

Yuhang Yang
Maode Ma
Editors

Proceedings of
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Conference on Green
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(GCN 2012): Volume 4

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 Springer

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Preface

Welcome to the *Proceedings of the 2nd International Conference on Green Communications and Networks (GCN 2012)*, which was held on December 12–14, 2012, in Chongqing, China.

GCN 2012 will be a venue for leading academic and industrial researchers to exchange their views, ideas, and research results on innovative technologies and sustainable solutions leading to green communications and networks. The conference will feature keynote speakers, a panel discussion, and paper presentations.

The objective of GCN 2012 is to facilitate an exchange of information on best practices for the latest research advances in the area of Green Communications and Networks, which mainly includes the intelligent control, or efficient management, or optimal design of access network infrastructures, home networks, terminal equipment, etc. GCN 2012 will provide a forum for engineers and scientists in academia, industry, and government to address the most innovative research and development including technical challenges, social and economic issues, and to present and discuss their ideas, results, work in progress, and experience on all aspects of advanced Green Communications and Networks engineering.

The GCN 2012 conference provided a forum for engineers and scientists in academia, industry, and government to address the most innovative research and development including technical challenges and social, legal, political, and economic issues, and to present and discuss their ideas, results, work in progress, and experience on all aspects of information computing and applications.

There was a very large number of paper submissions (1834). All submissions were reviewed by at least three Program or Technical Committee members or external reviewers. It was extremely difficult to select the presentations for the conference because there were so many excellent and interesting submissions. In order to allocate as many papers as possible and keep the high quality of the conference, we finally decided to accept 486 papers for presentations, reflecting a 26.5 % acceptance rate. We believe that all of these papers and topics not only provided novel ideas, new results, work in progress, and state-of-the-art techniques in this field, but also stimulated the future research activities in the area of information computing and applications.

The exciting program for this conference was the result of the hard and excellent work of many others, such as Program and Technical Committee members, External Reviewers and Publication Chairs under a very tight schedule. We are also grateful to the members of the Local Organizing Committee for supporting us in handling so many organizational tasks, and to the Keynote Speakers for accepting to come to the conference with enthusiasm. Last but not least, we hope you enjoy the conference program, and the beautiful attractions of Chongqing, China.

December 2012

Maode Ma
Yuhang Yang
General and Program Chairs
GCN 2012

Organization Committee

GCN 2012 was organized by Chongqing Normal University, BeiHang University, Peking University, and sponsored by the National Science Foundation of China, Shanghai Jiao Tong University, Nanyang Technological University. It was held in cooperation with *Lecture Notes in Electrical Engineering* (LNEE) of Springer.

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Part I
Information Security and Applications

Chapter 1

Research of Food and Medicine Brand Crisis Administration

Huan Cheng Gao

Abstract This paper defined the concept of brand crisis from the dissipative structure theory. It showed that brand crisis is a process and also the cause of enterprise evolution, which may not be good for the enterprise itself. Simultaneously, with the entropy and negentropy theory, the causes and ideas of brand crisis administration were examined. Moreover, the mechanism that brand crisis can promote the enterprise evolution was proposed. This paper is to introduce a brand-new understand to brand crisis and build a brand-new crisis concept, so as to improve the ability of crisis administration and adaptation.

Keywords Dissipative structure · Brand crisis · Enterprise evolution · Entropy · Negentropy

1.1 Introduction

The incidents drew the attention of all the society, such as the cantac “PPA” in 2000, Sanlu “melamine” in 2008, “pseudoephedrine” in 2009 and the cessation of “Qumei” in 2010, as well as the Shuanghui “clenbuterol hydrochloride” in 2011. Facing to these crises, the brand of Sanlu was worse and worse which finally tended to bankrupt [1]. The brand of Qumei is forbidden to sale in the market [2]. The Tianjin Smith Kline took measures in time to reduce the loss, but it was still influenced by the crisis. While the Topsun Science and Technology could change the crisis to the chance and finally turned defeat into victory. As the advertisement

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of Shuanghui said that it had 18 inspections and 18 assurances [3, 4]. However, when the crisis broke out, they did not work at all. Parts of its franchise stores are closed or transferred, some even chose to sale other meat brand, such as Yurun, Jinluo; and however, the fates of them are uncertain [5]. All these incidents initiate people to think about why there are different consequences facing to the same crisis and, what the brand crisis is, how it is formed and how the enterprise can administrate them.

1.2 Brand Crisis

The enterprise is an open system of multi-dimensions, multi-variations and multilayers. The normal operation of enterprise is influenced mutually by the internal and external environment. It cannot obtain good development unless it exchanges substance, information and power with the exterior.

Due to the interaction of internal and external factors, the enterprise total entropy is changed in the course of enterprise system operation. Then, with the nonlinear amplification, the reputation, value and property of the brand, as well as the trust and faithfulness of the public, are all changed, which form a state away from the balance and then initiate the eat and flow of enterprise.

As the definition said, brand crisis is a dynamic process, the results of which are uncertain. It may lead the enterprise to a bad or good direction. What's the brand crisis introduces is the fluctuation of enterprise. If the enterprise can treat and administrate the crisis reasonably, it may promote the evolution of enterprise.

1.3 Produce of Brand Crisis-Entropy Increase

1.3.1 Mathematic Model of Entropy

In a relatively closed system, there are so many factors that can lead to the increase of entropy, such as the imperfect policy, the collision between organization, the adaptive ability to the environment, the staff's quality and communication [6]. The entropy of enterprise facing to brand crisis can be described as follows:

$$S_1 = \sum_{i=1}^n K_i S_i \quad (1.1)$$

where i means the factor producing brand crisis, K_i means the weight of the factor and S_i means the entropy of each factor.

1.3.2 Principal Factor of Entropy Increase

There are many important factors that affect the entropy, such as policy system, enterprise policy, property right and management system. Moreover, the staffs are both the main part and the resources, whose quality and attitude will greatly influence the creation and maintenance of enterprise brands. The culture is also an important factor. Brand is the carrier of culture, while culture is the connotation of brand. In addition, the communication of information and the adaptive ability of enterprise are also the important factors.

The entropy can be increased on the effect of each factor by oneself. Actually, these factors will interact and interpenetrating between each other in the complex enterprise system, which is sure to produce more complex phenomenon and further accelerates the entropy increase. With the increase in entropy, the degree of chaos increases, turning the enterprise from an ordered state into an unordered one. It is the reasons for brand crisis and also the first stage of brand crisis.

1.4 Administration of Brand Crisis-Negentropy Increase

1.4.1 Mathematic Model of Negentropy

$$S_e = \sum_{j=1}^n K_j S_j \quad (1.2)$$

where j means the factor producing the negentropy, such as new and effective policy, new concept, new techniques, new structure, new knowledge, positive communication and innovation. K_j means the weight of each factor, and S_j means the negentropy.

1.4.2 Factors of Negentropy and Administration of Brand Crisis

1. Policy

With perfect strategies of brand development and sound crisis administration mechanism, it can make the negentropy of enterprise increase. Moreover, it can also introduce directivity and systematic to the enterprise so as to decrease the blindness of crisis administration.

2. Concept

Concept is the key factor of brand existence and also the center of brand protection. New concept can change the enterprise's value, update the marketing notion and build crisis sense, etc.

3. Innovation

Innovation means that the enterprise should introduce the new product, methods and markets to obtain new supply sources of materials or semi-manufacturing good and then realize a new organization. (Joseph Alois Schumpeter, 1912) Brand crisis results from the entropy increase caused by the old concept, policy, as well as the lagging techniques. Therefore, the enterprise cannot write off the entropy increase unless innovating in these aspects.

4. Information

Information represents the contribution to negentropy. The entropy decrease means the ordered degree increase. Therefore, it is the basic factor of brand crisis administration. While in order to play a role in the entropy decrease, communication is the crux. First, it should dredge the channel of communication and make sure that there are no holdbacks in the communications between enterprise and exterior, two layers of enterprise and each subsystem, so as to collect relevant information timely and correctly. Finally, it can make what is going on at higher levels known to lower or in turn and build the relationship between internal and external.

The communication includes two aspects: one is internal communication. When facing crisis, the enterprise should have a correct understanding of it, grasp correctly the development of crisis and carry out the administration work orderly. The other is external one. When the brand crisis breaks out, the enterprise should communicate with the consumers, the public and relevant groups deeply and sincerely so as to know what the key problem is and what they demand. The enterprise should meet their requirements as much as possible and offer some moral and material compensation to reach an amicable settlement with them. Finally, the crisis needs to be turned into an advantageous chance for the development of the enterprise.

5. Structure

The exchange of substance, information and power between enterprise and environment lies on the interaction between organizational factors and environment, such as task model, technological paradigm, organizational structure, work flow and enterprise system [1]. The iridescent organization leads to the entropy increase and the production of crisis. Therefore, if the enterprise wants to administrate the brand crisis well, it is necessary to divide the task, adjust the structure and build the work flow again. At present, people think that flat organizational structure, learning organization, decentralized model and specialization are the direction of organizational development as well as the most effective style

of enterprise management. Therefore, in order to administrate effectively, it can set up departments of brand and crisis administration and appoint relevant staff with decision-making authority of personnel, financial affairs and business. In a pinch, it can employ the social resources as the consultants to assist the administration. At the same time, it can also set up information center of the crisis administration, which can be accessed by the media and public at any time in 24 h.

During the operation of the enterprise, any factor mentioned above can play a role alone or interact between each other. It is the basis of the brand crisis administration and can increase the negentropy of enterprise, which means that the dissipation of chaos and the improvement of enterprise order. This is the second stage of brand crisis development.

1.5 Enterprise Evolution Mechanism with Promotion of Brand Crisis

When the brand crisis breaks out, entropy and negentropy play the role at the same time. According to the mathematic models of entropy and negentropy increase, we can get the total entropy of the enterprise as follows:

$$S = S_1 + S_e \quad (1.3)$$

where S means the total entropy, which is the sum of entropy S_1 and negentropy S_e . It is showed in the formula that there are three situations for the total entropy S .

1. $S > 0$, the negentropy increase cannot offset the entropy increase, which shows

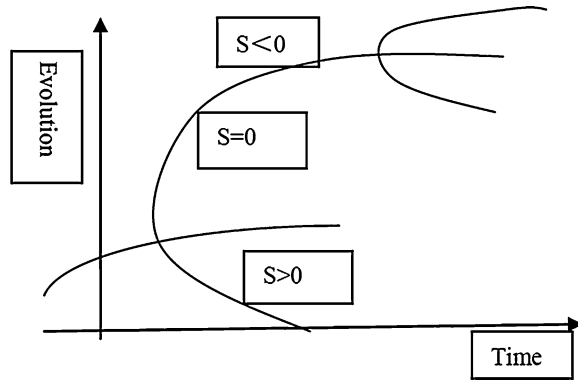
That the enterprise system is order less and lack of energy; therefore, the enterprise will be degenerated and even die out.

2. $S = 0$, there are two situations in this case. One is that the negentropy increase of the enterprise equals to the entropy increase, the evolutionary strength of enterprise system is not enough to turn the system into more advanced dissipative structure. The other is that the total entropy is zero, so is the negentropy, which shows that the enterprise is out of energy.

3. $S < 0$, the entropy increase is less than the negentropy, which shows that the enterprise is in order. With the dissipative effect, a self-organization will appear in the enterprise system, which will turn the ordered structure into more advanced one.

Therefore, it is when the negentropy absorbing from external environment is enough to offset the entropy increase in the internal system, the enterprise system can have a chance to evolve. The mechanism that brand crisis promotes the enterprise evolution is showed in Fig. 1.1.

Fig. 1.1 Enterprise evolution model



1.6 Conclusion

With the analysis mentioned above, we can know that entropy and dissipative structure are not only the reason for the formation of brand crisis, but also the instruction about the implementation of crisis administration. The innovation in this paper is that it defined the concept of brand crisis from the dissipative structure theory and studied the causes of brand crisis and the ideas of its administration. Moreover, two stages of brand crisis were proposed. The paper showed that brand crisis not only means the chaos, but also gestates the rebirth and evolution of enterprise. However, there are still some shortages in this paper, such as the models of entropy and negentropy are relatively simple and there are no demonstrations, which may be deepened and developed in the succeeding study.

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Chapter 2

On Business Model Innovation of Service Industry in Post-Crisis Era

Min Fang

Abstract The construction of business models has become the key factor to the success of service industry and service enterprises. Through explaining the connotation and formation mechanism of business models with economic and organizational theories, the paper applies the business model theories to the tourism industry and suggests a basic theoretical framework for the innovation of business models among tourism enterprises, which also serves as an conceptual analysis tool for Chinese local tourism enterprises' participation in international competition in post-financial-crisis era.

Keywords Tourism · Enterprises · Business · Models · Innovation

2.1 Introduction

Chinese modern tourism industry, starting under the background of globalization, has made huge progress within its 30 years developing history [1]. Tourism enterprises have transformed its task of participating in the international division of labor to the enhancement of international competition, in order that China, the great tourism country, will march toward the world tourism power.

In post-financial-crisis era, competition is not a one-dimensional comparison between products, technology, talent, marketing and system, but the competition of system models. The optimal model results in competitive while weak model leads to “passive, disorder and vicious competition.” Priority should be given to

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basic skills if the enterprises hope to go to the root of the problem [2]. Enterprises should implement the innovation and transition of business models, which will systematically upgrade the value creation ability.

The paper aims to establish a business model structural system for the tourism service enterprises, to analyze the formation mechanism of the business model, action mechanism and the evolution mechanism, to seek business model innovation methods and paths for the tourism service enterprise and to lay the foundation for further practice and perfection of the theoretical system among tourism service enterprises. The research significance is to provide an analysis means for tourism service enterprises during the practices of business models.

2.2 Reviews on Current Researches Home and Abroad

2.2.1 The Rise and Development of Business Model

Business model appeared first in academic circle in Accounting Review. However, it was not paid great attention by entrepreneurs, venture capitalists and managers until the end of last century to early this century, that is, with the rise of Internet.

Peter Drucker [3], the famous US managerialist defined Business Model as Business Theory in 1994. Dr. Michael Hammer defined Business Model as Operational Innovation in 2004 and believed operational innovation result in deep change of the enterprises. Dr. Hammer emphasized that operation innovation might appear to be strange or unattractive, but it is the only base for a lasting extraordinary achievement. Operation innovation is different from operation improvement and operation optimization. Operation innovation is a brand new method to accomplish tasks, to develop products, to provide customer service or to complete other enterprise operations.

Business model provides a brand new perspective of enterprise management. It pays attention to the description of the integrity and the systematicness of the enterprises, combining together the value creativity and value capture. It becomes an important component of the core competitiveness of enterprises.

2.2.2 Current Researches on Business Model

At present, researches on business model remain a frontier and hot topic as most related researches have been found during the past decade [4]. In foreign countries, relevant researches have extended from new and hi-tech enterprises to common enterprises. Chinese researches are still in the tracking stage.

According to the current literature, although researches have been done to the meaning, structure, the theory explain and model innovation mechanism of business model, a theoretic framework has not yet been built up due to the different perspectives of researchers. Overall, researches on business model still belong to the exploratory initial stage.

2.3 Connotation of Business Model

Any organization, whether for profit or non-profit, has an established target system to ensure its survival and development and measures for operation, in operation mode. For non-profit organizations, it is named as organizational activity model due to its non-profit survival and operational target. For profit organizations, it is named as organizational business model, which a challenge and feedback relationship existing between their operation modes and market competition.

In fact, organizational business model should at least meet two requirements. Firstly, organizational business model is a whole consisting of various components. It is a structure, not just a single factor. Secondly, there is internal connection between those components in an organizational business model, which makes them work in tandem with one and another to form a virtuous cycle.

In view of economics and organizational theory, the author holds that business model is a four-dimensional system structure consisting of customer interface, enterprise core strategy, strategic resources and the value network [5]. The four dimensions, closely contacted with each, supported each other; finally form a virtuous cycle with their combined efforts. Accordingly, business model innovation includes customer interface innovation, enterprise core strategic reform, strategic resources regaining and restructuring and the optimization of the value network, all of which belong to the technology innovation, management innovation, market innovation and system innovation. However, the innovation of a single dimension or a certain component is unlikely to constitute a business model innovation. Entrepreneurs will have to combine various components, to set up a new profit system and a new standard through competition so that the business model can be innovated, which is a systematic innovation of a combination of all kinds of traditional innovation (Fig. 2.1).

Business model innovation, based on the traditional system innovation and yet transcended beyond the traditional system innovation, establishes a new production function. The enterprise combines all sorts of resources, leading various factors of production and resources to new applications and production to new direction, which then creates new business, new technology, new sources of supply and new organization model for what Schumpeter claim of enterprise economic rent, namely “Schumpeter Rent”.

Schumpeter Rent comes from the innovation activities by entrepreneurs in the highly uncertain and complicated environment, which requires entrepreneurs to have “creative destruction” deliberately during innovation, and to reconstruct

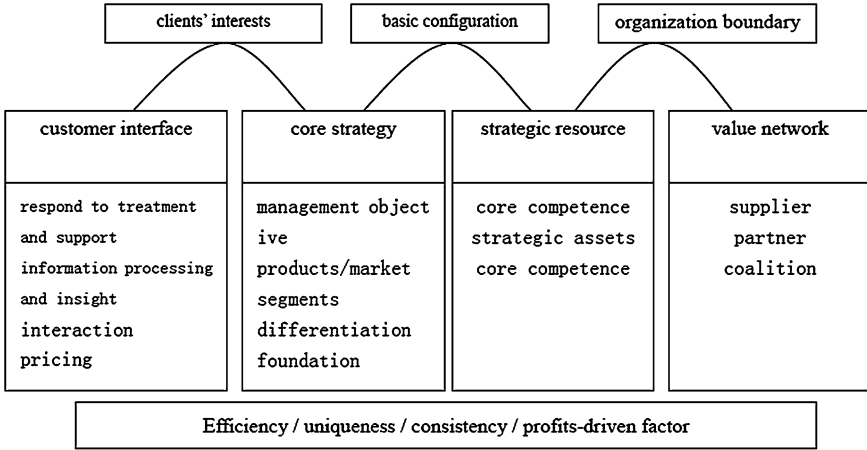


Fig. 2.1 Dimensions and elements of business models

resources and competence of the enterprises as a way to bring sustainable competitive advantages.

2.4 Key Points of Construction of Business Model for Tourism Service Enterprises

Along with the changes of development environment and management of tourism industry, entrepreneurs should constantly reconsider design and innovation of business models. This is the primary experience of how domestic tourism service enterprises improve their core competitive power. Overall, the business model of service industry is more complicated than manufacturing and retail business model. According to the characteristics of the tourism service enterprise, the key to the construction of tourism enterprises lies in the construction of core strategy and strategic resources construction, which, in more specific terms, is the construction of value-revenue management model, management model and operation model.

2.4.1 Connotations of Three Models

Value-revenue Management Model According to the difference of enterprise value among tourism service enterprise, the value-revenue management model can be divided into categories including the economies of scale operation model, scope economy (diversity) management model, rapid response operation model, the network economy operation model, brand economic (quality economic)

management model, polymerization (industrial cluster) economic management models, integration management models, standardization management models, characteristic service management model, cultural business models, etc.

Management Model Management model refers to the fulfillment of business model and strategic objectives of the enterprises through governance, organization structure and control system. Management model of tourism enterprises aims at reducing organization cost, improving management efficiency and realizing enterprise strategic goals indirectly.

Operation Model Operation model of tourism service enterprise segments service activities into different scales of service units or service modules. Here, the design of operation model refers to the Business Process Design, that is, Business Modeling of the tourism service enterprises. Process design of guest service in tourism service enterprise belongs to the product positioning and product design in the traditional business management.

2.4.2 Relationship Between the Three Models

Value-revenue management model, the theoretical guideline in conducting market behavior for tourism enterprises, is to work out mainly the value judgment and income management. Management model refers to the fulfillment of business model and strategic objectives of the enterprises through governance, organization structure and control system. Service model serves as not only basic operation and process of basic component of tourism enterprises, but the value foundation of leading service or service winning of enterprise management model. Tourism service enterprise, with the coordinate operation of value-revenue management model, management model and service model, is able to construct and operate its business model. Different selection and combination of various components of the three models results in most of the designs and structures of business models in the tourism service enterprises.

2.5 Construction of Business Model for Tourism Service Enterprises

2.5.1 Connotation of Business Model for Tourism Service Enterprises

Business model of tourism service enterprises is a strategic operation system combining value-revenue model, management model and service model. It is through the management principles, customized service, and management system and mechanism innovation to create enterprise advantage and to realize the value

enhancement. Among them, value-venue management model is essential to the value analysis and value shaping. It also determines management model and both can be realized through the service model of tourism enterprises. Tourism service enterprise, with the coordinate operation of value-revenue management model, management model and service model, is able to construct and operate its business model. In tourism enterprises, business model presents a consistency in logical form: the principles of value represented by value-venue management model and the execution efficiency required by management model shall be expressed and performed by service model.

A three-dimensional space analysis diagram as showed below may define the connotation and logical relationship of the above business model of tourism enterprises. It explains the logically cause and effect relationship and deduction connection of operation, management and service in its business model of logic of tourism enterprises (Fig. 2.2).

The value-venue management model, management model and service model synchronize in terms of time and space of organizational operation. Customized service, management model and business principles in the hotel business model present, in logical form, a connection of “symbiotic and synchronized” (Fig. 2.3).

Fig. 2.2 Special analysis diagram of the three components for tourism enterprises business model

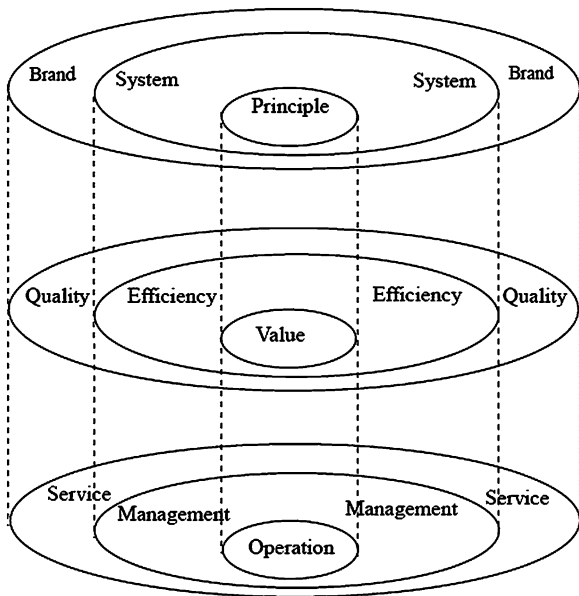
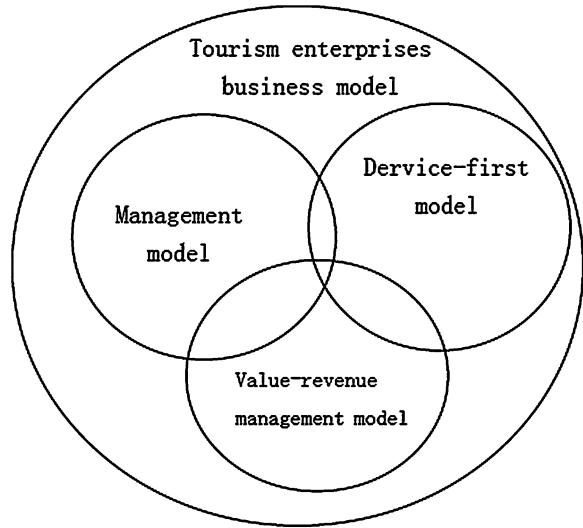


Fig. 2.3 Logical relationship diagram for tourism enterprises business model



2.5.2 Construction of Business Model for Tourism Enterprises Based on CBM

IBM Business Value Research Institute, based on the following theoretical researches, develops, Component Business Model (CBM). External specialization of enterprise affects the cooperation, exchange among enterprises and the interaction of the network and channel, which changed the entire industry's ecological environment, results in the cooperation between competitors by providing services and solutions to customers. Internal specialization is the ultimate stage of the development of enterprise—enterprises will be organized by networked business module. The operation of enterprise is the interaction of a series of discrete, modeling of modules within the enterprise and with other enterprises.

CBM provides a useful way to the specialization of tourism enterprises both internally and externally. It helps, internally, component of business model based on own assets and ability, to rethink what level they can reach. From the outside, components of business model can help the enterprise fulfill its own characteristics by taking advantage of resources. CBM can help enterprise to evaluate the objectives and strategies, to use of internal and external specialized advantage in the premise of not increasing complexity, and to promote the expansion of the organization, while at the same time, reduce the risk, improve the productivity, control cost, improve efficiency and foresee the financial issues. Figure 2.4 shows the steps to form the business model for tourism enterprises based on CBM (Fig. 2.4).

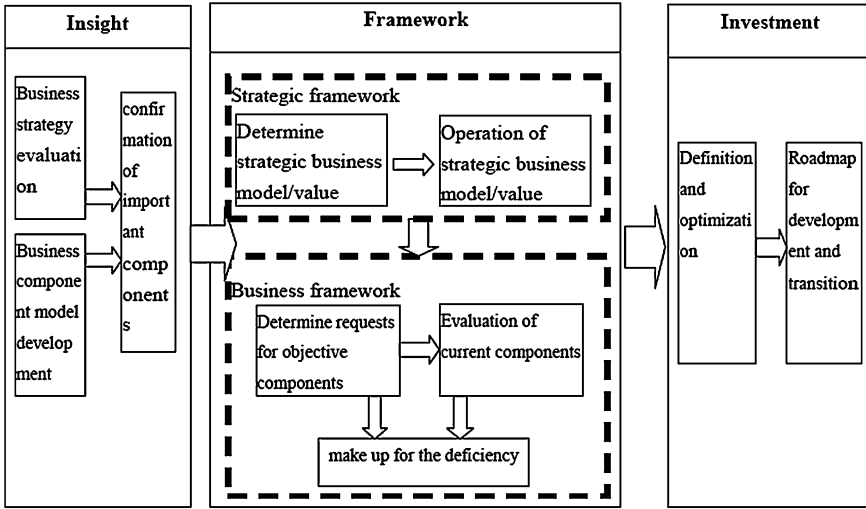


Fig. 2.4 Steps to form the business model for tourism enterprises based on CBM

2.6 Conclusion

As China marches toward world tourism power, the academic circle has showed great interests in the theoretical research of the framework of business model for tourism enterprises. The paper aims at providing a conceptual analysis tool for the innovation of business models of tourism enterprises through a study on the structural and internal logic of the business model. Moreover, at the same time, the paper provides a theoretical framework for designs and innovation of business models as well, which can highlight on the execution of tourism enterprises. Thus, it can help tourism enterprises, from a strategic perspective, to focus on the connection of business mix and the integrity of operation structure rather than value elements, resources and ability.

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Chapter 3

Uncertainty Reasoning in Education Evaluation Forecast

Bo Wu and Tuo Ji

Abstract Education Evaluation is an important area of educational research, is an important part of educational activities. By the limit of Education methods and educational resources, it is difficult to forecast the results of Education Evaluation. Uncertain reasoning is often used not strict enough, but the reasoning results consistent with the intuition of human experts, the probability can also be given some explanation. Uncertainty reasoning method is often used subjective bayesian approach. Using subjective bayesian approach, it can achieve some forecast Education Evaluation, such as forecast of individual learning, class examination pass rate of Forewarning Analysis, etc.

Keywords Uncertain reasoning · Subjective bayesian approach · Education evaluation forecast

3.1 Introduction

In education activities, we often use examinations for education evaluation. For the limit of education method and education resources [1, 2], it is very hard to intersperse the education activities with exams. Therefore, it is difficult to predict the results of the examination; it means that it is difficult to forecast the results of

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Education Evaluation. In this paper, we will take the university curriculum teaching activities as an example, and forecast the results of Education Evaluation. The basic idea is that by using the factors of affecting the examination results [3], such as Midterm data etc., reason for the final exam, and make predictions on the final examination. In the reasoning process, uncertainty reasoning method will be used to predict Education Evaluation.

3.2 Uncertainty Reasoning Method Introduction

Because of the imprecise and incomplete information, analysis and prediction system often have to deal with a lot of uncertainty, reasoning is often used in uncertain reasoning methods of non-standard logic. Uncertainty comes from the knowledge of objective reality and subjective knowledge level of awareness. Uncertain reasoning is often used not stringent enough, but the reasoning results consistent with the intuition of human experts, it can also be given some explanation by the probability.

Uncertainty comes from the knowledge of objective reality and subjective knowledge level of awareness. In the thinking process, uncertainty is often the emergence of a state of mind. Uncertainty reasoning method is proposed and researched from 70s of last century. Uncertain reasoning is often used not strict enough, but the reasoning results consistent with the intuition of human experts, the probability can also be given some explanation.

Uncertain problem model must explain the representation, Computing and semantics of uncertain knowledge. Expressed refers to the description of the uncertainty of the methods adopted, which is a key step to solve uncertain reasoning. Calculation mainly refers to the spread and updates of the uncertainty. Calculation of the uncertainty mainly refers to the spread and updates. Semantic refers to the representation and calculation of what is meant, that is, to interpret them.

3.3 Forecast of Individual Learning

“ACCESS programming” is a required course for non-computer majors [4]. Statistics from the historical examination of the course final exam pass rate was 85 %, that is, the prior probability of failing was 0.15. Analysis by the teacher of teaching the course, there may be events $A_1 \dots A_{20}$ (listed in Table 3.1 in the evidence column) have an impact on the event B (failed the exam). The introduction of each of the two measurements of evidence A LN and LN are defined as follows:

Table 3.1 Student A’s individual learning forecast

Evidence		LS	NS	Fit	O(B)	P(B)
A1	Midterm grades <60	1.95	1	1	0.176	0.150
A2	Non-English languages	2.48	1	0	0.344	0.256
A3	Midterm grades >80	0.75	1	0	0.344	0.256
A4	60 <= Midterm <= 80	1.20	1	0	0.344	0.256
A5	First-year students	1.17	1	0	0.344	0.256
A6	Sophomore	1.07	1	1	0.344	0.256
A7	Three students	1.09	1	0	0.368	0.269
A8	Fourth grade students	1.95	1	0	0.442	0.306
A9	Extension students	1.10	1	0	0.442	0.306
A10	Rehabilitation of student	1.85	1	0	0.442	0.306
A11	Girls	0.99	1	1	0.442	0.306
A12	Retaking students	1.02	1	0	0.437	0.304
A13	Liberal arts students	1.15	1	1	0.437	0.304
A14	Elective students	1.46	1	0	0.503	0.335
A15	Prerequisite failed	1.69	1	0	0.503	0.335
A16	Job situation is not good	1.81	1	1	0.503	0.335
A17	Attendance frequency <60 %	1.55	1	1	0.911	0.477
A18	Minority	1.00	1	0	1.411	0.585
A19	Student leaders	0.99	1	1	1.411	0.585
A20	Sports specialty students	1.55	1	0	1.397	0.583
Probability		–	–	–	–	58.3 %

Sufficiency measurement LS reflect the emergence of A to support B:

$$LS = \frac{P(A|B)}{P(A|\neg B)}, \text{ when } LS > 1, \text{ that the emergence of A supports B;}$$

Necessity measure LN reflects the nonoccurrence of A to support B:

$$LN = \frac{P(\neg A|B)}{P(\neg A|\neg B)}, \text{ when } LN = 1, \text{ that the nonoccurrence of A do not impact B;}$$

LS value for each evidence obtained by the statistical or historical data given by the experts, and LN values is set to 1 is based on the considerations: some evidence does not appear, will not affect the results. Establish probability function:

$$O(X) = \frac{P(X)}{1 - P(X)}, \text{ the } P(X) \text{ of the } [0, 1] \text{ to zoom into values in } [0, \infty] \text{ of } O(x).$$

Is not difficult to verify:

$$O(B|A) = LS \cdot O(B)$$

$$O(B|\neg A) = LN \cdot O(B)$$

Existing student A, the basic conditions listed in Table 3.1 an evidence of the “fit” column value is 1 indicates that the evidence occurred. When there is evidence A1, A2, ..., AK inevitable, calculate the probability P(B) of his failed a final exam of change. By the rules subjective bayesian approach of reasoning:

1. From $P(B) = 0.15$, known

$$O(B) = 0.1765$$

2. $O(B|A1) = LS \cdot O(B) = 1.95 \cdot 0.1765 = 0.430$

$$P(B|A1) = 0.301$$

3. $O(B|A1A2) = LS \cdot O(B|A1) = 2.68 \cdot 0.430 = 1.153$

$$P(B|A1A2) = 0.536$$

4. Similarly can be drawn from:

$$O(B|A1 \cap A2 \cap \dots \cap AK) = \prod_{i=1}^k \frac{O(B|Ai)}{O(B)} \cdot O(B) = 33.992$$

By $P(B) = \frac{O(B)}{1 - O(B)}$, student A's probability of failed the final exam is 58.3 %.

3.4 Class Examination Pass Rate of Forewarning Analysis

As indicated above, the course "ACCESS programming" final exam pass rate was 85 % [5, 6]. By analyzing the historical examination of the course data, and summarize the proportion (A') of class A, all kinds of situations are listed in Table 3.2. Now we use the uncertainty reasoning forecast the final examination of class a pass rate:

First calculated evidence "midterm grades < 60" ($A1$) this index. From the historical data analysis, LS value of "midterm grades < 60" is 1.95. For the group of "midterm grades < 60" their final exam the probability $P(B|A1)$ can be calculated by the following:

$$O(B) = \frac{0.15}{1 - 0.15} = 0.1765$$

$$O(B|A1) = LS \cdot O(B) = 1.95 \cdot 0.1765 = 0.344$$

$$P(B) = \frac{0.4302}{1 + 0.4302} = 0.256$$

This means that 25.6 % of the "midterm grades < 60" ($A1$) students will not pass the final exam. But how to analyze the class A, 35 % in the "midterm grades < 60" probability of occurrence, its final exam on how much influence it? Accordance with the subjective Bayesian approach, use the following derivation, obtained by the interpolation figure.

Table 3.2 The proportion of the class situation of the various data

Evidence	LS	NS	Historical statistics (Probability) (%)	Case A' of class A (%)
A1 Midterm grades <60	1.95	1	29	35
A2 Non-English languages	2.48	1	4	20
A3 Midterm grades >80	0.75	1	8	7
A4 60 ≤ midterm ≤ 80	1.20	1	63	58
A5 First-year students	1.17	1	10	8
A6 Sophomore	1.07	1	62	47
A7 Three students	1.09	1	12	12
A8 Fourth grade students	1.95	1	3	25
A9 Extension students	1.10	1	13	8
A10 Rehabilitation of student	1.85	1	45	42
A11 Girls	0.99	1	50	54
A12 Retaking students	1.02	1	40	45
A13 Liberal arts students	1.15	1	10	13
A14 Elective students	1.46	1	14	15
A15 Prerequisite failed	1.69	1	15	18
A16 Job situation is not good	1.81	1	9	10
A17 Attendance frequency <60 %	1.55	1	14	21
A18 Minority	1.00	1	15	18
A19 Student leaders	0.99	1	7	10
A20 Sports specialty students	1.55	1	1	2

1. By condition, $P(A1|A1') = 0.35$

2. If $P(A1 | A1') = 1$, then

$$P(B|A1) = \frac{LS \cdot P(B)}{(LS - 1) \cdot P(B) + 1} = \frac{1.95 \cdot 0.15}{(1.95 - 1) \cdot 0.15 + 1} = 0.256$$

3. The known $P(A1 | A1') = P(A1) = 0.29$, with $P(B) = 0.15$. Interpolation Figure (Fig. 3.1) can be obtained:

$$P(B|A') = 0.15 + \left(\frac{0.256 - 0.15}{1 - 0.29} \right) \cdot (0.35 - 0.29) = 0.159$$

4. For Class A, from the (3) the derivation can draw: the ratio of “Midterm grades < 60” makes the probability of failure rate rose to 0.159. With this results update “midterm grades < 60” LS' values:

$$LS' = \frac{P(B|A1')}{P(B|A1)} = \frac{0.159}{0.15} = 1.060$$

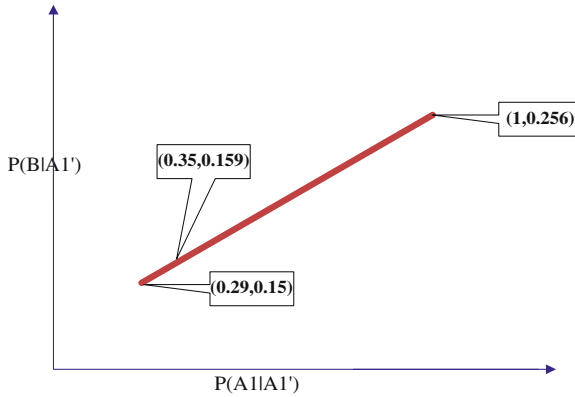


Fig. 3.1 Calculation of $P(B|A1')$ of the interpolation figure

Table 3.3 Class A of the final examination pass rate

Evidence	LS'	NS	O(B)	P(B)	
A1	Midterm grades <60	1.060	1	0.187	0.158
A2	Non-English languages	1.169	1	0.219	0.179
A3	Midterm grades >80	1.002	1	0.219	0.180
A4	$60 \leq \text{midterm} \leq 80$	0.979	1	0.214	0.177
A5	First-year students	0.997	1	0.214	0.176
A6	Sophomore	0.978	1	0.209	0.173
A7	Three students	1.000	1	0.209	0.173
A8	Fourth grade students	1.153	1	0.241	0.194
A9	Extension students	0.995	1	0.240	0.193
A10	Rehabilitation of student	0.968	1	0.232	0.188
A11	Girls	0.999	1	0.232	0.188
A12	Retaking students	1.001	1	0.232	0.188
A13	Liberal arts students	1.004	1	0.233	0.189
A14	Elective students	1.004	1	0.234	0.190
A15	Prerequisite failed	1.017	1	0.238	0.192
A16	Job situation is not good	1.006	1	0.240	0.193
A17	Attendance frequency <60 %	1.033	1	0.247	0.198
A18	Minority	1.000	1	0.247	0.198
A19	Student Leaders	1.000	1	0.247	0.198
A20	Sports specialty students	1.004	1	0.248	0.199
Probability	-	-	-	-	19.9 %

Similarly, get LS' value of A2, A3, ..., A20 in the list as shown in Table 3.3.

Derived from the above know, forecast the class A of final examination failure rate was 19.9 %.

3.5 Summary

Education Evaluation is an important area of educational research; it needs to study the problem of so many factors involved. Education Evaluation mode are also different. In this paper, from the perspective of uncertain reasoning, we propose the thought of the realization for Education Evaluation Forecast.

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Chapter 4

Research on College Students' Safe Educational System

Shao-rang Wang and Xiao-yun Xu

Abstract Safe education is important in construction of safe campus, as well as a part of students' education for all-round development and it has vital meanings in keeping campus safety and stable and fulfilling students' development. Through analyzing the current safe education, we take a further study in its model and strategy, and make its revolution and practice more effective.

Keywords College student · Safe education · Strategy

4.1 Introduction

College Students' Safe Education is that based on our country's law and policy administrators and educators, for our country's safety, social harmony and students' development, focus on one's duties, awareness and skills and knowledge about safety. Through go-to-school education, courses and many other ways, college students can strengthen their safe awareness and master skills about safety systematically in order to adapt to college life and get prepared for entering society.

In 1992, Rules on Students' Safe Education and Management in Ordinary Institutions of Higher Learning has been carried out, which requires schools to list safe education into institutions' daily schedule and strengthen the ability of leading.

All the departments, communities and organizations should work together, try hard to conduct safe education and then improve safe knowledge, which will strengthen students' safe awareness and form their defensive ability.

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But with the further reforming and development of higher education, when focusing on enlarging its scale, Institutions of Higher Learning often ignore safe educational work. As fierce competition, intense job-hunting and other new problems rising, safe education should be required more. How to adopt effective teaching measures is a thorny problem to current safe education.

4.2 Current Situation of College Students' Safe Education

Different colleges attach importance of different levels on safe education, which mainly focuses on freshmen.

4.2.1 Imbalance Development of Safe Educational

Safe education in different universities develops differently, and there is a big gap among their researching levels. Local governments and departments attach importance of different levels on safe education. For example, Beijing and Shanghai pay more attention on safe education. But the majority of universities concentrate on enlarging their scale and development of comprehensive universities rather than safe education. And they think safety of campus is the duty of security department. Safe education of college students develops slowly generally on the whole.

4.2.2 Safe Education with Different Models

There are various safe Educational models, as well as various effects. Advanced teaching models can make students' visual sense be stimulated, and students will accept teaching contents more easily. However, some universities still use glass billboards and other old and ineffective way to propaganda.

4.2.3 Incomplete Requirements of Safe Educational

Though Rules on Students' Safe Education and Management in Ordinary Institutions of Higher Learning has been carried out in 1992, there is no specific rule on safe education. Thus universities have different requirements, which results in different effects. Some universities begin to enforce safe educational academic credits system, and put forward that safe education should be regarded as compulsory courses. But some universities often attach importance to safe stability rather than safe education, and safe education is just a part of go-to-school education, which can not realize its inner meanings.

4.2.4 Safe Educational Contents Need to be Improved

Currently, the majority of safe educational contents is not perfect. And the content is just involved in life safety, property safety and other typical cases, but little in defensive skills and abilities. Based on the researching report of safe education of 30 colleges and universities, there are only 48 % colleges and universities establishing courses about safe education, 36 % developing activities like safe defensive training, which forms a huge gap with its necessity up to 92 % and self defensive courses that should be established up to 100 % [1].

4.3 Necessities and Urgency About Current College Students' Safe

According to the survey, 80 % cases including property loss, fire emergencies in dorms and labs and being defrauded result from students' weak awareness of protection or the lack of knowledge about safety, unlocking the dorm door, occupying seats in the canteen, libraries and those public places, regarding one's birthday as card code can be found in every college and university. And they also cannot use fire tools correctly.

The number of being probed is up to 1,200 and involved in each grade, which is mainly about national safety, life safety, fire safety, internet safety and mental health and so on. Besides, the researching report shows that the following issues are still serious.

4.3.1 Lack of Safe Knowledge

Students in elementary and junior high schools mainly study knowledge of each subject, and lack knowledge and education about safety in their process of learning. When students are asked whether they can use fire extinguishers correctly, 37.3 % answer "Yes", and 24.4 % "No", which is because the majority haven't accepted such training and education?

4.3.2 Weak Awareness of Protection

College students' awareness of protection is very weak. And locking the door can define their weak awareness of protection. On answering the question "Do you lock the door before you fall asleep", 81 % said they will, but 11.7 % said sometimes, and 7 % said they won't often. Unlocking the door is green passage to thieves.

4.3.3 Lack of Cognition About Laws and Regulations

Take MLM for example. 41 % students choose “Clear”, 50 % students know a little and 9 % students even know nothing. When students take part-time jobs or choose a job, they may be cheated, especially today’s intense job employment. If they do not strengthen their legal awareness, they will be easily cheated by MLM.

4.3.4 Weak Awareness of Psychological Aid

The survey shows that the majority of college students can have complete awareness of psychological aid. They believe having psychological problems is like catching cold, and both need immediate precautions and treatments. Most students will obtain some information about psychological health through magazines, the internet and other possible means. But at the same time, if one realizes he has psychological problems, 80 % will choose self-adjustment, only 3.9 % will go to the hospital for help, 4.2 % will consult psychological organizations and 18.8 % will ask relatives and friends for help. This result shows students with psychological problems are unwilling to treat them as catching cold, and it also reflects that they will conceal their psychological problems. With the rapid growth of only one child, change of their living surroundings and increase of social stress, psychological problems among college students are rising, too. What’s worse, they can’t differ mood problems, psychological problems from psychological diseases, which will lead to more serious psychological diseases [2, 3].

All the above cases show that college students’ current safe situations cannot be ignored. For the lack of safe education and learning, colleges should attach more importance to how to carry out safe education systematically and adopt effective teaching models in order to promote students’ safe knowledge and master safe defensive skills, which should be solved immediately.

4.4 Exploration on Safe Educational Model

Through analyzing the current safe educational situation and students’ safe situation, traditional teaching models and safe education that requires to be strengthened contradict each other. So, authorities should explore the revolutionary direction of safe education and practical ways. Through revolution of teaching contents and teaching models, they can promote safe educational academic credits, accomplishing safe skills with field drill system and building stereoscopic educational internet.

4.4.1 Promoting Safe Educational Academic Credits

Safe education should be contained in the regular teaching plan, and regard it as a compulsory course throughout four academic years. Putting safe educational academic credits into practice not only urge college authorities to attach more importance but also lead students to study themselves, form a good learning environment and improve the construction of safe campus. Knowledge about safety includes regular knowledge, legal knowledge and especially legal knowledge of internet. It is reported that a student in Beijing who spread more than 200 illegal pictures on the internet was put into prison for 10 years. And many college students cannot convince themselves that spreading pictures will cause punishment.

4.4.2 Accomplishing Safe Skills with Field Drill System

There will be flood prevention, fire prevention and wind prevention per term in some elementary and junior high schools; some open courses that help girls learn special skills to cope with sexual offenders. Safe skills will contain flood prevention, wind prevention and drunk aids. Besides, students can use some self-defensive skills [4] when facing dangers.

4.4.3 Ensuring Teaching Quality with Qualified Staff

Teacher staff can make sure that safe education will be carried out successfully. There are two-course teacher, law teacher, psychological teacher, political teacher, PE teacher and security teacher, who can teach students theoretical knowledge and self-defensive skills to meet students' need of safe education. Of course, to realize these goals needs much importance and human resources.

4.4.4 Building Educational Network

Internet life, an important part of college life should take effect on education. Building safe educational practical base on the internet can make it easy for students to get information. Besides, typical cases will be attached more importance and also can be made into videos for downloading.

To sum up, the revolution and practice of safe education is the key to the development of colleges. And we also should combine the principle of "safety should be placed at the first place and precaution is the core" with the teaching

theory of “educating in the first and people-oriented is the nature. Safe quality should be seen as the important part of college students’ quality”, and then fulfill our all-round development and form harmonious society.

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Chapter 5

Study on E-Government Information Security Management

Haicheng Zhang

Abstract According to the local government in e-government information security management existing of the problems, this paper draw lessons from foreign advanced experience foundation, from the security technology, security management, security team, and security legislation this four respects put forward some improvement countermeasures. These four aspects of ceaseless and outspread, development, will be for e-government information security management to provide a strong guarantee, Form of high-tech information technology as the core, with strict management organization, management system as the foundation, On the high level talented person troop to rely on, with the perfect legal laws and regulations for the protection of the four in one of the safety management mechanism.

Keywords Local government • E-government • Information security • Management • Countermeasures

5.1 Introduction

Along with the development of information technology, information security connotation also is in ceaseless evolution, China's e-government information security is still at the primary stage. E-government information security refers to government data or information in receiving, produce, processing, distribution, archive, including information lifecycle was stolen, tampering, including system information from threats and attacks, the security of information system,

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information security and information content security; In particular range of the social environment and established such condition, the information system, network technology and national security factors constitute the relevance of the national security of a kind of trend. The situation described the country from network accidental incident or malicious threat information security ability and information means to safeguard national security capability.

5.2 Construction Safety Technical Support

5.2.1 Guarantee Computer Physical Security

E-government information security management we must first ensure that the computer entity security, computer physical security for effective implementation of e-government the most basic security, Should pay attention to the security of computer system, the use of safe authentication level high operating system. In the maintenance of the operating system itself stable foundation, still should through the access control to check security vulnerabilities. Access that access control, such as reading, writing, modify, executive must be established the limits of the file. To strengthen the system running environment of technical support, completes the disaster prevention and disaster tolerance work.

5.2.2 Strengthening Software System Security

Software system itself inherent defect, the local government of the electronic government affairs information security threat was great. In view of this situation, the use of advanced reliable safety technology is the maintenance e-government information safe powerful guarantee. Computer software system of the security administration basically has the following four aspects:

1. Ensure complete software system security. Prevent software the plug in lost, damaged, modify, forge, the specific contents of the management system software about choice and development program, software security testing, system vulnerability scanning, testing and maintenance, system software users encryption, dynamic tracking, etc.
2. Ensure that the software storage secure. It main have confidentiality storage, compression storage, important data information backup, computer operating system recovery in such aspects as security.
3. Ensure the software network communication security. It main have software transmission, encryption software transmission, software security software users to download, identification, audit and tracking aspects of content.

4. Ensure the normal use security of software. Main have legitimate reasonable use, the user of the safety management, scientific whether grant access, system into the limit, prevention software abuse, stop stealing data, unauthorized copying, etc.

5.2.3 Strengthening Software System Security Emergency Management System

Emergency response refers to when the computer or network system security events occur, such as hacker attacks, Trojans malicious implant, the virus, can make the emergency judgment and rapid relief and recovery service. So, the urgent task is to establish the local emergency treatment system, and make corresponding control measures. The local government can set up information safety emergency response center, the establishment of early warning and emergency treatment technology platform, and to further improve the security incident found and analysis ability. By inhibiting strategy, to limit the potential loss and damage From technological gradually realize the early warning, disposal, found, various links and different about the network, system, and department of linkage system between the emergency treatment. Fully mobilize all positive factors, to establish and perfect the local e-government information security emergency management system [1].

5.2.4 Support Independent Information Security Technology and Products

Information security technology and product localization is to guarantee the safety of the electronic government affairs information at all. Information security technology, products subject to other countries in the interests of national security is great threat. According to information security technology and product development application, in our province need to formulate the related industrial support policy, intensify the independent technical products in the capital and technology of devotion, Strengthen the core technology of scientific research and the ability of independent innovation. Development of autonomous special chip, independent embedded operating system and independent password products technology, to ensure that government key departments of the information system security.

In the following three aspects of the technology breakthrough in focus: One is such as the password techniques, identification technology, virus defense technology, and intrusion detection technology equivalent of type, the key technology of daily contact; Two is such as network reconnaissance technology, information monitoring technology, risk management technology, the test evaluation

technology equivalent of type, can produce the effect of breakthrough innovative technology; Three is the operating system, such as key chip and security processor equivalent type, can have a decisive impact on the results of strategic technology. In addition, even will technology and system of the integrated into a necessary height, so as to ensure the reliable operation of e-government information system.

5.3 Make Safety Management Strategy

The electronic government affair that is the core of government affairs, the electronic government affairs is for support and service. Although the security technology and product development and breakthrough to solve the technical problems of e-government information security, but in order to realize the information security of e-government is also required in government management application efforts. Therefore, management has become the important basis of information security; management is the soul of information security. The local government should establish and perfect the security management mechanism, make the technology and management means cooperate with each other, in order to produce safety benefits.

5.3.1 Establish Security Management System

To implement the accurate information security evaluation to evaluate the system security is to establish electronic government information system before the necessary work. The system to determine to take security measures before, also need to make sure the system network type, encryption measures, the security of the system needs technical level and equipment, the safety degree of information on the Internet, the system of potential threat, etc.

The information security standards and meticulous, this includes participation system various items, personnel, information security.

To the electronic government affairs system construction and operation safety audit, and the acceptance ensures that security assessment the authentication, carry out on the introduction of the security policy and measures.

5.3.2 Improve Safety Management Mechanism

Local government departments arranged in a crisscross pattern, and lack of coordination and cooperation, information degree is not high, which increased the network information resources supervision and regulation of the difficulty.

Therefore, it is necessary to set up a unified, specialized management institution, to strengthen the management of network information resources.

1. As soon as possible to establish national, responsible for organization and coordination of national security, public security, confidentiality and other functional departments in the construction of information division, guidance information security of e-government development work of information security special management institution. Only in this way, each local government departments, enterprises and individuals to network information activities can be effective supervision, in order to ensure the reliability of information and health, the user's interests to get cogent protection.
2. Should establish a department, the system of specialized organization and leadership management institutions, clear leadership and working personnel responsibility, Be responsible for making management post responsibility system and internal information resources use system, strictly internal security management mechanism, and to destroy the electronic government affairs information security investigation and handling of the incident, ensure the safety of network information, Ensure users to the normal use of the network information resources, prevent internal user use a network to undertake various kinds of illegal activities and external users of this website illegal access.
3. Attention to "network police" on surveillance, attack network crime activity in a major role, improve the organizational construction.

5.3.3 Strict Internal Personnel Supervision

Some government internal staff, especially the e-government network operators to master password, know the e-government system structure and operation mode, they use these conditions for network intentional or unintentional damage. Therefore, the internal security also should give enough attention, and from the perfect management degrees on guard prevention [2].

Develop and implement safety management system. Specified strata and the main leader of the branch are as the information security for the first responsibility person. Expressly appointed the safety technology department head or competent as directly responsible or as of information security work held directly responsible, and is responsible for monitoring network technical management personnel and the actual operation personnel.

5.4 Strengthen the Team Quality Construction

Engaged in the electronic government affairs information safety work of the staff team construction is the important link of the safety management, especially the

electronic government affairs information security management of the main department staff, in electronic government affair safety management plays an important role. So, to staff orientation education, incentive system, orientation and all aspects of the management skills and reasonable design man-machine interface, etc., to e-government information security management has very big effect.

5.4.1 Improve Staff Confidential Consciousness

Confidentiality awareness increasing first need to have the guarantee system, need to set up the special security organization, from staff responsible for perfect confidential training and the responsibility system. And to strengthen organization and leadership, requirement leaders personally review, help decide to solve the problems at work. Also to strengthen the propaganda of knowledge education and confidential the popularity of the implement the relevant laws and regulations, especially for province above all cadres knowledge training on the educational basis, to enable staff to the current e-government information security work faces grim challenge to have a clear understanding, and thus keep highly vigilant, Consolidate the security line of thought, make information security awareness and thorough popular feeling, ensure the effective combination of civil air defense and system, in the ideological recognition on voluntary secrecy work well.

5.4.2 Pays Attention to the Cultivation of the Talented Person

The E-government of health development is inseparable from the personnel information support, especially know both information technology and understand the government business process technology refined type, application talents. Therefore, it is necessary for e-government construction of the need for personnel training and reserves. First of all, my province should strengthen the training of inputs and strength, Secondly, can adopt the “going out, bringing in” approach, the introduction and employ a number of information technology research and development, application, management of high-quality personnel.

5.4.3 Establish Stable Learning Training Mechanism

In training rules and systems, staff to cope with the different layer training exercise, For government decision makers, notice to update its original safety concept

and knowledge, in reform work innovation, so as to meet the needs of the technology development. For the competent business training, so as to improve its business level and skills as the core, comprehensive training of high-quality talents enables it to achieve business and technology of flexible unity, eventually the electronic government affairs information security management of high level talented person [3]. And for practical operation personnel, should focus on training the actual operation of the application skills up, Through the training to master the practical operation regulations, can through the electronic government affairs system to collect, release and skilled processing information. In summary, the stratified more forms of training exercise, and strive to improve its to be engaged in the electronic government affairs information security management personnel's capacity to ensure the e-government information operation safety and health development [4].

5.5 Perfect Law, Strictly Enforce the Law

The law is the system guarantee of the information security, and is the electronic government affairs orderly operation of the basic force. On one hand, it is a means of prevention; on the other hand, it also is known for its compelling force as the backing, to information network security and builds a last line of defense. The use of the power law to adjust the information activities of the various social relations, norms and constraints of main network information behavior, is the solution of e-government information resources sharing in the important way of the problem. Although my province already developed some on information security management regulations, but the overall is still in the initial stage, we should speed up the relevant laws and regulations, the early establishment of information security the system of laws and regulations.

5.5.1 Establish Scientific Concept of Legal Protection

In order to make our province can adapt to the society of policy and law existing reality and demand, need to set up the legal construction of the security and promote the information development in our province, legal system construction for the social information development to provide comprehensive service the guiding thought, Fixed the traditional legislation idea, from the thorough reform of our province traditional economic system and safeguard mechanism, to change the backward adjusting method, The information security of the legal system focus from simply "standard", "control" transferred to the construction and development of the information "remove barriers" up, to standardize development to a security development, Promote development by security development, promote the development of information building in our province social environment, to

form suitable for e-government information security actual need of rule of law culture [5].

5.5.2 Perfect Execute the Law Supervisory Mechanism

The establishment of information security laws and regulations at the same time, also should increase execute the law strength, execute the law strictly, raise the level of law enforcement, For a variety of crimes should be strictly investigated, absolutely not appeasement, For a variety of hidden trouble to try in time to prevent and stop, ensure that all laws and regulations to implement. At the same time, the information security work in the advanced units and individuals are encouraged, and gradually form a mechanism, fulfill real point. Only in this way, make the information security work benign development, advance ceaselessly. If found there somewhere down the system, the unit also should be adjusted to solve.

5.6 Conclusion

At present, the local government e-government information safety management exist many problems and the insufficiency, this is clearly not adapt to the electronic government affairs service government and the need of the society. Also it is difficult to satisfy the country to information security basic requirement. For the local government e-government information security faced with the problem analysis, we can see that pay full attention to local government e-government information security management has come to the point of it, How to take effective measures means there will be the safe hidden trouble to lowest which is the government affairs department to solve the problems.

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Chapter 6

Bayesian System Reliability Assessment Under Uncertain Environment

Lu Jin and Huanbin Liu

Abstract The Bayesian system reliability assessment under uncertain environments is proposed in this paper. In order to apply the Bayesian approach, the uncertain parameters are assumed as uncertain random variables with uncertain prior distributions. Then the traditional Bayesian estimation method and uncertain set theory are combined to the reliability of the system which is uncertain Bayesian point estimates.

Keywords Bayes point estimators · Uncertain set theory · Reliability · Uncertain random variables

6.1 Introduction

Some information and knowledge are usually represented by human language like “about 100 km,” “approximately 80 kg,” “warm,” “fast,” “wide,” “young,” “tall,” “strong,” “heavy,” “almost all” and “many”. Perhaps some people think that they are subjective probability or they are fuzziness. However, a lot of surveys showed that those imprecise quantities behave neither like randomness nor like fuzziness. In order to model those imprecise quantities, an uncertainty theory was founded by Liu [1] in 2007 and refined by Liu in 2010. Nowadays uncertainty

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theory has become a branch of mathematics based on normality, self-duality, countable subadditivity and product measure axioms. Lots of researchers have contributed in this area. Liu [2] proposed uncertain sets theory and the concept of uncertain random variable which is the important theoretical foundation in this paper. But in many cases, uncertainty exists with randomness simultaneously. Therefore, we have the concept of uncertain random variable. We know that the observations of random variables are real numbers; however, the observations of uncertain random variable are uncertain real numbers, and it makes the combination of randomness and uncertainty more persuasive. Sometimes the items may not be failed completely during a test, or the number of survivors cannot be recorded exactly. In this case, we may just say that there are around s survivors during the test of n items [3]. Therefore, the component reliability will be around s/n . The phrase “around s/n ” can be described by using uncertain sets theory. The main purpose of this paper is to provide a methodology for discussing the uncertain Bayesian system reliability from the uncertain component reliabilities.

In Sect. 6.2, we introduce the basic concepts and theorems which will be used in this paper. In Sect. 6.3, we discuss the uncertain Bayes point estimators. In order to obtain Bayes point estimator, we used a theorem called Resolution Identity. In Sect. 6.4, we discuss the uncertain Bayes point estimators of system reliability for series system, parallel system and k -out-of- n system.

6.2 Preliminaries

Definition 1 An uncertain set is a measurable function ξ from an uncertainty space (Γ, \mathcal{L}, M) to a collection of sets of real numbers; that is, for any Borel set B of real numbers, the set $\xi \subset B = \{\gamma \in \Gamma | \xi(\gamma) \subset B\}$ is an event.

Definition 2 Let ξ be an uncertain set. Then its membership function is defined as $\mu(x) = M\{x \in \xi\}$ for any $x \in R$.

The value of $\mu(x)$ represents the membership degree that x belongs to the uncertain set ξ . Keep in mind that only some special uncertain sets have their own membership functions.

Definition 3 Let μ be a membership function. Then for any number $\alpha \in [0, 1]$, the set $\mu_\alpha = \{x \in R | \mu(x) \geq \alpha\}$ is called the α -cut of μ .

Definition 4 A membership function $\mu(x)$ is called normalized if there is a point x_0 such that $\mu(x_0) = 1$.

Definition 5 Let μ be a membership function. ξ is called a convex uncertain set if $\mu(\lambda x + (1 - \lambda)y) \geq \min(\mu(x), \mu(y))$ for any $x, y \in R$.

Definition 6 Let f be a real-valued function defined on R . Then f is said to be upper semicontinuous, if $\{x : f(x) \geq \alpha\}$ is a closed set in R for each α .

We see that α -level set μ_α is a convex, closed and bounded in R . Since μ_α is a closed interval, we denote it by $\mu_\alpha = [\underline{\mu}_\alpha, \overline{\mu}_\alpha]$.

Under some suitable conditions on the membership function, the uncertain set is then termed as an uncertain real number. Let a be a real number, the uncertain real number \tilde{a} corresponding to a can be interpreted as “about a .” Let $X = R$ be a real number system and \tilde{a} be an uncertain subset of R .

Therefore, we propose the following definition.

Definition 7 Let ξ be an uncertain set, then ξ is called an uncertain real number if the following conditions are satisfied:

1. ξ is a normal and convex uncertain set;
2. Its membership function μ is upper semicontinuous;
3. The 0-level set μ_0 is bounded in R ;
4. The 1-level set μ_1 is a singleton set;
5. The functions $g(\alpha) = \underline{\mu}_\alpha$ and $h(\alpha) = \overline{\mu}_\alpha$ are continuous with respect to $[0, 1]$.

Definition 8 An uncertain random variable is a function ξ from a probability space (π, A, P_r) to a collection of uncertain variables such that $M\{\xi(\omega) \in B\}$ is a measurable function of ω for any Borel set B of real numbers.

Theorem 1 Let $\xi: \Omega \rightarrow U_R$ be an uncertain-valued function, and μ is its membership function, ξ is an uncertain random variables if and only if $\underline{\mu}_\alpha$ and $\overline{\mu}_\alpha$ are traditional random variables for all $\alpha \in [0, 1]$.

Theorem 2 Let ξ be an uncertain set with membership function μ . Then $\mu(x) = \sup_{\alpha \in [0,1]} \alpha \cdot I_A(x)$, where I_A is a characteristic function of set A , that is, if $x \in A, I_A(x) = 1$; if $x \notin A, I_A(x) = 0$.

Theorem 3 Giving the prior distribution is $\pi(\theta)$ and under the squared error loss function $L(\theta, \delta) = (\delta - \theta)^2$, the Bayes estimators $\delta^\pi(x)$ is the mean of the posterior distribution $\pi(\theta|x)$, that is, $\delta^\pi(x) = E(\theta|x)$.

6.3 Uncertain Bayes Point Estimators

Let x be a random variable with pdf $f(x, \theta)$ in which θ is called parameters [4, 5]. Let the parameters is an uncertain real number $\tilde{\theta}$ with membership function μ_θ , from the concept of the uncertain random variable, we can discuss the point estimator of $(\mu_\theta)_\alpha$ and $(\overline{\mu_\theta})_\alpha$ for all $\alpha \in [0, 1]$.

We can further assume that $\tilde{\theta}$ is the uncertain parameter of the uncertain random variable \tilde{x} with membership function μ_x . From the proposed concept of the uncertain random variable, $(\mu_\theta)_\alpha$ and $(\overline{\mu_\theta})_\alpha$ are the parameters of random variable $(\mu_x)_\alpha$ and $(\overline{\mu_x})_\alpha$, respectively, for all $\alpha \in [0, 1]$.

The purpose is to estimate $\tilde{\theta}$ under uncertain environments. In order to apply the Bayesian approach, the uncertain parameter $\tilde{\theta}$ is assumed as an uncertain random variable. Since $\tilde{\theta}$ is an uncertain real number, $\underline{(\mu_{\theta})_{\alpha}}$ and $\overline{(\mu_{\theta})_{\alpha}}$ are continuous with respect to α . Therefore, the closed intervals $\left[\underline{(\mu_{\theta})_{\alpha}}, \overline{(\mu_{\theta})_{\alpha}} \right]$, for $\alpha \in [0, 1]$, are continuously shrinking with respect to α . Then for any parameter $\theta \in \left[\underline{(\mu_{\theta})_{\alpha}}, \overline{(\mu_{\theta})_{\alpha}} \right]$, we have $\theta = \underline{(\mu_{\theta})_{\beta}}$ or $\theta = \overline{(\mu_{\theta})_{\beta}}$ for some $\beta > \alpha$, since $\underline{(\mu_{\theta})_1} = \overline{(\mu_{\theta})_1}$. Then for any parameter $\theta \in \left[\underline{(\mu_{\theta})_{\alpha}}, \overline{(\mu_{\theta})_{\alpha}} \right]$, we can find a Bayes point estimator $\hat{\theta}$ for θ . Let $A_{\alpha} = \left[\min \left\{ \inf_{\alpha \leq \beta \leq 1} \underline{(\mu_{\theta})_{\beta}}, \inf_{\alpha \leq \beta \leq 1} \overline{(\mu_{\theta})_{\beta}} \right\} \right]$, then this interval will contain all of the Bayes point estimators for each $\theta \in \left[\underline{(\mu_{\theta})_{\alpha}}, \overline{(\mu_{\theta})_{\alpha}} \right]$. According to the Theorem 2, we can naturally define the membership function of uncertain Bayes point estimator. The uncertain Bayes point estimator of $\tilde{\theta}$ is denoted by $\hat{\tilde{\theta}}$, and the membership function of $\hat{\tilde{\theta}}$ is defined by $\mu_{\hat{\tilde{\theta}}}(r) = \sup_{\alpha \in [0, 1]} \alpha \cdot I_{A_{\alpha}}(r)$.

6.4 Uncertain Bayesian System Reliability Assessment

From the Bayesian point of view, the Bayesian approach to system reliability is the assignment of the prior distribution, and the goal is to determine the posterior distribution of the system reliability [6]. The prior distribution is assigned to each component of a system. Therefore, the posterior distributions of each component reliability can be found by Bayes theorem. In this case, we can derive the posterior distribution of system reliability from the posterior distributions of component reliabilities. However, the key methodology in such a derivation is that system reliability can be expressed as a product of independent random variables each of which corresponds to either component reliability or component unreliability.

Therefore, we need to invoke the method of Mellin integral transform. Let X be a non-negative random variable with pdf $f(x)$: The Mellin transform of $f(x)$ with respect to the complex parameter μ is defined by $M(f : \mu) = \int_0^{\infty} x^{\mu-1} f(x) dx$.

It is also convenient to regard the Mellin transform as the moments of X , that is,

$$M(f : \mu) = E[x^{\mu-1}]. \quad (6.1)$$

Let x_1, x_2, \dots, x_n be independent non-negative random variables with pdf f_1, f_2, \dots, f_n , respectively.

Let $g_k(y)$ be the pdf of the product $Y = \prod_{i=1}^k x_i$.

$$M(g_k, \mu) = \prod_{i=1}^k M(f_i, \mu) \quad (6.2)$$

From (6.2), we can obtain the posterior distribution of system reliability from the posterior distributions of component reliabilities. Then the Bayes point estimator of system reliability is the mean of the posterior distribution under the squared error loss function from Theorem 3.

For a parallel system consisting of k independent components, the system reliability is $r = 1 - \prod_{i=1}^k (1 - r_i)$ where r_i is the component reliability of the i th component. Equivalently, the system unreliability $q = 1 - r$ is the product of component unreliabilities $q_i = 1 - r_i$, that is, $q = 1 - \prod_{i=1}^k q_i$. In this case, we can use the Mellin transform technique to obtain the Bayes point estimate of system unreliability.

Assuming the prior distribution of component unreliabilities for the i th component is Beta distribution $B(m_{i0}; n_{i0})$ where m_{i0} may be regarded as the number of failures in a test of n_{i0} items. Therefore, $n_{i0} = s_{i0} + m_{i0}$.

According to Eqs. (6.1) and (6.2), the Bayes point estimate of the system unreliability is given by $E[Q|m] = \prod_{i=1}^k \left(\frac{m_i + m_{i0}}{n_i + n_{i0}} \right)$.

Thus, the Bayes point estimate of system reliability r under the squared error loss function is given by

$$\begin{aligned} E[R|s] &= 1 - E[Q|m] = 1 - \prod_{i=1}^k \left(\frac{m_i + m_{i0}}{n_i + n_{i0}} \right) \\ &= 1 - \prod_{i=1}^k \left(\frac{n_i - s_i + n_{i0} - s_{i0}}{n_i + n_{i0}} \right) = 1 - \prod_{i=1}^k \left(1 - \frac{s_i + s_{i0}}{n_i + n_{i0}} \right) \end{aligned}$$

Under the uncertain environments, the Bayes point estimates of $(\mu_r)_\alpha$ or $\overline{(\mu_r)_\alpha}$ are $(\mu_r)_\alpha = 1 - \prod_{i=1}^k \left(1 - \frac{s_i + (\mu_{s_{i0}})_\alpha}{n_i + n_{i0}} \right)$, $\overline{(\mu_r)_\alpha} = 1 - \prod_{i=1}^k \left(1 - \frac{s_i + \overline{(\mu_{s_{i0}})_\alpha}}{n_i + n_{i0}} \right)$, $\alpha \in [0, 1]$.

The membership function of the uncertain Bayes point estimate of system reliability r is defined by the same way as discussed above.

6.5 Conclusions

In this paper, the uncertain parameters are assumed as uncertain random variables with uncertain prior distributions. Then the traditional Bayesian estimation method and uncertain set theory are combined to the reliability of the system is uncertain Bayesian point estimates. At the mean time, we also provide the computational

procedures and examples to evaluate the membership degree of any given Bayes point estimate of system reliability. Therefore, we can realized that the uncertain sets theory and uncertain random variable can also impose upon some known techniques of reliability analysis in the future research.

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Chapter 7

System Reliability Evaluation Based on Intuitionistic Uncertain Set

Shaohua Dang and Huanbin Liu

Abstract In this paper, a new general procedure is proposed to construct the membership and non-membership functions of the system reliability using time-dependent intuitionistic uncertain number. Using the proposed approach, membership and non-membership functions of reliability of series and parallel systems are constructed. Numerical examples are given to illustrate the proposed approach.

Keywords System reliability · Intuitionistic uncertain set · Membership function · Non-membership function

7.1 Introduction

In many cases, some information and knowledge are represented by human language like “about 100 km,” “roughly 80 kg,” “low speed,” “middle age,” and “big size.” How do we understand them? Perhaps, some people think that they are subjective probability or they are fuzzy concepts. However, a lot of surveys showed that those imprecise quantities behave neither like randomness nor like fuzziness. In other words, those imprecise quantities cannot be quantified by probability measure [1], capacity, fuzzy measure, possibility measure [2], and credibility measure [3]. In order to deal with this type of uncertainty, an

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uncertainty theory was founded by Liu [4] in 2007 and rented by Liu [5] in 2010. Up to now, uncertain process, uncertain set, membership function, cut, and uncertain set operations have been established. That has extended the usage of the uncertainty theory.

Traditionally, system reliability analysis is classified as the application of probability. However, because of the inaccuracy and uncertainties of data, the estimation of precise values of probability becomes very difficult in many systems. Uncertain set theory has been shown to be a useful tool to handle such situations by attributing a degree to which a certain object belongs to a set. In real life, a person may assume that an object belongs to a set to a certain degree, but it is possible that he is not so sure about it. When available information is not sufficient for the definition of an imprecise concept by means of a conventional uncertain set, the concept of an intuitionistic uncertain set can be viewed as an alternative approach to define a uncertain set. In uncertain set, the degree of acceptance is only considered, but intuitionistic uncertain set is characterized by a membership function (acceptance) and a non-membership function (rejection), so that the sum of both values is less than one.

The rest of the paper is organized as follows: Sect. 7.2 presents basic concept and definitions of intuitionistic uncertain set. Section 7.3 explains the principle of system reliability evaluation in detail. Section 7.4 introduces a new method of system reliability evaluation using time-dependent intuition uncertain set. Section 7.5 constructs membership and non-membership functions of reliability of series and parallel systems, nally numerical examples are given to illustrate the proposed approach.

7.2 Preliminaries

Definition 1 Liu [6] an uncertain set is a measurable function X from an uncertainty space (Γ, L, M) to the set of real numbers, that is, for any Borel set B of real numbers, the set $\xi \subset B = \{\gamma \in \Gamma | \xi(\gamma) \subset B\}$ is an event.

Definition 2 Liu [6] let X be an uncertain set. For any $x \in R$, then its membership function is defined as $\mu(x) = M\{x \in \xi\}$, $0 \leq \mu(x) \leq 1$.

Definition 3 Let μ be a membership function of ξ , then for any number, the set-valued function $\mu_\alpha = \{x \in R | \mu(x) \geq \alpha\}$, $\forall \alpha \in [0, 1]$ is called α -cut of μ .

Definition 4 Let X be a universe of discourse and T be a non-empty set. Elements of T are called time moments. A time-dependent intuitionistic uncertain set $\tilde{\xi}^i(t)$ in X is an object having the form

$$\tilde{\xi}^i(t) = \left\{ \langle x \cdot \mu_{\tilde{\xi}^i(t)}(x), V_{\tilde{\xi}^i(t)}(x) \rangle : x \in X, t \in T \right\} \quad (7.1)$$

where $\tilde{\zeta}^i(t): X \rightarrow [0, 1]$ and $v_{\tilde{\zeta}^i(t)}(t): X \rightarrow [0, 1]$ define the degrees of membership and non-membership, respectively, of the element $x \in X$ at time moment t to $\tilde{\zeta}^i \subseteq X$. For every $x \in X$ and $t \in T$, $0 \leq \mu_{\tilde{\zeta}^i(t)}(x) + v_{\tilde{\zeta}^i(t)}(x) \leq 1$.

Definition 5 An intuitionistic uncertain set $\tilde{\zeta}^i \square$ in the universe of discourse X is convex if and only if

1. Membership function $\mu_{\tilde{\zeta}^i(t)}(x)$ of $\tilde{\zeta}^i \square$ is uncertain convex, that is,

$$\mu_{\tilde{\zeta}^i \square}(\lambda x_1 + (1 - \lambda)x_2) \geq \min(\mu_{\tilde{\zeta}^i \square}(x_1), \mu_{\tilde{\zeta}^i \square}(x_2)), \forall x_1, x_2 \in X, \lambda \in [0, 1] \quad (7.2)$$

2. Non-membership function $v_{\tilde{\zeta}^i(t)}(x)$ of $\tilde{\zeta}^i \square$ is uncertain concave, that is,

$$\mu_{\tilde{\zeta}^i \square}(\lambda x_1 + (1 - \lambda)x_2) \leq \max(\mu_{\tilde{\zeta}^i \square}(x_1), \mu_{\tilde{\zeta}^i \square}(x_2)), \forall x_1, x_2 \in X, \lambda \in [0, 1] \quad (7.3)$$

Definition 6 An intuitionistic uncertain set $\tilde{\zeta}^i \square$ in the universe of discourse X is normal if there exist at least two points $\forall x_1, x_2 \in X$ such that $\mu_{\tilde{\zeta}^i(t)}(x_1) = 1$ and $v_{\tilde{\zeta}^i(t)}(x_2) = 1$.

Definition 7 An intuitionistic uncertain subset $\tilde{\zeta}^i \square = \{x \cdot \mu_{\tilde{\zeta}^i}(x), v_{\tilde{\zeta}^i}(x) : x \in R\}$ of the real line R is called an intuitionistic uncertain number if

1. $\tilde{\zeta}^i \square$ is convex and normal;
2. $\mu_{\tilde{\zeta}^i}(x)$ is upper semi-continuous, and $v_{\tilde{\zeta}^i}(x)$ is lower semi-continuous;
3. $\text{Sup } p \tilde{\zeta}^i \square = \{x \in X : v_{\tilde{\zeta}^i}(x) \leq 1\}$ is bounded.

At time t_1 , we have intuitionistic uncertain number $\tilde{\zeta}^i \square(t_1)$. At time t_2 , we have intuitionistic uncertain number $\tilde{\zeta}^i \square(t_2)$, etc. Those are time-dependent intuitionistic uncertain numbers.

Definition 8 (α, β) -cut of a time-dependent intuitionistic uncertain set $\tilde{\zeta}^i \square$ at time moment t is defined as

$$\tilde{\zeta}_{\alpha, \beta}^i \square(t) = \{x \in X : \mu_{\tilde{\zeta}^i(t)}(x) \geq \alpha, v_{\tilde{\zeta}^i(t)}(x) \leq \beta\}; \quad 0 \leq \alpha, \beta \leq 1, \alpha + \beta \leq 1 \quad (7.4)$$

Definition 9 Let $\xi_1, \xi_2, \dots, \xi_n$ be independent uncertain variables with uncertainty distributions $\Phi_1, \Phi_2, \dots, \Phi_n$, respectively. If the function $f(x_1, x_2, \dots, x_n)$ is strictly increasing with respect to $\xi_1, \xi_2, \dots, \xi_m$ and strictly decreasing with respect to $\xi_{m+1}, \xi_{m+2}, \dots, \xi_n$, then $f = (\xi_1, \xi_2, \dots, \xi_n)$ is an uncertain variable with inverse uncertainty distribution

$$\psi^{-1}(\alpha) = f(\Phi_1^{-1}(\alpha), \Phi_2^{-1}(\alpha), \dots, \Phi_m^{-1}(\alpha), \Phi_{m+1}^{-1}(1 - \alpha), \dots, \Phi_n^{-1}(1 - \alpha)) \quad (7.5)$$

7.3 The Principle of System Reliability Calculation

Assume that X and Y are two crisp sets. Let failure rate function be represented by an intuitionistic uncertain set $\tilde{H}^i(t)$ defined on X as

$$\tilde{H}^i(t) = \left\{ \langle x, \mu_{\tilde{H}^i(t)}(x), \nu_{\tilde{H}^i(t)}(x) \rangle : x \in X, t \in T \right\} \quad (7.6)$$

for membership function, α -cut and γ -cut of $\tilde{H}^i(t)$ are $\tilde{H}_\alpha^i = \left\{ x : \mu_{\tilde{H}^i(t)}(x) \geq \alpha : \alpha \in [0, 1] \right\} \square$, $\tilde{H}_\gamma^i = \left\{ x : \mu_{\tilde{H}^i(t)}(1-x) \leq \gamma : \gamma \in [0, 1] \right\}$, and for non-membership function, β -cut and η -cut of $\tilde{H}^i(t)$ are $\tilde{H}_\beta^i = \left\{ x : \nu_{\tilde{H}^i(t)}(x) \leq \beta : \beta \in [0, 1] \right\} \square$, $\tilde{H}_\eta^i = \left\{ x : \nu_{\tilde{H}^i(t)}(1-x) \geq \eta : \eta \in [0, 1] \right\}$

$\tilde{H}^i(t)$ is an intuitionistic uncertain number, then

$$\tilde{H}_\alpha^i(t) = [h_{1\alpha}(t), h_{2\alpha}(t)], \tilde{H}_\gamma^i(t) = [h_{1\gamma}(t), h_{2\gamma}(t)]$$

$$\tilde{H}_\beta^i(t) = [h_{1\beta}(t), h_{2\beta}(t)], \tilde{H}_\eta^i(t) = [h_{1\eta}(t), h_{2\eta}(t)]$$

where $h_{1\alpha}(t) h_{2\alpha}(t)$ and $h_{1\beta}(t) h_{2\beta}(t)$ are increasing (decreasing) functions of α and β , respectively, with $\alpha, \beta \in [0, 1]$; $h_{1\gamma}(t) h_{2\gamma}(t)$ and $h_{1\eta}(t) h_{2\eta}(t)$ are decreasing (increasing) functions of α and β , respectively, with $\gamma, \eta \in [0, 1]$.

Let us define a bounded continuous differentiable function from X to Y .

$f : X \rightarrow Y$ such that $y = f(x), \forall x \in X$.

Now, we wish to calculate the intuitionistic uncertain set (reliability function) $\tilde{R}^i(t)$ induced on Y by applying φ to the $\tilde{H}^i(t)$

$$\tilde{R}^i(t) = \left\{ \langle y, \mu_{\tilde{R}^i(t)}(y), \nu_{\tilde{R}^i(t)}(y) \rangle : y \in Y \right\}$$

To calculate $\tilde{R}^i(t)$, it is necessary to calculate the membership and non-membership functions of $\tilde{R}^i(t)$. So, based on the Theorem 11, we can obtain the inverse uncertainty distribution of $\tilde{R}^i(t)$:

$$\psi^{-1}(\alpha) = f(\Phi_1^{-1}(\alpha), \Phi_2^{-1}(\alpha), \dots, \Phi_m^{-1}(\alpha), \Phi_{m+1}^{-1}(\alpha), \dots, \Phi_n^{-1}(1-\alpha)) \quad (7.7)$$

If the function is strictly increasing, then we only need to consider the α -cut and β -cut; but if the function is strictly decreasing, then we need to consider the γ -cut and η -cut. We know that $\tilde{H}^i(t)$ and $\tilde{R}^i(t)$ have the same properties. Therefore, we can calculate the corresponding intervals.

$$\begin{aligned}
f(x) &= y \in [r_{1\alpha}(t), r_{2\alpha}(t)] \\
&= y \in [r_{1\gamma}(t), r_{2\gamma}(t)], x \in [h_{1\alpha}(t), h_{2\alpha}(t)] \\
f(x) &= y \in [r_{1\beta}(t), r_{2\beta}(t)] \\
&= y \in [r_{1\eta}(t), r_{2\eta}(t)], x \in [h_{1\beta}(t), h_{2\beta}(t)]
\end{aligned} \tag{7.8}$$

where $r_{1\alpha}(t) r_{2\gamma}(t)$ and $r_{2\alpha}(t) r_{1\gamma}(t)$ correspond to the global minimum and maximum of φ over the space $\tilde{R}_\alpha^i(t)(\tilde{R}_\gamma^i(t))$, and $r_{1\beta}(t) r_{2\eta}(t)$ and $r_{2\beta}(t) r_{1\eta}(t)$ correspond to the global minimum and maximum of f over the space $\tilde{R}_\beta^i(t)(\tilde{R}_\eta^i(t))$

If both $r_{1\alpha}(t) r_{2\gamma}(t)$ and $r_{2\beta}(t) r_{2\eta}(t)$ are invertible, then a left and a right shape function can be obtained:

$$\begin{aligned}
f_{\tilde{R}^i(t)}(y) &= [r_{1\alpha}(t)]^{-1} = [r_{1\gamma}(1-t)]^{-1} = \left[\min_{y_1 \leq y \leq y_2} y \right]^{-1} \\
g_{\tilde{R}^i(t)}(y) &= [r_{2\alpha}(t)]^{-1} = [r_{2\gamma}(1-t)]^{-1} = \left[\max_{y_2 \leq y \leq y_3} y \right]^{-1}
\end{aligned}$$

Similarly, if both $r_{1\beta}(t) r_{1\eta}(t)$ and $r_{2\beta}(t) r_{2\gamma}(t)$ are invertible, then a left and a right shape function can be obtained:

$$\begin{aligned}
f'_{\tilde{R}^i(t)}(y) &= [b_{1\beta}(t)]^{-1} = [r_{1\eta}(1-t)]^{-1} = \left[\min_{y_1 \leq y \leq y_2} y \right]^{-1} \\
g'_{\tilde{R}^i(t)}(y) &= [b_{2\beta}(t)]^{-1} = [r_{2\eta}(1-t)]^{-1} = \left[\max_{y_3 \leq y \leq y_4} y \right]^{-1}
\end{aligned}$$

In summary, we can construct the membership function and non-membership function completely.

If the failure rate of each component is taken as triangular intuitionistic uncertain number, then we can construct the membership function $\mu_{\tilde{R}^i(t)}(y)$:

$$\mu_{\tilde{R}^i(t)}(y) = \begin{cases} f_{\tilde{R}^i(t)}(y); & y_1 \leq y \leq y_2 \\ g_{\tilde{R}^i(t)}(y); & y_2 \leq y \leq y_3 \\ 0; & \text{otherwise} \end{cases} \tag{7.9}$$

where $y_1 \leq y_2 \leq y_3$, $f_{\tilde{R}^i(t)}(y_1) = g_{\tilde{R}^i(t)}(y_3) = 0$, $f_{\tilde{R}^i(t)}(y_2) = g_{\tilde{R}^i(t)}(y_2) = 1$.

Similarly, we can construct the non-membership function $v_{\tilde{R}^i(t)}(y)$:

$$v_{\tilde{R}^i(t)}(y) = \begin{cases} f'_{\tilde{R}^i(t)}(y); & y'_1 \leq y \leq y_2 \\ g'_{\tilde{R}^i(t)}(y); & y_2 \leq y \leq y'_3 \\ 1; & \text{otherwise} \end{cases}$$

where $y'_1 \leq y_2 \leq y'_3$, $f'_{\tilde{R}^i(t)}(y'_1) = g'_{\tilde{R}^i(t)}(y'_3) = 1$, and $f'_{\tilde{R}^i(t)}(y_2) = g'_{\tilde{R}^i(t)}(y_2) = 0$.

7.4 System Reliability Evaluation Using Time-Dependent Intuitionistic Uncertain Set

In probability theory, the system reliability function in terms of failure rate function is $R(t) = \exp[-\int_0^t x dx]$, $t \geq 0$, where x is the failure rate function.

According to Theorem 9, the inverse uncertainty distribution of $\exp[-\int_0^t h(t') dt']$ is $\psi^{-1}(t) = \exp[-\int_0^t h(1-t') dt']$ where $h(t)$ is the failure rate function. Let the failure rate function be represented by triangular intuitionistic uncertain number,

$$\tilde{H}_j^i(t) = [m_j(t) - \gamma_j(t), m_j(t), m_j(t) + \delta_j(t); m_j(t) - \gamma'_j(t), m_j(t), m_j(t) + \delta'_j(t)]$$

where $m_j(t) \in R$ is the center point.

Because the function $R(t)$ is strictly decreasing with respect to t , then for the membership function, γ -cut of $\tilde{H}^i(t)$ is $\tilde{H}_\gamma^i(t) = [(m(t) - \gamma(t)) + \alpha\gamma(t), (n(t) + \delta(t) - \alpha\delta(t))]$, and for the non-membership function, η -cut of $\tilde{H}^i(t)$ is $\tilde{H}_\eta^i(t) = [(m(t) - \eta\gamma'(t), (n(t) + \eta\delta'(t))]$.

Since the reliability function is a monotonically decreasing one, $\tilde{R}^i(t)$ attains its extreme at the bounds:

$$\begin{aligned} y_{1\gamma}(t) &= \exp\left[-\int_0^t m(t') + \alpha\delta(t') dt'\right], \quad t > 0, \\ y_{2\gamma}(t) &= \exp\left[-\int_0^t m(t') - \alpha\gamma(t') dt'\right], \quad t > 0, \\ y_{1\eta}(t) &= \exp\left[-\int_0^t m(t') + \delta'(t') - \beta\delta'(t') dt'\right], \quad t > 0, \\ y_{2\eta}(t) &= \exp\left[-\int_0^t m(t') - \gamma'(t') + \beta\gamma'(t') dt'\right], \quad t > 0 \end{aligned} \tag{7.10}$$

Take the inverse of (7.10) to obtain the left shape and the right shape functions of $\mu_{\tilde{R}^i(t)}$ and $\nu_{\tilde{R}^i(t)}$.

$$\mu_{\tilde{R}^i(t)}(y) = \begin{cases} -\frac{\ln(y) + \int_0^t m(t') dt'}{\int_0^t \delta(t') dt'}; & \exp[-\int_0^t m(t') dt'] \leq y \leq \exp[-\int_0^t m(t') - \gamma(t') dt'] \\ \frac{\ln(y) + \int_0^t m(t') dt'}{\int_0^t \gamma(t') dt'}; & \exp[-\int_0^t m(t') + \delta(t') dt'] \leq y \leq \exp[-\int_0^t m(t') dt'] \end{cases}$$

$$v_{\tilde{R}(t)}(y) = \begin{cases} -\frac{\ln(y) + \int_0^t m(t') + \delta'(t') dt'}{\int_0^t \delta'(t') dt'}; & \exp[-\int_0^t m(t') dt'] \leq y \leq \exp[\int_0^t m(t') - \gamma'(t') dt'] \square \\ \frac{\ln(y) + \int_0^t m(t') - \gamma'(t') dt'}{\int_0^t \gamma'(t') dt'}; & \exp[\int_0^t m(t') + \delta'(t') dt'] \leq y \leq \exp[-\int_0^t m(t') dt'] \square \end{cases}$$

7.5 Conclusions

In this paper, we construct the membership and non-membership functions of series and parallel systems. The major advantage of using intuitionistic uncertain set over uncertain set is that intuitionistic uncertain set separates the positive and negative evidences for membership of an element in the set.

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Chapter 8

Safety Assessment of Equipment Software Based on Fuzzy Petri Nets

Jiao He, Hou-Xiang Wang and Kai Nie

Abstract To assess the safety of equipment software effectively, we established the index system of software safety assessment based on life cycle of software, proposed an assessment method based on the fuzzy Petri nets, used fuzzy Petri nets to model the fuzziness and uncertainty of the system and assessed the safety of equipment software based on fuzzy reasoning algorithm. This method well combines the characteristics of specialist grading and FPN such as utility and briefness, and the result of safety assessment provides reasonable warranty for constituting corresponding safety control strategy.

Keywords Software safety · Assessment · Fuzzy Petri nets (FPN) · Index system · Model

8.1 Introduction

The modern equipment, especially large equipment systems grow in complexity, software has been an important part of the equipment system. Equipment system software are usually large scale, complex structure, higher hardware control and

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embedded degree, which leads to high require about the safety. Safety assessment for equipment system software makes maintenance persons realize the software residual unsafety design, assess the dangerous risk which has not eliminate, and easy to formulate control measures, banned items and software safety procedures.

At present, the technology used in software safety assessment includes the expert evaluation method [1] and the method based on statistical test [2, 3]. The assessment result of expert evaluation method is intuitive, but assessment data is strong subjective and fuzzy. In order to overcome the problem of traditional expert evaluation method, fuzzy analytic hierarchy process (FAHP) method is proposed in the paper [4]. However, the quantitative calculation of weights is complex, and the problem is still not solving well now. Aiming at these problems, the fuzzy Petri nets are introduced in the software safety assessment, and a software safety assessment method based on fuzzy Petri nets is put forward. It solves the fuzziness and uncertainty of the influence factors well, and the reasoning algorithm reduces the important degree of weights calculation in the assessment process, which makes the assessment results more scientific and reasonable.

8.2 The Safety Assessment Index System of Equipment Software

Safety index should be the result of comprehensive factors which will influence the safety and their influence. There are some common safety indexes, such as software accident probability (SAR), average accident time interval (MTBA), failure degree, harm degree. These indexes need a large number of accumulative total data to calculate. Li Meng [5] proposes a kind of 3 M model method to assess software safety in the software complexity, environment supporting development level and test correction. Some put forward to check and assess the safety of software in requirements, structure, source code, output and comprehensive test results. Software safety is a systematic problem; the influence of factors exists in the whole life cycle of software. This article sets up assessment index system based on software development life cycle, which can make full use of the specification documents and software entities and does not completely to depend on test data for assessment. The index system is shown in Fig. 8.1, including 4 first-class indexes and 18 s-class indexes.

C1 (consistency) represents that safety requirement needs to consist with system requirement, ensures the software will enforce the provisions of the system function, and safety requirements meet the system performance and related safety requirements.

C13 (consistency) explains whether the detailed design and structure are consistency.

Some indexes can be described by the mathematical expression with definite numerical calculation results, such as C8 (structural complexity), C17 (ordered

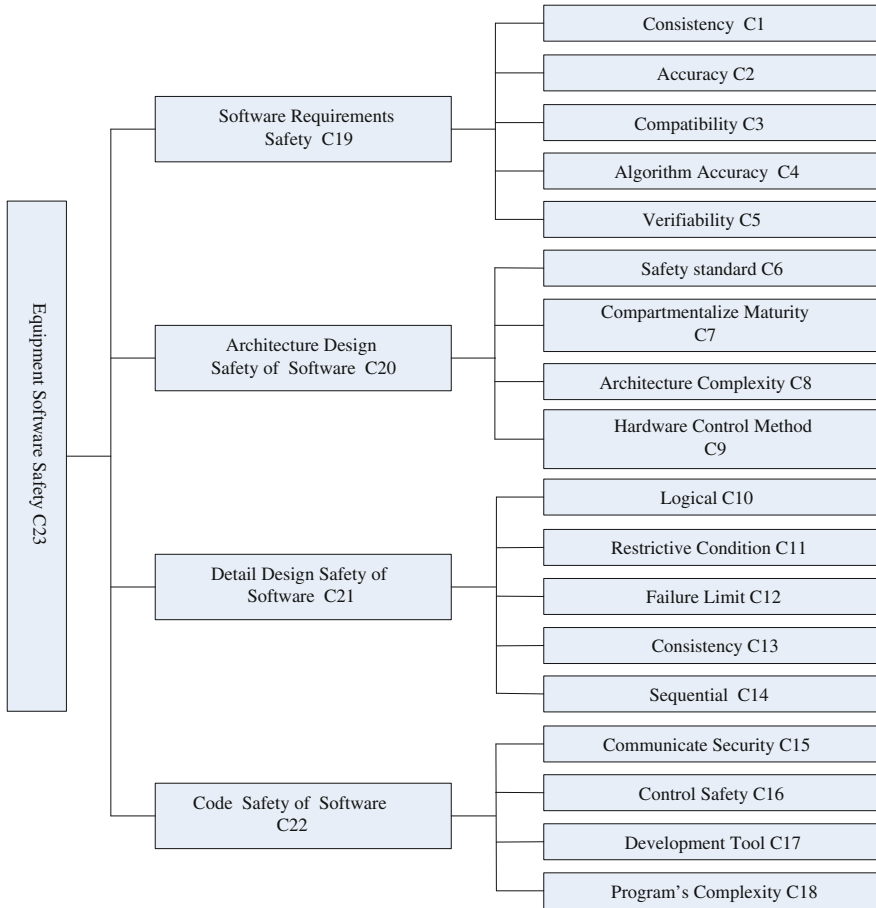


Fig. 8.1 Equipment software safety assessment indexes

several). Some can only be qualitatively assess, with the form of fuzzy knowledge, such as C1, C2.

8.3 Fuzzy Petri Nets Safety Assessment Method

8.3.1 Fuzzy Petri Nets

Petri nets are a formal analysis tools, describe system structure well. Fuzzy Petri nets (FPN) inherit graphics describing ability of Petri nets and are widely used in system performance evaluation and information security analysis fields [6, 7]. Fuzzy Petri nets can quantitatively assess uncertainty risk factors and the hazards which are uncertainty, simplify the expression form of knowledge.

Definition 8.1 A FPN is a 6-tuple $\Sigma = \{P, T, I, O, W, M(0)\}$, where $P = \{p_1, p_2, \dots, p_n\}$ is a finite set of places; $T = \{T_1, T_2, \dots, T_n\}$ is a finite set of transitions, every transition is associated to a fuzzy rule; $I : P \rightarrow T$ is input matrix of a transition, $I = \{a_{ij}\}$, $a_{ij} \in \{0, 1\}$ $a_{ij} = 1$ when p_i is the input place of t_j ; $a_{ij} = 0$ when p_i is not the input place of t_j .

$O : T \rightarrow P$ is output matrix of a transition, $O = \{\beta_{ij}\}$, $\beta_{ij} \in \{0, 1\}$ $\beta_{ij} = 1$ when p_i is the output of t_j ; $\beta_{ij} = 0$ when p_i is not the output of t_j .

$W = (\mu_1, \mu_2, \dots, \mu_m)$ is the degree of credibility vector of T , and μ_j is the credibility of t_j .

$M(0)$ is the initial marking of the system and is a state matrix order $n \times q$; $M_{ij}(0)$ is the initial state value of p_i in level j , and it denote the degree of truth of p_i under the state marking $M(0)$.

Definition 8.2 Fuzzy production firing rules. Transition fire of FPN must meet two conditions:

1. Input place must have a token which represents fuzzy input variables.
2. It must meet the fuzzy rules conditions which is relevant to the transition that is the membership function of fuzzy input variables must be greater than 0, that is, $\mu > 0$.

Definition 8.3 Supposed A, B, C, D are matrixes order $n \times m$, E is a n -dimensional vector, then:

Addition operator \oplus : $C = A \oplus B \Leftrightarrow c_{ij} = \max(a_{ij}, b_{ij})$;

Straight operator \otimes : $D = E \otimes B \Leftrightarrow d_{ij} = e_j \times b_{ij}$; where: $i = 1, 2, 3, \dots, n$; $j = 1, 2, 3, \dots, m$.

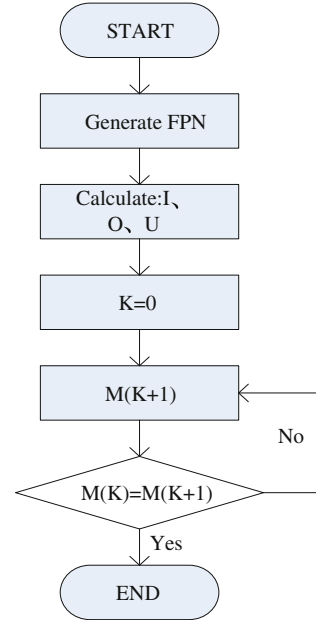
8.3.2 The Safety Assessment Reasoning Algorithm Based on FPN

In the assessment of software safety, the factors which influence the safety of software are defined as the address of FPN, and the process of judging the factors which change the safety is regarded as the transition of FPN. The possible assessment of each factor corresponds to the token number of FPN address, and the weights of each factor are the credibility of FPN transition.

In the chart, the address $p1-p23$ corresponds to index C1-C23. The possible token distribution produced by fuzzy rules is fuzzy identification, which reflects the assessment result of software safety. In the input arc of FPN, the arc rights correspond to the weights of assessment indexes.

The process of software safety transition is fuzzy reasoning process, and the next state caused by a transition is $M(k+1) = M(k) \oplus \{(U \otimes O)(ITM(k))\}$. I is input matrix, O is output matrix, U is credibility vector, and $M(k)$ is a state matrix which the transition fires K times.

Fig. 8.2 Flow chart of FPN reasoning algorithm



By the accessibility definition of fuzzy Petri nets, $M(k + 1) = M(k)$ indicates there is transition sequence making initial state $M(0)$ transition to final state $M(k)$, where the state matrix is the safety degree judge matrix represented by address.

The process of FPN used in software safety assessment is shown in Fig. 8.2, and the reasoning algorithm is as follows [8]:

1. Generate fuzzy Petri nets;
2. Get the input matrix I , output matrix O , credibility matrix U and safety assessment matrix Q according to the definition of FPN;
3. Calculate the credibility $I^T M(k)$ of input factor which will influence transition implementation and the credibility of transition output $U \otimes O$;
4. Make $k = 0$;
5. Calculate the transition degree $M(k + 1) = M(k) \oplus \{(U \otimes O)(I^T M(k))\}$ of system state caused by transition occurrence;
6. If $M(k + 1) \neq M(k)$, then $k = k + 1$, repeat step 5. If $M(k + 1) = M(k)$, stop the reasoning.
7. Calculate software safety $F = M(k)Q^T$.

The assessment can be confirmed by maximum membership degree method or weighted average method after getting judgment matrix $M(k + 1)$. Set the matrix of the safety assessment $Q = (10, 8, 6, 4, 2)$. The assessment value of all addresses can be calculated by $F = M(k)Q^T$, and the last element value (the assessment value of p_{23}) of this vector represents the safety degree of software.

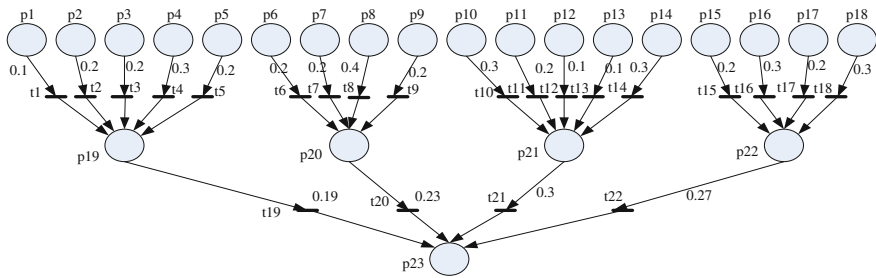


Fig. 8.3 Assessment FPN of the equipment software safety

8.4 Example

Now assess is the safety of one carrier-based equipment system software. Firstly, convert the assessment index system shown in Fig. 8.1 to a FPN shown in Fig. 8.3 according to the Definition 8.1.

We can get input matrix I and output matrix O of the FPN by Fig. 8.3, and matrixes are omitted here. With Definition 8.1 and the results of expert judgment, we can get FPN initial markings $M(0)$ of each place and the credibility matrix U of transition:

$$M(0) = \begin{pmatrix} 0.4 & 0.3 & 0.3 & 0 & 0 \\ 0.1 & 0.4 & 0.3 & 0.2 & 0 \\ 0.1 & 0.3 & 0.3 & 0.2 & 0.1 \\ 0.2 & 0.4 & 0.2 & 0.2 & 0 \\ 0.3 & 0.3 & 0.2 & 0.1 & 0.1 \\ 0.2 & 0.3 & 0.4 & 0.1 & 0 \\ 0.2 & 0.3 & 0.4 & 0.1 & 0 \\ 0 & 0.3 & 0.4 & 0.2 & 0.1 \\ 0.1 & 0.2 & 0.3 & 0.3 & 0.1 \\ 0.2 & 0.3 & 0.3 & 0.1 & 0.1 \\ 0 & 0.4 & 0.3 & 0.3 & 0 \\ 0.1 & 0.3 & 0.4 & 0.2 & 0 \\ 0.2 & 0.3 & 0.3 & 0.2 & 0 \\ 0.2 & 0.3 & 0.2 & 0.3 & 0 \\ 0 & 0.2 & 0.4 & 0.3 & 0.1 \\ 0 & 0.3 & 0.4 & 0.2 & 0.1 \\ 0 & 0.3 & 0.4 & 0.3 & 0 \\ 0.1 & 0.4 & 0.3 & 0.2 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \begin{matrix} p1 \\ p2 \\ p3 \\ p4 \\ p5 \\ p6 \\ p7 \\ p8 \\ p9 \\ p10 \\ p11 \\ p12 \\ p13 \\ p14 \\ p15 \\ p16 \\ p17 \\ p18 \\ p19 \\ \vdots \\ p23 \end{matrix}$$

$$U = (0.1 \ 0.2 \ 0.2 \ 0.3 \ 0.2 \ 0.2 \ 0.2 \ 0.4 \ 0.2 \ 0.3 \ 0.2 \ 0.1 \ 0.1 \ 0.3 \ 0.2 \ 0.3 \ 0.2 \ 0.3)$$

According to the safety assessment algorithm, we know

$$M(4) = M(3) = \begin{pmatrix} 0.4 & 0.3 & 0.3 & 0 & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 0.1 & 0.4 & 0.3 & 0.2 & 0 \\ 0.2 & 0.35 & 0.25 & 0.16 & 0.04 \\ 0.1 & 0.28 & 0.38 & 0.18 & 0.06 \\ 0.15 & 0.32 & 0.28 & 0.22 & 0.03 \\ 0.03 & 0.31 & 0.37 & 0.24 & 0.05 \\ 0.114 & 0.310 & 0.319 & 0.203 & 0.044 \end{pmatrix} \begin{matrix} p1 \\ \vdots \\ p18 \\ p19 \\ p20 \\ p21 \\ p22 \\ p23 \end{matrix}$$

The assessment vector of the software safety is (0.114, 0.310, 0.319, 0.203, 0.044), then

$F = M(k)Q^T = (8.2, 6.8, 6.2, 7.2, 7.2, 7.2, 7.2, 5.8, 5.8, 6.8, 6.2, 6.6, 7.0, 6.8, 5.4, 5.8, 6.0, 6.8, 7.0, 6.4, 6.7, 6.1, 6.4)$. The estimate of $p23$ is 6.4, and the corresponding level is good.

8.5 Conclusion

A software safety assessment index system based on software development life cycle is constructed in the paper. Fuzzy Petri nets are introduced into equipment system software safety assessment field, and the influence factors of software safety are taken as the FPN addresses. The safety of some equipment system software is assessed using fuzzy reasoning of fuzzy Petri nets. The proposed method not only solves the problem of fuzzy factors which inconvenience statistics, but also gives a safety assessment method performed by computers facility and can reduce the randomness and the subjective uncertainty of expert, narrowed differences of experts' subjective judgment to a certain extent, which makes the assessment results more scientific and reasonable.

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Part II
Software Engineering and Applications

Chapter 9

Study of Wood Marketing Management System Based on Workflow

Dan Li, Meng Gao and Yukun Cao

Abstract In order to improve the integration management level in timber circulation, different technologies are used, such as workflow technology, Web programming technology, and the wood marketing management system based on computer and Internet is designed and implemented. It can reduce the difficulty of developing complex processes and improve the management efficiency. The system can also enhance the information accuracy of timbers in the circulation system, and it integrates transportation, sales, management and storage of timber into together, not only improves some function defects existing in the previous systems, but also speeds up the pace in forwarding to informalization construction of timber industry.

Keywords Workflow technology · Wood · Management information system · Office automation

9.1 Introduction

Timber production, transportation, storage and sales have many characteristics, such as scattered locations, widely involved, and long distances, so it is easy to cause the block in information sharing and communication; meanwhile, the former management mode in timber circulation relied on artificial data transmission; it not only enhanced the labor intensity, but also virtually increased the possibility of wood benefit loss; in addition, the leaders could not master and analyze the

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real-time basic data and statistical data of time anywhere and anytime; therefore, it became difficult for them to find problems existed in timber circulation management, and decision making became difficult either [1]. Traditional systems based on client/server have defects in solving the above problems, and functions in most of them only involve single part of the circulation. So, it is important to build up the wood marketing management system based on Web integrating the timber transportation, storage, sales and management into together; it will be significant in improving the management level of timber circulation integration, integrating resources, safeguarding interests of different parts and assisting future decision.

A workflow is the computerized facilitation or automation of a business process. A workflow can be abstracted as a network with task nodes and flows. Domain business processes can be modeled through the execution of the network and thus can be controlled and managed by incorporating the domain business application into the execution process of the network [2]. Workflow technology has been widely used in all areas of office automation system with the benefits of flexibility, integration and reusability.

The rapid development of computer network technologies impels the construction of enterprise information management system forwarding to comprehensive development including management concept, networked system application, standard development platform, automatic business process and integrated application system [3, 4]. Based on this thought, the application requirements are combined and advanced technologies are used, such as workflow technology, Web programming technology; to design and develop the wood marketing management system, its main functions involve wood inventory management, market operation management, market trading management and logistics management.

9.2 System Analysis

Timber sales in Yinchuan, China, were relatively scattered before, and how to make the sale plan was determined by the subordinate 17 forestry bureaus. Since the establishment of unified timber sales policy, sale rights of the 17 forestry bureaus have been recovered into the city's distribution bureau, which centralizes and controls the timber sales. According to actual condition, designing and implementing an information management which integrates the subordinate forestry bureau with distribution bureau as an organic whole and connecting each relevant link of the timber circulation, through the system implementation, can be convenient for distribution bureau to master the timber sales situation of forestry bureaus in time, to make reasonable and effective timber schedule and sale plan, to achieve the purpose of information sharing and resources integration, then to improve the work efficiency and to increase the final sales performance.

9.2.1 Organization Structure Introduction

Institutions which are directly involved in the system work can be divided into two categories. Five functional departments directly belong to the distribution bureau: storage management branch, market operating branch, market trading branch, finance branch and logistics branch. Two main departments directly belong to forestry bureaus managed by distribution bureau: timber depot and timber section office. Each of these departments has two kinds of position: section chief and staff, in addition.

9.2.2 Function Requirement of the System

According to the organization structure above, the specific research is carried out and the main requirements are described as follows:

Timber depot: unified coding management of timber; automatic, informational and intelligent management in timber inbound and outbound management and daily inventory checking; inquire and manage daily timber record; record vehicles inbound and outbound time.

Timber section office: issue transportation certificate for qualified vehicles; flexibly query and statistical function to manage timber inbound and outbound data and visually reflect the result; put forward and modify requirements of the uploaded timber inbound and outbound data.

Storage management branch: master the timber inventory situation of different forestry bureaus anywhere and anytime; master the amount of timber inbound, outbound and inventory balance in a period of time and print reports; audit and manage the applies proposed by subordinate forestry bureaus.

Marketing operating branch: analysis the present situation and trend of the market; propose a reasonable timber price list for referencing.

Market trading branch: master inventory situation of all kinds of timber to apply for trading, and hanging out some kind of timbers for sales on the designated trading platform; receive orders feedback by the trading platform; issue lading certification for orders verified by finance branch.

Finance branch: check and audit the finance situation of each order; master the situation of financial transactions with customers and print reports.

Logistics branch: distribute transportation task to the subordinate forestry bureaus; master the timber transportation situation and supervise its transport flow.

9.2.3 Main Business Flow of the System

Through survey and analysis, the main business flow of the system is described as shown in Fig. 9.1; the core business ranging from information collection of

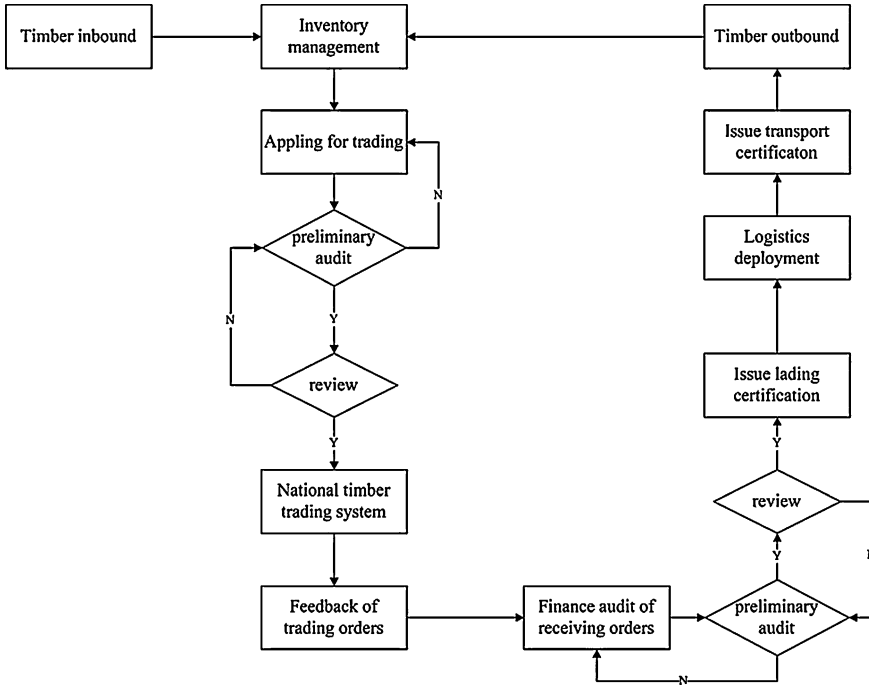


Fig. 9.1 Main business flow of the system

timbers transported into timber depot to sales timbers transported out of timber depot, in which businesses including hanging out timber information and sign bills do not belong to the system. In addition, due to the limitation of paper length, some other subordinate business flows of several departments are not described, such as applying for appropriate timber dispute and its audit and review process.

9.3 System Design

9.3.1 Design of Function Modules of the System

Through the analysis of function requirements of different departments and the whole business flow, the system can be divided into eight function modules:

System management: user management; role management; authority management; log management; personal information management; timber price viewing.

Timber depot management: barcode information generating; barcode information reading; information inquiring; information changes applying; vehicles inbound and outbound time recording.

Timber section office management: inventory inquiring; transport certificate issuing; inbound and outbound report printing.

Inventory management: inventory inquiring; report printing; applies auditing; appropriate timber dispute processing; sales inquiring.

Marketing management: price making.

Trading management: orders management; lading certification management; trading management.

Finance management: finance management of qualified orders; financial report of timber sales; final payment management.

Logistics management: transport management; transport report printing; transport supervision.

9.3.2 Design of Database

Using ER diagram, one can reasonably abstract entities and their relationship which are involved in the system and tables created through analysis and design, which includes user basic information table(user), system function table(menu), system role table(role), role and access table(role menu), user and role table(user role), wood inbound information table(sir), wood outbound information table (zest), wood inventory information table(kick), trade order table(dingdan), trade application table(jays), wood appropriated dispute table(zilch), lading certification information table(thud), transport certification information table (yes).

9.4 System Implementation

Wood marketing management system is designed to put nature information of timber into a barcode by unified coding rules; the barcode will be read by barcode acquisition device, then the system data are updated in realtime through the Internet, and other businesses are executed based on these data in order to achieve the goal of informational and intelligent management of timber storage, sales and transportation, to reduce the occurrence of data inconsistency and finally to improve the management level and economic benefits.

9.4.1 Selection of Development Environment

Wood marketing Web system and middleware system take JAVA as environment and use Web programming technologies including JSP language, JavaBean.

9.4.2 Implementation of Wood Marketing Web System

This section is the core of the whole system; the receiving, processing, trading, circulating and management of basic data are all completed in the subsystem.

For users having different permissions to log in the system with their user names and passwords, the operation interfaces can be different. The permissions are distributed and managed by system administrator; since the article length is limited, the simple introduction about the implementation of several key links is given below.

9.4.2.1 Implementation of Interface with Middleware System

The operation to call up middleware system to connect the barcode reader system and the wood marketing Web system is done manually by selecting the text files which are needed to be uploaded after depot staff log in the system. After the preprocessing of basic data in middleware system, the Web system receives the processed result and compares them with current situation of timber in database in order to perfect different kinds of timber data including timber inbound information, timber outbound information and inventory information in time.

Data update frequency is usually measured by cars when timber is transported into or out of the timber depot, namely update the database, once a car of timbers' data are all obtained. Timbers which have the same parameters must be more than one piece in one car, so it needs to merge these same data into one kind, calculate their total pieces and total volume, and then update the inventory and will reduce the system burden greatly.

9.4.2.2 Implementation of Workflow

Workflow is a calculation model of business flow; it is a model representing the logistic and rules used to organize work by order together and calculate their executed order. It is known that business flow in the system can stay stable, but business processing departments may be changing in the future. So, a kind of workflow management schema based on role is proposed [5].

The core idea can be described as follow: developers find out the whole business flow and other independent child business flow; then, administrator designates one or more roles for every business flow to process it, and this will realize that users belong to one role can participate into the business; if a flow does not obtain any role, then this flow will be automatically passed when executing business flows by order, and flexible business requirements are realized to some degree. As the business processing department changes, roles are needed to be adjusted corresponding to the business. The core algorithm can be described as below:

Initialization

Locate the current flow and find the next flow according to the configuration file; initialize the roles and specific users participated in the current flow and the same parameters of next flow; prepare the data to be submitted.

```

Current Flow = flow[i].ID; //locate current flow
Current User = this. Get Current User (); //find current user
Current Role = this. Get Current Role by User (current User); //find role of the
current user

```

Next Flow = this. Get Next Flow (current Flow); //initialize next flow
Next Role List = this. Get Role List (next Flow); //initialize roles participated in the next flow

```

For (next Role List: next Role) {
  Next User List add (next Role List[i].get User List ()); //initialize users participated in the next flow}
  For (next User List: next User) {
    Next User do = false; //initialize the operation status of users participated in the next flow, and default status is "false"}

```

Call up the flow

Trigger the flow and drive the business forwarding to the next flow; modify the parameters of the flow environment in order to be ready for the next business jumping.

```

For (next Role List: next Role) {
  Next User List = this. Get User List (next Role);
  For (next User List: next User) {
    Next User do = true; //initialize the operation status of users participated in the next flow, and default status is "true"}

```

Receive and process the business

Receive the business and process it, perfect the detail aspects of the business and update parameters of environment. If this business not ends, then forward to (4), else modify the end tag of this business flow.

Is Finished = current Flow. Is Finished;

```

If (current User. do == true) {
  .....//business processing
  If (is Finished == false) {
    If (has Next Flow ()) {
      .....//forward to (4)
    } else {
      Is Finished = true; //end the flow
    }
  }
}

```

repeat the three steps above

9.5 Conclusion

This system is a set of wood marketing information management system integrating information collection, wood storage sales, transport and management into a whole system. Advanced and popular technologies are used to solve some defects that are existing in traditional systems, such as operation mode, limitation in function amount. The implementation of the system not only greatly improves the data consistency and accuracy of timber, but also provides a solution to promote and perfect informalization degree of wood industry.

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Chapter 10

Study on Measurement of Class Coupling in Object-Oriented Software

Bo Yang and Fangting Zhao

Abstract Class coupling is dependency degree among classes, objects or components in object-oriented systems. It is important characteristic of software quality. This paper analyses the well-known class coupling measures in detail and depth, and indicates their defects. Based on anatomy of dependency among classes or objects a novel approach weighted-CBO is proposed to measure the class coupling to make up the deficiency of the existing measures. The experimental results prove the accuracy and validity of the metric method. The new method provides a guideline and new idea for evaluating class coupling.

Keywords Coupling · Metric · Object-oriented · WCBO · Method · Attribute

10.1 Introduction

In recent years, with the rapid expansion of software scale and complexity, the software quality has higher requirements. Software quality is often related to people's lives and property losses or the destruction of the ecological environment. The quality of software has become a hot field of study.

In the OO metrics research area, many researchers have researched different flank of internal quality properties of the software. And a software internal

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property of coupling metrics, one of the closest related software qualities of software metrics, has become a research hotspot.

Coupling is the relationship of software module components or objects is one of the most important characteristics of software.

Coupling degree marks the connection strength of multiple modules or objects of the software system. If coupling degree is low, the software is easy to be understand, modification and maintenance. Then, a module of the software is modified; the effect of other objects or modules is less [1].

Software coupling metrics is a combination of structured software design and object-oriented software design. Because both the structured software design and object-oriented software design, high quality software design, one of the many principles is to follow the low coupling principle. “High cohesion, low coupling” is one of the goals of software development. In order to objectively evaluate software module coupling degree, people put forward many measures and standards for the design staff to develop a low coupling modules or objects guide.

In this paper, first section introduces the classic type of coupling method, and further points out that a class of coupled measure affected by class property, class attributes and their methods. On the basis of first section, second section presents a new coupling degree measure method that is called weighted coupling measurement method. In the third section, the effectiveness of the proposed method is proofed through the experiment. Finally, fourth section gives the conclusion; points out the new method from the fully consider angle of the system. Thereby, the type of coupling metrics has more accuracy.

10.2 Related Work and Existing Problems

On the coupling metrics method, it has many kinds, they are object class coupling, class of response, message transfer coupling, data abstraction coupling, fan-in fan-out coupling, coupling factor, based on information flow coupling and Briand et al. proposed coupling method. Common methods are shown as follow:

Coupling between Object classes (CBO):

$$\text{CBO}(C) = \{D | \text{uses}(C, D) \vee \text{uses}(D, C)\} \quad (10.1)$$

Uses(X, Y) define the implementation of class X ; method, attribute and instance of class Y are used [2].

Response For Class (RFC): $\text{RFC}(C) = |RS|$, RS is the message response set of class C . $RS = \{M\} \cup \{R_i\}$, $\{M\}$ is the method set of class, $\{R_i\}$ is the method set that can be directly called.

Data Abstraction Coupling (DAC)

$$\text{DAC}(c) = \{a | a \in A_t \wedge T(a) \in C\} \quad (10.2)$$

$A_i(x)$ is the attribute set of class x , $T(a)$ is the definition type of attribute a , C is the set of all class in the system [3].

Coupling Factor (COF):

$$\text{COF} = \frac{\sum_{i=1}^{TC} \sum_{j=1}^{TC} \text{isclient}(c_i, c_j)}{TC^2 - TC - \left[2 \sum_{i=1}^{TC} |\text{Descendents}(c_i)| \right]} \quad (10.3)$$

$\text{Isclient}(c_i, c_j)$ represents a class c_i calls the method or property of c_j ; if c_i at least call a method or property of c_j , c_i and c_j is an inheritance relationship, the value of $\text{isclient}(c_i, c_j)$ is 1, otherwise the value is 0. $\text{Descendents}(c_i)$ represents a derived class set of class c . $TC^2 - TC$ is the system maximum coupling degree that has a number of TC [4].

Although, these metrics and the principles embodied in the class of coupling metrics do more in-depth research, however, problems still exist.

In the implementation of coupling metrics, these classic measurement criterion and method are all properties and methods without distinction, so the coupling metrics cannot correctly reflect the actual situation.

These classical measurement criteria and methods are only considering the correlation of system class of attributes, methods, while ignoring these attributes, methods for the class of measure coupling effect, so it can not reflect the actual coupled situation.

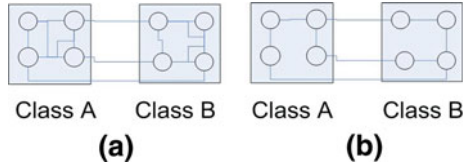
10.3 Improvement of Class Coupling Metric Method

Coupling metrics is the correlation degree of each module of the metric software program structure. Coupling intensity depends on the complexity of access module interface or call module position and the data the number transmits through the interface. In software design, looser coupled system should be the aim. Because design, test, maintain of any kind system modules are relative independence. Because of little connection among the modules, error in module transmission feasibility is also diminished. Module coupling degree has a directly influences the system' legibility.

When calculating the coupling degree, only considers the component external influence is not comprehensive. The effects to assembly members are both from its exterior, and inside [5].

Class A and class B are as shown in Fig. 10.1. Class association can be expressed as a class member visibility caused by the relation between classes. In Fig. 10.1a the coupling degree between class A and class B of (a) is less than the coupling degree between class A and class B of (b). But the previous measurement methods cannot distinguish the difference of the coupling degree in these two graphs.

Fig. 10.1 Class coupling metrics of comprehensive impact factors



In the JAVA and other object-oriented languages, the attributes of the class and member method statement for the public attribute and member method can be accessed, modified and used by all class; protected statement can be accessed, modified and used by subclasses of the class and the same package; private statement can only be used by the kind of class; private protected statement can be used by subclasses of the class; class member without the statement, they can be default accessed, can be used by the same classes in the package.

So, we propose a new method that called Weighted Coupling between Object classes (WCBO).

Let C be a class in system S , A is the attribute set of class C that contains n classes (A_1, A_2, \dots, A_n) attribute. M is the collection member method C that contains m methods (M_1, M_2, \dots, M_m) .

Definition 1 Class attribute internal influence factor λ' and class attribute external influence factor λ :

$$\lambda'_i = \begin{cases} 1, & \text{if attribute} = \text{private} \\ 1/\text{vis}(A_i), & \text{other} \end{cases} \tag{10.4}$$

$$\lambda_i = 1 - \lambda'_i \tag{10.5}$$

$\text{vis}(A_i)$ is the visible class number for the system S . Some properties of class are visible. λ' is the ratio of the number of class and the system of the property. Class of external environment on its impact factor is one minus the class attribute on its influence factors.

Definition 2 Class method internal influence factor ω' and methods of external influence factor ω :

$$\omega'_i = \begin{cases} 1, & \text{if method} = \text{private} \\ 1/\text{vis}(M_i), & \text{other} \end{cases} \tag{10.6}$$

$$\omega_i = 1 - \omega'_i \tag{10.7}$$

$\text{vis}(M_i)$ is the visible method number M_i for the system S . If a class method are visible for some classes. ω' is the ratio of the visible class number in the method

and system of the number, external environment class method on its impact factor ω is $1 - \omega'$.

Define weighted coupling degree of a class (WCBO):

$$\text{WCBO}(C) = \sum_{M_i \in C} \omega_i |\{D | \text{uses}(M_i, D)\}| + \sum_{A_j \in C} \lambda_j |\{D | \text{uses}(D, A_j)\}| \quad (10.8)$$

M_i is member method of class C , $\text{uses}(M_i, D)$ is method of class D that called class method M_i , $||$ is base number, ω_i is M_i method's influence factor for class C . A_j is attribute of class C . $\text{uses}(D, A_j)$ is class D that used attribute A_j of class C . λ_j is impact factor of attribute A_j of class C .

Then, the weighted coupling degree is normalized, normal WCBO can be defined:

$$\text{NWCBO}(C) = \frac{\text{WCBO}(C)}{|\{D | \text{uses}(C, D) \vee \text{uses}(D, C)\}|} \quad (10.9)$$

Finally, the system S weighted coupling degree is shown as follow:

$$\text{WCBO}(S) = \sum_{C \in S} \text{NWCBO}(C) \quad (10.10)$$

use (X, Y) define the implementation process of class X .

Formulas (10.9) and (10.10) can better reflect the complex coupling relations between classes.

10.4 Experiments Analysis

In order to prove that the weighted coupling measurement method is effective, a practical software measurement and classic type CBO metric are comparatively analyzed by formula (10.9) and (10.10). JUnit is an open source test tool that designed by the object-oriented expert Kent. Beck and Erich. Gamma. JUnit 3.5 is carried out on the basis of JUnit 3.4 by remodeling; its function and software quality have been improved. Similarly, the JUnit 4.4 is repeatedly remodeled on the basis of the JUnit 3.5; its function and software quality has improved too. We select JUnit 3.4, JUnit 3.5, JUnit 4.4 and weighted coupling method for JUnit source code in Base Test Runner, Test Result, Test Case Class Loader and other types class to couple degree measure. The results are shown in Table 10.1.

As can be seen from the measurement data's comparison, along with the software version development, NWCBO is shown in a downward trend. The software quality can be improved, which is consistent with the actual. And CBO can not reflect this trend, such as Test Case Class Loader of JUnit 3.5 CBO is rose instead. So, weighted coupling measurement method is more wide and accurate than CBO coupling condition.

Table 10.1 Coupling metric data of JUnit source code

Class name	Software version JUnit	CBO	NWCBO
Base test runner	3.4	21	0.4105
	3.5	21	0.3708
	4.4	20	0.3423
Test result	3.4	10	0.1462
	3.5	10	0.1344
	4.4	10	0.1123
Test case class loader	3.4	3	0.3562
	3.5	4	0.3439
	3.8.1	3	0.3323
Test suite	3.4	13	0.5397
	3.5	12	0.5165
	4.4	12	0.4964
Test tree model	3.4	3	0.2411
	3.5	3	0.2136
	3.8.1	3	0.1963
Test runner	3.4	6	0.4849
	3.5	6	0.4633
	4.4	6	0.4389

10.5 Conclusion

Famous class coupling metric is undertook more thorough analysis, the existence of defects and deficiencies is pointed out. In a comprehensive analysis of the class attribute and attributes, methods and attributes and methods and approaches and their relationship, a class of coupled measure is not only affected by other types of property and method, and it is also affected by the attributes of the class, method. These factors should be considered. Therefore, this paper puts forward a new coupling degree measure method of weighted object class coupling (WCBO). Then, JUnit open source software class coupling is measured by using a new measurement method. In the experimental data, the new measure method, comparing with the original measure, is more accurately and efficiently.

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Chapter 11

Research on Coding for Objects Oriented to Modular Product Platform

Pinglu Chen and Jing Xu

Abstract In order to improve its ability of fast response to replying the economic globalization and product diversification, the modular product platform is established in most enterprises. The new products are developed based on the modular product platform as well as the existing objects are used for configuration and modification. The ordering for the existing objects is firstly carried out of all things. On the basis of reviewing the coding methods, the coding system for objects oriented to modular product platform is proposed. Combined with the features of the modular product platform, the corresponding coding principles are analyzed. Viewed from enterprise reality, the coding schemes for objects are discussed oriented to the modular product platform. The application indicates that the coding schemes have strong maneuverability and improve the efficiency of enterprise personnel. It is the guide of implementation for information in future.

Keywords Coding system · Coding schemes · Modular product platform

11.1 Introduction

The enterprise competition core has come up with great changes caused by economic globalization and information. In order to adapt the competitive environment, the modular methods are studied and popularized. So, the requirements to build the modular product platform become even stronger. The higher demands are presented that the coding system would express the relations between platform

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objects perfectly. It is assure that changes may be traced from the ordered objects. The coding schemes would realize the identification of objects accurately so that the information interaction become more smoothly among most departments in the life cycle. Consequently, the technology of objects coding has been one of the key research problems in recent years.

Lots of researches have been launched about coding system, coding methods, coding technologies and so on. Coding is known as the process for endowing symbols, graphs, colors and writings and so on [1]. The codes must have certain rules and be identified easily. The main purpose is easy to organize, manage, reuse and interact the objects in the modular product platform. Qi [2] puts forward the coding system which it is composed by classification code, identification code and view code. Deng [3] proposed the information classification and coding system oriented to EAI. Currently, the common coding methods include subornation coding, composite coding, parallel coding, identifying coding, etc. Their merits and demerits are shown in Table 11.1. In addition, Neodesha [4] explicated the classification and coding method adapted to CAD/CAM. The system of classification and coding is developed to support different activities, such as design, manufacturing, management. Based on the requirements of large-scale group technology, Liu [5] established the method of classification and coding combined with folksonomy and part ontology. The coding model is described by Yi [6] based on ontology which the relations of code segment are represented. The coding systems in most countries are being applied at present including VUOSO, BRISCH, OPITZ, KK-3, JLBM-1, etc. Chen [7] analyzed the code points and applications of the above systems in detail. Zhang [8] indicated flexible coding system oriented to multi-view on the basis of reforming the coding rules.

Most of the above methods are judged by group technology which it is lack of the information about function and structure. The customized requirements are

Table 11.1 The merits and demerits of the coding methods

Coding method	Merits	Demerits
Subornation coding	<ol style="list-style-type: none"> 1. The code has abundant structure implication. For example, assembly relations 2. The method is fit for manual operation 	<ol style="list-style-type: none"> 1. The method has low expansibility 2. Lack of classification module
Composite coding	The code has certain classification information. It may be used for identifying	The method has low expansibility
Parallel coding	<ol style="list-style-type: none"> 1. The code has better expansibility 2. The code has certain classification information. It may be used for identifying 	The code has not contained structure information or engineering information
Identifying coding	The classification information is saved in database related with identification code	The classification information may not be reflected in the code

hard to meet for modular product platform to support design activities perfectly. So, a set of coding system and coding schemes may be need urgently oriented to modular product platform which serve as the theoretical foundation.

11.2 The Objects Coding System Oriented to Modular Product Platform

The objects coding system oriented to modular product platform is an organic whole including coding specifications, coding rules and relations between objects in the modular product platform. The coding system possesses the characteristics of adaptability, relevance, integrity and so on. The coding system is the basis of establishing modular product platform. It is convenient for information sharing among all departments or all application systems.

The types of coding are indicated by DIN 6763 [9] such as numerical code, alphabetic code and alphabetic code. The code can be expressed by some meaningful strings such as feature code, series code and abbreviated code. It is also shown by non-meaningful strings such as water code or disorder code in Fig. 11.1.

In order to meet the reuse requirements of modular product platform, the coding specifications should contain classification code, identification code and meta-attributes shown in Fig. 11.2. The classification code reflects the classification condition of objects in modular product platform. The definition of classification code is presented by DIN 4000 and GB/T 10091. The identification code is used to distinguish different objects. Each object has an only identification code. The meta-attributes are used to describe the status of objects which are managed in the attribute pool uniformly. In order to work normally, some enterprises carried out the transition between new coding scheme and old one. The coding information in the old coding scheme is treated as the value of meta-attribute in new coding scheme. In other ways, the attribute “old code” is added to the meta-attributes of new coding scheme.

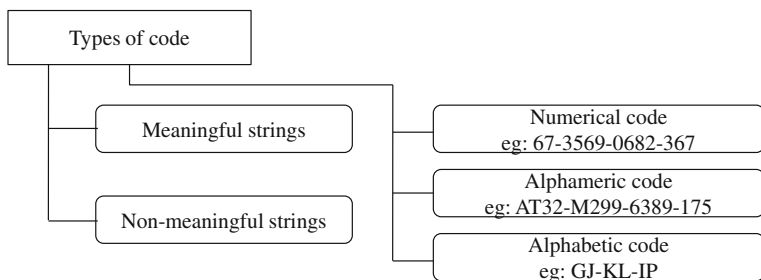


Fig. 11.1 Types of code

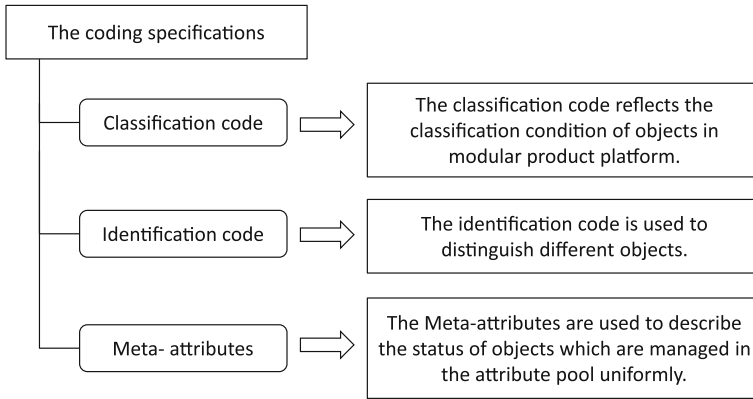


Fig. 11.2 The coding specifications

The relations of objects coding are set up through the form of objects chain in the coding system. After the information of object are altered, the status of the object would be occurred a certain change; at the same time, the information of the related objects would also be varied. For example, the meta-attribute “Revision” or “Version” would be obtained a new revision or a new version. Consequently, the coding relation model of objects comes into being naturally oriented to modular product platform [10, 11].

11.3 The Coding Principles Oriented to Modular Product Platform

During the course of coding for objects in modular product platform, the following principles must observe strictly [12].

Uniqueness principle There is a one-to-one correspondence between an object and a code.

Brief principle The code should be simple and catchy as far as possible.

Expandability principle Some code segments or code positions should be obligated for new objects in the coding system.

11.4 The Coding Schemes Oriented to Modular Product Platform

Based on the above coding system and coding principles, enterprises should set up the suitable coding schemes aimed at their own realities. Combined with much practical experiences in the manufacturing enterprises, the following coding

schemes are listed for your reference only. The merits and demerits of each selection method about classification code and identification code are presented. The meta-attributes are the management characteristics of objects which they are taken into consideration the actual conditions of mechanical enterprises.

The water code is adopted by classification code and identification code, respectively. The classification codes are obtained from the classification tree of water code. The identification codes are generated by computer orderly. The current code of objects corresponding to “old code” in meta-attributes. The original information of coding is still achieved for the enterprise personnel. The new creating objects are not given the old code. The set of coding scheme has high implement efficiency and strong expansibility. It is convenient for possessing by computers and reusing for design activities. However, the classification information cannot be comprehended from the code directly for enterprise personnel. They need some time to adopt the new coding system during the course of operation.

The classification code is chosen the combination codes with a certain meaning. Based on the enterprise own actual, the code segments are defined through related implications reasonably which may refer to the relevant rules of GB/T 7027 [12]. The current code of objects is acted as the identification code. The coding scheme would conform to designing habits of enterprise personnel. The classification information may be appeared clearly on the code. Yet it has a complex implementation process. Scalability is not strong.

The combination code is employed as the classification code. Meanwhile, the identification code may apply the water code. The coding scheme has explicit classification hierarchy which the process of retrieval becomes more efficient. Nevertheless, it is difficult to adopt the complex implementation process for enterprise personnel.

Before the coding schemes are implemented, a transition is set up between new scheme and old one. Aimed at the problem of multiple classifications, the object and the index of object should own different classification codes, respectively. Their identification must be the same one. Just so the redundancy of platform objects may be controlled successfully.

Propelled by the information process, the integration of systems is an important way to improve efficiency which occurs among the coding system with CAD, PDM, CAPP, ERP, SCM and so on. They are the core of informatization in the manufacturing enterprises. During the course of the integration between the coding system and PDM, the coding system provides the functions of code generation, code resolution and code management, etc. The interface of coding system and CAD has two core tasks. One is the information imported. Based on the chain of objects are built in the coding system, the required information are imported into CAD through the coding system. Another task is the information filled out. The related information in the coding system is recorded into the title bar of CAD. The data of the coding system and ERP must be interacted according to the actual situations which include the product structure, part master record, draft master

record, document master record, bill of material and so on. The process of transforming need to record the modification status of objects by the coding system, but ERP is hard to realize management. The interface of classification function would be established between the coding system and ERP. The objects of coding system are related with the objects of the product structure through the classification tree and tabular layouts of article characteristics. In the same way, ERP should supply the route of classification.

The implementation of coding system is an iterative process. The key and important objects may be chosen to experiment. During the course of implement, the users put forward the improvement suggestions to make the coding schemes better and better.

11.5 Conclusion

Stood in the point of view of the enterprise actual, the coding system oriented to modular product platform is proposed based on the current situation of objects coding. Aimed at the reuse requirements of modular product platform, some coding schemes are formed which they are fit for maneuverability. The application indicated that the coding schemes were reliable evidences and directive principles for objects ordering and design reuse.

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Chapter 12

Artificial Intelligence Design for Tropical Storm Surge Disaster Prevention and Reduction

Bo Lin

Abstract Tropical storm surge is one of the primary and also the most serious maritime disasters in the coastal areas of China. The backward aid decision supporting method is the largest and also the most urgent problem that is difficult to be solved in the current emergency management of tropical storm surge disaster prevention and reduction. In this paper, by applying the theory and technology of artificial intelligence (AI), researching knowledge base and reasoning machine, and using the rule-based production knowledge representation, the credibility-based forward reasoning strategy and the data-mining-based intelligent learning way, a practical AI is designed for tropical storm surge disaster prevention and reduction.

Keywords Tropical storm surge · Emergency management of disaster prevention · Aid decision supporting system · Research

12.1 Introduction

Artificial intelligence (AI) was known as one of the three sophisticated science and technology achievements (i.e. artificial, intelligence, atomic energy, and space technology) in the twentieth century [1, 2]. Although AI was early proposed as a branch of computer science in the twentieth century, it has changed into a cross-discipline that is applied in multiple areas such as computer science, psychology, biology, and nervous system science now.

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Expert system (ES) is the most active and the most extensive technology in the field of AI. Since the 1960s, ES was developed as a research tool. Edward Feigenbaum, professor from Stanford University, defined ES as “a kind of intelligent computer program and it solves the complex problems that can be solved only by experts by using the knowledge and reasoning process” [3, 4]. In the 1970s, the view of ES was widely accepted by people with a gradual step. In the 1980s, ES began to be put into commercial purposes, and also produced great economic benefits [5]. Since the 1990s, ES stepped into the period of high-speed development. Today, ES has been widely applied in almost all knowledge areas such as business, science, engineering and manufacturing [6].

However, researches on this aspect were started very later in China. In 1977, the first ES was successfully researched and developed in China. In 1981, relevant academic groups such as Chinese Association of AI were established one after another. Since 1986, related major projects were listed in the national high technology research plans. In the twenty-first century, there have been more and more ES researches to obtain supports from various fund plans.

Tropical storm surge disaster is in the primary position of marine disasters in the world. However, China is close to the world’s most troubled sea (Northwest Pacific Sea), and therefore is a hit area of natural disasters. For this reason, the National Program Planning on Developing Sea through Science and Education (2008–2015), which was formulated by the State Oceanic Administration, shows the guideline of marine management and security control and the requirement on constructing an emergency management aid decision supporting system for natural disasters such as storm surge, red tides, oil spill, sea ice, tsunamis, and sea levels rising and so on. In this paper, by using the ES theory and combining computer, time and space information, and database technology, an ES is designed for tropical storm surge disaster prevention and reduction, thus providing a reference for the establishment and implementation of disaster prevention and reduction emergency system and even the whole the decision supporting system under the condition of tropical storm surge disaster.

12.2 The Basic Structure of the System

Tropical storm surge disaster prevention and reduction is leading-edge systematic engineering that crosses multiple disciplines. However, the decision makers for tropical storm surge disaster prevention and reduction are unlikely to all-around experts integrating knowledge in ocean, security, information technology, etc. Fortunately, AI, which integrates the professional knowledge and research findings of multiple disciplines such as ocean, security and information technology, the rich practical experience in disaster prevention and reduction, and the super powerful problem-solving ability, can provide good technical supports and helps.

The effectiveness of tropical storm surge disaster prevention and reduction depends on the speed of responses to emergencies and the efficiency of emergency

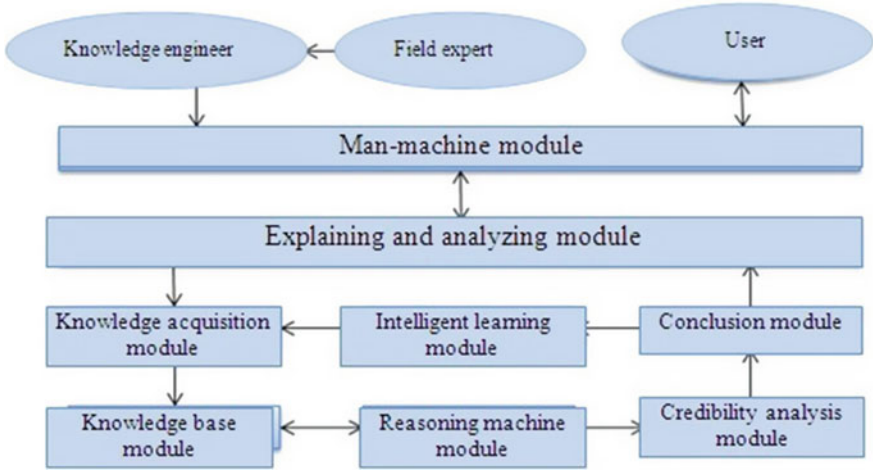


Fig. 12.1 Working principle of AI for tropical storm surge disaster prevention and reduction

rescues. However, making reasonable solutions and providing corresponding aid decision making tools are powerful guarantee and technical means for improving both speed and efficiency. Its working principle is shown in Fig. 12.1.

From Fig. 12.1, the AI for tropical storm surge disaster prevention and reduction comprises of eight modules as shown below.

Man-machine interactive module: Through multimodal user interface (MUI) technology, new interactive channels (sight lines, voice and gestures, etc.), equipments and technologies comprehensively, users are allowed to carry out man-machine dialogue in natural, parallel, and cooperative ways with multiple channels, and therefore interactive intentions of users can be captured through the integration of inaccurate and accurate inputs sourcing from multiple channels, and thus the naturalness and efficiency of man-machine interaction can be improved.

Explaining and analyzing module: The problems, knowledge, reasoning and conclusion can be explained and analyzed according to the ways that can be easily accepted by the users and the system.

Knowledge acquisition module: Knowledge from external environment can be acquired through the manual, semi-automatic and fully-automatic ways.

Knowledge base module: Knowledge base generally includes expert experience and field knowledge, and also is a memory for storing knowledge and data. In knowledge base, authoritative knowledge and data provided through knowledge acquisition, reasoning and intelligent learning can be stored. It can be classified into fact database, rules base, and knowledge base.

Reasoning machine module: The module is used for controlling and adjusting the core components of the whole AI.

Credibility analysis module: This is an inexact reasoning (IR) module, and is used for calculating the credibility of target conclusion through credibility factors.

Intelligent learning module: This is a data mining (DM) module.

Conclusion module: Result output is produced according to the reasoning results and credibility calculation.

12.3 Key Technologies

12.3.1 Knowledge Base Module

The tropical storm surge disaster prevention and reduction is affected by multiple factors. Therefore, how to select an optimal emergency response program according to the actual conditions of tropical storm surge disaster such as grades, affecting scope and marching route and the local coastlines and topographical structures is not only a key issue of AI, but also a content framework composing a systemic knowledge base, as shown in Fig. 12.2.

The quality of the knowledge system, knowledge organization, expression and storage ways of knowledge base will directly affect the reasoning efficiency of reasoning machine, the comprehensiveness and updating of knowledge in knowledge base, and the ability of ES to solve problems.

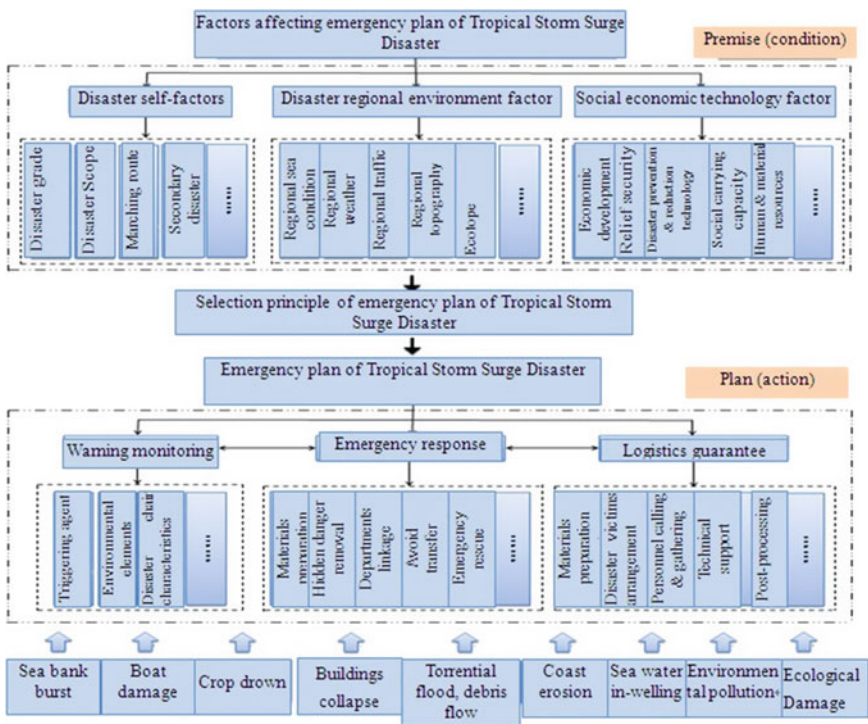


Fig. 12.2 Knowledge base framework of intelligent ES for tropical storm surge disaster prevention and reduction

The knowledge in the knowledge base of the tropical storm surge disaster prevention and reduction sources from tacit knowledge of ocean experts, security experts and rich-experienced emergency rescue personnel, explicit knowledge of case records, emergency rescues, disasters prevention and reduction documents and materials, and relevant departments' emergency plans, etc.

Knowledge representation is one of the key technologies of knowledge engineering.

Knowledge in disaster prevention can be mainly concluded in the following.

Factual knowledge: This refers to the knowledge about object and its concept characteristics and mutual relationship, and problem solving condition, and is the foundation of decision-making rules and reasoning rules in knowledge base.

Heuristic knowledge: This refers to the knowledge about the problem solving related to the field is expressed with cases and experience, and also is aid information for the operation of reasoning machine. This kind of information can be compiled into the rules in procedural knowledge through sorting.

Procedural knowledge: This is to describe how to solve problems, including the user-defined functions called in the reasoning process and the control strategies of problem solving, etc.

According to the actual conditions, production representation, semantic networks, frame representation, ontology representation, predicate logic, and object-oriented representation are comprehensively compared, and finally production representation, which is closer to human thinking, natural and easy-to-understand, and also free to add, delete and change rules, is decided to be applied, and also knowledge is organized, stored and managed with relational database.

In the rule-based AI, production knowledge representation is as shown below.

ID: If {P1 (cf1, w1)} & {P2 (cf2, w2)} &...

Then {Q1 (CF (H, T), λ)} & {Q2 (CF (H, T), λ)} &...

Note: ID Number of production representation

P_i ($i = 1, 2, 3...$) Premise of production representation, namely a precondition is given for whether this production representation can be used, and is composed of fact logical combinations;

cf_i ($i = 1, 2, 3...$) Credibility of premise P_i (true degree);

w_i ($i = 1, 2, 3...$) Weight of Premise P_i , expressing the relative importance of premise;

Q_i ($i = 1, 2, 3...$) Conclusion or plan, meaning that conclusion or implementation plan should be offered if premise p_i is satisfied;

CF (H, T) Premise P_i is true in rules and Q_i is a true credibility, reflecting the support degree of premise on conclusion and is an estimate value for rules' accuracy;

λ Rule threshold ($0 < \lambda < 1$), given by field expert

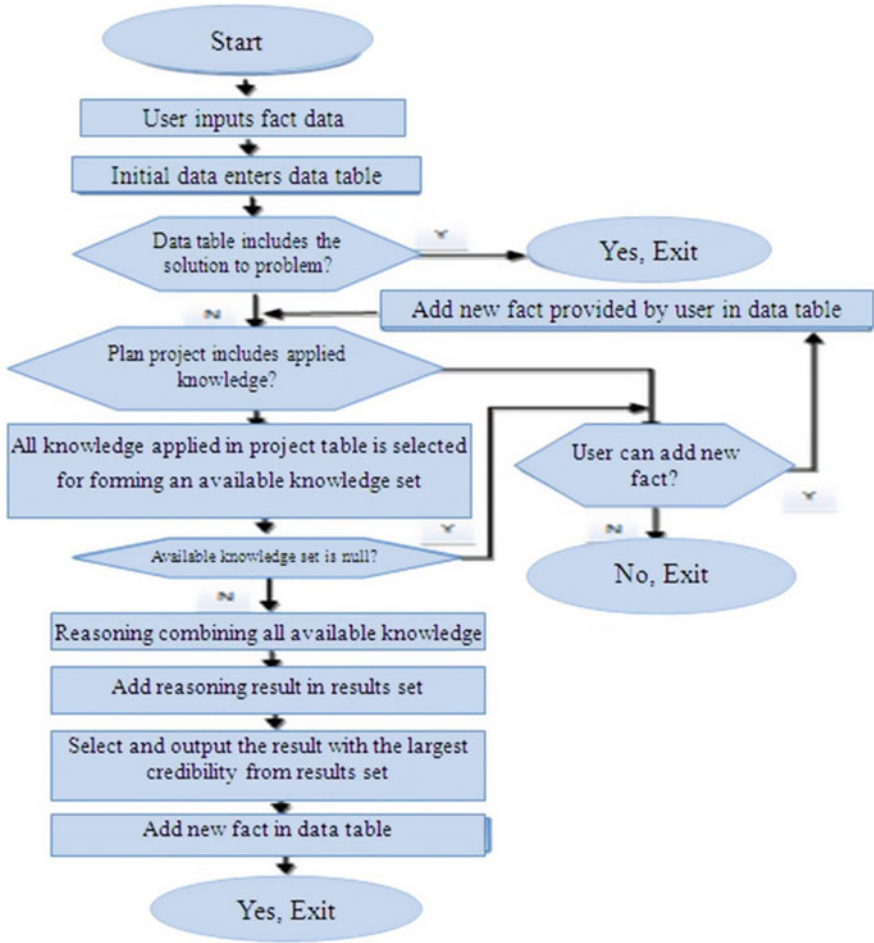


Fig. 12.3 Reasoning process

In above, values of cf_i , w_i , $CF(H, T)$ are in interval $[0, 1]$ (values are given by field experts), and also satisfy the following condition.

$$\sum_{i=1}^n w_i = 1 \tag{12.1}$$

12.3.2 Reasoning Machine Module

Reasoning machine is the core of the way of thinking of AI. Design of reasoning machine and knowledge representation method are greatly correlated, and

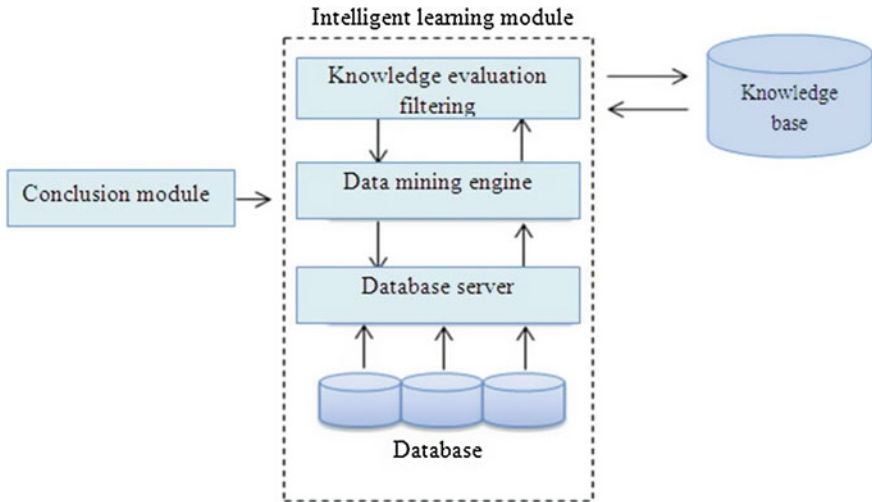


Fig. 12.4 AI learning module of tropical storm surge disaster prevention and reduction

therefore knowledge reasoning should be conducted with reasonable reasoning mechanism in order to acquire high-efficient and accurate problem solving ability. In this system, forward reasoning started from facts is applied and also matching and conflict resolution strategies based on credibility are combined. The reasoning process is as shown in Fig. 12.3.

Fact basis should be input into reasoning machine module first, and then whether solution to problem is included in database table is checked.

12.3.3 Intelligence Learning Module

From the actual domestic conditions of AI, because of the talented personnel structure deviation and technical personnel knowledge structure defects of employing units, the difficulties in the timely expansion, real-time modification, research and development of knowledge base have increasingly more obvious to become bottlenecks of new development. The AI learning module of the ideal tropical storm surge disaster prevention and reduction is shown in Fig. 12.4.

In Fig. 12.4, DM engine is the most fundamental part of DM system, comprises of a group of functional modules, and is used for correlation, evolution and deviation analysis.

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Chapter 13

Study on the Electronic Payment Technology in E-Commerce

Qidong Wang and Jun Zhu

Abstract Along with the rapid development of e-commerce, the traditional payment ways have been unable to meet the demands of electronic transaction currently. In this paper, the electronic payment technology in e-commerce is briefly introduced, the characteristics of many payment ways are analyzed and also the applications of these payment ways are concluded.

Keywords E-commerce · Electronic payment technology

13.1 Introduction

E-commerce application system involves a wide range, including buyers and sellers, banks, logistics department, network system, payment gateway, authentication center, and business management department [1, 2]. Figure 13.1 shows the structure of e-commerce application system in the following. In recent years, along with the continuous development of the network technology, the development of the e-commerce is accelerating without a stop. Now, e-commerce is permeating into the daily life of people little by little and also has changed into an indispensable part. Relative to the development of e-commerce, the traditional payment ways have been unable to meet the demands of the online operations of electronic transaction because of the limitation of the face-to-face transaction model [3]. With the purpose of adapting to the development of e-commerce better and meeting the demands of the online operations of electronic transaction, all sorts of

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electronic payment ways are born at the right moment. Because the complex and time-consuming problems of the traditional payment ways are overcome by the electronic payment technology, business transactions become more efficient, secured, etc. Therefore, the role of the electronic payment technology in e-commerce cannot be ignored [4].

Electronic payment actually refers to a payment way in which the traditional payment tools are replaced with electronic data loading specific information for fund flow through electronic computers and network and also with real-time payment effect. Compared with the traditional payment ways, electronic payment ways are to complete the information transmission by relying on the advanced technologies via digital circulation, and all sorts of electronic payment ways are to complete payments through the digital way. What electronic payment uses is the most advanced communication method, and its working environment is based on the Internet which is an open systematic platform. In daily life, the credit cards, debit cards, cell phones, online banking, Alipay and other online payment tools, which are commonly used by us, belong to electronic payment. Electronic payment can be classified into “online payment” and “offline payment” according to the difference of payment technologies [5, 6]. Payment transaction which is necessary to keep communication with banks in real time is called as “online payment.” However, the payment transaction which applies the way of pre-deposits and is unnecessary to keep communication with the accounts in banks is “offline payment.” Credit card, debit card, online banking payment and other payment

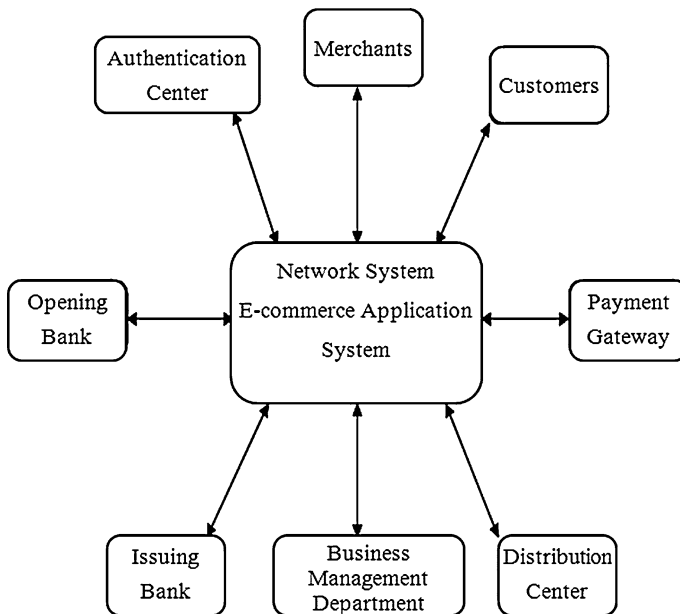


Fig. 13.1 The structure of electronic application system

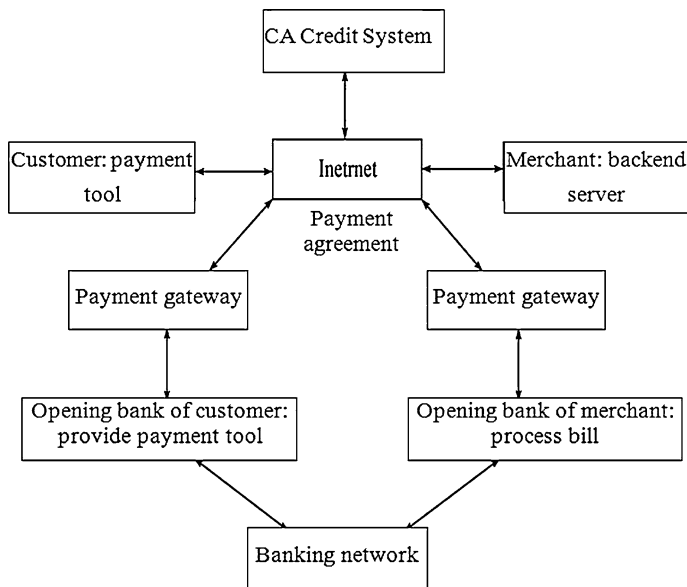


Fig. 13.2 The basic constitution of electronic payment system

ways belong to “online payment”; mobile payment, bus card and one-card belong to “offline payment.”

Electronic payment system refers to a system, in which consumers, merchants and financial institutions exchange products and services with each other using secured electronic payment means. That is, new types of payment means including the payment information of electronic currency, credit cards, debit cards and smart cards are sent to the corresponding processing agencies such as banks for realizing electronic payment with high security through the network. The objects that get involved in electronic payment system include customers, merchants, banks of deposits, payment gateway, bank network and CA certification [7]. The basic constitution of the electronic payment system is shown in Fig. 13.2. At present, the electronic payment technologies, which have been widely applied in e-commerce, include electronic currency payment technology, electronic check payment technology, bank card payment technology and electronic purse technology.

13.2 Electronic Currency Payment Technology

The currencies which realize payment functions in the form of information transfer through the computer network are called as electronic currencies.

Compared with the traditional currency payment, the electronic currency payment technology features easy-to-use, high security and fast speed and thus

ensures payment transactions to proceed with high efficiency. Electronic currency system is the foundation of e-commerce activities, and also the smooth development of e-commerce activities has a close connection with the establishment and well improvement of electronic currency system.

Electronic cash (e-cash), as one of the most representative electronic currencies, is an electronic payment technology that is developed by Digicash Company and very much applicable to small payment. Consumers can realize the bank savings between banks and personal computers.

If it is necessary to use currencies for payment, merchants receive the electronic cashes that are paid by consumers and verified by monetary banks. The electronic cashes that are verified by monetary banks to be effective can be exchanged with real currencies.

If it is temporarily unnecessary to use currencies for payment, consumers can return the electronic cashes on their personal computers to the electronic cash library of banks. At present, the electronic cash payment way has been accepted by increasingly more consumers.

13.3 Electronic Check Payment Technology

Electronic check refers to the data message with digital signature and is the same to the traditional checks in functions.

However, the confirmation on the identities of payers and receivers and the information of accounts and payment banks are realized through the digital signature. Compared with the traditional signatures, digital signatures are with a higher security performance. This also means that the security performance of electronic checks is further improved in comparison with the traditional checks.

In addition, electronic check is with a very powerful applicability, and its application has made the process of check payment become simple, thus promoting the efficiency of the check payment business to be greatly improved and helping the automation of check payment to be realized.

The structure and filling way of the electronic checks are generally the same to the traditional checks. Electronic check includes not only the information about the name, account number and amount of the receivers, but also the encrypted security information. The specific use way of electronic checks can be concluded from three aspects.

First, the payer sends the electronic check that has been filled completely to the receiver through email address and simultaneously sends the electronic payment notification to bank.

Second, the receiver, after receiving the electronic check, takes it out and verifies the information through the digital signature and sends the electronic check to bank after confirming it.

Finally, bank, after confirming the identity information of the receiver according to the payment notice sent by the payer, transfers the payment into the account of the receiver.

13.4 Bank Card Payment Technology

The payment technology which relies on bank card to complete the payment process is called as bank card payment technology. Bank card payment includes billing card and smart card.

First of all, billing card is a commonly seen bank card payment and generally includes debit card, credit card, charge card. Debit card is a type of bank cards needing users to deposit money first and does not have an overdraw function. At present, the debit cards provide users with a great number of value-added services such as insurance and funds on the basis of transfer account settlement, depositing and withdrawing cashes, shopping and consumption and other functions. Credit card, which is commonly used by people, generally refers to a type of borrowing card. It is a consumer credit card with a period of validity and a mainstream tool in the consumption of people. Cardholder is allowed to consume within the amount of credit and then provides a reimbursement. Compared with debit cards and credit card, charge card only has the same settlement functions with banks, but cannot be the bank cards in a real sense. However, charge card, like the credit cards, has the function of allowing users to consume first and then provide a reimbursement and also has high standards for the amount of credit. In addition, charge card has a higher requirement on card holders.

Second, smart card, as a special card payment way, is an embedded micro processing chip plastic card. Smart card is with the functions of storing and managing the information of personal information. In the process of applying smart card, smart card is with a greater information reserve (information reserve can reach 100 times of the ordinary cards), stronger privacy (information encryption ensures legal users to use it normally), easy-to-carry and other advantages. Moreover, the bank smart card payment trend in e-commerce gets increasingly more obvious. However, smart card imposes obstacles to its own development to some extent because it is necessarily equipped with special charge equipment.

13.5 Electronic Purse Technology

Electronic purse, just as its name implies, can play a part in storing money like the traditional wallets and is one of the commonly seen payment tools in the e-commerce shopping activities and highly applicable to small shopping.

In fact, electronic purse is a kind of computer software, which can be used for storing electronics cashes, credit cards, and user's personal information. Completing electronic transactions with electronic purse payment is conducted through the management of security certificate, and also transaction records can be timely recorded and saved. Electronic purse has the functions such as personal information management, online payment, transaction records inquires, bank card balance inquires merchant site connection.

Therefore, it can be seen that electronic purse features high efficient management, strong memory, wide application range and high security performance, etc.

However, at present, there has not been a universal standard for the application of electronic purse, and the extensive application and development in e-commerce payment transactions are greatly affected.

In e-commerce, the payment process is one of the most important parts of the whole commercial activity, and simultaneously a business process with the highest requirement on the accuracy and security.

Along with the rapid development of the wireless network technology, mobile communication technology and payment technology, electronic payment has transitioned to mobile payment with a gradual step.

As a carrier of mobile electronic commerce, the perfection and maturity of the mobile communication technology have made mobile payment become an extremely potential industry.

Under the continued driving of electronic commerce, the expansion to the electronic payment technology has been an inevitable requirement of the development of social economy.

Electronic payment technology will certainly attain a development in the social and economic life in an all-round way.

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Chapter 14

Greenhouse for Temperature Monitoring System Based on Fuzzy Control

Xianghua Lin

Abstract Designing a smart vegetable greenhouse temperature control system based on automatic computer controlled, elaborated on the temperature of the system acquisition, temperature control system, heater control circuits and other system hardware design ideas to improve the system's control algorithm, using MATLAB for system simulation. The simulation curve of the system has better control and tracking performance, high precision temperature control, also composed of two computer-controlled systems and the host computer, to facilitate the centralized management of the production. Practice shows that the study design, vegetable greenhouses intelligent temperature control system for man-machine interface, easy operation, high degree of automation, low cost, with a good prospect and promotional value.

Keywords Vegetable greenhouses · Temperature control · Fuzzy control

14.1 Introduction

With the development of national economy, people's living standards rising, winter greenhouse vegetable market continues to expand, especially in North Southern dishes to the north in the cold winter alone long-distance transport, not only the high cost and delays of the best eating of vegetables period, so rely on agricultural science and technology, to promote plastic greenhouses for growing vegetables can better meet the needs of the people, this is also the national food basket project included. Plastic vegetable greenhouses in winter most important

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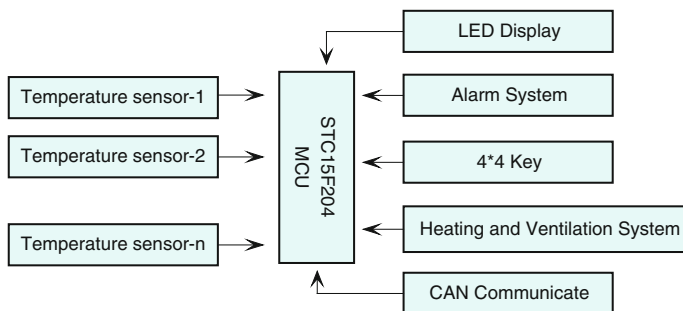


Fig. 14.1 Structure of intelligent temperature control system

management factors are temperature control. The temperature is too low, the vegetables were frozen to death or to stop growing, so the temperature is always controlled within the range suitable for the growth of vegetables. If only by manual control consuming and manpower, but also prone to errors [1]. To this end, the author designed the intelligent heating system to control the temperature of vegetable greenhouses and to meet the production needs.

14.2 System Design Features

Greenhouse ambient temperature, the system can be distributed measurement and display; growing of vegetables during the day, night, set the appropriate environment parameters, when the collection to the environment parameter value exceeds a set upper and lower limit alarm; agriculture can at any time for the acquisition of values and alarm messages and can be automatic or manual temperature control and adjust the grading; scalable, the system allowed to hang more than one sub-station. The system structure is shown in Fig. 14.1.

14.3 Hardware Design

14.3.1 Temperature Acquisition System

Using a digital temperature sensor DS18B20, temperature directly converted into a digital signal, one can communicate through a data line and the microcontroller, and does not require external components; the measurement temperature range is $-55\text{--}125\text{ }^{\circ}\text{C}$ to $10\text{--}85\text{ }^{\circ}\text{C}$ within an accuracy of $\pm 0.5\text{ }^{\circ}\text{C}$ and fully meets the temperature requirements of the greenhouses. The system does not require calibration, because the DS18B20 has been corrected, no longer need to be adjusted, and can be used directly, the collection of data directly to the microcontroller, so

that one cannot use the A/D converter, thereby enhancing the system accuracy. Multiple DS18B20 temperature sensors at the same time, the program calculated the average value of several Road [2]. This value will be more accurate, precise control of the microcontroller to provide the necessary data.

14.3.2 Temperature Display

The system displays the function by digital tube; the data shown by the microcontroller in parallel sent directly to the digital control, digital display of real-time temperature, and the button can switch to a different channel. The system design is a 3×4 determinant keyboard, the keyboard on the disk is divided into numbers 0–9, *, #, respectively, as forward and backward with. The application of three digital tube temperatures, the temperature can be accurate to $0.1\text{ }^{\circ}\text{C}$ and fully meet the temperature requirements of the greenhouses. Can also set an upper temperature limit, when the collected temperature exceeds the set temperature, the microcontroller will send alarm information, LED lights, the buzzer with the sound and light alarm, improving the stability of vegetable greenhouse temperature detection system.

14.3.3 Control System

To two STC89C54 serial communications, this can increase the number of control systems. The system can also detect the ambient humidity, CO_2 concentration, light intensity, to achieve simultaneous control of multiple tools greenhouse.

Can Communication Circuit In actual use, in order to facilitate system expansion, installation and commissioning of STC89C54 of P10, P11, P12, P13 and MCP2510 CAN communication circuit, as shown in Fig. 14.2. One can

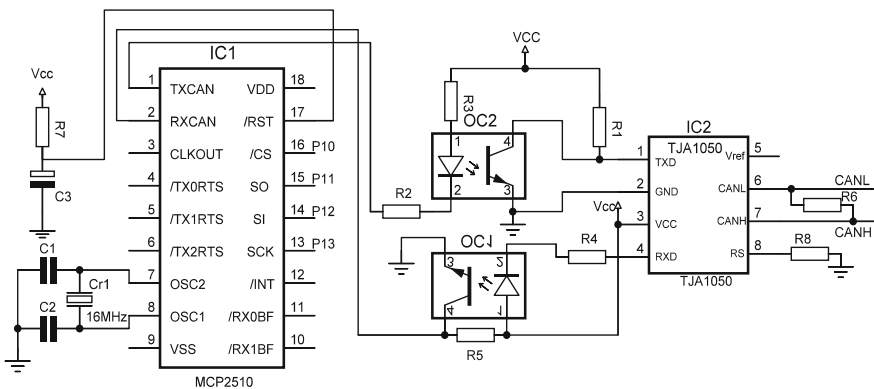


Fig. 14.2 CAN communication circuit

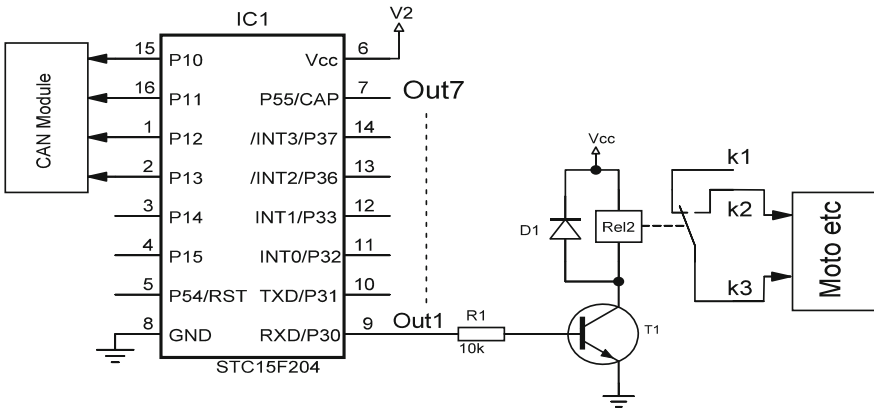


Fig. 14.3 The control output circuit diagram

achieve multi-channel control. Application opt coupler isolation of vegetable greenhouses heaters, carbon dioxide generator and fan control does not interfere with single-chip system, strengthen the stability of the system.

Control Output Circuit Figure 14.3 from the machine design principles, MOTOR interface received a control window of the motor, control windows; other interfaces both can be connected to a gas sensor; rain detection sensor can also be connected to the microcontroller and can be the interface A/D sampling.

14.3.4 Heater Control Circuit

In order to simplify the hardware structure of the output channels, taking into account the heating system itself has a large thermal inertia of the system using a solid state relay, no contact, no phase modulation, if we confine our single-chip output control on the grid does not cause waveform distortion; optocoupler triac on-off signal control, thyristor instant AC phase is random; this will cause a lot of high-frequency component of the pollution in the power circuit power and generate electromagnetic interference that may affect other devices. May also interfere with the control circuit, affecting the normal operation of the system. The system uses the inherent zero solid state relay trigger circuit, not only retains the advantages of solid state relays, but also makes the issue is satisfactorily resolved.

14.4 Control Algorithm

To improve the regulation time, overshoot and static error, the temperature control process is divided into two sections; the actual greenhouse temperature away from the set temperature using fuzzy control, in order to shorten the adjustment time;

close to the set temperature, the PID control to reduce overshoot and static error [3].

Fuzzy Control Fuzzy controller input signal for the temperature error E and error change rate EC, the output control is U. The input E and the language of the EC and the output U of variable values and symbols as follows: the error E: B (large), M (middle), S (small); error variation EC: P (positive), O (zero) N (negative); control variable U: B (large), M (), S (small).

System cooling equipment: It is not temperature overshoot. Exceeds the set temperature, turn off the heater. So, there is no need to consider higher than the set temperature of the error, E, according to size file can be. Determine the boundaries of the sub-file and the control state table for debugging based on the actual effect.

PID Control When $E \leq 20$ °C, transferred to the PID control stage, the same method as the basic requirements, but the parameters need to re-tuning. The parameter tuning emphasis on decreasing the overshoot and static error. PID control stage, the temperature settings mutation or environmental change, $E > 20$ °C, then transferred to the fuzzy control stage.

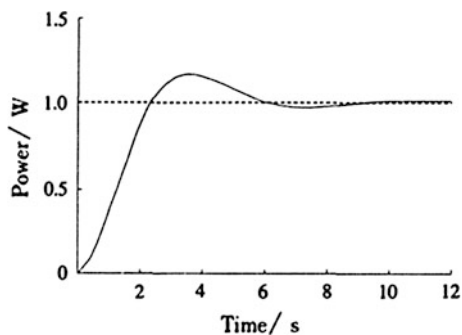
System Debugging The main task is to calibrate the temperature value and be prepared for the tuning parameters. System assembly is completed, the digital display vegetable greenhouse air temperature data, with the thermometer measured data, and there is no fixed error. Adjust the temperature in the conversion process parameters, fixed error basically eliminated, but there is a nonlinearity error. Based on the measured data to determine the nonlinear calibration data, in this way, the measurement error range of $10-95$ °C ≤ 0.5 °C. Through trial and error to determine the control parameters of the fuzzy controller sub-file boundaries as follows: error: B (large), >5 °C; M (), $2-5$ °C; S (small), <2 °C. The error variation: P (positive), >0.2 °C; O (zero), $-0.2-0.2$ °C; N (negative), <-0.2 °C. The amount of B (large), 250; M (), 180; S (small), 100 (control = 250 full power heating, electric stove power and proportional to the amount of control) was controlled.

Fuzzy control rules are shown in Table 14.1. MATLAB for system simulation, the simulation curve shown in Fig. 14.4, can be seen that the system has better control and tracking performance, high precision temperature control. The system also can be and the host computer, two computer-controlled system, to facilitate centralized management of production [4].

Table 14.1 Rule of fuzzy control

EC	B	M	S
P	B	M	S
O	B	B	M
N	M	B	S

Fig. 14.4 Curve of imitation system



14.5 Conclusion

Author introduced a temperature control system based on automatic computer-controlled intelligent vegetable greenhouses, man-machine interface, easy operation, high automation, low cost, can be applied to trial to prove the actual production, in the vast rural areas have a good prospect and promotion of value, can solve large-scale production problems of farmers of vegetable greenhouses.

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Chapter 15

Management and Control System of Tobacco Factory Warehouse

Lili Wang, Tao Wang, Defang Zhao, Xin Zhang and Li Ding

Abstract Using the ARM2440 control panel, the system is divided into the automated warehouse management and control system functional modules. And the Ethernet-based communication model used between the supervisor computer and the ARM2440 is presented. The realization and utilization of the design are described. The information and software integration of the system are illuminated too. The design has lower cost and achieves system integration of management and control of an AS/RS by common devices and technology.

Keywords Automated storage/retrieval system · ARM2440 control · Management system · Embedded system

15.1 Introduction

In order to improve logistics efficiency, new technologies have been rapidly applied to all aspects of the logistics. Tobacco factory, tobacco, finished cigarettes, factory consumption of materials and so very much, makes the warehouse automation, and information is an important part of manufacturers' urgent need to control.

Automated warehouse is top shelf for storing goods, the use of automatic mechanical stacker and storage peripherals of the library to the automatic operation of a warehouse. The development of the logistics demands for more extensive automation of the warehouse, which includes warehouse equipment operation

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automation and warehouse management (information) automation requirements of computer, information management, device control and integrated auto-complete access to the job of goods in accordance with control instructions and warehouse management. Warehouse automation is not the above two aspects of computer central added not only the integration of network and hardware devices, more information and application integration, and ultimately the functional integration.

15.2 System Requirements and Functional Analysis

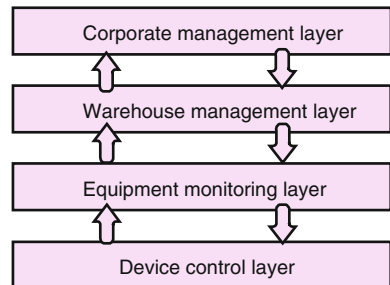
Automated warehouse management and control system in the enterprise information system in the workshop and device level. From the perspective of the automated warehouse, enterprise information systems in accordance with the vertical division of the principle of hierarchical layers are shown in Fig. 15.1. Among them, there are 1–3 layers automated warehouse management and control system.

Automated warehouse equipment, including stackers, cargo transportation machinery, they are controlled by the ARM2440 of these controllers the device control layer. The design requirements for each device can be run under the “manual,” “semi-automatic, automatic on-line” way. Online automatic mode, the operation command issued by the device control layer, transmitted through the network to embedded systems, embedded systems to automatically execute the command and feed back the results of the implementation to the monitoring layer.

Meanwhile, the equipment fault detection and diagnostic capabilities are also ARM2440; ARM2440 generate a fault code and save the failure of specific information for queries on duty. Automatic mode, equipment failure code over the network to the monitoring layer, monitor computer access to detailed fault information by querying the database and maintenance guidance information and real-time display on the monitor screen. The fault information is stored in a database for query statistics in order to develop a maintenance program.

Equipment monitoring layer also known as the monitoring and dispatching layer, automated shop floor extension to form the information layer and control layer integrated hub layer. The layer on the monitoring computer (PC or IPC) responsible

Fig. 15.1 Management and control system hierarchy



for data distribution management information layer operation commands to the device control layer controller and oversees the implementation of the controller; the feature is called supervisory computer control (SCC). The layer at the same time deals with all equipment operating status information and feeds back to management information layer; this feature is also often referred to as monitoring (monitoring and control). The monitoring of the automated warehouse includes SCC and monitoring functions. Automated warehouse control is different from the process control monitoring in that it does not have real-time curve display need, the interlock signal is generally not the device control layer feedback by monitoring computer transmission, monitoring the computer to send (storage) instruction than the average frequent monitoring system, monitoring the computer records instruction execution and SCADA data acquisition.

Warehouse management aims to achieve the automatic warehouse and cargo management, and the layer management computer (PC) system. Warehouse management includes the library allocation, cargo storage rules management, ABC analysis, pallet management. The cargo management, cargo statistics, inventory, shelf life management, storage rules management, storage management, inventory management, quality tracking, and maintenance of coding, barcode management, operation records, log management, system maintenance functions. Warehouse management and enterprise management interface take the initiative to report to their superiors' database, passive acceptance to query the database, dynamic web services browsing the stream based on the bill of material (BOM).

System function module division is shown in Fig. 15.2.

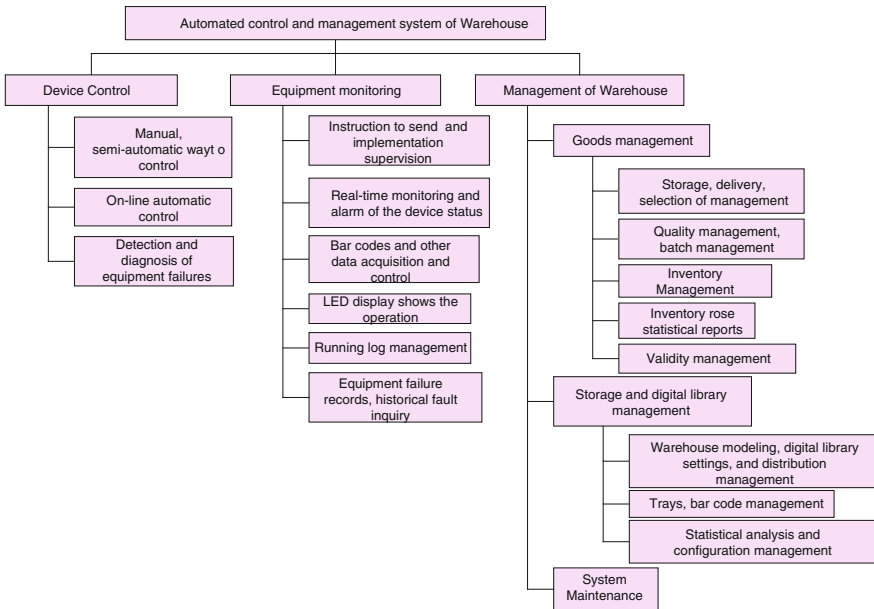


Fig. 15.2 System function module division

15.3 System Network Integration and Communication Protocol Design

The system network control system and information system integration hardware basis. Network in this system includes control network, monitoring network and information systems networks. In the information system network, Ethernet and TCP/IP occupy a dominant position, the information network and monitoring network preferred Ethernet [1, 2].

Equipment monitoring layer and device control layer integration is the key to warehouse management and control integration, the traditional point-to-point communication, the general use of a management ARM distribution instructions and upload information, extended to multiple devices is not convenient is not easy to maintain. Ethernet because of its flexible networking simple, easy to implement, high transfer rate, low cost, network integration and convenient features, an increasing number of applications in industrial monitoring, ARM2440 Ethernet Interface [3]. ARM2440 equipment can be extended through the switch. Monitor computer use ordinary card can be achieved in more than one the ARM2440 of physical connections, simplify the system level to reduce the system cost.

Traditional Ethernet-based CSMA/CD communication uncertainty and conflict issues, through the use of Ethernet switching technology to solve. Increase the bandwidth of each segment switched Ethernet segment the micro (store and forward mechanism), the exclusive point-to-point links for each node, no competition, the underlying transport channel, while Fast Ethernet network to 100 Mb/s rate, making the possibility of conflict between the different devices greatly reduces the certainty of the network transmission problems are properly resolved.

Ethernet only provides the underlying communication protocol, if there is no upper layer protocol network or no communicate. The design choices monitoring communication protocol is based on Ethernet-level model.

UDP/IP at the transport layer. UDP is a connectionless transport protocol and is located in the upper layers of the IP [4, 5]. UDP using a simple checksum error control does not handle the flow control. Compared with the TCP, UDP transport does not need to establish a connection, simple message transfer additional load, making data transmission more efficient, suitable for real-time communication. UDP cannot solve the reliability, and the problems of conflict of Ethernet itself communicate. These issues are solved through a combination of two methods: (1) at the bottom of the switched Ethernet technology; (2) design of reliable protocols at the application layer.

Switched Fast Ethernet technology used between the equipment monitoring layer and device control layer to form a star network structure. But switched Ethernet is not suitable for use in the device control layer, because a large number of sensors, actuators and the distribution of distance. The network selection of serial bus fieldbus controls information in the corresponding field bus high-speed transmission and constitutes the autonomous system. ARM in the middle of monitor and control network, played the role of the gateway, most of the control

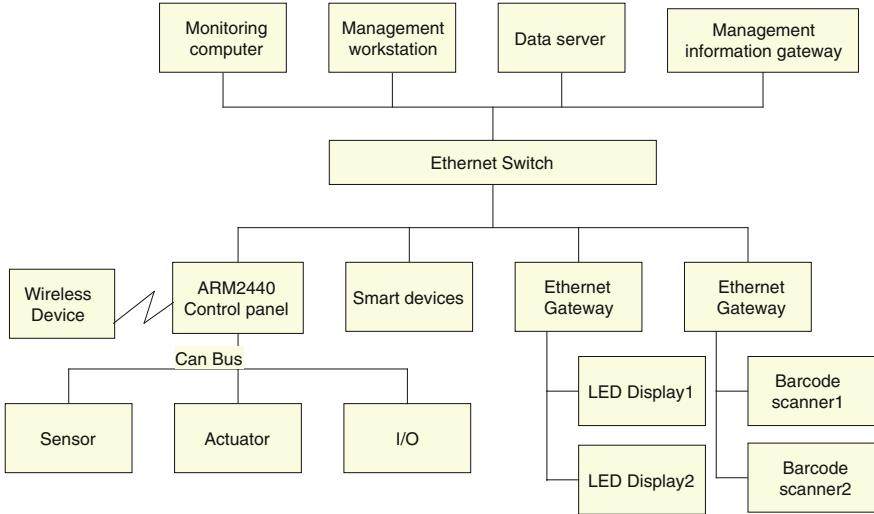


Fig. 15.3 Systems network architecture

information on the monitoring network is not visible. Only scheduled tasks, equipment failure information, the implementation of the mandate, and the transmission of device status information in the monitoring layer and control layer. This streaming and hierarchical management of network traffic.

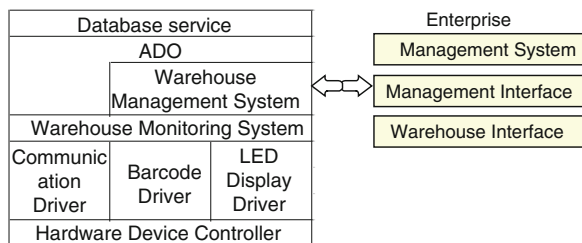
Reference based on the Ethernet integrated automated warehouse, warehouse management and control system network structure are shown in Fig. 15.3.

15.4 Warehouse Management and Monitoring Software Integrated Design

Warehouse management and monitoring software on the PC and its software-level structures are shown in Fig. 15.4.

Monitoring systems and management systems typically use public databases to exchange data [6]. First, establishing an information buffer table in the database,

Fig. 15.4 Monitoring and management software hierarchy



the data are generated to write a database, data users, data removed from the database constitutes the producer–consumer communication mode. The system design also network security, data security, control and safety aspects to consider, not repeat.

15.5 System to Achieve

In this paper, the design and development of the tobacco factory warehouse management and equipment control systems, in a cigarette factory production and storage of both the automated warehouse of the logistics function in the application implementation. The three-dimensional warehouse three roadways per lane for two rows of shelves, each shelf 10, 47, a total of 2,820 cargo space. There are six entrances, located in the 1st and 2nd floor, in the 1st and 2nd floor storage.

The system configuration of three workstations and a monitoring computer monitoring computer monitoring via Ethernet stacker and 6 sets of import and export of conveyor 3 stacker controlled by a set ARM control panel, six sets of import and export of conveyor controlled by a set ARM control panel.

Monitoring computer is installed in the warehouse entrance fixed bar code scanner, handheld barcode scanner and six operations to guide the LED display. Six RS-232 interface handheld bar code scanners were installed in the entrance of the warehouse and connected to the monitoring computer; an Advantech Ethernet to RS-232/422/485 Data Gateway ADAM-4.57 thousand was used. The gateway was used the supplied software Configuration Utility to set its parameters and then used the supplied software the Port the Mapping Utility remote serial virtual cost machine port this remote serial port operation, and the serial port of the machine, directly using MS Comm control read write data. Fixed bar code scanner the CLV410 scanners of SICK AG, Germany, its physical interfaces RS232/RS422, with its supporting power supply and communication control module for SICK AG Ethernet to serial gateway Ethernet Busmodule model BMH10-0411, which provides Ethernet-based Telnet service, monitoring computer uses MS Winsock control to communicate with TCP mode.

Six operations of the warehouse entrances and exits guide the LED display for the RS485 interface; each display has a 2B address (using the DIP switch settings). With an ADAM-4.57 thousand modules to the switch fabric hardware, monitoring computer uses the MS Comm control to send data to the same serial port and add the corresponding address to the head of the data control information to distinguish between different displays. Warehouse management workstation, data server, the monitoring computer, 12 barcode instrument and six LED display (through seven gateways) connect to a 24 interface Ethernet switches, to form a star network, monitoring software with Visual C++. To improve real time, four independent threads were prepared at the interface of the window to monitor the ARM control panel.

15.6 Conclusion

Put into use by the warehouse management and equipment control system scene. Operating during peak periods, a day out of storage up to 600 times. And adopted not shut down 72-h continuous operation grinded experiment. The field proved that the system is safe, reliable, high operating efficiency. The upper layer protocols ensures the monitoring computer with ARM; the system has a fault and then start the automatic recovery of executive function can be avoided the inventory chaos and Kuguan of cumbersome maintenance operations, praised by users.

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Chapter 16

Design of Granary Temperature and Humidity Monitoring System Based on STM32 and Multi-Sensor Data Fusion

Tao Wang, Defang Zhao, Xin Zhang, Lili Wang and Li Ding

Abstract To improve the monitoring and control capacity of granary temperature and humidity, sensors were evenly deployed around the ventilation opening of granary to detect the temperature and humidity with the cell of DHT11 per 10 m, and then the determination data were fused by adopting the self-adaptive weighed fusion algorithm. The granary temperature and humidity monitoring system based on STM32 and multi-sensor data fusion reduced the complexity of system hardware design, improved the accuracy of measurement results, and controlled the temperature and humidity according to the detection results. The system could effectively monitor and control the temperature and humidity of granary, create a suitable environment of food stored, and to improve the quality of food preservation.

Keywords STM32 · Data fusion · Temperature and humidity measurement · DHT11

16.1 Introduction

The food storage is the effective measures taken by countries to prepare for war, famine or other unexpected events, so the food storage is important. The main parameters of the impact of food security, storage temperature and humidity of the grain, between the two are interconnected relationship. Normal stored procedure, the grain moisture content is generally 12 % of what is safe, does not occur to

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sudden changes in temperature, food water, condensation the moisture content above 20 %, grain moisture, embryo germination, speedup metabolism arising from the grain temperature and may result in incalculable losses. The author for the distribution of temperature and humidity within the warehouse, based on the STM32 design warehouse temperature and humidity monitoring system using multiple sensors to monitor temperature and humidity in the warehouse, according to test results on the temperature and humidity control, in order to improve the storage temperature and humidity monitoring and control capabilities.

16.2 System Design

Evenly arranged in the region away from the vents in the warehouse six sensors to detect different regions of temperature and humidity, and the detection value of data fusion to improve the accuracy and comprehensiveness of the test results, the fusion temperature and humidity values by LCD, and compare the detected value and the default value, to make appropriate judgments based on the results of the comparison to control the working status of the relay, and then control the air conditioners, dehumidifiers, air turbulence and other equipment, the warehouse temperature, humidity monitoring and control. Temperature and humidity monitoring system by the sensor module, the STM32 controller, the implementation of the modules, display modules, power modules, and the overall system structure are shown in Fig. 16.1.

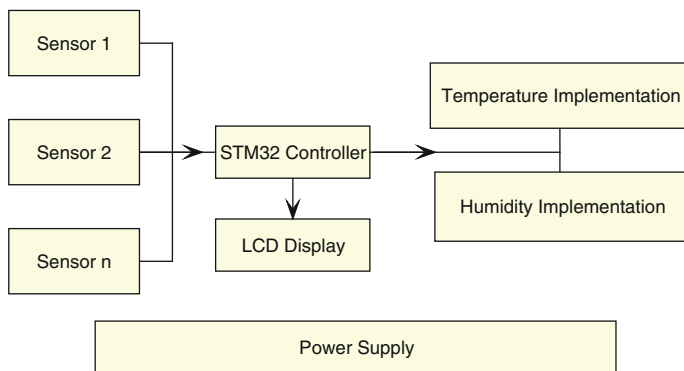


Fig. 16.1 Systems architecture

16.3 Hardware Design

16.3.1 Controller Module

The STM32 family is based on specifically for the requirements of high performance, low-cost, low-power embedded applications specifically designed for the ARM Cortex-M3 core. The performance is divided into two different series: STM32F103 “enhanced” series and the STM32F101 “basic type” series. Enhanced series of clock frequency of 72 MHz is the highest performance product in the similar products. Its characteristics are as follows: clocked at 72 MHz, 2–3.6 V power supply, tolerate a 5 V I/O pins, 1.25 DMIPS/MHz in 72 MHz consumption 36 mA (all peripherals in working condition), decline to 2 μ A standby internal RC oscillator, to support a variety of sizes of the LCD screen.

16.3.2 Temperature and Humidity Sensor

Using DHT11 temperature and humidity sensor, the temperature sensor, humidity sensor, signal conversion, the A/D conversion and two-wire serial interface integrated into a chip, with a small size, low-power consumption, rapid response measurement accuracy features. DHT11 operating voltage ranges for two, 4–5.5 V, temperature range -40.0 to 123.8 $^{\circ}$ C, the measurement accuracy of ± 0.5 $^{\circ}$ C, humidity measuring range of 0–100 % RH measurement accuracy of ± 5 %. System for simultaneous measurement of temperature and humidity values warehouse DHT11, the SCK line received a microcontroller I/O port, while the DATA line, respectively, received a different I/O port line. DHT11 connection to the microcontroller is shown in Fig. 16.2.

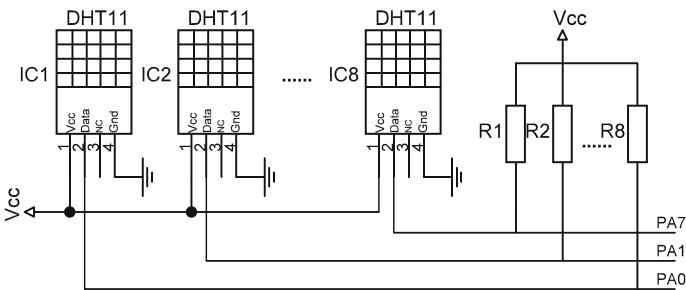
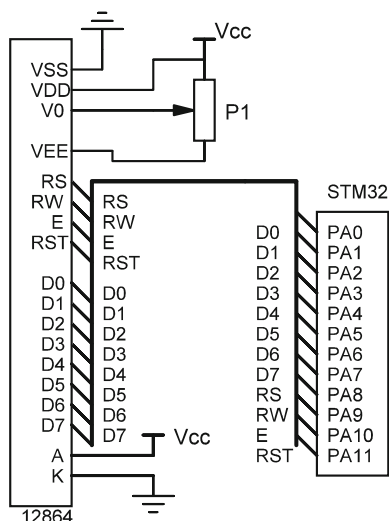


Fig. 16.2 DHT11 connection to the microcontroller

Fig. 16.3 GXM12864 connection to the microcontroller



16.3.3 LCD Module

LCD module uses GXM12864, containing KS0108B/HD61202 controller is a low-power CMOS technology dot-matrix graphic LCD module, with the Chinese character and 128 16×8 ASCII character set, and you can easily display Chinese characters and graphics. Its main function is to display the value of the integration of the warehouse, the integration value of the current temperature and humidity at the same time. LCD module and microcontroller interface circuit are shown in Fig. 16.3.

16.4 Multi-Sensor Adaptive Weighted Fusion Algorithm

Data fusion in the 1980s, the formation and rapid development of an information processing technology, takes full advantage of the complementary nature of the multivariate data to improve the quality of information. Multi-sensor measuring device can reduce the uncertainty of the measured object, thereby enhancing the detection and monitoring of the accuracy and reliability [3].

According to Li Zhan Ming study, the adaptive weighted fusion estimation algorithm for multiple sensor data estimation results better than the average of the results of the estimation algorithm. Adaptive weighted fusion, after the integration of value judgment whether the driver is controlling temperature and humidity devices in the system for warehouse temperature and humidity detection value. The specific method is: Let n be the only sensor of the variance, respectively, $\sigma_1, \sigma_2, \dots, \sigma_n$.

The true value of X to be estimated, the measured value of each sensor X_1, X_2, \dots, X_n , which is independent of each other, and X is an unbiased estimate; weighting factor for each sensor W_1, W_2, \dots, W_n , fusion jade X values and

$$\text{weighting factors to meet } \begin{cases} \bar{X} = \sum_{i=1}^n W_i X_i \\ n \sum_{i=1}^n W_i = 1 \end{cases}$$

Due to X_1, X_2, \dots, X_n are independent of each other, X is the unbiased estimator, so the total variance

$$\sigma^2 = E[(X - \bar{X})^2] = E\left[\sum_{i=1}^n W_i^2 (X - X_i)^2\right] = \sum_{i=1}^n W_i^2 \sigma_i^2 \quad (16.1)$$

According to the method of the multi-function extremum, the total mean square error for the most hours of the corresponding weighting factor:

$$W_i^n = 1 / \left(\sigma_i^2 \sum_{i=1}^n 1/\sigma_i^2 \right), \quad (i = 1, 2, \dots) \quad (16.2)$$

Corresponding to the minimum mean square error is

$$\sigma_{\min}^2 = 1 / \sum_{i=1}^n 1/\sigma_i^2 \quad (16.3)$$

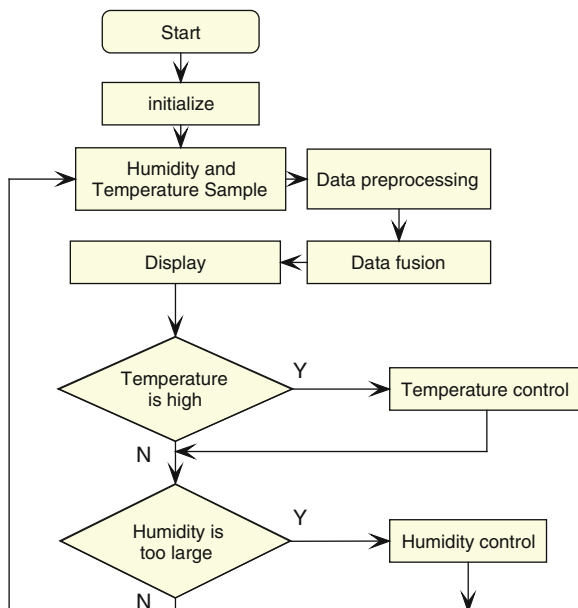
According to the actual measured values, the fusion of the optimal value can be calculated, that is,

$$\bar{X} = \left(\sum_{i=1}^n X_i / \sigma_i^2 \right) / \sum_{i=1}^n 1/\sigma_i^2 \quad (16.4)$$

16.5 System Software Design

The software part of the system includes initialization, the temperature and humidity acquisition, data preprocessing, data fusion, and display routines. Initialization routine completes the power-on initialization of the system, the system self-test, both peripheral initialization and other functions, temperature and humidity acquisition subroutine completes multiple DHT11 sensor communication and to read the temperature and humidity values, data preprocessing sub-the program reads the temperature and humidity values to compensate for more accurate temperature and humidity values, data integration subroutine using adaptive weighted fusion algorithm of multi-sensor data fusion detected a number

Fig. 16.4 Main program flow



of temperature values and humidity values, and display sub-the program is responsible for the fusion temperature and humidity values sent to the LCD. The main program flow is shown in Fig. 16.4.

16.6 Conclusion

Temperature and humidity inside the warehouse there are some differences in the horizontal direction and vertical direction, using a highly integrated DHT11 temperature and humidity sensors to detect the temperature and humidity inside the warehouse, reducing the complexity of the system hardware design, and adaptive weighted fusion algorithm for data integration test results, to improve the measurement accuracy of the results, according to test results on the temperature and humidity control system designed for monitoring and control of warehouse temperature and humidity, creating the appropriate environment of natural fermentation, to improve the fermentation quality of great significance.

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Chapter 17

Study on Role of Information Systems in Supply Chain Management

Hemin Da

Abstract The Institute for Supply Chain Management has defined supply management as “the identification, acquisition, access, positioning and management of resources an organization needs or potentially needs in the attainment of its strategic objectives.” The essence is a shift of focus away from business units such as warehouses or factories to a more holistic view of a supply chain. For a given company, this might include parts suppliers, manufacturers, transport, logistics and retailers. The purpose of this essay is to explore and evaluate the various approaches that can be taken to facilitate the management of supply chains.

Keywords Supply chain · Management · Information · IT · SCM

17.1 Introduction

17.1.1 Terminological Background

The Institute for Supply Chain Management has defined supply management as “the identification, acquisition, access, positioning and management of resources an organization needs or potentially needs in the attainment of its strategic objectives” [1–3]. The essence is a shift of focus away from business units such as warehouses or factories to a more holistic view of a supply chain. For a given company, this might include parts suppliers, manufacturers, transport, logistics and retailers.

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17.1.2 Origins of SCM

SCM has its origins in organizational extension theory first proposed by Mallen in 1963 [4]. Mallen's theory was developed within the context of marketing and advocated the extension of an organization to include all members of the distribution channel.

17.2 Body: Why Use SCM

Supply chain management as a concept has been evolved to address a number of issues that affect modern companies as follows [5, 6]. The number of suppliers that companies use has tended to increase greatly, for example, Sun Microsystems has three factories of its own but uses its supply base to increase its productivity by a factor of a hundred. Sourcing from such a large supplier base allows a company to choose the best value components available from the world market giving added value to the customer; the downside is the obvious extra management burden that comes as a result.

Economic factors such as global recessions and increased global competition have forced companies to focus not just on their product but also on streamlining every process across the value chain from the component suppliers to the end vendor [7].

As supply chains grow in size and complexity, it can become apparent that there are dependencies between companies in the supply chain. For instance, a smaller size supplier may maintain a line purely to service a larger company. When this happens, it makes sense to share information between the companies and maybe even to go as far as integrating systems for mutual benefit.

17.3 IT Approaches to SCM

In the 1970s, procurement professionals played a key role in cutting costs to help companies compete during the energy crisis, and in the 1980s, procurement had to again find ways to cut costs to fight against the competitive advantage of high-quality and low-priced Japanese products [8, 9]. From the mid-1990s to present, procurement professionals are combining best practices with technology to streamline processes, control costs, achieve operational efficiency and deploy strategic procurement initiatives across the enterprise.

17.3.1 Data Storage

Step one when looking at any company would be to examine how it stores its information. Many companies will still be using antiquated databases of different types or may even still be reliant on paper records. Centralizing the companies' data into a modern relational or object-oriented database would immediately reduce the amount of redundant or duplicated data. This approach would allow departments the ability to use data from other departments to reconcile their own data, highlighting errors that would otherwise have not been apparent [10].

While this is probably the most important factor for any company, it is often the most difficult to make changes in due to the extremely high initial costs and disruption incurred. However, without a well-structured database, a company will find its ability to make progress in other areas hampered.

17.3.2 Operational Processes

In this area are grouped together procurement, factory/warehouse management and logistics. These areas can all be greatly assisted by modern improvements in communications and software. A great deal of time and money is wasted by companies still relying on the use of the telephone, fax or post to communicate between these departments and with external sources. Once a company has rationalized its data storage, it becomes possible to automate many interdepartmental processes. It need not stop there either, and systems are available to transfer information between various trading partners; systems such as these are known as interorganizational information systems (IOISs).

The virtual corporate integration that results when such systems are adopted can lead to a reduction in what has been termed supply chain uncertainty. All companies within the IOIS will have a greater awareness of the state of play at any given time resulting in increased operational efficiency. The company that has access to this information is also going to be able to offer value-added services to its customer such as order tracking.

New approaches to manufacturing become possible such as just-in-time (JiT) and build-to-order (BTO). A large company is now able to react to a change request from a customer, giving more added values.

17.3.3 Inventory

Carrying unsold inventory costs US businesses about \$332 billion per year.

As can be seen from the above statistic, there is a huge scope for clawing back lost potential revenue in this area. If, for example, at the end of a supply chain,

company A is supplying vendor B; it is quite possible that both companies might keep a reserve surplus stock or worse still; and they may both run out of stock. The solution here, as I hinted at earlier, is to share information between the companies or even to integrate systems. This has been implemented in a number of different ways; we shall examine vendor-managed inventory (VMI) and continuous replenishment program (CRP).

With VMI: Company A is able to access B's inventory records and when they fall below a level, set by B, send more stock and raise the appropriate purchase orders.

With CRP: Data from the whole of the supply chain are analyzed with the goal being that when an item is purchased from the vendor (B), a message travels back through the supply chain requesting the production of a new replacement item. So far, this would seem to be similar in effect with VMI; CRP, however, makes use of the extra data it has, to make a prediction of the likely sales on a given day, and sets the recommended level of stock. This is known as demand forecasting. Depending on the complexity of the implementation, CRP may be able to take into account general trends, seasonal trends or other known patterns specific to a given product.

17.3.4 Potential Pitfalls

The obvious major drawback when thinking of redesigning a supply chain is cost. A very large company without these systems faces a fairly stark choice: invests millions in restructuring or watches market share slip away to those competitors willing to spend and give their customers better service.

There are off-the-shelf customizable solutions available from companies such as SAP and PeopleSoft, which are often referred to as enterprise resource planning applications. Large companies are often tempted by these systems as a comparatively cheap alternative to having a bespoke system built from scratch. As usual, there is a sting in the tail with SAP consultants being among the most costly in the market, and the various modules that make up these applications often need "tweaking" to bring them into line with business changes.

As with any major development project a company may undertake, there will be a resistance to change from employees, especially those who have served for a long period and are used to do the job in a particular way. A full impact analysis is always advised before embarking on any major project.

Implementing a JiT or BTO system that is very desirable for a producer will not be nearly so attractive to the suppliers. A supplier will be quite happy to deliver 10,000 widgets a month to the producer but will be much less amenable to being asked to supply variable amounts on a weekly or even daily basis. For a producer to implement such a system, it will generally require the producer to be in a powerful bargaining position with many competing suppliers.

17.3.5 Alternatives to SCM

Underneath the bonnet, most SCM software that has been written in the last 20 years uses a technology called electronic data interchange to implement the communications required between processes, departments and companies. With the advent of the Internet and the dominance of TCP/IP transport, new powerful concepts begin to emerge. Companies have understandably been reluctant to use what is essentially a public network to transmit their sensitive data, but the introduction of 128 + bit encryption is able to offer as least as much security as EDI over a phone line.

Business-to-business integration (B2Bi) is the name given to the standards for intercompany communications over the Internet. These are open standards, and they all revolve around the use of extensible markup language, better known as XML. This user-defined markup language can be used to describe interfaces to services that a company wishes to offer. The success or failure of B2Bi is largely dependant on the uptake of the various proposed standards such as Web Services Description Language (WSDL)—for defining services—and Universal Description, Discovery and Integration—which is like a yellow pages services for customers to look for available services.

A few leading B2Bi solutions include the following: IBM's MQ Series Integrator; Extricity; BEA's link; Web methods B2B enterprise; NEON's business integration servers; Vitria BusinessWare; and Microsoft's BizTalk Server.

17.4 Conclusion

It has been suggested that SCM will provide a sustainable competitive advantage to those organizations implementing it. Whether or not an advantage in business can ever be sustainable for eternity is doubtful; in the field of SCM, when a new technological advancement is always just round the corner, it is highly unlikely. Successful supply chain management strategies do, however, enable organizations to reduce costs while simultaneously improving service and product quality. The realization of these benefits can provide a significant competitive advantage over other organizations. In order to gain this advantage, it is important to implement a comprehensive supply chain management initiative that includes technological, organizational and attitudinal changes.

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Part III
Intelligent Evolutionary Algorithm

Chapter 18

Optimization on Multimedia Video Service in Mobile Internet Environment Based on Cloud Computing

Weihaio Ouyang

Abstract In the face of all sorts of different data, cloud computing can combine distributed storage database and a one-stop retrieval service, through the integration of the information resources, and provide one-stop service to the end user, provide a powerful technical support mobile multimedia development. This paper expounds the necessity of integrating environment, information, technical support and methods of the integration environment cloud computing; the purpose is to find out the way to establish the operation mechanism to realize the integration of the distributed heterogeneous data sources and integration and transparency position, structure and semantic enterprise of heterogeneous data, and the solution to the problem of comprehensive significance, resource allocation and timely response service integration and sharing of resources effectively.

Keywords Cloud computing · Mobile multimedia · Service integration · Service mode

18.1 Introduction

As the popularity of mobile data services, to improve performance terminal equipment and digital network and move the development of multimedia technology, mobile multimedia broadcasting (MMB) has become a new hotspot wireless application, and it can be regarded as the most promising multimedia applications on the 3G era. From 2003 to now, the United States, South Korea,

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Japan and other countries are developing TV technology, launch terminal business of the TV. According to the market research company in-stat, expected by the end of 2010, the number of user's global mobile TV broadcasting will increase from 34 million in 1.02 million to 2006 Euros [1]. Since 2004, China has launched mobile multimedia services, which is scheduled in May 2010, China established in 311 cities with television signals. In the next 3 years, it will cover more than 12 million people.

Developing mobile multimedia technology is the basic support. At the same time, some emergency crisis has also exposed in the process of development, such as the growth rate of the existing technology environment does not conform to the needs of the customer increase, a large number of growth data, heterogeneous and resource allocation and deal with difficult [2].

As a distributed computing technology, cloud computing realized the mass storage virtualization, through the network computing processing to solve customer demand and growth of enhance the service resources and processing difficulties Cloud computing is a shared service structure-based method; it is representative of the distributed processing development frontier [3]. Structure is as shown in Fig. 18.1.

Because of the characteristics of the MMB service as aware, production and consumption of the synchronization, heterogeneity, as storage, and service unrest, and so on [4]. It is difficult to make MMB of the interactive process, through the standardization method, special particularity, and different countries and regions service. Commonly used one-way and unity of the operating mechanism of the

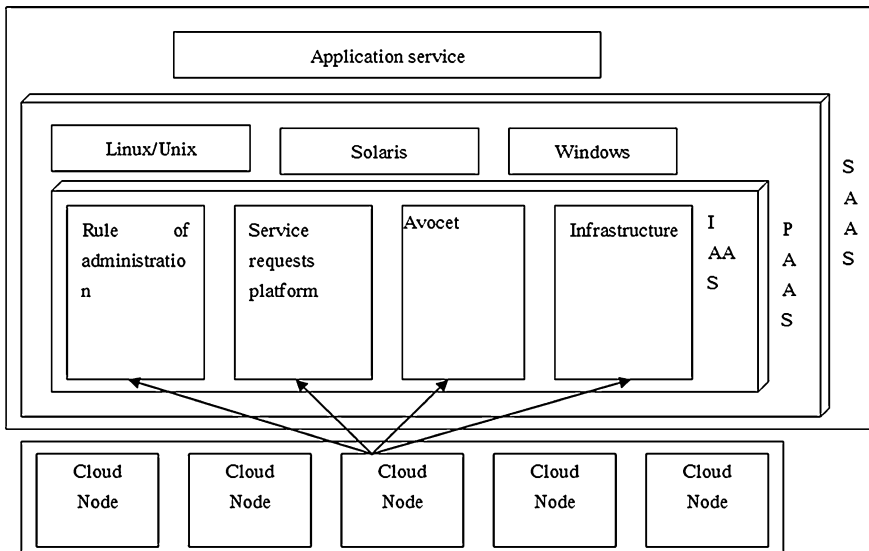


Fig. 18.1 The basic structure of cloud computing

broadcasting and television, and two-way interaction mobile multimedia, and cannot meet the operational requirements of mobile multimedia.

18.2 Studies on the Traditional Service Modes of Mob and Extension

At present, the multimedia service mode using the mature based on information technology is varied, including active information service mode based on agent technology, actively promote the system of information push technology, and on the basis of the RSS based on web information push service, personalized service push models based on ontology technology, and based on XML information push service mode and so on. At present, the results of the research in the field of information service, most unified information technology and information service accelerate the information technology to meet the personalized needs of users, the accuracy and timeliness of the service.

Li man and consider active information service mode based on agent technology as the user's interest and information needs, providing personalized information service of the trend [5]. We analyze the active information service system and the factors to consider: positive information push system based on push technology, designs and realizes an active information service system based on the books, magazines, newspapers and other literature [6]. C. J. Lock analyzes the intellectual push technology how to use simple push technology advantages and pull technology to provide individualized active information service, to meet the needs of the users of the individualized active information service, and has put forward a based on active information service mode of push-pull technology [7].

It is not hard to find the information service system or service model based on different network technologies that have advantages and disadvantages. Each model is based on the different statements and semantic specifications, technical platform, storage media, interactive. In the process of interaction, it exists in the bottleneck of integrated service model [8]. Although cloud computing consolidates grid computing, distributed computing, parallel computing, the utility computing, network storage technology, virtualization, load balance and other traditional computer technology and network technology [9], these make cloud computing services model based on open standards and services, and with the Internet as the center. Cloud computing provides safe, quick, convenient data storage and network computing service for users. Service or storage is based on the same type of media "cloud". The user needs only to make service request and do not need to care about the method to realize service, technology and process, let you directly through network service results.

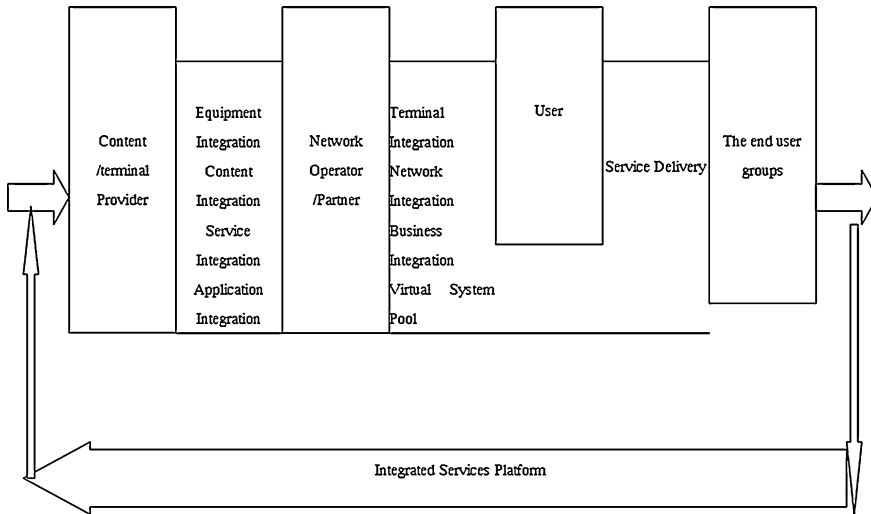


Fig. 18.2 The value chain based on the service integration

18.3 Cloud Computing Promoting the Integration of Mob Industrial Chain

The angle from the industrial chain and the value chain of the MMB include content providers, the network operators, partners, the manufacturer and the end user groups. MMB value chain is described in the following (Fig. 18.2):

18.3.1 Cloud Computing and the End User Groups

Cloud computing is not high to terminal equipment request; it can be a professional cloud terminal, general mobile phone or computer. Cloud used in computing the handheld multimedia terminal will realize the potential of the cloud computing applications to the level of ascension; most of the terminal user group do not need to buy the software, hardware and do not even know who provides the service, the user needs only focus on what you really need resources; implement cloud computing can improve network security, users do not need to download antivirus software, authorized the virus information feedback to the cloud, cloud processing [2].

18.3.2 Cloud Computing and the Network Operators

Cloud computing brings lower infrastructure costs. Cloud computing can be provided for MMB loss and management of virtual computing resources, that is,

the scale of the server cluster. Cloud computing allows network operators will use all sorts of different media resources, in a more efficient and low cost integration, so use media effect may be to upgrade to the new higher level.

18.3.3 Cloud Computing and the Terminal Manufacturers

Cloud computing can more easily implement internal sharing and cooperation between enterprise and terminal manufacturer. The enterprise computing clouds used in their project can get a more close cooperation. Even if the enterprise is located in different geographical locations, the project members can view the project of master files, projects, tasks and progress at any time anywhere. As the project management in the cloud, other members can see this update project information has made some immediately after the modification. This allows data and applications to share in different enterprises.

In addition, cloud computing can also affect MMB end products. At the same time, cloud computing provides a powerful technology, environment to support the mobile multimedia development industrial chain. It also brought new opportunities and challenges, content providers and network operators, partners, terminal manufacturers and the end user group formation action.

18.4 Research of Service Integration Based on Cloud Computing

At present, popular radio and TV, one-way unified operation system and mobile multimedia two-way interaction cannot meet the demand of MMB operation. Therefore, we need to build a based on the integration of the cooperation of service operating system and a MMB interactive to delivery of the style.

How to make these advanced computing clouds service model application to mobile multimedia format used analog TV broadcasting system, the active service information service and personalized service, explore new MMB work service mode. In the mobile terminal distributed, heterogeneous, and unstable large-scale unstructured data environment, the accuracy of the information service, effectiveness, and the efficiency of the cloud computing and destination building mobile multimedia combination of the service mode was improved.

18.4.1 Cloud Computing Service Pattern

Cloud computing services aim to let users only to make service request, not to care service method, technology and process, service, and can get the result directly

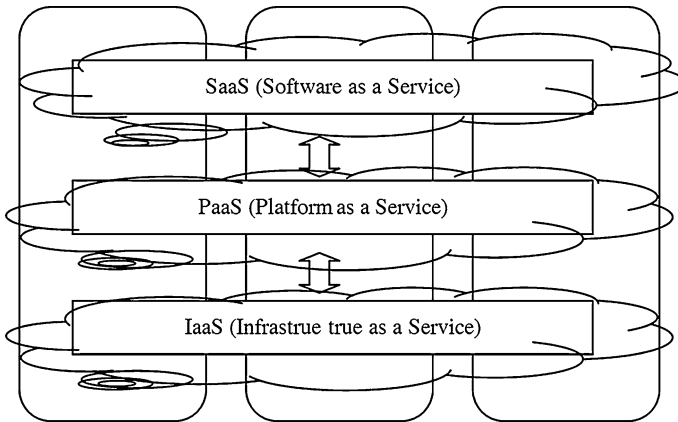


Fig. 18.3 Cloud computing in three modes

through the network. It opened three service models based on each software that software as a service (SaaS), platform as a service (PaaS), infrastructure as a service (IaaS), including the SaaS model provides low cost of mobile equipment group online software rental service, PaaS provides fast service model from the technical development to operation and maintenance MMB ability content providers and network operators, and IaaS provides low cost and highly reliable infrastructure MMB variety of integration model. As shown in Fig. 18.3 see [10].

The three models not only bring profound changes in the global IT industry fabric, but also affected the innovation and the further integration of the traditional industries radio and television and mobile multimedia.

18.4.2 SOA-Based Context-Aware Interactive Way

Service-oriented architecture (SOA) is to build the context service choice method [11]. Through the combination in the realization of SOA, service the external and internal integration, based on the framework of SOA, description, and express mobile entity and intelligent dynamic service interaction and coordination, describes their exchange activities, and mobile entity or service and the interaction environment [12].

MMB service which is based on the mobile terminal entity, because all kinds of equipment can only be aware of the entity state, service requirements; it is difficult to describe the state to be automatic mobile change, so the SOA is used; the end user can submit service directory through the user interface, so the network operation data that can help them decision context level of resources, virtualization technology improved resource reuse rate. It reduces the interaction between

individual users and raises the utilization ratio of resource nodes through such services.

This is the effective way to construct the context services integration based on SOA; MMB performs many forms of integration service provided to the original, and it can not only find service and different providers in the determination of the open network environment, but also will suit your custom service.

18.4.3 Combination of Distributed Mobile Services Based on Neural Networks

Using characteristics of interactive perception of neural wants to use the interaction characteristics of sensory nerve network, cloud computing will have all types of applications and services of the traditional mobile terminal in static network through the neural computational more abstract and dynamic interaction wireless sensor node. For MMB service type, comprehensive neural network mobility, of the organic combination of the dynamic characteristics of various service for different types of abstract dynamic nature of the interaction between a remote node, the use of neural network, and the end user not an induction state any request, form a mobile environment of the rapid response.

18.5 Conclusions and Future Work

Cloud computing to break the traditional mode, but at present, its development has not been formed stable value chain of the division of work. Cloud computing interoperability and norms are on the way. The user will face great difficulty migration of the cloud platform; there are no international standard or realize standards.

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Chapter 19

Virtual Infrastructure Management Framework for Cloud Computing

Guang He, KaiTian Chen, XuXiang Chen, ShiGui Cai
and ShiWen Mao

Abstract In this paper, we presented challenges involved in computational biology applications where enormous computing power and storage is required. In this context, we presented virtual infrastructure management framework Phoenix that aims to extend existing command-line-based management tools into a Web-based tool with security added. This is an open source framework built above OpenNebula to support VirtualBox and other standard hypervisors. The drivers developed are seamlessly integrated with current codebase with the Web-based graphical front end. The Phoenix framework is to manage GenomicsCloud, the Cloud Computing environment aligned to specific needs of OMIC sciences applications. Performance results of Phoenix indicate that the overhead induced is very less compared with functionalities introduced in this ecosystem.

Keywords Cloud Computing · Virtualization · Next-generation sequencing

19.1 Introduction

Cloud Computing demands high computing, storage and networking capabilities. The raw data generated by any experiment or in OMIC sciences often exceed terabytes of data and are already challenging the computational infrastructure typically available in many laboratories. Furthermore, biologic datasets are having exponential growth that doubles every 18 months [1]. These data are used to understand the genetic structure of a species and how to engineer them to the

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benefit of mankind by either to cure some disease or engineering high-yield crops. The only long-term solution to the challenges posed by the massive datasets being generated is to combine computational biology research with advances from Cloud Computing.

Systems biology is another faculty of research where multiple datasets from variety of species are examined. Large-scale data integration in systems biology has catalyzed identification of nearly all yeast mitochondrial proteins and many of their functional interactions, as well as how this knowledge has aided the search for new disease genes. The human candidate genes proposed can be tested back in the yeast, where cell-based assays can be performed in a high-throughput manner. All these types of research in systems biology and applications in OMIC sciences demand high-performance computing (HPC) and high storage capacity [2].

Cloud Computing [3] is emerging as a new style of distributed computing that adapts to dynamically scalable system resource requirements. With Cloud Computing resources, platform, infrastructure and software are dynamically configured and offered to user's on demand as platform-as-a-service (PaaS), infrastructure-as-a-service (IaaS) and software-as-a-service (SaaS), respectively. All these can be combined to build a GenomicsCloud. GenomicsCloud consists of a vast pool of virtualized resources in a hybrid Cloud environment with parallelized computational biology applications that can either scale-up or scale-down on demand.

Cloud Computing also offers some added advantages; through cycle scavenging or shared resources, it can create a "grid" (Grid Computing paradigm) from the unused resources in a network of participant (private or hybrid) nodes. Typically, this technique uses desktop computer instruction cycles through virtualization that would otherwise be wasted at non-peak hours like night, during lunch or even in the scattered seconds throughout the day when the computer is waiting for user input or slow devices [4]. Through this shared infrastructure, it improves energy efficiency, reduces hardware (compute, storage and network) infrastructure requirements, costs, floor space and carbon footprint and ultimately increases utilization.

Because Cloud Computing uses shared resource facility, it is important that the Cloud is managed effectively and efficiently so that service level can be ensured. Phoenix is an attempt to introduce ease of implementing and administering any GenomicsCloud instance.

Also, resources in the Cloud are distributed, which makes the management of the virtual resources available in Cloud complex. Thus, a virtual machine manager (VMM) [5] is required to manage clusters with lesser efforts. The existing VMMs have support for limited hypervisors. Also, most of these hypervisor tools have only command-line interface—this requires high level of expertise to use them. For computational biologists, a graphical user interface (GUI)-based tool is desired. Also, a command-based tool requires remote login into the remote system making it more prone to security attacks. The basic philosophy of Cloud is that it will be used over the Internet, making it necessary that the user interface is Web-based. Therefore, to make a GenomicsCloud user friendly, it is recommended that an administrative tool for GenomicsCloud should be Web-based tool that can be

used through a Web browser. Web-based management also makes it possible to be used from even a smartphone. In addition, the Web-based administrative tool must provide support for maximum and most popular hypervisors.

Phoenix is an open source tool developed at National Institute of Technology, Karnataka, at Surathkal by the Geschickten team and presented here to address all the challenges of a GenomicsCloud. It is designed to be hypervisor agnostic. It supports VirtualBox [6] hypervisor in addition to Xen [7], kernel-based virtual machine (KVM) [8] VMware and Amazon's Elastic Compute Cloud (EC2) [9]. It uses [10] as backend to manage virtual machines with many feature enhancements from security to rendering. Phoenix has a Web-based interface developed on top of generic messaging application programming interface (API) of OpenNebula. Another novel approach for Phoenix is that it offers higher security through user authentication; also, any third party application can be developed quite easily on top of this generic messaging API of Phoenix.

19.2 Cloud Computing

Cloud Computing can be viewed as a distributed computing system providing compute, storage and network as a service on demand on a pay-as-you-use basis. The Cloud appears to users as a single autonomous system providing all the computing infrastructure that user needs. It is built on servers having different levels of virtualization technologies. The services provided by Cloud are accessible to clients connected via a network infrastructure that may be wired or wireless using thin clients like a browser or a smartphone.

Many thinkers believe that Cloud Computing is poised to become the defining technology of the twenty-first century. It is claimed that Cloud Computing will become an essential tool in the world of research and enterprise alike, from aeronautics to life sciences including finance and computer simulation. Cloud solutions such as IaaS, PaaS and SaaS will make inroads into most areas.

As Cloud services need to be scalable, distributed and scale-up or scale-down on demand, some of the desired characteristics of such an infrastructure are as follows:

- Self-healing
- Self-monitoring
- Resource registration and discovery
- Service level agreement definitions
- Automatic reconfiguration

Cloud Computing provides benefits of enormous infrastructure to the users or clients without having to worry about the actual implementation and administration. Since storage service is one of the important services provided in the Cloud, clients have access to multiple data centers from any system in the globe having access to the cluster. Thus, Clouds provide more mobility to clients. One of the

major advantages of Cloud Computing is that it is highly automated and scalable. This means that clients can add services as and when needed without cost incurred for additional hardware. To support this flexible environment complex, Cloud infrastructure is built and maintained transparently by Cloud providers in distributed manner. So, clients need not worry about data centers or implementation and management of services.

19.3 GenomicsCloud

GenomicsCloud is a Cloud Computing infrastructure for computational biology and OMIC sciences applications. The path-breaking human genome project gave rise to an exponential increase in the volume and diversification of data, including gene and protein data, nucleotide sequences and biomedical literature. Research projects in genetics laboratories around the world that are researching on genome sequencing, transcriptome studies, etc. produce an ever-increasing amount of data; therefore, the area of computational biology now poses some of the biggest challenges in computer science and data mining such as data storage, visualization, modeling and discovering new meaning out of this enormous data.

GenomicsCloud is a conglomeration of clusters and grids specifically designed for computational biology applications. The computing infrastructure can be a private Grid Computing infrastructure (private Cloud) formed either out of the desktop computers that use the philosophy of CPU scavenging or cycle scavenging or dedicated HPC systems along with public Clouds (likes of Amazon and Google). GenomicsCloud includes any cluster as well the enterprise might have. In addition, GenomicsCloud has the capability to extend over the public Cloud infrastructure in a secured fashion. GenomicsCloud is managed through Phoenix (discussed in [Sects. 19.5](#) and [19.6](#)), which makes it quite easy to manage the hypervisors in the private Cloud or even public Cloud.

Providing an infrastructure like Phoenix to manage PaaS and IaaS is not sufficient; therefore, GenomicsCloud also provides tools for parallelization. This includes both tightly coupled parallelization and loosely coupled parallelization mechanisms. There are many OMIC sciences applications that are inherently serial, for example Bruijn graph [11] assembly following a sequencing experiment. For such applications, a tightly coupled cluster with parallel code is more suitable. In contrast, for sequence analysis or gene hunting applications loosely coupled grids will produce better results with the help of algorithms like MapReduce [12].

19.4 Related Work

In this section, we present various virtual machine manager tools and the underlying philosophy used to manage virtual infrastructure in distributed system.

Eucalyptus: Eucalyptus [13] is an open source tool, which can be used to create in-premise private and hybrid Cloud. The current interfaces to Eucalyptus are compatible with Amazon’s EC2, simple storage service (S3) [9] and elastic block storage (EBS) interfaces [9], but the infrastructure is designed to support multiple client-side interfaces. It is based on commonly available UNIX tools and Web services.

Nimbus: Nimbus is another open source toolkit [14], which is developed to build scientific Clouds. It is used to create IaaS type of Clouds. The Nimbus contains a front end Globus service and multiple workspace control agents on host resources for virtual machine deployment. Nimbus allows a client to deploy virtual machines (VMs) on physical resources to lease remote resources and configuring them to represent an environment as per the user requirements.

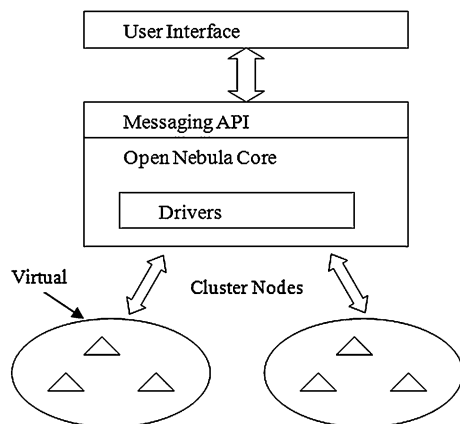
OpenNebula: OpenNebula is a VMM that enables the dynamic deployment and replacement of virtualized services. It is an open source virtualization infrastructure engine. It is used to deploy, monitor and control virtual machines. OpenNebula currently supports KVM and Xen hypervisors along with public Cloud interface Amazon’s EC2 over command-line interface.

19.5 Phoenix—the Open Source Framework

Phoenix is a framework that is designed to manage a large Cloud that comprise of grids, clusters and Clouds; these could be either in a private space or in the public space. The Phoenix framework consists of two modules viz. front end for user interface built on top of OpenNebula core and OpenNebula drivers for interfacing different hypervisors which extended from core as shown in Figs. 19.1 and 19.2. We discuss these modules and OpenNebula in subsequent subsections.

The communication between drivers and core is performed using simple ASCII protocol, which simplifies the development of new drivers.

Fig. 19.1 Phoenix architecture



Following are the three middleware access drivers (MAD) in OpenNebula:
 Transfer MAD: Transfer driver is used by transfer manager to transfer virtual machine images and checkpoint files.
 Information MAD: Information driver is used while deploying and monitoring virtual machine to gather information of physical resources.
 Virtual Machine MAD: It is used to deploy and control virtual machines.

19.6 Phoenix Architecture

Architecture of Phoenix core is shown in Fig. 19.2. The system is divided into three major components comprising static OpenNebula at the top, which is common for any hypervisor in use. The middle layer is the pluggable driver modules. Different information and virtual machine drivers are required to interact with different hypervisors. This figure shows drivers for VirtualBox, but similar type of drivers for other hypervisor may also exist when activated by the administrator. The lowest layer component is cluster node on which virtual Machine is deployed. The interaction of cluster node with VirtualBox hypervisor managed by libvirt [15] daemon is shown in Fig. 19.3.

The command-line utilities are available in OpenNebula to send commands to OpenNebula engine. These utilities are XML-RPC clients and call XML-RPC methods exported by Request Manager Module in OpenNebula core exports; these

Fig. 19.2 OpenNebula core

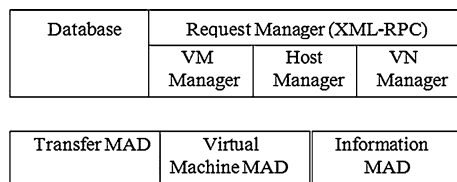
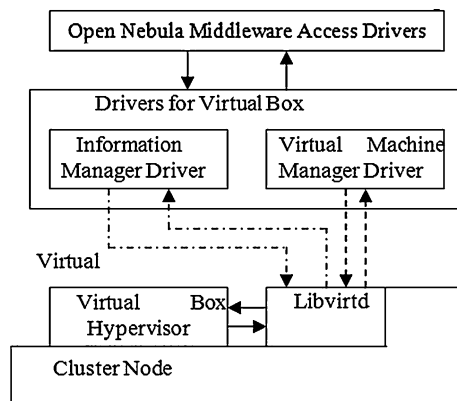


Fig. 19.3 Connector flow diagram



are called by XML-RPC clients such as command-line utilities provided by OpenNebula. All manager processes are created when OpenNebula daemon is started. These manager processes are responsible to call respective drivers for communication with underlying hypervisor on cluster nodes. The MAD layer in OpenNebula core provides uniform access to these drivers. To perform tasks such as deploying VM, gathering information, VMM and IM drivers issue libvirt-based commands to execute on cluster node using SSH. On the cluster node, libvirt daemon communicates with hypervisor. Libvirt can be configured to use TLS, SSH, TCP or UNIX sockets for communicating with the hypervisor.

19.7 Functionalities of Phoenix

The front end of Phoenix provides Web-based user interface to create and manage the virtual machines. The major components of user interface are host management, virtual machine management (VMM) and virtual network management. In addition to these cluster component management, Phoenix provides facility to administer users. With the built-in access control mechanism, users can view or manage virtual infrastructure.

This Web-based management console is basically divided into four subsections viz. user administration, host management, virtual machine management and virtual network management (Fig. 19.3).

User Administration: User administration is provided to users of Phoenix management console. It provides facilities such as new user registration (creation), login facility, changing user information, profile. It also provides user statistics such as login count, last login request time and IP address, current request time and IP address.

Host Management: Host management provides addition of cluster nodes where administrator can deploy virtual machines. Summary information provides details such as current state, monitoring drivers and supported actions such as hardware usage information, capacity of the hosts, memory usage, CPU usage, number of virtual machines running.

Virtual Machine Management: Virtual machine management gives an option to create a virtual resource and deploy it on any of the available pool of hosts. Once it is deployed, it is continuously monitored and its status is shown on the summary page of virtual machines.

Virtual Network Management: In Phoenix, we can define certain networks, having a pool of available IP address and MAC address which could be assigned to a virtual machine deployed on a host. Using these assigned addresses, virtual machines can make use of network adapters of hosts to communicate with each other and create a subnet among them.

Charging Billing and Audit Trail: All actions requested from the management console are logged as usage information. These are collective logs which are user specific. This usage information can be used to audit the usage. This can also be

used to reconcile the charges user might have been asked to pay to a public Cloud provider.

For GenomicsCloud hosted on top of Phoenix to be provided as a software-as-a-service (SaaS), some billing and charging capability is required. There are basically two ways by which a service provider can charge the user for using the GenomicsCloud service. Charging is mainly divided into three categories: one-time fee, recurring fee and usage-based fee.

There could be a one-time fee during registration or provisioning of service that is similar to license fee.

User can pay a fixed amount (recurring) and rent the specific set of physical resources for a specific amount of time. For example, user can rent 4 CPU machines with 2 GHz processing power and 10 GB hard disk space for a month. Phoenix provides the machine credentials which would be valid for a month and can be managed via Phoenix management console. This service can be charged for specific levels of authorization. For example, professional license will allow user to save the state of machine and migrate the machine to free physical resource, while basic license will allow only start and stop actions.

Second way to charge the user is to charge the user based on their usage. This uses logging of usage details of every action user performed and users are charged according to its use. This is useful for refund or service level agreement (SLA) management.

19.8 Major Findings

Phoenix tool was found to be better compared with other virtual machine managers such as OpenNebula, Eucalyptus and Globus Nimbus, based on factors like usability, flexibility and supportive to Cloud infrastructures. Table 19.2 shows comparison of Phoenix with other VMMs. The graphical user interface makes this tool user friendly and easy for VM management even for users who are not computer savvy like users from biology background. Also, additional support for VirtualBox overweights other VMM engines including OpenNebula (Table 19.1).

To test the performance of the tool, we used the following scenario. System specifications of the machines used are as follows: CPU: dual-core 2 GHz, RAM: 2 GB, OS: Ubuntu Linux 8.10.

Three machines connected in ethernet LAN have been used in which one of them acted as an OpenNebula server and has Phoenix Web-based management console, with messaging daemon always on run. Other two machines are configured as cluster nodes. We tested the delay introduced due to additional messaging API layer introduced. Results are presented in Table 19.2 and Fig. 19.4.

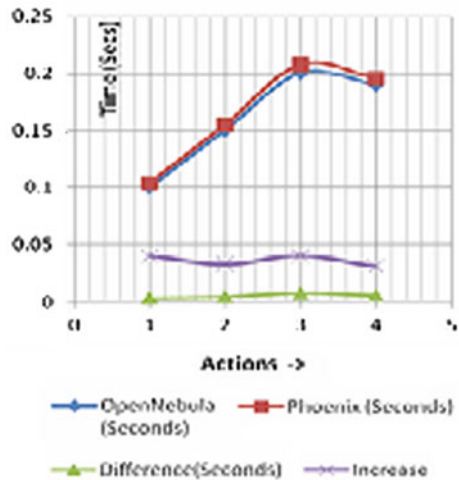
Table 19.1 Comparison results

Category		Eucalyptus	Globus Nimbus	OpenNebula	Phoenix
Virtual machines	Xen	Yes	Yes	Yes	Yes
	KVM	Yes	No	Yes	Yes
	VMWare	No	No	Yes	Yes
	VirtualBox	No	No	No	Yes
Cloud interfaces supported	Amazon's EC2	Yes	Yes	Yes	Yes
Cloud infrastructures	Simple (public/private)	Yes	Yes	Yes	Yes
	Hybrid	No	No	Yes	Yes
User interfaces	Command-line interface	Yes	Yes	Yes	Yes
	Graphical user interface	Yes	No	No	Yes

Table 19.2 Performance evaluations

Actions	OpenNebula (Sec)	Phoenix (Sec)	Difference (Seconds)	Increase (%)
Host creation (1)	0.1	0.104	0.004	4
Host deletion (2)	0.15	0.155	0.005	3.33
VM creation (3)	0.2	0.208	0.008	4
VM deletion (4)	0.19	0.196	0.006	3.15
			Average increase	3.62

Fig. 19.4 Graph plotted using data mentioned in Table 19.2



19.9 Conclusion

In this paper, we present the design and performance analysis of the Genomics-Cloud management tool Phoenix. We present the philosophy of Cloud Computing and GenomicsCloud. We provide related work including OpenNebula and Globus Nimbus. In addition to the features described in Sect. 19.6, the following feature set currently under development will be available in the future releases.

- Management of virtual machine templates on the server
- Web-based VNC interface for managing virtual machines
- Robust access control and multi-user management

Phoenix as GenomicsCloud administration framework with quality of service (QoS) for guaranteed service level at real time.

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Chapter 20

A Cloud Computing Data Model

Hua-Zuo Ying

Abstract In this paper, an in-depth comparison is conducted on the architecture of data services, and also the shared disc architecture of the cloud computing database is analyzed. Besides, the application of the cloud computing is implemented based on the open-source cloud platform. Furthermore, the research result improves the parallelism and extensibility of the actual system, and simultaneously increases the data capacity.

Keywords Cloud computing · Cloud computing database · Data architecture

20.1 Introduction

The cloud computing, due to its key and revolutionary technology concept for IT, has penetrated into the hearts of people day by day and will exert a profound influence as well [1, 2]. A core design concept of cloud computing is designing a dynamic extensibility, or providing an on-demand service [3]. However, a majority of database services cannot fulfill such a demand at the present time. In this paper, the author discusses the implementation of a cloud database service after introducing the cloud computing database service architecture and the shared/non-shared disk architectures.

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20.2 Cloud Computing

The cloud computing developed from the distributed computing, parallel computing, and grid computing; in other words, it can be a commercial implementation of these computer science concepts [4]. A large resource pool can be composed through the computation of the enormous and highly virtualized resources distributed in a great number of distributed computers. Besides, based on the open standard and service and centered at Internet, the cloud computing provides safe, fast, and easy data storage and network computing services.

20.3 Introduction to Cloud Database

20.3.1 Fundamental Concept of Cloud Database

The cloud database is a data management system based on the cloud computing platform, provides the parallel processing of mass data and good extensibility, and also can simplify the development of the cloud application. The application that the cloud database is appropriate to is mainly the OLAP application. The cloud computing databases are applications of cloud computing, and also are a cloud computing-oriented database resource management platforms, aiming to provide a cloud computing access environment for the sharing of the resources in many databases of Internet back ends and also provide a general plan for cloud computing applications to solve the fundamental structural-level database resources access, discovery, integration, and other problems.

20.3.2 Prominent Problems in the Cloud Computing Data Service

A core principle of cloud computing is the dynamic extensibility. The architectures of a majority of database system do not share the disks. The architectures not sharing disks rely on the distribution of data to different services. Perhaps, it is thought by people that the dynamic adding database is the same to the partitioning data. For example, if you get two servers, each of them will have 50 % data of a third server is added; also, there are lots of users to request to search relevant information; if they may want to look for the order information of all users, or may search an invoice list and all invoice information of last month, and then use relevant database keywords to search the customers list. If this is distributed in different data servers, the data shipping will smother the database performance. For this reason, the partition of database must be highly careful to reduce the data shipping. The partition of data, as a highly time-consuming process, is regarded as

a black art, because it requires a high-level technique. Certainly, the users can use the middleware to automatically partition data, but the performance will be reduced to be extremely low. Therefore, if a third server is added, it will greatly degrade the performance to use the middleware to dynamically partition data. This is the problem in the cloud computing database.

20.3.3 Data Replication Table Plan

The data partition does not match with the cloud computing, so Amazon and Google adopted plans to resolve the challenges of cloud computing. Hence, they created the persistent layer engine and gave up the typical ACID, and then adopted the data replication tables to support the dynamically elastic extensibility. Both the Bitable of Face book and the Sampled of Amazon are ideal for the above first application. However, they are not an alternative for the actual database, because they cannot satisfy the needs of clouding computing.

20.3.4 Shared Disk Data Architecture-Ideal Architecture of Cloud Computing

The shared disk architecture is unnecessary to partition data and is an ideal cloud database service. The shared disk database allows the low-cost cluster to use a single data set, and its typical application is SAN or NAS. All data can be accessed by all servers. There are no data partitions. As a result, adding more servers will improve the execution efficiency of statements. That is to say, the shared disk supports the flexible extensibility.

20.3.5 Database Solution Based on Cloud Computing

20.3.5.1 Eucalyptus Software Architecture

Eucalyptus is an open-source software architecture and implements the fundamental architecture of enterprises current IT service based on a cloud computing platform. The full name of Eucalyptus project is “Elastic Utility Computing Architecture for Linking Your Programs to Useful Systems,” which is an open-source project created by Santa Barbara University and is the software with the main purpose of fulfilling the elastic demands of the cloud computing environment. It is deployed on the clusters or server groups and also is a web-based service using commonly seen Linux tool.

20.3.5.2 Eucalyptus Plan System Structure

Eucalyptus platform framework is composed of a series of cooperative web services which are highly modularized [5]. The web services are interactive operation using the standard communication protocols. Through this framework, Eucalyptus implements virtual machines and storage resources which are connected by two isolation layers network. In terms of the client applications and users, the API is compatible with Amazon AWS (including SOA and REST interfaces support).

In Fig. 20.1, the CLC is the base (server, storage, and network) of the virtualized resources of cloud controller; the CCS cluster controller is the front end of each cluster definite in the cloud. The NCs is the machine to run the cases of virtual machines; the storage controller provides block services (similar to Amazon EBS), and the services can be extended to the whole cloud through Walrus storage system (similar to functions of Amazon S3).

In the deployment of the cluster servers, due to the shortage of IP address and the worry about the securities of the resources completely accessed through Internet, the system administrator usually deploys the cluster on a private and un-routable network, and this network has only one head node responsible for the routable traffic between the computing pool and the public Internet. Although such a configuration provides a security guarantee by using the least public and routable IP addresses, this means that a majority of machines cannot directly communicate with the machines within the cluster when connecting to the external hosts. Taking

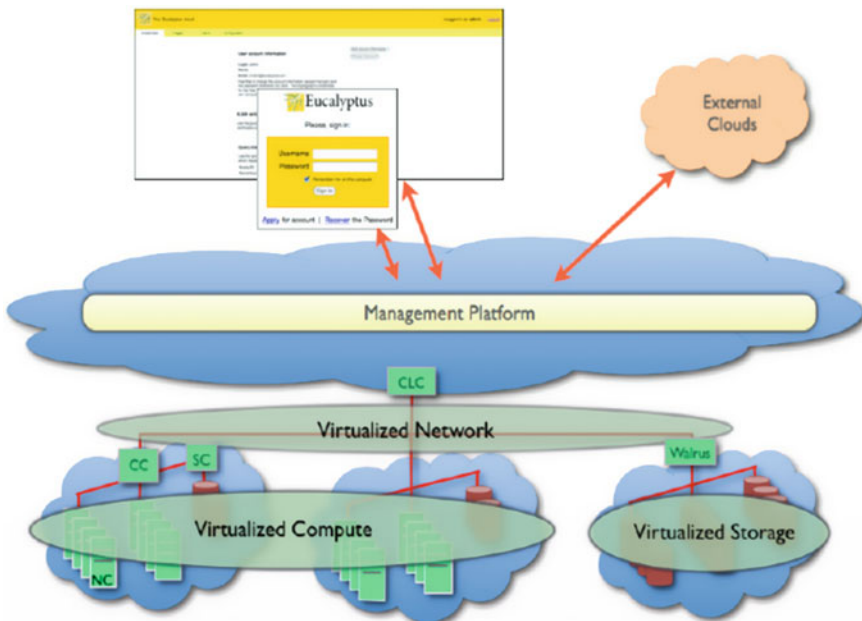


Fig. 20.1 Eucalyptus cloud concept

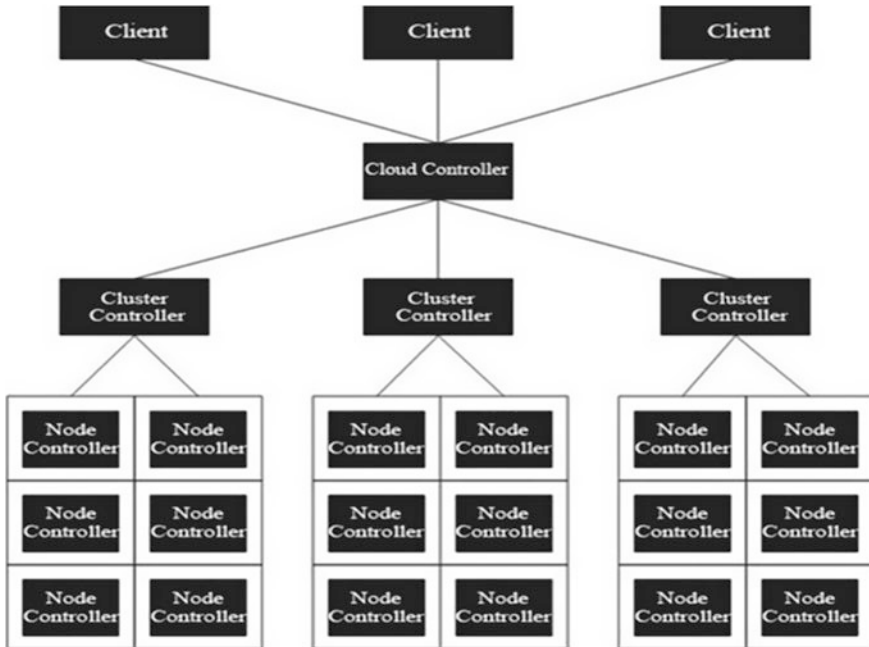


Fig. 20.2 Eucalyptus layered topological structure

the following circumstances for example, there are two small Linux clusters (a small server pool and workstation pool) and each cluster has a front-end machine whose IP address can be visited openly, while special networks are used to connect the spaces between nodes as well as the nodes and cluster head nodes; also the servers and workstations have open IP addresses, but these workstations are behind the firewalls and cannot be connected exteriorly; in this case, it is obvious that the installation of a completely interconnected system is impossible, because many machines can only send connections to the external hosts or are totally isolated from the external network. In addition, the nodes in the two clusters may have overlapped IP addresses because they are in different special networks. In order to use all these resources in a single cloud computing system, a layered architecture is applied in Eucalyptus as shown in the following Fig. 20.2.

20.3.5.3 Main Components

The main components of Eucalyptus include the node controller, cluster controller, and cloud controller.

20.3.5.4 The Node Controller

The node controller manages a physical node. It is a component running in the physical resources hosted by virtual machines and is responsible for the tasks of starting, checking, closing, and deleting virtual machines cases.

20.3.5.5 The Cluster Controller

The typical cluster controller runs in the cluster head node or server and can access the private or public networks.

20.3.5.6 The Cloud Controller

The cloud controller is composed of a group of services. These services are used to process the users requests, verification, maintaining system, and metadata (virtual machine mapping, SSH keys, and so on), and also can manage and monitor the running of virtual machine cases. These services are configured and managed through the enterprise service bus. Also, the operations such as service release can be implemented through the service bus. In the design of Eucalyptus, the transparency and easiness are stressed to promote the experiment and extension of Eucalyptus. In order to achieve the granularity-level extension, the components of the cloud controller include the virtual machine scheduler, SLA engine, user interface, and management interface. They are modularized components which are independent mutually and provide well-defined interfaces to the outside, while the enterprise service bus (ESB) is responsible for controlling and managing the interaction and organic cooperation between these services. By using the interactive operation of web services and Amazon EC2 query interface with EC2 client, the cloud controller can work as Amazon EC2. Why EC2 is selected? Is that it is relatively mature, has a great number of user groups, and has implemented Iasi excellent? As shown in Tables 20.1 and 20.2.

Table 20.1 The configuration requirements on other nodes

Hardware	Minimum	Suggested	Notes
CPU	1 GHz	2 × 2 GHz	For an all-in-one front end, it helps to have at least a dual core processor
Memory	2 GB	4 GB	The java web front end benefits from lots of available memory
Disk	5,400 rpm IDE	7,200 rpm SATA	Slower disks will work, but will yield much longer instance start-up times
Disk space	40 GB	200 GB	40 GB is enough space for only a single image, cache, etc. Eucalyptus does not like to run out of disk space
Networking	100 Mbps	1,000 Mbps	Machine images are hundreds of MB and need to be copied over the network to nodes

Table 20.2 The node controller (no)

Hardware	Minimum	Suggested	Notes
CPU	VT extensions	VT, 64-bit, multicourse	64-bit can run both i386 and amd64 instances; by default, eucalyptus will only run 1 VM per CPU core on a node
Memory	1 GB	4 GB	Additional memory means more and larger guests
Disk	5,400 rpm IDE	7,200 rpm SATA or SCSI	Eucalyptus nodes are disk-intensive; I/O wait will likely be the performance bottleneck
Disk space	40 GB	100 GB	Images will be cached locally, eucalyptus does not like to run out of disk space
Networking	100 Mbps	1,000 Mbps	Machine images are hundreds of MB and need to be copied over the network to nodes

Configuration Requirements:
 The cloud controller (clack)
 The cluster controller (cc)
 Walrus (the S3-like storage service)
 The storage controller (sc)

20.4 Implementation of Upgrade

On the Eucalyptus, cloud basis, huge virtual servers, and multiple virtual terminals can be created and implemented. Red hat Linux enterprise edition can be installed in the virtual machines and also the Oracle database can be installed in accordance with the shared disk architecture; also, the database in the former IBM4300 small machines can be transferred to virtual machines, and the former applications can be created in multiple virtual terminals; the application upgrades of the huge database can be implemented, to achieve the fast query of mass data and the flexible increase and decrease of application terminals.

20.5 Conclusion

The cloud database services are created through the Eucalyptus cloud platform. Such a database model service owns the features below:

Ultra-large scale: the HOSTING providing the cloud computing is more powerful than the common virtual hosts

Easy to use: the users can acquire the application services with multiple terminals at any position

High reliability: the data multiple replica fault tolerance, computing nodes isomorphism, and interchanges and other solutions are used to ensure the high reliability of services

Extensibility: the data and application sharing between different equipments can be achieved with this feature

However, there are two divergences in the IT world for whether the relational database can be appropriately used as the database in the cloud environment or not. The relationship between the Nasal in the research area and the traditional commercial database changes as well. The data services how to highly efficiently satisfy the multiple application models in the cloud environment are still necessary to be explored further.

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Chapter 21

Study on New Mode of Higher Education Information Based on Cloud Computing

Yi Gao

Abstract Objective: Aiming at the needs for the development of current higher education informatization, and the higher requirements on university information network and education information resource management methods, presents a new teaching resource application mode based on cloud computing, and elaborates cloud computing on the aspects of the design idea characteristics, system design method, system architecture, resource pool construction content, etc. Results: to further promote the extent of university informatization through the adoption of cloud computing, achieving more efficient use of existing hardware resources. Conclusion: to change software use method in teaching and enhance the sharing and integration of information resources and teaching resources.

Keywords Education informatization · Cloud computing · University teaching resources

21.1 Introduction

As the domestic development of education informatization is limited by the network transmission speed, the geographic location of information resources, the server's data processing capability and other various factors, education informatization platform cannot keep up with the development needs of teaching applications [1]. This mainly reflects on the problems that the speed of information

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networks and information resources cannot be effectively shared, the server utilization is less efficient, and information equipment is difficult to manage and maintain [2, 3]. Just under this background, we propose a new network computing model—cloud computing. Cloud computing is the combination of grid computing and internet computing, based on distributed computing, centered on the user, storing data in the clouds, and the user can securely access to data in some convenient way at any time, anywhere. Cloud computing enables each node of the Internet to be data storage center and computing data center, contributing to the advancement of the construction of university informatization resources platform based on cloud computing.

21.2 The Concept and Connotation of Cloudy Computing

21.2.1 *The Concept of Cloud Computing*

The definition of cloud computing is the delivery and use pattern of IT infrastructure, meaning that the user obtains the necessary IT infrastructure resources through the network according to the demand in an easy-expandable way. As shown in Fig. 21.1, it indicates that it is an abstract conception of the bottom layer infrastructure. The network that provides resources is known as the “cloud,” in which the resources appear unlimited to the user and can be obtained and expanded at any time, used on demand, and paid per use. This feature is often described as using IT infrastructure like water and electricity, for example, Amazon data warehouse rental. The generalized cloud computing refers to the delivery and use pattern of service, accessing to the needed services through the network according to the demand in an easy-expandable way. This service can be

Fig. 21.1 The concept of cloud



IT and software, Internet-related, or any other service. The generalized cloud computing includes more enterprises and service types, such as online financial software launched by UFIDA and Kingdee, CRM system of 800 apps, app package released by Google, and so on.

21.2.2 The Connotation of Cloud Computing

The connotation of cloud computing is an Internet-based super-computing model, a product resulting from the development and integration of traditional computer and network technology such as distributed computing, parallel computing, grid computing, virtualization technology, etc., using the method of virtualization aggregation and cracking to enhance the resources use efficiency, to improve the system's expandability, reliability, security, and flexibility to achieve "change upon demand" and improve the user's informatization experience. Relying on large storage system and thousands of servers, cloud computing compose a large data center, changing Internet into a ubiquitous, huge resources pool, providing the users with network-based services through a variety of applications. We do not need to understand the cloud infrastructure and that who provides the service, but simply make clear what kind of service we need. As the computing is distributed in a large number of distributed computers rather than local computers or remote servers, cloud computing does not require high performance of the terminals. Therefore, the user can access to the services they need anytime, anywhere, even including the task of supercomputing. The data are managed by the cloud management team, so the users do not have to worry about loss of data due to the destruction of the computer terminals. The advanced technology of cloud ensures high reliability of service. Therefore, we can say that the cloud is an independent application, through which the user terminal can access storage, computing, database, and other resources via Internet remote connection. Cloud computing system is divided into four layers, as shown in Fig. 21.2.

21.3 The Advantages and Characteristics of Cloud Computing

21.3.1 The Advantages of Cloud Computing

Cloud computing has the advantages of super-large scale, high expansibility, virtualization, high reliability, versatility, low cost, etc. The size of the cloud can be dynamically flexible to meet the needs of growing applications and user scale. The computers in the cloud can be updated at all times. The cloud is a huge resource pool, where resources can be bought on demand. Due to the facts that the

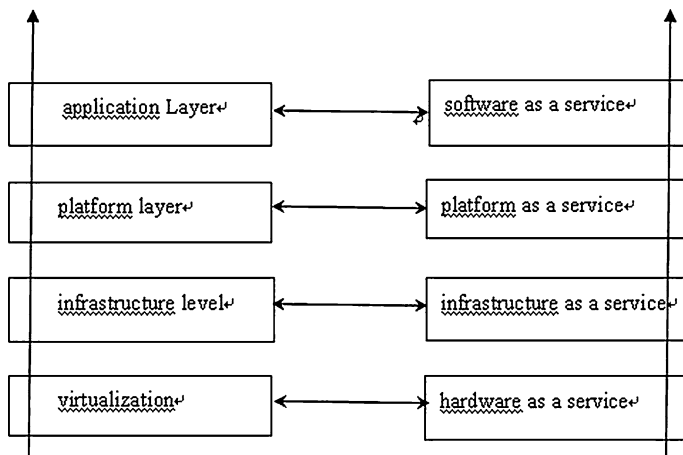


Fig. 21.2 Cloud computing four-layer system model

special fault-tolerant measures of the cloud can use extremely cheap nodes to form clouds, that the automation centralized management of the cloud free the users from burdening the increasingly high cost of data center management, and that the versatility of the cloud dramatically improves the resource utilization efficiency compared with traditional systems, the users can fully enjoy the low-cost advantage of the cloud. In addition, the core technology of cloud computing is a massive data distributed-storage technology. The building of cloud computing aims at providing services for a large number of users at the same time, so the cloud computing systems adopt distributed storage to store the data and use the method of redundant storage to ensure reliability of the data.

21.3.2 The Characteristics of Cloud Computing

User and Task Center The data centers that consist of many computers and servers will become the carrier of the approaching cloud computing era. It uses software to realize virtualization management, scheduling, and application of hardware resources, making Internet the center of the cloud computing application operation. Once connected to the cloud, the facilities to accomplish this task in the cloud all belong to the user. Cloud computing arranges appropriate resources, computing power, and service practices based on the user's needs, in order to quickly find the corresponding program to complete the task. Of course the user can manage the customization, which is, for many enterprises' informatization, an idea for reference and an ideal solution to try.

Powerful function and Low Cost The "cloud," formed by a number of distributed computer groups can be called a supercomputer. It has been given strong and intelligent computing power, capable of adding computer servers into the

cloud at any time to improve the cloud computing capabilities. A large number of files and data are stored in the “cloud.” The user can always easily retrieve more information from multiple databases to find the most accurate information.

Programmable and Service Security Large demand requires that cloud computing tasks must be able to run automatically, can provide the most reliable and secure data storage center, have strict access management strategic measures, and can help users to safely share resources with specific people. For example, the data stored in a computer in the cloud can be copied to other computers in the cloud (multiple computers), so that once the computer is offline, the cloud program will automatically relocate its data re-assigned some other computers in the cloud. This way even if the original data are accidentally deleted or crashed, it can still be used easily. Compared with existing computer systems, cloud computing has high-level fault-tolerant mechanism. Its calculation is done by the server, and all the services are located on different servers, starting a new program to process the failed data, to ensure normal operation of the application and calculation. The data storage centers also rely on the management of the expert team which ensures better reliability, security, connectivity, and other performances, protecting the users from troubles such as data loss, viruses, etc.

Based on its principles and inherent characteristics, cloud computing is easier to enter universities than any other new technology. Cloud computing requires very low equipment on user side, which feature determines cloud computing has obvious advantages for education applications.

21.4 Cloud Computing’s Effect on University Informatization

21.4.1 Cloud Computing Reduces High Hardware Cost

For various universities, in the informatization construction, there is always a huge expenditure on the purchase of hardware resources as well as operation and maintenance. These costs can be divided into the following sections: data center, teaching room and office computers. In the existing data center, one server generally runs an application only, and the CPU utilization rate is about only 5 %. But in the cloud computing center, each physical server can virtualized multiple virtual servers, and the CPU utilization rate can reach up to 60 %. It can be seen that cloud computing can greatly improve hardware resource utilization rate of data center. So universities can save the initial input and do not need to concern the upgrading of equipment but to focus on the construction of the university cloud computing center.

21.4.2 Cloud Computing Improves the Use Method of Applications

As informatization continuously goes deep into people's lives, people are increasingly dependent on computer [3]. So whether it is a personal computer or server, a lot of application software's must be installed to meet the needs of information processing. This is especially true for universities. Cloud computing provides the functions of online use of a variety of software, which people use in a lease-like form. All the software resources are from the "sea of clouds" of SaaS. If people need some kind of application software, there is no need to install software locally, but to simply submit an application through the browser, and the update of software version and licensing issue are all thrown into the "cloud" as well.

21.4.3 Cloud Computing Improves the Level of Resource Sharing

In the construction of university informatization, our country lacks of unified planning, long-term objective, and uniform standards, so we have the problems of serious overlapping, scattered resources difficult to share, and various platforms difficult to effectively integrate. The problems cause among colleges and universities that the information cannot be effectively shared between the various departments of the universities, seriously affecting the smooth implementation of the business, and the role of information technology is not embodied. The emergence of cloud computing brings hope for the solution of these problems. Cloud computing has unified configuration and management for infrastructure. It integrates the CPU, memory, network, and other infrastructure resources into a unified pool of resources, where people can easily use all the resources of the resource pool through the network. This centralized management; use resources on demand method will improve resource utilization efficiency and effectively eliminate resource idling and waste caused by independent dispersed resources, balancing the load between the devices through related measures, so that the IT infrastructure can be fully utilized. In addition, as cloud computing provides PaaS and platform virtualization technology, application software development can ignore the selection of operation platform and development platform, and the user can get their own applications through the browser. In this way, using a unified standard interface to develop all types software applications enhances the versatility and cross-platform ability of software, avoiding the interface problems caused by poor communication and the generation of information silos. So, the management layer can unify the scheduling of the tasks, providing convenience also for the university management data analysis and decision.

21.5 Education Informatization New Model Establishment

Education cloud is a transportation of cloud computing technology into the field of education and a infrastructure of future education informatization technology, including all the hardware and software computing resources needed by educational informatization. After virtualization, these computing resources provide services in the form of computing resources for educational institutions, educational practitioners, and students. In this paper, first design educational informatization platform structure based on cloud computing and explore the mode of operation based on the structure.

21.5.1 Overall Structure

With a modular, hierarchical design concept, the resource platform realizes data, business logic processing, and resources presentation in three layers, as shown in Fig. 21.3.

The resource layer is used to store various data and resources [4, 5]. Based on cloud computing’s security and deployment, and expansion flexibility, separate system data with resource data, and resource catalog data, both to ensure the security of system data, and to facilitate the flexibility to choose the database system as repository storage in the different deployment.

Application layer realizes resource-related, management-related business application processing logic, accesses down to the data layer, processes the low-layer data, and feedbacks the results to the upper presentation layer for presentation. Connected to the upper presentation layer, application layer, to receive from the presentation layer passed over the service request processing, and processing results are returned. The application logic implemented by the application layer include administrator management, user management, metadata management, resources, warehouse management, resource management, resources, application services, billing services, directory services, search services, U disk services, platform networking services, the client services, systems management, and extension services.

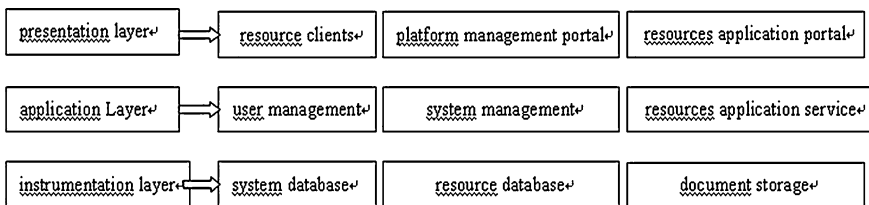


Fig. 21.3 Resource platform system structure

The presentation layer of the resources in the resource platform and related informatization is displayed and the provision of services and management interfaces, including resource portal resource platform management portal; resource application client; resource application portal to provide resources for the end-user of resources display, catalog, search, downloads, and other services; resource platform management portal to facilitate the management of the administrator on the platform and resources; resources application client via the desktop client to provide resources to browse, download, and search services.

21.5.2 The Model of Operation

The regional distribution in several major areas in China, the Education cloud composition of each region, the cloud by a number of private colleges and universities cloud computing services for all types of educational institutions Universities private cloud to expand the university's network center or informatization center formed by the various colleges and universities manage their own. The region cloud is relying on the existing educational network by the private cloud interconnection of the various colleges and universities from each region cloud the establishment of a governing body and management of regional cloud resources. Finally, the Interconnection of the various regions of cloud formation of the cloud of our education, the whole education cloud establishes a Management Committee for the integrated management.

In the clouds of education, infrastructure construction and management from different universities in the private cloud and regional cloud; application interface by various regulatory agencies of the cloud of Education jointly developed in consultation and, ultimately, to achieve standardization; educational applications can be from various colleges and universities, research institutions and educational management institutions according to their specific needs, developed by the universities or educational software development companies. To achieve effective sharing of resources and make full use of education cloud describe the response to the various resources provided by the layers, the establishment of the Education and cloud resources index database, the user can according to the needs of applications in the education of cloud resources index library to retrieve. Due to the many resources on the cloud, resource links, educational resources index library unless the person can understand, should also be a machine can understand, thereby enhancing the user retrieval accuracy and efficiency of resource use.

21.6 Conclusion and Outlook

The cloud computing model is the emergence of a new building for the University informatization system to provide ideas and methods. As an emerging technology, cloud computing is still no uniform standard and implementation, how cloud-based

integration of resources, there are still some difficulties and problems: how to unify and integrate the existing equipment in the existing University informatization and resources; cloud-based products of different manufacturers are different, how different the new products used in the construction of university informatization; heterogeneous resources how to use the middleware to be integrated and shared and unified. However, the development trend of cloud computing is increasingly clear, cloud computing will get more applications in the University informatization system to promote the healthy development of higher education informatization technology work.

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Chapter 22

An Optimal Production Scheduling Method Based on Improved Particle Swarm Algorithm

Ling Qin and Shulin Kan

Abstract To solve the dynamic and complex calculation problems in production scheduling procedure, a fitness function of particle swarm algorithm and operation strategy of shop scheduling agent are constructed by means of particle swarm algorithm and multi-agent cooperation characteristic. Moreover, an improved algorithm based on particle swarm algorithm is established and an optimal shop scheduling procedure by particle swarm algorithm based on multi-agent in this paper. Finally, the simulation system of production dynamic scheduling by particle swarm improved algorithm based on multi-agent was demonstrated and validated by QUEST software. It has shown the production scheduling calculation time in proposed method can be improved and provides a support for adapting to complex and dynamic production scheduling.

Keywords Production scheduling · Multi-agent · Particle swarm algorithm

22.1 Introduction

A work piece is manufactured by a serial of processes, and each process is implemented by special machines or resource in manufacturing system. Moreover, manufacturing order of each work piece is pre-established. Production scheduling

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is that manufacturing order is reasonable set by available resource to satisfy the demand of production. Production scheduling usually includes manufacturing order and resource allocation. Production scheduling can be described by:

$$P_s = \{\alpha, \beta, \chi, \delta\} \tag{22.1}$$

where α, β are the number of work piece and the number of machine, χ is the characteristic of manufacturing system, and δ is production scheduling object, such as manufacturing order and resource allocation. Production scheduling can be described in detailed:

$$\begin{aligned} & \min \max \{ \max C_{ik} \} && 1 \leq m \leq n, 1 \leq i \leq n \\ \text{s.t. } & C_{ik} - P_{ik} + M(1 - a_{ik}) \geq C_{ih} && i = 1, 2, \dots, n, h, k = 1, 2, \dots, m \\ & C_{ik} \geq 0 && i = 1, 2, \dots, n, h, k = 1, 2, \dots, m \\ & x_{ijk} = 0 \text{ or } 1 && i, j = 1, 2, \dots, n, h, k = 1, 2, \end{aligned} \tag{22.2}$$

where $\min \max \{ \max C_{ik} \}$, is the span of object function, C_{ik} and P_{ik} are implement time and manufacturing time of work piece i by machine k , M is enough positive integer, a_{ik} is indicator coefficient. If work piece i is manufactured by machine k earlier than machine h , a_{ik} is 0. Otherwise, a_{ik} is 1. x_{ijk} also is indicator coefficient. If work piece i is manufactured by machine k earlier than machine h , x_{ijk} is 1. Otherwise, x_{ijk} is 0.

Because urgency and emergency usually offer in manufacturing system, such as machines failure, work pieces order change, fittings adjustments, and so on, production scheduling should has dynamic ability or characteristic to adapt to dynamic environment. At the same time, because there are complex relationships among work pieces, machines, fittings, and so on in manufacturing system, the production scheduling of workshop is complex. At the same time, because production scheduling is optimal problem in equation or non-equation restraints, the problem scale and calculation quantity production scheduling is tremendous. Therefore, traditional scheduling methods do not adapt to complex production scheduling.

There were some researches of production plan and scheduling aspects, such as Wan et al. [1], Zhang et al. [2], Zhu et al. [3], Har-Peled et al. [4], Bayraktar et al. [5], Omkar et al. [6], Xin et al. [7], Niknam et al. [8], and so on. However, few studies have been devoted to dynamic and complex problem of production scheduling. Furthermore, few researches have investigated the problem by particle swarm algorithm based on multi-agent.

To solve the dynamic and complex calculation problems in production scheduling procedure, a fitness function of particle swarm algorithm and operation strategy of shop scheduling agent are constructed by means of particle swarm algorithm and multi-agent cooperation characteristic. Moreover, an improved algorithm based on particle swarm algorithm is established and an optimal shop scheduling procedure by particle swarm improved algorithm based on multi-agent in this paper. Finally, the simulation system of production dynamic scheduling by particle swarm improved algorithm based on multi-agent is demonstrated and

validated by QUEST software. It has shown the production scheduling calculation time in proposed method can be improved and provides a support for adapting to complex and dynamic production scheduling.

22.2 Fitness Function

In multi-agent, each agent is independent and capable of making decisions. An agent has its own objectives to achieve, and its autonomous behavior is a consequence of its observations, knowledge, and interactions with other agents [9].

The particle swarm optimization (PSO) algorithm is a recent addition to the list of global search methods. This derivative-free method is particularly suited to continuous variable problems and has received increasing attention in the optimization community. It has been successfully applied to large-scale problems in several engineering disciplines and, being a population-based approach, is readily parallelizable. It has few algorithm parameters, and generic settings for these parameters work well on most problems [10].

A particle is set as a production scheduling agent, and multi-agent has fitness value decided by optimal problem in particle swarm algorithm. Production scheduling agent's object is that decreases fitness value as soon as possible and take action by means of environment in case of satisfying condition. Each particle is a partition of whole dataset. The distance sum $f(O_1, O_2, \dots, O_k)$ among partitions is set as object rule function to whole understand and correct estimate the result of clustering calculation. In other word, the minimum object rule function is optimal the result of clustering calculation:

$$f(O_1, O_2, \dots, O_k) = \sum_{j=1}^n \sum_{p \in C_i} |p - o_j|^2 \tag{22.3}$$

where O_j is a set composing by data around the center O_i of a circle sample x . The k center object is O_1, O_2, \dots, O_k .

The fitness function can be described as: $\text{fitness} = \frac{1}{f(O_1, O_2, \dots, O_k)}$.

Real number coding is used, and data are coded by clustering center in particle swarm improved algorithm based on multi-agent. Each particle position is composed by k clustering centers. Characteristics of particle include position, fitness value, and velocity. Because the dimension of sample vector is d , there is $k \times d$ matrix to decide the position of particle. Velocity of particle should be $k \times d$ matrix. The coding rule of particle is as following:

$$\begin{aligned} \text{Position} &: p_{11}, p_{12}, p_{13}, p_{1d}, p_{k1}, p_{k2}, p_{kd} \\ \text{Velocity} &: V_{11}, V_{12}, V_{13}, V_{1d}, V_{k1}, V_{k2}, V_{kd} \end{aligned} \tag{22.4}$$

22.3 Operation Strategy

Each agent is randomly initialized in whole $Lsize \times Lsize$ grid environment, and each agent is set as a grid in multi-agent structure. The data information of grid represents the characteristics of agent including velocity and position information of particle in particle swarm improved algorithm based on multi-agent. $Lsize$ is plus real number and the number of grid relatives to size of population. Each agent can gain environment information from local environment and takes decision and action to achieve task. The local environment takes important role to each agent.

Firstly, each agent is randomly distributed space, and its position and velocity are initialized. Secondly, some neighboring agents are randomly distributed around each agent. The local environment is established among neighboring agent and agent. Moreover, the number of neighboring agent can be chose by different optimal problems in procedure of neighbors' distribution.

When particle swarm improved algorithm based on multi-agent is applied in production scheduling, random neighbors' number is set as 20 by means of complex degree of problem, optimal efficiency, and result to obtain minimum operation time. The optimal result can be obtained by the random number increase in neighbors, or minimum operation time can be obtained by the random number decrease of neighbors in different optimal problem.

Each agent can communicate with more neighboring agents and can break through information transferring restrict in particle swarm algorithm. As the operation of each iterative, each agent can gain more information. At the same time, an agent gains more information by communication, and this agent can faster take action or make decision. Moreover, this agent gains more cooperation function, so that whole system has better convergence velocity and optimal result.

Each agent needs update position in particle swarm improved algorithm based on multi-agent, but this agent firstly collaborates and competes with other neighboring agents in local environment. Consequently, each neighboring agent should calculate own fitness value at first. Supposing agent β 's adapting value is the minimum at 20 each neighboring agent around agent α , and $\beta = (\beta_1, \beta_2, \dots, \beta_n)$, agent α should meet this condition: $f(\alpha) \leq f(\beta)$.

If this condition can be met, agent α is good particle, otherwise, it is bad particle. When agent α is good particle, this agent's position will not be changed in solving space. Otherwise, this agent's position will be changed in solving space:

$$\alpha_k = \beta_k + \text{rand}(-1, 1)(\beta_k - \alpha_k) \quad k = 1, 2, \dots, n \quad (22.5)$$

where $\text{rand}(-1, 1)$ is random number in region $(-1, 1)$. If there is $\alpha_k < x_{k\min}$, $\alpha_k < x_{k\min}$, and there is $\alpha_k < x_{k\max}$, $\alpha_k < x_{k\max}$.

$x_{k\min} = (x_{1\min}, x_{2\min} \dots x_{n\min})$ is lower limit value in feasible solving space of optimal problem, and $x_{k\max} = (x_{1\max}, x_{2\max} \dots x_{n\max})$ is upper limit value in feasible solving space of optimal problem. Even if agent α is bad particle, this agent still reserves own useful information and fill absorb valuable information from neighboring agent to decrease own fitness value.

In particle swarm improved algorithm based on multi-agent, each particle can communicate with optimal particle after each change operation strategy by competing and collaboration. Finally, this algorithm can overcome environment localization and solve the low velocity problem in information transferring, which can accelerate information transferring among agents and improve the convergence velocity of algorithm.

22.4 Operation Procedure

When particle swarm improved algorithm based on multi-agent is applied in production scheduling, particles of multi-agent can be studied and optimized by competing and collaboration and perpetually update the individual extreme limit value and whole limit. The detailed procedure of particle swarm improved algorithm based on multi-agent is described as Fig. 22.1.

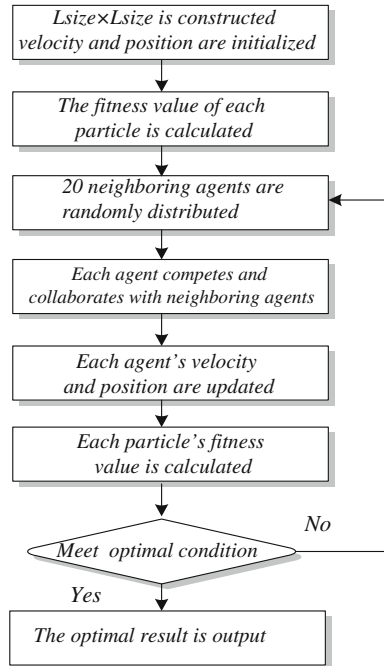
The detailed procedure of particle swarm improved algorithm based on multi-agent is as following:

- Step1: The grid environment $Lsize \times Lsize$ is constructed, and particle velocity and position of solving space are initialized in multi-agent.
- Step2: The fitness value of each particle is calculated by formula (22.4).
- Step3: Twenty neighboring agents are randomly distributed around each agent.
- Step4: By means of operation strategy, each agent competes and collaborates with neighboring agents, and each fitness results are recorded.
- Step5: Each agent's velocity and position are updated by iterative in solving space.
- Step6: Each particle's fitness value is calculated, and each particle's individual extreme limit and whole extreme limit are updated.
- Step7: If this algorithm cannot meet the optimal condition, the procedure turns to step 3. Otherwise, the optimal procedure is end.
- Step8: The optimal result is output.

22.5 The Simulation System of Production Dynamic Scheduling

QUEST/Delmia is simulation software of digital factory and discrete event. It is the solve scheme of CIMS, which could be used to perform process flow design, visually simulate, and analyze the veracity and efficiency of process flow [11]. With QUEST, users can visualize and prevent potential problems and improve existing processes. QUEST is also a powerful tool to design, analyze, and visually represent complex manufacturing processes and data, for those who are not familiar with the manufacturing process.

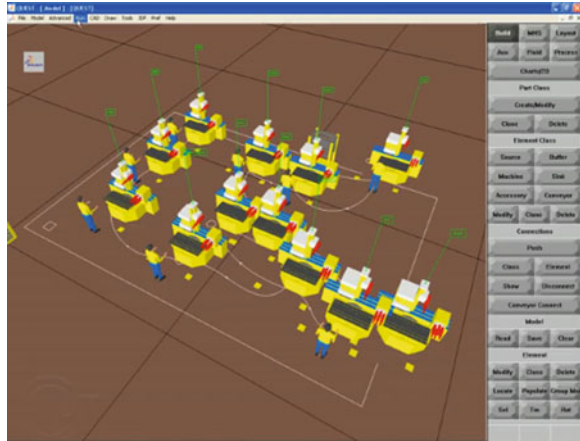
Fig. 22.1 The detailed procedure of particle swarm improved algorithm based on multi-agent



The simulation system of particle swarm improved algorithm based on multi-agent was consisting of an arrival process, a production process, and a queue. The arrival process is such that whenever the buffer of the group of machines of the very first process is free, and a new part will enter. In this simulation, the buffers monitored for arrival correspond to the buffers for the 32ed Lathe group, the 42ed Vertical Lathe group, and the 18th Lathe group. Queuing discipline used in this simulation is first-in first-out (FIFO). The simulation system of particle swarm improved algorithm based on multi-agent is shown in Fig. 22.2.

In Fig. 22.2, the simulation system was run for batch sizes ranging from 1 to 10. Several additional runs were done to determine total distance travelled by laborers, and the possible impact on the model when an additional de-bur machine and milling machine were added. One of the most distinguishing features of QUEST is the ability to calculate distances travelled in production dynamic scheduling. To make use of this useful feature, it was decided to change the arrangement of the plant. After checking trails, it was found that the new layout, if implemented, can save about 15.73 % of total distance travelled in production dynamic scheduling. Based on this simulation system, production scheduling time can be clearly decreased, and benefit can be evidently improved by means of QUEST.

Fig. 22.2 The simulation system of particle swarm improved algorithm based on multi-agent by QUEST



22.6 Conclusion

A fitness function of particle swarm algorithm and operation strategy of shop scheduling agent have been constructed by means of particle swarm algorithm and multi-agent cooperation characteristic. Moreover, an improved algorithm based on particle swarm algorithm has been established and an optimal shop scheduling procedure by particle swarm improved algorithm based on multi-agent in this paper. Finally, the simulation system of production dynamic scheduling by particle swarm improved algorithm based on multi-agent has been demonstrated and validated by QUEST software. It has shown the production scheduling calculation time in proposed method can be improved and provides a support for adapting to solve the dynamic and complex calculation problems in production scheduling procedure.

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Chapter 23

Study of Augmented Reality Registered Technology Based on Particle Swarm Algorithm

Jun Dai and Li-fen Zhang

Abstract Augmented reality (AR) is a hot field now emerging, which has the characteristics of virtual–real fusion display. It is often used in the control field, the main technical difficulties of which are the low precision of outdoor tracking registration and the low real-time quality. So, this paper presents a target tracking method, which combines the particle swarm algorithm and the Kalman filter. The method uses Kalman filter to forecast the position where the center of a target locates in the image, thus greatly reduced the search scope, and the position is used to set target search area as the center. And then, matching target templates and candidate area with the characteristics of target ensures the instantaneity and accuracy of registration and tracking.

Keywords Augmented reality · Control field · Particle swarm algorithm · Kalman filter

23.1 Summaries

Augmented reality (AR) is a new research field developed on the basis of the virtual reality technology. In recent years, the AR technology has been widely used in military, medical, educational, and other fields. 3D registration is the key technology to achieve the integration of virtual information and real world and also an important standard to measure the performance of the AR system. But, there are many interfering factors in the realistic environment, such as changes of

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light intensity and feature points are obscured or out of the vision in short time, which will impact on the accuracy and stability of tracking registration in varying degrees, so most of the AR system are design and developed for indoor environment [1]. To achieve the AR system freely running in any environment, anywhere, outdoor AR system becomes an important subject at the forefront of the field undoubtedly. At present, the most important technical difficulty obstructing the outdoor AR system from being widely applied is the outdoor tracking registration technique. Because the outdoor AR system has a higher demand on the speed, stability and robustness of tracking registration algorithm, considering the positioning stability of the Kalman filter and the efficient advantage of the particle swarm optimization (PSO) algorithm [2], the combination of both is applied to improve the tracking registration algorithm in AR which improves the speed and stability of the registration algorithm.

23.2 Kalman Filter and Optimization Algorithm of the Particle Swarm

23.2.1 Kalman Filtering

Kalman filter theory is a modern filtering theory put forward by Kalman (R. E. Kalman) in 1960, which is described by a series of recurrence formulas. Kalman filter introduced the thought of state space in modern control theory to the optimal filtering theory. Besides, it described system dynamic models with state equations and system observation models with observation equations. What is more, it can handle the time-varying system, the non-stationary signal and the multi-dimensional signal. The signal model is composed of state equations and observed equations, which are discrete [3]. Kalman filtering is a recursive process, which is continuously anticipated and revised. Due to we do not need to store a large number of observation data when solving, and when getting new observation data, we can get new parameter filter value at any time, which facilitates real-time processing observation results, so Kalman filter is applied in dynamic positioning data processing more and more, especially in GPS dynamic data processing, inertial navigation, etc. [4].

Kalman filtering model of GPS carrier phase dynamic positioning.

The state vector: $XK = [xk, yk, zk, \dot{x}k, \dot{y}k, \dot{z}k]^T$

xk, yk, zk are the 3D position of dynamic receiving antenna in the WGS geocentric coordinate system, respectively. $\dot{x}k, \dot{y}k, \dot{z}k$ are the 3D speed of dynamic receiving antenna, respectively. A filter model using Kalman filtering to process GPS dynamic positioning data with high precision can be summarized as follows:

$$XK = \Phi K, \quad K - 1XK - 1 + \Gamma K - 1WK - 1 \quad (1) \text{ state equation}$$

$$YK = B (XK) + \Delta \nabla NK + VK \quad (2) \text{ observation equation}$$

Thereinto, state-transition matrix $\Phi_{K, K-1}$, $K - 1$ and interference matrix, Γ_{K-1} are defined as follows:

$$\Phi_{K, K-1} = \begin{bmatrix} I_3 & T \cdot I_3 \\ 0 & I_3 \end{bmatrix} \quad (23.1)$$

$$\Gamma_{K-1} = \begin{bmatrix} T^2 \cdot I_3 \\ 2T \cdot I_3 \end{bmatrix} \quad (23.2)$$

I_3 is the three-order unit matrix, and ΔT is time-sampling interval.

23.2.2 PSO Algorithm

Particle swarm algorithm, also called PSO, is a new evolutionary algorithm based on imitating feeding habits of birds and is put forward by American electronic engineer Eberhart and social psychologist Kennedy. PSO has attracted the attention of academic circles for its easy realization, high precision, and rapid convergence, etc. [5] and has showed its superiority in dealing with real problems. But, using PSO alone is easy to make local optimization become invalid, so PSO is always used to solve practical problems with other algorithms.

In a PSO system, there is a certain amount of particles moving in a search space, each of which represents a potential solution which corresponds to a certain optimization problem. Each particle's position is affected by its optimal position during the movements and by the position of the optimal particle from its neighbor. When a particle's neighborhood is the whole particle swarm, the optimal position of the neighborhood corresponds with the global optimal particle, and it is called global PSO. What is more, if the smaller neighborhood is used in the algorithm, it is called local PSO customarily. Global PSO converges fast, but is easy to trap in local minimum value. However, local PSO can usually be used to search for better solutions but with lower speed. Besides, in different optimization problems, we need a fitness function relevant to the problems to evaluate capability of each particle [6].

The state of each particle i in the swarm can be described by the following characteristics:

- X_i the current position of particle i ;
- V_i the current velocity of particle i ;
- y_i the individual optimal position of particle i ;
- \hat{y}_i the optimal position of particle i in the field.

The fitness function is indicated by f , and the individual optimal position y_i of particle i can be adjusted according to the following equation:

$$y_i(t+1) = \begin{cases} y_i(t), & \text{if } f(x_i(t+1)) \geq f(y_i(t)) \\ x_i(t+1), & \text{if } f(x_i(t+1)) < f(y_i(t)) \end{cases} \quad (23.3)$$

The size of the particle field is 1, and the size of the particle swarm is s . When $l < s$, the PSO algorithm is local PSO algorithm. When $l = s$, namely the particle field is the whole swarm, the PSO algorithm is global PSO algorithm, and the optimal position \hat{y} of the swarm can be get by the following equation:

$$\hat{y}(t) \in \{y_0, \dots, y_s\} = \min\{f(y_0), \dots, f(y_s)\} \quad (23.4)$$

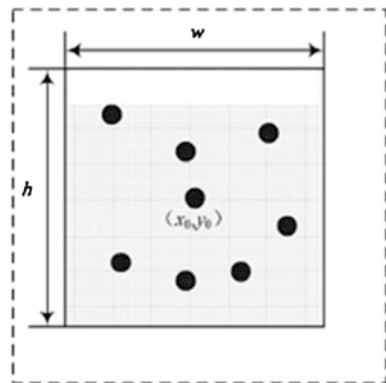
The position of the particle i in N-dimensional space is indicated by $X_i = (x_1, \dots, x_N)$, and the speed is indicated by $V_i = (v_1, \dots, v_N)$. At the same time, the fitness function decides the fitness value of each particle and the individual optimal position. XpBest found so far, the current position X_i and the swarm optimal position XgBest can be get. Each particle constantly adjusts its speed and position by tracking two extreme values.

In local PSO, each particle no longer tracks the extreme value of the swarm in addition to follow its own individual extreme value, but follows the local extreme value of neighborhood to adjust its speed and position. Iteration formulas of particle velocity and location in local PSO are the same as in global PSO formally.

23.3 Combination of Kalman Filtering and Particle Swarm Algorithm

Kalman filtering can be used to forecast and track objects' positions in next frame. Assume a object's coordinate of its central point is (x_0, y_0) and define a search area whose center is located at that point. The width is w , and the height is h (as shown in Fig. 23.1). The purpose is to find the central point of the candidate area, which is extremely similar to the target template. In order to combine particle swarm algorithm with Kalman filtering, scatter some particles are around central point (x_0, y_0) ,

Fig. 23.1 Candidate target central search area



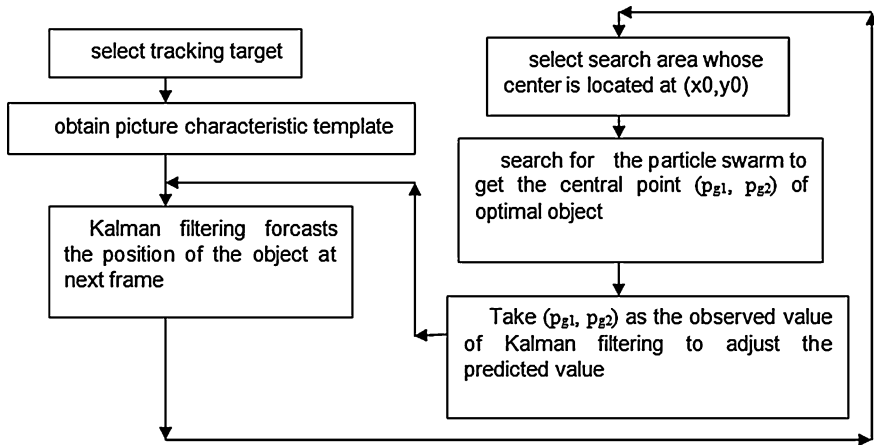


Fig. 23.2 Process flow diagram

y_0), as shown in Fig. 23.1, and build search areas whose width is w , and height is h . And, the center is located at each particle, thus having m candidate areas. It is known that the fitness function of the particle swarm is the grayscale characteristic similar between the target template and the candidate area, so we can use the particle swarm algorithm to find a optimal solution [7]. It is a target central point (Pg_1, Pg_2) which is most similar to the target template. Assign this optimal solution to Z_k in formula 23.4 and get the predicted value in next step. See PFD in Fig. 23.2.

23.4 The Application Particle Swarm Algorithm Works in AR

First, the PSO population size is set to 8. Select one point as the central point of the target zone of Kalman forecast and the other 7 will be selected around that point randomly. Then, when the iteration reaches its extremity, if all fitness function values are small, we can conclude that the target is partly occluded. If the optimal fitness function values are less than 0.65, we can conclude that the target is occluded seriously. In both cases, we can regard the Kalman filter prediction result as the optimal value to deal with. So, through the above method, the moving characteristic object can be identified.

As we all know, the White Deer Grotto Academy one of the Four Great Academies of China. It has a long cultural history, and many famous historical figures, like the philosopher, Zhuxi, gave lectures here. So, we think that we should do more to pass on its culture. We apply AR to protect the White Deer Grotto Academy’s cultural heritage and blend the virtual object into the real environment, so that tourists may easily understand the history and feel the past. Besides, with the Kalman filter combined with the PSO, in the AR of the White



Fig. 23.3 The enhanced effect comparison using PSO in the White Deer Grotto Academy scene

Deer Grotto Academy scene, we achieved the orientation of registration technology and the recognition of target. The result is shown in Fig. 23.3.

23.5 Conclusion

The AR is a new field of research in computer vision, which has a very big development and application space. The paper uses the Kalman filter combined with the PSO to introduce the registration technology research and development, which is the most important part in AR, which can greatly improve the efficiency and reduce the difficulty in the development process. All in all, it lays a good foundation to the application of AR.

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Chapter 24

Study of Protocol in Automated Negotiation

Kexing Liu

Abstract Automated negotiation based on agents can maximize the payoffs of the whole system and include every agent in the negotiation. When agents negotiate automatically with one another, they must share a formal protocol, specifying what possible actions. But the key issue is lack of formal protocol in automated negotiation. After a survey of multi-agents and some automated negotiation protocols, we represent a formal protocol model for Automated Negotiation based on FIPA Specification. This protocol, with formal and intuitive semantics, can be used in automated negotiation system where agents come from different organizations can interact with each others if they follow the same protocol.

Keywords Protocol · Agent · Automated negotiation

24.1 Introduction

Multi-agent technology facilitates negotiation at the operative decision-making level. This automation can save labor time of human negotiators, but in addition, other savings are possible because computational agents can be more effective at finding beneficial short-term contracts than humans are in combinatorially and strategically complex settings. This is because computational agents can find, enumerate, and evaluate potential deals faster than humans, and because computational agents can be designed to act optimally on the users behalf based on game theoretic prescriptions that are often not easily comprehended by humans [1].

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However, successful industrial deployment of multi-agent-based automated negotiation requires techniques that reduce the risk inherent in any new technology. It is important to provide explicit engineering tools that support industry-accepted methods of technology deployment [2].

In this paper, we focus on agent interaction protocols in Automated Negotiation based on FIPA Specification and AUML. We give an overview of agent-based automated negotiation and the importance of protocol, briefly describe FIPA Interaction Protocol Specification and the AUML—a set of MUL idioms and extensions—and then represent a protocol that can be seen as an extension of FIPA Interaction Specifications. Finally, a discussion and conclusion are given.

24.2 Background

There is little agreement on the definition of the terms ‘agent’ and ‘intelligent agent.’ They should be clearly more than just a program but where the boundaries lie is not at all clear. This is the manifestation of a general problem in AI of defining ‘intelligence’ that has led to much discussion.

The result is that there are as many agent definitions as there are researchers such as Brustoloni [3], KidSim [4], Maes [5], and Russell and Norvig [6] and leading to the term being substantially overused. Given this spread of definitions, it would seem a lost cause to precisely define what an intelligent agent is. However, there are several broad qualities that have some measures of general agreement. Wooldridge and Jennings [7] list the following qualities, not all of which need to be present:

Autonomy Agents should operate without the direct intervention of humans or others and have some kind of control over their actions and internal state.

Social ability Agents need to be able to interact with other agents (and possibly humans) via some kind of agent communication language.

Reactivity Agents should be able to perceive their environment and respond in a timely fashion to changes that occur in it. This environment may be the physical world, a user via a graphical user interface, a collection of other agents, the Internet, or perhaps all of these combined.

Pro-activeness Agents should not simply act in response to their environment; they should be able to exhibit goal-directed behavior by taking the initiative.

Compared to the objects, agents are autonomous and interactive. Based on internal states, their activities include goals and conditions that guide the execution of defined tasks. While objects need outside control to execute their methods, agents know the conditions and intended effects of their actions and hence take responsibility for their needs. Furthermore, agents act with each other [2].

However, the study of agent-based automated negotiation is in the stage of beginning now. COSIM [8] for multi-objective bargaining with human customers can be considered as an intelligent artificial saleswoman. And also MIT, HP, IBM have present some relative model prototypes. There are lots of problems have to be faced the reason, briefly, is that negotiation is difficult, and automated negotiation

is even more so. Beam [9] argued that it is impossible to realize automated negotiation completely by current technologies and theories of human. More and more researchers are working hard in negotiation protocols and strategies from different points of view.

24.2.1 The Issue of Protocol in Automated Negotiation

There are two key points in the field of multi-agent-based automated negotiation. The protocol determines the flow of messages between the negotiating agents; it is necessarily public and open. The strategy, on the other hand, is the way in which an agent acts within the protocol in an effort to get the best outcome of the negotiation; it is therefore necessarily private. In this paper, we concentrate on the protocol only.

Negotiation protocols defined as the set of rules which govern the interaction. Indeed, any negotiation is guided by a protocol, which describes the rules of the dispute, that is, how the parties exchange their offers, and how and when the negotiation can go on or terminate (by contrast with protocol, a strategy is a directive for deciding between different actions at a certain stage).

In the agent-based negotiation, the protocol is a formal model, often represented by a set of rules that governs software processing and communication tasks, and imposes restrictions on activities through the specification of permissible inputs.

There are some methodologies for protocol design.

The contract net protocol (CNP) [10] described by Smith in 1980 is famous. At first, it is deal with the tasks allocation problems between agents through communication and negotiation. Then there are some extended CNP, that is, TRAC-ONET, it provided a formal model for bounded rational (BR) self-interested agents to make announcing, bidding, and awarding decisions [10]. However, CNP needs a formal formatted contract describe, and it is fitness for the tasks allocation negotiation, not suitable for the automated negotiation in business.

Jennings et al. presented the argumentation-based negotiation. In their model, agents generate and exchange arguments to back up or justify their negotiation stance. The nature and types of the arguments can vary enormously; however, common categories include threats, rewards, and appeals. Arguments have the potential to increase the likelihood and/or the speed of agreements being reached. Carles et al. described a framework for argumentation-based automated negotiation for British Telecom [11]. But, to design and build an agent capable of effective argumentation-based negotiation, there are some key factors should be solved: (1) mechanisms for passing proposals and their supporting arguments in a way that other agents understand; (2) techniques for generating proposals and for providing the supporting arguments; (3) techniques for assessing proposals and their associated supporting arguments; (4) techniques for responding to proposals and their associated supporting arguments.

Pu Huang et al. presented a formal model for automated negotiation on the Internet. In the model, the negotiation process is driven by internal beliefs or

participating agents [12]. Agents ‘look’ each other’s actives and interpret these actives base on themselves’ beliefs, and then justify their beliefs and decide what to do next, where the beliefs are private information.

All the protocols and models mentioned above are presented by the way of themselves—a jungle of modeling approaches about the protocol. It is necessary to adopt a formal and easily implemented technology to develop E-commerce Oriented Automated Negotiation Protocols.

24.2.2 A Protocol for Automated Negotiation Based on FIPA Interaction Protocol Specification

The foundation for intelligent physical agents (FIPA) is an international organization that is dedicated to promoting the industry of intelligent agents by openly developing specifications supporting interoperability among agents and agent-based applications [13]. FIPA specification includes five parts: Abstract Architecture, Agent Message Transport, Agent Management, Agent Communication, and Agent Applications. Each FIPA specification is in a life cycle, and it will finally reach the standard state or obsolete state. There are 22 Acts defined in FIPA Communicative Act Library Specification, for example, call for proposal (CFP), propose, accept proposal, inform, confirm, request, agree, refuse, cancel, not understood. An interaction protocol describes a communication pattern as an allowed sequence of messages between agents and the constraints on the content of those messages [2]. The FIPA specifications are presented by unified modeling language (UML), which is gaining wide acceptance for the representation of engineering artifacts in object-oriented software. Odell et al. [2] suggested a specification technique for agent interaction protocols using AUML. The agent UML (AUML) is a set of UML idioms and extensions; and it synthesizes a growing concern for agent-based software methodologies with the increasing acceptance of UML for object-oriented software development.

However, FIPA’s protocols are concerning in physical interactions of intelligent agents rather than concerning in the environments or mechanisms.

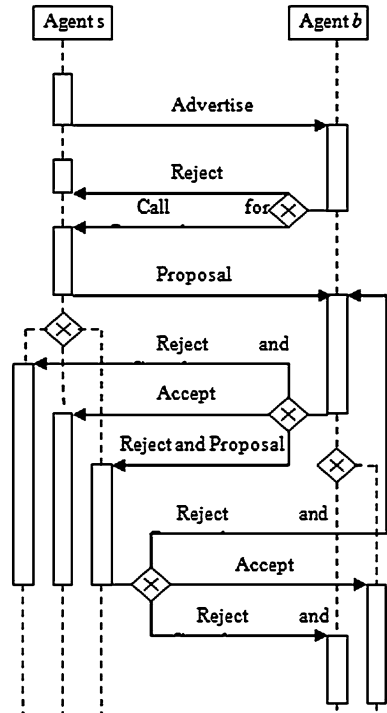
We have presented an automated negotiation model [14], in which the intelligent agents, with their private information set, generate proposals by the strategies of themselves and act under the control of negotiation. Now, we give an extension of our previous work.

The protocol described as in Fig. 24.1 is based on FIPA Propose Interaction Protocol Specification (SC00036) and English Auction Interaction Protocol Specification (XC00031) in AUML.

When agent i , ($i \in (s, b)$), receives a CFP from another agent, he makes an initial proposal by his proposal-making function: $P_i(t) = f(T_i, S_i, N_i)$.

Three factors in this function are time deadline, stocks and the number of thread he bargaining with others currently.

Fig. 24.1 A protocol for automated negotiation



When an agent receives a proposal, he/she should evaluate the proposal by his utility function, which is determined by reserve price of agent i and the proposal received: $U_i(t) = f(P_i, P)$. And then agent i can take one of the actions:

- A Accept—An agreement was reached;
- B Reject and cancel—the negotiation is failed;
- C Reject and send a proposal—the agent generates a new proposal with his strategy; the bargain will continue: $S_i(t) = f(P_i(0), P_i, T_i, \varphi_i)$, φ_i is recession index, which determine a strong or weak tact agent i employment.

Here, since we are discussing protocols only, all the details of these functions and negotiation strategies in this model are to be present in our another paper.

This protocol can be easily implemented by Java or C#.

24.3 Conclusions and Discussion

Protocols are basis of automated negotiation. Girivendhen given criteria for evaluating of negotiation protocols in a multi-agent system: Distributed, Instantaneously, Efficiency, Simplicity and Symmetric. As a part of our project [14], this paper focuses on the protocol only. We extend FIPA specification with AURL to

describe a bargain process which is a key point in the whole negotiation protocol. With this bargain protocol, it is easy to develop a system by JAVA or C#. So, the automated negotiation can carry out in an open system between agents come from different organizations if they follow the specification. There are several works should be deal with in future; for example, in addition to negotiation protocol, the agent negotiation strategy and learning mechanism are important too. And they will be integrated into the protocol dynamically.

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Chapter 25

Tread Patterns Noise-Reduction Based on Self-Adaptive Fuzzy Genetic Algorithm

Xiaohui Li and Huiyu Yang

Abstract In order to optimize the structure parameters of tread pattern and improve the efficiency of noise-reduction, self-adaptive fuzzy genetic noise-reduction algorithm (SFGNRA) has been proposed, which is also based on the prior fuzzy genetic algorithm (FGA). In the improved algorithm, the relationship between crossover probability and mutation probability and individual's fitness is adopted, operators of simple genetic algorithms (SGAs) are improved, and simulated annealing methods are introduced after crossover to improve enhance the local search ability of genetic algorithm. Some experiments have been done by means of the software of TNT and ODS simulation, and the results show that the tread patterns noise should be reduced, and the merit project of structure parameters may be found. The research was successfully applied to the design of way for the low-noise tread patterns.

Keywords Tread patterns noise · Fuzzy genetic arithmetic · Self-adaptive · Optimization

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25.1 Introduction

After decades of researches, it has been concluded that the tire patterns noise is mainly composed of three major noises [1, 2]. They are the following: the noise as tread blocks beat ground, which is associated with the area of tread blocks rather than the shape; tread groove pumping and ejecting noise that is associated with the width, length and direction of grooves rather than depth; combined noise intensity is highly correlated to the parameters and arrangement of tread on account of the enhancement and counteraction of sound wave as a result of wave interference. The three principals are theoretical basis of tire tread noise-reduction [3, 4]. For acquisition of rational structure parameters of tread patterns, we proposed self-adaptive fuzzy genetic noise-reduction algorithm (SFGNRA), where self-adoptive characteristic was introduced, as an improvement on fuzzy genetic noise-reduction algorithm.

25.2 Self-Adaptive Fuzzy Genetic Noise-Reduction Algorithm

25.2.1 *Idea of Algorithm*

Prematurity and low rate of convergence are two difficult problems with simple genetic algorithm (SGA), and since SGA is weak in local search capability, requirement for high precision is hard to be satisfied [5, 6]. Therefore, we proposed SFGNRA for the purpose of improving local search capability and rate of convergence, meanwhile, avoiding prematurity. We introduced the correlation of crossover probability and mutation probability, making individuals of low fitness, higher crossover probability and mutation probability; meanwhile, individuals of high fitness had low crossover probability and mutation probability. As a result, the self-adaptive genetic algorithm was implemented. For improvement of local search capability, we adopted simulated annealing after crossover operation. In addition, a new mutation operation was used in which two offspring were produced every mutation. Then, the probability of inferior offspring was introduced to partly avoid local extreme values.

25.2.2 *Description of Algorithm*

The flow of advanced algorithm is illustrated in Fig. 25.1, and specific description of the algorithm is shown as follows.

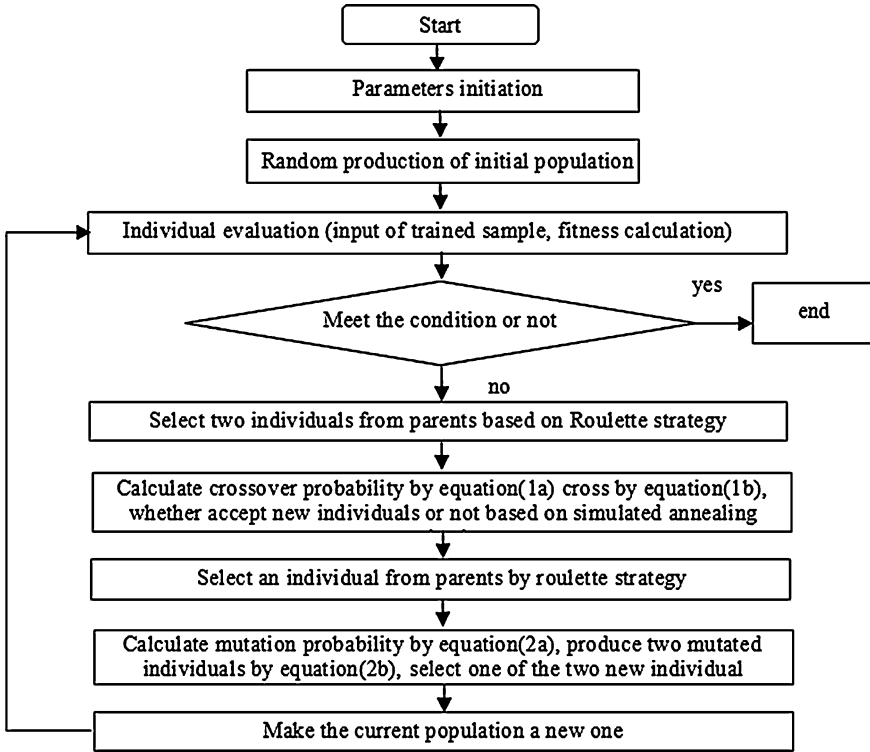


Fig. 25.1 Flow of SFGNRA

25.2.3 Crossover Operator

We selected two parents X_1 and X_2 from the population using selection operators. Crossover probability P_c was determined according to the fitness of parents. Selection of P_c is critical for genetic algorithm behavior and performance and has direct influence on convergence. As P_c increases, the production rate of new individual increases. Nevertheless, the probability of breakage of genetic model increases if P_c is oversized. P_c is calculated by the following equations:

$$P_c = P_{c1} - \frac{P_{c2}(f' - f_{avg})}{f_{max} - f_{avg}} \tag{25.1}$$

where $f' \geq f_{avg}$, $P_c = P_{c1}$, $f' < f_{avg}$. Where f_{max} denotes the maximum fitness of the population; f_{avg} denotes the average fitness of each population; f' is the bigger fitness of X_1 and X_2 ; $P_{c1} = 0.9$, $P_{c2} = 0.3$, and the value of parameters could be modified in actual experiments. The two parents X_1 and X_2 produced two offspring Y_1 and Y_2 by

$$\begin{aligned} Y_1 &= X_1 + k(X_2 - X_1) \\ Y_2 &= X_2 + k(X_1 - X_2) \end{aligned} \quad (25.2)$$

where k is ratio parameter, which is randomly selected within homogeneous distribution $[0,1]$. Variable value of each offspring was calculated by Eq. (25.2), and a new k is selected for each variable [7]. The specific idea is described as follows:

If $f(X_1) > f(Y_1)$, then Y_1 substitutes X_1 in current generation; otherwise $\beta \in [0,1]$ is randomly generated, $\Delta = f(Y_1) - f(X_1)$, $p_{\text{rob}} = \min(1, e - \Delta/T)$; Temperature $T = T_0(0.99g - 1)$, where g is genetic algebra. The initial temperature $T_0 = -d/\log p_r$, where d is the maximum fitness of the initial population and $p_r = 0.01$ which could be modified in actual experiment. If $p_{\text{rob}} > \beta$, then Y_1 substitutes X_1 in current generation. X_2 and Y_2 were processed in the same manner. The local search capabilities of the algorithm could be improved by the introduction of simulated annealing.

25.2.4 Mutation Operator

Mutation probability P_m as the key point for the performance of genetic algorithm was determined by the fitness of parents [8, 9]. P_m is calculated by the following equations: where $f \geq f_{\text{avg}}$, $P_m = P_{m1} - \frac{P_{m2}(f - f_{\text{avg}})}{f_{\text{max}} - f_{\text{avg}}}$, where $f < f_{\text{avg}}$ $P_m = P_{m1}$, where f_{max} denotes the maximum fitness of the population; f_{avg} denotes the average fitness of each population; f is the fitness of individuals to mutate; $P_{m1} = 0.1$, $P_{m2} = 0.099$, which could be modified in actual experiments.

The selected individual X mutated as following, set $X = [x_1, x_2, \dots, x_N]$, $x_i \in [-b, b]$, $i = 1, 2, \dots, N$.

$$Y_j = [x_1, x_2, \dots, x_N] + [b_1\Delta x_1, b_2\Delta x_2, \dots, b_N\Delta x_N] \quad (25.3)$$

$x_i + \Delta x_i = x_i \pm (b \mp x_i)(1.0 - f)^v$, $i = 1, 2, \dots, N$. Where $j = 1, 2$, and b_i is 0 or 1, $v = 2$. The first offspring was produced under the condition that a certain b_i was 1, and the rest are 0; the second offspring was produced under the condition that some b_i were 1, and the rest were 0 (b_i were probably all 1). For a random decimal $\alpha \in [0,1]$, if $\alpha < \lambda$, $\lambda \in [0,1]$ is a predesigned decimal, then the individual of minimum fitness f_{min} in parental generation was replaced by the individual of higher fitness; if $\alpha \geq \lambda$ and $f(Y_1) > f_{\text{min}}$, then the individual of minimum fitness f_{min} in parental generation was replaced by Y_1 . The second offspring was operated in the same manner. Λ was set as the receipt probability of inferior offspring to avoid local extreme value and improve the variety of population, thus to ward off prematurity, ensuring global optimization.

25.2.5 Termination Condition of Algorithm

Algorithm is terminated if one of the following two conditions is met:

- When the fitness of optimum individuals in a certain generation is equal to or bigger than predesigned value;
- Iterati006Fn times are run out.

25.3 Comparative Analysis of Optimization Case

The tire tread pitch ratio was optimized by FGNRA and SFGNRA (parameters were set as Table 25.1 shows). The two methods were comparatively analyzed.

Figure 25.2a and b shows the noise simulation curve of optimized tire tread scheme using FGNRA and SFGNRA, respectively. Curve 1 is curve M , and curve 2 is noise simulation curve of optimized scheme.

Table 25.1 Parameters setting of SFGNRA

Advanced GA crossover probability p_{c1}	0.8
Advanced GA crossover probability p_{c2}	0.3
Advanced GA mutation probability p_{m1}	0.1
Advanced GA mutation probability p_{m2}	0.09
Global optimization factor λ	0.1
SGA crossover	0.9
SGA mutation	0.01

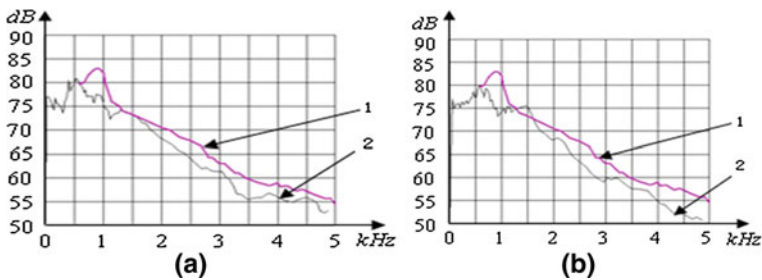


Fig. 25.2 Noise simulation curve of optimized tire tread pattern. **a** FGNRA optimized simulation curve. **b** SFGNRA optimized simulation curve

25.4 Conclusion

It is effective and feasible to use SFGNRA for tire tread pattern optimization. It has such advantages as low cost, short-term development period, great worth of popularization, remarkable noise-reduction performance, reliability and engineering utility.

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Chapter 26

Design of Campus Micro-Cloud Service System

Guanzhao Wu, Hejiang Pan, Peile Zhang, Junfei Zhuo and Min Yao

Abstract Campus micro-cloud service system, an innovative application which is combined with mobile Internet and cloud computing, is a convenient tool within the campus for home-school communication between teachers and parents. The system is based on the extension and upgrade of the application of the original School Card or home-school system which is mainly relying on the interaction between the mobile operator's text messages and computer platform. In this paper, the system requirement analysis is introduced firstly, then the system topology design is described, and finally the system logical design is given.

Keywords Micro-information · Cloud computing · Cloud services

26.1 Introduction

With the rapid development and wide spread of the campus information technology, the informative communication between teachers, students and parents becomes more diversified and shorter, and this is the origin of "campus information debris." For instance, fragmentary information produces from the Internet

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or mobile Internet without rules of interaction between PC and mobile phones and other mobile terminal. This information has now become the mainstream of campus information technology and information management object. At the moment, many school information constructions are disorganized and difficult to manage as well as higher input costs produce less output. How to effectively and generally manage the vast amount of information has become a key issue at this stage of sustainable development of campus information, and also, it is the core issue of campus information technology to better serve school teaching and management. Micro-information system, based on the cloud service model, can provide a highly reliable, high versatility, easily expandable, low-cost information communication service, which is progressively accepted by the majority of teachers and students and parents. The cloud service is a one kind of business model and a new concept which is based on the extensive concept of cloud computing [1]. It allows calculations on a large number of distributed computers, rather than the local computer or remote server. According to the specific needs of the cloud system, users only need to purchase the service or application directly, while they need not to consider the specific equipment and other factors, that is, computing tasks will soon be distributed in a large number of the resource pools which are constituted by computers and various application systems will obtain computing power, storage space and a variety of software services [2] as required. This type of service mobilizes the various resources for customer, which will be the mainstream of the future as well as the mainstream of the campus information system.

Micro-information is the chaotic piece of information that produces in people's daily life and work, especially the brief information appears during communication. Such as SMS, micro-letter, micro-blog and instant messaging information. It supports text, pictures, voice and video, but their commonality is short content and simple meaning, which is mainly used for real-time exchange of communication.

Based on the above considerations, the influence [3] cloud computing has on school teaching and learning in recent years and the next few years and its prediction are combined. Firstly, this thesis researches and explores the emerging technology of cloud computing and cloud services, then makes the upgrade of the School Card in the company where I work as the pilot project application, designs and implements micro-information system which is based on cloud services so that school teachers, students and parents can only access to system services while without need not to care about the specific hardware devices and system maintenance management.

26.2 System Requirements Analysis

The constant in-depth school information construction, micro-information exchange system has been widely used on campus, and the school has higher requirements on the features or services provided by existing micro-information system, which altogether makes the origin of the cloud service system of campus

micro-information. At present stage, “Home–School system” or “School Card” which is widely used in schools is a typical case of micro-information system. In many schools, teachers and parents are increasingly dependent on the micro-information system in the teaching activities of the exchange of information.

Firstly, with the campus micro-information data growing increasingly, the type of data tend to be diversified, including pictures, text, voice and video. If this non-structured data organization is to take the traditional single-node storage, database methods, its performance would be inefficient for the following three reasons: firstly, system reliability is low and it is vulnerable to hardware or software errors which cause data not available or even lost; secondly, high concurrent performance of the system will lead to bottlenecks, during peak periods, and they may even make the whole system to crash; thirdly, large-capacity storage devices are expensive, especially business solutions. So, faced with rapidly growing data resources and a growing number of users, we urgently need a fast and reliable system to support micro-information access and delivery services. To be scalable, highly performable, easily manageable, highly available and highly reliable goals, our system needs to meet the following points: (a) The system can handle huge amounts of data. Under the condition of limited storage capacity of an ordinary PC or a single-server case, the system can rely on to increase the storage devices to easily expand storage capacity while ensuring reliable data resources and the stability of the system. (b) No need to require expensive commercial investment, through a common server (or even PC) system cluster, which makes it highly reliable and available. This requires that we consider a data backup mechanism as well as how to effectively use existing equipment resources. (c) Teachers and parents may access to system lopsidedly, and users have hot tendency in the choice of resources, which makes us to consider how to ensure load balancing of data and system. (d) To ensure ease of use and manageability. In other words, the system administrator can easily add and delete nodes without needing professional help, and work such as expansion becomes easy; meanwhile, it does not make the system stop or crash. (e) Systems should minimize the consumption of resources, including energy consumption and bandwidth.

Secondly, with the extension of the application, most campus micro-information is based on the mobile operator’s SMS channel, using ordinary SMS send and receive mode to establish the short message communication. Such communication channels can carry a lot of limitations on amount of information and information content, and this is far from being able to meet the increasingly high demand for modern campus in the degree of information technology. Campus micro-information system based on the cloud expands well in the field of micro-information applications, such as in the original form of words; on the basis of expansion, you can use the pictures, audio and video to communicate. On the basis of a single mode of information exchange, steering embedded in various campus applications, such as information flow in the OA office systems like tips and audits. In the history of information storage and statistics to provide long-term effective service, that is, provide the campus micro-information storage with the cloud storage

service. In addition to the above aspects, the system provides the interface for easy expansion in case system service that requires expanding in the future.

Third, campus micro-information at this stage is mainly based on B/S structure of the Internet model, which mostly combines both the Web display and mobile phone text messages modes. And now is the era of mobile intelligent Internet, smart phones, tablet PCs and other terminals with Internet capabilities are becoming increasingly popular, especially the heavy use of micro-information on these mobile intelligent terminals, therefore, Campus micro-information is also imminent in the mobile terminal application requirements. Thus, the system will also support a variety of intelligent terminals with Internet capabilities, including the traditional Web, text messaging and Android/the iOS mobile intelligent terminal.

Finally, as more and more schools are using the micro-information systems, system construction and maintenance inputs also have more complex requirements, such as the original schools with better economic base can put some infrastructure to maintain the operation of the system, but many schools are unable to take into account the information construction of this piece of content, including financial funding reasons and other reasons of technical expertise. In short, the schools themselves are not likely to maintain the information systems, and this will cause unnecessary trouble to the schools. This is not in compliance with the new pursuit of green, low-carbon education which is also the urgent needs of schools and education departments of the traditional model of information systems to improve the current implementation.

26.3 System Topology Design

The overall design of the system should follow two basic principles: firstly, users just concern for their own needs without the development costs and infrastructure investment. Secondly, supporting a variety of Internet devices to access the system analysis of system requirements, we design the overall system network architecture as shown in Fig. 26.1. As shown in the figure, a variety of clients such as computers, laptops, handheld computers, smart phones are connected via the Internet or mobile Internet connection to cloud micro-information system. The user access to cloud micro-information system, connected to the system Web server or App application services, optical switches (FC Switch) connected to data service equipment needs to go through rigorous testing of the firewall (Firewall), in order to reduce a variety of attacks and viruses' intrusion.

From the Fig. 26.1 the system architecture design, school access and user access can be unlimited expansion, and response to the increase in maintenance costs brought about by the market expansion is very limited, and can even be said to be zero increase. To schools, schools do not care about specific infrastructure investment but also do not care about system maintenance and even they do not care about the basic maintenance of the data, and it can be referred to the unified maintenance of cloud customer service. Schools need only according to their

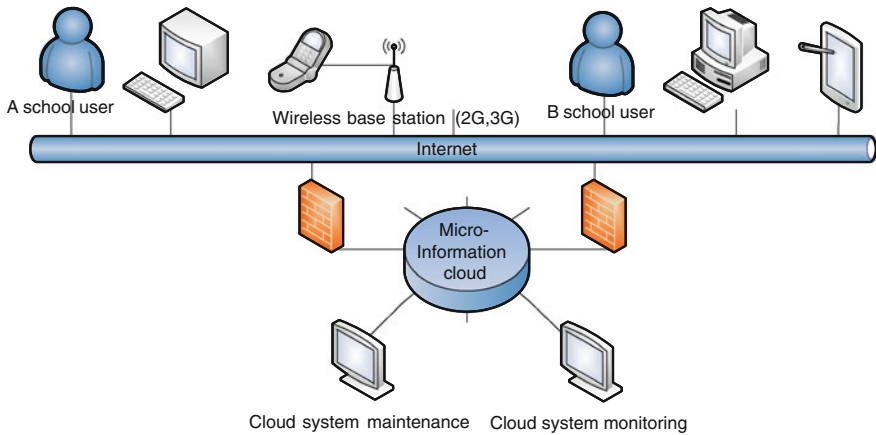


Fig. 26.1 Micro-information cloud service system network topology

actual situation of the application services they need, you can find the appropriate application program from the clouds, if the demand is rather special, the cloud is not yet provide the appropriate service application, commissioned the development according to the actual situation in the clouds.

The stable operation of the system cannot be separated from the long-term equipment monitoring and management, and ongoing data maintenance, especially the basic data (such as personnel information, department information) to maintain survival. Equipment monitoring and maintenance of cloud-based micro-information service system is centralized and unified, and the system also provides remote data maintenance and application of remote assistance service, which not only can greatly save the cost overhead due to market expansion, but also makes it more convenient for school to use the system and extend the applications.

For effectively deploy cloud system infrastructure, virtualization technology has played a key role. Virtualization technology enables the isolation of upper layer of software applications and the underlying hardware, which includes the splitting model that divides single resource into multiple virtual resources and aggregation model that integrates multiple resources into a virtual resource, in order to achieve part or completely machine simulation of time sharing. Virtual technology has potential applications in many important areas, such as service integration, security, computing multiple operating systems run in parallel, the kernel debugging and development, system migration. There are already many systems that use virtual technology to fully tap the rich resources of modern machines [4]. Virtualization technology based on the object can be divided into the storage virtualization, computing virtualization and network virtualization; computing virtualization is divided into system-level virtualization, application-level virtualization and desktop virtualization. The virtualization technology is the key technology to achieve cloud computing [5]. Virtualization technology can improve the utilization of server resources, but also provide technical support for flexible

and easily expandable cloud computing platform application. This system uses virtualization technology on the deployment of server distribution and cluster. This can not only reduce cost, but also ensures running as fast and efficient as the originally built in the campus internal system, and will not affect users using the system when a large number of school data are summarized.

26.4 System Logic Structure Design

Above these considerations and system goals, the service architecture of our system is composed of client, view layer, business logic layer, data access proxy, data access layer.

The client can support a variety of Internet terminal equipment, including desktop computers, laptops, handheld computers, smart phones. There are two main access routes: one is based on client user application, which is integrating or installing the client to the user equipment, and generally uses more mobile intelligent terminal; another way to access is through a Web browser, which is generally accessed using the desktop and notebook.

View layer is mainly responsible for the user experience on a variety of clients, which involves the UI to show mod, and possible options include Web, Winform, WPF and Windows Phone/Android/iPhone terminal services. The service-side data access interface for application uses Web service mode of interaction. Web service is based entirely on the SOAP message mechanisms (standard XML/HTTP data format); it is independent of the operating system and the standard of software vendors and is used to create interoperable, distributed applications, and its biggest advantage is cross-firewall communications and cross-platform access, which is ideal for a variety of different system-based intelligent terminal development. The view layer logic also includes the log services, certification services and page-level permissions. Specific view layer design also involves the UI independent, testability, the dependence of the data model and graphical elements dependent. Ultimately, a good presentation layer satisfies the following: can be very intuitive display system functions, data, etc.; can have friendly interaction with the user; and can have sophisticated interface to give users a better user experience.

The business logic layer is the core part of the system architecture, which is focused on system design to the business needs of the business rules and business process implementation. It is in the middle of the data layer and view layer, which plays marked the business logic, and a connecting role. In the system, the business logic is coarse-grained divided into three parts: the first part of the system is system business logic, including a variety of system-level business logic, such as the service status tracking, the configuration of the system parameters, the system performance monitoring; the second part is the administrator business logic, including a variety of administrators or business to maintain the operation of personnel possible, such as basic data management (teachers, students and other information), customer service management, business management; the third part is the user business logic, including a variety of user behavior, such as user login,

the use of micro-information business. Specific difference of how a business is what kind should also be classified in after a detailed analysis.

Data access proxy is mainly responsible for the data transmission between data access layer and business logic layer and achieves load evenly balanced, caching and prefetching strategies. The proxy interface consists of storage proxy, proxy management and cache pool. Buffer pool plays a role as data cache and reduces the server pressure, which can be deployed on a separate server or storage agent server. When there is a request to read data, firstly the system checks whether there is any associated data in the cache pool; if yes, then it directly access the buffer pool data; to the contrary, the storage agent obtains data from the storage layer and optionally adds data to buffer pool. Agent manager is used to manage the storage agent; storage agent is not only one, the number drawn after a detailed analysis. Data access within the agent scheduling process:

```
publicServiceDataGetData(ServiceType)
{
    //fetching access type according to business type
    AccessType type = ServiceAccessType(ServiceType);
    ServiceData data;
    if(AccessType.DataPool == type)
    {
        //reading data from cache pool
        data = GetDataFromPool(ServiceType);
        if(data == null)
        {
            //no data in cache pool, read data from business database
            data = GetDataFromServiceDB(ServiceType);
            UpdatePool(data);//push the data to cache pool
        }
    }
    else
    data = GetDataFromServiceDB(ServiceType);
    return data;
}
//read data from Summary or school databases
publicServiceDataGetDataFromServiceDB(ServiceType)
{
    ServiceData data;
    if(IsSchoolService(ServiceType))
    data = GetDataFromSchoolDB(ServiceType);
    else
    data = GetDataFromDB(ServiceType);
    return data;
}
```

Data access layer, also known as the persistence layer, is mainly responsible for the database or data file access, data tables Select, Insert, Update, Delete and file additions and deletions to read operations. System requirements, in addition to the summary business data access summary data cluster, schools independence business data access call data on school data service node to achieve, of course, the popular service access through the buffer pool to do the middle of scheduling.

The above logical business design is based on the realization of the cloud framework model, uses distributed storage to achieve the high availability of data storage and uses redundant storage to achieve the high reliability of data storage, that is, store the data block or file storage in different server groups [6]. In terms of cloud storage and data management technology with extensive use of Google's GFS [7], it is a highly scalable distributed file system for large-scale, distributed, massive data access applications. It runs on inexpensive commodity hardware and can also provide fault tolerance, which uses Google's BT (BigTable) [8] and Google's MapReduce programming model [9], which is a simplified model of distributed programming and efficient task scheduling model for large-scale data sets (greater than 1 TB) parallel computing. These models and technical methods are the main reference in this system and are used to manage the campus mass micro-data access, data copy scheduling and data between the different business data and the different schools to block zoning and management and establish the appropriate mapping.

26.5 Conclusions

The implementation of this system and the upgrade and replacement of original system are not only a revolutionary upgrade of the original campus of micro-information systems, but also an important milestone in the informational construction of campus to the cloud era. It also marked the era of campus information system into the user experience, which is a completely different campus information product before, because an information technology product for school teachers brings more or less additional personnel and resources overhead adds to schools. Cloud-based campus micro-information system can efficiently address these problems, truly user-oriented, and the system can meet the needs of future development and expansion of the school, having unlimited life.

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Chapter 27

Posture Error Correction of a Six-DOF Serial Manipulator Based on Genetic Algorithms

Kun Wang, Minzhou Luo, Tao Mei, Xin Lin and Yi Cao

Abstract Traditionally, the posture errors of a serial manipulator are corrected through the calibration of geometric parameters. However, this paper presents a compensation method based on genetic algorithms which corrects the joint variables of a serial manipulator, thus reducing the posture errors. The structures of the kinematics model and the error model of the 6-DOF manipulator are firstly established. Using the position and posture data of the manipulator measured by the NDI 3D dynamic displacement measurement system, the errors between the desired and the measured poses of the end-effectors are then calculated and set as the fitness function. The fitness function is used in the genetic algorithms to determine the compensation for the manipulator's rotational joint variables. Finally, the joint variables 'compensation is implemented to the control system of the designed 6-DOF serial manipulator, and groups of experimental data are presented to demonstrate the efficiency of the technique discussed and the improved performance of the manipulator.

Keywords Genetic algorithms · Robot manipulators · Error correction · Kinematics model

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27.1 Introduction

The operation of a manipulator is conducted in terms of a sequence of poses of the end-effectors, while the poses are controlled by specifying the corresponding joint displacements. When the off-line programming technique is used, joint displacements are calculated based on the inverse kinematics of the nominal model of the robotic manipulator [1, 2]. Under such circumstances, the positioning accuracy of the robotic manipulator is affected by the precision of the nominal kinematic parameters. In practical operations, due to manufacturing tolerance, compliance, transmission errors, and setup errors, the actual kinematic parameters of the manipulator usually deviate from the nominal values, which would result in incorrect desired joint displacements and give rise to end-effectors pose errors. Therefore, robot kinematic calibration is an effective method to improve robots' positioning accuracy.

Research on robot kinematic calibration approaches has been under intensive investigation over the past decades [1, 3]. Newman successfully realized calibration of the Motorman P8 industrial robot by using the circle-point analysis technique with the high-accuracy SMX coordinate measuring device. The superiority of this technique is to avoid both convergence problems and sensitivity to unmodeled effects [4, 5]. Direct and inverse dynamic identification models (DIDIM) were used by Gautier for the identification of the dynamic parameters of robot [6]. This method highlights the bypassing of the measurements of joint variables. Genetic algorithms were introduced by Kesheng for calibration of ABB Irb 6000 robot, with the superiority in the avoidance of the calculation of complex inverse mathematical formulas [7].

All these methods improved robot positioning accuracy by means of revising the robot kinematic parameters. However, robot geometric structure with the revised kinematic parameters no longer satisfies Pieper criterion. This would cause complicated calculations of inverse kinematics solutions and lead to inferior effects on real-time capability, stability, and the robustness of robot operating system. Since the poses of the end-effectors of manipulator directly depend on the values of joint displacements variables, the end-effectors errors caused by the kinematic errors are conceived to be reduced with the compensation of controlled joint variables.

In this article, a variable compensation approach based on genetic algorithms (GAs) is used to increase the absolute accuracy of the 6-DOF manipulator. The kinematics model and error model are formulated and conducted for the manipulator. The NDI 3D dynamic displacement measurement system is implemented in the measurement of the actual poses of the end-effectors of the 6-DOF manipulator. Hundreds of position errors and corresponding values of joint variables are recorded as samples for the GAs. The objective of the GAs is to determine the compensation. The values of the compensation of robot joint variables represent the parents and offspring population and the end-effectors errors represent the fitness functions. Finally, variables compensation is implemented in the control

system of the designed 6-DOF manipulator and numerical experiments are utilized to demonstrate the improvement of end-effectors poses accuracy. Therefore, the effectiveness of the variables compensation approach is certified.

27.2 Kinematics Model and Error Model of the Manipulator

The test-bed consisted of an all-revolute 6-DOF serial manipulator and the NDI 3D dynamic displacement measurement system. The geometry structure of the robot is shown in Fig. 27.1. The Denavit–Hartenberg (D–H) kinematics model is used to describe the geometry of the robot. In the figure, Cartesian coordinates are, respectively, attached to each link for purpose of defining the link position. The origin of the coordinate system is set on the intersection point between the first two perpendicular joint axes. The joint 3 is with a horizontal axis, which is parallel to the joint 2. The last three joint axes intersecting at a common point which is considered as origin of link coordinate system of links 4, 5, and 6 comprise a spherical wrist [8].

The joint coordinate frames using the D–H convention are firstly established. The designed D–H parameters of each link of the manipulator are listed in Table 27.1. It is straightforward to obtain each unique homogeneous transformation matrix A_i . The forward kinematic equations are therefore established as $T_n^0 = \prod_{i=1}^n A_i, n = 6$.

The end-effectors' position and orientation $[X, Y, Z, \varphi, \theta, \psi]$ are determined in terms of the joint variables $\theta_1 \cdots \theta_6$; forward kinematic equations also could be expressed by

$$[X, Y, Z, \varphi, \theta, \psi] = f(\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6). \tag{27.1}$$

Similarly, when solving the joint variables in terms of the desired position and orientation of the end-effector, the inverse kinematics equation can be written as

Fig. 27.1 D–H kinematics model of the 6-DOF series manipulator

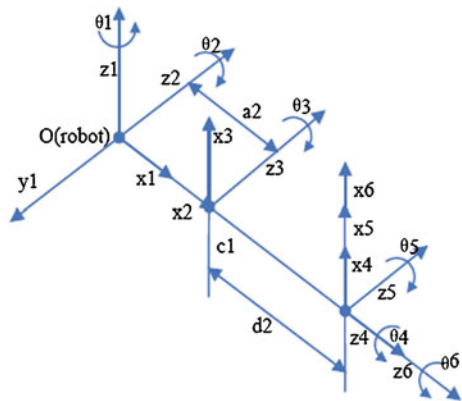


Table 27.1 D–H parameters for the manipulator

Link	a_i (mm)	σ_i ($^\circ$)	d_i (mm)	θ_i ($^\circ$)
1	0	0	0	90
2	0	-90	0	0
3	270	0	0	-90
4	0	-90	200	0
5	0	90	0	0
6	0	-90	0	0

$$[\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6] = f^{-1}[X, Y, Z, \phi, \theta, \psi]. \quad (27.2)$$

In the above two equations, f is the transformation matrix which is relative to the nominal mechanical parameters. Because the nominal parameters differ from actual values, the actual position the manipulator arrives at would deviate from the pre-conceived result of the forward kinematics. The forward error model is given by

$$[\Delta X, \Delta Y, \Delta Z, \Delta \phi, \Delta \theta, \Delta \psi] = f'\{\theta_1, \dots, \theta_6\} - f\{\theta_1, \dots, \theta_6\}. \quad (27.3)$$

where f is the transformation matrix which is relative to the actual mechanical parameters.

The actual geometric parameters for the manipulator can be obtained though calibration method. But it is complicated and the calibrated D–H model is adverse to the solution of inverse kinematics equation. Here, we assume that the actual position could be reached as accurate as possible by add compensation to the controlled joint variables. Then, the errors between the prescribed poses and the actual poses after compensation shown below are desired as small as possible.

$$[\Delta X', \Delta Y', \Delta Z', \Delta \phi', \Delta \theta', \Delta \psi'] = f\{(\theta_1 + \Delta\theta_1), \dots, (\theta_6 + \Delta\theta_6)\} - f'\{\theta_1, \dots, \theta_6\}. \quad (27.4)$$

27.3 Compensation Algorithms

27.3.1 Principle of Variables Compensation

In a robot manipulator task, the position and orientation of the end-effector are determined by joint variables, which are calculated according to the inverse kinematics. The pose errors induced by the imprecise kinematic model are desired to be reduced though the joint variables compensation. The GA search method is implemented to find the optimal compensations to decrease the error between the prescribed pose and the actual pose of the manipulator.

The detailed procedure of pose error correction for the manipulator is described as follows.

- (1) Establishing the D–H parameters and the forward and inverse kinematics model of 6-DOF manipulator.
- (2) Collecting a set of data which consist of the prescribed poses, nominal rotation variables, and actual poses by experiments. First, give a group of desired poses of

the end-effector and then calculate the nominal joint variables based on the inverse kinematics from the above step. Drive each actuator according to the corresponding nominal joint variables and then measure and record the actual position and orientation with the 3D dynamic displacement measurement system.

- (3) Implementing the GAs to find the optimal compensation variables by using the errors as the fitness function.
- (4) Applying the revised variables to the 6-DOF manipulator control system and testing the accuracy.

27.3.2 Implementation of Genetic Algorithms

GAs have been theoretically and empirically proven robust for identifying solutions to combinatorial optimization problems [7]. Therefore, the GAs method is used here for finding the adjustment of the control variables of the joints. Firstly, the compensation for each joint $\Delta\theta_i$ ($i = 1 \dots 6$) is chosen randomly as the chromosomes of the initial population pool. These individuals are used as parents for producing offspring in a new generation though genetic operators and expressed as

$$x_m = [\Delta\theta_1, \Delta\theta_2, \Delta\theta_3, \Delta\theta_4, \Delta\theta_5, \Delta\theta_6]^T, \quad m = 1, 2, \dots, M. \quad (27.5)$$

where M is the individual's number of population pool.

The update pose of the end-effector of the manipulator then will simply be obtained with corrected joint variables (by adding correction values above to nominal joint variables).

$$[\hat{x}_i, \hat{y}_i, \hat{z}_i, \hat{\phi}_i, \hat{\theta}_i, \hat{\psi}_i] = f\{(\theta_1 + \Delta\theta_1), \dots, (\theta_6 + \Delta\theta_6)\}, \quad i = 1, \dots, N. \quad (27.6)$$

where $\hat{T}_i = [\hat{x}_i, \hat{y}_i, \hat{z}_i, \hat{\phi}_i, \hat{\theta}_i, \hat{\psi}_i]$ is the position and orientation for the i th measurements. N is the number of measurements samples.

Meanwhile, the defined fitness function can be calculated

$$F(X) = \frac{1}{N} \sum_{i=1}^N \sqrt{\frac{((x_i - \hat{x}_i)/x_i)^2 + ((y_i - \hat{y}_i)/y_i)^2 + ((z_i - \hat{z}_i)/z_i)^2 + ((\phi_i - \hat{\phi}_i)/\phi_i)^2 + ((\theta_i - \hat{\theta}_i)/\theta_i)^2 + ((\psi_i - \hat{\psi}_i)/\psi_i)^2}{}}. \quad (27.7)$$

where $T_i = [x_i, y_i, z_i, \phi_i, \theta_i, \psi_i]$ is the actual position and orientation measured with the NDI 3-D dynamic measurement system. The offspring of the correction values which be as the chromosomes of the GAs are reproduce by generations with the roulette wheel method being used as the selection approach and appropriate mutation and crossover rate being chosen for the GAs operators. The process is iterated until the fitness function is satisfying or the given number of iterations is met.

27.4 Numerical Examples and Experimental Result

The experiments include the measurement of the position and orientation of the end-effector of the manipulator as well as the implementation of GAs with the MATLAB. The progress could be described in detail as the following three steps:

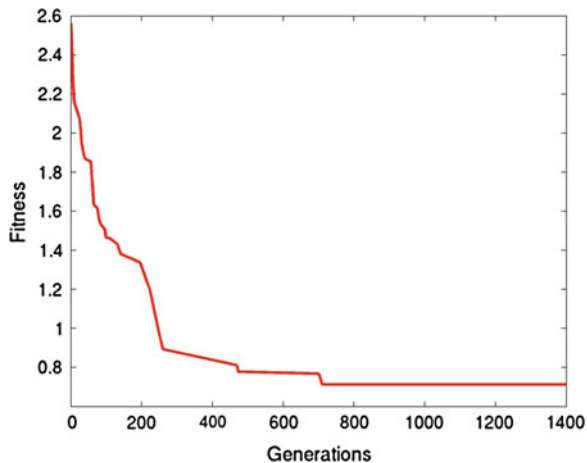
$$\Delta\theta = [\Delta\theta_1, \Delta\theta_2, \Delta\theta_3, \Delta\theta_4, \Delta\theta_5, \Delta\theta_6] = [0.003065153, 0.000461247, 0.0003220547, 0.0181416, 0.02526204, 0.03165852]. \quad (27.8)$$

- (1) Data-collection. Giving 105 groups of arbitrary poses as the targets for the manipulator in the work space and then driving the corresponding actuator based on the calculated value of the nominal control variables and measuring the real poses the end-effector arrived at. The experimental facilities are shown in Fig. 27.2. Record the 105 group of the nominal variables, desired poses, real poses, and position and orientation errors.
- (2) Application of GAs. The first 100 groups of learning data from the previous step are used for the GAs to finding the optimal control compensatory variable of each joint. The principle and application of GAs are detailedly presented in Sect. 27.3. The GAs parameters were chosen as, namely: Population Size: $M = 20$; Crossover rate: $P_c = 0.9$; Initial mutation rate: $P_m = 0.05$, and the value varies with change of generation: $P_m(g) = 0.1 - (0.1 - 0.001)g/G$, where g is the current generation. GAs program stops when the optimal fitness value remains unchanged after 500.

Fig. 27.2 Experiment setup



Fig. 27.3 Evolution graph of the GAs



The evolution graph of the GAs solution is shown in Fig. 27.3. The best correction values of each joint variable computed by GAs are given as:

- (3) Experimental verification. In order to verify the effectiveness of the proposed method, the last five groups' data are used for the contrast. Driving each joint actuator in terms of the modification values of joint variables to, respectively, reach the last five desired poses of the end-effector, measure the actual position and orientation again with NDI measurement system, and then calculate the errors and make comparisons with the recorded errors from step one. The position error is obtained through actual physical distance, while Euclidean norm is used for evaluations of the orientation error, namely

$$\begin{aligned} \|\Delta P\| &= \|P' - P\| = \left(\sum_i (\Delta p_i)^2 \right)^{1/2}, \quad \|\Delta R\| = \|R' - R\| = \left(\sum_i \sum_j (\Delta r_{ij})^2 \right)^{1/2} \\ &= (tr(\Delta R^T \Delta R))^{1/2}. \end{aligned} \quad (27.9)$$

The errors of position and orientation of end-effector based on the original and revised joint variables are separately marked in Figs. 27.4 and 27.5.

It can be seen that the pose accuracy of the manipulator is obviously improved with compensation of joint variables. The original average position error and orientation error of the end-effector are, respectively: $\Delta P = 2.18$, $\Delta R = 0.2590$; after the correction, the average location error is $\Delta P' = 1.27$, the orientation error is $\Delta R' = 0.1727$. Therefore, the precision of position and orientation are, respectively, increased by 41.74 and 33.32 %.

Fig. 27.4 The comparison of position errors

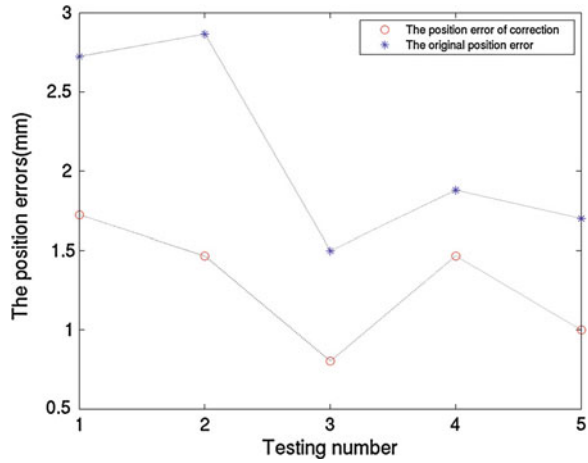
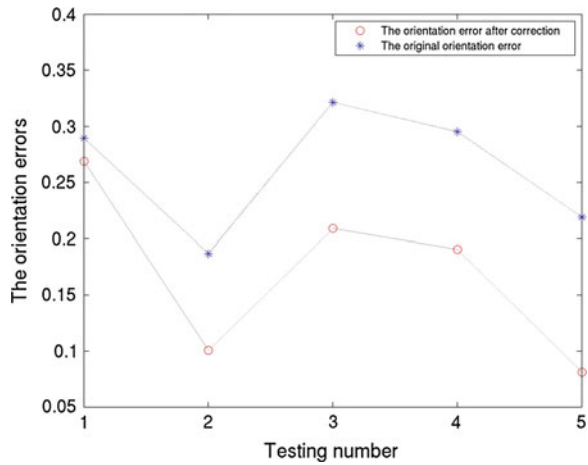


Fig. 27.5 The comparison of orientation errors



27.5 Conclusions

In this paper, the genetic algorithm is used for the modification of controlled joint variables, in a bid to improve the control precision of the manipulator. The experiments tested on the designed 6-DOF manipulator prove that the control accuracy is improved by using this method. The effectiveness of the algorithm is verified. The advantage of this method is to replace robot kinematics calibration and avoid the complex inverse kinematics calculations caused by the traditional robot calibration. But the drawback is that responsibility of the approach depends on the selection of the samples. Enhancing the number of measurements can increase the reliability of the approach but also induce more complexity and labor cost of the experiments.

Future works will be involved in building intelligent systems that combine the genetic algorithm with artificial neural network, which may enhance further the reliability and availability of the optimization algorithm.

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Part IV
Information Management and
Applications

Chapter 28

Study of Coal Consumption Intensity Based Energy Conservation

Guangming Li

Abstract Coal consumption is the main form of energy consumption in Xinjiang. The task of energy conservation and emission cut-down in a fragile ecological system presents a new challenge to Xinjiang's economic development. Facing a situation of coal-guided energy consumption, this paper has a helpful discussion on how to carry on a balanced development and how to modulate relative relationships.

Keywords Xinjiang · Coal · Consumption intension

28.1 Introduction

The industry sector is the main coal consumption department in Xinjiang. It is the main way of the energy conservation to enhance the industrial coal-use efficiency [1]. The results of the research indicated that the influence coal expense intensity factor mainly includes the following: (1) social factor is the population quantity and quality, the expense ability, the engineers, technicians proportion, and so on; (2) fund factor, as scientific research investment, government investment, and so on; (3) the technical factor is the profession (equipment) the scale, with can the plant efficiency, produce the craft, technological innovation ability, the equipment level, and so on; (4) substitution effect, the producer can select can an effect higher technology, thus promotion energy intensity drop if the energy relative other element of production becomes more expensive [2]; (5) industrial factor, as industrial structure, heavy

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industry proportion, and so on; and (6) system and policy factor. The research will be a selection suitable target according to these factors to relate these factors to the coal expense intensity influence, to choice gradual key point work provides the basis and to reduces the energy consumption for the government.

28.2 Sample Choice and Original Data

The sample data are from 1990 to 2007 in Xinjiang [3]. The selection variable is all previous years engineers and technicians proportion (%), technical activity total funds (10,000 Yuan), equipment purchase (10,000 Yuan), energy processing transfer efficiency (%), energy processing transfer efficiency electricity generation efficiency (%), the coal accounts for the energy expense total quantity the proportion (%), the natural gas accounts for the energy expense total quantity the proportion (%), and accounts for the gross value of industrial output with the heavy industry the proportion (%).

The eight targets are mainly based on the following: (1) the social factor selects the engineers and technicians to account for the total number of staff and workers the proportion (z_1), with reflected the profession human resources provide the condition as well as the research and development level; (2) the fund factor selects the technical activity funds (z_2), reflected main the social economy to promote the endeavor which the advance in technology does (z_5); (3) the equipment purchase for the technical factor selects (z_3), energy processing transfer efficiency (z_4) and energy processing transfer efficiency electricity generation efficiency (z_5), the equipment purchase reflection profession equipment renews the behavior in service; the energy processing transfer efficiency is refers to in certain time the energy after the processing, the transformation, delivers in each kind of energy product quantity and the same time invests each kind of energy quantity ratio which the processing transforms, is observes the energy processing switching device and produces the craft advanced and backward, the management level high low status important target; it is thermoelectricity generation primarily in Xinjiang. Therefore, the energy processing transfer efficiency electricity generation efficiency happen to can reflect its use the technical level; (4) the substitution effect selects the coal to account for the energy expense total quantity the proportion (z_6) and the natural gas accounts for the energy expense total quantity the proportion (z_7), mainly considered the industry profession energy expends mainly is by the coal primarily in Xinjiang, the natural gas that will have the good substitution function to the future coal expense is used the clean energy; (5) the industrial factor selection heavy industry accounts for the gross value of industrial output the proportion (z_8), the heavy industry energy consumption is principle problem in Xinjiang; (6) the system and the policy factor select industry profession overall coal expense intensity (10,000 tons/hundred million Yuan), indicated with y .

Table 28.1 CMCV and TPF

	Prin1	Prin2	Prin3
z_1	-0.02156	0.708596	-0.66862
z_2	0.415176	0.062997	0.035197
z_3	0.408564	0.011189	0.080788
z_4	0.031019	0.68451	0.711087
z_5	0.380819	-0.07705	0.074013
z_6	-0.41271	0.054381	0.093418
z_7	0.409442	0.107649	-0.15767
z_8	0.419858	-0.069	-0.02183

28.3 The Practical Analysis

The principle components analysis is one kind of statistical analysis method through which falls the Uygur technology changes into many variables the minority several principle components (i.e., synthesis variable) [4]. These principle components can reflect the primitive variable, the major information. And they usually express some kind of linear union of the primitive variables. This paper selects eight targets, all of which are regarding a subject that has the closing relevance, suitable with the main ingredient analysis.

Main Ingredient Analysis After primary data were standardized (standardized process omitted), the SAS software was used to conduct the principle components analysis. Analysis results are summarized in Tables 28.1 and 28.2. From Table 28.1, the 1st principle component's (Prin1) technical progress factor is 67.38 %, the 2nd principle component's (Prin2) technical progress factor is 16.53 %, the 3rd principle component's (Prin3) technical progress factor is 9.17 %, and these three principle component's accumulation technical progress factor is 93.08 %, well above previously achieved 85 %; therefore, these three principle components are selected for the analysis.

Meanwhile, characteristic vector which gives according to Table 28.3, according to the above writes the first three principle components relationship which expresses by the standardized variable, namely [5]

$$\begin{cases}
 \text{Prin1} = -0.022z_1 + 0.415z_2 + 0.409z_3 + 0.031z_4 + 0.381z_5 \\
 \quad - 0.413z_6 + 0.409z_7 + 0.42z_8 \\
 \text{Prin2} = 0.709z_1 + 0.063z_2 + 0.011z_3 + 0.685z_4 - 0.077z_5 \\
 \quad + 0.054z_6 + 0.108z_7 - 0.069z_8 \\
 \text{Prin3} = -0.669z_1 + 0.035z_2 + 0.081z_3 + 0.711z_4 + 0.0741z_5 \\
 \quad + 0.093z_6 - 0.158z_7 - 0.022z_8
 \end{cases} \tag{28.1}$$

Then, each target z_i coefficient the characteristic value square root product which corresponds with these principle components figures out these principle components with this target between correlation coefficient by type in front of (28.1) uses in SAS, the CORR correlation process to extract the correlation is the mathematical Table 28.3.

Table 28.2 Characteristic vector

<i>I</i>	CV	DNTCV	TPF	ATPF
1	5.390623	4.068588	0.6738	0.6738
2	1.322034	0.588349	0.1653	0.8391
3	0.733685	0.469147	0.0917	0.9308
4	0.264539	0.089812	0.0331	0.9639
5	0.174727	0.105195	0.0218	0.9857
6	0.069532	0.03565	0.0087	0.9944
7	0.033882	0.022904	0.0042	0.9986
8	0.010978		0.0014	1

Notes

I Integer

CV Characteristic vector

CMCV and TPF Correlation matrix characteristic value and technical progress factor

DNTCV Difference in the neighboring two characteristic values

TPF Technical progress factor

ATPF Accumulation technical progress factor

Table 28.3 Correlation coefficient and examination probability

	z_1	z_2	z_3	z_4	z_5	z_6	z_7	z_8
Prin1	-0.05	0.9639	0.9486	0.0720	0.8842	-0.958	0.9506	0.9748
	0.8436	<.0001	<.0001	0.7764	<.0001	<.0001	<.0001	<.0001
Prin2	0.8147	0.0724	0.0129	0.7871	-0.089	0.0625	0.1238	-0.079
	<.0001	0.7752	0.9596	<.0001	0.7267	0.8053	0.6246	0.7543
Prin3	-0.573	0.0302	0.0692	0.6091	0.0634	0.08	-0.135	-0.019
	0.013	0.9055	0.7850	0.0073	0.8027	0.7523	0.5931	0.9413

Note Pearson's correlation coefficient $N = 18$, while $H_0: \text{Rho} = 0, \text{Prob} > |r|$

In (28.2), the absolute value of correlation coefficient is bigger, and these principle components are showing much influence. Therefore, the technical activity funds collection total amount (10,000 Yuan) z_2 is decided mainly the first principle components Prin1 size, the equipment purchase (10,000 Yuan) z_3 , the energy processing transfer efficiency electricity generation efficiency (%) z_5 , the coal accounts for the energy expense total quantity the proportion (%) z_6 , the natural gas accounts for the energy expense total quantity the proportion (%) z_7 , and the heavy industry accounts for the gross value of industrial output the proportion (%) z_8 ; its coefficient quite is big.

$$\left\{ \begin{array}{l}
 \text{Prin1} = -0.05z_1 + 0.9639z_2 + 0.9486z_3 + 0.072z_4 + 0.8842z_5 \\
 \quad - 0.958z_6 + 0.9506z_7 + 0.9748z_8 \\
 \text{Prin2} = 0.8147z_1 + 0.0724z_2 + 0.0129z_3 + 0.7871z_4 - 0.089z_5 \\
 \quad + 0.0625z_6 + 0.1238z_7 - 0.079z_8 \\
 \text{Prin3} = -0.573z_1 + 0.0302z_2 + 0.0692z_3 + 0.6091z_4 + 0.0634z_5 \\
 \quad + 0.08z_6 - 0.135z_7 - 0.019z_8
 \end{array} \right. \quad (28.2)$$

Therefore, the first principle components available reflects the industry coal to use the comprehensive level; the second principle components (Prin2) size the factor mainly is the coefficient accounts for the total number of staff and workers for the engineers and technicians the proportion (%) z_1 and the energy processing transfer efficiency (%) z_4 , also coefficient for positive [6], but the energy processing transfer efficiency electricity generation efficiency (%) z_5 and the heavy industry account for the gross value of industrial output the proportion (%) the z_8 coefficient for negative may be used the second principle components to reflect the improvement coal-use efficiency the state-of-art; the third principle components (Prin3) size the factor mainly is the engineers and technicians accounts for the total number of staff and workers the proportion (%) z_1 , the energy processing transfer efficiency (%) z_4 and the natural gas accounts for the energy expense total quantity the proportion (%) z_7 , moreover the engineers and technicians account for the total number of staff and workers the proportion (%) z_1 , the natural gas account for the energy expense total quantity the proportion (%) z_7 and the heavy industry account for the gross value of industrial output the proportion (%) the z_8 coefficient for negative, may be used for to reflect the coal use the marketability level. The first three principle components have already contained 93.08 % information of primitive variable.

Returning Principle Components To carry on the regression analysis using the principle components to determine coal expense intensity of industry, Y obtains the following result:

$$Y = 5.43101 - 0.35679Prin1 + 0.2504Prin2 + 0.29196Prin3 \tag{28.3}$$

(<.0001) (0.02) (0.0387)

$R^2 = 0.83 \quad DW = 0.738$

The operation results from (28.3) type, the return pass the examination, but because the DW value is 0.738, the existence autocorrelation quotes the AR elimination autocorrelation. The result is as follows:

$$Y = - 0.43518 - 0.14783Prin1 + 0.087498Prin2 \tag{28.4}$$

$+ 0.15097Prin3 + [AR(1) = 0.71012]$

(0.047) (0.0507)

(0.0135) (0.0000)

$R^2 = 0.96889 \quad DW = 2.2$

To eliminate the autocorrelation, the confidence is 90 %; from this, this model may be judged as having strong simulation and the confidence level to cause (28.4) principle components returning to original state, that is, to the primitive variable, and then return to original state result will be as follows:

$$Y = 0.435 - 0.008z_1 - 0.132z_2 - 0.129z_3 + 0.15z_4 - 0.129z_5 + 0.159z_6 - 0.15z_7 - 0.154z_8 + [AR = 0.71012] \quad (28.5)$$

In the (28.5), each factor coefficient with experience anticipate direction basic consistent.

The Result of Practical Analysis (1) The engineers account for the total number of staff and workers, which increases by 1 % every time, and coal expense intensity of industries fall down 0.800 tons/hundred million Yuan. (2) The funds of technical activity increase 10,000 Yuan every time, and overall coal expense intensity of industries drops 0.131 tons/hundred million Yuan. (3) The equipment purchase increases 10,000 Yuan every time, and coal expense intensity of industries fall down 0.129 tons/hundred million Yuan. (4) The energy processing transfer efficiency increases every time 1 %, and overall coal expense intensity of industries increases 0.15 tons/hundred million Yuan. The reason is that possibly the transfer efficiency enhancement has stimulated the expansion of industry sector, which has led the overall coal expense intensity enhancement. (5) The energy processing transfer efficiency, that is, electricity generation efficiency, increases every time by 1 %, and overall coal expense intensity of industries falls down 0.129 tons/hundred million Yuan. (6) The energy expense total quantity increases every time by 1 %, and overall coal expense intensity of industries increases 0.158 tons/hundred million Yuan; this is suitable with the actual tallies. If the highly effective substitution energy or the new energy is used as far as possible, its coal expense intensity can effectively be reduced. (7) Natural gas accounts for the total quantity of energy expense, which increases every time by 1 %, and overall coal expense intensity of industries falls down 0.15 tons/hundred million Yuan. It indicates that increase in new energy use can be helpful not only in reducing the coal expense intensity of industries, but also in alleviating Xinjiang's environment pressure. (8) The heavy industry accounts for the gross value of industrial output, which increases every time by 1 %, and overall coal expense intensity of industries falls down 0.154 tons/hundred million Yuan.

28.4 Countermeasure Suggestion

The thermoelectricity generation is primary in Xinjiang: More than 90 % of energy consumption depends coal—for example, the national electricity generation efficiency is 40.24 % in 2007, but it is only 28.6 % in Xinjiang, only to reach the national average level 71 %. It indicates the existing big disparity between Xinjiang and the other parts of the nation. So, these can be improved by following aspects.

Enhancement in Technical Improvement and Innovation To depend on technology advancement and the technological innovation, to take conserve energy fall consume as the goal, these will be the next time enhances the coal-use efficiency important measure and the direction in Xinjiang. The industrial structure is very difficult to change primarily by the basic characteristic of raw material

foundation industry, but it is possible to carry on partial adjustments; especially, adjustment in internal technology structure and the product mix is possible. If extension development is carried on through the newly built project, no doubt it is possible to enhance the energy-use efficiency, but majority professions need, through the technological transformations, the technological innovation, and the energy conservation, and enhancement in energy-use efficiency will be achieved this way. The goals are the following:

- a. To eliminate the small thermal power firmly, to promote energy conservation, and to cut down the consumption.
- b. The new technology and the equipment will be accepted for the profession as soon as possible, to use the energy fully to play the role using the efficiency aspect, to establish and consummate the energy conservation service system, and to encourage and support new technical and equipment's promotion.

To Enlarge Industry-Scientific Research Funds Investment To enlarge science and technology funds investment, may choice to have the key development high new technology industry, to transform the traditional industry, to realize the industry economy and the knowledge economy interaction positively. It is not only to save the coal but also to effectively enhance the coal efficiency.

To Promote the Energy Consumption Pattern Adjustment As the natural gas accounts for the energy expense total quantity, the proportion is increased every time by 1 %, and overall coal expense intensity of industries decreased 0.15 tons/hundred million Yuan; therefore, use of the renewable energy or other clean energy much in the industries is suggested, such as wind energy and the solar energy, so as to reduce the use amount of the coal.

To Adjust the Industry Structure Quickly To introduce consuming energy lowly, the high technical level to developed superiority consumes energy the industry, to reduce the pressure of environment using coal in Xinjiang. Specifically:

- a. In the existing highest unit energy consumption quota foundation, to formulate and announce the main profession, the product unit source consumption rate ceiling standard in Xinjiang. To restrain strictly surpasses the standard, the project in aspects and so on examination and approval, loan, industry and commerce registration, production permission.
- b. To conform Xinjiang's heavy industry. The heavy industry is the economy development to use coal many professions, it is proportion to rise instead causes the industry coal expense intensity to fall down 0.154 tons/hundred million Yuan. This indicates the major industry was enhancing the coal to use efficiency aspect to make the important contribution. Therefore, the large-scale may be carried on reorganization restoration to the similar heavy industry, to cultivate the ultra large-scale heavy industry in Xinjiang.

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Chapter 29

Study on Color in Landscape Architecture

Honglei Xu

Abstract Color is related closely to human beings. Human life and habitat are full of colors. Color reflects human civilization and spiritual demands. It takes on the responsibility of embellishing life and beautifying environment. Karl Marx once said, the feel for color is the most popular form of general esthetics. With the rapid development of landscape architecture in our country, landscape architecture design has a higher and higher demand of color combination design, which means color planning in landscape design has become a typical issue.

Keywords Landscape design · Color · Landscape architecture

29.1 Introduction

As research and design of color in landscape architecture go deep, some designers have begun with planning and design work of color landscape [1, 2]. In landscape design, the principle of color planning and combination can be applied to make landscape architecture that present certain characteristics of culture and locality and also create specific ambient of landscape colors [3]. This article makes a basic exploration of color portfolio planning in landscape design.

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29.2 Configuration Relations of Colors in Architectural Landscape

Color itself is not definitely beautiful or ugly. It should be that there is only harmony in color combination instead of ugly color. The beauty of color lies in the mutual combination of colors. When studying color, we should reveal relations between colors and emphasize the functions of their combination.

Configuration relations of similar hue, contrast hue, adjacent hue, colors, non-colors and so on are often used in color configuration relations. When color combination form conforms to human psychological needs, it will arouse resonance with audience.

29.2.1 Similar Hue Relations in Landscape Colors

Similar hue refers to hues with close distance. Similar hue configuration has same hue motif and subtle changes in cold and warm, bright and dark, thick and thin in hue. It is similar hue with subtle differences among large similarities. It has a peaceful, bountiful, simple, refreshing, complete and quiet character. It can best unify the integral coordination and perfection of landscape colors. Usually, similar hue is used in solemn and elegant space, which can regulate disorderly forms and complicated displays. Beige building elevation, celadon roof in Sweden palace, produces similar hue contrast with well-trimmed lawn.

29.2.2 Adjacent Hue Relations in Landscape Colors are Contrast Between Strong and Weakness, and Combination of Adjacent Hues

It not only keeps intimacy of adjacent hue, but also presents color differences. Gamut of adjacent configuration is relatively wide. Range of adjacent colors is relatively large, so it can take in wide hues. It has flexible adaptability and broad inclusiveness in garden space. For example, in Cascais beach, in Portuguese, there are white buildings, a large area of blue sky and sea, and green plants, forming adjacent color combination.

29.2.3 In Contrasting Hue Relations in Landscape Colors, There is a Big Difference Between Hues

The strong contrast and impact form a strong, clear-cut and active character of landscape colors. It is a color configuration which is full of expression and a sense

of power. The area of color is paid particular attention to in space environment, and a large area of contrasting color blocks is cautiously used to create disorder sense of colors. For example, in Grand Place, in Belgium, brown architectural complex and high-purity flowers and plants form color combination with contrasting color relations.

29.2.4 Complementary Hue Relations in Landscape Colors are the Strongest Hue Contrast with Strong Excitement

When using complementary colors as contrast combination in landscape colors, primary and secondary relations, relations of value and chroma of colors are particularly important. For example, in Kikenny Castle, in Ireland, brick-red building materials are embedded in verdurous plants, forming clear-cut and strong contrast combination of complementary colors.

29.2.5 Relations Between Colors and Non-Colors in Landscape Colors

All hues in colors and black, white and gray in non-colors can easily obtain harmony visual effects. Non-colors appear to be quite simple but elegant. Configuration between colors and non-colors can avoid dreariness of non-colors and also whoopla of heavy colors. It is widely used not only in individual building but also in internal space environment.

29.3 Contrasting and Harmony Relations in Architectural Landscape Colors

Contrast of Colors Colors exist in contrast. Any two colors can create differences when being juxtaposed. And this is color contrast. The relative property of colors refers to clear and obvious color contrast. Application of contrast colors is fairly important in architectural landscape color design. When making color contrast combination in architectural landscape, we should stress moderation and primary and secondary relations. Strong color contrast will create excitement and distracting, while weak color contrast cannot present color contrast effect. A pair of proper color contrasts can make visual image to have variations in uniformity. Usually, several hue contrast combinations will be used in landscape color

combinations. We can apply combination of color-matching relations and geometric figures in hue colors to make cadent and metrical color contrast.

Harmony of Colors Color harmony is the color relations made up by harmonizing color contrasts. It can make the distracted, strong and chaotic colors become organized, orderly and unified harmony, thus achieving changeable but unified harmonious beauty. In landscape color design, this harmony is realized by means of color combination and coordination. By applying theory of color harmony, we can create harmonious but changeable color landscape.

29.4 Design Means of Color Combination in Architectural Landscape

Color assumes important responsibilities in landscape design. On the one hand, it is attached to some specific carriers and represented by these carriers. On another hand, it plays many roles such as four-color, background color and decorative color. The visual effect of color combination is decided by the balance between colors. In order to master this balanced relation, we should master design means of color combination.

29.4.1 *Application of Combination of Cold and Warm Color in Landscape Design*

Application of Warm Color Combination in Landscape Design In warm colors, color has long wavelength and high visibility. And color sense is relatively jumping, so warm colors are often used in general landscape design. Warm colors mainly refer to red, yellow and orange and their adjacent colors. Red, yellow and orange symbolize fervency and liveliness in people's heart. They are usually used in celebration scene, flower-bed in square, main entrance, lobby and so on.

Application of Cold Color Combination in Landscape Design Cold colors in hue circle mainly refer to blue, purple and adjacent colors in color cycle. As cold color has short wavelength and low visibility, it will create a distant and shrink feeling. Plants with cold color or near-cold color can be applied to increase sense of spacious depth in some environment edges with small space in landscape design. In addition, cold color creates sense of smaller area than that created by warm color when they have same area of color blocks. In landscape design, cold color and warm color should create sense of same area. Cold color can also create sense of silence and solemnity. In landscape design, especially in combination with flowers and plants, cold color is usually matched with white and warm color to create bright and lively ambient. For example, it is used in lawns and flower-beds in large squares. Cold color may generate sense of lowering temperature

psychologically, so cold color can be used in hot summer or high-temperature south to generate cool feelings.

29.4.2 The Combined Application of Color Contrast in Garden Design

The difference formed by comparing two or more colors is referred as color contrast, which includes lightness contrast, purity contrast and hue contrast.

The Application of Lightness Contrast in Garden Design In garden planning and design, the color combination of lightness contrast plays an important role in displaying the space dimension and volume. Space of different lightness also gives people different feelings. High lightness gives people a clean, quiet and harmonious feeling, which is mostly used in the constructions of garden planning and design.

The Application of Purity Contrast in Garden Design Purity is the degree of saturation of color. To match colors of different purity, based on the differences between the purity, comparison between contrasts of different purity can be formed, which is purity contrast. High-purity color in the garden constitutes a large proportion known as the “fresh hue,” which gives people positive, strong and impulsive, expansive, outgoing, happy, lively feelings. If it is used improperly, it will produce vulgar or irritative effects. Middle-purity color in the garden constitutes a large proportion known as the “middle hue,” which gives people refined, safe feelings. Low-purity color in the garden constitutes a large proportion known as the “gray hue,” which gives people dull, negative, weak, old-fashioned, simple, durable, graceful, quiet and easy-going impressions.

Application of Hue Contrast in Landscape Design Hue contrast refers to color combination formed by color contrast in color cycle. It is used most widely and relatively difficult.

At first, similar hues refer to those colors whose distance of hues is not far or close. In color wheel table, they refer to adjacent colors that have few differences in hues, belonging to weak hue contrast. They can easily create coordinative and integral effect.

Secondly, in contrast colors, there is a big difference between hues, which may easily generate strong visual effect. These colors are represented as contrast combination of natural colors and artificial colors in architectural landscape design. As the contrast effect is strong and clear, it is widely used in landscape design. Contrast colors can be used in squares, amusement parks, main entrance and significant festival scenes. Contrast colors can be applied to form all kinds of pictures, flower-beds, styles, main body sculptures and so on to present strong visual effect, thus bringing a happy and fervent ambient.

Thirdly, it is hue contrast of complementary color. Complementary color exists in mutually against position in color cycle. It is the strongest contrast combination,

such as red and green, yellow and purple, orange and blue. Architectural landscape, scene are mostly used as decorative colors in architectural landscape, scene, especially in combination of plants and flowers.

Contrasting Application of Color Area Combination in Landscape Design

Forms in landscape as carrier of colors have certain color area. Color area is directly related to convey color intent. Therefore, color area is an indispensable character of colors. In color combination, single color is seldom used to represent. Instead, two or more than two colors are combined for use, so contrast relations of areas should be taken into consideration.

Contrasting Application of Non-Colors in Landscape Design Golden, silver, black and white are called non-colors and are usually used in landscape architecture, landscape, sculpture and walls in landscape design.

Golden is usually called as warm color, while silver is called as cold color. In tradition landscape, golden and silver are generally used as decorative colors in architectural drawing. They are seldom used in other environment. Instead, they are often used in modern landscape environment design with the application of modern industrial materials such as copper, stainless steel, titanium alloy. Black and white are also called as extreme colors and are used in landscape architecture and civil architecture in the south in traditional landscape. In modern landscape design, it can be seen that black and white are widely used, such as in walls, fences and iron. These fences and walls form a contrast with the environment.

Besides, the non-color combination of black and white is used in some squares and picture portfolio on roads. In design of flowers and plants, white is used to increase the value of pictures and the sense of hierarchy. And white is used in contrast colors to buffer contrast.

29.5 Conclusion

No matter what the style of color combination design in architectural landscape is, design principle of contrast and harmony should be carried from the beginning to the end. Also, other factors, such as culture, region, modeling, light, mechanism, psychology and season, should be taken into consideration. Architectural landscape color planning, design and combination are a deepening and exploring process. With the continuous hard work, more diversified architectural landscape colors will be created.

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Chapter 30

Efficient Scheme of Reducing Carbon Emissions in Export Trade

Yumei Ding

Abstract In the bottlenecks of resources and environment, it is an inevitable choice for China to reduce carbon emissions so that to achieve a low carbon economy and make it becomes stronger. This essay tries to analysis export trade and carbon emissions from the angle of theory and practice and stress to raise how to realize lower carbon emissions in export trade so that it will enhance the international competitiveness of national export trade.

Keywords Export trade · Carbon emissions · Carbon trading

30.1 Introduction

With China's emissions and export trade growing fast, Chinese energy consumption effect and environmental effect of foreign trade have attracted many domestic and foreign scholars' attention [1]. Shun and Harris (2006) calculated and found that 7–14 % of Chinese carbon emissions were caused by commodity that China exports to the United States. Liu Qing and so on (2008) calculate, compare and analyze the energy load and carbon emissions of 46 kinds of key products of China's export trade, and the results show that the carbon emissions of these exports take up 14.4 % of the national carbon emissions. On basis of previous studies, the passage provides feasible countermeasures and suggestions for transformation of China's export trade to the low carbon economy [2].

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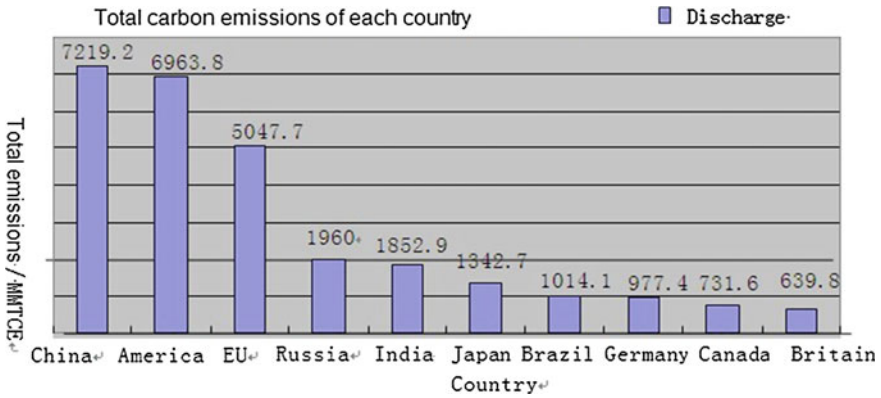


Fig. 30.1 The ranking of total carbon emissions of each country

30.2 Carbon Emissions Status of Chinese Export Trade

As a rising great country which is in the fast development of industrialization and urbanization, Chinese fossil fuel has increased much in recent years, the fuel structure is mainly coal, which also leads to Chinese huge greenhouse gas emissions. In fact, China has become the world’s biggest country for emission of greenhouse gases (as Fig. 30.1), and the growing rate is fastest.

Data sources: the World Resources Institute

The Dutch research institution, Netherlands Environmental Assessment Agency (MNP), analyzes the main greenhouse gases the carbon emissions in 2007 according to the use of fossil fuels and the latest statistics of cement production. The results show that in the 276 million tons world’s emissions, China accounts for 67.2 million t, which is much more than American 59 million t.

Chinese academician Ding Zhong li and so on have roughly analyzed Chinese 2020 CO₂ emissions reduction targets, and the data show that pressure of carbon emissions is big (as shown in Tables 30.1, 30.2, 30.3, 30.4, and 30.5).

Rough analysis for Chinese 2020 CO₂ emissions reduction targets

Table 30.1 Emissions data of 2005 and 2008

Invariable	Per capita GDP	Total carbon	Per capita	Carbon emission	
GDP	(ten thousand	emissions (Get	annual	intensity(t CO ₂ /ten	
(billion)	Yuan)	CO ₂)	emissions	thousand Yuan)	
			(t CO ₂)		
2005	18.39	1.40	5.63	4.28	3.06
2008	25.42	1.90	7.05	5.28	2.77

Table 30.2 Estimate carbon emissions in 2020

GDP average growth (%)	Targets for reducing emissions (%)	2020 GDP (billion)	2020 per capita GDP (ten thousand Yuan)	2020 total carbon emissions (billion CO ₂)	2020 per capita annual emissions (t CO ₂)
8	40	64.01	4.50	117.52	8.27
	45			107.73	7.58
9	40	71.50	5.03	131.27	9.24
	45			120.33	8.47
10	40	79.78	5.61	146.48	10.31
	45			134.27	9.45

Table 30.3 The first time estimate of Chinese energy consumption in 2020

	Increment of GDP		
	8 %	9 %	10 %
First energy consumption after reducing 40 % emission	53.26	58.89	66.11
First energy consumption after reducing 45 % emission	47.72	53.69	60.32

Table 30.4 2009–2020 Chinese energy average growth rate and energy elasticity coefficient

GDP growth rate (%)	8		9		10	
	40	45	40	45	40	45
Reduction ratio (%)						
Energy average annual rate of growth (%)	5.02	4.21	6.05	5.24	7.08	6.26
Energy elasticity coefficient	0.63	0.53	0.67	0.58	0.71	0.63
Per capita carbon emissions rate of growth	3.81	3.06	4.77	4.02	5.73	4.97

Table 30.5 2005–2009 Energy-saving cases

	Invariable GDP (billion)	Total energy consumption (million tons)	Total emissions of CO ₂ (million tons)	Unit GDP consumption of energy (ton/ten thousand Yuan)	Unit GDP carbon emission intensity (ton CO ₂ /ten thousand Yuan)
2005	18.39	22.47	56.26	1.22	3.06
2006	20.52	24.63	61.03	1.20	2.97
2007	23.19	26.56	66.06	1.15	2.85
2008	25.42	29.10	70.50	1.14	2.77
2009	27.63	31.00		1.12	

Data sources 2010-4-27 Science Times

30.3 Carbon Emission Reduction Exerts Pressure on Chinese Export Trade

30.3.1 Carbon Emission Reduction Suppresses the Increased Cost of Export Trade

The World Bank and the United States Peterson Institute release the research report to predict that once world carries out a full implementation of the carbon tariffs, the commodity made in China will face an average 26 % tariffs that can make Chinese exports reduce 21 %. The European Union, the United States and France have raised the carbon tariff system on the agenda one after another. Chinese food, tires and other industry have also received the alert of carbon tariffs.

Carbon emission reduction objectively has the trend that marginal cost and emission reduction difficulty increase with the reduction. From 1980 to 1999, Chinese annual energy intensity is below 5.22 %, but during 26 years from 1980 to 2006, the annual reduction rate of energy intensity is 3.9 %, the difference of which hides the fact that marginal cost is increasing.

Carbon tariff means levying special carbon emissions tariffs for import of high energy-consuming products. The structure of Chinese export commodity is low and still have not shaken off the old way to compete on cost. This extensive growth mode brings many problems and has to face many demanding complex technical foreign barriers, which has greatly restrained the exports of our products.

30.3.2 Energy Demand is Growing Fast; the Coal-Based Energy Structure is Difficult to Change

According to relevant prediction, energy consumption will continue the accelerate growth trend in the short term (Tables 30.3 and 30.4). By 2020, Chinese energy demand will have been reached 50 million t; from energy consumption structure, the proportion of coal consumption is too high. In 2007, proportion of coal is only 27.8 % in the global one-time energy consumption constitution that is less than 20 % in the developed countries. However, in Chinese energy consumption, the proportion of coal is as high as 69.5 %. Big coal consumption and high CO₂ emissions have made obvious characteristics of high-carbon in economic development process. So in the next period, China has severe form to solve the environmental pollution and reply to climatic change, besides the task is very arduous.

30.3.3 Lack of Effective Incentive Mechanism and Low Carbon Technology Development Face Many Difficulties

Technological innovation is the key to the development of low carbon economy, but in China is facing many difficulties of the development for low carbon technology [3]. On the one hand, we lack of complete and effective policy support system, although our country-related departments have formulated and issued some preferential policies which are related to and low carbon technology, but along with the development of structural reform, change in management agencies and faultiness of policies make policies exist in name only, and part of policies are not enforce for difficulty. On the other hand, Chinese low carbon technology project, especially the investment of large-scale demonstration project, mainly relies on government provisional appropriations and policy loans and international institutions donations and loans, which have not form a stable government input mechanism. At the same time, the support of financial system for the low carbon technology project is not enough. Even if some banks implement financing, but the credit loan amount is very limited, which cannot meet financing needs of low carbon technology's development. What is more important, the support from developed countries is much less, at present China introduces low carbon technologies mainly relying on the commercial channel, which has become burden of economic development.

30.4 Measures of Carbon Emissions Reduction in the Export Trade

30.4.1 Develop the Low Carbon Industries and Optimize the Export Product Mix

As the multiple pressures from adjustment of domestic economy and energy conservation and emission reduction of international society, we must deal with the harmonious development relationship of trade and environment to realize low carbonation and sustainable development of Chinese foreign trade [4]. So, we must adjust our current export industry structure with low technical content, environmental standards and value-added. In addition, governments should also further refine the export products policy to reflect carbon emissions features in export product tax and price, adjustment of product structure and policies and regulations about internal and external investment, and prevent China from becoming the world's energy consumption base and pollution discharge pool. Besides we should further concern and have more in-depth researches on the problem about multi-national load transfer of environment hidden in huge trade shun defining Chinese responsibility in the global greenhouse gas emission reduction reasonably.

30.4.2 Adjust the Export Trade Policy, Encourage Participation of Stakeholders, Reduce Carbon Emissions of Per Unit GDP

China should levy domestic carbon tax to make American carbon tariffs lose rationality while implementing preferential taxes and preferential credit and other supporting measures to finally form a green policies and regulations system. Once China levies carbon tax to domestic enterprises, it will become double taxation if importing country levies carbon tariffs again, which is against WTO agreement [5, 6]. And that will undoubtedly increase enterprise cost and reduce export competitiveness. Increase of carbon cost may lead to the increase in the price of domestic products and make some damages to the economic growth. However, this will be good for adjustment of Chinese industrial structure, and the growth of general economy and employment may not necessarily suffer great losses. Rather than allow other countries levy carbon tariffs to subsidize their enterprise, we had better first levy a carbon tax and use it for carbon abatement of our companies. Meanwhile, China can still draw lessons from the practices of Europe: on the one hand, levying carbon tax and on the other hand reducing the rate of enterprise income tax and the labor protection that enterprise pay. In this case, enterprises' overall cost has not increased, and we can also encourage participation of stakeholders.

30.4.3 Strengthen Low Carbon Technology Research and Development, and Participate in the Formulation of International Standards

Take participating in the formulation of international standards as a breach; to further enhance the competitiveness of several industries is the major decision of Chinese government. Therefore, the relevant departments of the state put forward that to 2007 the international standards that China participates in are totally 300–500 items in which over 50 items are drafted mainly by China or transferred and adopted from Chinese standards. But it requires to invest a lot of research funds to form the technical standards that can get the international recognition with own technical innovation separately and needs a series of strategic resources, which general Chinese enterprises cannot bear at present. Therefore, to participate in international standards, China should pay much attention to the construction of technical alliance between domestic enterprises, meanwhile, actively strive for the technical alliance of international manufacturers, and research the technology and participation standards to compensate for their strategic resources gap. The national energy saving and emission reduction standardization technical alliance is established in Beijing on April 29, which is a sign that China standardization of energy saving and emission reduction has a new open information and technology platform.

30.4.4 Actively Participate in the International Carbon Trading

With the Kyoto Protocol, international society has established many carbon emissions trading markets including clean development mechanism (CDM), emissions trading (ET) and joint performance (JI). As for the financial crisis, brown economy that blindly seeks high commodity exports has been out of date, China should make trade-offs between trade benefits and environment, and establish low carbon trade and investment system to avoid pollution outsourcing and carbon leakage, improve the admittance threshold for the foreign investment and obtain more national strategic interests. CDM is a win-win mechanism to promote the developed countries to transfer technology and capital to the developing countries so that developing countries can receive funds and clean technology to promote sustainable development while developed countries can obtain low cost of carbon emission rights. Climate change has brought huge opportunity, and carbon trading, low carbon products and low carbon service market have very well-explored prospects.

China has become the world's largest carbon emission rights supplier; according to the volume calculation, its market share already accounts for nearly 40 % of the globe. However, as international carbon-trading rules is basically formulated by developed western countries, China is lack of discourse. CDM project is between the main forms for China to have carbon emissions trading with the western countries. In 2008, the reductions volume China nuclear card CDM project takes up 84 % of the total volume of world. But as China is in the bottom of industry chain of the whole carbon trading and is lack of the direct transaction platform with the secondary market of international emissions trading. So, these reductions in nuclear card can only salt to developed countries with cheap price, which makes foreign trade agencies obtain permits, and China only descends to the cheap emission reduction tool for developed countries. In order to change the disadvantage in the global carbon trading that gains national strategic interests in the low carbon economy, we should improve the domestic carbon-trading system and establish own carbon-trading market and get rid of dependence of international carbon-trading market so that we can get out from the lowest level of carbon-trading industry and have more rights of discourse and pricing power to protect the interests of all Chinese enterprises. Under the CMD mechanism, with constraint CO₂ emissions credits, developed countries enterprise and government agencies can have cooperation with developing countries' energy conservation and emission reduction projects by transferring the technology and invest funds to get the carbon emissions that the project has reduced, which creates good conditions for Chinese enterprise industry's green upgrades. The related enterprise should be guided by government and take part in the upgrades to get direct economic benefits and obtain upgrades channels of energy conservation and emission reduction technology to complete enterprise green upgrades with low cost so as to participate in international competition with high value-added cleaning products.

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Chapter 31

Research on Sole Proprietorship of Transnational Corporations in China

Yu Liu

Abstract Investment of transnational corporations in China has experienced the transformation from principally cooperation and joint venture to principally sole investment and holding. These are all problems worth paying attention to: what influences wholly foreign-owned enterprises tendency will bring to Chinese economic; whether it will control Chinese economic or threaten industry safety; what sole influence will proprietorship make to Chinese economic development and how to deal with it.

Keywords Foreign direct investment · Sole proprietorship · Influence

31.1 Current Condition of Exclusively Foreign-Owned Investment in China

31.1.1 Definition of Sole Proprietorship

Generally, sole proprietorship of foreign investors mainly refers to the process of making joint ventures into transnational corporations by holding or total purchase through increasing their investment. In this paper, sole proprietorship mainly includes new-found sole corporation of transnational corporation or total purchase to get subsidiary corporations. In addition, it also includes acquires control rights of enterprises through increasing their investment, thus realizes sole proprietorship and makes it a subsidiary corporation.

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31.2 Present Situation of Exclusively Foreign-Owned Direct Investment in China

With the deepening of reform and opening up, the market mechanism keeps on perfecting. Foreign investment mode of entering into Chinese market has been changed, from mainly joint venture at the beginning to the current sole proprietorship. The sole proprietorship trend of foreign investors is apparent (see the data in the Table 31.1). An apparent fact is that the pace of sole proprietorship is fastening, which makes the foreign investment accounts for main places in many industries, even becomes monopolist in the industry.

Analysis of Passive Influence of Exclusively Foreign-Owned Direct Investment in China.

Cause Intensified Monopoly in Chinese Market; Part of It Threatens China's Economic Safety The amount of foreign investors' sole proprietorship is on the increase. In some areas, the competitiveness of transnational corporations is strong, making considerable domestic business hard to survive [1]. Foreign businesses are leading the industries. The market competitiveness of domestic business is becoming more and more severe. Moreover, the main status of domestic and foreign business in some industries has threatened the economic safety of the country.

Erode Brands Transnational corporations in China pay great attention to brands strategy. In it, brand block is the common strategy for transnational corporations in China. In the beginning, transnational corporations prefer joint venture when entering the Chinese market. But once they achieve the control rights of joint venture, they "freeze" Chinese brands or just use Chinese brands for low- or middle-grade products. Using private brands for high-grade product and then making full use of Chinese sales net will bring the products into Chinese market easily. Many domestic brands were beat in this way and disappeared.

Control Internal Trade and Transfer Prices In global strategy of transnational corporations, parent firms and subsidiary firms, subsidiary firms with each other apply a price when trading internally, which is called "transfer price" in transnational corporations. It is determined by internal special management department in transnational corporations and according to the whole management strategy and whole profit maximum principles [2]. The standard is "market intermediation."

Table 31.1 Material resource: 1998–2009 statistics yearbook

Years	The actually paid-in capital (100 million dollars)			Rate (%)
	Joint venture	Sole proprietorship	Amount	
1997	194.95	161.87	452.57	32.77
2000	143.43	192.64	407.15	47.31
2005	146.1	429.6	603.25	71.21
2007	155.96	572.64	747.68	76.59
2008	192.21	731.74	923.95	79.20

“High importing and low exporting” refers to export raw materials, equipment and spare parts with high prices and lower the prices of manufactured products. This way can make the profits in domestic firms lower or even lose. Correspondingly, reduce tax and result in a large amount of taxes losing. When transnational corporations entering into Chinese market, with the method of sole proprietorship, the entire control rights of their subsidiary companies is owned by parent companies. In this way, it is benefit for parent companies to control the inner trade and transfer prices. For Chinese government has information asymmetry inevitably, transnational corporations can get rid of taxes by transferring prices.

Weaken Technologies Leak of in Transnational Corporations Generally, the leak of technologies in Chinese and foreign joint ventures is larger than those in foreign sole proprietorship companies. For joint ventures, the advanced technologies and management experience can be learned by Chinese more easily. But in foreign sole proprietorship companies, this way of learning is not so easy. The leak of technologies should be partied in foreign sole proprietorship companies [3]. Advanced technologies are not easy to acquire. But transnational corporations can further strengthen the menology power in China. In talent flow, sole proprietorship companies usually use their excellent working conditions to introduce high technology talents from enterprise with domestic funding and research and scientific academies. This is the free expansion of new technologies to transnational corporations, which is called “technical diffusion in contrary motion.”

Cause Loss of Talents Compared with domestic firms, transnational corporations in China have apparent advantages. Their standard management system, good motivation mechanism, perfect training system and good welfare are important conditions. These can easily cause domestic talents to get into transnational corporations. It will make the research accumulation in China flow into foreign companies, which is apparently harmful to the technology innovation in China. It can be said that the fight of human resources in market competition is the most fierce and deadly. Transnational corporations can attract a large amount of domestic talents by good welfare and flexible human mechanism while these talents are the most excellent entity in China.

31.3 Countermeasures to Cope with Exclusively Foreign-Owned Investment for Transnational Corporations

31.3.1 Policies in the Aspect of Government

Strengthen Anti-Monopoly Law and Perfect Law and Regulation Environment With the fastening pace of foreign sole proprietorship, the menology status of transnational corporations in China at the same time keeps strengthening. It is very important to create domestic good market environment and provide effective

law protection. Given this, departments in government should strengthen the realization of anti-monopoly and regulate competition environment.

First, ensuring the effective execution of “Anti-Monopoly Law,” “Anti-Monopoly Law in People’s Republic of China” has been carried out in Aug 1, 2008. In mature market economic countries, “Anti-Monopoly Law” can be seen as the most powerful tool to protect fair competitive market orders. But the current “Anti-Monopoly Law” in China has not yet been mature. So, it is urgent to build anti-monopoly rules to solve some problems. At the same time, cultivate the ideas of anti-Monopoly should be cultivated. Moreover, practical anti-monopoly system is to be built, which is the necessary choice for government.

Strength Tax Supervision In order to fight against the tax avoidance in transnational corporations, it is necessary to regulate transfer price tax system and build international market price information system, to set up special institutes to transfer price tax system, at the same time, to investigate and to adjust the tax and accounting, and to protect the Chinese interests in joint ventures. Chinese certified public accountant should carry out strictly the accounting audit system for concerning foreign enterprises. This can adjust partly transfer price in auditing stages. It is an important task to build systematic international market price system.

Currently, electronic commerce is developing rapidly. So, the measures to regulate e-commerce international tax avoidance should be carried out. First, the tax system should meet the requirements of e-commerce. After that e-commerce tax registration system should be promoted. Lastly, the problems related to tax imposition of e-commerce by starting from payment system should be solved.

31.3.2 Countermeasures of Enterprises

Enlarge Independent Research and Development, Improve Core Competitiveness of Enterprises In order to hold considerable share in the market with the challenge of transnational corporations, enterprise with domestic funding should strengthen and cultivate core competitiveness. It mainly embodies in technology development and innovation ability. It can be said that for enterprises build their own core competitiveness, they have to innovate technologies, strengthen research and development ability. This is a progress keeping pace with the times, and it needs continuous exploration.

Enhance Brands Protection Awareness As said before, during the process of setting up joint ventures, Chinese part has to protect self-interests. Now that we all realize brands are the basis of enterprises development, and also the invisible asset for enterprises. Chinese part has to realize the value of brand asset and pay attention to asset accumulation. Especially for those brands with many years cultivation and certain reputation, we should prevent famous brands from being occupied by foreign parts. On the one hand, we should realize the influence of

brands in foreign parts is larger than that in Chinese parts. On the other hand, if foreign parts occupy the famous brands in Chinese parts, Chinese part will lose the advantage of competition for the market share is lowered, resource advantages are disappeared. Therefore, brand awareness and brand strategies in transnational corporations are the objects of learning.

Asset value of brands in joint venture should be learned and evaluated accurately. Different strategies according to different industries for domestic brands should be applied. Domestic brands reasonably in merger and acquisition of transnational corporations to avoid the loss of domestic invisible assets should be treated.

Build Strategy Union and Integrate Industry Chain Transnational corporations currently are no longer satisfied with investing single projects; their objects are to drive the whole industry chain to invest. Transnational corporations found sole proprietorship enterprises in China. It is also the new international strategy adjustment and business process basing on China. For competition in foreign transnational corporations, Chinese big enterprises should pay attention to cooperation with each other even if they have competitive relationship in the market. For example, found strategy unions of technology research and development, lower the risks and costs of technology development and found strategy unions of enterprise with domestic funding through the ways of cooperation, union, purchase and merger. Enterprises in the whole industry chain can extend the industry chain. In this way, industry cluster effect can be enlarged. A classical case is that Carrefour has been out of the Kong Hong market by two local Chinese firms. Found domestic enterprises union and strengthen the cooperation between enterprise with domestic funding are important channels to improve the entire competitiveness of enterprises with domestic funding and cope with the competition with foreign transnational corporations.

Build Effective Talent Excitation Mechanism Talent excitation is an important matter that all enterprises have to face. The method of transnational corporations in this area is more advanced and regulated. The excellent talents in our country have been attracting by transnational corporations with a fast speed. Of course we can see that the excitation mechanism in some famous enterprises is very well. Some domestic workers learn and accumulate experiences in transnational corporations and then choose to found a company of their own or go back to enterprise with domestic funding to work. This, however, better proves that that foundation of effective talent excitation mechanism is urgent and necessary. The foundation of talent excitation mechanism has to pay attention to the three following points: first, to enlarge talents consideration range. High-level talents have to be motivated as well as ordinary workers. Second, the cultivation of talent potentiality is prior to merely simple knowledge such as learning technologies and skills. Specific methods should be worked out in order to motivate the potentiality of workers.

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Chapter 32

Efficient Scheme to Improve the Technological Innovation Abilities of Special Industrial Bases

Chang Li and Hong Qing Rong

Abstract The technological innovation is a key step to enhance the core competitiveness of special industrial bases. At present, the special industrial bases all over the country begin to develop from the scale-expanded development stage into the quality-improved mature stage, and the innovation driving has been an inevitable choice for the industrial bases to be optimized and upgraded. Strengthening the research abilities of enterprise technology centers and technological incubators, establishing public technological service platforms, extending “the commercial application of politics, productions and researches” innovation R&D cooperation carriers, improving the public service systems of industrial bases and regulating macro-management frameworks are the effective paths to improve the technological innovation abilities of special industrial bases.

Keywords Industrial bases · Technological innovation · Synchronous development · Paths

32.1 Introduction

Since established in 1995, the national torch plans special industrial base always focuses on the national key revitalization industries and the strategic emerging industry fields, promoting the high-tech special industrial bases to develop all over the country rapidly, and having transformed into an important carrier and impetus for the optimization, upgrade and development model change of local industries.

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Improving the technological innovation ability of the special industrial bases and realizing the synchronous development of the special industrial bases and technology R&D centers are important subjects to achieve the innovation driving of the industrial bases and to strengthen the industrial competitiveness with the industrial innovations.

32.2 Special Industrial Bases and Technological Innovation Abilities

The industrial bases are a typical form of industrial clusters in essence. The “industrial base” term was a concept first mentioned by American Digital Equipment Corporation CEO Jane Holland in the research of the corporation strategic alliance and industrial cluster [1]. It was thought by him that the industrial base refers to a relatively concentrated area gathering one or several industrial chains or groups with distinctive product characteristics, advanced technologies, larger industrial scales, good economic returns and broader market prospects, which is a district compacting one or several products, enterprises, R&D centers and talents, and is a new production and management model.

In 1995, the strategy of invigorating China through science and education in the “Decision of the State Council Concerning the Deepening of the Reform of the Science and Technology Management System” was formulated [2]. Since then, the industrial clusters all over the country attain a great development and expansion and gradually form into the industrial bases which become the important supports for the rapid development of regional economies, the new economic growth points of competitive industries with the introduction and arrangement of innovative resources as the major sticking points.

The technological innovations of special industrial bases are founded on the innovations within enterprises, but the industrial technological innovation ability is not a simple combination of the enterprise innovation abilities. The industrial innovation taking the special industrial bases as the carriers and the technological innovation as the core is an organic integration of the technological innovation network of the industrial clusters, and is a social cooperation process and a dynamic system, and also is a multidimensional integrated innovation of the technology, system, environment, organization and management as well as the cooperatively interactive innovation. The technological innovation system framework of industrial bases is composed of the innovation platform and system. There are five main bodies in the innovation platform, namely government, enterprises, higher learning schools, scientific research institutions, agencies and industrial organizations and users. Also, the innovation platform is divided into three levels: macro-public platform, medium resources platform and micro-operation platform. Based on the inner relation, the five systems including the technology, organization, institution, environment and policy come into being (see Fig. 32.1).

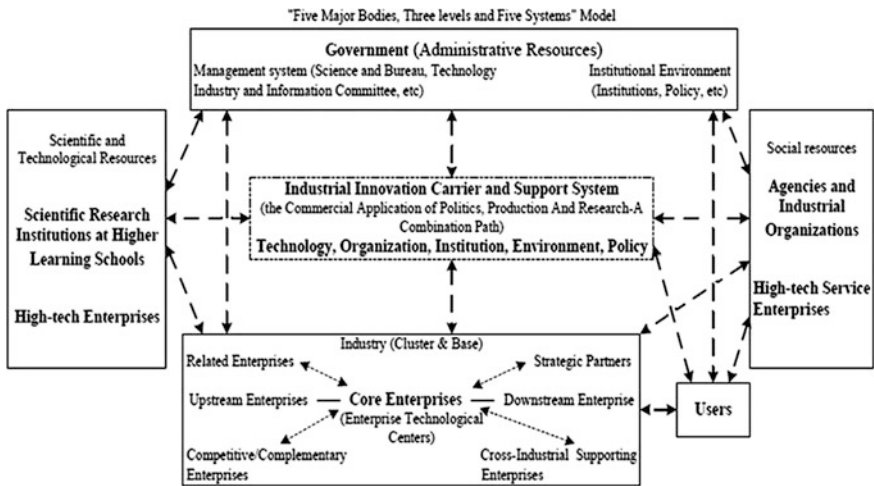


Fig. 32.1 The industry-based technological innovation system framework

32.3 Analysis on the Problems in the Technological Innovation of Special Industrial Bases

32.3.1 Small-Scale, Weak-Ability and Poor Technological Supporting Capability in Enterprise Incubators

The special industrial bases are marked with the local characteristics and are majored at the high-technology industries. However, some new bases are still in developments, so the technologies of their production and manufacturing, product and process are in the middle and low ends, which are able to meet the general needs at markets, but have not formed into the urgent needs on the high technologies. However, the technological R&D centers of the industrial bases are mainly established with the form of the incubator, so its scale is small, the science and technology condition is weak, the capability to undertake risks is weak, self-operation and innovation ability is limited, and the running costs and risks in the initial stage are high, posing restrictions on the improvement of the scales and technologies to some extent.

32.3.2 Operation Mechanisms and Abilities of Technological R&D Centers of Core Enterprises to be Improved

The technological R&D centers (technological innovation incubators) of the industrial bases are mainly oriented at the small and medium-sized enterprises; the core or leading enterprises with strong strengths in the mature special industrial

bases usually have their own technological R&D centers and cooperation networks. However, all technological R&D centers of the industrial bases and the enterprises are confronted with the shortage of motivation, the limited funds investment, the key scientific and technological difficulties to be tackled, the operation and cooperation mechanisms, the business models, the science and technology R&D supporting, the R&D resources reservation (absorption reservation and of talents, fundamental theories researches, etc.), technological innovation system, etc.

Insufficient Innovation Network Development of Industrial Clusters, Unsmooth Path for Science and Technology Resources to Link to Enterprise Needs, and Short Innovation Carriers.

The home-grown R&D powers of the enterprises within the bases are still obvious to be insufficient, and especially they are short of the R&D abilities of industrial core and generic technologies, so it is hard for them to form a innovation network among the cluster enterprises, and the development of the technological innovation network among enterprise is in shortage.

Insufficient Investments on the Construction of Technological Innovation Public Service Platforms and Relatively Lagging Management Models of Industrial Bases.

Each special industrial base establishes a certain number of technological R&D platforms, but the investment is limited, talents are in shortage, sustaining power is insufficient, and the sharing and integration between the public technological service platforms is not high enough as well. The infrastructure of public technological service platforms, information networks, professional databases, public laboratories, professional test analysis centers and other service systems in the industrial bases is still necessary to be improved well. The joint tackling of key technologies, R&D cooperation carriers, operation and cooperation mechanisms in the public technological services and other platform cooperation mechanisms as well as the industrial park management, department segment management and local government administrative management all are hard to meet the development requirements of the open and cross-regional technological innovation organization model in the industrial bases.

32.3.3 Shortage of Technological Innovation and Management Talents to Give Rise to the Insufficient Sustaining Power of Industry-Based Developments

The special industrial bases are in the different developments and have different demand keys on the resource elements. As the industrial bases step into the mature developments, the strategic resources will transfer from the capitals and projects into the technological and management talents and need to introduce “brains”—

strengthening the scientific and technological innovation management through the introduction of R&D institutes and innovative results and from the scientific and technological sources. In addition, the shortage of talents exists all over the country universally gives rise to the insufficient sustaining powers of the industrial bases developments, and the same structures in the industries are highly severe.

32.3.4 Unsound Developments of Social Service Systems and Slow Developments of the High-Tech and Social Services Industries

The development of the intermediary organizations is slow and also the social service systems are not well improved. At the present time, the bases are in short of the development production service industry and high-tech service industry; many service projects cannot totally undertake the risk investment, technological transaction guarantee, technological innovation financing guarantee, middle- and small-sized enterprises finances, laws and management service, etc.

32.4 Selection of the Paths to Improve Technological Innovation Abilities of Special Industrial Bases

Strengthening R&D Abilities of Enterprise Technological Centers, Driving the Innovations of Industrial Chains and Clusters and Establishing Home-Grown R&D Demonstration Bases.

The core manufacturing enterprises are the central nodes of the cluster enterprises R&D networks and also are the national or provincial enterprises technological centers, integrating the application fundamentals, researches and technologies, but the enterprise resources are limited, and thus, the governments should improve their R&D abilities. The industrial R&D cooperation networks can be constructed under the leadership of the core manufacturing enterprises, based on the enterprises technological centers and by starting from the generic technologies, and hence, the industrial chains and clusters innovations can be driven completely by the overflowing knowledge and the synchronous learning and doing paths.

Supporting Technological Incubators, Establishing Public Technological Service Platforms and Realizing Synchronous Developments with Industrial Bases by “Technological Roadmap” to Breakthrough Technologies.

The establishments of the public technological service platforms are the duties of the governments to implement the public services, so governments are necessary to exercise the advantages in resource allocations, coordination and organization, and support and guide the research and development of the public technologies. The government science and technology departments shall transfer the project funds

into the technological innovation funds, formulate a five-plan and implement it by stages, increase the operation abilities of technological incubation centers, establish industrial technology engineering centers, product quality inspection centers, product authentication centers and other public technological platforms.

Expanding the “Commercial Application of Politics, Production & Research” Innovation R&D Cooperation Carrier and Establishing Domestic and Foreign Innovation Resource Joint Platforms.

On the basis of the existing alliances, it is necessary to encourage enterprises to develop toward the alliance of the regional industrial technology innovations and establish a diversified and opened technological innovation alliance under the leadership of enterprises but along with the participation of scientific research institutes and set up a diversified R&D cooperation network with continuous and stable development. At the same time, by applying the experience of Taiwan to construct the industrial technology research institutes [3], establishing the entity research institutes such as “Industrial Technology Research Institutes” as the carriers, collecting the science and technology and talent resources of higher learning schools, the major R&D results and industrial strengths, and focusing on the breakthrough of the core technologies, great numbers of important innovation platforms can be established with emerging technology R&D and industrial gathering abilities [4].

Establishment of Long-effective Element Investment System and the Synchronization of Policy Guidance, Environment Supporting and Encouragement to Innovation Project R&D.

The technological R&D requires large investment, high risk, long return period and fierce market competitiveness, so it is necessary to formulate a long-term strategy, invest funds and reserve talents. Therefore, the governments necessarily provide not only the fundamental environments but also the development environment and then establish policy support systems and operation mechanisms for the banking public finance, taxation, technological talents, innovation projects, etc. In addition, the overall-process mechanisms with long-term effects can be founded, such as the “production, study, research and application” joint bidding system, governmental allowance system for the project R&D, science and the technology “1,000-elite Program” talents reserving system.

32.5 Improving Public Service Systems of Industrial Bases and Establishing Multilevel Public Service Platforms

The relationship of the industrial bases with the technological R&D, innovation and services is the mutual promotion and interactive development. Therefore, it can be seen that the improvement on the services within the industrial bases is beneficial to the enhancement to the whole level of the industrial bases. Also, it is necessary to establish the technological innovation service system with the governmental

supports and people's leadership and set up the logistics, information and storage centers and other public service platforms in the industrial bases, and hence enhance the public supporting facilities and management modernizations.

Standardizing the Macro-Management Framework, Establishing and Improving the Coordination Operation Mechanism and Developing Social Service Organizations to Support Industrial Innovations.

Currently, the verification and management of China's industrial bases are implemented by multiple parties; the responsible institutions all over the country are different, with the science and technology departments or the economic and information committees as the main bodies; the verification standards and investment policies from all systems are different as well. All these give rise to the decentralization and poor utilization efficiency of the innovation resources. Therefore, it is necessary to explore the regional industry-based management models, by introducing Germany Trinitarian technological innovation management system integrating industries, education and science and technology sectors [5], and the special establishments of the research innovation and enterprise committees whose members include all innovation elements, and the national research foundations, learning research foundations, industrial innovation guiding committee in Singapore to development its biomedicine industry [6].

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Chapter 33

Study on Technical and Economic Integration Assessment Based on Transmission Planning

Ding Yi Cen

Abstract In engineering, technology assessment and economic evaluation in transmission expansion separate planning scheme selection. It cannot fully assess planning scheme. This paper presents a new transmission planning method based on the technology and economic integration assessment and establishes the evaluation index system for an organic whole. Considering the influence of uncertainty factors, the synthetic sensitivity analysis method is put forward. The project example shows that the technology and economic integration transport planning evaluation method is feasible, and this method can effectively overcome the defect of the choice of economic transmission.

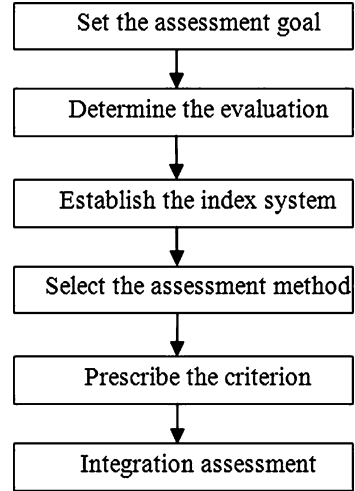
Keywords Technical and economic assessment · Technology assessment · Transmission planning

33.1 Introduction

The transmission system is one of the major components; reasonable transmission power industry planning scheme can not only get huge social benefits but also get economic benefits [1]. Transmission planning method can be divided into two categories. One is a scheme comparison method. It is widely used in engineering. Another kind is a mathematical optimization method. Using single scheme evaluation index comparison methods, it is based on the scheme contrast and selects the optimal scheme of the economy and preliminary feasible scheme, and it has no

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Fig. 33.1 Flowchart of integration assessment



smaller technical differences. Scheme comparison method is easy, and its simple features can be widely applied in engineering [2–5], but it cannot comprehensive evaluation planning scheme [6]. Based on the mathematical optimization method, it establishes a mathematical model and operational research constraint condition, from planning objective function transmission. This is the solution to the problem of optimal solution, in a particular transmission scheme optimization algorithm. Mathematical optimization method is strictly based on reasoning, but along with the increase in the number of the most ideal object, especially the only goal, the network changes in the scale of the optimal scheme will be highly complex; even if it gets optimal solution, it does not work. Is this the reason that mathematical optimization method cannot widely used in engineering design. The integration assessment flowchart is shown in Fig. 33.1. The process of integration assessment includes the following six steps:

Step 1: Set the assessment goal

The first step is based on evaluation target according to type, conditions, scope, evaluation objects and some other factors.

Step 2: Determine the assessment scope

The second step is to determine evaluation scope. Analyzing these factors have contributed evaluation target, to know that these factors, and choose the correlation of some main factors comprehensive evaluation method [7].

Step 3: Establish the index system

According to design some index evaluation target, scope and understand relevant index, the calculation method of the index has been put forward.

Step 4: Select the assessment method

Integrated evaluation method includes the qualitative method, quantitative method and mix. An appropriate evaluation method in response to the index system is chosen. Normally, using the linear evaluation method, using linear weighted and value evaluation value integration of these indexes.

Step 5: Prescribe the criterion

There are two methods to prescribe the standard: (1) opened marginal value evaluation and integrated various solutions that compare the marginal value. (2) choosing optimization scheme sorted by size integration evaluation value. The method is used after.

Step 6: Integration assessment.

33.2 Technical and Economic Integration Assessments for Transmission Planning

33.2.1 Process of Integration Assessment

This paper establishes the framework of index system for transmission planning integration assessment; see Fig. 33.2. These indexes are classified into three sorts as follows:

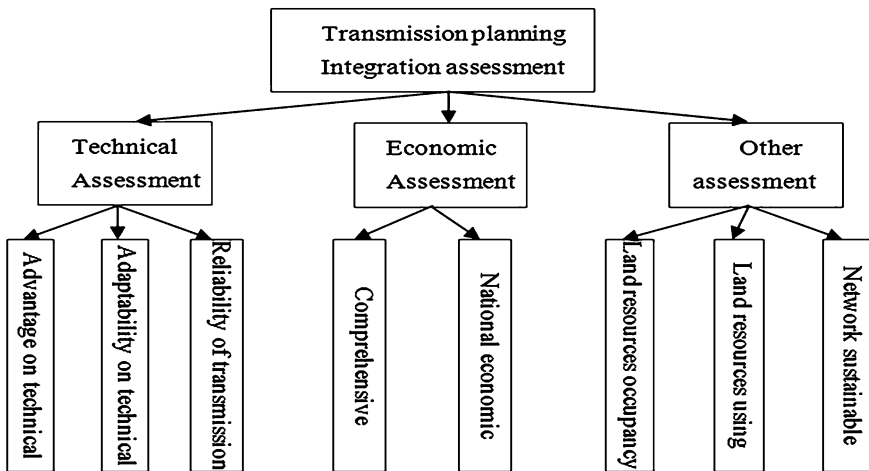


Fig. 33.2 Index system of transmission planning integration assessment

(1) Technology assessment index

From the point of view of technical, there are four indexes: advantage on technical (X_1), adaptability on technical (X_2) and reliability of transmission system includes the adequacy (X_3) and security (X_4). Usually, the X_1 and X_2 are qualitative description.

EENS describes the expected energy not supplied due to the transmission network fault. PLOS describes the probability of system loss of stability due to the transmission network fault. The calculating method of X_3 and X_4 was described in [8] and mainly considers the fault of new additional transmission network in primary feasible transmission planning schemes.

(2) Economic assessment index

There are two indexes for economical assessment: comprehensive transmission cost (X_5) and national economy contribution (X_6).

$$\begin{aligned}
 X_5 &= \frac{\text{Equivalence annual expenses}}{\text{Mean annual transmission electric energy}} \\
 X_6 &= \sum \left(\frac{\text{GDP of receiving energy area}}{\text{Total electric energy consumption}} \times E \right)
 \end{aligned}
 \tag{33.1}$$

Transmission energy E is the corresponding receiving electricity region’s new project. National economic contribution index is designed for varieties to transmit power distribution solutions in expansion plans. If every power allocation plans, this index can ignore.

(3) The other assessment index

There are three indexes: land resources occupancy (X_7), land resources using efficiency (X_8) and transmission network sustainable development (X_9). X_7 is transmission expansion planning occupying the land resources, and it is the sum of farmland occupancy, forestland occupancy and residential occupancy.

$$X_8 = \frac{\text{Transmission capacity of right of way}}{\text{Width of right of way}}
 \tag{33.2}$$

Usually, transmission network sustainable development described by the minimal short-circuit current margin, because the circuit breaker has limited switch ability.

$$X_9 = 1 - \frac{\text{System maximal short - circuit current}}{\text{Breaker allowable maximal short - circuit current}}
 \tag{33.3}$$

By assumption, the preliminary feasible transmission expansion plan scheme number is n , and the index number of index system is nine (X_1, X_2, \dots, X_9). So, the decision-making matrix is $A(a_{ij})_{n \times 9}$. The element a_{ij} is the index value of X_j on preliminary feasible transmission expansion plan scheme I , and the calculating method of index X_j as above the established index system.

33.2.2 Integration Assessment

This paper puts forward the difference method the largest integrated evaluation index, the largest index difference method to solve the weight of every index, and using the linear weighted and operates these indicators [9]. The index should endow small weight if these values of a specific index in the index system every basic feasible transmission scheme nuances and no distinction, or anything else, should give greater weight. That is the basic idea of maximal index differentia method. This method includes following four steps:

Step 1: The value of index normalization

If the value of a certain index is larger and the preliminary feasible scheme is much more superior, we called the index as benefit type index, else we call it as cost type index [10]. To normalize the index value, use the following formulae to decision-making matrix elements:

When index j is benefit type index, $x_{ij} = \frac{a_{ij}}{\max_i(a_{ij})}$.

When index j is cost type index, $x_{ij} = \frac{\min_i(a_{ij})}{a_{ij}}$. Where $i = 1, 2, \dots, n, j = 1, 2, \dots, 9$. Then the normalized decision-making matrix is $n \times 9$.

Step 2: Construct the assessment function

The value vector of these normalized indexes of preliminary feasible scheme I is $X_i = (x_{i1} \ x_{i2} \ \dots \ x_{i9})$, and the weight vector of these indexes is $w = (w_1 \ w_2 \ \dots \ w_9)^T$, and the integration assessment function $Y = f(X)$ is

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix} = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} \times w \tag{33.4}$$

Step 3: Solve the index weight

To the index j , use V_{ij} describe the preliminary feasible scheme I difference from the rest schemes, defined $V_{ij} = \sum_{i=1}^n |x_{ij}\omega_j - x_{kj}\omega_j|$, and the total difference of index j as $V_j = \sum_{i=1}^n V_{ij}$, all of index total difference is $V = \sum_{j=1}^9 V_j$. Maximal index differentia method, in other words, maximum V , considers the normalization constraint condition $w^T w = 1$ and can solve the weight using the formula:

$$\omega_j = \frac{\sum_{i=1}^n \sum_{k=1}^n |x_{ij} - x_{kj}|}{\sum_{j=1}^9 \sum_{i=1}^n \sum_{k=1}^n |x_{ij} - x_{kj}|} \tag{33.5}$$

where $j = 1, 2 \dots 9$.

Step 4: Calculate the integration value

Through the integration assessment function (7), we can obtain the integration value of each of preliminary feasible scheme y_{es} (where $i = 1, 2, \dots, n$) and sort these preliminary feasible schemes by integration value size to decision maker for choosing the optimal transmission planning scheme.

33.2.3 Composite Sensitivity Analysis

Due to some uncertain or other factors that are existing, the index value will change, and the normalized decision-making matrix $(x_{ij})_{n \times 9}$ has a change quantity matrix $(\Delta x_{ij})_{n \times 9}$. In order to research the maximal allowable change quantity value subject to unchanged sorting of schemes, this paper presents the composite sensitivity analysis method [11].

The minimal integration value difference is defined as $h = \min\{|y_i - y_j|, i \neq j\}$, and the integration value change quantity is given as follows:

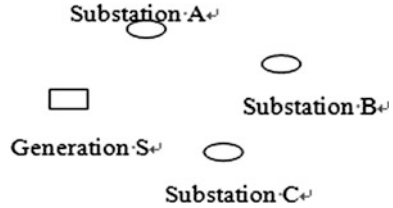
$$\Delta Y = \begin{bmatrix} \Delta y_1 \\ \Delta y_2 \\ \vdots \\ \Delta y_n \end{bmatrix} = (\Delta x_{ij})_{n \times 9} \times w, \Delta y_i \leq \sum_{j=1}^9 |\omega_j \Delta x_{ij}| \leq \sum_{j=1}^9 |\Delta x_{ij}| \quad (33.6)$$

If $\Delta y_i \leq h$ (where $i = 1, 2, \dots, n$), these uncertain factors are not effect the sorting of schemes, and more the total index change quantity of a certain scheme is not greater than h , it is not effect the sorting of schemes, either [12]. Due to this criterion can identify the influence of not only a single index changed but also multiple indexes changed to scheme sorting, this paper called composite sensitivity analysis.

33.3 Simple Case

The proposed technical and economic integration assessment method was applied to a project case system as shown in Fig. 33.3. The new generation station (generation S) output capacity is 4,000 MW, and it may be connected to the transmission network by substation A, B and/or C [13]. These three substations are in different areas, and the distance from generation to substation A, B and C is 90, 150 and 70 km. There are four AC transmission planning scheme: Scheme A , three-circuit transmission line from generation to substation A ; Scheme B , three-circuit transmission line from generation to substation B ; Scheme C , three-circuit transmission line from generation to substation C ; and in Scheme D , for two-circuit transmission line from generation to substation A , the transmission capacity

Fig. 33.3 The geographic layout of generation and substation



is 2,000 MW, and for two-circuit transmission line from generation to substation C, the transmission capacity is 2,000 MW.

The basic data of transmission planning: Mean annual working hours of generation *S* is 4,000. Economic life is 30 years. Discount rate is 8 %. The investment of one AC 500-kv interval is 12,000 thousand RMB yuan. The investment of per kilometer 500-kv AC two-circuit transmission line (4 × 400) on the same tower is 2,800, 3,000 and 3,600 each in area *A*, *B* and *C* (the unit is thousand RMB yuan). The investment of per kilometer 500-kv AC single-circuit transmission line (4 × 400) is 1,410, 1,520, 1,830 each in area *A*, *B*, *C* (the unit is thousand RMB yuan). The ratio of output value to unit electric energy consumption is 20.6, 10.7 and 9.0 each in area *A*, *B* and *C* (the unit is RMB yuan/kWh).

The indexes value of every scheme formed the decision-making matrix

$$A(a_{ij})_{n \times 9}: A = \begin{pmatrix} 9.0 & 8.5 & 641 & 5.23 & 0.3017 & 3296 & 13 & 44 & 17.5 \\ 8.8 & 8.2 & 690 & 4.92 & 0.4433 & 1712 & 15 & 44 & 17.2 \\ 9.0 & 8.7 & 455 & 5.13 & 0.2849 & 1440 & 12 & 44 & 17.7 \\ 9.2 & 9.0 & 494 & 4.17 & 0.3894 & 2368 & 16 & 37 & 18.2 \end{pmatrix}$$

The index value in *A* notes that the scheme *A*, *B*, *C* and *D* are corresponded to the rows of matrix *A*, and the indexes X_1, X_2, \dots, X_9 are corresponded to the columns of matrix *A*. X_1 and X_2 are graded by ten experts, then adopt average score to quantify the X_1 and X_2 . X_4 and X_9 are percentage, X_4 is calculated by probabilistic security evaluation software PSD-PRE (in developing by China Electric Power Research Institute) and the index value of X_4 in *A* is multiplied 10^3 . The unit of X_3 is 10^4 kWh/year, the unit of X_5 is 10^{-2} RMB yuan/kWh, the unit of X_6 is 10^8 RMB yuan, the unit of X_7 is 10^4 m², and the unit of X_8 is MW/m. And the total investment of scheme *A*, *B*, *C* and *D* is 4.788, 7.035, 4.521 and 6.18 (unit is 10^8 RMB yuan).

33.4 Conclusion

Integrated evaluation technique is widely used in statistics, medical, military, economics and sociology. Recently, the analytic hierarchy process (AHP) and fuzzy comprehensive evaluation have gradually applied to power system. It is the research and application of transmission planning method, integrated assessment used in transmission planning [8]. This paper presents a new transmission planning method based on the technology and economic integration assessment and

established the framework of the technology and economic integration evaluation for transmission scheme and a set of evaluation index as one. In order to analyze the influence, the uncertainty of measurement results is the basis of options; this paper puts forward a comprehensive sensitivity analysis method. A simple example shows that the technology and economic integration transmission planning assessment is feasible, and it can avoid a shortage of selling method.

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Chapter 34

Study on the Knowledge Economy's Growth Model in Resource-Oriented Enterprises

Peng Li and Xiaochuan Guo

Abstract This article from the knowledge economy, content and features to explore the knowledge economy, resource-oriented enterprises to remain competitive, we must change the traditional growth model. For the characteristics of resource-oriented enterprises, according to technology, resources, business units three dimensions, the establishment of a resource-oriented model of firm growth TRU, and make resource-oriented enterprises in the knowledge economy's growth strategy under the logical choice, considering the technical state to, resources, status and business status, in order to establish their own unique competitive strategy. Technological innovation ability growth driven by business organizations to strengthen the operational ability of integration and resource management ability to determine the three dimensions of the basic resource-oriented enterprise growth direction, the three also constitute a model of its growth strategy, so as to promote resource-based business under the new economic environment for sustainable growth.

Keywords Knowledge economy · Resource-oriented enterprises · Growth model · TRU model

34.1 Meaning of the Knowledge Economy

In 1996, the Organization for Economic Cooperation and Development (OECD) gave a clear definition to the “knowledge-based economy,” and first put forward the index and test systems of this new economy. In the knowledge economy, the

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most important factors are the occupation, investment and allocation of the intellectual resources as well as the production (emerging), the distribution (communication) and the consumption (utilization) [1, 2].

34.2 Analysis on the Growth Mechanism of Resource-Oriented Enterprises in the Knowledge Economy

The resource-oriented enterprises are those organizations which focus on the developments and utilizations of the ground animal and plant resources and under ground mineral resources. In this paper, the author introduces the selection of the technological strategies of the resource-oriented enterprises by establishing a TRU model, which refers to the technology, resource and strategy business units. As shown in Fig. 34.1, in the three-dimensional TRU space, Technology, Resource and U represent the strategic business unit (SBU) [3, 4]. In this model, there are 27 space positions for the resource-oriented enterprises; the enterprise managers can select their own development strategies by deciding their technological ability, resources and businesses.

Based on the Fig. 34.1, the technological selection, resources and business units in the resource-oriented enterprises have an inseparable relationship with the strategies, which is specifically explained as the following.

Explanation 1: The technology directly influences the competitive position of an enterprise and is the core essential factor for the resource-oriented enterprises to succeed in the market competition.

Explanation 2: The relationship between the technology and enterprise resource is that the technological innovation gives rise to the innovation in products.

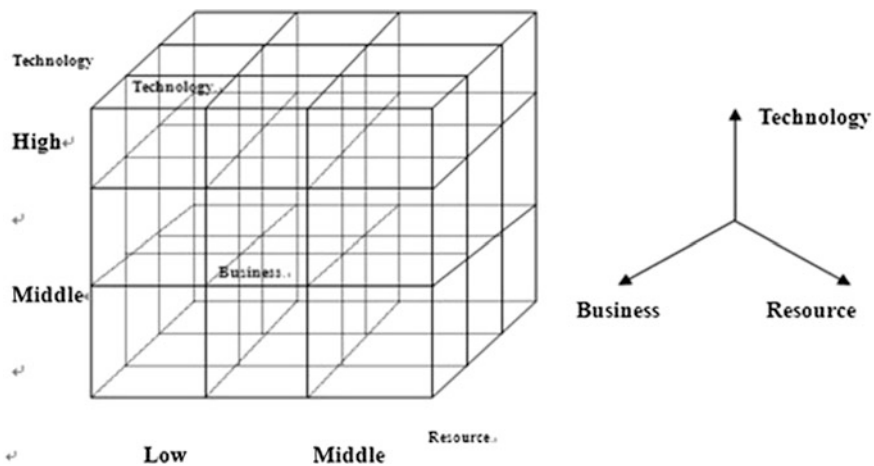


Fig. 34.1 The technology–resource–business model

Explanation 3: The technological strategy in a resource-oriented enterprise is a form of the technological selections and includes the resources which are invested to acquire, maintain, utilize or abandon a technological ability.

Explanation 4: The technology exerts a great influence on the transfer degree of the resources. The higher the transfer degree is, and the increasingly more fierce the competition will be.

By inference, therefore, a TRU model can be established in the following.

34.3 Selection of the Strategic Models of the Resource-Oriented Enterprises

Along the above theoretical logic, the author simplifies the TRU model as shown in Fig. 34.2. According to high, middle and low positions, the technology, resource and business in a resource-oriented enterprise can be located as 3, 2 and 1, respectively, and then a (3*3*3) cube can be constructed. Thus, when the technology, resource and business all have been given, the resource-oriented enterprise can be typically classified into nine types [5, 6].

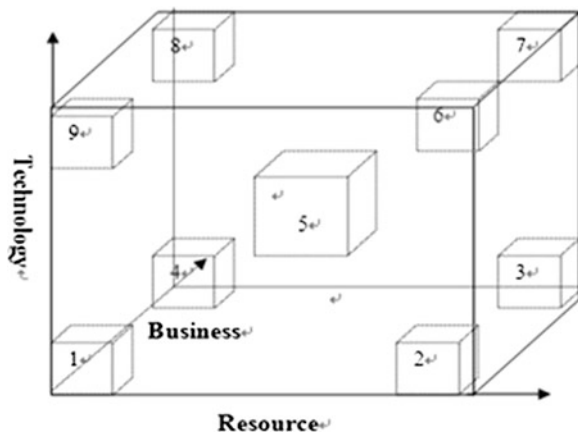
Module is the home-pig type of enterprises and means the enterprises have low technological ability, uncompetitive resource and less business units. The overall technology in the resource-oriented enterprises is rather low and so is the transfer degree of the resources.

The resources possessed and controlled by the enterprises are rare, and a majority of the resources in the whole environment are nonrenewable.

The business units are simple, and business units are composed of only one or two types of resource-oriented products.

It is necessary to speedily scan the original advantages to seek new business units, make profits by introducing the business units with a good promising market prospect, and positively establish the cooperation with relevant technological units to develop new products and businesses and found technical barriers.

Fig. 34.2 The location map of the modules (3*3*3) in the true model



Module 2 is the olive type of enterprises and means the enterprises have weak technological strength, highly competitive resource and less business units. The technology is below the industrial average, the ability to develop new products is weak, and the product quality is not high.

Abundant resources and product series can extend a highly long industrial chain.

Single business model, bad market growth and homogeneity competition give rise to the fierce price competition [7].

It is necessary to establish the technological cooperation with external organizations and seek internal business breakthrough points, for the purpose of developing new products, increasing new businesses and quickly unfolding markets.

Module 3 is the golden monkey type of enterprises and means the enterprises possess the strategies as flexible as the golden monkeys and multiple businesses and profit-making points though the technology is single, and the competition is high in resource markets. The technology exerts a weak influence on the resources, but the influence on the enhancement to the product innovation ability is smaller.

Resources are in an abundant state.

The market space results in huge needs on the products in each product.

It is necessary to expand the production scale, lower the production cost, make rapid transformations to the production technologies, make use of the advanced technology to control key resources, store the strategic resources and prevent five external pressures.

Module is the cattle type of enterprises and means the enterprises have low technology and low-competitive resources although the business units are multiple. The technological strength is weak, and the R&D investments are rare.

Both the resource scarcity and transfer degree are quite low, and such a resource is without a strong competitiveness, and hence the bargaining ability of the resource suppliers is rather weak as well.

The business units are multiple and are in a good market growth; most of them belong to the problem-based or well-known reputation-based enterprises and require plentiful capital investments.

It is necessary to broaden the financing channels, continue to increase funds and support business units, reduce the production cost with a scale economy, increase the technological investments with the accumulated capitals and apply the technical cooperation models.

Module is the elephant type of enterprises, and means the enterprises can attain an unbalanced development though the technology, resource and business do not achieve the highest level. There is a strong technological strength to some extent, but the technologies are low when compared with the advanced international level and can only reach the domestic advanced level.

The resource suppliers have a strong bargaining ability, so the strategic alliances or the backward integration is necessarily established to neutralize the ability.

Most business units are problem based, and only a few are well-known reputation based.

It is necessary to conduct multi-channel financing, expand the production scale, build or exit the barriers with lost costs and prevent the threats from five pressures.

Module is the panda type of enterprises and means the technological ability is strong, the resource is rare, and the business is quite single within the enterprises. There are advanced technologies, and also the strong technological ability has been formed.

Resources are abundant and precious with a high scarcity, and the transfer degree is different based on the change in the technological abilities.

The business types are quite single and lack market growth rates as well as huge market spaces.

It is necessary to take advantage of the leading technology strategy to consolidate the existing business units, positively develop new business units with huge market spaces and high growth rates, strengthen the control on the resources and simultaneously take the strategic resource reserve or the acquisition of the global resources into consideration.

Module is the Saussure Involucrate type of enterprises. These units are the resource-oriented enterprises with a typical technological growth, occupy in an industrial leading position in the technological ability and also have strong resource competitiveness, multiple business units and powerful profitability. Strong technological ability can meet the market needs and produce new products constantly; in the enterprise operation, the technological ability permeates into the value chain; the enterprises occupy an industrial leading position and are the constitutors to make the industrial technological standards.

Resources are abundant and precious; the competition for the resources is violent among all competitors; the control on the upstream resources has changed into a focus of competition.

There are multiple business units, most of which are well-known reputation based or the strong cash based and have a strong profitability. Thus, these enterprises own powerful cash flow to sustain the business growth.

It is necessary to be the constitutors to make the industrial technological standards quickly and strengthen the strategic competitions with the leading technological strategies.

Module is the hump type of enterprises and means the high technology and business are at a high level, while the resource is at a low level. Strong technological ability represents a strong self-developing ability, and hence new products can be produced constantly; most technologies focus on the process flow, but the technology of the enterprise to develop resources is increasingly prominent along with the expansion of the enterprise scale.

The resource is poor but can be sustained for a long time, and the competition of the resource scarcity is not high. Thus, the technology is required to increase the transfer degree of the resource.

There are good business units to bring the cash flow, which can constantly improve the ability to develop new businesses, and thus have good market growth rates.

It is necessary to improve the value chain through process technologies, enlarge the scale and reduce the production cost. Also, the market position of the strategic businesses shall be ensured by increasing the capital supports.

Module is the cucurbit type of enterprises and means a high technology but low resource and business in an enterprise. The strong research and development ability suggests that the technology exerts a great role in the technological process and product development.

The resource is poor but can be sustained for a long time, and the competition of the resource scarcity is not high. Thus, the technology is required to increase the transfer degree of the resource.

Business types are in short and lack the market growth rate as well as huge market spaces.

It is necessary to develop the business units with promising market prospects as the strategic business units, positively exercise the characteristics of the strong technological ability and quickly foster such a type of business units, so as to make the problem-based enterprises transformed into the well-known reputation-based units.

34.4 Conclusion

Resource-based enterprises must transform the traditional value chain through the improvement of the technological ability and make rapid changes to the technology and the product development process through the advanced modern information technologies, so as to form technological barriers, increase the intelligence capitals and drive enterprises to transform to the knowledge-based model with the technological innovation abilities. Under the promotion of the technological innovation, the growth of the technological ability, the enhancement to the integrated business ability of organizations and the ability to control resources are the three aspects to decide the basic direction for the resource-based enterprises to attain the innovation growth and also compose the growth strategic model of these enterprises. Hence, the sustainable growth is driven within the resource-based enterprises. These can be seen in Fig. 34.3.

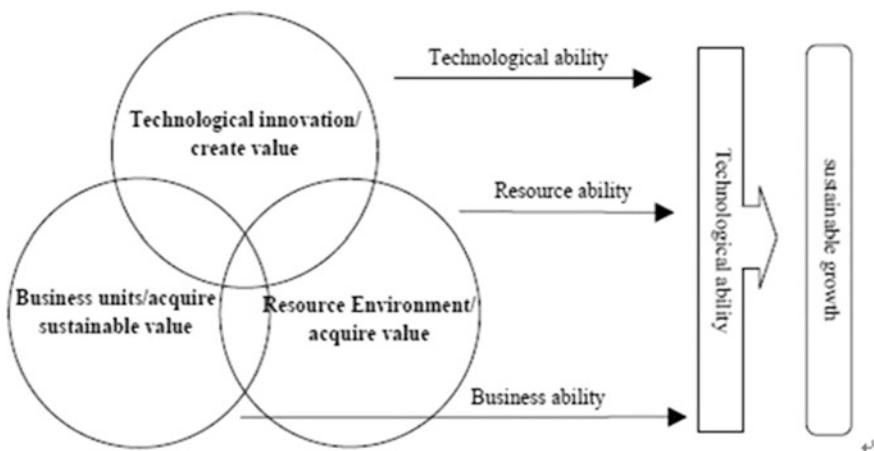


Fig. 34.3 The sustainable growth model of resource-based enterprises

Therefore, the transition of enterprises from resource based to knowledge based is inevitable in the knowledge economy age.

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Chapter 35

Study on Merger and Acquisition Strategy of China's Enterprises in Post-Financial Crisis

Yu Liu

Abstract Along with the severe impacts from the international financial crisis, there are also opportunities for enterprises to make adjustments to their structures and implement oversea merger and acquisition strategies (M&A). At present, it is necessary for China's enterprises to focus on the long-term development, research the trends, strive to improve the market competition ability and the risk resistance ability, step out of the country with courage and insight, implement the oversea M&A strategies, and ultimately accomplish new developments.

Keywords Post-financial crisis · China's enterprises · Oversea merger and acquisition

35.1 Characteristics of Oversea M&A of China's Enterprises in the Financial Crisis

35.1.1 *Swift and Violent Development Impetuses of Oversea M&A*

Since the occurrence of 2008 financial crisis, oversea merger and acquisition made a hit among China's enterprises, promoting them to attain unprecedented development, scale and influence. Also, the merger and acquisition transactions were distributed extensively, because they had appeared in developing countries/regions and the developed countries at the same time [1]. Besides, the total volume of the

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merger and acquisition continued to increase. The total volume of the merger and acquisition of China's enterprises reached \$21.8 billion in the first quarter of 2009, ranking second in the world. In addition, the single merger and acquisition transaction was large-scaled; there were transactions exceeding \$1 billion respectively at the end of 2008; it was delectable that several transactions at the beginning of 2009 were more than \$10 billion.

35.1.2 State-Owned Enterprises Remain the Main Investment Bodies

In recent years, private enterprises in China rapidly rise, and have gradually become a new fresh troop in the market economy, and begin to positively implement the overseas mergers and acquisitions, making the main investment bodies of overseas merger and acquisition diversified. However, during this financial crisis, the main investment bodies of China's overseas merger and acquisition are still concentrated in large state-owned enterprises.

35.1.3 Financial and Natural Resources are the Key Fields of Oversea M&A

In recent years, the industries in which China's enterprises have implemented overseas merger and acquisition are gradually decentralized and diversified; the merger and acquisition shares in multiple industries have attained a certain increase. However, during this financial crisis, the distribution of the industries in which China's enterprises have implemented overseas merger and acquisition is still quite concentrated. In 2008, the financial crisis was mainly limited in the financial field. After the first half of 2009, in face of the downturned prices of staple commodities and energies, the overseas merger and acquisition of China's enterprises were swift to transfer to the field of natural resources. From the data of 2009 and 2010, it can be seen that the overseas merger and acquisition of China's enterprises preferred the fields of resources.

35.2 Analysis on the Dilemmas of China's Enterprises in Oversea M&A in Post-Financial Crisis

Oppositions to Oversea M&A of China's Enterprises the overseas merger and acquisition of China's enterprises excessively focus on the fields of resources, which have made multiple countries to worry about. Thus, the global protests break out here

and there [2]. For example, the investments on Australia from China continued to increase in 2009; China co, China Mineral and Vain Group completed three transactions with Australian mining companies in 2 weeks; the announcements of the continuous transactions were unavoidable to let Australians think that China was snatching their domestic resources, and also aroused a great number of conjectures about whether Chinese government was the hand holder of the mergers and acquisitions in a wide range of places, and hence the protesting voices became increasingly louder. Next, the ignorance of the cultural differences in the management gave rise to the great conflicts between the investment party and purchased party in the behavior and concept. There is a very typical example that the marriage between Shanghai Automotive Industry Corporation and South Korean Sang Yong Motor Corporation encountered a huge conflict. Then, political factors always exist. From the perspective of the bias of the ideology, the protesters hold the discriminations and even hostilities on China's rapid economic growth, and also forcefully give the huge pressures on the domestic governments by all means to their utmost. Finally, China's competent departments give negative responses to the oppositions to the oversea M&A of China's enterprises. For the rights to speak, China's enterprises and some Chinese competent departments concerning foreign affairs collectively choose to keep silent in face of the distorted reports and malicious speculations, which seem to hold an indifferent attitude or lack the abilities.

Shortage of Long-term M&A strategies in China's Enterprises Merger and acquisition touch upon a great number of problems, and can be upgraded to the level of strategy. Therefore, it is necessary to conduct a prudent strategic plan before the implementation of the oversea merger and acquisition. The absence of the strategic plan or false strategy is extremely likely to give rise to the failure of the overseas merger and acquisition of enterprises.

Insufficient Abilities of China's Enterprises to Manage Knowledge The acquisition of cooperative advantage is the core target of enterprises to implement mergers. However, only two enterprises can be successfully integrated, such an advantage can be obtained [3]. This successful integration is reflected not only on the operational level and but also on the cultural ideas. It can be said that the merger and acquisition in the initial stage is only completing a unity in the right, administration and materials between two enterprises, but the cultural unity can only be finished after the merger and acquisition. Only clear main bodies and orientations are likely to integrate the cultures of both the merging enterprise and merged enterprise very well. The results from the processing of this problem have been obviously reflected on some Chinese enterprises such as Lenovo. The business income of Lenovo quickly turned into over \$16 billion from more than 20 billion RBM after the acquisition of IBM personal computer business, but it began to enter the most difficult integration period. In the 4 years after acquisition of IBM personal computer business, Lenovo became a typical international IT enterprise to integrate cultures, in which different cultures are crossed and weaved, adding more difficulties into the hard-won integration process.

Incomplete Developments of China's Capital Markets Currently, China's capital market structure is incomplete and excessively relies on the stock market, and

the bond market as well as its over-the-counter market is still under development. The international financial groups change into the forces for China's enterprises to seek helps in the overseas merger and acquisition. As a result, a great number of earnings are occupied by the international financial groups, and also the financing efficiencies decrease to a great extent. At present, the financing of China's enterprises at the security market not only stays at the collection at the international securities market, but also the financing of their overseas merger and acquisition are hard to gain well-improved services. Based on the reasons, China's enterprises usually pay in cash in the overseas mergers and acquisitions, which greatly increases transaction cost and also brings the integration of enterprises and the financial burden of the long-term development after merger and acquisition.

35.3 Countermeasures for China's Enterprises to Implement M&A

35.3.1 Countermeasures from the Perspective of Enterprises

Thinking M&A from the Strategic Level Based on the above analysis, a clear strategic thinking has become the first consideration of China's enterprises to implement the overseas mergers and acquisitions. China's enterprises are necessary to research whether the overseas mergers and acquisitions can generate a cooperative effect; the adjustments to products, markets and industrial structures are primary; a strategic layout takes the long-term interests into a full consideration. In the selection of the areas of mergers and acquisitions, China's enterprises shall go out in an all-round way in terms of the strategies, and also lay some stresses based on the actual business conditions.

China's Enterprises Shall Continue to Increase the Dynamic Ability The frequently-discussed dynamic ability of enterprises mainly includes the abilities of absorption, integration and innovation, etc. The absorption ability is to integrate the external knowledge and internal knowledge very well and eventually absorb and use it internally. The integration ability is to coordinate the internal organizational factors and the external environmental factors of enterprises very well. The innovation ability is to identify the value of the external knowledge, fully combine with market advantages, digest the external knowledge and put it into a commercial utilization. There are multiple factors to restrict the international competitiveness of the enterprises in developing countries owing to the influence of major environments. The backward natures of these factors are not presented in the simple domestic competitions, but are undoubted after the complex competitions and more extensive transnational mergers and acquisitions. All transnational mergers and acquisitions in the past time prove that it is necessary for the enterprises in the undeveloped countries to continuously improve the dynamic abilities if desiring to rapidly increase the market competitiveness after the mergers and acquisitions of the enterprises in developed countries.

35.3.2 Countermeasures from the Perspective of Governments

Improving the Governmental Management and Service Abilities The overseas mergers and acquisitions of China's enterprises can't do without the governmental support or intervention. Currently, it is necessary to further improve the laws and regulations to standardize, restrict and protect the enterprises to implement overseas mergers and acquisitions; the mature export credit, trade financing and trade insurance policies in developed countries to support their overseas mergers and acquisitions, can also be introduced to learn. Because China's enterprises engaging in the direct overseas investments are mainly state-owned, it is necessary to strengthen the macroscopic coordination and management on these enterprises. Also, the governments and especially the existing foreign institutions shall have the obligations to provide perfect investment services, including the information services at the overseas markets, and talent training. Simultaneously, it is necessary to further strengthen the international cooperation, and sign agreements such as the investment protection agreement and the agreement on avoidance of double taxation with a mutually beneficial attitude, protect the overseas mergers and acquisitions and also reduce the political risks as far as possible.

Improving the Structure that State-owned Enterprises are the Main Investment Bodies Owing to the existence of the endogenous defects, the state-owned enterprise operators don't pay much attention to possible risks. Due to the state-owned background, many state-owned enterprises operators think that the government won't just sit back once a problem appears in them. Thus, the self-restraints on their own behaviors are reduced, and large numbers of risks turn to government. For 30 years of China's reform and opening-up policy, compared with the state-owned enterprises without internal driving forces, the private enterprises have undergone the cruel market competitions and develop constantly, and more importantly this helps them create a powerful ability to survive. For the markets, the private enterprises are more sensitive, and had very early recognized the opportunities of the M&A in the *r* financial crisis. However, owing to the existence of the discriminations from the ownership system, the private enterprises are in the dry tree in the acquisition of the governmental support when gaining financing, which has become a "bottleneck" for private entrepreneurs with internationalized visions to implement the foreign direct investments. Therefore, the government should support and encourage private enterprises from various aspects at present, eliminate the discriminations from the ownership system at the capital markets and bank loan markets, and change the situation that the state-owned enterprises are dominant in the overseas mergers and acquisitions.

Accelerating the Support to the Construction of the M&A Financial System As mentioned above, the capital market with mature developments is a powerful support for the overseas mergers and acquisitions. It can be said that the leverage financing has developed quite maturely at the today's international finance market. At the financial markets of Europe and America, the leverage

financing has aroused the upsurges of merger and acquisition one after another. On December 9, 2008, CBRC published the “Guidelines for Risk Management by Commercial Banks of Loans Extended for Mergers and Acquisitions”, and hence opened a new door for commercial banks. Thus, the commercial banks meeting the conditions were qualified to start the mergers and acquisitions. By now, China’s leverage financing market was unfolded finally. Certainly, the loan of commercial banks for the mergers and acquisitions is only a part of the leverage financing. Thus, it is necessary to stress a long-term objective and commit to a broader market construction. In the construction of the leverage financing market, it is necessary to expand the indirect financing development idea, increase various channels, gradually eliminate the policy barriers, financing limits, financing interest rates of private enterprises in financing, vigorously develop the capital market, and approve all kinds of capitals into the merger and acquisition financing area, and let the leverage financing market to get more supports form the credit market, stock market, security market, bill market, etc. As the existence of the current institutional arrangement with congenital defects for the financing of state-owned enterprises, the “path-dependence” is increasingly apparent. Thus, it is necessary to allow the institutional arrangement for the security market to develop towards investment, and make all enterprises including the private enterprises to participate in the market competition.

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Part V
Innovative Education and Applications

Chapter 36

Teaching Reforming Methods in the Volley Curriculum

Yue Jia and Xiaofang Wang

Abstract Analyzed and researched the current situation characteristic, process of reform, developing trend of volleyball course of ordinary higher university at present. There is unreasonable phenomenon at various degrees in respect of examining in the teaching goal, content of courses, teaching hours, teaching, etc. proposes the countermeasure of the curriculum reform, offer reference and suggestion for reform in education of sports of the university.

Keywords Ordinary higher school · Teaching of volleyball · Reform in education

36.1 Introduction

The teaching of sports is a core of sports of the school, but volleyball teaching is one of the more important tasks in the teaching of sports. For many years, we have adopted “asking amount type” the teaching mode of sports, it learns something what student the teacher teaches, students follow the teacher’s password, how much heart rate amount of exercise each class reaches, the result causes students not to like the volleyball lesson, afraid of having the volleyball lesson, lose interest and confidence to volleyball finally [1]. So, present volleyball teaching, the obvious guidelines not in accordance with new outline of current situation. I set out in terms of character building education, entity characteristic this, combine the new outline, have comparatively discussed the reform in education of the volleyball lesson from respects such as teaching goal, content of courses, examination

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content, etc. Systematically, offer certain reference and suggestion for reform in education of sports of university, and hope to make students in the harmonious and democratic, lively first-class volleyball lesson in the atmosphere of classroom through the reform, become interested in volleyball. Thus and gets used to the volleyball as a way to take exercises by oneself [2].

It is research objects to choose 7 representative academics and students. Law, investigation method of the questionnaire, mathematical statistic law, reasoning from logic law that research approach mainly includes the documents and materials.

36.2 Result of Study and Analysis

The research approach herein has analytic approach of materials, expert's investigation method, head storm law, analytic approach of the system, mathematics modeling, computer technical treatment law, feed backing the control method, etc.

36.2.1 Overall Analysis of Volleyball Course at Present

For the cost that reduced the work and analyzed, should try hard to utilize the existing materials, task, responsibility, right, working load, qualifications of roughly each job of understanding, etc. as to establish the foundation for further investigating.

36.2.1.1 Goal Analysis

- (1) Goal content. According to investigating the teaching goal of volleyball lesson is learnt in the volleyball syllabus, all is built up body strong body by the school investigating and knows volleyball main technology, content of tactics; About 90 % of the schools demand to know the basic rule of volleyball; About 70 % of the schools include passing volleyball culture on and learning the volleyball competition method; About 60 % of the schools have this goal of social life of the development person; 30 % school have amusement, form exercise used to, prepare for lifetime sports and learn athletic injury about knowledge and how prevent and therapeutic content only [3, 4].

In a word, teaching goals of the volleyball lesson of these universities are not overall enough; some goals are required relatively low, have not fully considered the psychology, physiological characteristic and era requirement for development of university students in formulation of some goals and prove every university pays attention to incompletely, or the emphasis point is different on the teaching goal [5].

Table 36.1 University's volleyball course goal situation

Classification	Proportion (%)	Sequencing
Improve the health	84.27	1
Amusement	61.29	5
Used to serve lifetime sports taking shape	53.31	6
Pass volleyball culture on	46.56	8
Promote people's socialization	52.18	7
Society volleyball match	62.23	4
Find out about the volleyball rule of the match	72.43	3
Prevention and health care method which the society damages	77.17	2

- (2) Teaching goal and task. We can know by Table 36.1 the sequencing of 9 goals is more normal. Each school regards it as the teaching goal of the volleyball lesson to strengthen the body and build body. And arrange in an order the first, this is even the most basic goal of sports. Basic rule to understand volleyball, learning the competition method, grasping the main skills and tactics of volleyball, etc. is common goal contents too, basically accords with questionnaire and actual conditions of the outline materials too. Used to being regarded as the teaching goal amusement, transform into exercise, the teacher does the difference chosen and is up to 61.29 and 53.31 %, very great change has already taken place in the idea of explaining the teacher. And already regarded it as the teaching goal to carry out and implement in actual teaching, it is that only some schools write these goals into the outline regretfully. It may not be mainly a regulation of unification of the motherland to form such a state because of the syllabus, but is made according to one's own condition by each school; some school degrees of attention to sports syllabus are not enough, or the idea upgrades slower. The socialization of promoting people is a very fuzzy, goal not strong of practicality, after sequencing depends on naturally. What deserves to be mentioned is it is only 46 to choose to pass culture on as the teacher of goal of teaching. 56 % rank the 8th, the formulation about this goal. There are important realistic meanings, 2008 Olympic Games is held in Beijing, recommends "Cultural Olympics." So movement passing on of culture one very important propagation and education content learn athletic injury prevent from and health care method rank the last location, account for 13.59 %, quite a few of Mr. realize the knowledge is to practice what the middle school student need most, especially or the knowledge seems especially important at the extra-professional activities after class. Students produce the psychology which fears sports easily after being injured, so this teaching goal is very important, there is very great facilitation as to lifetime physical training.

Table 36.2 Students study the situation of the volleyball

Attitude	Study the interest	Choose the volleyball after class	Choose the volleyball after class
Yes	21.25	14.49	16.46
Yes	59.96	52.81	58.51
Yes	17.53	21.71	22.18
No	0.42	10.16	2.24
No	0.84	0.83	0.61

- (3) Study the situation of the volleyball. Known by the investigation result, most students are interested in the volleyball lesson, come to like the volleyball lesson, 67.30% of the students would like to play volleyball at ordinary times, and really want to regard the volleyball as the students tempering an alternative project all the life and up to 74.97% especially, explain if the reform in education of volleyball that relies mainly on student, establish the overall, rational goal, the chance to succeed is very big, see Table 36.2.

36.2.1.2 Analyses on Content of Courses

- (1) Theory part. In every the intersection of university and syllabus that collect, study, recommend prevention and the intersection of health care and the intersection of method, etc. and the intersection of sports and the intersection of health and knowledge of athletic injury have 30%; There are knowledge such as production, evolution, current situation that 50% of the schools mainly study modern volleyball and developing tendency and trend; and 90% of the schools study basic rule and judgments method of the volleyball especially. In general, the content of courses of the theory part overweight's basic theories general knowledge of volleyball, introduction to knowledge, can guarantee students have cognition on the whole on whole volleyball.
- (2) Skills and tactics part. According to investigating, the volleyball technology, content of courses of tactics in the syllabus of each university are mainly including preparing the posture and moving footwork, the technology of serving, the technology of digging, the technology of passing, the technology of one-man block, deal with ball technology, the volleyball special general body practices method and simple tactics and cooperates. These have basically contained main technology and tactics of the volleyball in form as content of courses of volleyball lesson which university's volleyball teacher choose; roughly reflect the basic, commonly used key skills and tactics of volleyball through arranging in an order. There is great relation in realization and choice and use of the content of courses of the teaching goal, goal label basic the intersection of theory and basic point, reasonable association and use, can guarantee and impel to reach goal effectively of content for content.

Table 36.3 Studying the attitude of the current situation at present

The content of courses needs the reform	The lesson of the competition is arranged hour	Examination mode
Yes	40:50:10	Yes
Yes	50:20:30	Yes
No	60:20:20	No
No	70:20:10	No

(3) Students' feedback. Content of courses and teaching material are contacted closely, and the volleyball teaching material that every university uses is not unified at present, and that some schools used oneself to write. So, the characteristic is different, meanwhile, many problems exist. Some schools write text books according to the system of volleyball sports, though the content is abundant, but lack the interest; the soft volleyball, this new developing project of combining fitness and sports together, has already marked the content of courses stipulated as the new lesson, but lack guidance in theory; it is known from Table 36.3, after the new outline is implemented, every university should pay attention to write the work of student's sports teaching material and deal with the relationship between teaching goal and teaching material; 57.28 % of the classmates think to change the content of courses of the volleyball, and prove the present content of courses of volleyball cannot meet student's demands, see Table 36.3.

Find from the outline which every university makes, teaching generally teaches one from basic movement paces, then basic fundamental, continue it is simple tactics that study, there was the teaching match in the past at the 1/3-more than 1/2 lesson and then. So, the first half students' union in 1 term of volleyball lesson feels more uninteresting. Will not carry on the teaching match unless learn technology? Carry on the teaching match and promote technological learning earlier? These questions deserve the discussion very much.

Can know from investigation result, 61.9 % student approve 50:20:30 these teaching allocation proportion. On class, are favorable to the overall study of the volleyball according to this proportion. In addition, most students agree to increase the hours of the teaching match. The investigation still reveals, and the proportions of technology, tactics, the competition of no school can meet requirements for such one, and the hours of match of actual teaching are far from meeting student's requirement, see Table 36.3.

36.2.1.3 Examine Analyzing in Teaching

(1) Examination mode. At present, in every university volleyball teaching, the teacher generally carries on teaching from theory knowledge, technological movement and 3 parts of skill. According to questionnaire obtained, the teaching of the theory, technology and skill has an examination, and comments on the way

are identical with above-mentioned teaching situation. Explain for the example by volleyball lesson assessment criteria, content with an ordinary institute.

The volleyball lesson assessment criteria of the university follow the modes of the theory, technology, skill, and the proportionate relationship is 30:50:20. The theory has an examination and adopts and closes the roll form more and collected the examination question at random by the exam pool. The standardized intensity of the proposition has been improved a lot. The examination content involves the contents of lessons of theory that a teacher teaches. In terms of proportion of the examination question, the rudimentary knowledge has taken the majority, ability question or giving play to the question to only take very small proportion. The technological marks of the examination take half, mainly carry on the technological movements of the individual event and have an examination, rely mainly on finishing the quantity of technological movements in the examination, is set off by the investigation of technological movements to the cushion volleyball, from full marks to pass quantization, 60 full marks such as 2 people, pass 36, namely adopt “the skill up to standard is commented.” Appraisal way, the reason why take quantity as the core, the technological foundation on which not study guarantee, cannot go on to the exercise digging at all.

The technological skill examination mode of the theory is similar through the survey of every university, but the corresponding proportionate relationship is different to some extent; among them, the proportion that technology accounts for is roughly the same and distinguished in the theory, and proportions of the two skills are changed; the proportion of skill of some schools is a little higher, it is 20:50:30 or 10:50:40. The some of the schools are basically equal in proportion. But the concrete form of every examination is very much the same. In a word, there are certain problems in volleyball lesson examinations in the university; some proportion of theory of some schools is too low. Unfavorable to the enthusiasm of stimulating student’s study; the examination relying mainly on technology is too simple, because of emphasizing the quantity cannot reflect students’ real standard; the examination of technical ability is dull. So, the examination mode must be improved to a certain extent.

- (2) Student’s satisfaction to examination mode. By contrast, significant to the expression of examination of technical ability students are unsatisfied with, but the theory has an examination and stands opposite each other a little smaller. So, it is imperative to accelerate and strengthen the reform of the examination of technical ability, see Table 36.3.

36.2.2 Tactics Idea of the Reform in Education of the Volleyball Lesson

According to the existing teaching goal, combine the actual conditions, the teaching goal of the volleyball lesson of ordinary higher learning school can be

made: teach through volleyball, make students know key rule and basic fundamental, tactics that the match needs; meet different sports demands such as student's body-building, amusement, contest; can train and develop students' sports individual character, train students' entity, in order to meet the social development; improve students' psychological quality and social adaptive capacity through the teaching of the volleyball lesson; pass the culture of the volleyball on, make students appreciate this sport of the volleyball; teach through volleyball and improve students' comprehensive sports quality, establish the solid lifetime sports foundation for students.

According to the needs of students' entity, on the basis of original theory knowledge, skills and tactics study increase the knowledge content of passing volleyball culture on; the knowledge can already be placed on the theory knowledge part and specially explained and also can weave in and explain in the skills, and tactics practice is studied, let students experience volleyball from the idea constantly and have deep cultural intension. Secondly, proceed from students' motive, needing, interest, on the basis of technology, tactics and ABC, etc. Content of courses generally chosen at present, regard it is clear not to need the method that can be well tempered too the main content of teaching under the situation of the field condition. The match content should be increased, and the enthusiasm of student's study should be improved. The habit of the exercise volleyball and the concept of lifetime sports should be formed finally. Moreover, regard appreciating the match as a piece of content of courses, though students' body constitution, movement ability are different, some student may very much difficult to know better volleyball technology, but everybody passes and studies, it is known how to appreciate volleyball, will meet these classmates' demands too. Finally, the content which increases prevention of the athletic injury and health care method is explained, while improving the future of the social people of is engaged in the sport activity that solves the ability of the problem.

In the intersection of volleyball and teaching process of lesson, the second, 3 lesson learn the simple throwing can organize match after receiving or digging, have a match and practice combining, mutually promote, make students enter and study volleyball, be familiar with the state of the volleyball quickly, this is to stimulate their interest from the angle of student's subject, lay a solid foundation for lifetime sports.

36.3 Conclusion and Suggestion

- (1) The teaching goal should meet different sports demands, such as student's bodybuilding, amusement, contest, and make the teaching of volleyball really develop student's individual character and entity.
- (2) Teaching through volleyball lesson makes students to know key rule, basic fundamental and tactics that the match needs, to improve students' psychological quality and social adaptive capacity, to pass volleyball culture on, to

make students appreciate volleyball, to improve students' comprehensive sports quality and to establish the lifetime sports foundation for students.

- (3) Proceed from student subject angle, in order to meet student's interest in volleyball lesson and demand, the teaching match in the teaching process ahead of time can be arranged, and the teaching hours of the match at the same time can be increased. Diversified forms of volleyball matches should be organized; tactics consciousness and behavior through teaching of volleyball should be carried.
- (4) Proceed from student subject angle, the volleyball course examination mode can be reformed and students' study level and ability to have an examination to enable can be reflected and through examining, interest and enthusiasm of student's study can be stimulated.

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Chapter 37

Research of Network on Physical Education Teaching Reform

Weifeng Kong

Abstract The teaching model built up by the use of online teaching can be applied to the teaching of all aspects, must comply with the laws of physical education teaching, and can be used in frontline teaching. How to strengthen the ability of creative thinking on the basis of selection of basic knowledge, we still need to emancipate the mind. The development of multimedia and network technology, the effectiveness of the school's physical education reform shows it fascinating and broad prospects, has a special significance, and school sports reform also continue to deepen due to the popularization and application of computer network technology.

Keywords Online teaching · Physical education · Network

37.1 The Characteristics of the Physical Education Model for a Network Information Age

Currently, instructional design is widespread concern in the areas of research and the areas of practice, in addition to instructional design theories and models studied by theoretical workers and used in related fields, the first-line physical education teachers have generally been concerned about the experience by traditional style lesson planning a shift to the instructional design of scientific importance, urgency [1]. Thus, the network of sports instructional design does have an important theoretical value and practical applications of space. However, due to the diversity of physical education's own characteristics and classroom organization, space, making the difficulty of the

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instructional design of online sports greatly improved. Therefore, research in this area has still many problems [2]. At the same time, instructional design theories and models still remain on the stage of introduction and presentation, and the lack of systematic theoretical study of the localization led directly a lot of unnecessary trouble during frontline teachers apply instructional design theory to practice, and also because classroom teachers lack deep instructional design theory, learning and thinking and basic instructional design operating standardized training [3].

The new university physical education model is easy to stimulate students “interest in learning, students learn how to exercise and to stimulate students” creativity, to equip students with the ability of lifelong learning and the development of consciousness. At the same time, quality and efficiency of physical education teaching was ensured in order to adapt to the development trend of the rapid replacement of the information society knowledge.

The new university sports education model based on the characteristics of the students’ learning and development center, the teachers in the teaching activities ask questions, guide students to engage in sports learning, sports research, exploration, problem solving. Students anywhere study in collaborative learning and work of individuals or in small groups, online sports search, enjoy, learn, access to guidance published sports information to simulate the practice of sports activities [4].

Because of unlimited expansion of the time and space in the network environment, everyone can study, live and play at any time, place, through the network and this is the true sense of self-learning and lifelong education that every graduate can enjoy.

37.2 Influencing Factors of the Network Sports Teaching on Physical Education Teaching

37.2.1 The Impact of the Teaching Model

University Physical Education Teaching has long practice teaching, the teachers in the teaching process mainly explain the main demonstration, and it is spoon-fed to impart knowledge to students, teaching and learning out of touch, learn and use separate, although teachers dedicated, but not cause the resonance of students. As we all know, it is not enough to rely on class to reach a certain level in any sport, independent learning is particularly important for students after-school, lack of teachers after school and the problems students encountered cannot be resolved, which is a direct impact on teaching effectiveness.

37.2.2 The Impact of Teacher Development

The ability to use the Internet for teaching physical education teachers to be further improved, from the survey conducted, master of multimedia technology,

especially the courseware produced by physical education teachers are even scarcer, and sports online teaching requires teachers to have the ability to complete the learning resources building, is also both sports professional, versatile and network technology. The quality of online teaching goes way beyond just simple basic computer operations, which can be said a big test for the PE teacher.

37.2.3 The Impact of the Degree of Attention

Physical education and networks of many colleges and universities simply do not have much linked, and it is not to say that the school's network hardware and software do not meet the requirements, but the enthusiasm of the teachers and students is not enough. How to mobilize the enthusiasm of teachers and students to use the Internet, and this will be the key to college sports network teaching ability to play its real role.

37.2.4 The Impact of Students' Independent Study

Students now can browse the web site of sports, especially the NBA broadcast frequently, unable to watch during class time, after-school the students has to browse related articles. Also very concerned about the other major sports events, and also like to see some of the technical and tactical instruction video, learn and discuss, gossip is commonplace. In short, students of sports autonomy initiative are still relatively strong. But the universities sports teaching network has been unable to drive student interest, this is a long-term problem our sports workers facing.

37.2.5 The Impact on Teaching Effectiveness

As information technology continues to mature, more and more teachers understand the knowledge of the network in-depth, network teaching and research gradually penetrated into the teaching practice of teachers. Therefore, the establishment of teachers in information technology capacity development supports environment, education theories and models, integration of network resources and improves the level of application of the existing regional networks and campus networks, making it effective support services in the classroom teaching and extra-curricular teaching activities. The integration of network resource utilization that was improved is an important link to promote the development of local education information. Our network teaching is one of them will be difficult to decompose action of sports technology the use of multimedia in teaching, such as playing video, the production of the PPT, cartoons, not only to solve some action

because the speed is too fast to look at the problem, but also to avoid the embarrassment of the older teachers cannot complete certain actions, but also so that students can clearly see the composition of the action, in repeated play their own actions, and more easy to grasp to understand.

This closely integrated method of educational technology and teaching process improves teaching efficiency that played a good role. The most common blog, will be personalized knowledge, ideas, knowledge posted on the Internet, and share resources by a simple operation. The majority of physical education teachers, through the blog platform to exchange, share wisdom, can promote their own growth and professional development. Will these tips, learn the golden ideas to use in their teaching, not only improve the efficiency of teaching, but also welcomed by the students naturally fall in love with the physical education.

In this part of the “lectures” Pingke the “sports network platform upload a lot of physical education video, we can stay at home to see the lesson, the feelings of classroom reality, to make their own evaluation of the class teacher students and to discuss the exchange, to avoid face to face the embarrassment and the formality of courtesy, this is the real vitality of the teaching and research. In the constant practice as a physical education teaching and research staff, found that the network is not only the efficiency of their work has increased while allowing teachers to truly experience the help of their own, they set up her own blog, often write down their reflection of teaching, school-based teaching materials, games, compose, case analysis, these wonderful part to accelerate the growth of the teachers, but also promote the development and research based curriculum. Really be able to explore the network teaching and research ways of classroom teaching, less formally, generalities, and increase the substantive content in the classroom teaching, to improve the efficiency of classroom teaching has played an important role in.

37.3 The Development and Application of Sports Teaching Network Resources

First, we need to establish a network of inter-school inside and outside or a higher level of physical education teaching. Not just the connection of computer networks, more importantly, the sports learning environments that build the network of sports teaching and learning resources, through the computer network to be extended to every corner of society as a whole, fully integrated living and learning. Sports class is no longer the only physical learning environment, students in the family, society can be anywhere sports to learn, get help and guidance, which is the true sense of the open learning. Physical education teaching in many schools, the use of network resources stay online sports information and simple processing of the primary stage of search and seize most of the positioning assisted instruction, to help teachers solve the sports technology major and difficult issues, so that easier for students to understand the knowledge to master the action technology,

the ability of students to culture and learning styles did not play a fundamental change, we can say that the traditional physical education courses online to move, a “low level”, operating tendency. Sports teaching network actually provides us with sports knowledge and sports culture, various sports, live games, selected physical works (sports, movies, sports animation, combined with other art works) and sports exchanges, and a comprehensive three-dimensional sports learning environment and resources. To continue to develop these sports network resources, and always let the students are in excellent learning environment.

Secondly, the international Internet search and gather information about physical education theory, sports information, sports courseware, rich discipline resources. The establishment of school or sports connection teaching resource library, sports web sites, so that the different characteristics of the regional school sports teaching resources to fully share. The database software should meet the sports disciplines rich in content and forms requirements, to suit the learning needs of students from different grades sports. And in some campus network to create a CD server, using the CD-ROM storage of audio visual and other teaching-related sports materials and important sports book information, and provides a wealth of reference information for teachers, students. Targeted for a broad array of sports web site, the teachers need to provide students with some common sports web site, teachers and students in teaching practice can also build some of the sports learning site.

Vigorously the educational resources of the college sports network in practice were promoted. This requires that the traditional physical education system reform in education management, teacher evaluation, teacher training and other aspects of bold reform and innovation, a hot issue with the current physical education teaching, and constantly add fresh content to adapt to the higher education needs of future development, improve the function of the sports network of educational resources to make it better for the development of higher education for our services.

37.4 Sports Network Teaching Platform

37.4.1 The Principle of Platform to Build

College sports network learning platform is the set of module content to meet the different learning requirements of different learning objects, with modern educational model of convergence and other issues. Module must be set to follow the following principles: first, student-centered principle. The main body of students as a learning module content setting must follow students' interests, hobbies, psychological and physiological characteristics, and to stimulate students' interest is to have the principle of advancing with the times. In College Physical Education site the course of the study, the College Physical Education web site prevalence of slow update. Therefore, improving the update speed of the network learning platform of network resources and meeting the learning requirements of students

in different periods are important. Thirdly, to enhance the principles of the teaching goals of college sports so that every college student in school period can acquire a certain amount of sports expertise and skills to enhance their exercise levels, and can apply their knowledge in the back of the work and life.

37.4.2 Platform Feature Set

According to the literature research and teaching characteristics combined with our network platform, college sports network learning platform should have the following functions.

37.4.2.1 Course Design Features

Curriculum designs have main following functions: instructional design tools, curriculum design templates, courses, web site search engine and personal pages. Including instructional design tools and curriculum design templates for teachers of online teaching teachers to use good instructional design tools to edit the course structure, learning modules and other teaching resources, into the pre-selected course template system functions automatically organize these materials into an online learning environment, to enable teachers to design and develop network programs. Course web site search engine facilitate students in this platform to quickly find the information they need. Personal web pages provide a convenient space for a simple web page design and management for students or teachers.

37.4.2.2 Communication and Collaboration Features

Platform, in addition to learning resources, as well as provides students with communication and collaboration space to enable students to study and discuss, through the platform to express their views, ask for advice, make friends, but also to communicate via chat tools and teachers to understand the course teaching content, teaching requirements, teaching progress, and promote the exchange of learning between teachers and students and problem answering, and enhance the emotional communication between teachers and students, conducive to the smooth development of teaching activities.

37.4.2.3 Management Functions

Network learning platform with the management function is divided into two types of functions of course management and administration. Administration is secure login and technical support. Course management refers to the course unit, self-test,

job ratings, online submission of job, courseware on demand, to track students' online activities, digital libraries, etc. This feature can reflect students' online learning, the organization of students and guide students to independent learning, active learning.

37.4.3 An Instance of Network Teaching Platform

Internet-assisted teaching platform is an Internet-assisted teaching platform. Mainly by the system management module, teaching module, including course descriptions, teacher profiles, interactive space, online testing, related links, and other modules. In these functional modules, teachers not only can take advantage of own teaching experience, teaching materials, but also can use a lot of online teaching resources. Students also have a wider range of learning space, and they can always learn the knowledge of his class that did not master the knowledge they need. Interactive space for teachers and communication platform for students, teacher–student interaction in BBS platform, teacher–teacher exchange, life and communication, teachers can also be a message on the platform, to grasp the students' feedback on the practice of classroom, and to keep abreast of what knowledge students need, based on available teaching programs to make timely adjustments to meet student learning requirements. Online test module constantly monitors evaluations on students learning in the network teaching platform for students to learn to play a catalytic role.

Internet-assisted teaching resources is a powerful network environment of production and organization of teaching activities and diversified teaching materials, which includes all information resources that might be helpful in teaching activities and the construction of online teaching resources, according to the sports features to design network instructional. Online teaching resources, based on the composition way, can be divided into three levels: basic resources, communication platform and courseware. Basic resources includes network basic technology video game video, action diagrams and related professional web site of the project. Exchange platform includes the form of a BBS, blogs and QQ senior groups.

37.5 Network Technology Development Prospects in the Physical Education Management

With the rapid development and increasing popularity of computers and networks, the use of computer network technology, modern management has become an inevitable trend. Computer network technology has injected new vitality into the modern physical education, and it also brings new opportunities and challenges and the traditional physical education management. We have to continue to assimilate fresh knowledge from the external information in order to progress and development. The reforms of the education system, the development of teaching management level, require renewal and development of management tools, office automation is

the product of this period, computer network technology and management fields. At present, many of our industry to the direction of the Office for Standardization, automation and networking school sports reform efforts will continue to deepen due to the promotion and application of computer network technology.

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Chapter 38

Study on Protection and Inheritance of Traditional Sports Culture

Guangtian Qian

Abstract Through the literature material, field investigation and expert interview of Honghe Hani and Yi Autonomous Prefecture, Hani minority regions such as Yuanyang, Honghe, Lvchun and Jin Pingxian and so on. All of these areas are in Yunnan Province. This paper has made an investigation research into the protection and development of the traditional sports item swing. This paper makes analysis into the national sports culture and value from the perspectives of the orientation of the swing, the protection and development content. In this way, it aims to promote the ecology civilization process of the Hani nationality area. It also has sustainable development construction significance to the economic development and the national sports project research.

Keywords Nonmaterial culture heritage · National traditional sports culture · Swing · Protection · Heritage

38.1 Introduction

With the continuous development of the sports industry and the further understanding of the national traditional sports, the theory of the national traditional sports culture development and the practice of research are booming, gradually forming the new situation of the Chinese traditional sports culture. The national sports in our country have the characteristics of the Chinese traditional sports

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culture development. The Han nationality is treated as the main body. It is the fusion of many kinds of national culture and thus a kind of cultural formation has been formed. It is a cultural form that contains rich cultural connotation and has the characteristics of various factors. The national traditional sports culture is the external expression form that all nationalities have accumulated wisdom and experiences for a long period of time. It contains culture connotation and that is derived or created in the minority evolution process [1]. The Hani nationality is one of the ancient ethnic groups in southwest China. It has the world-famous Hani terraced fields. The Hani are renowned for their terraced fields. The Hani started this terraced fields project that some compare with Great Wall of China, using only the simplest of tools. Generations of Hani people have devoted themselves to tending the terraced fields. The Hani believe in multiple gods and practice ancestor worship. Ceremonies are held regularly to worship the Gods of Heaven, Earth and the Dragon Tree and may involve animal sacrifices. This paper makes analysis of the national sports culture and value from the perspectives of the orientation of the swing, the protection and development content. In this way, it aims to promote the ecology civilization process of the Hani nationality area. It also has sustainable development construction significance to the economic development and the national sports project research. This enables traditional ethnic sports to get protection and development in the harmonious society.

38.2 The Orientation of the Swing, a Traditional Sports Item in the Hani Nationality

38.2.1 The Distribution of the Hani Nationality

Hani Nationality has a population of 1,439,000 who are unique to Yunnan and are the descendants of the ancient Di-Qiang ethnic group in northwest China. Yunnan has more than 1.248 million people, among which there are Yunnan Honghe Hani and Yi nationality autonomous prefecture of the Hani nationality has a population of 700,000 accounting for about 17 % of the total population of state and accounting for about 50 % of the population of the Hani nationality. The origins of the Hani are not precisely known; though their ancestors, the ancient Qiang tribe are believed to have migrated southward. The Hani oral traditions state that they are descended from the Yi people and that they split off as a separate tribe 50 generations ago. One of their oral traditions is the recital of the names of Hani ancestors from the first Hani family down to oneself [2]. Hani now live mainly in the mountain along Honghe River in south Yunnan and are a typical ethnic group on Yunnan-Guizhou Plateau specializing in growing terraced-field rice. The dwellings of the Hani are usually two or three stories high, built with bamboo, mud, stone and wood. They play a wind instrument called the ebi. Part of 1,000-year-old culture is terraced fields. The traditional clothing of the Hani is used made

out of dark blue fabric. The men dress in short jackets and in long wide pants. They also wear turbans which are white or black. There is no gender difference in the clothing of children under the age of seven. With great creativity, Hani, skillful at adapting to the local geographical features, have created the world-famous terraced-field culture. One of the Hani nationality population is concentrated in the regions that are in the south of the Red River, Yuan Yang green spring and the central region of Lantsang River, which are Jiangcheng, Yuanjiang and Mojiang.

38.2.2 The Orientation of the Swing

Hani national swing is created by the Hani national ancestors in the long historical process. They gradually and perfectly created the Hani national swing and passed it from generation to generation. This is a kind of a traditional sport [3]. The Hani have many spiritual ceremonies to be carried out along the year. The Amatu Festival is celebrated in the second lunar month. It has not a fixed date. During three to five days, the people stop all their productive activities and celebrate the festival. Amatu was a legendary heroin that became the goddess of the village. These days, male representatives of every family make sacrifices before the sacred tree. Young people join in festive mode, dancing, singing and playing drums and cymbals. The Kuzhazha Festival is in the fifth lunar month. It is a festival to worship their ancestor. The most important part of this festival is the killing of a cow to present them. In every home, the people also worship their ancestors before their altars. This is the best chance for the young people of different villages to meet. At night, they sing and dance in groups until the dawn. The Zalete Festival is the Hani New Year. It is celebrated in a dragon day of the tenth lunar month. Sometimes, the shamans chose a dog or sheep day for the start of the festival. It usually lasts one week. It has a double function: to thank the ancestors for the good harvest and to ask for a prosperous new year. Every family kills a pig to offer their ancestors. The old people sing until night. Young people sing and dance the whole day. This is a very special festival, because the Hani people use to make a big street banquet. Every family cooks some dishes that all the people of the village will eat in the street. Every family takes out a table and some chairs to the main street, where all together enjoy the New Year. Sometimes, there are more than 100 tables connected in the street. Though these three festivals are the main celebrations of the Hani's year, there are some minor festivals with a special interest. The Mother Festival is in the second lunar month. It is celebrated during one day and one night. Supposed to be an occasion to praise the mothers, in fact, it is the time for the young people to pay their respects to the old ones. Maybe is a vestige of the matriarchal character of the primitive Hani society. In memory of the sister and brother, people have created this festival.

38.3 Protection and Inheritance of Traditional Sports Cultural Swing Under Nonmaterial Culture Heritage

38.3.1 Intangible Cultural Inheritance of Traditional Sports Cultural Swing Under Nonmaterial Culture Heritage

Based on the intangible cultural heritage of the national traditional sports native culture, the differences of the local culture and other cultures are that the traditional sports acts as the important part of the literal culture and the behavior culture. In addition to this, there is also one of the main differences of the national sports culture and other intangible cultural heritage culture forms. That is to say, the acrobatics martial arts sport and the folk custom culture together with the body performance skills in the world of competitive and so on. They are together to express the challenge of physical limits. They aim to challenge ourselves and attach high importance to the pursuit of the value concept of self improvement. Zhang and Bai [4]. For the national traditional sports culture nationality heritage, it has included three aspects of meaning. That is to say, the national traditional sports culture nationality heritage means the inheritance of the social ideology, the social and cultural life inheritance as well as the inheritance of the production way of life. Under this circumstance, the national traditional sports can neither separate from these material production modes. The national traditional sports act as a compensation of these modes of production. They run through the whole course of the activities of human production practice.

Hani national swing marks the belief in the native folk culture. It is eager to a better future. Under this circumstance [5], the national traditional sports act as a social means and this function can promote the spread of the traditional culture. The Hani people form one of the 56 nationalities officially recognized by the People's Republic of China. People living in different parts can form their own way of life in the long process of the development of the social form. In addition to this, they can form their customs and national culture. Each ethnic group has its own traditional festivals. The traditional ethnic sports performance held in celebration of the activities is indispensable. The national traditional sports act as a medium for the spread of the national culture unconsciously. In the performance, people communicate with each other and learn from each other. This enables their respective national culture to spread among different regions. Moreover, it helps to promote the traditional culture and the integration.

38.3.2 Protection of Traditional Sports Cultural Swing Under the Value of Regional Ethnic Culture

Because of the fact that the intangible cultural heritage is rooted in the soil of the national living condition culture and that it is the developing traditional pattern of behavior and way of life, it cannot be separated from producers and person who

enjoy and thus exist independently. Its survival and development live forever in the “living” heritage and the “living” condition of protection. So, the inheritance subject and protection subject are the core factors in the process of intangible cultural heritage and protection [6]. It aims to promote the ecology civilization process of the Hani nationality area. It also has sustainable development construction significance to the economic development and the national sports project research. Therefore, Hani national “swing” is a kind of “primitive state,” and it is a physical activity dynamic passed down with national cultural characteristics. The inheritance subject and protection subject are the core factors in the process of intangible cultural heritage and protection.

Make full use of modern means of science and technology and sort out and make a summary of the good information about the national traditional sports. This can make up the limitation of the inheritance population. Make use of the modern means of science and technology in order to protect better the reserves of this precious intangible cultural heritage. In this way, it can effectively and quickly make a summary of the precious national traditional sports culture. In the process of popularization, in order to provide complete information, all kinds of social institutions can be offered with the traditional Chinese national sport. The descendant of the Chinese national sports culture is to inherit and protect the national sports culture, and this is the first step to inherit and protect the national sports culture. For the descendants, they should have the corresponding social status. In addition to this, they should improve the degree of cultural transmission. They should make themselves comprehensively grasp the modern education as well as grasp the propagation theory means. The descendants should realize the spread and implementation in the way of school education. In this way, the efficiency of communication and protection can be improved [7].

38.4 The Development Strategy of Traditional Sports Item Swing for the Hani Nationality

38.4.1 National Sports’ Entering into School is the Basic Guarantee of Talent Cultivation

“The Teaching Program for National College Physical Education Course” is an elemental national requirement for college physical education. It is announced by the State Education Commission. It has clearly pointed out the requirement, which is that “Drain world excellent sports achievements and continue to carry forward the Chinese traditional sports, combine these two together” [8]. It sets up a national traditional sports training base in colleges and universities. They have national regions combined with school. It sets up with the national traditional sports culture characteristics in sports so as to make the national sports into school. It inherits the national sports career development base. Make the selection and training athletes easy. It enriches the school sports activities.

38.4.2 Pay Attention to National Traditional Sports and Protect the National Traditional Sports Resources

With the development of the times, some traditional ethnic sports appear to have degradation. Some of the traditional ethnic sports die. The traditional sports culture of Hani and the Hani nationality cannot be separated from each other. The traditional sports culture of Hani and the Hani nationality is indivisible. In terms of the traditional sports culture of Hani and the Hani nationality, it recognizes that the nature of things must conform to the requirements of the development of this nation and that any modern competitive sports come from the national sports. From the ancient times to the present times, we should deeply understand that both in the past and the present, they have the fitness and entertainment value. They can maintain a vigorous vitality in the traditional festival of the Hani nationality.

38.4.3 Give Publicity of Promotion and Highlight the Nation's Characteristics

The sport of swing has superior presentational skill and performance characteristics for the Hani nationality. They are well received by old man as well as loved by the children and the young people in Hani nationality. These activities can get steady development in the rapid economic development today. We should notice the use of the Hani nationality traditional sports culture resources development. We can put it into the commercial packaging, use the medium of publicity and promotion, promote the development of the Hani nationality sports industrialization and improve the mass sports activities. The Hani people revere the color black. Men wear front-buttoned jackets and trousers made of dark blue cloth and black or white cloth turbans. Women have collarless, front-buttoned blouses with the cuffs and trouser legs laced. In this way, the Hani nationality is made to have the traditional projection survival development and it can continue to survive.

38.4.4 Perfect the Rules Strengthen Competitive Performance

Swing sports come with the passing of time. Many old things cannot keep up with the change and development of the modern culture life. They cannot adapt to the need of modern life. On the basis of keeping the swing of the Hani nationality and maintain its original sports style, the rules of the sports should be kept revising and improving. In this way, they can be made to be more reasonable. The swing activity can be made to be more competitive, presentational and full of appreciation.

38.5 Conclusion

To sum up, the swing sports of the Hani national traditional sports events should be kept with the original project style. At the same time, we should pay attention to the history. We should get to recognize all kinds of changes and the development trend of the future. We should unceasingly improve in the development and make continuous improvement. In the process of mining, arrangement and protection, we should make the swing sport of Hani national sports obtain the very good sustainable development.

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Chapter 39

College Sports Management Model Based on System Science

Mingqiang Wang

Abstract To know managerial knowledge, office procedures are comparatively superficial, and then the sports management of the ordinary higher school is still on the management aspect of the experience at present. Let alone to set up the sports management mode on the basis of a certain scientific theory. Try regarding systematic science as guidelines, analyze through the relation in structure level and every factor to the sports management system of ordinary higher learning school. Propose the sports management mode that the ordinary higher school regards systematic science as guidelines.

Keywords Ordinary higher school · Systematic science · Management mode of sports

39.1 Introduction

The American famous management family Peter Drucker has said so: “In the history of mankind, it is more important than anything to manage the appearance of the family, have greater and fiercer influence on the mankind.” A large number of facts prove that it is likewise self-evident to manage the power to effect development of the sport in sports [1, 2]. Each improvement of sports management theory each renewal, management and administrative skill, having produced the enormous impetus to the development of the sport, this has already been the masses of sports organizers’ common understanding [3, 4]. However, with the maximization day by day,

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complication of fast development and scale of sport activity of the contemporary society, when people's degree of dependence to sports management is larger and larger, original to implant on traditional sports management mode of management theory but demonstrate its lagging behind more and more: Sports problem taking place actually in settlement that method and technology that the thought foundation of management is not enough for complete, management clearly, enough cannot be prompt, accurate either [5]. More scientific, more rational new management mode has already become the goal that the masses of sports organizers have pursued.

Similar to the whole sports management, the sports management of the university and college of our country lag behind facing same management theory and office procedure in the unfavorable situation of the real sports problem seriously. Ordinary higher learning school sports management is still remaining to manage at the subjective aspect. The clear and complete ordinary higher learning school sports management mode has not been set up. With the constant development of socialist market economy, the opening up constantly widely of sports function of the school, the scrappy scattered management mode in the past of ordinary higher learning school cannot already meet the demands. So, try to set up the sports of ordinary higher learning school with clearly demarcated structure with clear level and manage the total system, explore and summarize one that has sports of university and college with rational, practical science to manage the new mode. This has become an important and urgent subject.

39.2 Research Approach

The research approach herein has analytic approach of materials, expert's investigation method, head storm law, analytic approach of the system, mathematics modeling, computer technical treatment law, feed backing the control method, etc.

39.2.1 Analytic Approach of the Materials

For the cost that reduced the work and analyzed, should try hard to utilize the existing materials, task, responsibility, right, working load, qualifications of roughly each job of understanding, etc., as to establish the foundation for further investigating.

39.2.2 Expert's Investigation Method

Consult the expert opinion in order to predict a certain special topics or future development methods of a certain project extensively through the written form. When the historical materials or data are not abundant enough, or when need

subjective judgment of suitable intensity in the model, adopt questionnaire way to seek the opinion to a group of selected experts, through the seeking the opinion of several repeated wheels, it make reach unanimity expert opinion, thus get by prediction result for future.

39.2.3 Head Storm Method

Head storm method also called intelligence encourage method, the intersection of BS or call freedom think method. It was created and studied to put forward a stimulating thinking method at the first in 1939 by Asben. This method was issued formally in 1953. This method is created practice and development which study the researcher by various countries, has already formed group of an invention skill and technique so far, favor deeply by the numerous enterprises and the organization.

39.3 Result of Study

39.3.1 Set Up the Meaning of the Sports Management Mode of Ordinary Higher School of Regarding Systematic Science as Guidelines

College sports management model is based on system science as the guide and composed of two parts (recognizing system and method system). The former is the system of philosophy, including the Marx doctrine on the philosophical expression system. Bertalanffy, Prigogine, Haken system scientists' system view is basis on understanding and observation of ordinary higher school physical education management system. Understanding of system is specifically expressed in the ordinary universities sports management activities as a system, namely the ordinary university sports management system.

Under the philosophical guidance of system, proceeds from actual conditions of the school, define this system with the subdivision, know connection and difference between this system and its external environment condition, draw a clear subsystems of this system, analyze connection and demarcation line among the subsystems, set up an organization mechanism of structural platform paying attention to, clear, coordinated sports management of ordinary higher learning school that cooperates, high-efficient and orderly of level; the method system refers to on the basis of this adequate realization. With the engineering (system engineering, automatic technology and information technology) of systematic science as run through, organize mechanism, transform and control the intersection of ordinary higher learning school and the intersection of sports and administrative system and their basic practice method of the subsystem while being whole of.

According to the characteristic of the sports administrative system of ordinary higher learning school, use the modeling method of mathematics synthetically; determine the nature with the quantitative systematic analytical method, electronic computer technology, etc., technological method to combine together. Form a set of multi-functional, multi-form, and the systems approach system with stronger level that practicability high, science is rational as to hold and organize the purpose of the mechanism entirely. It is to the system, management practice course of goal, subsystem, sub goal that the method system displays specifically. Cognitive system and method system are basic contents of the sports management mode of ordinary higher learning school of regarding systematic science as guidelines, these two are open systems.

39.3.2 The Total System of the Sports Management Mode of Ordinary Higher Learning School of Regarding Systematic Science as Guidelines is Designed

Under the guidance of the sports management mode meaning of ordinary higher learning school regarding systematic science as guidelines, design and set up a feasible sports of ordinary higher learning school easy to operate and manage the total system, it is exactly the concrete application of this procedure, and it is the essential links of fulfilling meaning too.

39.3.2.1 Network Analysis

If you want to design the total system of sports management of ordinary higher learning school rationally, must analyze the characteristic of the sports administrative system of ordinary higher learning school and proceed from these characteristics, combine the meaning of the sports management mode of ordinary higher learning school of regarding systematic science as guidelines, go on with a definite target in view. Can see the sports administrative system of ordinary higher learning school and have the following characteristics through network analysis:

Adjustable array

The adjustable array of the sports administrative system of ordinary higher learning school can be called the controllability. Namely mean because this system takes person as the core, in keeping the system relative steady state or change course, systematic structure and function permitted people for the word section, revise and supplement. The traditional sports management mode has not solved this problem effectively. In the structural respect of the system, organize the mechanism to be stiff, with big flexibility in traditional management mode, make array adjust automatically according to need while being difficult as to fixed relation between the every subsystem. Even adjust under external function to some

extent, will make it lose value because of lagging of this kind of adjustment. In the respect of running systematically, the administrative system middleman's enthusiasm is not big. Except that the top, other operation of level basically person who deal with basically, the array is adjusted to rely on the leader and make excessively and adjust blindness to a great extent.

Overall design of the sports management mode of ordinary higher learning school regarding systematic science as guidelines can solve this problem.

Complexity of the sports administrative system information of ordinary higher learning school

The science and technology of present information is a pillar of reliance of human high science and culture. The sports management of ordinary higher learning school must handle sports information well when wanting to obtain the good result. Each sports administrative staff is all due to information all the time, from microscopically decision to general attendants, most contents of its work are the collection, save, transmitting and dealing with of the information. In the sports administrative system of the ordinary higher learning school, waiting a moment in the transmission of the order and feedback of result forms longitudinal information transmission; the exchange and cooperation between subsystems, such as every department, etc., form horizontal information transmission. Dealing with the mechanism in information transmission of the sports administrative system of ordinary higher learning school is a crisscross information network in fact. Network of this information is open, roaming the course on the net of information; it is the collection of the information and course of processing.

39.3.2.2 Total Systems are Designed

On the basis of above-mentioned network analysis, we have designed the totality of the sports system of ordinary higher learning school. The sports system of ordinary higher learning school was divided into five subsystems: Sports administrator's subsystem, and subsystems of teachers, sports course subsystem, training contest subsystem and student's subsystem have carried on the deep discussion to the relation between the subsystems. On this basis, we thought, between these five subsystems not completely we separated, but the dependence of crossing each other. Such as training contest subsystem and student's subsystem, subsystems of teachers and sports course system, etc., are inseparable. Administrator's subsystem regards other subsystems as content and existing foundation of the work especially, regard administrator as the core on operating mechanism, the management function is radiated outwards, manage the result to amass inwards. But traditional organizing the system to be very difficult sharply type shows such complicated relation.

The characteristic of this kind of system is as follows:

All subsystems are open systems, constantly and external environment condition including exchanging goods and materials energy with information

between other subsystem and social environment. This is each Unicom managed between the subsystems. Unicom is according to changing each other between each subsystem and environment; under certain conditions, some environments may become a part of the system; under another situation, a part of the system may be isolated from system, incorporate in the environment. This kind of separation and combines and realize through amalgamation or the personnel's transfer of the department. The scientific array controllability of the sports administrative system of ordinary higher learning school becomes possible in this case.

According to the view of the general profit high Tianjin, the open system should form the structure of dissipating finally, it is "not the new ordered structure under the equilibrium state." Because speed and content that every stature system external world exchanges are different. So, the sports administrative system of ordinary higher learning school cannot always keep the steady state. As coordinating the central administrator, must be according to the management result held back inside constantly, the management function radiated outwards in adjustment in right time, adjust the focus of work, coordinate the relations between every stature system, in order to make the whole system reach the steady state, namely "new ordered structure" at the new height again.

In the total system, the exchange of information has formed a reticular formation. There is mutual information exchange among subsystems. There is information exchange of external world and system. Under mechanism's normal running, the flow on the information network should be unblocked. If the clogging situation appears in information processing, namely a certain subsystem cannot finish a certain requirement to it of another stature system in time, then the information network will transmit this kind of situation to coordinate a administrator's subsystem of the center, and this center will adjust content and direction of radiation according to the demand. Solve the state that information stops up. This course can be finished with the information management system of the computer together by the network technique; the processing of a large amount of sports with fast, accurate information can be realized too.

39.4 Conclusion

39.4.1 Improve the Management Level of Sports

The sports management mode of ordinary higher learning school of regarding systematic science as guidelines, it is scientific, rational in the theory, it is feasible in practice, have heightened the level of sports management of ordinary higher learning school greatly.

39.4.2 The Administrative System of Sports is Divided

Divide the sports administrative system of the ordinary higher learning school into administrator's subsystem, teachers' subsystem, and sports course subsystem, training contest subsystem and student's subsystem, can make the thinking of management in order, there is stronger science.

39.4.3 Give Full Play to Sports Education

Regard thinking of systematic science as guidelines; manage the sports system of the ordinary higher learning school, the function that can make sports educate gets abundant full play.

39.4.4 Introduce the Newest Achievement of Scientific Development

The intersection of ordinary higher learning school and the intersection of sports and management mode that regard systematic science as guidelines it introduce modern science into attempt in the sports managements of ordinary higher learning school to be successful. Prove, if you want to settle the sports problem of the modern ordinary higher learning school well at the same time, must pay attention to introducing the newest achievement of scientific development.

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Chapter 40

Training and Reform Scheme of Football Talents in China

Ronglin Wang

Abstract Review China's development of football talent cultivation mode and analyze the status of football reserve personnel training, respectively, from the culture of football teenagers back-up personnel to learn the status quo, resource allocation problems one by one analysis found that the Football Talents contribution rate is not high, for this reason the main problem is to train the model, environmental issues, training system, and basic issues. Asked the Football Talents Training System reform measures, and establish long-term personnel training objectives, improve China's youth football training system, improve the construction of coaches, vigorously develop the school football, establish a wide range of training channels, and improve the athletes' social security system.

Keywords Football · Football talents · Cultivation mode · Reform

40.1 Introduction

The Chinese Football personnel training has always walked a tortuous development of roads, the traditional Football Talents culture no longer meets the requirements of market economy [1]. With the implementation of professional soccer, a lot of Football Talents training institutions bring vigor and vitality to our backup talent training; there are also many problems for these training institutions, if not caused great importance by the leadership, which will seriously affect the Football Talents market development [2, 3].

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40.2 China's Football Training Mode Development Review

In the planned economy period, China's football talent cultivation mode is mainly composed by three training network, the Amateur Sports School of the primary schools, the county amateur sports school, and the provincial and municipal. On the basis to select formation of the Province, the representative team (Tigongda-duit) formed through the selection to form the national team at all levels [4]. Competent national sports administration department—Central People's Government Sports Committee—was founded in 1952. 1956, in order to strengthen the management on the ball, ball games, the Secretary, Division consists of football Division of the ball. According to the Soviet Union to carry out competitive sports advanced experience of our amateur training system for the establishment of youth football, football classes run around the Amateur Sports School, the establishment of grass-roots football team, Traditional Sports School Taki, a sports school, sports secondary schools and focus on amateur sports school for middle provinces and municipalities on behalf of the team and national team for the training mode the tip of the pyramid-shaped layers of convergence. In 1990s, for the reform of the professional soccer in China, soccer talents cultivation has also undergone major changes. The Amateur Sports School is no longer football classes, football management department for the professional football club to set up their own echelon, but the beginning of the professional echelon of the professional teams building is far from perfect, football schools emerged, appeared in large numbers. Domestic Football Talents training system as follows: the lowest echelon of the football schools and professional clubs, in the middle is the professional football clubs at all levels, the top national team.

40.3 Reserve Football Talent the Status Quo

40.3.1 Management System of Talent

Football Talents training management system includes two systems: one is a fully market-oriented club system; the concrete embodiment of the Football Association of Local Sports Bureau began to weaken the youth training investment market, and commitment to young people by the club and football schools training. Under this system, football schools, clubs echelon cannot get any funding from the physical education department, the various units that are responsible for training young people are bound to be the driver of the economic benefits to the players to charge exorbitant training fees, and tuition is increasing year by year. Club echelon and soccer schools are fee-based, and high tuition fees hinder the effectiveness of the outstanding young enthusiasm of the local club and killed a poor family, but talented football talent opportunity to continue to engage in the football sector; those of a plan the economy of football management system, specific performance

tend to focus on management of the adult group, contempt of the management of youth football. We can see that both the management system had a negative impact of the current youth football training.

Youth football players are the focus of the human resources, and the run of training mechanism is around the young football players.

It can be seen from Table 40.1 in Chengdu, Sichuan Province, nearly half of the traditional football schools, enrollment is far more than other cities, which resulted in the significant difference in the number of Football Talents of Chengdu and other cities is not conducive to Sichuan Province of Football Talents in balanced development.

40.3.2 Cultural Learning Situation of the Young Reserve Talent for Football

The culture learning difference of youth soccer players is not a new problem, according to the Shanghai Yangpu foot school Shenhua Soccer Schools, Anhui, China Football School and Anqing City Amateur Sports School student culture of learning survey, we found that these training institutions are the half-day cultural learning and half-day soccer training, learning and training arrangements, many of

Table 40.1 Municipalities and districts football school and enrollment of Sichuan Province

Municipalities and districts	Football school	Football tradition advantage of school	Enrollment
Chengdu	1	65	823
Yaan	0	3	41
Panzhihua	0	2	26
Yibin	0	3	37
Deyang	0	6	74
Nanchong	0	6	63
Luzhou	0	4	52
Aba	0	1	16
Leshan	0	3	33
Zigong	0	4	49
Ganzi	0	0	0
Neijiang	0	2	36
Guangan	0	3	29
Mianyang	1	10	132
Ziyang	0	2	25
Liangshan	0	1	16
Dazhou	0	3	46
Guangyuan	0	4	40
Meishan	0	8	98
Bazhong	0	1	14
Suining	0	1	22
<i>Total</i>	2	132	1,672

the training unit to students of cultural studies, learning was negligent; from the enrollment rate reflects low culture of the teaching quality of the amateur training unit; cultural learning courses opened amateur training unit are less than ordinary full-time primary and secondary schools. In short, not comprehensive and insufficient courses have affected the comprehensive development of young athletes, and the nine-year compulsory education quality completed.

In nationwide system, all levels of sports school-based three-tier network back-up personnel convergence mechanism are the national use of administrative means, the formation of another outside the education system in physical education and cultural and educational system. The development of football, too, in this system, the football sports schools at all levels to seek maximum benefits are obvious heavy sports training, light cultural cultivation, resulting in lower cultural attainment of athletes. This has been going on for many years and has not yet been well solved. "Learning and training" the existence of contradictions, which means the opportunity cost of exercise training. If the differences can not be successful in the sport, on the cultural level will become a further development of resistance of the child. In particular, competitive sports and social reform, the Government is no longer responsible for the resettlement of retired athletes, sports school in the original policy has lost its institutional strengths.

Due to the special nature of football in this athletic event, after retirement, for the outstanding athletes in addition to the work of a small number of people engaged in the coach, most athletes will be re-career, faced with the challenge of other jobs. In Football Talents culture, we must not care for immediate benefits without considering the long-term development, must be emphasis on youth culture learning.

40.3.3 Issue of Resource Allocation

The optimal allocation of resources needs to stand on the whole concept of a global point of view, the rational flow of factors of resources. The resource requirement of the scientific concept of development is to take the benefit, intensive road to achieve the optimal allocation of resources. However, due to the management structure for historical reasons, the culture of the current Football Talents, sports and education sectors independent of each other, loosely connected, each has advantages in resources is difficult to obtain the optimal allocation, cooperation, more than a mere formality, and it is difficult to form an overall emergence of effect. Meanwhile, the various cultured path is not fully to play their respective comparative advantages, and do not form the core competitiveness, leading to the Cultivation of Football Talents overall level is not high, low efficiency.

Found through interviews with relevant managers of the Football Association, the education sector, due to historical reasons, the advantage of the education sector with the education software and hardware, and professional clubs, the sports school, the technological advantages of private foot school and amateur club coaches and cannot interact, so that young players cannot be all-round development.

40.4 Football Talents Contribution Rate is not High

Football Talents key schools in the direction along a combination of sports and education development, to a certain extent, ease the contradiction of athletes learning and training. However, due to less chance to compete, the primary trainer of quality and quantity is difficult to guarantee athletes, in grossly under contribution rate of competitive soccer is very limited. 17 Football Talents schools in Jiangsu Province Wu Zhongqi surveyed, as of 2005, the Football Talents school average annual transported to provincial sports teams, for eight people, this situation with the expected objectives and financial input is not consistent also show that the Football Talents school and did not give full play to its proper functions.

40.5 The Problems in the Cultivation of Football Talents

40.5.1 Analysis of the Main Problems

The training mode is single, market level is not high, culture system reform needs to speed up the culture system, the nature of the training institutions is single, the social nature of institutions is too small, and the development level is not high, the sports system reform at a slower pace, inadequate social forces involved in football reserve personnel training.

Join the Youth Soccer Reserve personnel training coaches are few in number, level should be improved in the reserve personnel training coaches, their coaching level need to be improved, many coaches education level is not ideal, the lack of modern, scientific training theory knowledge, training plan is not perfect, and some athletes from directly into the coaches, without the requisite training coaches, athletes are of excellent coaches thought still exists. Athletes outlet narrowing, reading training is contradictory and outstanding, participates in the soccer training youngsters number.

40.5.2 Environmental Problems

Because Chinese football “false, roulette, black” negative news are increasing, the overall environment of public opinion for Chinese football held a negative and critical attitude, so that many parents of students and school management are not willing to let the children play football, believing that it is no hope and future. This kind of public opinion environment caused great damage of the youth football development atmosphere.

Due to re-light arms of traditional idea, examination-oriented education environment, the only-child status social factors such as culture, parents only pay

attention to students' learning achievement, the school principal is concerned only with the students, think it will take up too much time for the children to play football, influence learning achievement. So for youth participation in football training has certain conflict. Many parents and schools have not fully realized that football is a kind of youth development process that has very good promoting function of education.

Specially after football is specialized, most of the provinces and cities canceled municipal professional team, excellent reserve talents only occupation club a conveying channel, but the delivery of reward and compensation mechanism has not been established and standardized to the club, talents not only benefit compensation, instead lets parents adds additional expense. This mode of transportation is not only good to mobilize the amateur training system training enthusiasm, but greatly dampened the enthusiasm of coaches and parents, seriously affected the healthy development of football amateur training system.

40.5.3 Training System

Various campus football designated school basic managers, coaches and referees have low level, also cannot bear the youngster Soccer Reserve Talents of popular culture tribute, primary school professional football coaches of the gap is very big because many city to carry out the amateur football training target is directly positioned on the Provincial Games champion to take the brand, for coaches management personnel evaluation, is a "games" scores for objective assessment, training and delivery of high level sports reserve talent has become the "provincial sports, city sports strategies" by-product. In this case, sports school coaches to athletes for long-term planning and scientific training, often using "spoil things by excessive enthusiasm," "early specialization" training method, use even "depletion" training mode, leading to juvenile sports training against the amateur training of basic rule, resulting in a large number of sports reserve talent resources waste and damage of.

40.5.4 Basic Problems

All kinds of sports school football widespread coaches are insufficient, and the quality is not high, the low overall quality of the phenomenon. In addition, the school system and less addendum difficulties, many city, county two class sports school personnel flow, causing the football coach unreasonable age structure, knowledge of aging, the training quality is not high, do not follow to go up the need of situation. And there are different degrees of dating phenomenon, which seriously restricts sports school football project development, leading to the development of the lack of development and potential.

40.6 Soccer Reserve Personnel Training System Reform Measures

40.6.1 Set Up the Long-Term Objectives of Cultivating Talents

A variety of training mode cannot change Chinese football “Couture”; it is the cultivation target of short term and utilitarian. Soccer Reserve personnel training must resolutely eliminate trophy doctrine, eager for quick non-sport moral behavior, and strive to create a campus culture of football, can raise the production of Jianyou, all-round development and has a certain football talent adolescent talents. Therefore, football reserve talents should not be too pursuit of short term inside the amount of talent, and athletic level should be to foster youth football interest as the fundamental, focus on the future—a player for the future, the future fans and future genuinely committed to the development of football. In this process, emphasis on school activities of the organization of the evaluation results, desalination, cultivate students’ interest in soccer. Even if the young athletes will not a good player, also can become excellent fan, be willing to contribute to the development of football.

40.6.2 The Sound of Our Junior Soccer Training System

Chinese football youth education mechanism and mode should be taken by the education departments at all levels, shall be responsible for the specific and sports, football department, sports and education departments joint consultation to strengthen the youth training institutions and training center, established by primary school, junior high school, high school, University training system; all the work by education departments the sports department assist the Football Association specifically involved in the implementation of the “combination of training and teaching” mode; the football youth training bodies made of a separate dedicated to serve young people training and competition, as well as the stage coach fee. Active state, family, society, and other aspects of the comprehensive investment method should be taken; the problem of funds should be solved. Learn from their successful experience, to establish multi level, multi level basic training base and the elite training center.

40.6.3 Improve the Training of Coaches

Improving coaches' knowledge structure and level, improve the scientific culture quality is to improve the coaches, the level of China's football powerful guarantee. Encourage coaches business training and academic exchanges, qualification, obtain national, and international coaches certificate. If the certificates and salary income are better, this is to guarantee the stability of effective means of coaches. Unified make coaches induction and coaching level standards, regular assessment and training of coaches; establishing coaches' introduction mechanism and coaches' competition mechanism, is to promote the effective measures to improve the level of coaches. Organized specifically for grassroots' soccer coaches training project, tendentious expanding grassroots coaches, make our country football is more popular; realize what Comrade Xiaoping said football should grab from baby's desire.

40.6.4 Vigorously Develop the School Football, Establishing Diversified Culture Channel

Our country's present stage is spoken by more than 400 million students in school, so large a group which had a football reserve talent, and the talent is subjected to a complete education, self-cultivation and cultural quality is relatively higher professional players. The relevant departments should pay full attention to the development of the school football, inside the school to find talent. Club, professional team can be in the host of college football, high school football stadium on the discovery and selection of outstanding personnel for. At the same time, the professional team, the club can be a player to a high school, university cultural course learning, to enhance the player's own cultivation and cultural quality. Let the football back education position, make football in school health, healthy, active in the development of. And only let football back education position, can reverse the player's cultural learning is weak, self-cultivation, low quality of undesirable phenomena.

40.6.5 Improve the Social Security System of Athletes

Athletes as a special group, engaged in the occupation with high investment, high risk, long cycle, and high degree of uncertainty, we must establish a consistent with this social security system, to attract more people to join the ranks of competitive sports. The athletes' social security system should consider the following aspects: social insurance, disability insurance, job placement and benefits, and allowances. In order to fully mobilize the elite athletes training and competition in

the initiative, they have their family and social support, for Chinese football reserves more, more potential talents, promote the sustainable development of football reserve talents cultivation.

40.7 Summary

Sports are cruel; the replacement of old and new is natural. All we can do is to proceed to the training and selection of Chinese Soccer Reserve Talents, and this is the true way of Chinese football. A national soccer level can be measured in addition to the national team's performance in the match, but also from the Soccer Reserve Talents. Overview of world football power, in addition to their training, competition advantages, continue to reform measure and a strong reserve force, it is one of the important conditions for them to maintain the level of. Through the establishment of Soccer Reserve Talents training goal of the long-term, the sound of our junior soccer training system, improve training of coaches, vigorously develop the school football, establish diversified training channels, improve the social security system of athletes, improving our soccer reserve personnel training system to improve the healthy development of Chinese football, athletics level.

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Chapter 41

Reform of College Sport Education Curriculum Goals System

Yejun Zhan

Abstract Comprehensive reform of university physical education curriculum reform of physical education curriculum goal, expounds the mechanism, physical course structure, physical education curriculum teaching and sports curriculum evaluation system. The whole system should break through the traditional physical education concept, adhere to the “health first” guiding ideology, reflected the value of health, practical, sustainable development and evaluation of the concept and development point of view, incentive in addition, for comprehensive reform of college physical education course countermeasures were introduced in detail.

Keywords College · Sport education · Curriculum goals system

41.1 Introduction

Comprehensive reform of university sport education curriculum means is that in the process of implementing college physical education curriculum reform, should by the general mechanism university physical education curriculum object, curriculum structure, curriculum teaching and course evaluation system, every link to join closely to form an organic whole, hope to achieve overall goals of the comprehensive university physical education curriculum reform [1]. The whole system must break through the traditional physical education concept, adhere to the “health first” guiding ideology, reflected “the value of health, practical, sustainable development and evaluation of the concept and development point of

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view, incentive in the process of implementing curriculum, we should correctly handle the relations between and maintain contact of the trend of the development of integrated curriculum, teaching and evaluation.

41.2 The Reform of College Sports Mechanism

The three management mechanism is college sports education, management departments and university management system, and establishes a vertical layer-management and distributed coordination [2]. With the major university physical education curriculum reform, we must improve the physical education mechanism, form physical system-coordination as national macroeconomic regulation and control and university, and submit to the specific right school have more flexibility, causes the university fully play the role, deal with sports independently. Comprehensive reform of college physical education curriculum and the reform of college physics influence mechanism and promote each other. Generally speaking, the new trend of comprehensive reform, the reform of physical education curriculum will inevitably affect university physical mechanism.

41.3 The Reform of College Physical Education Curriculum Goals System

College sports course target, it is the education administrative department according to university of talent training, the beginning of the overall goals, is curriculum design and teaching, guidance, make the curriculum standard university development the important standard guide college sports, and demand, not only manifests the needs of the community requirements and the development of personality, and conform to the characteristics of physical education. Fitness and health sports education is the basic functions and the objective, university physical education curriculum reform is seeking constantly [3].

41.4 The Reform of College Physical Curriculum Structure

Determines the function of the law reveals the system theory. So the university physical education curriculum structure to achieve the goal of a function of the sports curriculum. However, and realize the objective must be based on science course structure formation must be reflected in the design of curriculum plan, so specific problems lesson plans that solve what lessons should be set, how to set up,

how to make these courses curriculum content of combining various, various kinds of types and different forms to the effect of the whole optimization, which requires course, curriculum content, curriculum type proportion.

41.5 The Reform of College Physical Education Curriculum Instruction

Construction of Teaching Staff Education reform in the process is also the process of learning and development of teachers. All we can do is change the concept and expand their knowledge and skills is to meet the requirements of reform, and, after that, we can ensure that the successful reform. The problem facing the physics teachers university physical education curriculum comprehensive reform include two: one, sports teachers' comprehensive quality improvement, but still lags behind the quality of teachers need the new physical education curriculum progress in college. Second, the reform of physical education curriculum requirements sports teacher role reversal, in the college, this is to transfer soldiers "or" performers "in the sports teaching outline developers" or "designer" in the physical education curriculum. So, continue to education of the university physical education teachers to provide these aspects of the development of opportunity and science, continuous, lifelong and personalized connotation is rich of education.

The Fully Utilization of Physical Facilities and Resources Stadiums and sports equipment is powerful guarantee of physical education teaching reform, is the premise of the completion of the teaching task success. At present, the most outstanding problems is to use university faces of sports facilities and resources, university sports not only need to complete the normal physical education course also laid special emphasis on in one of the internal and external course, so that the students take part in physical exercise as much as possible to retain and increase the use of stadium; In addition, opening to the degree of social also increased.

The Reform to Teaching Materials of Physical Education The sports education content is an important part of the quality education, physical education curriculum resources and tools, for the learning of students, sports theory knowledge and the skill system and a certain range and depth, this is organized, and the purpose is to realize the sports education professional training target and the teaching goal. In the process of physical education, teaching material is material, can make the teachers' and students' learning and teaching of sports, the main media connection education thought, and teaching methods. Therefore, the teaching materials play an irreplaceable role in sports, education. At present, the main problems of the teaching materials including: first of all, the form is not enough, the content of the novel is simple, repetitive; Secondly, the revision process theory criticism is not comprehensive.

The Conversion of Students' Attitude and Action toward Physical Education Ministry of education and the state general administration of sports and the communist youth league central committee decided together types of school all

levels of deepening a wide range of “sunshine sports to the millions of students’ national” since 2007. The document shows that the sun sports should combination and extracurricular sports activities, to ensure that all students have an hour of exercise time average each time, and the learning extracurricular sports activities in the teaching plan and form a system. However, the survey students attitude and actions to sports programs, nearly four students don’t like physical education, many students don’t take part in extracurricular sports activities in time of regular exercise and physical activity does not reach the standard of sunshine sports.

41.6 The Reform of College Physical Education Curriculum Evaluation System

With the students as the main part, college physical education curriculum concentrates on the learning activities of students.

Sports Index Including sports knowledge index the target of the campaign skills. Knowledge of the target motion control basically make students the basic theory and method of constructing the scientific use of body scientific theory to guide the practice of motor skill, goals means that control one or two good sports through research and development from the sports course they lay the foundation of the professional future selves exercise.

Health Index Health index is health objectives, by the shape of the target function and fitness knowledge goal. Health is the goal of the need to develop the physical quality has close relations, to facilitate students’ health. The function requirements of the target shape student body composition and body symmetry at or close to ideal standard and requirements; Fitness knowledge goal requires students to control the theory and method of the relevant health fitness, protection, preservation, health and other knowledge.

Behavioral Indicator Behavior is mainly by sports participation, index of mental health and social adaptation ability. Sports participation is his most prominent characteristics of sports education. In the sports teaching the university students’ psychological health education purpose, mainly in the emotional control ability, establish the confidence of the health. The content of the social adjustment includes developing cooperation ability, communication skills and adapt, and establish long, good interpersonal skills and team spirit of unity and cooperation.

41.7 Countermeasure for the Comprehensive Reform of College Physical Education Curriculum

“Invigoration” of Patterns for Teaching and Learning Teaching and learning mode is a necessary condition, the development of education activities. Reform and development of the teaching and learning model is the most direct and the

reform of the teaching thought and vividly embodies the teaching content of change. Teaching and learning mode of the sports curriculum not static, but to emphasize “vivid” of the word, students participate in a wide and increase the wisdom and innovation ability. In class, more in the teaching activities, mode and discussion of the game mode should be able to make every student to share experience, really with teaching activities and learning cooperation process, found that his teacher and classmates’ communication.

Improvement of Teaching Method In the application of teaching method, we should emphasize to arouse the students’ interest in study of sports activities and guide the settlement will not certainty and the difficulties of exercise, pay attention to an important part of learning, emphasizing the students’ emotional experience, full consideration of the differences in health, interests and sports skills, we can determine the teaching methods and puts forward the corresponding teaching advice, want to ensure that most students can complete course of study goal, that every student can feel the fun of learning and success.

Public sports course, guidance, and extracurricular sports course and public physical education curriculum should be united, formed the sports curriculum integration system in and after class.

To Stimulate Study with Competition, Promote Progress with Inspiration and Emphasize the Personal Ability Establishment of Teacher Strengthen the establishment of teacher’s personal ability is an important measure to execute establish teachers’ team.

To Play Down the Difference of Evaluation And Emphasize the Difference of Individual and the Evaluation to Process The evaluation of students’ study should be assessment from the two aspects of learning effect and process, so we should pay attention to the school two evaluation the learning process records and students.

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Chapter 42

Research on Physical Education of Higher Vocational Colleges

Ye Zhang

Abstract In this paper, on the basis of giving an introduction to the current situation of the physical education of higher vocational colleges, the author carries out an analysis on a series of problems in the physical education. These problems mainly include the unclear teaching objectives, unreasonable curriculum design, inadequately original teaching contents, unenlightened teaching concepts, and no embodiments of the characteristics of vocational education, etc. In view of such a current situation, hence, the author puts forward the ideas of conducting reforms on the current physical education of the higher vocational colleges. More specifically, it is necessary to update the physical education concepts, improve conditions for the physical education, highlight the occupational characteristics of the higher vocational colleges, and also enrich and develop the contents in the physical education around the objectives of the school physical education and by taking the quality education and people-oriented idea as the starting point, so as to make the teaching forms and methods diversified, and the evaluation systems well-improved.

Keywords Higher vocational colleges · Physical education · Teaching reform

42.1 Introduction

The profession education at higher vocational colleges, as one of the important contents of the higher vocational education exerts a unique role in the all-round development of the qualities of students and the improvement of their health.

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Therefore, it is one of the important tasks of the higher vocational education. As the higher vocational education has attained a rapid development in China, there are a series of problems in the physical education of higher vocational colleges. Thus, it is necessary for the physical education of the higher vocational colleges to adapt to the requirements of society, and simultaneously implement constant exploration and reform. In this paper, through the combination with the characteristics of higher vocational colleges, the author conducts an analysis on the current situation and problems of the higher vocational colleges, and subsequently puts forward the new ideas for the reforms of the physical education.

42.2 Current Situation of the Physical Education of Higher Vocational Colleges

Generally speaking, the physical education is educated for one year at the higher vocational colleges. Then, it can be known that the period for the physical education is too short, and the foundation of students is too bad without saying. A long time ago, the diversified patterns happened to the physical education model. However, the traditional physical education model, which is majored at the “Three Foundations”, stills takes up a significant proportion in the practices of the physical education, but this cannot be divorced from the profound influence of the traditional physical education model [1]. These can be mainly reflected from four aspects. First of all, all kinds of activities in the physical education are implemented around the impartation of the sport techniques. Second, the guiding ideologies of the physical education go to extremes to some extent, and also lay an excessive stress on the “happy sports” or “exam-oriented education”, resulting in a polarization. Third, generally speaking, what the teachers educate at schools are the contents in the examination, and therefore the students only exercise these contents, which is to the disadvantage of the all-round development of the qualities of the students. Finally, the evaluation system is still not sound. The evaluation on the physical education is implemented in accordance with the scores that the student achieved at physical educational classes, and simultaneously is centered at the competitive standards. Therefore, it lays an excessive stress on the practices and looks down on the theories, and also is difficult to stimulate the interests of the students. As a result, some students with good congenital qualities can be easy to pass the examinations of the courses in physical education without any efforts, while the others with a weak foundation are hard to achieve a relatively good result even though they make the greatest efforts. Therefore, the results from the evaluation on the physical education cannot really reflect a student’s healthy condition, self-exercise ability, sports knowledge, personality development and lifelong sports consciousness.

42.3 Main Problems in the Current Physical Education of Higher Vocational Colleges

According to this problem, the author conducts an investigation on over 30 higher vocational colleges all over the country, in which a questionnaire survey was implemented among 130 physical education teachers and over 2,000 students. Thus, the data which was obtained from this investigation all was first-hand, from which it can be known that the existing problems can be concluded as the following.

Backward Physical Education Ideas Due to the influence from the traditional physical education and concepts, the physical education at the higher vocational colleges always lays a one-sided emphasis on the knowledge in the traditional physical education as well as the classroom teaching of the sport techniques. However, the consequences produced from these ideas and concepts are only attaching high importance to the present interests, and giving a cold shoulder on the speculative knowledge and guiding methods supplied for the health education and scientific fitness of students [2]. At the mean time, the cultivations on the sport consciousness, ability and habit of the students are in absence, which allow them to have difficulties to form the ability and habit to persist in the physical exercises for a long time after graduation.

Insignificant Professional Features of the Physical Education System In China, the main characteristic of the training objective of the higher vocational education lies in the “pertinence”. In other words, the higher vocational education has a direct connection with an occupational position in society, and hence is of a distinct occupational orientation. Besides, the training objective attaches high importance to the occupational abilities in the positions after graduation, which is applicable for a specific occupational position group or the talents in a certain technical field, but is not directed at the talents in the ordinary junior college education. The technical, practical and application characteristics of the education of higher vocational colleges in the cultivation of the comprehensive occupational abilities make them different from the general higher learning schools. In addition, the students at the higher vocational schools will step into the front-line work positions at a fast speed after receiving a systemic learning. Thus, the obvious occupational feature is another embodiment of the education of the higher vocational colleges.

Unclear Objective and Content of Higher Vocational Education At the present time, the objective of the physical education of the higher vocational colleges is randomly classified into the “fundamental objective” and the “development objective”. Based on the conventional practices, the students with poor abilities in the sports are required to reach the “fundamental objective”, while those with powerful abilities are necessary to achieve the “development objective”. These, hence, puts forward a higher requirement on the teachers in the physical education [3]. That is to say, it is necessary for these teachers to carry out correct analyses and evaluations on the differences in the sport foundations of all

students from all aspects in the teaching process, and adopt the appropriate ways to help students realize these two objectives at the same time. Through such a classification, the objective of the courses can be educated with a clear objective. However, it is a great difficulty for the teachers in the physical education to conduct specific implementations on these objectives, which require them to make constant explorations in the teaching practices.

Obsolete Physical Education Teaching Methods and Unsound Management Organizations At the present stage, a majority of the higher vocational colleges in China do not establish the special organizations to manage their physical education internally in accordance with the regulations in the national “Regulations from the School Physical Education”. As the necessary management organizations and personnel are in absence, the physical education at the higher vocational colleges is under an unmanned management [4]. As a result, it is in an unrestrained freedom, and exerts a serious influence on the normal exertion of the functions of the physical education, and prevents the physical education from developing at a higher level as well.

42.4 Reform Ideas of the Physical Education of Higher Vocational Colleges

Improving the Law Consciousnesses and the Conditions for Physical Education At the beginning, it is necessary to select the physical education teachers with high occupational qualities and powerful abilities to be responsible for the special management organizations for the physical education at the higher vocational colleges. This is able to make a further improvement on the work of the school physical education, and bring the initiatives of the physical education teachers into full play, and provide better services for the practices in physical education. Next, it is necessary for the leaders from all vocational colleges to arrange the sport fields, facilities and apparatus in accordance with the quota standards in the “list for the facilities and equipments in the gyms of general higher learning schools” which was issued by the ministry of education in 1992. At the mean time, for those higher vocational colleges in absence of the gym’s facilities and equipments and exerting a serious affect on the normal physical education, it is necessary to put forward measures to rectify and reform them with a time limit according to the national the requirements on the school hardware condition.

Highlighting the Occupational Characteristic of Higher Vocational Colleges, and Enriching and Developing the Contents of Physical Education As for the reform of the contents of the physical education at the higher vocational colleges, it is necessary to combine the characteristics of the higher vocational colleges, and simultaneously comply with the applicability principle, the lifelong principle and the pertinence principle. The so-called applicability principle means that the teaching materials with a strong applicability are necessary to be selected

in accordance with the difference between the occupational technologies and the physical qualities required by the actual occupations, which will be in favor of the majors of the students as well as their future jobs [5]. However, the ultimate purpose of the pertinence principle is to prevent the emerging of the occupational diseases. Therefore, in the selection and compilation of the teaching materials, it is necessary to lay a stress on the pertinence principle; it is better to select the teaching materials which have the health-protection, rectification and prevention functions, so as to restrain the mistakes of the students and make up their shortcomings. At last, the lifelong principle requires the physical education teachers at the higher vocational colleges to attach high importance to those sport items with strong continuity, pragmatic function and fitness value. In addition, it is also necessary to select some teaching materials in theory, and there the lifelong physical education idea can be provided for the students from the theoretical perspective, for the purpose of allowing the students to get an understanding of the physical exercise principles and methods, the prevention of the sport injuries, the medical supervision in sports, the method of evaluating the body-building effect, etc.

Diversified Teaching Forms and Methods In view of the characteristics of the students at the higher vocational colleges, almost all kinds of forms and methods can be adopted to reform the physical education, such as the simplification of the teaching contents, the implementation of the system combining the both primary and auxiliary teaching materials, the proper increase of the number of the students at the physical educational classes, the grouping the students based on their actual physical qualities and sport foundations or their comprehensive indexes (i.e., height, weight and age). In terms of teaching, it is necessary to not only pay attention to the researches on the educational methods, but also strengthen the guidance to the learning and practicing methods of the students, with the purpose of making an enhancement to the self-study and self-practice abilities. Besides the traditional repeated practice and grouping practice, it is also necessary to widely apply the suggestive teaching, psychological teaching, small-group education mode, creative learning, audio-visual education program and other methods to the physical education. In addition, it is necessary to reinforce the extracurricular activities, making the classroom teaching and extracurricular teaching integrated together.

Reforming the Evaluation System of Physical Education First of all, the physical qualities and sport competences have a close connection with genetic factors of the students. Thus, it is necessary to establish an evaluation system which helps to encourage the students to development their physical education qualities in an all-around way on the basis of the objective of the quality-oriented education, and then a comprehensive evaluation can be implemented on the students; the evaluation indexes are able to really reflect a student's physiological, physical, intellectual and technical states. Secondly, in the light of the requirements of the vocational education, the physical education is necessary to attach higher importance to the evaluation of the occupational abilities of the students and the promotion effect of the physical education on occupational operational

skills. Furthermore, the method of combining the result evaluation and the process evaluation is necessary to be adopted to check the increasing degree of a student's physical education scores and the seriousness to learn. Thus, a comprehensive evaluation on a student's physical fitness, sport skills, learning attitudes, behaviors, emotions and wills, cooperation and interpersonal communication, etc.

Under the circumstances, it is necessary for Chinese people to reform the examination system of the physical education, revise the standards and methods of reforming the physical education scores of students again. The specific suggestions are dividing the evaluation of the physical education courses into the difficulty-increasing and difficulty-reducing examination on the sport skills, the sport theory examination, and the attendance of the extracurricular sport activities. The ratio among the three examinations is 50:20:30. The purposes of evaluating the extracurricular activities are driving the students to initiatively participate in the extracurricular activities, cultivating their lifelong physical exercise habits and abilities, making the extracurricular sport activities into an important extension of physical education classes, and urging the students to form the good habit to do physical exercise.

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Chapter 43

Research on Rural Sports Development in the Construction of Powerful Sports Country

Hongxue Zhang

Abstract Our country is being on a new stage from the construction of sports giant to the construction of sports power. Whereas, rural sports development, as one important part of mass sports, does lag behind. Such a situation focuses on the following problems: regional imbalance of sports development, relatively less capital input, the shortage of sports playgrounds and facilities, relatively less peasant sports population, out-dated sports concepts, lack of professional sports instructors, and so on. Based on the analysis of the causes and uniting the aims of sports power, the paper analyses and elaborates the above problems systematically, and also proposes the corresponding suggestions and solutions.

Keywords Rural sports · Sports construction · Public sports · Sports development planning

43.1 Question Proposed

For the several generations of sportsmen and sports workers, to build the powerful sports country is not only their dreams which they have been craving for, but their goals which they have always been striving for. The development of rural sports is an indispensable part during the construction of sports power. When the significant breakthroughs were achieved in Beijing Olympic Games and Paralympics games, President Hu jintao made a speech in the summary and commendation congresses respectively [1]. Mr. Hu put forward to the strategic choices —“to further promote

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the development of our country from Sport Giant to Sports Power” [2]. This is a call of action to accelerate the development of sports in the new periods. Meanwhile, Mr. Hu’s speech pointed out the new direction for sports work, and provided a strong spiritual motive for sports development [3].

Our country is a developing agricultural country. Among the total population of 1.3 billion, rural population has more than 9 billion, accounting for 70 % of the total [4]. The sports problem of rural population is the most important and the most sensitive topic for the launch of “Sports Power” strategy. The farmer physical culture involves the population which is the most in numbers, the poorest in wealth, and the most needed in development. The culture construction of the New Socialist Countryside, based on the enforcement of the rural public cultural construction, is to hold various folk culture activities representing local characteristics, to enrich peasants’ spiritual and cultural life. With the strengthening of rural economic development, cultural construction should embody the new image and new face of new countryside [5]. After decades of development, as a part of the construction of new countryside culture, can sports adapt to the environment and undertake its advantageous role in the construction of the New Socialist Countryside? These are a series of problems before us.

With consulting the document in recent years, the paper elaborates the occurring problems in the current farmer physical culture, in order to offer solutions to problems in the construction of new countryside sports [6].

43.2 Confusion of the Rural Sports Development in the Construction of Sports Power

Toward sports power, experts have different interpretations according to their own arguments. The consensus for sports power is that the comprehensive strength is obvious ahead of the other countries, as well as the overall level of the country’s sports development [7]. There are two basic standards to evaluate and distinguish sports power: one is the international competitiveness of athletic sports; the other is the development level of mass sports. Elements, to compose of the bracing system of sports power, are sports industries, sports science and education, sports law, sports communication, sports management and sports communication and so on. Simultaneously, the embodiments of soft power of sports power are spirit of sports, sports prestige and the international rights of speak [8]. From the current situation of sports development in our country, sports undertaking is on the stage of quantity accumulation, and head for the direction of sports power, but there is a long way to realize the goal. Because at present our sports culture has a very modest influence on the world; our sports lacks of speak right in the world sports, and also our rural sports is backward and imbalanced. And now the backward rural sports have become a bottleneck during the process from sports giant to sports power. This situation can be specified as follows:

43.2.1 Peasants' Weak Sports Consciousness Because of Their Traditional Thoughts and Less Publicity of Relevant Departments

Sports consciousness is the self-awareness of fitness which comes into being naturally after people's long-time exercise. They not only know the time and Intensity of activity, but also can diagnose themselves. Most peasants have no concept for sports exercises because they are influenced by traditional thoughts and relevant departments' less publicity. They mistakenly believe that working in the fields and daily physical labor are physical exercise. What's more, the sources are very limited for them to learn physical fitness knowledge, so that they know little about the knowledge. They believe "One is healthy if he is well". Correspondingly, they can't experience the physical and mental fun which is brought by sports exercises [9].

Although some peasants know a thing or two about the function of sports activity, they have some misunderstandings and prejudice on some activities. Peasants resist taking part in some activities which are inelegant and indecent in their eye. For instance, the annual Finland's "Wife-Carrying Contest" can't be held in some rural areas in our country.

43.2.2 Government's Less Capital Input is the Reason Why a Rural Sport is Short of Sports Playgrounds and Fitness Equipments

As we all know, athletic sports can stand for government's feat, and the number of gold can reveal the development level of national athletic sports. There is still no guarantee for rural fitness equipments, although in recent years, there is a rapid development in rural economy and also a great increase in peasants' income. The government's capital input is very little in rural sports, especially in sports facilities and playgrounds. In our country, there are more than 60 million all kinds of gymnasiums and stadiums, accounting for 83.5 % of land size. However, vast rural areas, owning 61 % population of the total, account for 20.2 % in all kinds of gymnasiums and stadiums (cited from China's Social Sports Survey Report). These playgrounds mostly exist in rural primary and middle schools, so that it is very inconvenient for peasants' participation. Peasants have the physical exercises in their own yard, on the road, on the streets and fields. The government's capital input in athletic sports is 4.8 billion Yuan. However, it is 2.7 billion Yuan in mass sports. Furthermore, urban mass sports occupy the most in the input of 2.7b. As for the countryside, having the larger population and area, capital input can not meet the need of people's culture and sports. Facing the existing sports facilities, most peasants are stranded or blind just because they lack of sports knowledge and are

very weak in sports consciousness. In addition to peasants' own factors, the reason is that the local sports departments focused only on urban residents and school sports, and also held less sports activities in rural area.

43.2.3 As a Whole, Peasants' Sports Consumption Level is Very Low and the Rural Sports Population is Relatively Rare

Since the Fourth Plenary Session of the Thirteenth Central Committee, most rural areas have entered a new stage of building a well-off life. To Peasants, they have a great increase in their income, an obvious promotion in the quality of their life and a great rise in the overall consumption level. As far as the vast rural areas are concerned, sports consumption level is relatively low. They mainly spend their money on the materials of production and livelihood and the child's education, etc. On the contrary, the input is quite slim in sports. Sports population is an important index to measure the development of a country's sports undertaking. It is quite crucial for us to study the sports development level in a region, or a country. Survey and Research on the Status Quo of Mass Sports in China revealed that 51.23 % people take part in sports exercise in cities, while in rural areas, 28.97 %. In different age brackets, the proportion of participants in rural areas is obviously lower than that in the urban areas. In addition, with the age growth, the gap is larger and larger.

43.2.4 The Unbalanced Regional Development of Rural Sports, Result from the Influence of Geographic Environmental Factors, and Restriction of the Level of Economic Development

Restricted by geographic environmental factors and influenced by the level of economic development, the difference of sports development is very great between "the urban and rural, the east and the west, and the developed and underdeveloped", according to work report of General Administration of Sport. In some provinces, the rural sports are almost blank. In rural areas of china, the population of 58 million still doesn't get rid of poverty. Most peasants still strive for their survival. Restricted by economy, culture and consumption level, peasants' sports activities are scare and monotonous; sports market is sluggish and is hard to develop. As we know, economic imbalance will certainly bring peasants' sports imbalance in various aspects. Every level presents the uneven development phenomenon. The difference of sports development degree can be seen between

coastal areas and inland, as well as between inland and remote areas. The development has both advanced and backward sides.

43.2.5 The Bad Working and Salary Condition has Restricted the Team Foundation of Social Sports Instructors in Rural Area

The professional sports instructors has to slow down their steps to rural areas because of the bad working condition, low salary, behindhand basic sports facilities and some other reasons. For the development of rural physical exercise, social sports instructors, as the organizers of sports fitness, direct the bodybuilding scientifically and popularize sports fitness knowledge on the one hand, and train the reserve peasant social sports instructors and expand the team of sports instructors on the other. Through training sports instructors help to develop sports propaganda, to guide the bodybuilding in good methods and to form consciousness of body soundness among peasants. In July 2005, State Physical Culture Administration promulgated the “Proposals on Further Strengthening Social Sports Instructors Work”. After the Proposals are issued, the rank of social sports instructors has been developing so rapidly that the number of social sports instructors has grown to over five hundred thousand. However, China, because of its huge population, the social sports instructors are far from enough to meet the practical demand. And meanwhile, the existing social sports instructors mainly live in urban areas, and the people who do service for the rural sports cause are very few.

43.2.6 The Local Government has not Recognized How Important the Sports are and has not Established the Special Functional Department for the Rural Sports Development

Since the reform and opening up, China has four reforms in government organization. Some unreasonable problems, such as an unwieldy organization, overlapping functions, overstaffing, and unfavorable personnel structure, have been solved basically. But some derivative problems also appeared from the merger and reorganization of culture and sports departments. For example, some sports departments have been revoked in many counties and towns, or have been managed by the culture, education or health department, which has greatly restricted the development of rural sports cause in China. Nowadays, the grass-root public sports cause still need the state and government investment mainly. The fact that the function of grass-root sports management department has been weakened may

lessen the investment for the public sports cause including the rural sports, which will be the other factor to restrict the sports development in our new countryside.

43.3 The Developing Countermeasure of Rural Sports Work in the Construction of a Strong Country in Sports

For the purpose of turning China into a sports power, we should create a good fundamental environment, which is the goal to fight for and also the dream pursuit by sportsmen for several generations. We'd better pool the wisdom and efforts of everyone to create a favorable environment for the rural sports which is an inseparable part of building a sports power, and take actions that suit local circumstances in order to make the rural sports viable.

43.3.1 To Develop Different Kinds of Ethnic Sports Activities on the Basis of the Nationality of the Rural Sports Work

The development of rural sports bears the sign of the ethnic and cultural identity. China covers a vast territory and is abundant in natural resources. The contents of the rural sports are rich and colorful. Rural sports have such a close relationship with the rural natural conditions that it may be influenced considerably by climatic conditions and geographical environments. The fact that the climate in China is diversified characterizes the rural sports as the season diversity and region diversity. While, the season diversity expedites the diversification in the ethnic sports activities, which is shown by the nationality in rural sports. In China, several hundreds ethnic minority sports items are unique and rare in the world. Combining innovations with inheritance, the local government should exploit and develop the regional and ethnic folk traditional sports in order to give a new lease of life to the dying sports culture activities. To the nationality of sports as an opportunity, the local government should exploit the immense potential capacity in all nationalities and have ethnic sports activities to promote the development of the tourist industry. For example, "the firecracker ball" in the Dong nationality, "the flaming rope skipping" in the Yi nationality, "the vaulting horse or camel" in the Man nationality, the Mongolia wrestling, sheep-chasing on horseback in the Uyghur nationality, the pearl ball in the Man nationality and the bowl in Hui nationality. The sports management should improve standardize and methodize the competing policy of these items to lay stress on national and local style. So the "the Guidelines for Our Sports Industry Development" will be implemented, and the rural ethnic sports will be push to a new high.

43.3.2 To Develop Different Kind of Simple Sports Activities on the Basis of the Flexibility of the Rural Sports Work

With the farming mechanization, peasants have more spare time. The demand for the sports in rural areas is becoming stronger and stronger, and the content of the sports activities need to be richer and richer. Peasants can choose their favorable sports freely according to their interests and practical conditions. Due to the organizational form of the rural sports is flexible, sports activities can be played by an individual or an institution entity, can be organized by the village committee, the country government, an individual or several villagers without a fixed form. In term of the form of physical exercise, it is so rich and personal that it varies from person to person and peasants can take actions that suit local circumstances. The local sports management should respect the flexibility of the rural sports and make a lot of easy-operating sports activities. For instance, in Chungmou County, Honan Province, peasants have a match of clinging watermelon each year. In Heze, Shandong Province, peasants have a match of picking up apples in the harvest season every year. All these activities are free from body-building apparatus and exercise yard. Having their sports activities in fields, peasants not only enrich their life but also enjoy themselves. Even if their prize is only a sack of fertilizer, they may jump in with both feet.

43.3.3 According to the Spontaneity and Seasonal Rural Sports to Carry Out Different Sports, the Farmers Involved it and Enjoy it

Sports in the rural area are a basic form of sports entertainment for the local people in the purpose of improving their quality of living. The farmers take the exercise during the farming times or while they are taking a break.

The operation forms of these activities can vary sometimes well-organized by some leading person or most of the time it seems to be spontaneous behavior are taking a break. Generally, this spontaneous behavior will be restrained by the productive seasons. Consequently, in the busy time of the year there will be less sports activities. Various sports only happen in the free time or important festivals. Local authorities should express approval officially and hold colorful sports events providing the farmers a stable front stage to participate in and to perform, such as

43.3.4 According to Rural Sports of the Times, According to Local Conditions to Carry Out Sports Activities to Local Conditions

Our economy has developed at a great pace after reform and opening up. Rural sports activities which have the distinctive flavor of the times also advance with the times. In addition to their own sports of ethnic minority, modern recreational sports activities also covered the countryside, in billiards, mahjong, and ball games to yoga, aerobic, hip-hop. Rural sports which advance with times have various forms. With the organization by national and local sports departments, enthusiasm of people is running high. The local sports departments should guide the farmers to actively participate the new cultural recreations and regularly hold diverse forms of sports to provide farmers with the chances of exercises and participation.

43.3.5 Implement the Seventh Congress, to Increase Investment in Rural Sports, Sports Publicity Efforts, Rural Sports Fitness Instructors to Enhance Team Building

Under the leadership of the superior sport department, the local authority should fully arouse the enthusiasm and increase capital investment, adjusting the measures to the local conditions with the construction of a fitness equipment and fixed exercise ground, and regularly carry out sports competition. Social funds should be encouraged to invest the new rural sports and culture construction. Farmers should be encouraged to develop the new rural sports and culture construction in the self-financed way and their awareness for the maintenance and care should be nurtured at the same time. The management responsibility of local basic government should also be strengthened.

Implement the spirit of the 17 session of the General Assembly and carry out official action guide of sports. Launch the organized national fit-keeping activities and district farmers sport games combining the rural status of the fit-keeping, and arouse the farms' initiative of participation to propaganda the knowledge of scientific health. Broadcasting is regularly carried out in the local radio station by radio and television, the internet, posters and leaflets, propaganda should be carried out in the community which rural workers are occupied intensely in the market and square. Build the atmosphere of the fitness to a maximum range to make every farmer understand the advantage of fitness and conscientiously and voluntarily participate in the rural sports activities.

According to the scale of the rural area development, the certain number of professional sports instructors should be appointed and training should be developed regularly to expand the team of professional instructors. Pay attention to the

identity of the farmer's sports instructors during the training, Only the sports instructors who are fit for the model of rural area sport development can they make the most of the advantages to appeal farmers to participate in sports to the maximum by exploiting the present conditions in rural area.

43.3.6 Learn from Foreign Experience in the Construction of Community Sports in Rural Areas, the Establishment of Pilot Rural Sports Development Planning, Active Play to Rural Schools, and Village Committees in Rural Areas Work in the Role of Sports

In the new rural construction of the experimental unit, study and implementation of sports development plan should be paid attention. Learn from foreign experience of sports development of rural communities, our model of new rural sports development should be made specifically according to our own national conditions. Start the competitions according to the different ages by the committees in village and schools. Guide the participant actively and scientifically in the competition by their hobbies to lead a gradual transition to a professional sports training and competition in order to find sportsman with potential talent and reservation of human resources for china's sports comprehensive development. When organizing rural sports, the peculiarity of rural sports participants should also be considered. Aiming at attended children and women, provide recreational activities which are fit for their participation to promote the development of the rural area sports and play the role of sports in the new rural construction.

43.4 Conclusion

Our rural sports are an important part of the mass sports, but it also meets with great perplexity in its development and self-improvement. Farmers' weak awareness of the sports, lack of fixed exercise and fitness ground and equipment, unbalanced sports development relative less population of sports for the rural areas, the low consumption levels of whole sports, lack of rural public sports supervisors, lack of knowledge for the sports of local government demand prompt solution.

Therefore, in the process of development from the sports great country to the strong country, we must increase investment proportion of the sports, carry out various kinds of sports activities according to the characteristics to publicize the knowledge of sports development of science, train professional sports supervisor teams regularly, make the advantage of the villagers' committees and rural schools, establish the experimental unit for rural sports development to ensure the

implementation of the rural sports by utilizing the experience of rural sports construction from the foreign countries. Only when those problems are solved may our process of transition from great country to the strong country get better and faster.

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Chapter 44

An Adolescent Physical Exercise Ability Evaluation Method in Sports Training

Xiaokun Zhang, Tao Cheng and Yan Liu

Abstract This paper describes an evaluation index system of youth sports exercise ability on the basis of four-electrode technology using biological resistance and sine constant current. There is a strong relationship between the different size and shape of the impedance measurement parts including body shape. The relationship between a parameter is equivalent series resistance index live analysis. The operation mode using impedance waveform and the stability of movement using reproducibility of impedance waveform were evaluated. We expect to find all kinds of sports training application, rehabilitation, and related fields.

Keywords Adolescent · Physical exercise ability evaluation · Sports training

44.1 Introduction

With leisure activities in the high aging society as the background, all kinds of sports and fitness are getting more attention to promote health preservation. As the quantitative evaluation method of physical fitness, a positive health diagnosis was carried out not only in schools but also in the business environment.

We put forward an evaluation on youth sports exercise ability in sports training and related fields using human body impedance. This idea originates from the following reasons: first, in the fact that the reason of human movement impedance variations. Second, impedance method satisfies measuring conditions and suitable for daily use. Needed measuring conditions are as follows:

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The measurement must be non-restrictive as possible and easily done.
The information of movement must be obtained instantly from the results of measurement.

The measurement system must be cost-effective.

In the traditional way to measure youth sports exercise, some kinds of equipments have been employed detector, for example, electromyography, cameras, and video cameras. Each equipment has unique advantages, but there are still some problems in relation to the equipments. Some examples are given in the following [1, 2]: (a) detector is not suitable for complex or rapid movement, it is not sustainable, and it restricts the campaign theme, because it has a structure of mechanical parts. (b) The results are very difficult to analyze, for example, electromyography results are kinematics and dynamics parameters. (c) The data are in a camera, so they cannot be quickly handle on film. (d) A video analysis using video analyzer is of high cost and not simple. Memory space for the camera is limited.

Impedance method has the following advantages: it can be used with the telemetry system and no space limit for measurement. Data can be compressed and measured continuously long time. The results can be displayed easily. Different analysis methods can be performed, for example, superimposing cycle sport. This topic, that spreads in his body, small electrodes in the movement and almost no limit not given mental pressure.

This paper describes an evaluation index system of youth sports exercise ability on the basis of bio-four-electrode impedance spectroscopy technology using biological resistance and sine constant current. This method uses a human body itself as a part of the sensor. First, we show people's limb impedance characteristics. Second, we put forward on the basis of the detection principle, youth sports exercise corresponding size, morphology and stable movement impedance waveform. So, we can let you use this method to assess the youth sports exercise ability with impedance characteristics. Finally, we show two applications and agility evaluation gait gripping assessment test bar-use.

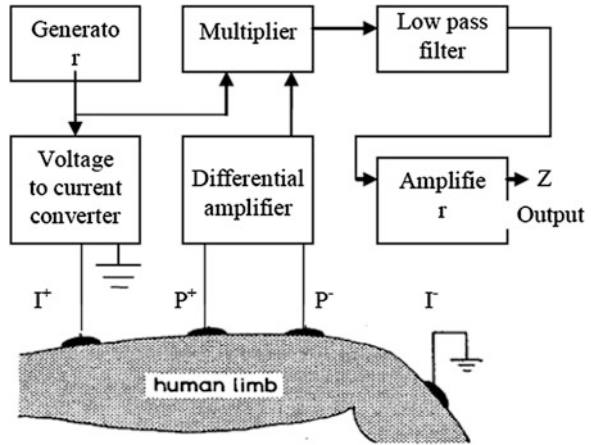
44.2 Measuring Method of Electrical Impedance

44.2.1 Impedance Measuring Device

Figure 44.1 shows a block diagram of the human body impedance measurement device. The four-electrode impedance technique was used as the measurement method based on constant current (50 kHz, 500 μ A) [3, 4]. Measuring device by generators, voltage current converter, differential amplifiers, and amplifiers and low pass filter (cut frequency: 350 Hz). The output signal proportional to the impedance equivalent series resistance.

Four-electrode technology in four-electrode method is put on in a line, constant electric current flows through two outside electrode (the current electrode: I^+ , I^-)

Fig. 44.1 Block diagram of impedance measuring device



and potential difference, between electrodes produced within the potential electrode P^+ , P^-) is detected. Electrode polarization silver/non-AgCl skin surface types of 10 mm diameter. We defined equivalent series resistance as impedance Z this placed electrode; When be modified, and the obtained impedance waveform changes. Impedance is a sufficient change get each action and conditions among the subjects is as far as possible to keep unity.

44.2.2 Evaluation System of Adolescent Physical Exercise Ability

Figure 44.2 shows the evaluation index system on the basis of the youth sports exercise ability bio-electrical impedance. We mainly use impedance data from the impedance measuring device for the type of exercise purpose and other auxiliary sensor use. These sensors switch acceleration sensors, microphone, etc. By measuring body part using sensor, it is possible to analyze various motions.

44.3 Principle of Detection of Adolescent Physical Exercise

44.3.1 Mechanism of Impedance Change

The human body is composed of complex structure of bone, muscle and fat, blood, and skin. A constant current frequency 50 kHz flow through the organization almost muscles and blood resistance rates lower than others [5]. Changes in the cross-sectional area of the muscle tissue and volume of the change of blood impedance in some types of sports, we tried to measure and analyze human movement impedance of change.

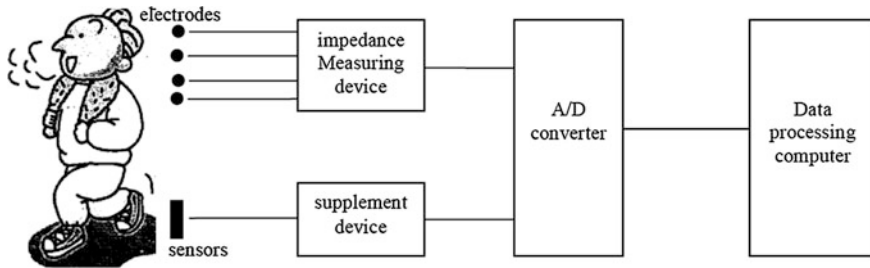


Fig. 44.2 Block diagram of evaluation system of adolescent physical exercise ability using bio-electrical impedance

Table 44.1 Correspondences of human movement to impedance waveform

Human movement	Impedance waveform
Magnitude form	Pattern
Stability	Reproducibility

44.3.2 Correspondence Human Movement to Impedance Waveform

It is very important to assess the truth. We suggest you use impedance analyzing youth sports exercise, because the human body impedance characteristics and human vane motion [6]. We tried to evaluate the operation mode using impedance waveform mode (model) and the stability of the closed impedance mobile, using reproducibility of impedance, waveform shown in Table 44.1.

44.4 Applications for Rehabilitation Field

44.4.1 Gait Evaluation

Crus impedance Z is mainly by the magnitude of the ankle joint Angle size and a moment’s ankle, as Mr. Ma and do not affect feet power is knee Angle. The waveform Z is shown in the diagram. For example: the case that subject is standing straight at first, began to normal gait for about 30 m, and stand again [7, 8]. Gait can be characterized by two stages, Z is the change in the impedance mode, the impedance levels and dZ means that other ZL . Therefore, $Z = dZ + ZL$. Because thoughtful discussion, mainly by the model is one of the important dZ , horse in static conditions rarely [9] (Fig. 44.3).

For different theme, wave impedance and phase of gait were measured with a foot switch. This project deals with young normal subjects, baby, old theme, and

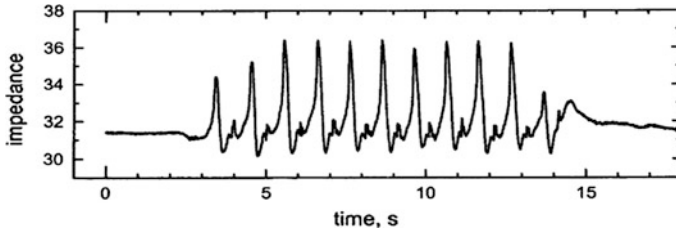


Fig. 44.3 Lower leg impedance during gait of normal subject

hemiplegic patients. In each of the waveform, Z is very different from the other team. For the patient’s waveform characteristics as follows: (1) waveform various appear, (2) dispersions gait cycle time is big, (3) impedance has changed little, and (4) change impedance is slow. According to these characteristics, six parameters are defined as follows:

- Sim: Each impedance waveform similarity average impedance waveform pattern, pattern normal subjects.
- ST: Gait cycle stable time is standard deviation of gait cycle time divided by the average of the gait cycle time.
- Sz: Stability of impedance level is standard deviation of impedance level divided by mean value of magnitude of impedance waveform pattern.
- Zp: Change impedance is the average value of different size, divided by mean of impedance waveform mode impedance levels.
- Zsp: Change value of impedance in stance phase is mean value of magnitude of impedance in stance divided by mean value of impedance level.
- Sp: Sharpness of impedance waveform pattern is ratio of power spectrum of higher frequency.

Figure 44.4 shows hexagonal of 10 patient’s hemiplegic patients normal and 10. These parameters value represents six coordinate axes, which established a connection with the hexagon six vertexes fixed at its center. Each axis of the scale of the outermost location decision mean 10 cases of normal and inside each parameter is not normal direction. Hexagonal normal subjects are similar to the regular large

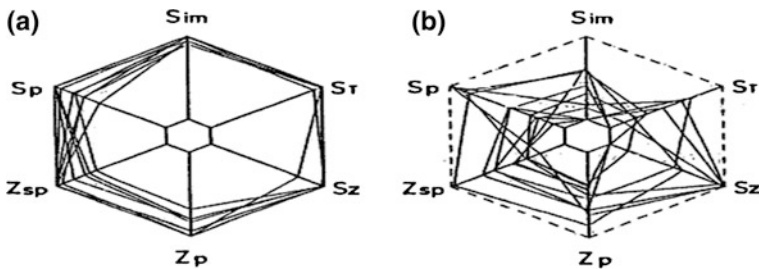
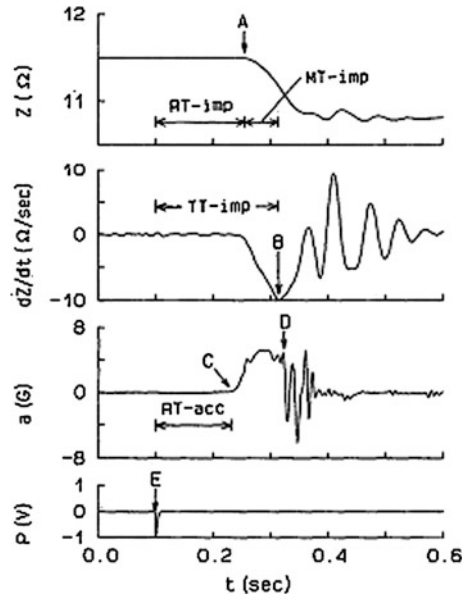


Fig. 44.4 Hexagon displays of lower leg impedance. 10 subjects of **a** normal, **b** patient

Fig. 44.5 Measurement example of the bar-gripping test



hexagon; however, hexagonal patients reduce and distorted significantly. These two kinds of hexagonal babies and the old man was distorted, but their forms with each other in.

44.4.2 Agility Evaluation

We explain bar-gripping test for agility. The subject sits on the chair and places his forearm on the table at approximately 75 cm above the floor. He prepares himself to grip the vertically hanged bar. After warning, the bar starts to fall in 2–6 s. The subject grips the bar as quickly as possible when recognizing that the bar started to fall. In the traditional methods, the bar has the scale of mm, and the agility is evaluated by the fall distance of the bar.

Figure 44.5 is a measurement example of the bar-gripping test. The figure shows the impedance Z of the forearm, the derivative dZ/dt of the impedance, the acceleration a of the acceleration sensor attached to the third finger, and pulse signal P indicating the start of the fall of the bar. Point E is the time when a pulse is produced as the output when the bar starts to fall. Point A and C are the times of the waveform changes.

The total time of reaction is calculated from the fall distance of the bar (TT-bar). EA interval is defined as reaction time by impedance (RT-imp), EB interval is

defined as total time by impedance (TT-imp), and AB interval is defined as movement time by impedance (MT-imp).

There is a strong relationship between TT was bar and TT-correlation coefficient is the imp. Thus, we can j 0.90 imp and conclude that TT—almost the bar of TT—same unstressed what the point is. Total owners cannot be separated into the areas in a context. The benefit the put a bar, the methods to while strong relations, TT-imp TT-bar. Curve and the correlation coefficient are 0.90. Therefore, we can draw the conclusion: TT-imp and TT-bar are almost the same. Another thing is that total time cannot be separated into the reaction time and exercise time in the traditional methods using only the bar, although we probably put method. This test is a gripping bar-motion of the small muscles. Therefore, make sure the reaction time mostly nerve and sensory functions. In the traditional method, however, the reaction time cannot be sure, and the effect of the nervous system on the results of the tests of gripping bar is still not clear.

Curve and the correlation coefficient are 0.90. Therefore, we can draw the conclusion: TT-imp and TT-bar are almost the same. Another thing is, total time cannot be separated into the reaction time and exercise time in the traditional methods using only the bars, and the following results are guided by this method. Four subjects drink two large bottle (633 ml) beers bar-gripping 30 min.

The reaction time is clearly seeing increased from 3 min drinkable? We can find nothing change athletic time, when the reaction time greatly increased. The reaction time does not come back, before drinking it in the original value, even 3 h after drinking; prominent reflects limit nerve and sensory functions. The results have not obtained the traditional methods and show the effectiveness of this method in separation and reaction time and running time.

44.5 Conclusions

With leisure activities in the high aging society as the background, all kinds of sports and fitness are getting more attention to promote health preservation. We put forward an evaluation youth sports exercise ability in sports training and related field using human body impedance. The measurement method uses four-electrode impedance technique based on constant current (50 kHz, 500 pa). This method uses a human body itself as a part of the sensor. We also put forward the flying detection based on the communication of youth sports exercise, morphology and size of the sports impedance waveform stable. We mainly use impedance data from the impedance measuring device, this type of exercise purpose, and other auxiliary sensor use. We showed two applications and agility evaluation gait gripping assessment test bar-use.

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Chapter 45

College Sport Education Reform Based on Learning Organizational Theory

Xiaoqing Dong

Abstract Presently, college sport education in China exist a lot of disadvantages, for example, teaching methods are single and outmoded, course contents break away from practice and teaching arrangements lack the links of practices, etc., the cause of which is that students lack the study enthusiasm and therefore the teaching effect is not that favorable. However, the Learning Organization Theory has a strong objective, which, specifically, cannot only enable the teachers to become the organizer, guider, regulator, decider, instructor and participator instead of the role as an authority in an activity so that teacher objectively treats students' individual difference and teaches them according to their aptitude, but also stimulate students' learning enthusiasm and initiative to better excavate students' potential so that students constantly break limitation of ability to improve their learning efficiency. Thus, teaching target will be more reasonable. In addition, it also makes teacher and students to learn communication, cooperation, sharing and creating so as to cultivate the ability of communication and corporation and team spirit.

Keywords Learning organizational theory · College sport · Education reform

45.1 Theoretical Base on Setting up Colleges and Universities Sports Training Learning Organization

Currently, educational reform and innovation are the hot topics in colleges and universities. During the process of educational reform, not a few teachers borrow teaching ideas from higher education and educational psychology, getting the good

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teaching achievement. But, in fact, the experiences and theories on educational reform we can use are not only limited in the fields of education. The learning organization theory in the field of management caters to the improvement of students' passive and objective role in the traditional classroom teaching and the need of improvement of teaching efficiency. It also supplies an effective way on how to train students' teamwork consciousness and ability, as well as the sustainable development in learning ability. The theory of learning organization appeared in western scholar Hutchins's Learning Society, published in 1968 at the earliest and then finally was formed in *The Fifth Discipline—Art and Trend of the Learning Organization*, written by American managerialist Senge [1]. The five disciplines of learning organization refer to personal mastery, improvement of mental models, building shared vision, teamwork learning and system thinking. The personal mastery means organization is made up of several individuals engaging in the continuous creations. The shared vision means to unite the different people with different personalities through the shared will, value and mission, gradually breaking through the top limit in organization members' personal ability growing in order to make progress for the shared aim. To improve mental models is to breach the traditional thinking patterns to the disadvantage of the development of organization and to overcome all factors influenced organization activities efficiency. Instead, it aims to improve organization activities efficiency by use of new ideas and ways, methods in favor of its development [2, 3]. The feature of teamwork learning breaks through the individual's being enclosed learning state and organizes the active discussion in members for the purpose of making progressing together. The system thinking requires the notice of the interaction among all factors. It requires one should not take link between the learning organization and other organizations one-sidedly, regarding the links in learning organization activities as the isolated states. It is a kind of beneficial attempt to apply the learning organization to colleges and universities' educational reform especially to the teaching reform in sports major.

45.2 Analysis of Applicability of Learning Organization in the College Sport Education Among Institutions of Higher Learning

In modern society, the need for the talents specialized in PE is not limited to the professionals of a single sport, on the contrary, those versatile talents who have a better understanding of the expertise and possess related organizational abilities are really favored by the society. Therefore, for students who are specialized in PE, it's equally important to foster the creative and organizational ability as well as the teamwork spirit besides leaning professional skills and theoretical knowledge.

45.2.1 Students' Physical and Mental Characteristics are Conductive to Carry out the Learning Organization Theory

Students of PE major in universities and colleges are a special group, as art students, the mark of their college entrance examination is the combination of the mark of their academic courses and the mark of their PE examination, therefore, the general academic level of students of PE major is relatively low. Their temperament type mostly belongs to sanguine temperament and choleric temperament, and their main psychological characteristics include: Students belong to sanguine temperament are living, active, vigorous, expressive, with changeable and alternative moods, quick and smart languages and behaviors, optimistic, amiable but impulsive; while students with choleric temperament are energetic, with changeable and enthusiastic moods, quick and uncontrollable languages and behaviors, demonstrative, straightforward, warm but moody, rash, courageous and resolute. Meanwhile, students of PE major also have the general character of modern students, that is, their body and psychology are close to maturity and stability, and their logical thinking and creative thinking are also gradually mature. The most striking characteristics of learning organization is "learning as a whole" and "team learning", emphasizing the cooperative learning among organization members and group's organization intelligence development. Therefore, if such organization can be built up, it can make up the defects in bad cultural performance for PE students. Also, it can help them to overcome the individual character weakness in favor of collective intelligence development, learning together and making progress together. In this way, students' learning initiative must be driven.

45.2.2 Particularity of PE Teaching is Beneficial to Operation of Learning Organization Theory in Teaching

Particularity of PE lies in: first, the PE major courses are divided into two parts: theory and practice lessons with the majority in practice lessons [4]. Second, the learning combines static and dynamic and the former gives priority to the latter. Third, it takes the physical exercise as the principle thing in learning content and it has less extracurricular work. Thus, there is abundance of free time. At present, the teaching from the two-classes successively is used in colleges and universities' PE teaching. Within the limited 90 min, students can only get sports training and physical exercises, but the training for their cooperation, creativity and consciousness is relatively rare. If some practice lessons are properly arranged to students, it is good for students' realization to teaching content improvement from perceptual level to the rational level. If some practicable operations such as match,

holding the post of judge and teaching practice and organized for students in teaching process, it can make students experience the whole process in which theory knowledge and techniques are applied to the practice. It will get the incomparable effect beyond the simple lecturing. It is urgent affairs to take a way to combine the class and extracurricular lessons, individual and community lessons. Once such organization which has cooperative, focus on teamwork learning and shared knowledge is set up, the whole teaching process becomes the process of collective exploration and studying on the basis of mutual inspiration and thinking. It can bring up a kind of relation that teaching benefits teachers as well as students. This process can benefit for the product of innovative thinking.

45.2.3 The Modern Teaching Development Provide the Convenient Conditions for Carrying out Learning Organization Theory

The application of the multi-media in teaching can widen teachers and students' knowledge vision and can provide them with rich and teaching-related information source and learning materials, saving time for their material and information searching. At the same time, it can supply an exchange platform between students and teachers, students and students so that the exchange cannot be limited in space and time [5, 6]. As a result, people can learn from each other and solve their common problems in groups, breaking down the bounds between class and outside of classroom. After the building up of learning organization, teachers, just as students, become the members in the organization. Thus, teachers can change their identity in thinking and can realize what students really want in teaching, making their teaching objective more directed to demand students' need in learning. In addition, their teaching efficiency can be improved greatly. These fit into the modern teaching theory.

45.3 Application of Learning Organization in Teaching of PE Major in Universities and College

45.3.1 Cultivating Cooperative Consciousness and Summarizing and Improving Teaching Method

Combined with the first practice—personal mastery, the teacher should firstly propagate the advantage of learning organization and mobilize students to join the organization. Competition in class, election of the representatives of subjects, comparing and appraising of groups, setting up progress award and other activities should be held. Its purpose is to place students in dynamic environment and to

make the members of class, representatives of subjects; groups and organizations surpass themselves and progress constantly. The second purpose is to make the members of organization process collective honor and the achievement and pride of conquering themselves. The third purpose is to give students inexhaustible motive of study by continuous self-motivation and stimulation of external condition. What's more, by combining the second practice to improve the mental model, physical education teachers' traditional managing modes and teaching ideas should be alter in studying-type class. The theory of learning organization focuses on giving full play to the positivity, initiative and creativity of the members. It also emphasizes humanism, because human is both the production factor and the factor different from other material form, highlighting that people are a kind of living elements. Teacher as the organizer and guides of the organization is the supervisor of executing the decision and provides the time and space guarantee for organization learning. Teacher should ensure that the information of organization learning is unblocked, try to communicate with students, develop the communication among students and timely praise progressive students. Teacher and students should be together to question the problem in PE teaching and investigate and find the solutions.

45.3.2 Defining the Learning Goals and Establishing Shared Vision of Teachers and Students

Shared vision is an important feature of learning organization. The goal of learning organization refers to that the learning subject should specially describe the goal he or she wants to realize. It is not an external standard, but the internal forming. It is the common vision of both parties of teacher and students. When processing the common vision, the members of origination will strive for the common goal.

Concerning with teaching practice of PE major, establishing the corporate vision actually requires teacher to formulate the teaching goal of applying to the teaching features of PE major, combining the different demands and the physical and mental features of every students. PE major students have the strong desire performance and yearn for the recognition and approval of college and teachers. At the same time, PE major students' self-consciousness and independence formed in the competition are more obvious than students' of other majors. They will affect the character formation of modesty and tolerability. Thus, as long as they meet the problems, they will have the improper actions and destroy the harmonious development of class under the influence of self-consciousness. Therefore, to make students establish the clear learning goals and plans is good for students, who can have guide to action. Thus, students can work hard toward the common goal that includes both short-term and long-term goals. The long-term goal covers the curriculum goal of PE major, the goal of academic year and the goal of semester. The short-term goal refers to the goal of every unit, the goal of every class and the

special activity goal of group and its members in every class. It is essential to help students to define the orientation of long-term goal and to and make student earnestly practice the special short-term goal. By this method, every student can have his or her own target system, combining the long-term goal with the short-term goal, the individual goal and the common goal, the personal goal and the class goal. Thus, every student can define their goal and understand the goal and hope the class wants to finish. Hence, students should improve their learning efficiency by the definite object in view. The goal will be achieved through the common effort of teacher and students in a community and the mutual help among students.

45.3.3 Reorientation of Relationship Between Teachers and Students to Establish Team Learning Model

Team learning is a process that members of team work hard and actively and coordinate with each other to realize the goal of team under the guidance of common vision and that all the members change the common vision into its individual ideal. Learning organization focuses on stimulating members to create new knowledge by learning ability of collective intelligence, based on group learning to pool collective wisdom and rational communication and assistance to share the learning experience. Thus, the efficiency of individual learning is much poorer than group learning.

45.3.4 Reorientation of Relationship Between Teachers and Students

To build mode of group learning requires the new orientation of role of teacher and students. In traditional teaching mode, teacher is the only subject and students are just the objects to learn passively. Thus, students cannot study initiatively and there is not enough communication between teacher and students and among students. At present, the classes of college and university are typical individual learning and leaning efficiency is low. Therefore, in the process of building organization learning, teacher should be not the subject of teaching and students not the object of teaching. Traditional relationship between teacher and students should be changed to be more equal like the members in a group. Through the role transformation, teacher should be the guider and partner of students in the process of class teaching. Namely, both teacher and students should be the subjects of class teaching. Thus, teaching method in class is not to emphasize teacher' lecture but to concern with students' discussion and practice in line with such requests. In class, teacher should not just encourage students to express their opinions, but also guide

them to obtain actively truth from their practice. In the entire stage of learning, teachers should pay attention to grasping the overall situation and coordinating relation. In physical activity, students' bodies and minds are excited so that the little thing may cause the great conflict. Teacher should use aptly the conflict and guide students to change the conflict into inflection and discussion of skills and actions. Thus, conflict can become the learning motivation and a chance to increase the friendship of students.

45.3.5 Establishing Mode of Group Learning by Reasonable Grouping

Reasonable grouping is an important step of implementing the learning organization theory. When students are simply divided into several groups and each group has the same task, teaching task can not be distributed reasonably and students' learning enthusiasm and initiative can be fully mobilized, based on the grouping. In addition, because students have no positive interaction, the expectant goal can be achieved. Therefore, groups should be classified by students' common interests or specialties. On the premise, there should be diversity and complementarily of students' learning foundation, learning style, grade, gender, personality and other aspects. It is a method of combining similarity in a group with difference among groups. Based on the grouping, teaching task should be assigned and teacher should guide students to think actively and explore bravely so as to give full play to groups' wisdom and creativity. When steering the groups to communicate and share the knowledge, the difference of members' receiving ability should be considered. Thus, everyone in a class should be stimulated to improve overall and progress together. Before carrying on the activity of learning organization, teacher should elaborate the learning content and goal, rule of active and main methods and evaluation standards of completing learning task so that students can understand them clearly. Teacher can apportion the different learning groups the different tasks and ensure that the different teaching tasks are developed in different groups at the same time. In the process of groups' cooperative learning, teacher should teach students how to divide the task in a group and choose a group leader, who is responsible for organization.

45.3.6 Cultivating the Ability of System Thinking

System thinking is the core among the five disciplines in realizing the learning organization. System thinking enables people to get a complete picture of the problem and comprehensively consider the interactive relation of various factors, rather than one-track thinking. In terms of the teaching practices of physical

education in colleges and universities, most students cannot relate different aspects of learning and they don't know how to integrate the knowledge of each teaching unit together, neither do they know how to connect each course laterally into a whole so as to make a systematic study. System thinking actually requires the teachers to cultivate their ability of systematic thinking in teaching and to set the courses systematically. Meanwhile, teachers are also required to foster students' ability of system thinking in learning. Take the ball teaching as an example; teachers should pay attention to the relationship among skill teaching, theoretical knowledge and the judging, as well as the links of this course with other courses. For instance, in the teaching of basketball course, teachers should note its connection with volleyball and football courses, and try to compare the different features, teaching methods, game rules of these different sports, and organize some competitions so as to find out the teaching similarities of various sports through this kind of comparative teaching. Besides, in the process of teaching, teachers should consciously link and compare with different sports to extend students' horizon so that they can study systematically with a large frame.

45.4 Conclusion

In the united and positive collective atmosphere, teacher and students can gain positive emotional experience and produce innovative thinking in the interaction. The learning organization theory is a relatively new and strange theory system and its application is still at the embryonic stage of exploration. To use learning organization theory in teaching of PE of college and university aims to find a new idea by the theory and to make it lay the foundation for the further teaching practice.

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Chapter 46

Interaction Between Specialty Curriculum-Setting of Physical Education and Rural School Sports

Yuanjin Tang

Abstract The article studies the interaction between specialty curriculum-setting of physical education and rural school sports. The demand of the rapid development of a new socialist countryside and rural school sports speeds up the building of specialty curriculum-setting of physical education and promotes the interaction between these two sides. It is considered that specialty curriculum-setting of physical education and rural school sports have interactive history, advantages. They also have interactive features of desirability, integrity and development. Based on it, effective interaction measures are put forward.

Keywords Physical education · Curriculum-setting · Rural school sports

46.1 Introduction

Whether Curriculum Reform in Physical Education is successful or not is decided by the quality and standard of physical education teachers. The main task of deepening physical curriculum practice is decided by the adaptability and creativity of primary and secondary physical teachers [1, 2]. Physical education is always related closely with new curriculum reform in physical education, and also has interactive relation with curriculum reform in basic physical education. Interaction is a fashionable and common-used word in times of information technology [3]. Its meaning lies that both sides carrying certain activities influence and supplement each other. It can vividly reflect the relations between specialty

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curriculum-setting of physical education and rural sports. One side is the active object of curriculum reform in physical education, and another side is the active promoter of curriculum practice of physical education.

46.2 Interaction Between Specialty Curriculum-Setting of Physical Education and Rural School Sports

The Origin of Interaction Between Specialty Curriculum-Setting of Physical Education and Rural School Sports The Ministry of Education issues the new formulated Syllabus of Physical Education and Health in December 2001. It points out that the goal of physical education professionals training is to train professionals with systematic mastery of basic theories, basic knowledge, basic skills of physical education, and teaching law. These professionals should also be equipped with strong practice ability and have specialty on the basis of all-around development. They are required to be able to take on physical education teaching, extracurricular sports, sports training and competition in secondary schools and research on physical education, physical education management in schools and physical education guiding work in society [4]. Meanwhile, the teaching goal of physical education in primary and secondary schools is to build up people's health and promote the healthy and psychological growth of students. Students are taught to master basic knowledge and skills of physical education and health and improve their sense and ability of sports, laying a foundation for lifelong physical education. Also, it aims to instruct students' moral education and education of volitional quality, training their mental quality. It can be seen that physical education is the cradle of training rural school sports talents and the machine of creating sports teachers in rural primary and secondary schools. Rural school sports and specialty curriculum-setting of physical education have inherent interactive origin.

Advantages of Interaction Between Specialty Curriculum-Setting of Physical Education and Rural School Sports The core of curriculum research is curriculum construction. There is no uniform definition for curriculum construction. Social needs are the primary basis of curriculum construction. The eleventh item in compendium of National College PE Curriculum states that curriculum construction should satisfy the needs of students' individual development and adaptability to the society. Specialty curriculum-setting of physical education should be closely related to social needs. Training qualified rural sports teachers is the final product of the universities. Whether graduates can satisfy social needs is an important factor for examining the reasonability of specialty curriculum-setting of physical education.

The fifth meeting of the 16th Central Committee of the CPC Congress makes the strategic decision and puts forward the goal of building a new socialist countryside. It proposes to promote the project of peasantry sports for building health and actively carry out various forms of entertainment and sports activities.

Under the circumstances that rural sports resources are extremely lacking, teaching resources and facilities should be fully taken advantage of. Most importantly, curriculum-setting of physical education should open different small courses based on the actual conditions of different rural areas, local characteristics and students' life experience to enrich contents of sports curriculum and represent times and local features. In addition, physical education specialty should also intensify curriculum teaching of health education to ensure that rural school sports can succeed in teaching students' sports knowledge and scientific means of physical exercises, effectively improving rural students' physical fitness, helping rural youth cultivate the sense and habit of lifelong exercises and promoting the continuous growth of rural sports population.

Features of Interaction Between Specialty Curriculum-Setting of Physical Education and Rural School Sports Physical education specialty is developing rapidly during the process of rural school sports development. It has active interaction with rural school sports and has profound influence on rural school sports. Specialty curriculum-setting of physical education satisfies the needs of rural school sports development actively, intensifying curriculum research and construction. It is also actively transformed as education function to serve rural school sports, which is the result of increasing understanding and demands of specialty curriculum-setting of physical education in the process of rural school sports development.

46.3 Desirability

The specialty curriculum-setting of physical education takes the needs of rural school sports as the opportunity [5]. The specialty curriculum-setting of physical education and topic research should be combined closely with rural school sports. Meanwhile, in the process of building a new socialist countryside and rapidly promoting rural school sports development, specialty curriculum-setting of physical education should have break-through. Theories and knowledge of curriculum-setting should play a role in promoting rural school sports development. For example, rural school sports development should be promoted; the nationwide fitness campaign should be populated throughout the rural areas and quality of peasants' life should be improved. A series of theoretical and practical guide from rural school sports teachers are needed. Specialty Curriculum-setting of physical education should be studied profoundly and systematically from aspects of core courses, marginal courses, explicit courses, and especially implicit courses which suites rural conditions and further study of rural school sports teachers to guide the deepening of rural school sports reform and the increase of quality.

Integration The target of specialty curriculum-setting of physical education is based on university students' curriculum physical education. It is similar to what has been involved in rural school sports—middle school students' curriculum physical education. Both have similar informational symbols, backgrounds and

knowledge integration. The development of rural school sports needs the achievements from the research of specialty curriculum-setting of physical education both in theory and in practice. It also needs the support of technology and creative usage of physical education. At the same time, these theories affect and penetrate into the theory and practice of specialty curriculum-setting of physical education via various methods, which forms many social issues in the physical education curriculum for professional researchers to solve. For example, with the development of the construction of new socialist countryside and rural school sports, it is important to develop rural PE, enhance the health of farmers and improve the quality of human resources. All of these need the proper arrangement and optimization settings of physical education curriculum as well as the enrichment of the knowledge system, methodology and theory system of rural school sports. It is more and more important to enrich and improve the functions and values of physical education, making use of them to service the construction of socialist new countryside and the rural school sports.

Development With the influence of the national fitness campaign and the construction of new socialist countryside, the need for rural PE and the development of rural school sport are growing increasingly. Physical education specialty has great potential in developing in this regard. And with the promotion and implementation of the scientific concept of development, harmony society and the construction of new socialist countryside, rural school sports encounter unprecedented challenges, so does the specialty curriculum-setting of physical education. On the one hand, we need to provide training for those PE teachers who are on the jobs. On the other hand, we should reform the system of the physical education curriculum that aims at fostering teachers for rural school sports. In this way, teachers can adapt to the development of rural PE and the new trend of the construction of the new socialist countryside and national fitness campaign. The situation of the development of rural school sports has changed a lot with the great adjustment of the national Three Rural Policy. The harmony of the specialty curriculum-setting of physical education and rural school sports and the good environment has been formed. It exists in the development of the society, improving the development of the two subjects and meeting various needs from the society.

46.4 Interactive Strategies of Specialty Curriculum-Setting of Physical Education and the Rural School Sports

Development of the Curriculum Target of the Rural School Sports According to the principles of curriculum-setting, the establishment of the curriculum targets of the rural school sports mainly takes the establishment orientation and the statement of purpose into consideration. From the aspect of establishment orientation, we should be guided by the curriculum target of the rural school sports in

the local college service area, based on the practical needs of the rural school PE development and making the internal characteristics of the rural school sports to be contents. We should keep the aim of developing students' overall basic quality in mind to establish the curriculum targets. As for the statement of the purpose, it should include the knowledge aim, ability aim and ethnic aim of the rural school sports development. The knowledge aim includes the following: development characteristics of the school sports development history and rural school sports, targets and tasks of the local college service areas on rural school sports, development status of the national physical education in service areas, basic theories of the rural PE management as well as the related rural PE policies and regulations of the construction of the harmonious society. Ability aim includes the ability to promote the harmonious, sustainable and overall development of the guiding of rural school sports by the national fitness campaign, the ability to improve the industry of rural physical education and improve the fitness for farmers and the ability to improve farmers' physical health and their PE environment. And the ethnic aim includes loving the countryside, understanding and respecting farmers, being glad to take over the tasks of rural school sports, firm confidence of researching and solving the new problems during the course of rural school PE development and the consciousness of serving farmers wholeheartedly.

Definitude of the Form and Requirements of Curriculum-Setting In accordance with the plate mode of curriculum design ideas, the format of local college specialty curriculum-setting of physical education should include general module, subject basis module, courses module, teacher education module and practice module. Among the five modules, general module aims at basic knowledge, scientific spirit enhancement and the linking and integration of human spirit, which helps to foster students' active emotion of three agriculture and lay foundation for the rural school sports career. Subject basis module helps students to master the basic principles and knowledge needed in the tasks of rural school sports and improve their ability to undertake the tasks. In order to implement the standard reforms of the PE and health curriculum, this module adds the content of the ability to develop school-based curriculums. The courses module is competent for the tasks of rural school sports. However, it adds some contents that are opened up on the general rural schools and curriculums that require PE teachers to have the ability to make sports equipments and repair related equipments. The teacher education module updates the teaching contents of the rural school PE curriculum and enhances teachers' career aspiration from the professional point of view so that excellent teachers can be fostered. The practice module mainly focuses on the development of the job skills in rural schools sports, ensuring students to clear their role positioning in the future jobs of rural school sports. It can add curriculums such as competition organization, referee practice and training practice.

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Chapter 47

Study on Physical Quality Education

Libin Zhang

Abstract Using the principle and method of quality education, this article first expounds the theoretical basis of physical quality education and then analyzes the difference between the quality education and physical quality education. Second, the article has some discussion on the characteristics, structure and content of physical quality education, and finally raises the primary means of implementing physical quality education.

Keywords Quality education · Physical quality education · Goals · Approaches

47.1 Introduction

The theoretical basis of physical quality education and the difference between the quality education and physical quality education are described below.

47.1.1 The Theoretical Basis of Physical Quality Education

The implement of physical quality education is influenced with the view of magnificent sports and accompanied by the prosperity of magnificent education. The view of magnificent sports is the general view and points about the view of magnificent sports, which wants to establish the view of magnificent sports with

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the characteristics of socialization, scientificness, lifelong and functionality for all mankind and the whole society in which socialization and lifelong are distinguishing features.

To raise the thinking of physical quality education is for the constant reflection of the status of Chinese school sports. At present, it seems that school sports are important, but it does not deal with concrete matters relating to work, and is even ignored when people are busy, and the problem shows in some parts. First, the physical quality education is ignored, and in some schools, PE is inoperative, which restricts the students' success edgewise. Some colleges think that sports are the exercise, and the body is referred to the flesh, so exercise can only make body become strong, and has nothing to do with spirit and heart, and that makes the students hate sports and be away from the sports.

47.1.2 Physical Quality Education is the Colliding Product of Contemporary Various Sports Thoughts

Modern sports change involves a series of updates of sports ideas. In view of the development track of the various sports thoughts, we can find some representative sports thoughts that have a great effect on the development of Chinese sports career.

47.1.3 Physical Quality Education is the Basic Requirements for Cultivating and Improving National Quality

With the rapid development of modern construction, the population will appear negative growth and population quality will be improved significantly. The main changes are physical further is strengthened; ability to fight with disease is enhanced; sports level is higher; pay attention to mental health; life can reach the national average level.

47.2 The Difference Between the Quality Education and Physical Quality Education

Physical quality education: physical exercises are the intermediary and physical and mind quality is the leading content. The direct purpose is to pursuing all-round development of one individual and the group optimization. Executive objects: generally, they refer to ordinary citizens of the society and the most are individuals; the purpose: to cultivate and improve the citizen's sports quality to lay a solid material base for high quality life; contents: physical quality, psychological

diathesis, health education, school sport, sports innovation, bodybuilding, lifelong sports, physical environment, sports law, sports safety and other ten aspects of the education.

47.2.1 Characteristics of Physical Quality Education Target

Physical quality education target is the start of implementation of education and the standard of evaluation for physical quality education. To raise the physical quality education target from the point of biology, psychology and sociology or development targets, teaching targets, educational targets and social targets. Different schools, learning paragraph should put a different goal which means progress goals for the age with different physical characteristics. The goal should more comprehensive and specific but not general and synoptical, which should cover the targets about sports, entertainment, healthy, skills, life, even about the law, safety and environmental and so on.

47.2.2 The Structure of Physical Quality Education

The physical quality education target is a multi-level network system, which can be reflected intuitively with the goal tree.

47.2.3 Contents of Physical Quality Education Target

Master the three basic levels of sports and health education targets: exercise body and mind, enhance physique and promote health; cultivate the attitude and ability for lifelong sports and develop individuality with physical quality education about moral and esthetic, innovation, the legal system, safety and the environment and so on.

47.3 Primary Means of Implementing Physical Quality Education

47.3.1 Scientificalness of Physical Quality Education

PE Teachers Should Learn to Process the Competitive Sports as Sports Curriculum Contents from Every Point For specific teaching material contents, we should gradually change the pure athletic type and administer sport, and pay attention to

national sports content and rural sports content. The game rules are formulated for high level players; if we stick to these rules no matter in what situation, the activity will be lack of energy, and we should seize the main factors to simplify rules according to students' physical and psychological characteristics. Sports curriculum organization mode can be simplified according to needs. Physical location and equipments can be transferred appropriately.

Courses Transfer Modernization The first is the Modernization of Material Conditions, and the second is Modernization of People, which means the Humanity.

Scientific Curriculum Evaluation Evaluation objects should be the curriculum evaluation process including students' academic and the effect of teachers' organization and implementation and the curriculum management and decision. The evaluation target should be the unity of quantification and non-quantification, because internal requirements of modernization are more concerned about people's value, emotional and will, and pay attention to the development of the spirit world. There are a lot of cultural resources in curriculum knowledge, such as the non-quantitative knowledge which has the ultimate meaning for life but cannot be defined by operational definition, and the resources should be the important goals of curriculum evaluation. Evaluation orientation should abandon one-sided course evaluation idea and try to reflect the whole course fully and truly.

The Standardization of Curriculum Management In order to increase the applicability and flexibility of courses, Ministry of Education combines the national course management with local course management to implement hierarchical management for the course. The national unified course is ideological and moral and cultural science, including compulsory courses and basic elective course and some most basic practical courses. Schools need to set aside a certain position for local course and school curriculum according to the national unified regulation and local regulations and schools' situation and conditions, at the same time, to formulate appropriate curriculum system, arrange the unified national curriculum and local courses selectively and flexibly, and appropriately develop some school-based courses.

47.3.2 Never Animalize Students

We cannot treat students and cultivate them like animals. Never mechanize students. We cannot treat students and manipulate them like machines. Never enslave students. In China, many teachers beat and scold students literally, strangle their personality and control their destiny.

47.3.3 Course Physical Quality Education

Classroom teaching is the main channel of physical quality education. Some people think much make activity is equal to the physical quality education in

operation, and classroom teaching seems to be the patent of examination-oriented education. Actually though PE teaching, extracurricular athletics, community sports practice and family sports are all the ways for implementation of the school physical quality education, classroom teaching is still the main channel.

Judging from the curriculum, the reform of curriculum and teaching materials should reduce compulsory courses and add more elective courses, reduce the single class and add comprehensive courses. As for textbook construction, in order to adapt the trend of the curriculum reform, we should change single and close, rigid teaching material system to diverse and open teaching material system. We should emphasize the course change for physical quality education, which requires to just pay attention to the classroom teaching channel and curriculum reform, but not to consider all sports education activity and the measures as courses. The curriculum is a very scientific and regular thing; we cannot course everything of schools.

Setup Integrated Curriculum

Integrated curriculum means the integrative course including school discipline knowledge learning for students and off-campus social life and their needs combined with interest, which has a great enlightenment for implementing physical quality education and perfecting sports course structure of middle and primary schools.

Develop Informal Courses (Potential Courses or Recessive Courses) Chinese and foreign scholars have already noticed the problem. American scholars P. W. Jackson formally put forward the concept of potential course in 1966 when there have from different points of view about recessive courses in west. The different organization characteristics of schools subtly make students accept social value and become one part of their quality and individuality. Some scholars believe that the school is not a market with open concept, and it will always choose specific kinds of knowledge and put them to the course. Facts have proved that students have great independence and activity in informal curriculum which has both positive effects and negative effects on students. So, the responsibility of educators is to strengthen its positive impact.

Create Environmental Course With creating environmental course, students form following basic points that man is a member of nature and human survival and the health depend on the environment; humans and other biological are coexist in one world, and the harmonious coexistence with nature is good for humans and environment. We must take into account the interests of all mankind and make use of resources effectively; productivity of production system is limited, so infinite development will bring mankind poverty and destruction. Global environment problems are caused by human, and it is our task to protect the environment.

47.3.4 Mobilization of Physical Quality Education

To implement four types of courses:

Implementation of physical quality education can not only depend on the classroom teaching, but also need to carry out a series of extracurricular sports

activities, community sports activities and family sports activities, which means to enhance students' physical and mental qualities and sports cultural literacy with various sports activities.

Sports subject curriculum and sports activity curriculum are two main plates for school physical quality education, and they are the battleground of implementation of physical quality education. The function of the two plates can just make up mutually, especially the sports subject curriculum is the sally port, while sports life curriculum and sports leisure curriculum are auxiliary contents. Sports life curriculum helps students form scientific sports lifestyle, and sports leisure curriculum is the regulator and catalyst of life.

47.3.5 Behaviorism of Physical Quality Education

The transformation from passive practice to active practice means making students repeat to perform some requirements and finish some behavior under certain conditions. The transformation from compulsory sports to the sports initiating students' inner need for sports. In the past, sports teaching took students as infusion vessel and paid special attention to the function of mandatory in sports. Teachers usually did not care whether students are willing to, interested in or needed, and just forcibly taught, which made students have psychological resistance and resistance behavior. Innovation of physical quality education requests that the teacher must seriously study and initiate students' inner need for sports.

47.3.6 Examples

Examples are demonstration that are verbal instruction and to lead by example in Chinese traditional culture. Only oneself has good behavior can cultivate other people's good behavior.

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Part VI
Sustainable Education Management

Chapter 48

Communicative Language Teaching in Ordinary Universities in China

Pan Heng

Abstract English teaching in China has long been dominated by the grammar-, text-, and teacher-centered method. Since the early 1980s, the student-centered communicative approach has been introduced into China. But the effectiveness and the efficiency are not to our satisfaction, especially in ordinary universities in China. To discover the reason, I find that the difficulties for the college teachers in implementing the approach in some ordinary universities hinder communicative language teaching (CLT) in classroom settings. In this paper, I first give the brief introduction to the definition of CLT and the characteristics of CLT. Then I state the differences between ESL and EFL in learning and teaching English and analyze the factors constraining CLT in some ordinary universities in China. Lastly, I put forward some suggestions. My findings indicate that Chinese college teachers in ordinary universities should reform their mentalities and attend to various learning styles by developing a more practical, student-centered way of teaching foreign languages.

Keywords Communicative language teaching · Ordinary universities · China

48.1 Introduction

In the history of ELT, China saw its first movement toward CLT in the early 1980s. It has been more than two decades since the communicative language teaching (CLT) approach was introduced to the Chinese foreign language

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community, affecting tens of millions of Chinese learners of English. In an arena previously dominated by the grammar-translation approach, these 20 years have witnessed profound changes in foreign language teaching. However, a variety of constraints have inhibited the adoption of CLT in ordinary universities in China.

48.2 What is CELT

The communicative approach, also CLT is an approach to foreign or second language teaching which emphasizes that the goal of language learning is communicative competence (the ability not only to apply the grammatical rules of a language in order to form grammatically correct sentences but also to know when and where to use these sentences and to whom). CLT as a theory and as a method, which treats language as a tool of communication, is well established. As far back as 1983, Stern noted that, unlike the six most influential languages teaching methods (i.e., the grammar-translation, audio lingual, direct, reading, and audio-visual methods, and cognitive theory), CLT does not treat language learning as code learning [1]. It explores “the possibility of non-analytical, participatory, or experiential ways of language learning as a deliberate teaching strategy” (p. 473). Stern thus concluded that because all the old methods “tend to place over-emphasis on single aspects as the central issue of teaching and learning, none of them are adequate” (p. 473).

48.3 The Characteristics of CELT

In CLT, meaning is paramount. Wilkins classifies meaning into notional and functional categories and views learning an *L2* as acquiring the linguistic means to perform different kinds of functions.

According to Larsen-Freeman, the most obvious characteristic of CLT is that “almost everything that is done with a communicative intent.” Students use the language a great deal through communicative activities (e.g., games, role plays, and problem-solving tasks). Another characteristic of CLT is the introduction of authentic materials. In CLT, it is considered desirable to give learners the opportunity to respond to genuine communicative needs in realistic *L2* situations so that they develop strategies for understanding language as actually used by native speakers, and also “activities in the Communicative Approach are often carried out by students in small groups” [2, p. 132].

Students are expected to interact with one another, either through pair and group work or in their writings [3]. CLT favors interaction between small numbers of students. In order to maximize the time, each student has to learn to negotiate meaning. Teachers therefore select learning activities according to how well they engage the students in meaningful and authentic language use rather than in the

merely mechanical practice of language patterns. Another dimension of CLT is “its learner-centered and experience-based view of second language teaching” [4, p. 69].

According to CLT theory, individual learners possess unique interests, styles, needs, and goals that should be reflected in the design of instructional methods. Teachers are to develop materials based on the demonstrated needs of a particular class. Students must be made to feel secure, unthreatened, and no defensive in a CLT classroom, so teachers using CLT should avoid adopting a teacher-centered, authoritarian posture. Thus, CLT is characterized by

1. A focus on communicative functions;
2. A focus on meaningful tasks rather than on language items (e.g., grammar or vocabulary study);
3. Efforts to make tasks and language relevant to a target group of learners through an analysis of genuine, realistic situations;
4. The use of authentic, from-life materials;
5. The use of group activities;
6. The attempt to create a secure, nonthreatening atmosphere.

The Difficulties in Implementing CLT in Ordinary Universities’ Classrooms.

48.4 The Differences Between ESL and EFL Settings

A communicative approach is more difficult in an EFL environment because the students’ use of English is unnatural, their motivation is weaker, and their expectations of how a class should be conducted often conflict with the notions underlying a communicative classroom. A good communicative activity asks students to do a task, gather information from a partner, or express an opinion about an engaging topic. ESL students have no alternative but to use English to communicate because their classmates and teacher do not know their language. In the EFL situation, on the other hand, we as teachers expect students to communicate with equal enthusiasm in the target language, even though everyone speaks the same language [2]. We aim for authenticity of materials and situations, but we ask students to willingly ignore their highly developed communication skills in their own language and communicate in the target language at what for them is often the level of a 4-year-old child.

It is unnatural, some may think absurd, to communicate important information in a second language when both speakers are articulate in the same first language. And the need to use the target language is always more distant for the EFL student than for the ESL student. ESL students have the real, immediate need to speak English as soon as they leave the classroom. If they learn in class how to ask for pizza with mushrooms, they will get immediate gratification upon leaving the classroom and asking for such a pizza in the pizza place next door. By the time EFL students get to a pizza place that requires the use of English, their appetites and enthusiasm will surely have dampened.

Another difference between the ESL and the EFL setting is the students' cultural expectations with regard to teachers' roles and classroom management. ESL students are uncertain what to expect because they are the outsiders [5]. They are therefore more willing to accept or go along with untraditional or unusual methods. EFL students, on the other hand, may lose confidence in a teacher who abdicates some authority and waits for students to take more responsibility, as is necessary in a communicative approach. For instance, EFL students may even think their teacher is betraying cultural norms by the loss of authority that accompanies methods in which the teacher is not the focus but is rather a coach or facilitator.

Finally, EFL classrooms are often large and have unmovable seats, which inhibits the pair and group work that typifies communicative activities.

48.4.1 The Lack of Qualified English Teachers

But the most important constraint comes from the lack of qualified English teachers. A qualified English teacher should, in the first place, be capable in all four skills.

Quite a number of teachers know only some Basic English grammar and vocabulary. For them, the grammar-translation method is the most acceptable because they can basically teach English in Chinese. Moreover, qualified English teachers should be familiar with theories of linguistics, psychology, and pedagogy. A sound knowledge of these theories will support the use of creative CLT in class and help teachers understand the new curriculum and new CLT textbooks. Motivated by the value of CLT, classroom teachers may be encouraged to overcome the existing constraints on CLT in China.

One reason to reject reform was the inability of the teachers to do their jobs well. Most ordinary university teachers, especially those in rural schools, lack a sufficient level of English proficiency.

Deficiency in spoken English Although the teachers generally felt that they were highly proficient in English grammar, reading, and writing, they all reported that their abilities in English speaking and listening were not adequate to conduct the communicative classes necessarily involved in CLT. Deficiency in spoken English apparently prevented some teachers from applying CLT, but for others lack of confidence was more likely to have been the reason.

Deficiency in strategic and sociolinguistic competence in English As teachers' sociolinguistic and strategic competence must be much greater in a communicative classroom than in a traditional grammar-focused classroom, the participants generally felt incompetent to conduct a communicative class. Students asked more questions in the class. But those questions that are related to the sociolinguistic aspects of English are really hard for some teachers. The teacher's ability to answer all questions promptly is highly valued in China. The fear of losing face because of not being able to answer students' questions all the time-

discouraged teachers from using CLT. Because of their deficiency in sociolinguistic competence in English and fear of losing the respect of their students for being unable to give prompt answers in class, teachers chose to stick to the traditional grammar-, text-, and teacher-centered methods so that they always had a good idea about what was going to happen in every class and made adequate preparations for it.

48.4.2 Misconceptions About CELT

Few opportunities for retraining in CLT, few in-service teachers' education programs offered training in CLT. Without proper retraining, teachers will inevitably misunderstand some elements of CLT.

A typical misconception was that by concentrating on appropriateness and fluency, CLT does not teach form at all and thus totally neglects accuracy.

Another misconception was that by concentrating on communicative competence, CLT does not develop linguistic competence at all. In fact, the relation between linguistic competence and communicative competence also is important. At the foundation stage, linguistic competence is the spontaneous, flexible, and correct manipulation of the language system. Communicative competence involves principles of appropriateness and a readiness on the part of the learner to use relevant strategies in coping with certain language situations. Linguistic competence, then, is the basis of communicative competence. Without linguistic competence, there is no communicative competence. But communicative competence does not automatically result from linguistic competence. Forms of classroom activities such as role-playing, simulations, and real-life interactions should be used to provide as much practice as possible for students to develop communicative competence while practicing linguistic competence.

Such misunderstandings led the teachers to believe that CLT contradicted their beliefs about language learning and did not allow them to prepare students for the various examinations that are critical to their future careers. For that reason, the teachers refused to accept CLT.

48.4.3 The Students' Resistance to Class Participation

As the university students are already adults, most of them, especially for those who are not quite strong in spoken English, have strong self-dignity and are afraid of losing face before their day-to-meet classmates. They cannot overcome their shyness, so they usually talk less or even none. To play it safe, they usually chose to behave traditionally in English class. When students were not willing to participate in class activities, teachers saw little chance of fulfilling their goal of using CLT, rendering it pointless to adopt CLT in their class. Even there are few students

who are active in class perform well.¹ The teacher can always hear only their voices in class. Consequently, the situation causes vicious circle and makes it harder for the teacher to manage the class with the students whose English levels are quite different.

48.5 Some Other Factors

Economically speaking, the low incomes of English teachers drive them into taking a second or even a third teaching job. “Consequently, few university teachers will not spend time analyzing learners’ needs or designing their own syllabi, nor will they collect suitable materials to create communicative tasks and activities”.

In addition, classrooms with 60 students are too crowded for learner-centered teaching.

Culturally, due to the pervasive influence of Confucian ideas, “teachers are viewed as knowledge holders. If teachers do not display their knowledge in lectures, or if they play games with students or ask students to role-play in class, then they are not doing their job!”

Last but not the least, the current CET-4/6 (College English Test Band 4/6), started some 10 years ago, although some reforms have occurred to the system, has led students to a false belief that written English is more important than spoken English. As a result, it is not unusual to see a holder of band 4/6 certificate very weak in spoken English, so much so that he/she often fails to speak a complete sentence.

The effective and efficient assessment instruments were to be set up for CLT. Maybe one of the best ways to test students’ communicative competence was to give the students oral tests. But this will take both teachers and students a long time. Besides, some teachers do not support these subjective tests. Although there should be some criteria for the tests, the teachers inevitably use some personal criteria to give the results of the test. In this way, the oral tests may be considered less convincing than the written tests. But if there is an effective and efficient assessment instruments for CLT, I believe both teachers and students will be greatly motivated in CLT class.

China has begun its own exploration for methods with its own characteristics because imported methods, such as translation and the communicative approach, are unable to improve the efficiency of teaching. With a learning environment and learners different from English speaking countries, demands its own unique methods of English teaching. But the domestically born methods are still fledglings, unable yet to compete with their foreign counterparts. Our methods need further experimenting to set up supporting theories. All we have at present is

¹ Professor Liu’s lecture on CLT.

simple practice, while most alien methods are based on convincing linguistic, psychological, and educational data. On the one hand, we should improve current domestic methods, such as Men Wan jin's Dual-Brain Method—English learning method involves activating the right hemisphere of the brain through a large amount of graphic input as well as the commonly involved left hemisphere, because they are not complete. Strictly speaking, they should be termed teaching models, rather than methods. Methods are regarded as more abstract and mature than models and therefore more important to teaching. From the 1990s, international English teaching research has shifted from looking for the best methods to looking for reasonable principles inside each method. Years of teaching practice have shown that there is no single best method. Every method has its own advantages [4]; the challenge for method seekers now is setting up their own complete English teaching methodology to fit the situation in China. But lack of sponsors is the biggest barrier blocking them from pursuing this dream. Development of viable theories depends on systematic and large-scale research. However, most initiators reported it is difficult to conduct research with the meager income from textbook sales or teacher training. In this sense, we call for support from administration. What we will probably find now is a more balanced approach with opportunities for structural input (including practice of language patterns). There will, however, almost certainly be an emphasis on more authentic contexts with example sentences being at the very least semi-authentic and potentially of communicative use rather than arbitrary examples of form with little or no communicative value. In today's classroom, we will probably also see a lot of authentic listening and reading material being used and far fewer contrived texts designed to illustrate grammatical form or present items of vocabulary and with no attempt to communicate a meaningful message to the listener or reader. Perhaps the most enduring legacy of the communicative approach will be that it has allowed teachers to incorporate motivating and purposeful communicative activities and principles into their teaching while simultaneously retaining the best elements of other methods and approaches rather than rejecting them wholesale.

48.6 Conclusion

This paper examines the communicative approach that is adopted in ordinary universities in China. The wholesale adoption of this approach has proven to be counterproductive. What is needed is for teachers to be more discerning in their use of the communicative approach by being cognizant of its limitations, and implements appropriate communicative activities judiciously to meet the learning styles and needs of their students. What EFL teachers in China need to do now is to modernize, not Westernize, English teaching. They need to combine the new with the old so as to work out a more practical domestically born English teaching or learning method.

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Chapter 49

Stability of a Predator Prey Model with Stage Structure and Intra-Specific Competition

Huan Tao Zhu and Hong Shi Wang

Abstract In this paper, stability of predator prey model with stage structure and intra-specific competition is investigated. Sufficient conditions for global attractiveness of positive equilibrium are derived by using iterative technique and comparison theorem.

Keywords Stage structure · In transpecific interference · Predator prey model · Stability

49.1 Introduction

The biological problems, what is the consequence of competitive exclusion and law of the jungle among animal populations, how they balance in ecological, have been received extensive attention by scholars studying in biological and mathematics filed. It does not conform to the reality that all individuals have the same degree of viability, predation, which is assumed in the classical Lotka-Volterra predator models. Because the biological individual often grows up from childhood to adulthood, immaturity to maturity, adult to old age, etc., the difference of their predation capacity is extremely significant in different stages. Therefore, we studied it by establishin the appropriate model with stage structure based on different physiological characteristics stages (such as juvenile, adult, elderly) [1, 2]. In recent years, many scholars studied the population dynamics with stage structure

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models [3]. In [4], the author studied the stability of predator prey model with the following Bed ding ton-De Angelis function:

$$\begin{cases} \dot{x}_1 = x_1(1 - x_1) - \frac{Ax_1x_2}{1+Bx_1+Cx_2} \\ \dot{x}_2 = \frac{Ex_1x_2}{1+Bx_1+Cx_2} - dx_2. \end{cases} \tag{49.1}$$

In this paper we discuss the stability of the following predator model with intra-specific competition and stage structure considering intra-specific competition among predators

$$\begin{cases} \dot{x}(t) = \alpha_1 e^{-\gamma_1 \tau_1} x(t - \tau_1) - \beta x^2(t) - \frac{b_1 x(t)y(t)}{a_1 + mx(t) + ny(t)} \\ \dot{x}_j(t) = \alpha_1 x(t) - \gamma_1 x_j(t) - \alpha_1 e^{-\gamma_1 \tau_1} x(t - \tau_1) \\ \dot{y}(t) = \frac{b_1 \alpha_2 e^{-\gamma_2 \tau_2} x(t - \tau_2) y(t - \tau_2)}{a_1 + mx(t - \tau_2) + ny(t - \tau_2)} - dy(t) \\ \dot{y}_j(t) = \frac{\alpha_2 b_1 x(t)y(t)}{a_1 + mx(t) + ny(t)} - \gamma_2 y_j(t) - \frac{b_1 \alpha_2 e^{-\gamma_2 \tau_2} x(t - \tau_2) y(t - \tau_2)}{a_1 + mx(t - \tau_2) + ny(t - \tau_2)} \end{cases} \tag{49.2}$$

where the variable $x_j(t)$ and $x(t)$ respectively represent the prey density of Juvenile and adult, $y_j(t)$ and $y(t)$ respectively represent the density of juvenile and adult predator, $a_1, b_1, m, n, \alpha_1, \alpha_2, \beta, \tau_1, \tau_2, d$ are positive constants. Let system (49.1) satisfies the following initial conditions

$$x_j(\theta) = \phi_j(\theta) \geq 0, y_j(\theta) = \psi_j(\theta) \geq 0 \quad x(\theta) = \phi(\theta) \geq 0, y(\theta) = \psi(\theta) \geq 0, \\ \theta \in [-\tau, 0] \quad \phi_j(0) > 0, \psi_j(0) > 0, \phi(0) > 0, \psi(0) > 0,$$

where $\tau = \max\{\tau_1, \tau_2\}$, $\Phi = (\phi_j(\theta), \phi(\theta), \psi_j(\theta), \psi(\theta)) \in C([-\tau, 0], R^4_{+0}) C([-\tau, 0], R^4_{+0})$ represents Banish space of continuous function from $[-\tau, 0]$ to R^4_{+0} , $R^4_{+0} = \{(x_1, x_2, x_3, x_4) : x_i \geq 0, i = 1, 2, 3, 4\}$. In order to maintain the continuity of the initial conditions, let $x_j(0) = \int_{-\tau_1}^0 \alpha_1 e^{\gamma_1 \theta} \phi(\theta) d\theta$, $y_j(0) = \int_{-\tau_2}^0 \frac{b_1 \alpha_2 e^{\gamma_2 \theta} \phi(\theta) \psi(\theta)}{a + m\phi(\theta) + n\psi(\theta)} d\theta$, then $x_j(t) = \int_{t-\tau_1}^t \alpha_1 e^{-\gamma_1(t-\theta)} x(\theta) d\theta$, $y_j(t) = \int_{t-\tau_2}^t \frac{b_1 \alpha_2 e^{-\gamma_2(t-\theta)} x(\theta) y(\theta)}{a + mx(\theta) + ny(\theta)} d\theta$.

By calculating, the system (49.1) can be simplified

$$\begin{cases} \dot{x}(t) = ax(t - \tau_1) - x^2(t) - \frac{bx(t)y(t)}{1+c_1x(t)+c_2y(t)} \\ \dot{y}(t) = \frac{vx(t-\tau_2)y(t-\tau_2)}{1+c_1x(t-\tau_2)+c_2y(t-\tau_2)} - dy(t) \end{cases} \tag{49.3}$$

where $a = \alpha_1 e^{-\gamma_1 \tau_1}$, $b = \frac{b_1}{a_1}$, $c_1 = \frac{m}{a_1 \beta}$, $c_2 = \frac{n}{a_1}$, $v = \frac{b_1 \alpha_2 e^{-\gamma_2 \tau_2}}{a_1}$. Obviously, system (49.3) has non-negative equilibrium $E_0(0, 0)$, $E_1(a, 0)$, by directly calculating, the system (49.3) has a unique positive equilibrium $E(x^*, y^*)$ if and only if $\frac{av}{1+ac_1} > d$,

where $x^* = \frac{1}{2}(-\Delta_1 + \sqrt{\Delta_1^2 + 4\Delta_2})$, $y^* = \frac{(v-c_1d)x^*-d}{c_2d}$, $\Delta_1 = \frac{v-c_1d-ac_2v}{c_2v}$, $\Delta_2 = \frac{d}{c_2v}$.

49.2 Definition and Lemma

49.2.1 Definition

System (49.3) is said to be uniformly permanence if there exists a positive constant δ such that $\liminf_{t \rightarrow \infty} x(t) > \delta$, $\liminf_{t \rightarrow \infty} y(t) > \delta$ for any positive solution $z(t) = (x(t), y(t))$ of system (49.2).

It is easy to show that all solutions to system (49.3) satisfied the initial conditions (49.2) are positive.

49.2.2 Lemma

Assume that $t \geq 0$, then the solution of system (49.3) with initial conditions is bounded.

Proof From the first equation of (49.3) and positive of solutions, we have $\dot{x}(t) \leq ax(t - \tau_1) - x^2(t)$. From the Lemma 3.1 of literature [5] and comparison theorem, for sufficiently large t , we have $\lim_{t \rightarrow +\infty} x(t) \leq a$. We define functional equation

$$w(t) = \frac{v}{b}x(t) + y(t + \tau_2) \tag{49.4}$$

By calculating derivative on $W(t)$ along the orbits of (49.3), it follows

$\dot{W}(t) = -dy(t + \tau_2) + \frac{av}{b}x(t - \tau_1) - \frac{v}{b}x^2(t)$. We obtain that there exist positive constant M and T such that $\frac{dW(t)}{dt} \leq M - dW(t)$ for $t \geq T$. Hence, we have $\limsup_{t \rightarrow +\infty} W(t) \leq \frac{M}{d}$.

49.2.3 Lemma

For the equation $\dot{x}(t) = \frac{ax(t-\tau)}{1+bx(t-\tau)} - cx(t)$, are positive constants, $x(t) > 0$, $-\tau \leq t \leq 0$. Assume that $a > c$, then $\lim_{t \rightarrow \infty} x(t) = \frac{a-c}{bc}$.

It can be obtained directly from the Theorem 4.9.1 of the literature [6, p. 159].

49.3 Mail Results

49.3.1 Theorem

1. The equilibrium $E_0(0, 0)$ of (49.3) is not stable;
2. Assume that $\frac{av}{1+ac_1} < d$ is satisfied, then the equilibrium $E_1(a, 0)$ of (49.3) is locally asymptotically stable;
3. Assume that $\frac{av}{1+ac_1} = d$ is satisfied, then the equilibrium $E_1(a, 0)$ of (49.3) is linear neutral stable;
4. Assume that $\frac{av}{1+ac_1} > d$ is satisfied, then the equilibrium $E_1(a, 0)$ of (49.3) is not stable.

Proof 1. $(\lambda - ae^{-\lambda\tau_1})(\lambda + d) = 0$ is the characteristic equation of the equilibrium $E_0(0, 0)$, so $\lambda_1 = -d < 0$, $\lambda = ae^{-\lambda\tau_1}$. And the images of $y = \lambda$, $y = ae^{-\lambda\tau_1}$ will intersect at a positive λ . Hence E_0 is not stable. $(\lambda - ae^{-\lambda\tau_1} + 2a)(\lambda - \frac{av}{1+ac_1}e^{-\lambda\tau_2} + d) = 0$ is the characteristic equation of the equilibrium, $E_1(a, 0)$, so $\lambda = ae^{-\lambda\tau_1} - 2a$, $\lambda = \frac{av}{1+ac_1}e^{-\lambda\tau_2} - d$.

For $\lambda = ae^{-\lambda\tau_1} - 2a$, the real part of its roots is negative. In fact, assume that $\text{Re}\lambda \geq 0$ by directly calculating, we obtain $\text{Re}\lambda = ae^{-\tau_1\text{Re}\lambda} \cos(\tau_1\text{Im}\lambda) - 2a \leq a - 2a < 0$, which contradicts $\text{Re}\lambda \geq 0$.

2. For $\lambda = \frac{av}{1+ac_1}e^{-\lambda\tau_2} - d$, similar to the above discussion, we obtain that the real part of its roots is negative too when $\frac{av}{1+ac_1} < d$. Hence, the equilibrium $E_1(a, 0)$ of (49.3) is locally asymptotically stable when $\frac{av}{1+ac_1} < d$.

3. For $\frac{av}{1+ac_1} = d$, let $f(\lambda) = \lambda + d - de^{-\lambda\tau_2}$, obviously $f(0) = 0$, $f'(\lambda) = 1 + \tau_2 de^{-\lambda\tau_2}$, $f'(0) > 0$. We obtain that $\lambda = 0$ is a simple root.

Assume that there is a complex root $\lambda = \alpha + i\beta$, then we obtain $(\alpha + d)^2 + \beta^2 = d^2 e^{-2\alpha\tau_2}$. The necessary and sufficient condition for the above type is $\alpha \leq 0$. That is there exist nonpositive real roots of its characteristic roots. Hence E_1 is linear neutral stable.

4. For $\frac{av}{1+ac_1} > d$, let $f(\lambda) = \lambda + d - \frac{av}{1+ac_1}e^{-\lambda\tau_2}$, obviously

$$f(0) = d - \frac{av}{1+ac_1} < 0, f(+\infty) = +\infty.$$

We obtain that there exists at least one positive real part of its roots for $f(\lambda) = 0$. And for $\lambda = ae^{-\lambda\tau_1} - 2a$, the real part of its roots is negative. Hence, the equilibrium E_1 is not stable.

49.3.2 Theorem

Assume that $\frac{av}{1+ac_1} > d$ and $(H_1) : c_2 > \max\left\{\frac{b(v-c_1d)}{d}, \frac{b(v-c_1d)}{a(v-c_1d)-d}, \frac{b}{a}\right\}$ are satisfied, then positive equilibrium of the system (49.3) is global attractor.

Proof From the first equation of (49.3) and positive solutions, we have

$$\dot{x}(t) \leq ax(t - \tau_1) - x^2(t), t \geq 0.$$

By using comparison theorem and Lemma 3.1 of literature [5], we obtain that there exist a T_1 and a sufficiently small $\varepsilon > 0$ such that $x(t) < a + \varepsilon = M_1$ for $t \geq T_1$. Substitute into the second equation of (49.3) and it follows that $\dot{y}(t) < \frac{vM_1y(t-\tau_2)}{1+c_1M_1+c_2y(t-\tau_2)} - dy(t), t \geq T_1 + \tau_2$. Consider the following equation:

$$\dot{u}(t) = \frac{vM_1u(t - \tau_2)}{1 + c_1M_1 + c_2u(t - \tau_2)} - du(t), t \geq T_1 + \tau_2, u(t) = y(t), t \in [T_1, T_1 + \tau_2].$$

From $vM_1 - d(1 + c_1M_1) > av - d(1 + c_1a) > 0$ and the Lemma 2.2, we obtain

$$\lim_{t \rightarrow \infty} u(t) = \frac{vM_1 - d(1 + c_1M_1)}{c_2d} > 0.$$

By using comparison theorem, we obtain that $y(t) \leq u(t)$ for $t > T_1 + \tau_2$. Hence there exist a T_2 and a sufficiently small $\varepsilon > 0$ such that

$$y(t) < \frac{vM_1 - d(1 + c_1M_1)}{c_2d} + \varepsilon = P_1 \tag{49.5}$$

For $T_2 > T_1 + \tau_2$.

From (49.4) and the first equation of (49.3), we have

$$\dot{x}(t) > ax(t - \tau_1) - x^2(t) - \frac{bx(t)P_1}{1 + c_2P_1}, t > T_2.$$

From assumption of the theorem, it follows that $a > \frac{b}{c_2} > \frac{bP_1}{1+c_2P_1}$ for $t > T_2$.

By using comparison theorem and Lemma 3.1 of literature [5], we obtain that there exist a $T_3 : T_3 > T_2$ and a sufficiently small $\varepsilon > 0$ such that $x(t) > x_0 - \varepsilon = N_1 > 0$ for $t \geq T_3$ where $x_0 = a - \frac{bP_1}{1+c_2P_1} > 0$ from (49.5) and the second equation of (49.3), we have $\dot{y}(t) > \frac{vN_1y(t-\tau_2)}{1+c_1N_1+c_2y(t-\tau_2)} - dy(t), t \geq T_3 + \tau_2$.

Considered with (49.4), we have $vN_1 - d(1 + c_1N_1) = (v - c_1d)(a - \frac{bP_1}{1+c_2P_1} - \varepsilon) - d > \frac{(v-c_1d)(a-\varepsilon)-d}{c_2} \left\{ c_2 - \frac{b(v-c_1d)}{(v-c_1d)(a-\varepsilon)-d} \right\}$.

From assumption of the theorem, for sufficiently small $\varepsilon > 0$, we have $vN_1 - d(1 + c_1N_1) > 0$. By using Lemma 2.2 and comparison theorem, we obtain that there exists a $T_4 : T_4 > T_3 + \tau_2$ such that $y(t) > \frac{vN_1 - d(1 + c_1N_1)}{c_2d} - \varepsilon = Q_1 > 0, t \geq T_4$. By using Lemma 2.2, we obtain that $N_1 < x(t) < M_1, Q_1 < y(t) < P_1, t \geq T_4$. From (49.6) and the second equation of (49.3), we have $\dot{x}(t) < ax(t - \tau_1) - x^2(t) - \frac{bx(t)Q_1}{1 + c_2Q_1}, t > T_4$. Similar to the above discussion, from $a - \frac{bQ_1}{1 + c_2Q_1} > a - \frac{bP_1}{1 + c_2P_1} > 0$, for sufficiently small $\varepsilon > 0$, we obtain that there exists a $T_5 : T_5 > T_4$ such that $x(t) < x_1 + \varepsilon = M_2 > 0, t \geq T_5$, where $x_1 = a - \frac{bQ_1}{1 + c_2Q_1} > 0$. From $x(t) < x_1 + \varepsilon = M_2 > 0$ and the second equation of (49.3), we have $\dot{y}(t) < \frac{vM_2y(t - \tau_2)}{1 + c_1M_2 + c_2y(t - \tau_2)} - dy(t), t \geq T_5 + \tau_2$. From $M_2 > M_1$ and $vN_1 - d(1 + c_1M_2) > 0$, we have $vM_2 - d(1 + c_1M_2) > vN_1 - d(1 + c_1N_1) > 0$.

Similar to the above discussion, for sufficiently small $\varepsilon > 0$, we obtain that there exists a $T_6 : T_6 > T_5 + \tau_2$ such that

$$y(t) < \frac{vM_2 - d(1 + c_1M_2)}{c_2d} + \varepsilon = P_2, t \geq T_6. \tag{49.6}$$

From the definition of M_1 and M_2 , it follows that $M_2 < a < M_1$. From (49.4) and (49.7), we have $P_2 < P_1$. From (49.7) and the second equation of (49.3), we obtain that $\dot{x}(t) > ax(t - \tau_1) - x^2(t) - \frac{bx(t)P_2}{1 + c_2P_2}, t \geq T$. From (H_1) , it follows that $a > \frac{b}{c_2} > \frac{bP_1}{1 + c_2P_1} > \frac{bP_2}{1 + c_2P_2}$. By using comparison theorem, for sufficiently small $\varepsilon > 0$, we obtain that there exists a $T_7 : T_7 > T_6$ such that

$$x(t) > x_2 - \varepsilon = N_2 > 0, t \geq T_7. \tag{49.7}$$

where $x_2 = a - \frac{bP_2}{1 + c_2P_2}$. From the definition of N_2 , it follow that $N_2 > N_1$.

Similar to the above discussion, from (49.8) and the second equation of (49.3), we obtain that there exists a $T_8 : T_8 > T_7 + \tau_2$ such that $y(t) > \frac{vN_2 - d(1 + c_1N_2)}{c_2d} - \varepsilon = Q_2 > 0, t \geq T_8$. So, we have $Q_2 > Q_1$. Based on the above, we obtain that $0 < N_1 < N_2 < x(t) < M_2 < M_1, 0 < Q_1 < Q_2 < y(t) < P_1 < P_2, t \geq T_8$.

Repeating the above iterative process, we obtain the sequence $\{M_n\}_{n=1}^\infty, \{N_n\}_{n=1}^\infty, \{P_n\}_{n=1}^\infty, \{Q_n\}_{n=1}^\infty$ to meet

$$\begin{cases} 0 < N_1 < N_2 < \dots < N_n < x(t) < M_n < \dots < M_2 < M_1 \\ 0 < Q_1 < Q_2 < \dots < Q_n < y(t) < P_n < \dots < P_2 < P_1, t \geq T_{4n} \end{cases} \tag{49.8}$$

From $M_1, N_1, P_1, Q_1 > 0$, it follows that $\{M_n\}, \{P_n\}$ are bounded declining sequence and $\{N_n\}, \{Q_n\}$ are bounded increasing sequence. So, we obtain that there exist positive number $\bar{M}, \bar{N}, \bar{P}, \bar{Q}$ such that $\lim_{n \rightarrow \infty} M_n = \bar{M}, \lim_{n \rightarrow \infty} N_n = \bar{N}, \lim_{n \rightarrow \infty} P_n = \bar{P}, \lim_{n \rightarrow \infty} Q_n = \bar{Q}$. According to (49.9), it follows that $\bar{M} > \bar{N}, \bar{P} > \bar{Q}$.

Next, we prove $\bar{M} = \bar{N}$, $\bar{P} = \bar{Q}$. Based on the above discussion, we have

$$P_n = \frac{vM_n - d(1 + c_1M_n)}{c_2d} + \varepsilon, Q_m = \frac{vN_m - d(1 + c_1N_m)}{c_2d} - \varepsilon,$$

$$M_n = a - \frac{bQ_{n-1}}{1 + c_2Q_{n-1}} + \varepsilon, N_n = a - \frac{bP_n}{1 + c_2P_n} - \varepsilon.$$

So, e obtain

$$P_n - Q_m = \frac{v - c_1d}{c_2d}(M_n - N_m) + 2\varepsilon \tag{49.9}$$

$$M_n - N_n = \left[a - \frac{bQ_{n-1}}{1 + c_2Q_{n-1}} \right] - \left[a - \frac{bP_n}{1 + c_2P_n} \right] + 2\varepsilon$$

$$= \frac{b(v - c_1d)/c_2d \times (M_n - N_{n-1}) + 2\varepsilon}{(1 + c_2Q_{n-1})(1 + c_2P_n)} + 2\varepsilon \tag{49.10}$$

$$< \frac{b}{c_2d}(v - c_1d)(M_n - N_{n-1}) + 2\varepsilon(1 + b)$$

Setting to the limit of (11) as $n \rightarrow \infty$, e obtain $[1 - \frac{b}{c_2d}(v - c_1d)](\bar{M} - \bar{N}) \leq 2\varepsilon(1 + b)$.

From (H_1) , it follows that $1 - \frac{b}{c_2d}(v - c_1d) > 0$. And ε is arbitrarily small, e have $\bar{M} = \bar{N}$. Setting to the limit of (49.10) as $m \rightarrow \infty, n \rightarrow \infty$, obtain $\bar{P} = \bar{Q}$. This ends the proof.

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Chapter 50

Study on the Scientific Development and Brand Strategy of Police Education

Zhang Kai

Abstract In this paper, the author introduces the police higher learning schools shall focus on their scientific developments and simultaneously specifies they shall try to achieve the harmony development of the policemen in the three aspects of knowledge, ability and quality to the maximum in the big context of the public security education system transformation, and then thoroughly reforms the police education model and constructs an educational training structure which combines the police education higher learning schools at all levels and is mutually complemented by all police sectors by using the empirical investigation and research as the main research method, and the computer, network and other modern technologies as an auxiliary tool and the intelligence-led policing, prevention and integration of hitting crimes and protecting commons as the theoretical guidance.

Keywords Police education · Scientific development · Brand strategy

50.1 Introduction

After the integration of education resources, a majority of secondary police schools have smoothly transformed from the majored diploma programs into the in-service people's police training centers, and some have upgraded to colleges and universities. Besides, the training objectives have shifted from the secondary level focusing on the applicable, creative and development talents with social practices to the junior colleges or above cultural levels stressing the comprehensive, innovative and development talents with the future development potentials.

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However, the corresponding education concepts, teaching mechanisms, contents, methods and means are being confronted with new opportunities and challenges.

50.2 Development History of China's Police Education

The development history of China's public security higher learning schools can be generally divided into three main stages.

50.2.1 Emerging and Formation of Public Security Higher Education from 1939 to 1980

After the foundation of the People's Republic of China, the Ministry of Public Security, all provinces and cities established the public security higher learning schools in succession and had began to train the in-service public security cadres and new people's policemen in a planned way; there were 57 public security higher learning schools by 1980 in China totally. During this period, the trained objects of the public security higher learning schools were mainly both the in-service and new people's policemen, and there were no diploma programs offered by the public security higher learning schools all over the country.

50.2.2 Formation and Development of Public Security Higher Learning Schools Diploma Programs from 1980 to 2008

The diploma programs offered by Chinese public security higher learning schools started from the 1980s. In 1982, China Criminal Police Institute began to enroll their first undergraduate students, and this was an important symbol for Chinese public security higher learning schools to develop the undergraduate diploma programs. Also, China People's Public Security University began to enroll students in October 1984. By the end of 1984, there were 17 formal public security higher learning schools established successfully in China, and the number of students reached 6,300.

During the late 1984–2008, China's public security higher learning schools achieved constant developments. The colleges and universities (China People's Public Security University and China Criminal Police Institute) subordinated to the Ministry of Public Security and the public security colleges and universities in 16 provinces such as Guangdong and Jiangsu were composed of the main body of the public security undergraduate diploma programs; Railway Police College,

Nanjing Forest Police College and other province-owned colleges constituted the main body of the public security junior college diploma programs. During this period, the full-time public security higher education whose students were the high school students of the national common enrollments was the structure subject of the public security schools [1].

50.2.3 New Stage of the Public Security Higher Learning School Reform from 2008 to Now

In June 2008, China's public security higher learning school reform was formally started, which was symbolized by the notification named "about printing < 2008 Implementation Plan for Political and Judicial Higher Schools Enrollment System Reform Pilot >" which was commonly issues by eleven sectors such as the Political and Judiciary Commission under the Central Committee of the Communist Party of China, the Organization Department of the CPC Central Committee, and the Ministry of Human Resources and Social Security of the People's Republic of China. Before this, Shanghai Police College firstly implemented the "2008 Implementation Plan for Political and Judicial Higher Schools Enrollment System Reform Pilot," and latter there were 17 public security higher learning schools to participate in the pilot as well in 2008. In 2009, the pilot scope was continuously expanded based on 2008 pilots, so the number of enrollment students increased [2].

50.3 Keys to the Scientific Development of Police Education

The education of the public security higher learning schools education is a kind of vocational education in essence, and its ultimate objective is to train the application-based and compound talents with high-quality political and professional qualities and powerful practical abilities [3]. Based on the clear understanding of the people's policemen comprehensive professional abilities and all-round qualities, it is necessary to strive for new explorations and construct rational and scientific training systems from the actual professional needs of police education.

50.3.1 Clearing the Training Objects

In accordance with characteristics of the modern police tasks, only the policemen can meet all standards of the politics, business, culture, psychology and body, their

real abilities and future potentials are likely to reach the requirements, and then they can be trained as the real talents who are beneficial to society. Specifically speaking, the talents trained by the police colleges and universities are necessarily equipped with two professional recognitions which are loyalty and self-discipline. At the same time, the modern policemen are necessary to have three-dimensional knowledge system which integrates the broad cultures, actual laws and proficiency in the career, and the four abilities of political identification, learning innovation, organizational coordination and serving the public, as well as the five fundamental skills which are persuasion, text production, on-site guidance, antiriot action and crashing the enemies.

50.3.2 Adapting to Social Needs

The police tasks are transforming from the static management to dynamic management, the single type of policemen to the compound type, and the single management and enforcement to the comprehensive administrative management and enforcement. Moreover, the standards for the police talent competition tend to be consistent with each other, but the forms become increasingly fierce. Different types of talents at different levels are being generated now. However, the construction of the comprehensive professional abilities and all-round qualities are necessary to look forward to society and future, be market oriented and always adhere to the social talent needs at different aspects and levels; especially, along with the continuous deepening of China's reform and open-up policy and the huge changes in the social economic structure, there are some situations and features in the social security management. This requires the police schools to change their concepts as soon as possible, accelerate the transformation of the police education, aiming to allow the police education really back to the track of training the students' professional abilities and all-round qualities.

50.3.3 Reflecting the Characteristics of Police Tasks

The economic development and harmonious social services to create a good security environment are necessarily persisted in the construction of the police comprehensive professional abilities and all-round quality training system, which must feature the industrial, policemen profession, police school and police major. Based on the different talent needs of economic development, the social security situation and police tasks, the schools must make full use of their own educational resource advantages and increase meanings for the relevant abilities and qualities with intensification or exploration [4].

50.4 Scientific Development of Police Education and Brand Strategy Construction

50.4.1 Constructing the Competency-Based Content System

The construction of the police comprehensive professional abilities and all-round quality training system is necessary to take the training of the police core professional competency as the starting point, not only form a common system, but also being a personalized system, and merging the contents of both the competencies and qualities. In the combination process of all elements of this system, everything should be based on the competency, and especially the professional ability should be deemed as the core.

The construction of the police all-round quality common system not only necessarily focuses on the science and culture, profession, humanity and body qualities, but also specifies and clears the detailed contents. For instances, the cultural and professional qualities can be divided into abundant and solid cultural and professional fundamental qualities in details; the specification of the humanistic qualities can be the professional ethics, work responsibility and carrier attitude, professional dedication, pioneering spirit, competitive recognition, teamwork and cooperation ability of policemen [5].

50.4.2 Reforming the Teaching Model and Establishing the Methodological System

First of all, it is necessary to transform the educational concept and form new police professional ability idea. Under the new situation, the police professional ability is no longer limited to the specialized knowledge and skills of a specific police position but is a comprehensive embodiment of multiple abilities and qualities. Besides, it is necessary to use the interpersonal skills, cooperation abilities, problem-solving ability and innovation ability as the important components of a qualified policeman when the role of personal quality is valued in the professional activities.

Second, it is necessary to emphasize and strengthen the policemen's characteristics and optimize the educational contents. The police education is the policemen professional knowledge and technique education which is carried out based on the existing cultural fundamentals. Therefore, it is necessary to attach importance to the transformations of the educational objects and functions, break through the major, subject and course barriers according to the requirement on the police professional ability and quality, integrate and improve the teaching contents, optimize the curriculum system, avoid repeated teaching, utilize and allocate the teaching resources, complete the necessary police knowledge and skill

trainings within the limited teaching hours, and also pay much attention to the collection and understanding of modern technologies and information to form high development potentials and spaces, stress and intensify the police features and competency fundamental, consolidate the practical education and actual-combat trainings and construct a police-featured curriculum with moderate basic theories, strong operation abilities and meeting the actual-combat needs.

Third, the classroom teaching must be close to the practices, and the integration of teaching and training shall be implemented. In the design of the classroom teaching, plan, cases, discussion, argumentation and skillful operation training are advocated to be added. In the organizational form of the classroom teaching, the “going out and introducing” shall be adopted to increase the perceptual knowledge in communities, courts and grassroots units, so as to motivate students to initiatively learn. In the teaching model and method, the simulation, on-site and context teaching means shall be applied for any courses involving in the skills, techniques and operations, so as to make the classroom teaching training more purposeful and effective.

Finally, it is necessary to apply the innovation practice teaching model to strengthen the trainings with the policemen characteristics. The new teaching model—teaching and practice and re-teaching and re-practice teaching model shall be adopted, in which the students can judge, analyze, process and solve the actual problems in work by closely engaging in the practices, allowing the theoretical knowledge to be intensified in practices and training their practical and problem-solving abilities.

50.4.3 Strengthening the Faculty and Facility Construction and Establishing a Guarantee System

First of all, it is necessary to build a high “double-quality” faculty team with solid theoretical foundation and powerful practical abilities. Primarily, the teachers teaching the major core courses should not merely strengthen the learning and updating of their own theoretical knowledge, but also continuously improve the education background and professional title, regularly penetrate into the industries to carry out practices and investigations in the business departments, so as to know the development direction of industries from practices, the talent needs trend, and intensify the improvement of the purposeful theoretical knowledge and practical training skills. Next, the relatively stable part-time teachers can be recruited, and especially the frontline leaders and experts in industries can be invited to do special lectures and professional practice courses for students.

Second, it is necessary to establish the training model commonly cooperated by the schools and the business departments and the relatively stable practice site. Also, a great number of industrial elites can be selected as the instruction teachers

with strong professional abilities, upright ideology and solid theoretical foundation to take charge of the practices, trainings and evaluations.

Finally, it is necessary to set up the interactive, simulation experimental and training bases which can connect with the realities, such as the on-site protection, bench training fields, simulation court, and simulation monitoring areas, interrogation simulation training fields, mobile and interactive shooting simulation trainings, and the tactics of preventing and countering smuggling, giving chances to let students personally feel the complexity of police tasks, participate in the actual operations and master all kinds of skills [6].

50.5 Coring at the Development of Students and Creating a Talent Training System

From the above analysis, it can be known, it is essential for the police higher learning schools to develop the educational concept cored at the development of students, change the situation cored at majors with a single talent standard and structure, set up the great police education idea, correctively handle the relationship between the knowledge impartation, ability training and quality improvement and select the teaching contents carefully. Simultaneously, the school fundamental theoretical knowledge shall be oriented at the actual application; the moderation shall be controlled at the necessary and enough-to-use levels. Also, the professional education shall be based on the fundamental knowledge and skills, aiming at implementing applicable practices, strengthening the direction and practicability, stressing the real combat ability training, and fostering the general talents who can meet the needs of multiple positions, and ultimately helping students obtain larger and sustainable development spaces.

Looking into the future, the police higher learning schools at all levels are essential to hold the scientific development as the primary objective, persist in creating their own teaching characteristic and brand, try to achieve the harmony development of the policemen in the three aspects of knowledge, ability and quality to the maximum in the context of the public security education system transformation, and thoroughly reform the police education model and construct an educational training structure which combines the police education higher learning schools at all levels and is mutually complemented by all police sectors through the empirical investigation and research, and the computer, network and other modern technologies as an auxiliary tool and the intelligence-led policing, prevention and integration of hitting crimes and protecting commons as the theoretical guidance.

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Chapter 51

Efficient English Teaching Scheme Based on Combination of Grammar Method and Communicative Approach

Liang Tianzhu

Abstract With the development of the globalization, college English teaching plays a more and more important role in training good language learners. Neither only grammar-translation teaching method nor only communicative approach can satisfy the needs of accuracy and fluency of English learning in the modern times. This paper is to prove that with their characteristics, the grammar method is of great use to students' reading and writing and that the communicative approach does well to students' listening and speaking. Thus, it is necessary that teachers should adopt both of these two methods and make use of them to teach their students well.

Keywords Grammar method · Communicative approach · College English teaching

51.1 Introduction

With the development of our national economy and the entry of China into WTO, efforts should be made in response to the call of the job market for new talents and skills. This also challenges our English teaching. A need for a functional command of English in the field of industry, science and technology, commerce, tourism and so on has been created. As a result, a corresponding change in the methodology of teaching foreign languages is also desirable. Generally speaking, there exist two methodologies of ELT in China, namely the traditional approach and the

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communicative approach. In my opinion, we had better prefer an integrative approach, that is, the combination of traditional and communicative approaches. But here arises a question: can traditional and communicative approaches be reconciled? As for this question, my answer is “yes.”

51.2 The Definition of the Traditional and Communicative Approaches and Their Characteristics

51.2.1 The Definition of the Traditional Approach and its Characteristics

As we know, the traditional method of ELT in China could be labeled “grammar-translation,” or “direct-method.” grammar-translation Method is based on the traditional teaching of classical Latin and Greek. “Grammar Translation dominated European and foreign language teaching from the 1840s to 1940s,” Richards and Rodgers [1, p. 6]. It started from a belief that learners learn a second language by comparing it with their first language. According to Grammar-Translation Method, languages are systems of rules for the construction of correct sentences. Thus, sentence is the basic unit of teaching and language practice. Literature is considered to be the superior form of a language. And languages are believed to be learned efficiently by memorizing the rules, along with bilingual vocabulary lists, and by applying them when making sentences. Translation is considered as one of the best ways to practice the application of rules. Reading and writing are the primary skills that the learners should develop, but there is much less attention given to speaking and listening, [2]. Teacher’s role is to explain grammatical rules and vocabulary and to correct their mistakes. For the learners, foreign language learning is a dull process of memorizing numerous materials and attempting to produce perfect translation of literature.

The approach has the following characteristics:

- (a) Focus very strongly on language as language (not as use). The so-called intensive reading class is a prime example of this, where the text is removed from its total context of meaning and examined as object for analysis.
- (b) Emphasize the memorization of vocabulary and the internalization of rules at the expense of appropriateness and use.
- (c) Restrict the quantity and variety of languages to which students are exposed.
- (d) Offer very few opportunities for real communication among students.
- (e) Rely very heavily on strong teacher control, and apportion a major part of the total talking time to the teacher.

51.2.2 The Definition of the Communicative Approach and its Characteristics

Communicative approaches are aimed at developing the communicative competence as opposed to the purely linguistic competence of learners; first, we should know what communicative competence is. It is fairly agreed that communicative competence is made up of four major strands: grammatical competence (mastery of the language code), sociolinguistic competence (the ability to produce and understand utterances which are appropriate in terms of the social context in which they are uttered), discourse competence (the ability to combine meanings with united and acceptable spoken or written text in different styles), and strategic competence (the verbal and nonverbal strategies). In Communicative Language Teaching, language is considered to be a system of communication, in which linguistic forms convey messages in specific contexts. Languages are acquired by using them in communication. Communicative skills are emphasized as one of the best ways to promote both subconscious acquisition and conscious learning of the language. Teaching is learner-centered and responsive to learners' needs and interests. The teachers' role is to facilitate the communication process, Breen and Candlin [3], but not to dominate the class. In Communicative Language Teaching, teachers are helpers, advisers, and facilitators. Learners hear and speak the language in real communication, and the learning process is slow, subconscious, and probably full of errors. Learners are more responsible managers of their own learning, [2]. Learners are encouraged to discover the forms and structures of language for themselves. Because of the participation, learners may find they gain confidence in using the target language step by step. "At the level of language theory, Communicative Language Teaching has a rich, if somewhat eclectic, theoretical base" [1, p. 1602161].

Communicative approaches have the following characteristics:

- (a) Concentration on use and appropriateness rather than simply on language form.
- (b) A tendency to favor fluency-focused rather than simply accuracy-focused activities.
- (c) An emphasis on student initiative and interaction, rather than simply on teacher-centered direction.
- (d) Sensitivity to learner's differences rather than a "lockstep" approach.
- (e) An awareness of variation in language use rather than simply attention to the language.

51.3 The Current Situation of College English Teaching in China

In today's Chinese college English teaching context, teachers are confronted with the pressure from both sides, that is, the growing class size and the improvement of students all-round ability, especially in listening and speaking. Thanks to the growth and popularity of modern information technology, the design and use of PC-based and internet-based multimedia teaching model provide an efficient assistant to help the teachers to alleviate the burden. In this way, the teachers are able to get easy access to the trends of English teaching and acquisition, and actively participate in and stimulate the change. Change is essential. However, some teachers are used the traditional teaching methods and technologies. They still hold the traditional way of teaching with a textbook, a classroom, a mouth, and a group of obedient but reluctant students. But now they should realize that change is a must. Only in this way, can we emancipate ourselves from the heavy teaching burden and free our students from test anxiety and distressing spoon-feeding or duck-stuffing in the Chinese expression. Therefore, we are endeavoring to keep balance between traditional teaching methods (Grammar-Translation Method) and new approaches like Communicative Language Teaching. For example, in order to deal with the exam-oriented education system, we adapt the grammar- and vocabulary-focused, teacher-dominant and textbook-based teaching methodologies. We also give consideration to the development of the students' communicative competence to keep up with the tendency of quality-oriented education. The 2004 national curriculum reflects the progress of college English teaching in China, that is, the transition from traditional approaches to Communicative Language Teaching. First, the new national curriculum lays more emphasis on communicative competence, requiring that the objective of college English is to develop students' ability to use English in an all-round way,

Especially in listening and speaking (2004, p. 5); second, the new national curriculum is more flexible. Under the guidance of the curriculum, the teachers in different regions can choose particular principles of instruction in order to meet the specific demands of the individual learners, which will be realized by "the extensive use of advanced information technology" (2004, p. 19), mostly the computer-based and web-based English teaching facilities. Furthermore, the curriculum introduces some new concepts, such as developing students' autonomous learning ability, and making more use of formative assessment, which includes students' self-assessment, peer assessment and assessment conducted by teachers and school administrators so as to complement summative assessment, that is, final tests and proficiency tests (2004, p. 25). While the new curriculum has been broadly acclaimed by teachers for its reflection of communicative teaching approaches, it sets higher standards for the students. For instance, students' vocabulary requirement has been enlarged from 5,000 to 6,500 words in its higher demands. The requirements of listening and speaking are both more demanding than before. Meanwhile, another impressive characteristic is that the new national curriculum tries to lighten the negative effects caused by national proficiency tests, that is, CET-4 and CET-6.

51.4 The Complement of Traditional and Communicative Approaches

From the facts mentioned above, we know communicative approaches lay emphasis on both structures and functions. What is most important is not language form but its use. Fluency should take precedence over accuracy. The students should be the central figures in classroom activities, and the teacher serves as the organizer and guide. However, in traditional approaches, the teacher plays a central role, with the students participating in various activities. The teacher expounds grammatical rules and sentence patterns, giving translation whenever necessary. Emphasis is laid upon grammar, language points, and accuracy of language rather than its application. Therefore, communicative and traditional approaches are considered not mutually contradictory but complementary.

51.5 Necessity of Integrating Communicative Approaches into Translation Method

For Chinese students, the traditional approach is out of date. As we all know, language is a vehicle of communication. Based on the traditional approach, no matter how well a student masters a language, he cannot use it freely in communication. A typical example is that most students who have passed Band-6 English test cannot communicate with foreigners. Students learning in this way only remain in the stage of combining vocabulary and grammatical rules to express meaning. Obviously, this method is not suitable for English teaching in China, which has to catch up with contemporary development of the world trends.

The single use of the communicative approach will not do in China, either. Influenced by the cultural tradition of unconditional obedience in which we are always taught to obey, not to invent, students see their teacher as an authority figure, and as a source of all the knowledge which they will need to acquire. As a result, students cannot get used to communicative approaches immediately. As for teachers, the communicative method makes greater demands upon the professional training and competence of the teachers. Teacher withdrawal is not the same thing as in activity. In terms of preparation and sheer professional skill in knowing when and how to intervene productively, the method demands very much more energy and adaptability from the teacher. The teacher also needs to be more confidently competent in foreign language.

Nevertheless, in China, good English teachers are hard to get at present, even mediocrities are now prized as valuable acquisitions. To make students have a real command of English, communicative should be used, but according to the practical situation in China, we can only use the method step by step. In my opinion, it is the initial stage of applying the method at which we had better use it with the help of traditional method, that is, integrating communicative approaches in the Chinese context and changing a traditional method toward a more communicative one.

51.6 Some Advice on the Integration of the Two Approaches

51.6.1 Taking the Advantages of Traditional and Communicative Approaches

Make use of the traditional approach in its accuracy about language. For example, English vocabulary and grammar are to be studied in detail. In class sessions, English words similar to Chinese but different in connotation will be clearly explained by the teacher and then used by the students in various contexts. Meanwhile, more communicative method should be used in our English teaching. In class, for all the oral and written activities, the students that play the central roles and the teacher functions as the designer and coordinator. The purpose of English teaching is to cultivate the students' ability to meet future needs. Listening, speaking, reading, writing, and translation are integrated in a single lesson. When a graduate goes to work, he will have to use his tongue and his pen even at one single meeting.

51.6.2 Utilize the Traditional Study Scheme of Preview, Practice, Review, but Change the Content of Each Stage. Each Stage is Carried Out by Task-Based Interaction

Before class, students are required to preview the text with a given topic which is relevant to the text. For instance, when I taught the text "love," I asked each of them to tell the class the most exciting love stories, from which the best one would be singled out for reward. It turned out that most students gave a full play in storytelling activities and read the text with more pleasure. In class, the teacher also gives learners tasks to transact rather than items to learn and provides an environment which best promotes the natural language learning process. By engaging in a number of communicative activities such as problem solving, discussion, or narratives, the learners' inter-language system is stretched and encouraged to develop. Take the procedure of intensive reading for instance, students in pairs could be given a passage to read out of class. No questions would be set, instead, each pair would have to decide up which points of grammar or vocabulary they would choose to highlight. They would then write out the questions or exercises associated with these points. In class, pairs would exchange their texts and questions with other pairs. They would then try to answer the questions. It is likely that at this stage, a number of disagreements would arise about the clearness of the questions, the importance of the language points.

After class, students are given an assignment to do in pairs. This might involve them in skimming through a number of magazine articles to find examples of the

forms they have been studying. They have to write out all the sentences, which contain their examples. From this, they try to formulate a generalization about why each form is used when it is. This might also involve them in retelling and summarizing the text and so on. But the important thing for a teacher to do at this stage is to check up the assignment carefully. In a word, task-based interaction gives students opportunities for the real communication we hear so much about. Moreover, it does not perturb the normal pattern of classroom teaching since it can be conducted in self-study time.

51.6.3 Try to Improve Teachers' Quality

Language instruction needs teachers, but good teachers are hard to get. If you ask a college dean what worries him most, most probably, the reply is the shortage of competent English teacher. While the student enrollment is getting bigger and bigger, the ranks of the teaching staff do not swell correspondingly. To solve the problem of lacking competent teachers, one way is to attract many Chinese post-graduate scholars to return from training overseas, as they will exercise considerable influence or pedagogical change. Perhaps even more important will be the advanced teacher training course currently being set up by the Ministry of Education. Teacher training is clearly the key to teacher development, and in this way, teachers will be given the confidence to embark upon the uncertain waters of experimentation. Only when there appear a lot of skillful English teachers in China, can the integrative teaching method be carried out smoothly.

51.6.4 Reform the Present System of Testing

In recent years, the forms of language tests have been changed a lot. Many tests include the multiple-choice items and subjective ones, which is regarded as one to test students' comprehensive skills. However, in my opinion, these forms are not enough until it includes the oral tests. Moreover, it is a common phenomenon that many students who have scored high in the English tests are incompetent at using English freely. Therefore, I think questions designed for English testing should be changed in both form and content with more emphases on students' communicative competence.

51.7 Conclusion

As to the significance of most influential teaching methods, namely Grammar-Translation Method and Communicative Language Teaching, I cannot say which one is superior to another, because all of them play very important roles in our

college English classroom. Based on the reality in the context, it is risky to aimlessly get rid of either of them. But we do hope to keep a balance between them. Grammar-Translation Method is important because the rudimentary knowledge is the core of language acquisition, and we believe that grammar remains a significant part for English acquisition in today's China. As we can see, the recent history of second language teaching methodology has seen a shift away from the consideration of teaching methods in isolation toward a focus on classroom interaction as the most vital element in the instructed second language learning process. Nevertheless, based on the reality about the difficulty of relating communicative theory to classroom methodology in the English teaching in China, we can only take the advantages of communicative approaches without upsetting the hallowed patterns of traditional practices integrating communicative approaches into traditional method.

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Chapter 52

Innovative Education of the Universities of Finance and Economics

Jun Li

Abstract Based on the same core of “innovativeness,” the cultural creation industry has a close relation with the innovation education of universities. The training for talents of cultural creation industry is the goal of the innovation education, as well as the most serious problem for the cultural creation industry. The universities of finance and economics have the advantages, such as comprehensive and professional courses, and the relationship with the society and practice have been emphasized by the daily education. The universities of finance and economics should go spearhead in such creation education among these universities and provide such talents for the culture creative industries.

Keywords Innovativeness · Creativity · The talents of the culture creative industries

52.1 Introduction

In the book “Creative Industries,” Australian John Hartley points out that the creative industries combine but then make great changes to two old concepts, which are creative art and culture industries, respectively [1].

The link between the culture creative industries and the universities lies in the “men.” The “men” refers to the creative talents with a special meaning. The initial link with the culture creative industries in the industry chain is the factor of men. However, the creative talents are the scarcest in the culture creative industries at home and abroad at the present time.

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Today, as the state vigorously develops the culture creative industries and the creative economy booms in China, the higher education is a transformation stage, and how to foster the creative talents has turned into a key factor that higher education explores diligently [2]. In this context, through a series of inherent advantages, the universities of finance and economics walk in the forefront of the delivery of the creative talents in the culture creative industries. Based on all these, and through the cognition on the inherent advantages and disadvantages of the universities of finance and economics, the author analyzes the current situation of the innovative education at these schools and also attempts to explore a way for these schools to meet the development needs of the culture creative industries from the aspects of the specialty structure setting, teaching practice, and means [3].

52.2 Advantages for Universities of Finance and Economics to Join with Culture Creative Industries

In the culture creative industries, the application of the “industries” term suggests that people begin to make use of the economic concepts to consider the art and culture, and the economic factors have stepped into the cultural perspectives. Thus, the theories and practices in both the economics and management have been indispensable to learn the culture creative industries. The basic principles, operation rules, laws and regulations, and practices, which are touched upon by the “industries,” are contained in the economics and management. Then, people can know the primary professional foundations by taking the complete development process of the industrial chain as references. For example, a market research may be necessary before the production of the culture creative products, and this may require the fundamentals of the statistics, international economy and trade, and business administration, and also the budgets of the cost and output may need the fundamentals of economics, fiscal science, and finance.

Another significant advantage of the universities of finance and economics lies in the emphasis on the social practices. In general, the universities of finance and economics attach importance to the social practices, allowing students to widen their knowledge and increase abilities in the practices. The things in the culture creative industries seem to be ideological. However, the original intention of the “creativity” is only seen in brains, so it is necessary to put it into practices and allow it to circulate in the industry chain, in which the role of practice cannot be ignored. Thus, it is another major advantage of the universities of finance and economics in the development of the culture creative industries. For this reason, the universities of finance and economics often establish many experiment and internship bases with enterprises and public institutions, encourage students to start their own businesses and set up university science and technology parks.

Besides law, arts and science and engineering disciplines are also offered in the universities of finance and economics and hence can give powerful assistance to the culture creative industries. At present, many universities of finance and economics have begun to value the interdisciplinary education and the integration between different knowledge and hence change the single teaching structure that is followed previously. For example, in the art and design major in the School of Art and Design of Nanjing University of Finance and Economics, not only the fundamentals are provided for the students, but also the interdisciplinary courses such as design management are provided for them, so the management knowledge is integrated into the art and design industry. Undoubtedly, such a measure is beneficial to the students at all kinds of positions of the culture creative industries after graduation.

52.3 Current Situation of the Innovative Education of the Universities of Finance and Economics

The innovative education is an effective way to link the universities of finance and economics with the culture creative industries. Currently, the general universities or the universities of finance and economics have recognized the importance of the innovative education and have attained some effects in the aspects of cognition and concept. However, all these are still far from enough.

First, the innovative education concept, which is student-centered and practice-oriented with talent-cultivating as objective, is still insufficient. The innovative education requires the teachers to fully excavate the potentials of students. Besides, the innovative education is not solely a part and also a focal point of the quality education and is implemented unfavorably in the domestic universities at the present time. In the universities of finance and education, owing to the problem in the specialty provision, the education has presented two divisions: (1) the simple completion of the learning tasks and giving a full satisfaction with 60 scores; (2) multiple utilitarian exams or participations in all kinds of society.

Next, the innovative education model, in which the interaction between teachers and students is valued, the classroom learning and extracurricular activities are equally important, and the cooperation between universities and social organizations is introduced, has not been formed yet. The innovative education lays a stress on the initiatives and consideration and requires the students to own multiple abilities. All these need the close cooperation between teachers and students at the universities. However, a great number of universities of finance and economics are still unclear about the innovative education model now and do not know how to start even through the innovative education is advocated. Thus, it can be said that they are quite blind about the innovative education. For example, some universities have established the experiment bases with many enterprises, but the students have no ideas about how to start in the bases owing to the shortage of

good plans, and even cannot provide any help at all, not to mention the cultivation on their practical abilities. Also, many universities advocate the “second classroom,” but do not have a general scheme, so they end up with nothing conclusive or are contrary to the original intention. As a result, the student cannot learn beneficial things and effective experience, but also waste time and energy. Therefore, the innovative education, as the core of the quality education, needs a good long-term and overall plan; the universities of finance and economics shall better exert the role of the advantageous relationship with the culture creative industries and hence become outstanding pioneers for the innovative education.

52.4 How to Further Innovative Education at Universities of Finance and Economics

It is necessary to establish a cooperative relationship with the culture creative industrial units, set up innovative bases, and lay a stress on the innovation practices. The culture creative industrial units are necessary to absorb inspirations from multiple levels and also require a great number of talents or man power, while the creative talents at universities can be the best source and target. Therefore, generally speaking, the culture creative industrial units are willing to establish a good cooperation relationship with universities and set up experiment and practice bases as the training grounds for the students. In this process, on the one hand, the universities of finance and economics shall endeavor to make use of their own major advantages and actively take initiatives to keep contact with all kinds of culture creative industrial units; on the other hand, it is necessary to deliberately make a good overall plan and neatly arrange the target, progress, and all kinds of details for the experiments and internships, so as to act with a well-defined objective in mind and allow the students to involve in the culture creative industries. Hence, they can have a good command of the useful knowledge, experience, and lessons. In addition, it is necessary to encourage or organize students to frequently participate in various social cultural creative competitions. For example, in July this year, the first China’s university student creative entrepreneurial competition, which will be cohosted by Copyright Society of China and China Association of Higher Education, has attracted great numbers of students to join in its final on the education activities of intellectual property rights. Besides this, multiple universities attach high importance to it as well, appeal the students to actively participate in it, organize the teachers to give those instructions, select outstanding projects, and foster their practical innovative ability in competitions.

Next, it is necessary to implement the “undergraduate tutorial system,” advocate the individualized education, and cultivate the characteristic talents. The “undergraduate tutorial system” is a new system which has been implemented by universities in recent years. Based on the current situation of the universities of

finance and economics, a majority of universities need the associate professors or high-level teachers to undertake the tutors for undergraduates, but also there are some schools to allow the middle-level teachers and those with a doctor degree to hold the tutor post. Generally, the number of the students whom the tutors teach is below ten; the tutors will perform all the joint liabilities for the study and life of their students. However, in recent years, the promotion of the “undergraduate tutorial system” faces up multiple difficulties and remains in an exploration stage. To actually implement the innovation education, the author believes that the role of the “undergraduate tutorial system” cannot be ignored, because it makes the individualized education possible, while the individualized education is a premise of the innovative education. Each student has his own strengths or strong points. Thus, if the tutors can find apt and specific ways to effectively instruct him and interactively exchange ideas, his potentials will certainly be expanded to a great extent, and his learning and innovation enthusiasm can be stimulated as well. Ultimately, the character of the student can achieve a full and perfect development. However, in the course of promoting the “undergraduate tutorial system,” the selection of the tutors for the undergraduates must be scientific and reasonable. On the one hand, the students shall be guided to choose the tutors based on their own interests and hobbies. On the other hand, the universities are necessary to strictly manage the tutors, making the matching degree between the tutors and the students achieve the optimal state. Then, a win-win result can be accomplished for the innovative education.

Third, it is necessary to put an emphasis on the general course education, offer the comprehensive courses, and make students develop in an all-round way. The universities of finance and economics own the strong advantages in the professional fundamentals needed by the culture creative industries, but also have their own weaknesses (i.e., their culture majors or subjects may not be strong, nor are valued). Therefore, to make up such a defect, the universities must attach importance to the education of the general courses which should be all-round, scientific, and systemic, offer comprehensive and interdisciplinary courses, and make advantageous guidance and plan to the selective courses of students. For example, the universities of finance and economics must offer traditional courses related to the modern culture, esthetics, psychology, sociology, and other culture creative industries, allowing the students to learn in-depth cultural meanings and to have an understanding of the social condition and psychology and also possess strong esthetic consciousnesses. Moreover, the integration and influence of the multiple disciplines are capable to help the expansion and cultivation of the creative idea of the university students. Hence, when the students step into the culture creative industries, they can transform into specialists with the qualities of the generalists. Such a type of talents is scarcely rare in the culture creative industries.

Finally, it is necessary to encourage the students to create self-employments and develop the innovative spirit in an all-round way. The fundamental standpoint of education lies in that it shall foster the real abilities but not ram knowledge into students' heads, which include the abilities of basic reading, writing, arithmetical operation, responsibility for all actions on others, initiative and creative work, and

cooperation. Among them, the most important ability is the continuous learning and longing which is the worst weakness of the traditional education, but excessive schools often strangle the desire of students to learn. Moreover, the traditional education at schools destroys their aspirations to start their own businesses and forces them to be daunted at the sight of entrepreneurship. In the traditional education, it is believed that the primary task of a student is to learn and the self-employment seems “not to engage in proper work.” Nowadays, the changes in the world situation allow people to see the shortcoming of the traditional education. However, the flourishing development of the culture creative industries promotes people to witness the necessity of encouraging students to initiate a self-employment. The “study for the purpose of application” shall be the best explanation to self-employment and also is the best way to exploit the innovation spirit. Therefore, the universities of finance and economics shall exert the role of the friendly relationship with multiple enterprises and public institutions and hence provide the most convenient conditions and most effective guidance for the student to do self-employment. Then, an appropriate interaction between the students and the culture creative industries can come into being, driving the innovative education at universities simultaneously.

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Chapter 53

How to Cultivate the Students' Motivation in English Teaching?

Kun Han and Xianmei Wei

Abstract Motivation is important for studying English; the teacher should have positive expectation on the students. The English studying interest of the students is aroused by singing English songs and setting the studying goals for the students. The following steps are used to improve the interest of studying English: instruct them the strategies of studying, guide the students to choose the contents of studying, direct them to practice speaking English, conduct them to learn the vocabulary and the text, and guide them to study English outside the classroom. The multiple equipment should be sufficiently used with reason and feedback exactly on time so as to arouse the students' motivation in English teaching.

Keywords Cultivate · Motivation · English teaching

53.1 Introduction

At present, in the English teaching of middle school, the phenomenon of knowing is separated with emotion is very serious; neglecting the emotional teaching is important to the English teaching. The teaching is just for the examination. The teacher never tries his best to train their interests, so that the students do not have the passion to study, and they are lack of confidence; as a result, it is difficult to cultivate the competence of English autonomous study, the habit to learn and the communicative competence. If the students feel successful in the English study, they will have more motivation [1]. The psychological study shows that when the students are feeling successful, they will have positive emotion, so that they will have new passion and interest. English study is just the same. So, the English teacher should

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study the students and try to understand them, so that the teacher can educate them according to their natural ability and give the students more chance to experience the success. On the other hand, the teacher should learn to praise and admire the students [2]. The psychological study and practical teaching show that the teacher affirms, praises and encourages the students and it will enhance the students' decision to study English, so as to improve the motivation of studying English.

53.2 The Teacher Should have Positive Expect to the Students

The teacher should have positive expectation on the students. His language should be filled with encouragement and motivation; no matter whether is good at English or not, the teacher should make the students feel the hope of success. When the teacher ask the students to memorize the new words, they can encourage the students: "In fact, you can understand well, when you are in the middle school, you can read the famous long novels, you feel it is hard to study English because there are too many new words for them to memorize. If you memorize the new words, you will find it is easy for you to understand the passages." If the students find preview the text before the classroom, or some of the students do well when they are retelling the passage in English, the teacher can praise and encourage them in public: "I find there are a lot of excellent students in the classroom, when they retell the text in English, they reach high level." "I find a lot of students have strong autonomy, and I see the hope from you." So that, the students will feel that they are urged and encouraged, and the other students will also do their best to imitate the advanced students. During the beginning of speaking English, they are always too shy to open their mouth to speak English. So the teacher should catch every chance to encourage them, even if the students only have made some progress, when they are act out a dialog in public, they can only speak some simple sentences, the teacher should also affirm them, so as to improve their confidence. Of course, when the teachers encourage the students, they must have pertinence, but they do not think so. So the teacher should guide the students to find their progress, so as to improve their motivation of English study. They will be filled with passion while they are studying.

53.3 Arouse the Students in English Studying Interest

53.3.1 Singing English Song

Singing English song will help to train the students English listening and improve their English spoken language, and it can also help the students enlarge their vocabulary, learn the grammar and cultivate their sense of English. Song words are

important for the students, if the students have them, they can practice singing whenever they free. During the multiple classes, when teacher can guide the students to sing English songs which can be downloaded on the internet, the students can write down the song words on the screens, and the teacher can also ask one of the students to copy the song words for each of the students. There is no need for the teacher to copy them down on the blackboard. While the students listen to the song, they are made to copy the words so that they get familiar with the tone and words of the song. Then, the teacher can ask the students to listen and follow, when they are able to sing the song, it is better to guide them sing together. As a result, the students will learn to sing English song without a lot of effort and with happiness. By learning English song, not only make the classroom teaching atmosphere active, but also train the students temperament and interest, and it also enhance the English speaking and listening while they are singing songs.

53.3.2 Set the Studying Goals for the Students

The goal is very important for the students, because it will urge the students to study hard. When the teaching is giving lesson to the students, he should often encourage the students to take part in the self-taught examination, upgrade from junior college student to university student examination, urge the undergraduate to take part in the Graduate Record Examination, tell them the advantage to improve their education and then finally, give them proper guidance. If the teacher never tells some of the policies to the students, they will know nothing about it. And the teacher should also tell them how to register for the examination and prepare for the examination. While the students are preparing the examination carefully, they will improve their autonomy naturally.

53.4 Instruct Them the Strategies of Studying

Some of the students know nothing about the good method, so that it is hard for them to improve; even if they study hard and careful, after class, they also spare time to study, but they cannot get the best result. So it is necessary for the teacher to master the best methods of studying English, so that while they are studying, they will feel that they get twice the result with half the effort. Of course, the teacher should tell the students the strategy of studying English, especially how to memorize new words and phrases, and he should also tell the regulation of the memory and the forgetting. While the teacher is giving the lesson to the students, he should remind them to take notes during the studying; the teacher must also spare some time to check their notebooks and the textbooks and praise the students who do it well.

Guide the Students to Choose the Contents of Studying For years of observation, most of the students are lazy sometimes; they always only finish the assignments which the teacher offers to them. They pay more attention to the content which the teacher ask them to finish and do their best to do it well. But for the content which the teacher tells them to complete, most of the time, they do not see it. The time in the class is too limited; there are only four classes for the college English, so the teacher must make the students master more knowledge during the limited time. The classroom teaching allotted with reason. TEXT A should be treated as intensive reading course, which includes guiding the students to read and get the main idea of each paragraph, and explaining the key points for some words, sentences and the grammar which are very difficult for the students to understand or memorize. The TEXT B should be treated as the fast reading material. The teacher should guide the students to read the new words, texts, and direct them to find the key words and the key sentences, strengthen them to understand and master the passages and enlarge their vocabulary by reading.

Direct Them to Practice Speaking English When the teacher guide the students to practice speaking English, first of all, they should let them listen to the tape and imitate, then ask them to underline the words which they are not familiar with, tell them to read again and again to memorize them. Then, the teach should ask them to make a conversation in English according to the key words and the main idea of the each paragraph, when speaking, some order can be upside down, if it is logical and does not influence the communication. So that the students will use the language flexibly, they will not learn it by rote.

Conduct the Students to Learn the Vocabulary and the Text For example, during the English studying, in order to let the students to master and memorize the new words after some time of learning, the teacher can ask the students to make marks where they are not familiar with, they do not have deep impressions, or the words which they never see before every time they go over this unit. During the class, the teacher can guide the students to preview the text, give them time to prepare for it with time and underline the key points, the difficult new words, the important sentences and grammar, which the students feel hard to learn. At that time, the teacher can walk up and down the classroom, observing and trying to know the students. When the students are studying the English new words, the teacher can guide the students to read, he can also ask the students to read together; so that, the students who cannot read can correct the errors and learn from the others. Of course, the new words are difficult for the students to read, the teacher should show them how to read, he can use the record to help or multiple equipment. Using this method can help correct the students' sound. In order to check if the students can read the new words, the teacher can ask the students to read several new words one by one, of course, the teacher cannot use too much time to study new words, or the students will feel bored. The teacher should try to let the students to read the texts retell a part or the whole passage, listen to the English tape, speak English, do exercises and so on to enlarge the vocabulary. Because it is hard for the students to forget them when they learn the English in the exact situation, by this way, they can master the English new words and use it freely.

Guide the Students to Study English outside the Classroom For years of teaching observation, most of the students are more or less lazy, they will pay more attention to the contents which the teacher guides them to learn, and always try their best to study and master; they are not willing to study the contents that the teacher never instructs. The time in the class is limited there, so the teacher must catch time to guide the students to students and learn more knowledge; he should always tell the students to study outside the classroom, especially the weekend and the holidays. The students are encouraged to keep diary in English, the habit of speaking English in everyday life should be formed, so as to form the ability to use the language freely. So the teacher should give them task to practice, for example, ask them to keep diary, and check them occasionally. If there are too many students in the classroom, it is hard for the teacher to correct all the exercises, it will take too much time for the teacher to finish them; as a result, he cannot give feedback on time. And the time for the teacher is also limited. Above all, the teacher can correct some of the exercises, check some of the exercises, give some time and guide the students to correct each other; before the students are doing it, the teacher must tell the students that he believe that all of the them have the ability to correct the exercises, and they will also benefit from it by doing so.

53.5 Use the Multiple Equipment Sufficiently with Reason

When the teacher is giving lesson in the multiple classrooms, it is not better to make more and more PPT, and it is not better to make more beautiful PPT, the teacher should make the PPT, whose contents and the form should be decided according to the students' situation. But while the teacher is making the PPT, he must make sure that it is good for the students to cultivate their English listening and speaking and communicative competence. The teacher must use the principle of students—centered, this is to say, in the class, the students should spare more time to study than just listen to the teacher. They should have the time to practice listening, speaking, reading and writing. If the teacher can do like that, after a class of English teaching, they will feel that they have learned a lot in the classroom.

53.6 Often Feedback Exactly on Time

Besides giving the task for the students to finish, the teacher should check it regularly and irregularly. Most of the students have the habit of studying the contents which are required by the teacher. Only handful of the students can study autonomously. Therefore, no matter which content that the students should finish, the teacher should spare some to check. Don't think it is waste of time to do so, in fact, it will save the time for them. Before the teacher check the assignment offered, first of all, the teacher should give the exact tasks. When the students are

studying, the teacher can walk up and down the classroom and check the tasks. Of course, the teacher should collect their assignment regularly and irregularly to check or correct, no matter how many students the teacher has. It is necessary for the teacher to check. When the students in the classroom is about 60 students or so, and the teacher sometimes have two or more class to teacher, if the teacher correct all the exercises for the students, it will too long for the students to get the feedback. So, the teacher should deal with the situation flexibly. He can spot test, or correct all of the exercises, he can also guide all of the students to correct them each other. The teacher should do it according to the real situation. Of course, no matter how the teacher deal with the students exercises, he should make the students understand the advantage of doing it.

53.7 Conclusion

At the beginning of the class, the teacher should tell the students the teaching plan and the reason to do so, so that the students can understand the purpose of the teacher, and the teacher should also tell the students the advantage of doing so, in order that the students will follow the teacher's instruction and study hard and actively in the class. According to the psychological principle, the students ate the immature individual, and they the deep potential, the teacher should follow the law of the students' mental development, improving the classroom teaching, make them study initiatively, so that they will master the English. And the teacher should also use the function of affection, arouse the students' interest and motivation, correct their studying attitude, enhance their confidence and overcome the nervousness in the English studying, so as to achieve success in the English studying.

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Chapter 54

Study on Cultivation of Talented Foreign Languages Personal with Multi-Abilities Regional

Bin Li

Abstract The development of regional economic needs both professionals in the field of deep knowledge and good foreign language skills of the multi-abilities language experts, college English teaching is necessary to overcome the traditional teaching mode, the drawbacks. With multimedia and network technology, learning of advanced Western teaching methods has become easy. By establishing a new type of foreign language training model, we focus on the training of practical, applied, and multi-abilities.

Keywords Regional economic · Foreign language personnel · Multi-abilities · Modes of education

54.1 Introduction

With the increasing regionalization of economic development and higher education institutions to speed up the process of transition, cultivating talents, services, and regional economic development are the people's consensus. Training high-quality personnel to achieve regional economic development is one effective way to adopt it. The reasons are as follows: firstly, high-quality talent makes resources more fully and effectively utilized; secondly, high-quality talent leverages other resources to compensate for the scarcity of certain resources; thirdly, high-quality natural resources and human capital themselves are a substitute for knowledge-intensive production case in

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point. So, regional economic development is the inevitable result of development of market economy. As the community's demand for foreign talent has grown, a trend of diversification of foreign language training of personnel must focus on the "scholastic" training model, which can develop wide caliber, application-oriented, multi-abilities talents of the "Foreign language skills - knowledge - cultural awareness" training model integration.

54.2 Regional Economic and Foreign Languages Personal with Multi-Abilities

Since the 1980s, China began to implement efficiency-oriented non-balanced regional development strategy to accelerate economic development in the eastern coastal areas and also contributed to the rapid growth of the national economy. Development conditions in different regions, under conditions of limited resources, and non-balanced development strategy will help to effectively allocate scarce resources and improve efficiency and quality of economic growth. However, if the regional economic development gap is too large, it can easily lead to all kinds of contradictions and conflicts. Thus, the analysis on the factors related to regional economic development for China's economy has maintained sustained, stable, and coordinated development that has a positive and practical significance. It is shown that regional economic development and higher education have great relevance.

Therefore, how higher education affects the operation of the regional economy, promotes their growth, and develops? It is mainly through the cultivation of high-quality talent, developing science and technology, to create a good cultural environment, to promote regional economic impact of the regeneration of run elements affecting of elements and braking elements directly interact, so as to promote regional economic development [1]. According to Sun (2006), high-quality labor force is not only essential for regional economic development, but also essential for the sustainability of regional economic growth, and sustainable social development is also important. The past century's world economic history shows that in a period of time, rapid economic growth through significant investment of capital and natural resources is achieved, but it is likely that the consequences of resource depletion, environmental degradation, and unequal distribution of income are growth without development or destruction.

Since the 1970s, the economic circles and relevant international organizations of the "basic needs strategy" concept of development; in 1980s, more emphasis on sustainable development concept, that in promoting socioeconomic development, improvement of human life quality, no more than support the development of the capacity of the ecosystem, humanity and nature, between man and society can be sustained, coordinated and interdependent. Great efforts to train high-quality workforce are taken to achieve regional economic development and there is no doubt that it is an effective way. The reasons are as follows: firstly, high-quality

labor force makes effective use of resources more effusively; secondly, high-quality workforce leverages other resources to compensate for the scarcity of certain resources; thirdly, high-quality natural resources and labor are an alternative capital of itself, especially knowledge-intensive production is a very good example. To achieve regional economic growth pattern successfully, a very important measure is to dynamically cultivate talents, promote scientific and cultural quality of workers, in order to effectively use limited resources to achieve with a wealth of labor resources for scarce natural resources and the replacement of social resources.

54.3 The Training Modes of Foreign Languages Personal with Multi-Abilities

As China's economy goes into the world economy, both a deep knowledge and expertise in the field of foreign language skills and good publics will be welcomed by all sectors of society, more economic and social development needs of foreign language and other related subjects, for example, diplomatic, economic, legal, news and culture with multi-abilities talents. As we know, twenty first century is a fast-changing, innovative information age; the training mode of foreign languages personal with multi-abilities should target a certain market demand for a special adjustment and professional courses, which for the formation of a setting different from traditional teaching methods and curriculum training model [2]. Cultivating foreign talent must clear two principles: first of all, based on its own characteristics, the developments are featured. Because with the entry into the WTO, it has brought opportunities and challenges; based on regional economic development needs, it is possible to reexamine and develop talents in cultivating foreign language goals and direction. The second principle is to strengthen the linkage with local government, since there is a clear economic service for the region's guiding ideology. Institutions of higher learning should be the country's economic construction and social development, but to serve the country for local services must be reflected. Professional curriculum should be consistent with the region's own characteristics and the spirit of service to the regional economy, to meet public needs in the region and actively set up the regional economic and cultural development and the urgent needs; meanwhile, full use of regional resources, efforts to carry out cooperation projects. Obviously, the strength of parties in the region must also be complex foreign language training, which can provide the necessary cooperation of preferential policies and projects.

Therefore, the question is, how to train "multi-abilities" foreign talents to make them serve the regional economic development? According to the information society on the demand for multi-abilities foreign language, generally speaking, it should form a "foreign language skills - knowledge - cultural awareness" integrated mode [3]. Firstly, cultivating talent is the core of foreign language knowledge and skills to

develop language, complex language, and foreign language professionals to reflect the advantage. Universities should be combined with the characteristics of regional economic development and should enhance professional development efforts. Secondly, it should focus on different regions, and different industries, targeted at English language training. Universities should be combined with regional differences, with different training and methods, highlighting the usefulness of learning English. Once more, regional exchanges and cooperation should be strengthened to improve foreign language teaching. Since China's accession to WTO, interschool exchanges and cooperation opportunities will be more content and more in-depth. Domestic colleges or universities can introduce advanced ideas and methods of teaching, education, management experience, and language teaching materials. Finally, it should establish market awareness. Recently, a large number of foreign multinationals entered into China not only in the economic field, but also in various ways the Chinese education market; our colleges and universities face the same stage with foreign educational institutions' competitive pressure. By means of the admission of foreign educational resources, it can provide us with a reference, absorption, utilization, and optimal allocation of educational resources [4]. So as to domestic colleges and universities, they should adopt the concept of advanced education and managements, strengthen the sense of market competition, access to education competitive advantage.

54.4 Conclusions

For most foreign language experts, training multi-abilities of foreign language talents is not new, but there are many specific issues that still need further exploration. For example, how does foreign language courses should be adjusted and streamlined; how to set up a reasonable course on relevant professional knowledge; how to combine the orientation of professional courses and foreign language courses, even if the specialize courses; how to carry out training on appropriate teaching materials for the teaching staff, in order to facilitate students' practical ability and innovative training; and how to reform the teaching content, teaching methods, and assessment methods.

During the exploration, there are several principles which needed to pay attention to: firstly, multi-abilities of foreign language training is the core. Whatever the mode is, it should be proficient in foreign languages [5]. According to the high standards of professional foreign language, a solid foundation should be laid, setting up specialized courses in foreign languages as much as possible, meanwhile noting that the use of foreign language students with good cross-cultural communicative competence. Secondly, multi-abilities of foreign language training with the fundamental purpose needs to create an advantage language, to be able to engage in different professional talents. Thirdly, it also encourages students to learn professional knowledge seriously and to promote the humanities, social sciences, science, and engineering, such as the intersection between different

disciplines and penetration, thus constructing a broader perspective on the future of professional work and making differences.

With the multi-abilities of foreign language training, it strives to implement the principles of quality education and pay attention to the overall trainings, which includes ideological and cultural qualities, professional qualities, and physical and mental qualities [6]. Meanwhile, attention should be paid to all aspects of teaching practice in order to improve students' ability and innovation. Fourthly, different regions of the various university in cultivating foreign language talents should be realistic, as the teaching system, it should be more advantages, by using different teaching models, strives to do the own characteristics, do not follow the competition blindly, and ensure the quality of training. Fifthly, in order to prevent us from being profit-driven and short-sighted, it is necessary to develop various multi-abilities foreign language talents. Some language and foreign language education disciplines can be encouraged, and the combination of foreign linguistics and foreign literatures supported

Cultivation of talented foreign languages personal with multi-abilities is a systematic project. It requires national policy guidance and support and needs cares and investments from education departments and universities [7]. Furthermore, it requires foreign language teachers with more professional teaching expel irenics in the first line, especially to explore, practice, and dedicate experiences. However, in order to develop more and more outstanding international talents to meet the opportunities and challenges in the twenty first century, it is believed that in this historical period of cultivating talents, all the efforts made by foreign talents will prove to be worth it.

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Chapter 55

Innovative Scheme in College Ideological and Political Education

Long Li

Abstract Cultivating students' innovative ability is not only related to the success of talent training, but also related to national rise and decline. Although the training quality of colleges and universities in our country has a good reputation in the international with foreign university that is more high level, innovative personnel training is a serious shortage. Higher education to complete its historical mission in the new century, the high quality talent development and innovation of ideological and political theory teaching must play an irreplaceable role and cultivate the students' ability of innovation.

Keywords Ideological and political education · Innovation · Cultivation

55.1 The Role of Ideological and Political Theory Course Teaching in Undergraduate's Innovative Ability Cultivation

Innovation ability refers to practice ability, and it can make the creative idea, theory and design a valuable products and unprecedented use of the existing knowledge and experience [1]. Ideological and political theory course is the most fundamental and most important part of the discipline of Marxist theory [2], and on the basis of it, it is also the key to the teaching of Marxist theory of the training, and it plays an important role in college students' innovative ability.

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To Stimulate Innovative Consciousness Innovation consciousness is to show the creation subject to produce a power according to the new individual needs and social development and demonstrates the wishes and eager to create [3]. Ideological and political theories teaching can help students establish a correct world outlook, the outlook on life and values, to guide the students to understand the development of the world trend and important role of innovation activities of personal, nation and state of survival and development, and guide students to improve on the historical responsibility, to help students desire success into a relentless pursuit of innovation and reform.

To Format Innovative Thinking Creative thinking is the human brain that reflects new links, new structures and new characteristics; it is also the innovation of the object of subject of mental factors innovation treatment were innovation object [4]. Based on the scientific world outlook and methodology, and the results of the Marxist theory itself, inherent creative thinking must include the identity of highly innovative thinking and innovative spirit. Basic knowledge and the basic point of view and Marxist theory, especially the dialectical materialist point of view and methodology, epistemology and dialectics is based on the theory of indispensable, make innovative thinking, and cultivate the spirit of innovation.

To Nurture the Spirit of Innovation Innovative spirit is the spirit and pragmatic spirit key is not harmonious, the pursuit of novel of the road, people when they are actively to understand the world manifestation and reform of the world. The Marxist theory system contains the spirit of the criticism, exploration and realistic. Through the ideological and political theory, teaching is to make the students deep feelings, the real Marxists have spirit and the courage to explore, to seek truth, criticism and creation, and ideological and political theory can help students learn to think in a comprehensive and dynamic way and then help them beyond the narrow daily experience, break the shackles, and finally by the current knowledge of the format of the internal power innovative behavior.

To Cultivate Innovative Personality Innovative personality is a progressive force by the formation of the integration and all kinds of ideals, beliefs, emotion and the will of the innovation subject. Innovation is not only a purely rational activity; it also needs from outside factors of intelligence, non-intelligent factors, including the incentive innovation emotions, etc. In addition, as Einstein said: "the intellectual achievements dependent degree of quality". Ideological and political theories teaching can show the great and innovative personality of the classic Marxist writers, to train young students, strengthen the training company materialism of human spirit, life philosophy and ethics, help students to obtain the correct value judgment and good quality, promote mental health of college students' personality that is formed.

To Enhance Innovative Practice Ability Innovation practice ability is pointed out that the mouth, research, organization and coordination and other practical innovation subject have information collection, identify problems, this paper puts forward ideas, and make plans, in order to solve the problem. Emancipating the mind, seeking truth from facts and keeping pace with The Times is the essence of Marxism, ideological and political theory course teaching can provide nutrition

and college students' thinking method shape innovation quality, the principle, the training of the students' practice ability.

55.2 Impact Factors of Undergraduate's Innovative Ability Cultivation in Ideological and Political Theory Teaching

At present, the teaching effect of ideological and political theory course not satisfied; Ideological and political theories teaching did not play its proper role, college students' innovative ability construction. The main reasons include: function orientation of ideological and political theory course teachers are biased, ideological and political theory course teachers' scientific research ability of the lack of, often use single teaching tools and boring teaching methods, teaching content from reality, and the traditional examination system constraints students' innovation spirit.

55.3 Orientation Deviation of Educational Function

The main problem in the ideological and political theory course teaching is the ideological and political theory teaching of ideological and political education of separation, unity and innovation education, ideological and political theory course teaching has been politicized, innovation training than was completely ignored. Many teachers of the ideological and political theory aim to spread the theory of Marxism and ideological and political quality of the training students, and they do not use Marxist theory as a tool to improve students' innovation ability and practice ability, and they do not explore the innovation education function, and internalization of Marxist theory method.

Teachers Lack of Knowledge Reserves and Research Capability The teacher is the core of the university. For historical reasons, knowledge and knowledge structure of most of the reserve college teachers teach ideological and political theory course that is not reasonable, scientific research direction has deviated from Marxist theory and its teaching content, and this already cannot adapt to the current subject education needs. In addition, doctor's degree of teachers in the ideological and political theory course education teaching and opposite less, teachers' scientific research ability generally weak, Marxism theoretical research has a little effect, to the campus of ideological and political education, it is difficult to deepen the validity, can cultivate students' innovation consciousness of the unconscious.

Teaching Contents Divorce from Reality At present, the ideological and political theory teaching lack of "problem consciousness" and "activities

consciousness” to some extent, the features of The Times and targeted not strong, teaching material selection have two kinds of orientation, they are: to take the theory and reality, emphasize knowledge content and neglect of content, teaching content non-intellectual have little access to social practice development and the real life of the students, it avoids the practical problems, heavy, and the main problems for students attention, lack of theoretical and practical the Angle of combining more existence and contrast, demand of students ideological and political theory course, it is hard to mobilize students’ learning initiative and creativity, but also to develop the ability of innovation.

Teaching Methods and Means are Single At present, our country college ideological and political theories teaching generally uses relatively simple teaching methods, and teaching methods are mostly education type, always putting undue stress on the transmission and absorption of knowledge. Students rarely have the freedom of the challenge and cannot produce thinking storm in the class. Spoon-feeding education mode mandatory “teaching mode, ignore students’ subject status, in the study, can’t develop their independent character; it not only not obeying the law teaching, can not mobilize students’ learning enthusiasm and initiative, and restrain the students’ individual character development and innovation ability of the play, eventually restricts the cultivating students’ innovative ability”.

Appraisal and Evaluation Methods are Rigid Appraisal and evaluation method of ideological and political theory course teaching and education in the university still continue to use traditional test mode, test project design to ignore the insight into children the economic transformation and social change, requirement of knowledge is often small and scattered, the examination emphasizes speed and skill, few encourage innovation, often guide students to recite and remember abstract concepts and theoretical understanding, cause no students’ thinking to stiff and rigid. This test pattern constraints students’ innovation spirit and restrains the development of students’ imagination and creativity, lack of creative thinking training and practice ability, so in ideological and political theory teaching, there will always be “phenomenon in high scores, poor ability”.

55.4 Innovative Thinking in the Ideological and Political Theory Teaching

Ideological and political theories teaching should be to internalize the spirit of innovation, innovation ability and innovative thinking of the students are the important work, and innovation practice is to reflect the students. In the process of teaching of ideological and political theory course teaching law, should grasp, teaching content, teaching methods and evaluation methods for reform, and then the teaching innovation of ideological and political theory, the level of training university students’ creativity can be constantly improved.

To Grasp the Law of the Ideological and Political Theory Teaching Based on politics, scientific sex, promote the development of the human nature of the three basic legal ideological and political theory course teaching [5]. The political nature of the course requirements of ideological and political theory teaching in higher school holds to the correct political orientation, human nature requires the ideological and political theory teaching, the students of a series correct format of the concept and the view of human existence significance and value in social activities. Scientific curriculum needs to promote doubt, criticism and innovation spirit ideological and political theories teaching. Therefore, in the ideological and political theory in the process of teaching, China should allow students to bring their questions and encourage students to think actively. When students are in the process of creative thinking and seeking truth, the teacher wants to provide effective guidance and help to ensure those young students' innovation activities and adhere to the correct value.

To Improve Innovative Quality of Teachers In the ideological and political theory course teaching, teachers play a leading role in students' innovative consciousness and ability construction. We need to pay attention to the reality of the competent education administrative authority learning and training teachers teaching of ideological and political theory course. Teachers' ideological and political theory course should constantly enrich and perfect the moral self, scientific knowledge, academic literacy requirements, in order to adapt to current ideological and political theories teaching on the innovative ability of college students as soon as possible, from "teaching" into "teaching and research", through the development of cultural creative teaching and research activities for the students' creativity, the better quality.

To Promote Innovation of Teaching Contents The reform of teaching is the core content of the ideological and political theory course teaching reform ideas. Ideological and political theories teaching should follow the principles; we should study Deng Xiaoping to put forward intensive and effective content and Marxism-Leninism, grasp the essence of Marxism-Leninism, and reality. We try to make the teaching content, to cultivate the students' innovation quality. In the teaching plans, course content and structure of all of the relevant course should be arranged reasonably, connected properly, and strive to achieve "three points, three points to avoid close", they are: avoid abstract, and avoid the repeated text strictly, avoid from reality, draws close to the time, close to the national crisis and social conditions, close to the students. In particular, first of all, the teacher should understand the spiritual essence of ideological and political theory, using the accurate laws and design principle, design method shows as the core of the teaching content, strengthens the ability of students to identify, analyze and solve problems right; Second, completely correct "megaphone" method in the process of teaching, emphasizing the theory innovation, innovation practice and its founder theory characteristics, application of creative thinking theory innovation; Third, reform of teaching contents should adapt to the request of the comprehensive construction well-off society and building a harmonious socialist society should keep pace with The Times, raise the student has the Chinese characteristic socialism theory; Four,

teaching content should be according to the ideological reality of the students in colleges and universities, the practical relevance. According to the chaos and doubt in thinking and understanding of the students decided to solve some practical teaching the concerns of the hot and difficult problem of the students; Finally, this paper introduces the practice teaching system, the big classroom teaching. The purpose is, under the guidance of teachers, students can use of my knowledge to guide practice in the social practice and test the theory in practice, in the realization of his social change of the role, the internal emotion, faith, and guidance, convicted so as to realize the unification of knowing and doing together.

To Explore Training Model of Innovative Ability The innovation ability training mode of teaching methods and defined as organization form, through the teaching technology and operation mechanism and incentive mechanism to achieve specific goal, the innovation ability construction, under the guidance of education philosophy must [6].

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Chapter 56

Study on Aesthetic Education Method in Chinese Teaching

Zhanrong Liu

Abstract Seeing from a comprehensive view on Chinese teaching materials, there is a resplendent world before our eyes and each text is shining with beautiful splendor. It almost accumulates beauties in various areas in human cultural traditions such as natural beauty, social beauty, scientific beauty and artful beauty and so on, which declare publicly the connotation of beauty by different points of view. Therefore, Chinese textbooks are excellent materials to undertake aesthetic education and Chinese teaching is an important position for aesthetic education. On this position, teachers should correctly guide students to grasp the aesthetic objects and the regulations of beauty and develop their abilities to find, appreciate and create beauties. However, in order to achieve this goal, it is the key point to adapt effective ways for aesthetic education.

Keywords Chinese teaching · Aesthetic education · Materials

56.1 Establishing Aesthetic Target and Defining Aesthetic Object

In order to strengthen students' aesthetic abilities and improve their percipient to beauties during Chinese teaching, teachers can establish aesthetic target, design aesthetic topics and guide them to scan objects of beauties from various points of view [1]. They can make students deeply discuss the nature of beauty based on the feeling of beauty. For example, Lotus Creek, they can design the following topics:

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the first one is the description of imagination of Shuisheng's wife; the second one is the description of language of Shuisheng's wife; the third one is the description of details of Shuisheng's wife; the fourth one is the description of heart of Shuisheng's wife. Through the discussion, let students really understand the meaning of imaginal beauty of Shuisheng's wife [2]. For example, Farewell to the Cambridge, students can discuss following topics: The first one is the choice of image; the second one is the creation of artistic conception; the third one is the aesthetic perception of music. Having understood three mentioned topics, students can grasp the emotional pulse of poetries and experience the feeling of farewell to Cambridge of the poet and thus appreciate the special lingering charm of the poetry [3]. Therefore, during Chinese teaching, teachers need to combine texts and scientifically design aesthetic topics and use suitable forms to organize students to have discussions. Purposefully explore the nature of beauty and enlighten their hearts and let them understand the real meaning of beauty. Let them perceive the true meaning of beauty and improve their aesthetic judgments [4].

56.2 Grasping Aesthetic Objects and Feeling the Connotation of Beauty

The colorful contents in Chinese textbooks present many splendid pictures and the scene, the object, the person and the matter, which all remind people's longing and pursuit for beauty. The descriptions of nature make us experience incomparably graceful and extraordinary splendid beauty [5]. For example, Moonlight over the Lotus Pond, written by Zhu Ziqing, in the text, the lotus pond under the moon and the moonlight over the lotus pond create quiet, elegant and hazy beauty; In Yu Dafu's Autumn of the ancient capital, the descriptions of the autumn of northern part of country vividly draw up clear, quiet and dreary autumn lingering charm. In Xu Zhimo's Farewell to the Cambridge, cloud, gold willow, water and grass and bright stars attract people into a beautiful prospect [6]. The descriptions of various personages can make students appreciate the beauty of character imaginations. For example, in Sunli's Lotus Creek, the descriptions of Shuisheng's wife give us an expression of a graceful, smart, loyal and patriotic and working woman; In Si Maqian's Lian Po and Lin Xiangru Historical Records, we can see an ingenuity and heroic Lin Xiangru with wise demeanor. The descriptions of things and matters can make us understand the beauty of social scenery. For example, Shi Tiesheng's I and the Temple of Earth, through the relation between I and the temple of earth, we can feel the importance of survival faith and the greatness of motherhood; Caocong's Miraculous Aurora let students not only understand the miraculous and wonderful aurora but also learn the shape, color and factor of aurora from scientific point of view. Therefore, in Chinese teaching, teachers should guide students to seriously read [7].

56.3 Tasting Beautiful Languages and Appreciating Beautiful Rhythm

Beautiful contents need beautiful languages to reflect in articles. Because of different article styles, there are different styles of language beauty such as the narrations. The language is vivid and lively and flexible. For example, the language in *Moonlight over the Lotus Pond* is vivid and excellent. Firstly, the author use a lot of reduplicated words such as profuse and luxuriant, thick, light and zigzag and so on and read full of lasting appeal. Secondly, the author pays more attention to practicing calligraphy. Some featureless words have wonderful aesthetic perception under the author's writing [8]. Such as the word rush down in the sentence the moonlight quietly rush down on leaves and flowers and the word painting in the description of pretty image of willow in the sentence it likes painting on the lotus leaves. The language of literature has more beautiful charm. For example, *Farewell to the Cambridge*, its languages have harmonious and splendid musicality. Four lines make one block and the arrangement of each block is well-proportioned. The word number of each sentence is six and seven or may be eight and there are changes in orderliness. Each block rhymes and exchange rhyme one by one and there is flowing beauty in rhythms. *Lotus Creek* reflects the clear and smooth language style. As for expositions, languages are precise and concise such as the article *Miraculous Aurora*. In addition, the language of argumentation is also interesting. Wandering in the ocean of language and appreciating different styles beauties make people reluctant to leave. Therefore, in Chinese teaching, teachers must strengthen language teaching and pay attention to beautiful points in language. They should let students ruminate repeatedly and really feel the charm brought by beautiful languages and stimulate them to use and create beautiful languages [9].

56.4 Recurring to Multi-Media and Experiencing Beautiful Circumstances

Modern colorful teaching methods provide powerful ways for aesthetic education. The usage of multi-media greatly enriches aesthetic education, increase experience to beauties and make students integrate into the immense beauty just like seeing its shape and hearing its sound. Many contents in text and class designs can be expressed by sound, light and electricity. For instance, *Moonlight over the Lotus Pond*, listening to textural voice as over the zigzag lotus pond, there are sweet leaves and leaves are much higher than water, there are a slice of green and then lotus flowers, lotus leaves and so on before students' eyes. Being affected by quiet and elegant beauty, students are intoxicated in it. For instance, *Miraculous Aurora*, looking into the distance of wonderful and glaring light in the sky, listening to teacher's splendid performance and appreciating the well-proportioned blackboard-writing design, students all

marvel at uncanny workmanship of nature and excellent talent of scientific workers. Therefore, in Chinese teaching, teachers should take full advantage of modern teaching methods as multi-media and create a colorful world for students. They also need to stimulate their sensation for beauty, intensify their aesthetic awareness and increase their aesthetic experience.

56.5 Requirements on Teachers

Teachers should have a scale plate of beauty and general aesthetic standard accords with the public requirements. They need to have aesthetic interests only had by Chinese teachers and have the ability to sense beauty from common things. Only by these they can find beauty, pursue beauty, and consciously express beauty and promote students to create beauty in life and teaching. If teachers are blunt to beauty and indifferent with many beautiful things and emotions, it is difficult to teach aesthetic education and we can imagine the result. Next, we have had a discovering heart. Teaching materials are too much and so as teaching elements. Too much knowledge points, ability points and emotional points in each piece of texts will make classes disorder and no highlights. Teachers should make clear understand about aesthetic education involved in teaching materials and repeatedly compare and select the most valuable key points and underplay other involved contents. There are many texts involve in aesthetic education such as the broad and bright Changsha Qiuhaio written by Mao Zedong, equal and interdependent love in Shu Ting's writing, a group of positive and aspirant women who love their husbands as well as their country in Shun Li's writing, Wang Xizhi's elegant and vigorous handwriting, Dai Wangshu's resentment just like clove and Darwin's strict, practical and realistic and persistent scientific attitude and spirit and so on. There are too many beautiful points. If referring to each text, it will become miscellaneous and make students fell tired and no good results. Many times we need to meticulously select background music, pictures, videos and other phonotype materials based on textual contents or encourage students to self-edit and self-perform melodramas to create circumstances and attract students into corresponding circumstances to let them get edification and more aesthetic experience. Sleepless blossom and Milo's Venus can be key important articles for aesthetic education to specially discuss beauty. There is a new position for teacher's roles. Teachers are favorers on students' study, cooperators in exploration, orienteer for students' development, and innovators of personalization teaching and constructors of new courses. Chinese teachers should be more directors in some teachings on key important contents. They need to study teaching objects, combine course features, and flexibly use various teaching strategies. In teleology and designedly teachings, they should take full advantages of their initiative and creatively use textbooks and other relevant materials. When teaching Sleepless blossom, teachers can find out sentences of expression of author's viewpoints and quickly grasp the author's intention. Recurring to the sleepless blossom, discuss aesthetic questions and then consciously talk about the following questions:

Using examples to express the most beautiful moment.

Beauties widely exist around us, how can we find beauties? Find out the author's viewpoints.

In order to develop aesthetic ability, what things can we recur to and what way we choose? What the author talks about and have you had particular experience? Among so many methods, what is the most important?

What is the significance for us to find and appreciate beauties?

Is it the final target of aesthetic education to find and appreciate beauties? After discussing these questions, students will have more rational knowledge and can improve their former aesthetic experience to a rational height as well as can make them more positive and conscientious on feeling, appreciating, expressing and creating beauties and a series of pursuing activities. In the process of guiding students to discuss, teachers should respect their unique feelings and heartfelt experience various beautiful moments. They need to correctly express the move and evaluation on beauties and self-heartbeat can make more students heart beating. Finally, actions to pursue are highly motivated. Teachers also enrich their emotions in the communications with students and promote accomplishment and achieve teaching others teaches you. Finally, teachers should take consideration on the whole situation. For aesthetic education of students, it cannot be finished overnight and not the patent of teaching materials. Teachers should have an outlook on overall situation and know perfectly about aesthetic target in the whole high school and make summaries for each stage. Teachers also need to have outlook of great Chinese and combine life reality to undertake aesthetic education.

In a word, as the important content of Chinese teaching, aesthetic education has various accesses. There is an old saying: Every road leads to Rome. Accesses can be used if they are useful to the cultivation and improvement on aesthetic abilities. As Chinese teachers, they need to continuously explore to find feasible accesses to precede aesthetic education and awaken their wisdom to create beauties and develop their abilities to create beauties based on the regular patterns of creating beauties by using for reference of predecessors. Thus aesthetic education can be realized and Chinese teaching can be the real important position of aesthetic education.

Chinese teaching is content of various kinds of art pithy words. The essence of the language, we referred to it as art articles or literature. Famous Chinese teaching Yukon home Zhang Zhigong said: "the literature education is a kind of spirit education, thought education, aesthetic Education, each pedagogue must have certain literature literacy—literature Understanding and appreciation, discrimination and lenovo force and imagination". Literature is able to arouse our aesthetic feeling, and bring into full play and aesthetic function appeared a language Art. Therefore, Chinese teaching material carrier—text for our language teaching Learn aesthetic infiltration possible. Literature is language.

Speech is their symbols and media. Language as a symbol of existence, also Is the unity of those referred to, and with the tones of the language materials such as shell in aesthetic life Motion is of great significance. First, literary works are often himself the symbolic form in reality The aesthetic value of independent, writers and

poets often forms of on its works fine vulture thin Cut, repeatedly modification, in addition to the more accurately communicates, also to enhance form outside Type itself has the aesthetic feeling. As ancient Chinese poet exquisite practicing, not only chase for words' sound effects (such as "the spring of southern river"), and the pursuit of hearing Aesthetic feeling, such as Chinese "push", "Knock" ("bird lodge pool trees, monk knock Months door"). As for poetry aesthetic effect, it is the rules for successive poet, word home Attention and to be remembered as the du fu YaJuan masterpiece the excellence of poetry, is up Letter neatly, appreciates, only to see it from its symbolic form has irreplaceable trial Beauty effect. Or: the wind rush the days of high apes squealing was the bird flew back to zhuqing. Boundless fell Wood, rustling endless Yangtze River flowing. The BeiQiu often away, more than 100 years illness put alone Computers. Difficult bitter hate numerous frost whiskers, ZhuoJiu cup out new pavilion. "This poem from end to end, quad Read antithesis, melody harmony pleasing, as Clive bell thought that, art Product is" can arouse our aesthetic emotion, just because of the works are a kind of "has the meaning form". The language teaching should have to literature beautiful "Has the meaning form", in a revealing and show, achieve confess to works of art Width and depth of knowledge.

Fine literature has its own image world layer, or trial Beautiful imagery. It is the art of a higher and more internal level. Literary works with its own physical materials as the foundation, with its own symbolic form in order, directs in the hearts of the reality, vivid image, even to ultra aesthetic layer, or artistic conception Image is the rich thus suggesting after the metaphysical life philosophy meaning on top Boundary. The so-called "last night, alone remains the west wind ubisoft's tree looked on as tall" "faraway road" Asymptotic unofficially engaged Wide will not be regrets, the Iraqi people to wave gadites gaunt. The entire he found thousands of baidu, MuRan look back, that person but in the lights dim. "Speak Chinese ancient literature subject-object artistic conception, stockings One, blending, spatio-temporal conversion, and presence of phase was born". Not only embodies the Chinese ancient art Spirit of the aesthetic connotation and artists in mind to grasp and care outside object Understanding the basis of object in his imagination adequately, the ideology of the field Create new meaning and the realm. Language teaching should not only reveal the ideological work within Han, more to discover the writer, the work and The Times characteristic, thus reach spiritual please Yue, the answers we aesthetic activities, and improve the people's comprehensive mental element Quality.

When I'm writing, should discover beauty, cognitive beauty and creating beauty prerogative among them. The specific practices are: (1) pays special attention to the observation training. First to stimulate students to observe, namely every thing of beauty a kind of things have beautiful contain them. Secondly, we should strengthen the purpose, make students. Guide passively accept teachers from the task of writing, and gradually developed into actively, consciously intentional writing. Again, to guide students to overcome constantly observations One-sidedness enhance the overall cognitive ability of beauty. (2) Pay special attention to comment. Composition evaluation is in developing students' intelligence, the best time to cultivate

aesthetic appeal. In cultivating their concept should be Ever, imagination, thinking, memory ability premise actively develop beauty, achieve a kind of aesthetic pleasure. Commentator should teach students in composition places, not seen place step analysis induction, deep down, improve their ability to identify beauty. From language to think, layered in-depth comments, so that student's aesthetic infiltration can achieve widely Degrees depth, that they subject and object deep "common", in order to achieve an intellectual transcendence.

Chinese teaching to the aesthetic infiltration is a gradual process, each class teaching, every little bit penetration into, reverse. After accumulation can also be useful implement. Must not overnight, eager for quick success and instant benefit otherwise students difficult? Accept, teaching the effect not beautiful. In improving methods, such as the point at points in the process of surface combining, in combination, and even speak enlightenment q&a with etc. it might as well teaching use.

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Part VII
Knowledge Management Engineering

Chapter 57

Study on Ecotourism Product Development in Lingyan Mountain

Changtai Lu, Yu Li, Ju He and Meitao Lan

Abstract The paper introduces the general situation of the ecotourism of Lingyan Hill, analyzes the feasibility of the development of the ecotourism products in the scenic spots of Lingyan Hill and designs the ecotourism products in accordance with the specific features in development of Lingyan Hill by strictly conforming to the principles in developing ecotourism and the situation of tourism resources in Lingyan Hill and the current market demand.

Keywords Lingyan hill · Ecotourism product · Design and development of product

57.1 Introduction

In 2002, World Tourism Organization has clearly pointed out that ecotourism is one of the key steps in the sustainable development of tourism industry. Forest ecotourism is the main form of ecotourism. Previous study has pointed out that, compared with other tourism facility, forest is the most suitable and ideal place for ecotourism because it has the lowest average temperature and greatest air humidity [1].

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57.2 The Basic Condition of Lingyan Mountain

Lingyan Hill is at longitude $103^{\circ}37'30''$ east, latitude $31^{\circ}02'05''$ north, at an highest altitude of 1423.4 m. Lingyan Hill is located at the northern suburbs of Dujiangyan City, which is at the northwestern border of Chengdu, and is adjacent to the Dujiangyan hydraulic project, on the opposite to the well-known Taoism mountain Qingcheng Mountain, and is 50 km away from Chengdu and only 2 km from the center of Dujiangyan City.

Lingyan Hill has beautiful natural landscape, abundant human spots, geographical advantages and convenient transportation.

57.3 The Ecotourism Resources in the Lingyan Hill

57.3.1 The Typographical and Soil Features

The geological configuration of the Lingyan Mountain belongs to the branch of the Ming River and the cathaysian of the final part of Jiuding Mountain, scenic spot is consisted by two mountain ridges and one ravine. The altitude of its highest peak is at 1423.4 m. Lingyan Hill stretches up to more than 1,000 m in the direction of four sides; its topography is high in the northwest and low in the southeast, its southwest is connected with Yulei Mountain, and the southeastern mountain stretches into Chengdu plain. The main soil of Lingyan Hill is mountainous yellow soil.

57.3.2 Favorable Climate

Lingyan Hill belongs to the subtropical humid climate, which has distinct four seasons, humid and mild climate, no scorching summer and freezing winter, abundant rain, humid air, more cloudy and rainy weather with less sunshine [2].

57.3.3 Water Recourses

Because the Lingyan River flowing through the Lingyan Hill and the abundant rain, each river branches gurgles across the whole year, in addition, there is abundant and fresh underground water for drinking directly.

57.3.4 Abundant Animal and Plant Recourses

Lingyan Hill has lush vegetation, mainly including ginkgo forest of 100 years old, neatly planted japan cedar forest, several pieces of nanmu forest, special machilus bombycina, tall and straight camptotheca acuminata; in addition, there is precious yew, Cephalotaxus oliveri, Manglietiastrum sinicum, Japan cedar, American loblolly pine and pinus elliottii, Mexican swampcypress, mao bamboo woods and so on.

57.3.5 Human Sights with Long History

The Lingyan Temple on the top of Lingyan Hill has a history of over 1,000 years, whose whole name is “Lingyan Buddha Mountain”. Kwan-yin is the main figure for all of the Buddha images. In June 1996, Sichuan Culture and Economy Development Stock Company invested for the repair and construction of the Lingyan Buddha Mountain in the area of Dongyue Temple at the right side of Lingyan Hill. Mutually connected Lingyan Buddha Mountain is famous for the “various images of Kwan-yin” [3].

57.4 The Analysis of the Feasibility of the Design of the Ecotourism Products in Lingyan Hill

57.4.1 Abundant Resources of Ecotourism

Lingyan Hill has high forest coverage and fresh air, which makes it green and fresh across four seasons. Its favorable environment and climate, abundant plant, animal and mixed scenic resources, and air rife with negative oxygen ion etc., are the foundation of the ecotourism in Lingyan Hill.

57.4.2 Feasibility of Construction Transportation System and Perfect Reception Facility

Although Lingyan Hill is not considered as the prominent scenic spot in Dujiangyan, it has highly convenient transportation in that tourists could take coach and arrive at Lingyan Hill directly from the bus station or the scenic spots in Dujiangyan, there are many local bus which travels to the foot of Lingyan Mountain.

57.4.3 Extensive Tourist Market

Because of the favorable environment of Lingyan Hill and its closeness to the city area, Lingyan Hill is the best choice for the entertainment, tourism and physical exercises of local residents, which indicates extensive tourist market. Most of the tourists come from the surrounding areas of Dujiangyan, Chengdu and other provinces.

57.4.4 Government Support

According to the “Reconstruction Planning of the Sichuan Tourism after Wenchuan Earthquake”, Sichuan will focus on the planning of the new tourism resources after earthquake, and new tourism product of Sichuan will be formed, and world-class earthquake tourism product will be made by taking the growing reputation of the line of Dujiangyan-Wenchuan-Beichuan and learning the models of Lijiang [4, 2].

57.5 The Principles of Developing Tourism Product in Lingyan Hill

57.5.1 Principle of Protective Development

The environmental protection must be the fundamental condition for developing the ecotourism in Lingyan Hill. Relevant professionals should take into consideration Lingyan Hill’s maximum number of tourist, its capacity of reception and the environmental capacity of the scenic spots in the process of development [5].

57.5.2 Principle of Comprehensive Development of Ecosystem

Based on the principle of environmental protection, the development of any tourism project should minimize the negative influence upon the natural landscape; the project should be harmonious with its surrounding environment [5].

57.5.3 Principle of Region

Maintaining the local facility style and utilizing local materials. Reducing the introduction of foreign species and conforming the prerequisite of harmonizing the designed spot to local environment [5].

57.5.4 Principle of Minus

According to the principle of minus in Liu et al., the purpose of the principle of minus, which is nature-oriented, is to reduce the human activity's interference into the original natural landscape. Besides, the principle of minus is based on the theory of vigorously protecting tourism resources [5].

57.5.5 Principle of Comprehension

Relevant professionals should do well in electricity and water supply, drainage, telecommunication and medical care. The environmental protection, preventing the forest from fire, diseases and insect pest should also be emphasized during the process of development. At the same time, the development should also be demand-and-market-oriented so as to develop reasonable ecotourism products [6].

57.6 The Development and Design of the Ecotourism Product in Lingyan Mountain

57.6.1 Survey

The author published questionnaire in Diaocha.com and obtained 189 valid questionnaires, and the male–female ratio of the respondents is relatively equal; the age range is primarily within 18–55 years old, which rife with consumer of great consuming capacity. The survey shows:

The Lingyan Mountain has certain reputation and tourist market. There are more respondents from foreign provinces, the result shows that the 43.40 % of the respondents have heard of Lingyan Mountain, and 41.3 % are familiar with it. The purposes of traveling in Lingyan Mountain (see Table 57.1) show that Lingyan Mountain is a good choice for holiday and sightseeing.

For the development of some ecotourism products in Lingyan Mountain, the tourism products are primarily related to forest sightseeing, forest bath, forest wandering, agri-tourism, fruit and vegetable plucking (see Table 57.2).

Table 57.1 The purposes of traveling in Lingyan mountain

Purpose	Percent (%)
Gathering with holiday	23.80
Exercise	59.30
Sightseeing	9.50
Internship	43.40
Others	1.10
Family and friends	11.10

Table 57.2 The ecotourism items tourist hope to join in

The forest activities that you would like to join in the most (multiple choices)	Percent (%)
A. Forest sightseeing	67.20
B. Forest bath	46.60
C. Outdoor training	39.70
D. Bird visiting	27.00
E. Science education	22.80
F. Forest farms	38.10
G. Forest wandering	49.70
H. Agri-tourism	57.10
I. Farm tea house	34.90
J. Plucking	47.60
K. Others	3.70

57.6.2 The Development and Design of Ecotourism Product in Lingyan Mountain

57.6.2.1 Sports Activity

Lingyan Mountain has unique advantage for developing forest sports activity and tourism: mountain climbing, forest wandering, mountain climbing by bike [7].

57.6.2.2 Leisure and Holiday Activity

Various entertainment and leisure activities, such as poker, mahjong, walking, visiting plants and animals.

Carrying out gathering and conference tourism. It is a popular way of gathering that the seller provides site and materials for the tourists to cook by themselves. We could take the advantage of existing tourism facility and lease the resources for friends and family gatherings.

Making use of plant and animal recourses, Lingyan ancient streets and Lingyan Temple to carry out sightseeing activities.

57.6.2.3 Health Caring Activity

With the improvement of the standard of living, people are more focussed on the health caring. The forest bath is one of the air baths among the three health caring bath [5]. Lingyan Mountain has the foundation for forest bath [8]. In addition, an hot spring was developed, which is at 2,850 m deep beneath Lingyan Mountain. The temperature of the underground water is 52 °C with abundant mineral composition. Therefore, Lingyan Mountain has relatively mature conditions and recourses for developing health caring tourism products such as forest bath, hot spring and so on.

57.6.2.4 Science Education Activity

The intern forest area of Sichuan Agricultural University is located within the scenic spot of Lingyan Mountain and the intern base of this tourism department. Science educational farm could be developed for carrying out teaching and scientific activities about plant and edible fungi cultivation.

57.6.2.5 Planting and Plucking

Constructing specific vegetable and fruit gardens in the scenic spots could not only increase the entertainment items, but also make city residents experience the interest of farm planting by carrying out various plucking activities.

57.6.2.6 Special Tourism Product

Photographic and writing competition could be held in Lingyan Hill. In addition, some tourist products for summer camping could also be developed. Establishing wedding activity in Lingyan Hill, which could be named as “Forest Wedding”, because the forest wedding is not only cool and cost-saving, but also special and representing the “being witnessed by the nature”, this is innovative especially for the couple having their wedding ceremony in summer.

57.7 Conclusion

In order to further strengthen the benefit-relevant persons’ recognition of the ecological environment, local government should establish reasonable regulations and administrative mechanism so as to improve the efficient development of the ecotourism; the administration department in the scenic spot should not only minimize the negative impact on the sensitive ecosystem, namely the overall

ecological environment, and carry out “green management”, but also publicize the knowledge about environmental protection among the tourists and community residents.

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Chapter 58

Study of Marketing Quantitative Theory

Shufeng Xiao

Abstract The theory of marketing refers enterprise regard marketing activities as an applied science. It is the study of the appropriate product, right price, at the appropriate time and place and using the appropriate method to sell to as many customers to the greatest extent possible to meet the market needs. The essence of marketing management company is creative development of marketing strategy to adapt to environmental changes. Through the analysis of the 4C marketing theory, 4R Marketing, 4P theory of marketing theory, marketing applied in practice to provide a basis.

Keywords Marketing · Application mode · Theory

58.1 Introduction

The marketing strategy means that the enterprise take customer needs as a starting point, based on experience, customer demand and purchasing power and the expectations of the business community [1]. There are plans to organize various business activities, mutually coherent product strategy, pricing strategy, channel strategy and promotion strategy to provide customers with satisfactory goods and services to achieve business goals in the process.

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58.2 The Marketing Concept

58.2.1 4C Marketing Theory

4C (the customer, cost, convenience and communication) marketing theory of consumer demand-oriented reset the four basic elements of the marketing mix: targeting the needs and expectations of consumers (the customer). We must first understand, research, analysis of consumer needs and desires, rather than to consider the enterprise can produce products; consumers are willing to pay the cost (cost). First understand the consumer to meet the needs and desires how much they are willing to pay (cost), rather than to give pricing and consumers to buy the convenience (convenience). First consider how consumers' shopping and transaction convenience of the consumer, rather than consider the choice of sales channels and strategies (communication) to communicate with consumers. Implementation of consumer-centric marketing communication is very important; ongoing interaction, communication, internal and external marketing integration are invisible to the interests of both consumers and businesses together. Compared with the last century, today's market is very different, whether it is the competitive landscape, or the thoughts and actions of the consumer, have undergone great changes. With the changes in the environment, the marketing idea changes have gone through three typical marketing concepts: 4P theory, the pursuit of market as the goal; 4C theory, the pursuit of customer satisfaction as the goal to meet market demand; 4R theory, to build customer loyalty goals.

58.2.2 4R Marketing

4R-generation of relevance (association), reaction (reaction), relationship (relationship) and reward (return) [2, 3]. The marketing theory is that with the development of the market, companies need a more effective manner from a higher level between enterprises and customers to establish different from the traditional new initiative relations.

58.2.2.1 Close Contact with Customers

Enterprise must be some effective way in the business demand and customer associate to form a mutual aid, mutual seeking, the relationship of mutual need, the customer and the business together, reducing the loss of customers, in order to improve customer loyalty, winning the long-term and stable market.

58.2.2.2 Improve the Response Speed of the Market

Most companies tend to say to the customer, but often overlooked the importance of listening. Mutual penetration and mutual influence of the market, the enterprise is the most realistic problem does not lie in how the formulation, implementation planning and control, but rather in a timely manner to listen to the hopes, aspirations and needs of the customer, and timely response to meet customer needs. So it is beneficial to the development of the market.

58.2.2.3 Interaction Between Attention and Customer

4R marketing theory holds that the key to seize the market today has been transformed into the establishment of long-term and stable relationship with the customer transaction into a duty, to establish interactive relations and customer. Communication is an important means for the establishment of such an interactive relationship.

58.2.2.4 Return is the Source of Marketing

The marketing objectives must be output-oriented; focusing on the return of corporate marketing activities, the enterprise must meet customer needs, providing value to customers and cannot do useless things [4]. On the one hand, the return is a necessary condition to maintain market relationships; on the other hand, the pursuit of return is the power of marketing development; the final value of the marketing is whether it can bring about short-term or long-term earning capacity for enterprise.

58.2.3 Characteristics of 4R Marketing

4R marketing competition, new marketing ideas in a new level, according to the increasingly fierce market competition situation, 4R marketing focuses on the enterprise and customer interaction and win-win relationship, not only to meet customer needs, but also take the initiative to create demand, established through the form of association, relationship, response and its unique relationship between enterprises and customers linked to form a unique competitive advantage [5]. 4R Marketing truly reflect and implement the idea of relationship marketing, 4R marketing raise how to build relationships, long-term with customers and ensure long-term interests of the particular mode of operation, which is a big step forward in the history of relationship marketing.

4R marketing is interactive and win-win guarantee; 4R marketing response mechanism provides the basis and guarantee for the establishment of the enterprise associated with the customer, interactive and win-win relationship, but also

sublimation of marketing convenience. 4R return of marketing companies to take into account two aspects of the cost and win-win, in pursuit of profit, business is bound to implement low-cost strategies take full account of the customer willing to pay the cost, minimize cost, and on this basis for more customer share of scale. As a result, the return of the enterprise provides customers with products and the pursuit of the ultimate integration and promotes each other, so as to achieve the goal of win-win.

4R marketing, like any theory, has its shortcomings and deficiencies. Relationship with the customer needs the strength of the foundation or some special conditions, not any business can easily be done. However, 4R marketing provides a good idea that is operators and marketers should understand and master.

58.3 4P Theory of Marketing Theory

Marketing, the traditional theory is that the marketing mix, is composed of product, price, place and promotion. The competitiveness of enterprises in the target market and the enterprise's own operating characteristics are determined by the effect of the mutual combination of these four elements. The theory is that, as long as the company's products set a reasonable price, the use of appropriate distribution channels, matched with certain promotional activities, will succeed.

In fact, from the development trend of the marketing strategy, marketing strategy is not necessarily 4P, the "4P" production, price, place, promotion, represented by the production general term for marketing four-factor combinations. On behalf of the entire twentieth century and the 1990s, corporate marketing used the "4P" strategy. This marketing model is different from the rest of the marketing concept and gives new marketing ideas from the inside out. Product, price, distribution, promotion plans and implementation, to make a positive and dynamic response to external uncontrollable factors, which led to the transactions and to meet individual and organizational goals. So the core of the marketing activities is to develop and implement effective marketing mix.

58.4 Marketing Theory in Quantitative Research and Development

The impact of quantitative study on the development of modern marketing theory in the process of marketing, quantitative research usually cannot do without the extensive use of mathematical models. Up from the overall analysis, quantitative study has several advantages over the use of mathematical models of marketing problems: First, the distinction between the marketing concept and definition of more accurate, to identify and test the relationship between the various variables; symbolic of the marketing concept, easy to abstract analysis of all relevant

variables in the marketing phenomenon; to the model in the form of a variety of relationships combined, in order to adopt accurate and creative description of the relationship between variables, improve the theoretical level and the possibility of the formation of theory; Fourth, by providing a variety of substitution variables, technical indicators and the probability of occurrence, and to facilitate the marketing management decision-making.

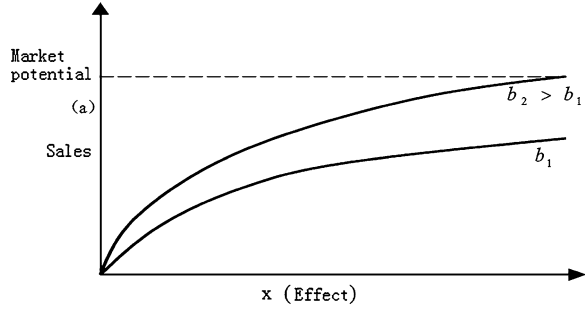
From comparison and analysis of existing marketing quantitative research results, we found that the study most widely cited social and natural sciences, and the latest research results, as the basic analytical tools of mathematics, physics and engineering, the scope of the study from the previous focus on the process of marketing research broadened the systematic analysis of the conditions of marketing, process and results. Therefore, a quantitative study of marketing problems is carried out, not only to broaden the scope of application of mathematics and other quantitative analysis tools to further enrichment and development of marketing theory and complex marketing problems simplistic image of the marketing problems of abstraction, but also can promote us to borrow the abstract thinking of the brain, specific marketing conditions, the process and results closely reasoning, gave full play to the advantage of the careful thinking of the human brain to help us with a more scientific means and methods to solve real marketing problems.

58.5 Application Mode of Marketing Theory

In 1940, the market area and market network are raised on the basis of Industrial Zone, which is characterized by the combination of the production location and scope of the market, and thus his theory is called the “market area.” He assumed an industrial center and the surrounding agricultural area, agricultural area residents is the purchase of industrial products and consumer preferences for these residents is the same, that is it has the same personal demand curve, the factory to product pricing. Assume no new companies joined the industrial zone mainly determined by the scope of its product sales, that is, the industrial zone is mainly determined by the demand for its products. If the enterprise is located able to attract a sufficient number of the consumer’s location, the companies will be able to make a profit; otherwise, it will not be able to make a profit, this region also is not suitable for the industrial location of, thus, forming round the product market area.

The circular market is not sustainable, because the circular area is bound to exist between the blank areas, these blank areas will gradually become a poverty area. Each other intersect between the circular market average is divided into two parts, in accordance with the consumer connection to the recent market shopping to assume that the overlapping area can be two circular intersection of this line can be called as undifferentiated line. Undifferentiated line is connected to the circular market area into a hexagonal market area. This is more than one center without the combination of the market area of the blank area to a hexagonal network structure, and this is the Liao even the market network model.

Fig. 58.1 The relationship between the cost of advertising and sales



58.6 Quantitative Analysis Model of Marketing Theory

Geometric model refers to a model in the form of charts or graphs to represent, such as road maps, organizational charts, flow charts, and flow Fig. 58.1.

- a The potential market for the product (i.e., an infinite number of advertising spending in order to get the most sales).
- b With the increase in advertising costs, sales of the ratio of the potential market.

Mathematical model: The mathematical model is in the form of the language of mathematics (mathematical equations), through abstraction and simplification to an approximate representation of the actual phenomena.

The figure is to represent the mathematical model; we can obtain the following equation:

$$S = a(1 - e^{-bx}) \tag{58.1}$$

Again, the mathematical model of population growth

$$\frac{dN(t)}{dt} = rN(t) \tag{58.2}$$

The model reflects decreasing advertising inputs and sales revenue, the extra advertising will not increase the sales of the product.

58.7 Marketing Theory Outlook

Fast response marketing organization is streamlined. The biggest feature of the twenty-first century information society is the network, the Internet has brought speed and efficiency; it also brings uncertainty, and it is this uncertainty, traditional marketing, organizational design ideas from the change in their nature, to adapt to the changes in marketing organization of the Internet age, must be responsive, smooth communication, internal and external coordination and interaction. Traditional products, sales, advertising and other departments will be eliminated one

by one. The characteristics of enterprise marketing framework have no middle management agencies, organized in a hierarchy system will be replaced by the network organization system. Because competition in the market for information society to emphasize speed, fast product replacement, rapid changes in consumer behavior, competitor reaction and the rapid development of IT, these “fast” impact on the model of the marketing organization streamlined; flexible and interactive, highly efficient, highly automated, network, etc. will be the basic principles to build the future of marketing organizations.

Digital distribution channels. The twenty-first century, mankind quickly into the digital age, a high degree of automation and networking of business processes, marketing distribution ported to the Internet to achieve a true virtual marketing. The e-commerce has changed the traditional industrial age the materialized distribution system, companies must adapt the BtoB or BtoC operations carried out the online distribution activities. Digital distribution channels shorten the distance between production and consumption and save the commodities in circulation and many other areas; the consumer or user in front of the computer screen can be completed via the Internet purchasing behavior. Online shopping can not only save time, convenient and quick, but also save money and effort. The most revolutionary internet to traditional marketing is in this.

58.8 Summaries

In summary, 4P, 4C, 4W marketing portfolio theory the relationship between them should be understood: they are not to replace the relationship but the improvement and development; they have a deep origin of microeconomics. Enterprise level, the situation is very different markets and corporate marketing in the development of enterprises in understanding, learning and mastering these quantitative theory, according to the actual combination of the three guiding marketing practice in order to obtain more good results.

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Chapter 59

Positioning Method for Automated Warehouses Based on RFID

Xin Zhang, Lili Wang, Tao Wang, Defang Zhao and Li Ding

Abstract In order to solve difficulty of AGV in accurately reaching destination in the material handling process in automated warehouses, the paper put forward a method based on radio frequency identification (RFID) technology. It utilizes the average distribution reference tags in room and the range of reader and then reads the reference tag's coordinates information and adopts the id algorithm of equilateral triangle and calculates the coordinate position of the reader. The result and simulation show that the method is more precise.

Keywords RFID · Indoor localization · Equilateral triangle

59.1 Introduction

Promote the rapid development of mobile location technology to mobile calculator development and the progress of the wireless LAN technology, triangulation, image analysis and beacon positioning, the three major auto-positioning technologies [1]. Positioning System (GPS) positioning the different environment can be divided into outdoor positioning system and an indoor positioning system. In recent years, GPS, cellular network positioning technology was developed very rapidly and gradually constitutes outdoor positioning system technology. Indoor environment in a large number of the block, the positioning accuracy of the positioning method is not enough, so the need to adopt new methods and techniques [2].

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At present, the common indoor positioning system is an infrared I EEE802, Ultrasonic and Radio Frequency Identification (RFID). In addition to these, there are many systems with other positioning technologies such as UWB, Bluetooth and so on. However, due to radio frequency identification (RFID) technology RF way non-contact two-way communication, in order to achieve automatic target recognition and access to relevant data, with high precision and strong ability to adapt to the environment, anti-jamming, operating fast, to identify fast moving objects, and can simultaneously identify multiple tags, and many other advantages, so much attention [3].

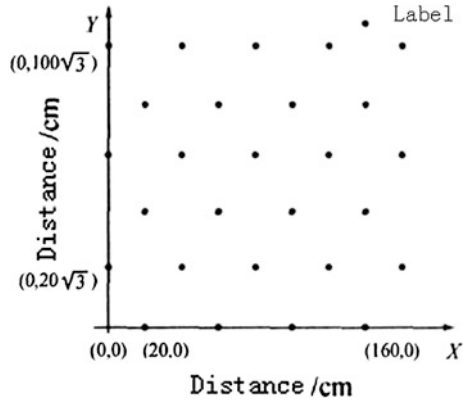
The use of RFID technology is a typical representative Spot ON. The system is based on signal strength, the development of an aggregation algorithm to locate the three-dimensional space. Spot ON system hardware label into a network-like distribution, without central control unit, the test signal strength through the label to characterize the geometric distance between the labels. However, complete Spot ON system had not yet been completed. It is worth mentioning that LANDMARC system through the introduction of a reference location tags and different labels between the residual weighting algorithms can obtain high positioning accuracy [4].

This paper discusses the use of RFID technology, setting the reader's read range, known location on the reference label layout, the use of the equilateral triangle centroid obtained the position of the reader and the relative coordinates of the reference label to realize their own positioning. The reader can be placed in a mobile cart or robots.

59.2 Basic Principles of Locate

Using RFID tags as reference coordinates, the role of the reference coordinates as the reader locates the reference point, placed in the position of the indoor known coordinates. The principle of selection of the label moves the car or a robot with a reader in the process of movement and will read the tags within its read range of the position calculation. In the reader's read range, for various reasons (such as interference, reflection, metal block, etc.) identification of the label, there will be some deviation. Under normal circumstances be able to read the three labels, read three, you can still be calculated in accordance with the established algorithms. Due to reflection or for other reasons, leading to read the label more than three, you can use the nearest neighbor data association method to elect the historical data and the prediction of the measured target location/nearest neighbor within the read range from 0 three labels to participate in the calculation. The so-called data association is to merge with the observations from one or more sensors or point trace Y_i ($i = 1, 2, \dots, N$) and j already known or has confirmed that the event so that they belong to the j th collection of events, that is to ensure that the probability of each event set contains observations from the same entity. Specifically, take the point of each batch of target trace the track matching with the database. Label in the room layout is shown in Fig. 59.1.

Fig. 59.1 Label layout



Operating frequency is the RFID device 13. Length and width are dimensions of 56 MHz, the reader is 14.5×5 cm read range of 30 cm.

59.3 Positioning Algorithm

The coordinate information is written to the tag reader to read the label, according to the coordinates where the label information, the use of an equilateral triangle's centroid, label layout, you can calculate the coordinates of the location of the reader.

59.3.1 Average of the Label Layout Based on the Error Distribution

First, the RFID tag layout into a grid constitutes a Cartesian coordinate system and records label in the label information (tag ID) and the absolute coordinates of the location information in each tag.

Secondly, the reader in front of the AGV car in the process of moving forward in the car, the reader reads a different label, and according to the different storage location information of these tags, analysis, calculation, draws the reader regional location in order to achieve the positioning of the car.

59.3.2 Positioning Methods

Definition 1 The reader lobe angle alpha, this article refers specifically to the horizontal lobe angle, fan-shaped region of the radiation in the horizontal plane, the reader antenna can point of view.

Definition 2 The reader identifies the maximum identification range of the distance between the distance r , the reader can identify to the maximum distance label called reader.

Definition 3 Tag spacing d (this article assumes that unit 1), adjacent to the physical distance between the two labels.

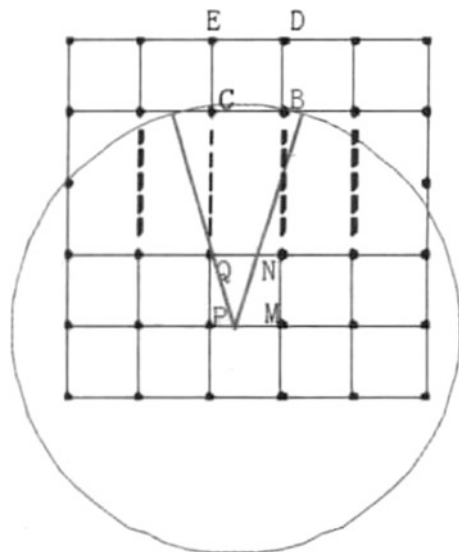
Definition 4 The reader label detection state S , when the reader can detect the label, the detection status of the reader of the label is denoted by $S = \text{True}$, otherwise denoted as $S = \text{False}$.

For a location bound to need a reference point for auxiliary judge a correct judgment of the reference point, which can positioning rules on the location, the environmental characteristics of the RFID and indoor positioning, and the car to walk the path of relatively simple, allowing this reference point selected to conform as closely as possible to the linear representation in order to simplify the calculation. The following from the lobe angle and identify the radius of the two positioning methods discussed.

Shown in Fig. 59.2 for AGV car in the region PMNQ positioning, setting the bit field four endpoint coordinates $P(x, y)$, $M(x + 1, y)$ of $N(x + 1, y + 1)$, $Q(x, y + 1)$, α is read-write device lobe angle, r is the reader to identify the radius, d is the unit length of the coordinate system, there are:

1. At $\alpha \in [2 \arctan 1/n, 2 \arctan 1/(n - 1)]$, desirable to identify radius $r = \sqrt{n^2 + 1}d$, where $n \in N$, the geometric meaning of the interval $[0, \pi]$ is divided into n parts.
2. When the reader detection of point $B(x + 1, y + n)$, then detection of point $C(x, y + n)$, but did not detect the point $D(x + 1, y + n + 1)$ and $E(x, y + n + 1)$

Fig. 59.2 Positioning algorithm



$y + n + 1$), reader B, C, D, E four-point detection status of (Sb and Sc, Sd, Se), the change process (false, false, false, false) \rightarrow (true, false, false, false) \rightarrow (-true, true, false, false), you can determine reader in regional PMNQ, and even if in this process, the reader reads B and C in the same horizontal position, but also to determine the reader in the Regional PMNQ its error range in the M point, the error is 0, that is, to achieve accurate positioning.

3. When the reader detection of point C ($x, y + n$), detection of point B ($x + 1, y + n$), but did not detect the point D ($x + 1, y + n + 1$) and E ($x, y + n + 1$), the reader the process of change of B, C, D, E four-point detection state (Sb and Sc, Sd, Se.) (false, false, false, false) \rightarrow (false, true, false, false.) \rightarrow (true, true, false, false), you can determine the reader is located regional PMNQ, even if in this process, the reader reads and B, C are two points located in the same horizontal position, but also to determine the reader is located in the region PMNQ its error range, in which the P, the error is 0, that is, to achieve accurate positioning.

Below by it taking any one of $\alpha = 5/12\pi$ to verify the feasibility of the method of positioning.

1. After analysis, as shown in Fig. 59.2, decision rules, to make the reader at the critical point P can read about point C, the minimum recognition radius $r_{\min} = 2$; radius $r > \sqrt{5}$, although the reader exactly the same time identify the B, C, two reference points, but quite far away from the judgment region, the large error, therefore the case take $r \in [2, \sqrt{5}]$ ideal, and because the selection of the radius to large principle, it can choose $r = \sqrt{5}$.
2. Identify the radius $r = \sqrt{5}$, is shown in Fig. 59.2, make the reader can read the critical point P, B, C, at this time lobe angle minimum $\alpha_{\max} = 2 \arctan 1/2$; but to α_{\max} then take the smallest angle, $\alpha_{\max} = 90$, so when the identification radius $r = \sqrt{5}$ lobe angle can achieve the purpose of positioning.
3. In the method validation are given in the interval $[2 \arctan 0.5, 900]$, the positioning method presented in this paper is feasible.

59.4 Conclusion

This paper presents an effective and simple method—the use of passive RFID AGV positioning, RFID reader to read the location of the passive tags, resulting in the location of the AGV, the positioning method is in an ideal state deduced through the calculation, and analysis is to explore a kind of passive RFID tags locate, but in reality, the relative complexity of the indoor environment and walking on the path obstacle avoidance need to be considered, and this is the future work of the main problem of research.

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Chapter 60

On the Ideological Theory in the Institutional Economics

Yue Zhang

Abstract In the researches on the modern economies, a great number of experts pay increasingly more attention to the important role of ideology in the institutional change and economic performance. Under the background of the modern social economic development, the belief systems and values which are determined by ideology have a very important impact on the emergence and development of the market economy. At the mean time, each active agent will inevitably be restricted and affected by the power of ideology. By affecting active agent's mentality, ideology put an impact on the behavioral patterns and the efficiency of economic growth in a further way. As a kind of social environment, ideology forms an interactive relationship with social members and will affect economic performance under the interaction effect of systems. The paper, on the basis of Douglass C. North's theory of ideology, identifies the close relationship between the ideology and the institutional changes as well as its mechanism toward the economic performances. The above make us realize that ideology, which takes up the core position in informal institution, will have an impact on the selection of formal institution.

Keywords Institutional economy · Institutional change · Ideology

60.1 Introduction

Ideology is a very important field which formed along with the development of the western philosophy. In the area of the western economic theory, Douglass C. North, one of pioneers who introduced the ideology into the economic analyses,

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gave definition and analysis to the ideology through the methods in economics as well as the cognitive science. For this reason, it can be said that Douglass C. North is a typical and well-known representative on the studies of the institutional changes and ideologies in the field of neo-institutional economics.

In terms of reality, the development of Douglass C. North's theory of ideology can be divided into two stages. The systemic ideology at the early stage appeared in his book which was named as the "Structure and Change in Economic History" (1981). During this stage, North (1978, 1981) basically relied on the cost in the neo-institutional economics in most cases—an analyzing framework of income so as to inspect the ideological attributes and functions as well as the reasons for its changes. At the late stage, namely in the 1990s, he turned his energy to the analyses of the institutions and economic performances through the theory of ideology. In his book of "Institutions, Institutional Change and Economic Performance" (1990), North [1] placed the ideology and the cognitive restriction onto a highly more prominent position; he also thought that a majority of the economists gave a cold shoulder on the role of ideology in the process of the decision making, except very few economists such as Friedrich Hayek. In the book of "Understanding the Process of Economic Change," North [2] relied on the cognitive science and the culture evolution theory of Hayek to carry out an analysis on the dynamics of the uncertainties, mental constructs and institutional changes.

At the mean time, North had a belief that the allocation of resources in the real world and the changes of the history had no abilities to be stated and explained clearly if there was no a related theory on ideology. On the basis of such a dilemma, North introduced the theory of ideology into his analysis of institutions. Thus, he pointed out that "ideology" was a subjective view of people on the objective world, and especially was a view on the fairness and justice of the current institutions, which was regarded as an "opinion" or a "faith" and finally turned to a set of information about the world and also a tool to save the transaction cost. The theoretical foundation of ideology in the institutional analyses lies in the theory of the division of labor of Adam Smith. From the perspective of the exchanged interpersonal relationship, he conducted a comparative analysis on two distinct countries in the historic period of the modern European economies, which were Britain and Spain, respectively. In the history of the modern European economies, Britain was a successful example indeed. In Britain, the change of the relative prices used to give rise to the evolution and development of the political and economic systems and the generations of a series of the legal systems and the constitutional and democratic politics, and therefore the financial crisis was resolved at last. However, Spain was a contrary example. Although the conditions of Spain at the initial stage were superior to Britain, the change of its internal relative prices resulted in a financial crisis, bankruptcies, property confiscations as well as an unsecured property system which were unable to be settled. Therefore, the ultimate result happened to Spain was that it was in a relatively stagnant state for more than three centuries.

60.2 Cognitive Psychology and Institutional Changes

As a matter of fact, in the late 1990s, the cognitive psychology exerted a very important role in North's analyses on the institutions; North's studies on the informal institutions and the relevant implementations could be reflected on the dynamic processes of the cognitive and institutional evolutions. When criticizing the neo-classical economics was on the basis of the rational assumption of human beings, he also put forward that the factors to decide the selection of the limited rational parties under an uncertain circumstance lied in the "mental constructs" of the parties on the real world. Therefore, people, in order to make their behaviors adaptable to both the known and the unknown environments, have the necessities to look for some rules of conduct as their guidance. However, such a kind of rule of conduct was accumulated with a gradual step by a good many of generations during a mutual adaptation process under different environments for a very long time. These rules which gave guidance to the behaviors of individuals could be only generated and evolved within the cultures and traditions which were handed down from generation to generation for a very long time, which could not be constructed with intentions and rationalities. The "preexisting mental constructs," on the basis of the view of North, rooted in the genes, cultural heritage and personal experience. From the perspective of society, people make communication with each other, and then the "mental constructs" of individuals convert into the collective mental constructs, which can be also called by people as the "sharing mental constructs." This is also named as the "ideology".

North was the first person to conduct the theoretical studies on the important influence of the informal systems on the process of the institutional changes. Where were the informal constraints from? They sourced from the information handed down in society and were called by people as the partial heritages of cultures. Certainly, the evolution of culture is a continuous and gradual change, so there is "path dependence" in the continuous institutional changes. This is the basic clue for the North's theory of ideology. In the neo-institutional economics, it is thought that the fundamental purposes of the system change are reducing the cost of the social transaction, enhancing the overall social benefit and efficiency, and increasing the effective resources for society; in other words, the system change is a kind of motivation to reduce the behaviors of the opportunism and increase the rational behaviors through the market resource allocation model. However, the result from the change of the formal system and structure of an economic entity often depends on the changes in the interactive relationship between the newly established formal systems and the gradually transformed informal behavior rules. Besides, in the process, the ideology, which occupies a core role in the informal systems, exerts a center position. Economists interpret the ideology as a set of beliefs of people about the world, which specifically are men's values, ethics as well as the relationships between individuals and the state. The economic men with limited rationalities always seek the maximum material and non-material benefits in the activities. During such a process, the sequence and

importance of the material and non-material benefits in people's subjective preferences, the willingness of people to pursue or abandon their own interests and whether to reach an agreement with the external environments all have a close relation with the "ideology" of people. At the same time, ideology constitutes a "prior" model for a formal institutional arrangement in the form or composes of the theoretical principle and the highest standards for the formal institutional arrangements with the form of guiding concept. If people have a sense of identity on the process and direction of a system change, namely the concept of people on the "justice" or "fairness" is matched, they are willing to participate in and support the process and also can temporarily sacrifice some individual benefits. The theory of ideology is often used to analyze the continuous institutional changes, based on which the institutional economists classify the role of ideology into four types: (1) the ideology simplifies process of the decision making from the perspective of the world value and reduces the operating cost, so it is a tool to save cost in the institutional changes; (2) the ethics about fairness and justice in ideology can help people make an alternative choice between the plans which are opposite with each other, which are able to save time, reduce cost and effectively overcome lift behaviors; (3) when people's experience is inconsistent with the ideas and ideologies, the formation of new ideologies can save the cost of people to know each other and deal with the mutual relationship, such as the cost to compulsorily execute some laws and institutions; (4) ideology is with the characteristic of the path dependence in the mode of action.

60.3 Institutional Changes and Economic Performance

In the book of the "Structure and Change in Economic History," Douglass C. North put forward the theory of ideology as the theory of transaction costs and the supplement to the theory of state. North's theory of ideology occasionally touches upon the political ideas such as "Marxism" but mainly refers to the soft rules of cultural traditions. This is because North got a definite understanding that Marxism was the constraint mechanism of a formal system, but not the soft constraint of an informal system as a supplement to the formal system.

In the book of "Institutions, Institutional Changes and Economic Performance," North [3] had a belief that the institutional changes had two sources: (1) the change of the relative prices; (2) the change of the preferences of behavior actors. The belief systems are internal performances, while institutions are the external appearances of these internal performances. When there is often a faith conflict between different people, the systems are able to mirror the beliefs of those people who have the ability to achieve their goals. This can clearly explain that two societies could have the same system arrangements in the initial stage in general but evolved into highly different system arrangements due to the differences in the cultural traditions and values in the subsequent changes.

In the book of “Understanding the Process of Economic Change,” North [2] integrated his own views with Hayek’s opinions, and put forward the new “superstructure” concept, and also thought that institutional changes were a part of the knowledge accumulation and cognitive process of human beings, in which the institutional changes were analyzed under a broader background. North insisted that the institutional changes were conscious in most cases, pointed out that different cultures and ideologies played a decisive role in the initial choices of the different systems and simultaneously inspected their operation mechanisms in details, so they were very insightful. Moreover, he thought that the history or the modern economy was hard to be understood by people if the important function of the subjective value preference in the constraint logics of the formal systems was not known well, and it allowed people to express their beliefs and ideas at a zero or very low cost, and hence the ideologies with organizations as well as the fanaticism in religion played an important role in society and economy. In other words, ideologies decide the long-term institutional changes.

From the superficial sense, the institutional changes were that the new systems constantly substituted the old ones. However, on the other side of the institutional changes, it can be seen by people that the “invisible hands” of ideology exert an influence on both the direction and strength of the institutional changes at a higher level. Therefore, the institutional changes or continuities rely on the supports from ideology. To some extent, it can be said that the institutions are the direct embodiments of ideology, and the process of an institutional change is the development and change of ideology in essence. The deeper the institutional changes are, and the more significant the role of ideology during this process will be.

60.4 Conclusions

Ideology exerts a highly important function in the process of the institutional changes, which can be respectively reflected on its economic function and social function. On the one hand, the economic function can be mainly reflected on two aspects: (1) saving the cost of transaction; (2) providing the explanations for the rationalities of the currently existing systems. On the other hand, the social function can be mainly manifested from that ideology has become the common standards for the behaviors of the members of society as a part of social culture, so as to ensure all the members of society can be united together and all of their behaviors are consistent with each other. The above make us realize that ideology, which takes up the core position in informal institution, will have an influence on the selection of formal institution.

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Chapter 61

Study on International Trade of China's Agricultural Products

Shehua Qin

Abstract As is known to all, the trade of the agricultural products is an important part of the international trade. Since China entered into the world trade organization (WTO) in 2001, China has attained a continuous expansion in the trade scale of the agricultural products and has become the fifth largest agricultural exporter and the fourth largest agricultural importer in the world. However, the international trade of China's agricultural products is still in face of a series of problems. As a large traditional agricultural country, the great and rapid development of the international trade of China's agricultural products is of an extremely profound strategic significance.

Keywords International trade of agricultural products · Significance · Current situation · Problems · Strategies

61.1 Introduction

The developments of economies of all counties are not balanced. Along with development of the international trade, the mutual interdependence on the economy is increasingly high [1]. At the mean time, the products stepping into the international trade vary with the changes of the times. From the ancient shells to the modern gold, different kinds of products are beginning to participate in the international trade [2]. The author mainly discusses the problems in the international trade of China's agricultural products, and hence this paper has certain realistic significance and guiding significance.

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61.2 Significance and Roles of the International Trade of Agricultural Products

In the economic life of a country, the foreign trade of the agricultural products can at least exert the roles as the following [3].

61.2.1 Improving the Allocation Efficiency of Agricultural Resources

International trade is not only to seek markets for the surplus products or sources for the excessive needs. As a matter of fact, international trade is participating in the international labor division and carries out the re-allocations of resources all over the world and hence constructs an import and export division on the basis of the difference of the agricultural resources. This can help all countries to take advantage of the natural resources to engage in the products which are suitable for production. Thereby, the efficiency of the allocation of resources can attain an increase.

61.2.2 Meeting the Domestic Consumption Needs in Multiple Aspects

There are almost no countries which have the ability to rely on the domestic agricultural production completely to meet the domestic consumption needs in multiple aspects. Some countries get help from the international market to resolve the food problems, and others rely on the international market to acquire the funds and technologies to drive the development of their domestic agricultural economies. Therefore, the participation in the international trade of the agricultural products is able to fulfill the domestic consumption needs on the agricultural products in multiple aspects.

61.2.3 Promoting the Economic Development

There is a group of development economists to carry out a conclusion on the economic development of the last century, which suggests that the exports of the agricultural products and other primary products were the “engine” for the economic developments of the developing countries. On the one hand, the exports of the agricultural products and other primary products are the foreign exchange guarantees for the developing countries to introduce the foreign capitals and technologies and import

the industrial products. Today, there are about half developing countries to depend on the exports of a single agricultural products or primary products to obtain 50 % or even more foreign exchange incomes. Therefore, the foreign trade of the agricultural products and other primary products is of an extremely important significance. On the other hand, there are many developing countries to rest on the export of the agricultural products as the motive power of the economic growth before the industrial system with competitiveness is constructed, which often helps bring the advantage in resources into play and hence increases their national incomes.

Currently, the development of the international trade of China's agricultural products plays a direct influence on the income increase in peasants, the employment and the sustainable development of the rural economy. Therefore, it is necessary for China to greatly develop the international trade of the agricultural products and enhance the core competitiveness of the agricultural products.

61.3 Current Situation of the International Trade of China's Agricultural Products

After joining the world trade organization (WTO), China attains a continuous expansion in the trade scale of the agricultural products. Today, China has become the fifth largest agricultural exporters and the fourth largest agricultural importer in the world. However, there are still a series of problems in the international trade of China's agricultural products. These are mainly reflected as the following.

61.3.1 Agricultural Product Export is Majored at Primary Products with Low Technological Processing and Added Value and Poor Quality, and Seriously Lacks Product Brands

At the present time, the agricultural production mainly takes a family as a unit in China, and also the agricultural business management is highly scattered. At the same time, the development level of the agricultural processing industry is far from the advancement, and a great number of business nodes still do not act on the steps of the international world, and the quality of the agricultural products have not fulfilled the needs of the international market as well. In addition, there is a big population but little land in China; the cultivated land area per each peasant does not reach 0.5 ha. Therefore, the production costs of the agricultural products are very high. As both the quality and technological processing level of the agricultural products are not high, the agricultural product exports of China can only rely on the competitive selling at a low price. This, however, is extremely unfavorable

for the export enterprises of the agricultural products to generate their core competitiveness, and the advantage in China's labor resource receives a great restriction as well.

***61.3.2 The Threshold of the International Trade
is Not Lowered Though the Door
for China's Agricultural Products to the International
Market has been Opened***

Seen from the current situation, the nontariff trade barriers and especially the green trade barriers at the international market pose all kinds of serious threats on the export of China's agricultural products. The frequently discussed green trade barriers refer to a series of strict green environmental protection standards to post a certain restriction on the products and services from all other countries, with the ultimate purpose of protecting the existing environment, limited resources and people's physical health. Furthermore, some developed countries have evolved the green trade barriers into a kind of technical barrier to limit the entering of agricultural products from other countries, aiming to protect their own benefits. Nowadays, the green trade barriers have exerted a direct impact on the adjustment of China's agricultural product structure and also have turned into the biggest obstacles to the export of China's agricultural products.

***61.3.3 Domestic Enterprises to Export Agricultural Products
Blindly Compete with Each Other
and the Agricultural Products Export Management
Systems are Not Well Improved***

At the present stage, Chinese governments implement the multiple segmentation management systems for the export of the agricultural products. This situation, however, is easy to make the supervision on the agricultural products separate from these systems. Therefore, not only does the whole process management system cannot be formed, but also the emergency mechanisms to deal with the emergencies cannot be constructed. Moreover, the contradiction between the open international market and the scattered small-scale agricultural production model becomes increasingly obvious; the domestic market is in shortage of the cooperation organizations to gather the peasant households together. This current situation that the production divorces from the trade not only cannot increase the economic benefits of peasants, but also is unfavorable for the peasants to know the

information at the international market, make adjustments to the structure of their agricultural products and produce the agricultural products meeting the needs of the international market.

61.4 How to Solve the Problems in the Current International Trade of China's Agricultural Products

61.4.1 Accelerate Agricultural Industry Structure Adjustment Oriented at International Market Needs

At the present time, an important task for Chinese peasants in the adjustment of the agricultural product structure is to increase the quality and varieties of China's agricultural products as well as their applicability and specificity to a great extent. For this reason, during the adjustment of structure, the peasants can be instructed to enlarge the production of their agricultural products to a great degree and also vigorously improve both the grade and quality of the agricultural products. Only the agricultural products which are supplied to the international market are well-known, special, high quality and fresh, the core competitiveness of these agricultural products can be strengthened at the international market. Subsequently, a better economic effectiveness can be accomplished at a higher price. In addition, it is necessary to guide them to carry out the innovations for the agricultural products without a stop, take initiatives to create the famous brands of their agricultural products and ultimately make the sustainable development of their agricultural products production come true.

61.4.2 Positive to Respond to the Green Trade Barriers of Agricultural Products

The appropriate and scientific green trade barriers are propitious to the protection and improvement on the environments and the realization of the sustainable development of the international trade. In order to bring the favorable advantages of the green trade barriers into play, it is necessary for China to give active guidance to the production of the agricultural products from the aspects of the quality standard, supervision and authentication, for the ultimate purpose of developing the green agricultural products. Besides, it is necessary to add increasingly more environmental protection factors from multiple aspects of the product design and packaging quality, technology, production, safety, environment, health and so on, for the purpose of conforming to the requirements of the international market on the green consumption. At the mean time, it is necessary for China to greatly develop the green agricultural products which is not only with low cost and high quality and also accords with the international environmental standards, so as to improve the methods to inspect the products with poisonous

and harmful materials and residues as sooner as possible. In addition, it is essential to introduce the foreign successful experience and promote the grade standards for the agricultural products at the domestic market, to drive the agricultural product market to develop toward a favorable orientation and then construct a proper agricultural production and inspection system that is not only in keeping with China's domestic actual condition, but also can integrate with the international market.

61.4.3 Promoting the Agricultural Industrialization and Enterprise Development with Great Efforts

In order to allow the domestic agricultural production to develop in order, China should make changes to the small, scattered and extensive management way in which a family is regarded as a unit at the present time and simultaneously take initiatives to make use of the high and new technologies and the scale management model, aiming to push forward the industrialization of the agricultural production. Practices have proved that the agricultural business management model of "peasants + intermediary agencies + leading enterprises" has the ability to carry forward the application and innovation of the agricultural technologies, expand the scale of agricultural management and also strengthen the adaptability of the agricultural products to the international market. With a view to systemizing the peasants with the decentralized management model together, the community economic cooperation organization, professional economic cooperation organization and the elementary forms of other agricultural enterprises can be implemented in China, and the "production-learning-research" and "trade-industry-agriculture" modern agriculture comprehensive systems can be adopted as well. Therefore, the scale economy, modern factory production and market economy can be accomplished in China's agricultural industry ultimately.

61.4.4 Strengthening the Governmental Supports for Agricultural Products

In China, agriculture has been a weak industry for a long time, and its abilities of the self-development and self-accumulation are not strong. This is because there are a great number of factors to exert a negative impact on its development, such as the agricultural resource conditions, relevant agricultural policies, infrastructure conditions and macroeconomic environment. Therefore, at the present time, to make the international trade of China's agricultural products gain a great development, it is unrealistic to only depend on the agricultural self-accumulation. The development in the agricultural industry needs the vigorous supports and funds subsidies from government as well. Hence, Chinese governments at all levels

should formulate the policies such as tax policy and credit policy which are able to promote the sustainable development of the agricultural industry, speed up the construction of the agriculture infrastructures and simultaneously make encouragements to the innovations of the agricultural science and technology, providing powerful capital and technical supports for the production of China's agriculture.

In short, since China joined the WTO, the international trade of China's agricultural products is in face of the unprecedented challenges and opportunities. At the international market, there are not only many unfavorable factors to influence the development of China's agricultural products, but also unfavorable factors to promote its development. Therefore, China's agricultural market is necessary to be adroitly guided according to the actual circumstances and be oriented at the international market demand, so as to develop the green agricultural products actively, break out the international trade barriers, transform the unfavorable conditions into favorable conditions and hence strengthen the core competitiveness of China's agricultural products and push forward it to attain an increasingly better future.

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Chapter 62

Study on Industrial Information Service of Libraries of Higher Vocational Colleges

Yun Zhou

Abstract The exertion of the service function of libraries for society, industries and enterprises can be a very good point to give expression to a new leapfrog development of the demonstration higher vocational colleges. In view of the bottleneck of the libraries at higher vocational schools to implement the industrial information service, the author puts forward the effective strategies for their industrial information service in this paper. At the mean time, it is suggested that it is necessary to establish the alliance of the industrial digital libraries, optimize the work flow for the business activities, improve the industrial information service mechanisms, and develop special information service projects, for the ultimate purpose of making enhancement to the penetration role of the higher vocational colleges in the developments of society and industries.

Keywords The digital library federation · Higher vocational colleges · Information service · Development of the industry

62.1 Introduction

In recent years, China's governments vigorously inject great investments into higher vocational education, and also enlarge the investments on the software and hardware of the libraries one after another, so as to provide supports for the educational scientific researches of the higher vocational colleges. Therefore, the libraries at the higher vocational colleges, which had tremendous difference with the general higher

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learning schools in all aspects in the past, have obtained considerably abundant collection resources after the demonstration projects are implemented. Today, how to exert the service function of the libraries of the higher vocational colleges for society, industries and enterprises is a very good point to give expression to a new leapfrog development of the local economies and industries.

62.2 Advantages of the Libraries of Demonstration Higher Vocational Colleges in the Development of Industrial Information Service

62.2.1 Rich Collection Resources

According to the statistics, 58 out of 100 national demonstration vocational colleges are the industrial schools, and 65 out of 100 national backbone demonstration vocational colleges are the industrial schools as well. In view of this, the actions of the libraries of the higher vocational colleges on the social services and their attentions paid to the effective information services for the relevant industries can help finish half the job of the demonstration vocational colleges. Furthermore, at the present time, in the higher demonstration vocational colleges, the school digital document information resource centers which focus on their libraries have been formed.

62.2.2 High-Quality Information Technology Services

Due to the role of the demonstration construction projects, the libraries of the higher vocational colleges pay high attention to the unification of the resource constructions and technical specifications, and the collection, selection and integration of all kinds of teaching resources, continuously add a variety of reference materials for their teaching resources, and also often provide high-quality services for the constructions, researches and reforms of the specialized fields. Therefore, a professional information service team with rich experience and high quality has been formed at the higher vocational colleges in recent years.

62.2.3 Strong Supports from the Alliance of the Libraries of Higher Learning Schools

At the present time, all provinces have established a digital library alliance among different higher learning schools one after another, which is playing a more positive role in the social service. It is fortunate for the libraries of the higher

vocational colleges to become its members. Thus, these libraries have the ability to promote the developments of the major teaching and scientific researches of their schools by use of the strength of the alliance, and also train talents for the industries and develop technological innovations for the enterprises.

62.3 Bottlenecks of the Libraries of Higher Vocational Colleges to Develop the Industrial Information Service

62.3.1 Shortage of the Information About the Front-Line Industrial Service Needs

Currently, the higher vocational colleges take how to get help from the external resources into much more consideration in the school-enterprise cooperation, but rarely think how to take advantage of their own advantages to provide technical supports and services for the industrial enterprises [1]. On the one hand, during the successive establishments of the industrial vocational education groups at the demonstration colleges, the resource integrations in the reaching process are unceasingly explored for the school-enterprise cooperation talent training mechanism. On the other hand, in face of the enterprises with strong needs on the industrial transformation and upgrade information, intelligence and technical project materials, the libraries are still the outsiders and can help them for nothing, just having the service willingness but having no specific methods.

62.3.2 Shortage of the Links to Integrate Industrial Information Resources

The libraries of the higher vocational colleges have possessed powerful storages of resources at present, but the link between school and enterprise to commonly explore the cooperative fields and the information for the key problems is not very close, so that they are unable to provide the information resources about the enterprise competition and innovation for the cooperators, not to mention about saving the costs of buying recourses for the enterprises and achieving reciprocal and mutual interests.

62.3.3 Shortage of the Mechanisms to Capture the Original Industrial Information

At the present time, the higher vocational colleges are in shortage of the powerful supports in the cooperation goals, contents and systems of the information sharing; the libraries lack the ability to undertake the tasks of delivering documents and providing digital library technical supports which they would like to do.

62.4 Strategies for the Libraries of Demonstration Higher Vocational Colleges to Develop the Industrial Information Service

62.4.1 Establishing a Library Alliance Information Service Platform

62.4.1.1 Establishing a Regional Industrial Digital Library Alliance Commonly by Schools and Enterprises

To develop the industrial information service, the libraries of the higher vocational colleges are necessary to not only strive for larger development rooms, but also strength the cooperation with the industrial enterprises and create the partnerships as much as possible, aiming to make enhancement to the overall strength to provide the industrial and social services, and then constantly enlarge their social service scope.

62.4.1.2 Unifying Standards and Promoting Resource Co-Construction and Sharing

In accordance with the CNKI and other academic journals databases which are bought by the libraries of the demonstration higher vocational colleges, as well as the development needs of the school professional teaching and scientific researches, it is necessary for the higher vocational schools to construct a service platform for the development of scientific researches based on the classification of relevant majors, and group all kinds of resources which are related to the disciplines and industries, for the ultimate purpose of forming a well-improved and value-added knowledge resources system.

62.4.1.3 Implementing Flexible Management and Reducing Service Threshold

On the one hand, it is necessary to positively provide convenience for the enterprises participating in school-enterprise cooperation to search information. On the other hand, it is necessary to create the reading conditions within the libraries and open up the reading services for the people at the neighboring regions, for the purpose of resolving the difficulties of the far journey to the public libraries [2].

62.4.2 Optimizing the Work Flow of the Industrial Information Service

62.4.2.1 Restructuring the Work Flow of the Libraries

To unblock the channels of the work flow, ease the contradiction among interior departments and improve the work efficiency, it is necessary to eliminate all kinds of constraints in the work flow of the libraries, merge the complicated and trivial working procedures, reduce the crossed business procedures as much as possible, simplify the links in the work flow, and shorten the operation cycle of the work flow. As a result, the operation efficiency of the work flow can be truly increased [3]. The specifics can be seen in the Fig. 62.1.

62.4.2.2 Strengthening the Guidance Service for the Search of Information

The readers from society and different industries are not very skilled in the digital information search in general. They often meet with difficulties in the search of information. Thus, it is necessary for the libraries of the higher vocational colleges to set up a search room to provide the relevant trainings and the selective dissemination of information, and also allow the talents with good educational backgrounds and at high levels to play their abilities to implement the face-to-face or remote guidance service, making the readers twice the result with half the effort in the search of information.

62.4.2.3 Ensuring the Smoothness of the Service Network

Through the network, the industrial enterprises can be allowed to search all kinds of databases bought by the libraries, and also the working personnel in the libraries can make use of the rich digital information databases to provide services for the

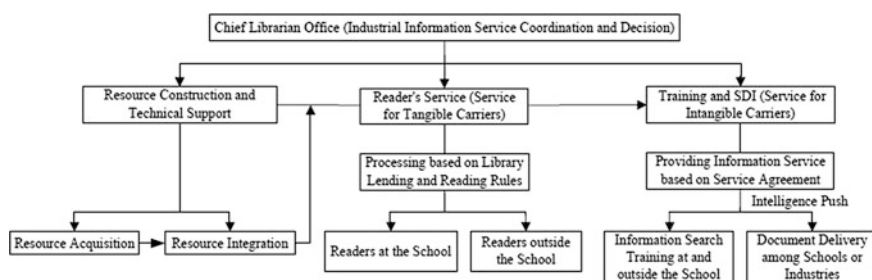


Fig. 62.1 The work flow for the industrial information service of the libraries of higher vocational colleges

monographic studies to some extent. For example, new science and technology, special subject consultation, entrusted investigation and competitive intelligence supplying can be directly acquired and read from the digital resources bought by the library of a school if the relevant results are searched. However, for the full texts not bought by the library and having no direct use right, its system can automatically send a document delivery request to the members of the digital library alliance of higher learning schools, and then the document is delivered by the personnel in the member libraries based on certain service strategy and scheduling mode. Hence, the alliance can exert the role of an industrial information resource center.

62.4.3 Improving the Industrial Information Service Mechanism

The essence of the libraries of higher learning schools to provide social services lies in this. Thus, it is necessary for the libraries of the higher vocational colleges to seize the opportunities to increase the professional qualities in the ride of the school-enterprise cooperation.

62.4.3.1 Perfecting the Social Service Mechanism of the Libraries of Higher Learning Schools

The social service development of the libraries at higher learning schools has received the guidance and regulations from some national policies and education departments, but all them are only the files at the macroscopic level and have no specific construction goals and evaluation standards. For this reason, it is necessary for the education departments to get help from the experts in the committees of academic libraries so as to establish a set of scientific, systematic and operational service evaluation methods and evaluation index systems which are suitable for the libraries of higher learning schools to develop the social service of document information. Thus, the construction situation and service quality of the libraries of higher learning schools can be measured objectively.

62.4.3.2 Setting Up an Interest Driving Mechanism of the Industrial Information Service

On the one hand, agreements can be signed to make the relevant units gain some fund supports or some internal statistical data. On the other hand, the document information, reference work, subject tracking, special databases, personnel training and other services can be provided for the sponsors, to achieve a win-win result.

Besides, libraries can be managed under the cooperation of the large industrial enterprises. The libraries of the higher vocational colleges can rely on their own advantages in the document information and the digital library network resource of higher learning schools, to provide dynamic information for enterprises at an all-round way. Also, in the survival and development process, the enterprises can put investments on the libraries of the higher vocational colleges based on a certain profit or the original ecological resources in the production of products, to drive the libraries to establish the special databases and online cataloguing databases, and hence constantly enrich the teaching resources of school major construction and improve the students' perceptual knowledge of the application of the front-line production technology [4].

62.4.3.3 Strengthening the Intellectual Property Right Management Consciousness

On the one hand, it is necessary to strengthen the consciousness to protect the intellectual property rights, and collaborate on the intellectual property right problems in the process of the information service with the cooperators. On the other hand, it is necessary to improve the service skills and related legal consciousnesses within the scope of the existing intellectual property right, so as to increase the utility of the library resources and meet the user's needs on information to the maximum [5].

62.4.3.4 Outsourcing and Customizing the Business Under the Cost Strategy

The libraries of the higher vocational colleges should enlarge the intensity of the industrial service, and also should strengthen the cooperation with the local governments and database suppliers, and especially should make clear the relevant resource sharing services provided for industries in the negotiation with the database suppliers, so as to increase the utilization rate of the search of the databases. Meanwhile, it is necessary to purposefully guide the technicians of the database suppliers to timely give feedbacks to the specific needs, so as to gain the technical supports from personalized services and realize the remote self-help search services for the readers to search and download information.

62.4.3.5 Developing Special Industrial Information Service Projects

The value and vitality of the libraries of the demonstration vocational colleges to develop the industrial information service lie in providing special services and resources. The libraries can give expression to their unique advantages in a certain area or project, and hence seek a foothold in the industrial service. Therefore, it is necessary for them to introduce the special resources and services meeting the requirements of different industries.

The libraries of the demonstration vocational colleges to develop the industrial information service are still faced with multiple problems, but they will certainly exert a huge promotion role in the development of relevant industries and also increase the influence of the demonstration vocational colleges in society, as the school-enterprise cooperation mechanism is constantly improved, the formation clusters and technical service strength from the digital library alliance of local higher learning school can be utilized, and the support and participation are received from the industrial governmental departments, relevant public institutions and enterprises.

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Chapter 63

Effective Managing Approaches in Student Management Work

Qiaoyuan Wei

Abstract Student management work is complicated and also diverse. How to do it well is a problem that must be tackled with by student managers. This article states the effective management methods from the aspects of strengthening the daily ideological and political education, the construction of learning style and academic advising, solving the students' practical difficulties, cultivating outstanding student leaders, increasing class cohesion, keeping safety education and maintaining stable operating, emphasizing on home visits and so on.

Keywords Student management work · Effective · Managing methods

63.1 Introduction

Student management work is complicated and also diverse and that the thoughts of working objects—students are becoming more complex, working enthusiasm and sense of responsibility are particularly important in order to do a better job in less time and establish a good image in the minds of students. On the one hand, trying to guarantee the investment of certain amount of time and energy to develop good work objectives and fully mobilize and play the subjective initiative of each student [1], especially student leaders to improve work efficiency; on the other hand, student managers should use every opportunity to strengthen the emotional exchange with students, narrow the psychological distance, actively care about

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them, be close to them, open their heart to students and have a heart-to-heart talk and treat them frankly and warmly solve the difficulties for students and timely figure out the emerging questions [2]. Student managers should always adhere to the belief of “everything for the students, for all things of students, for all students,” keep the work style of “be aware of the students, relieve students from anxiety, be heart-warming to students,” regard student management work as a cause to sacrifice, pursuing work sincerely and loving students.

63.2 Strengthen Daily Ideological and Political Education

Student managers should attach importance to the entrance education for new students, teach them how to adapt to college life, how to take care of themselves, organize them to study the school’s student management manual seriously by ways like having class meetings, going into the quarters and having heart-to-heart talks, etc. Educate students to follow school discipline, strictly check on work attendance, make roll call every Sunday night in each dormitory, keep abreast of the situation of students in school, in addition, also go to classrooms to check the class participation constantly, if one absent is found, then make phone calls or check his dormitory, and find reasons to avoid further absences. Students are required to determine learning goals and life goals at the beginning of each semester. Often conducted topic, class meetings learn the Student Management Rules and other related management regulations and actively cooperate with the various aspects of school work [3]. In addition, the contents were selected in the student handbook which are closely related to student daily life or learning, and then give tests in the form of examination paper. The test not only deepened the understanding of the students, but also can understand some of the ideas of students which can achieve sound effects.

Think highly of the internet ideological and political education on students, student personal information files were established, communicate with or interview the students regularly by means of Fetion, QQ, mailbox, telephone, short messages and so on, listen attentively to heartfelt wishes of students, keep abreast of their thinking dynamic and guiding them with the utmost care.

Limited ideological and political work of education in the classroom has been far away from meeting the job requirements, and the student hostel would also become an important position to carry out the ideological and political work.

In addition, give effective psychological counseling guidance to students who are under psychological distress or mental block, respectively, and enable them to get rid of obstacles as soon as possible, do self-regulation to improve the mental health and enhance ability of self-education.

Nowadays, the employment situation is severe, and students need to be educated to improve their overall quality and ability. In addition to learn the professional knowledge, students should also actively participate in extracurricular activities.

Pay attention to train the applicants for party membership, cooperate with student party branch secretary and launch students to actively write party membership application and thought reports. Focus on the outstanding students of all aspects in class, encourage and help them, ask them to be hard on themselves according to the standards of party member and endeavor to join the party at an early date. Promote good department atmosphere and study style through the power of examples.

63.3 The Construction of Learning Style and Academic Advising

Pay adequate attention to class construction and make the best use of the circumstances to mobilize the learning initiative of students; further regulate the daily students management, attach importance to the daily discipline of students, and handle with student who violates any disciplines timely, fair and with equitable. At the same time, combined with the construction of a harmonious campus, further regulate students' behavior and promote construction of class atmosphere.

Further improve the system, strengthen the publicity and education on construction of the learning style, with strict management, carry it out seriously, value the exam style, promote study style, check on work attendance well and regulate test discipline seriously, and boost the construction of learning style to a new level. Regularly hold class meetings of various topics and meetings to exchange learning experience and other activities, which emphasize the importance and necessity of learning, so as to form a rich learning atmosphere that students chasing each other in the class. Teach students to learn the specialized knowledge well and read extensively to the best of their ability at the same time, determine the learning orientation, take examinations in school as much as possible for getting some useful qualification certificates, make career planning and fully prepare for the future employment.

63.4 Advocate Colorful Class Activities

Participate in extra-curricular activities organized by classes as often as possible, frequently go deep into students, play down the status of teachers themselves, and let students feel that the teacher is an ordinary member of them. In a relaxed and lively atmosphere, all can easily open up. So encourage and support the class leadership to organize excursion and head the students personally such as picnic in the open air, barbecue, etc., in each semester. These not only let students enjoy the fun of doing it by themselves, but also exercise their survivability; visiting the suburbs not only broaden the horizon of students, but can also enhance their

collective consciousness; actively participate in the activities of delicious food street, through buying materials, processing them and then street hawking all by themselves which make them understand the hardships of making money, and of course appreciate the fun. Carry out the learning from Lei Feng activities in March each year, students can realize the preciousness of love by going to welfare to convey greetings for the old and help the cleaning. The conducting of class volleyball games and English reading competitions that try to let every student to participate which greatly enhances the cohesion of the class.

63.5 Solving the Practical Difficulties for Students

Concerning about the students from poor families, and do thoroughly investigation on poor students in class, separate different levels of poor students, organize the survey and master the lives and learning of them and establish poor students file. Talk with them about their physical condition and daily living conditions at ordinary times from time to time. Do poverty assistance job carefully, make a good use of the limited specific funds from the state and school, try to reduce the worries of poor students, and alleviate their life stress caused by their financial difficulties. Strengthen the humanistic concern and psychological counseling to foster their good mental qualities. Help them establish the concept of self-confidence and self-improvement. Poor students often have low self-esteem due to economic reasons, financial assistance to poor students is important, and it is more important to care about their mental health and help them out of inferiority complex. What is particularly important among them is to correct their concept of money, values and outlook on life, making them aware of whether the economic situation is good or bad does not represent the level of personality, and let them face their own, to explore their potential, knowledge and abilities as their spiritual food and enrich themselves out of poverty in spirit.

63.6 Cultivating Outstanding Student Leaders, Increasing the Construction of Class Cohesion

In the usual work, counselor or head teacher should be strict on the student leaders and create opportunities for them to establish some credibility in the class. While the time is ripe, boldly let them manage the class, and give full play to their work enthusiasm, initiative and creativity.

Equality and democracy are the basis for the existence of all the collectives and their healthy development, and class group is also without exception. Head teacher or counselor should set an example and equally treat each student. Everybody has a bright spot, but sometimes only overwhelmed by some criteria. Therefore, we

must not be cynical to students who have learning or living difficulties; on the contrary, they should be given enough help and encouragement. In this context, the students would not get along with each other with snobblings, making a more harmonious relationship between the students.

63.7 Keeping Safety Education and Maintaining Stable Operating

Strengthen the inspection and supervision of electrical appliances that are out of line by valuing the safety and civilization of the dormitories, and carry out safety and legal education steadily. Often go to student residences, make regular inspection and occasional spot checks, and prevent the “dirty, chaotic, and poor” and so on in the dorms. In addition, strengthen the publicity, create a strong safety culture atmosphere, and enhance student awareness of safety and legal compliance. Through developing educational activities by full using the classroom, broadcast, blackboard newspaper, meetings, and other forms, make safety education on fire protection, traffic, property, and personal safety and so on. Remind students to keep in mind their own property, personal safety, improve protection awareness during the holidays.

Newly enrolled students came to a new environment, who are not familiar with, cannot adapt to or the gap is too great in their imagination, or family financial difficulties, etc., would drop out of school with psychological fluctuations. Students of this type can be kept by adopting the methods of paradoxical intention and giving methodical and patient guidance, etc.

63.8 Emphasizing on Home Visits

Home visit is an important means for school to link and communicate with families. It is also an important element in school education and important complement for teachers to do a good job of their classes. The effectiveness of home visits is directly related to the communication and understanding between the school and the community, teachers and students’ parents, and affects the participation and support of the community for schools, thereby affecting the overall quality of education in schools. Through home visits, teachers can understand the performance of students learning at home, understand the family background, and know the students living habitual actions. Through home visits, teachers can let parents be aware of their learning, work and behavior in school. Home visits in the new semester, teachers can learned from parents in all aspects of information of students such as family status, personality habits, academic performance but also discuss their existing strengths and weaknesses and noteworthy and so on with parents. All these are very helpful to start the student management work. Before

home visits, the route should be worked out, book parents in advance, be familiar with the student records, draws up the conversation content and other preparatory work.

Whether are the class teacher, or parents, only understanding students in depth, can they teach students in accordance of their aptitude and educate effectively and of optimization. Home visiting conscientiously is a good way to comprehensively understand students, improve education and teaching and promote quality education. For the future of our country, the class teachers or counselors are duty bound, shouldering heavy responsibilities and must strive to do it.

63.9 Making Concentrate Accumulation, Learning Continuously, Trying to Improve the Ideological and Political Consciousness, Theoretical Level and Working Ability

The highest state of class teacher or counselor is that there is no class teacher or counselor. When our students do not need to tutor in their growing, you would be successful. When students make progress in their learning, happy, with job proficiency and rich in their minds, whether there is teacher or counselor or not is the same. But when students encounter difficulties, or trouble, confused, and can think of the class teacher or counselor around them, and seek help from them, or the sense of security from class teacher or counselor, then, this teacher or counselor is successful.

Experienced a lot from student's management, the joy is continuously. Student management workers should always with fresh enthusiasm to infect people, warm person with a sincere concern, inspire people with the progressive attitude, shape person with noble spirits, perform the sacred duties continuously and meet the greater challenge!

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Chapter 64

Study of Pricing Strategy of Hotel Prices in Less Developed Regions

Li Huang

Abstract This article has analyzed the influential factors of hotel prices and discussed how to promote the prices potential in less developed regions from the basic law which is based on maximum profit principle so as to execute revenue management pricing strategy. The author puts forward some suggestions that hotels in less developed regions should improve the value of its products and service and guide the consumption demand on order to achieve price discrimination.

Keywords Hotel prices in less developed regions • Influencing factors • Price discrimination • Pricing strategy

64.1 Introduction

The price is an important factor in the management process of hotels, and how to set the scientific and reasonable room price is especially important. Competition of hotels is fierce in less developed regions, as profits of guest room take up more than 50 % of the hotels' revenue more, so the establishment of house prices is the key step of marketing and the important decision for hotels, which is also the key factor affecting the revenue and profit. To achieve maximum profit for hotels in the less developed regions, the establishment of house prices needs to break limitations of the local economic environment and raise the price to realize the yield management [1, 2].

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64.2 Status of the Hotel Rooms Pricing in Less Developed Regions

The hotel rooms pricing is one of the main strategies of the hotel management. The guest room price in less developed regions is affected by variable costs, market structure, capacity of the guest room and changing needs, so the pricing is one-way thinking and takes a one-sided approach to pursuing the short-term profit and lack of overall strategic thinking. What's more, rivals are always competing the price regardless of the cost, so the pricing and the quality of hotel itself do not match, and the price and the discount are both in a state of disorder and confusion. Specifically, there are the following problems.

64.2.1 Insufficient Consumption Demand and Low Room Income

Consumption demand and amount are subjected to regional economic development, while the hotel rooms demand is affected by consumption level, so in less developed regions, the main consumption object of hotels focuses on the business guests from developed economic or tourists in boom season. In addition to consumption demand and rivals' price, the room price is also affected by the season and some other factors. Consumption demand is obviously insufficient, so the room price is different for even the same star level or brand hotels compared to the hotels in first-tier cities or developed areas. In the sight of the real hotel price in less developed regions, the average price is generally very low, because of the large upfront input and high cost, profits of even some star-rated hotels have reduced greatly for the influence of the room price. The higher the star-rated hotel is, the larger the guest room income gap will be [3, 4].

64.2.2 Pricing is Not Systematic and the Room Price is in a State of Disorder and Confusion

Many hotels lack the perfect pricing system and house prices management. Most hotels have not set up a special pricing department, so they cannot predict accurately the guest demand function and cost function, and cannot directly calculates the price of profit maximization, either [5].

64.2.3 Profits of the Room Price have Some Potential to Be Dug to Achieve Revenue Management

In the economic environment where competition is more and fiercer, because of excess production, most hotels are be aim for keeping running which is also the principle of pricing. As long as the room price can compensate the variable cost and some fixed cost, we can keep the hotel running. So the room price is generally low when compared to the same star level or brand hotels in developed areas, and the price has certain potential for rising. In the long run, hotels in less developed regions have to learn how to add value and improve the profit space, which not only needs to raise the room price but also to execute profit management.

64.3 Factors Affecting the Pricing of Hotels in Less Developed Regions

64.3.1 Value of Own Products and Service of Guest Rooms and Variable Cost

The room price is determined by the value of guest room products, which is determined by social necessary labor time for making the product. Labor creating the value of guest room products reflects in the design, construction, decoration, arrangement and daily service process of the guest room products. There is great difference of support, perfection and comfortability of facilities. And maintenance, quality assurance and advanced degree of necessary facilities in first-tier cities are greatly different from those in two three-wire cities, which cost different necessary labor time; therefore, the price is greatly different too. In addition, the hotel price level also embodies the quality of hotel service labor provided by the service personnel. And the operation level of operators in developed areas is higher than that in less developed areas, so the individual labor time may be more than the social necessary labor time. According to the law that the social necessary labor time decides the value and the value decides the supply price, it can reflect that the operation level of operators in developed areas is higher than that in less developed areas [6]. So in less developed areas, the hotel price is low is decided by the value of the social necessary labor time.

64.3.2 Purchasing Power and Consumption Custom of the Consumers

With the development of economy, Chinese people's purchasing power is rising. The rate of business trips among mainland cities and travel and vacation has also raised a lot compared to former years. People also gradually become accustomed to choosing a hotel when traveling across cities. Hotels in less developed regions should cater to this part of people's consumption habits, considering its ability to pay and the demand price, and take some active promotion means like to set a preferential price or to exchange presents with integral to enhance core competitiveness, so that they can attract a certain number of loyal and fixed customers [7]. At the same time, operators must pay attention to the change of the consumption custom, and people's consumer psychology has changed from the material consumption stage to mental consumption stage even the brand stage. At present, rational consumption idea is grown with the tourist market which is deeply implanted in consumers' consciousness, and people has paid more attention to the comprehensive ratio when choosing a hotel. The hotel room price, room facilities and comfort levels and whether traffic is convenient are the three indexes that consumers care most. What's more, the hotel also needs to consider spending habits and the ability to pay of consumers and business men in this region in order to determine a reasonable and scientific room price.

64.3.2.1 Competitors and the Competitive Environment

The market competition of hotel industry is unusually fierce, and the price is at a point that both operators and demanders can receive, which is determined by market competition. So, the pricing of hotels must synthetically consider the competitor's price level and consumption demand. As a result, before the price for the hotel is established, we need to understand the competition position and environment where the hotel itself locates and research the competitor's price and other marketing factors carefully to establish the price on this basis. At the same time, when hotel rooms are oversupplied, the room price can only reflect operators' survival goal that is just a low supply price. While hotel rooms are in short supply, the room price can only reflect operators' goal of profit maximization.

64.3.2.2 How to Achieve the Optimal Pricing Strategy for Hotels in Less Developed Regions

The basic principle for hotels in less developed regions is still trying to seek profit maximization, so the traditional pricing strategy based on costs is difficult to adapt to the fierce competition and changes of market demand. The precondition of the pricing strategy for hotels in less developed regions is to meet overall operation

strategy, and then the hotel should select the optimal pricing strategy which is oriented by demand:

The Pricing Oriented by Consumer Demand Hotels in the less developed regions should take pricing strategy that is oriented by consumer demand. The consumer-oriented hotel pricing strategy concerns in consumers' demand difference of different segments of the market, and the point of implementation is to identify customers' different demands for products systematically. As the Marginal cost MC is the same in the same kind of hotel products. If we want the maximum profit, MR must be the same in different customer groups. But the elasticity of demand is different in various customer groups. According to the calculation formula for marginal benefit that $MR = P (1 + E/E)$ (MR is marginal gains, P is the price, E is elasticity of demand), we can deduce that the pricing is absolutely different in different customer groups so that the hotel can gain maximum profits.

To Implement Price Discrimination and Reduce Consumer Surplus First, we can implement price discrimination according to the position of guest rooms and supporting facilities and then price according to different check-in time. According to international practice, hotel prices are generally calculated with the unit of the room and time. Usually the calculation time for a room/day is from 8 am to 12 at noon next day. But if there is a great difference between the buy time and the check-in time, the customer will feel exchange value is unequal between hotels and them. For example, guests who check in before dawn could feel that exchange value is unequal between hotels and them, and they have just suffered losses. If the hotel can consider that the special buy time will have a special effect on guests' psychology and hotel management, and for guests who check in at this time, hotels can calculate the price by hour prices, which will dissolve the guest's loss psychology and make the guest feel fair and considerate, thereby guests will trust the hotel more and become much more loyal. In addition, it is a good way to use preferential price and appropriate discount to stimulate and encourage guest to make full reservations. At last, the hotel can price on the basis of customers' own differences with other marketing methods.

Raise the House Price on the Basis Of Promoting Service Value of Products At present, the consensus of hotel prices is mainly the door market (only used for identification), and the real prices that hotels implement are group price, promotion price, contract price, reservation center price and the individual traveler price. The individual traveler price is for the guests who check in directly without a business contract with the hotel, which is the highest price. The individual tourists can bring greater revenue and profit for the same type rooms. In order to achieve profit maximization, hotels in underdeveloped areas need to develop passenger sources which is mainly based on the tourists from develop regions. But considering the long-term benefits, hotels also need to maintain a batch of faithful target customers and execute the contract price. Even business contract price is signed, it is not unalterable, and the hotel can raise it in proper time according to development of economics. Of course, the premise to raise the room price should be based on perfection of the hardware facilities and improvement of service and the added value of corresponding products, and then customers who have signed an

agreement would like to pay more. So in addition to trying to satisfy the guests' special needs, hotels in less developed regions also need to master the basic information of guests and the ability to pay, experience the guest potential psychological and physical needs, with sophisticated marketing techniques, to satisfy consumers' more demands through improving the value of products and service so that customers would like to pay more for a deal which can strive for highest possible profit for hotels.

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Chapter 65

Study of Superficies System of Germany and Japan

Cheng peng Ye

Abstract As an ancient form of property rights, superficies system was originated in Roman law. It effectively resolved the contradictions of ownership land between uses of land and had a high degree of adaptability to the market economy. It was inherited and developed by civil law countries, but also later had a huge impact on the property rights legislation of civil law in concept and technology. By combing the evaluative path of the superficies system of continental law legal family, we may find many characteristics in its developing process which include the changed goal of building superficies from “having” to “using”, many types of superficies and the strengthened rights of superficies, and so on. These characteristics provide references to further improving China’s land-use right system.

Keywords Land of ownership · Builds of ownership · Right to use land

65.1 Introduction

Superficies, as one of the indispensable property rights in modern continental law legal family countries, is granting right on other’s land, and hence, the owner enjoys the right to transfer or inherit the buildings (including working substance) under or below the land. Also, it is of vital introducing value for China to resolve the problems of land use, public land as well as housing problem.

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65.2 The Evolution of Germany Superficies System

65.2.1 Legislation Reforms

Recognition of BGB on Superficies System In 1990, the provisions of BGB on superficies system were mainly seen from the general regulations on the real properties in the part 3 and the direct regulation on superficies in the chapter 4, which was the first time to carry out legislation recognition on the superficies with the form of law. As lawmakers despised the dynamic functions of the use of property, it was thought that superficies had no applicable spaces, and the regulations on superficies only had six provisions (from No. 1012 to 1017). The lawmaker, who was known as the “the loyal recipient of Roman laws”, however, did not accept Roman laws inflexibly [1].

Intensification of “Superficies Regulations” on Superficies At the beginning of the twentieth century, Germany who had accomplished industrialization encountered agricultural population urbanization and caused “housing problem”. Hence, the problems such as land price rising and land speculation were triggered, and the applicable opportunities of land increased unexpectedly. The superficies system provisioned in the Chapter of real properties superficies of BGB was quite weak and had large defects and blanks in the content, which was unable to meet the new challenges proposed by times. In order to overcome the land crisis as soon as possible at that time, the lawmakers timely promulgated the “Superficies Regulations” (coming into force on January 15, 1919), which marked the real formation of modern superficies system [2]. This regulation basically abolished the related regulations of BGB on superficies and adopted 39 articles to re-construct a relatively perfect superficies system. Compared with BGB, the intensification on the protection of superficies and the promotion on its accommodation were the major two characteristics of new system [3].

Improvement of “Housing Ownership & Eternal Residence Right Law” on Superficies The severe damage of World War II to housing and considerable immigrants from Eastern Europe forced the housing of Western Europe after war to be highly tensional. Also, the land-use relation turned into very complex. Then, only relying on changes in the land ownership system and housing lease system could never fundamentally resolve the problem of a land to contain multiple housings. In order to deal with the rapidly increasing housing problem and ease the resulting worse social contradictions, the “Housing Ownership & Eternal Residence Right Law” emerged along with times and came into effect on March 15, 1951. The “housing superficies” was created in the part 4 of chapter 1. This new type of superficies made limited land capable to carry much more houses and became the ideal legal means to resolve the housing problem at that time [4]. Housing ownership was the perpetual ownership of multiple land non-ownership owners to build houses on others’ land, which hence broke the principle of land adsorbing building, establishing the thorough legal separation of buildings and the land ownerships to make them independently exist and independently punished by

its ownership owner, strengthening the legal position of building ownership further. As an important law ranking only second to the real property provisions in BGB, the promulgation of “Housing Ownership & Eternal Residence Right Law” promoted the superficies system to be improved well beyond doubts.

65.2.2 Characteristics of Germany Superficies System

Property Right Rome superficies was never the property rights, but was only a land-use right with the nature of obligatory right and the owner of superficies could only enjoy the right of transferring and inheriting, while the owner of land ownership still kept the ownership of buildings [5]. Germany civil law clearly stipulated that the superficies was the typical property rights and the owner of superficies possessed the complete ownership on the working substance constructed on the others’ land and could also have other limit properties and the claim right of independent performance in addition to transferring, inheriting and mortgaging rights. In the Germany civil law, superficies had been described as a kind of “similar ownership” or “the right equal to land ownership” [6], which was the intermediary and technological supporting point to promote the separation and combination of land ownership and its building ownership [7].

Diversity Due to the constraint on the plane utilization of land, Rome superficies was only regarded as the right to construct buildings on the lands of others, and the type was too single. In order to meet the needs of contemporary society on the compact utilization of land, Germany superficies types were diversified, which included several types of superficies with different functions besides the traditional superficies: Subordinate superficies (referred to as low-level superficies) provided new legal means for the spaces above and under land to divorce from ground to independently become the object of property rights; the superficies of owners made land ownership owners kept the actual utilization of land when attaining the exchange value of land, mobilizing the initiatives of and ownership owners to transfer land; the housing superficies and partial superficies which were right mainly established on the public land allowed the rights of land ownership owner into a position unable to be performed, exerting an important role in the realization of government housing welfare system and the solution to the housing problem of people with low income.

Independence The superficies in Roman law was the temporary separation of ownership right and was only a kind of right restricted on ownership without independence. However, German civil law regarded the superficies independent of ownership, which was a kind of property right setup based on the right contract and had no direct relationship with the powers and functions of ownership. In contemporary German civil law, superficies has a specific registration for immovable property like real property ownership and can be set up at the first place; when superficies suffers from disturbance or faces up to the danger to be disturbed, superficies will be protected based on the claim right of owner. In

Germany, the land ownership is also withered as an “ownership without usufruct” (the right of attribution) because of the restrictions on the superficies, and the superficies changes into ownership to play the same role of ownership with ownership, evolving into “using proprietary” and being applied universally in the daily economic life.

65.3 The Development Changes of Japanese Superficies System

65.3.1 Overview to Japan Superficies System

Since the promulgation of civil law in Meiji 23rd year 1890, there was superficies concept in Japan. After a short while, Japan’s legislatures re-formulated the civil law (which was successively promulgated from 1896 to 1898 and is being used to now) by imitating the mode of the second edition of Germany civil law draft which was promulgated not long ago. The chapter 4 (article 265–269) of the new law established the superficies system, which introduced or followed the Germany superficies system much more. Since the new law was implemented, Japan legislature strengthened the superficies system by continuously issuing separate laws. Most noticeably, a series of laws and regulations, such as “Law about superficies” (Meiji 23rd year), “Law about the Protection of Buildings” (Meiji 24th year), “Land Borrow Law” (Taisho 10th year), “Land and House Rent Law” (Taisho 11th year) and “Temporary Treatment Law of Land and House Rent for Disaster City” (Showa 21st year), strengthened the rent right targeting at the ownership of building to make themselves close to superficies and complete the transforming of land rent right into property right when striving for the intensification of their own superficies [8].

65.3.2 Innovation of Japan Superficies

Changing the Purpose of Formulation In the view of the essence, Germany superficies influenced by Roman law was the right taking the working substance on other’s lands, focusing on the holding of working substance. In order to achieve the maximum benefit of land, Japan civil law centered on the utilization in the concept of superficies and relied on the combination of land, houses and other facilities, which was convenient for superficies owners to engage in non-agricultural business operations.

Expanding the Scope of Subject Matter According to the provision of the article 265 of the old Japan civil law, superficies referred to the right to use the other’s land (the ground, the space above or beneath the ground) in order to hold working substance on the other’s land.

Increasing the Types of Superficies The generation of Germany superficies was only the property consensus between the parties. In Japan, superficies could be generated not only from the direct provision of law under specific circumstances, but also from the consensus between the parties, which was the legal superficies. The establishment of legal superficies meets the concept of Japanese separating buildings and lands, allowing buildings themselves to own independent transaction. Most noticeably, in 1966, the “Japan Civil Law” added the “Space Superficies” into the article 269 of the superficies chapter in No. 93 Law. The “socialization” of land ownership was a process of the independence of the space interests of land and the gradual confirmation of law on the space right.

65.4 The Evolution of Superficies System in the Continental Law System

65.4.1 Transformation of Essence

The modern superficies of Germany, Austria, Switzerland and French, which succeeded in the concept of Roman superficies, concentrated on the objects above ground and did not think the existence of superficies if no realistic and governable objects were above ground, lied in “having” in essence but not in “using”. Modern superficies focused on the utilization of land and stressed the essence of superficies in “having” but not in “using”, and the existence of working substance did not influence the superficies and the loss of working substance would not result in the perishment of superficies, hence exercising the utilization of land completely.

65.4.2 Enhancement of Rights

Roman superficies was regarded by Roman jurists as the right of superficies owner to build houses and use other’s land for a long time and to be enslaved to ownership, which was only a kind of burden of land ownership. From Germany, the superficies of continental law system developed into a typical real property right. This was reflected not only on the establishment of superficies necessary to comply with the basic principle (consensus and registration) of real property right establishment, but also on the aspects of superficies able to transfer, inherit and burden other restricted property rights (subordinate superficies, mortgage, land debt, regular land debt and substance burden) as well as the obligee was able to perform independent claim right, etc.

65.4.3 *Increasing of Types*

After entering the industrialized society, the development of science and technology expanded the activity space of human beings above or beneath ground, the use of land trended differentiation or spatial pattern, and the types of superficies increased as well. Other than the ordinary type, superficies included subordinate superficies, housing superficies, ownership owner superficies, space superficies, etc. Superficies with a wide variety made full use of various legal means to expand the powers and functions of superficies, meeting the condition of market economy; the real property right and especially the land property right as the basic real property right stepped into the tendency of trading mechanism with the form of multiple levels of right.

Generally speaking, the superficies in continental law system gradually ascended and developed. The superficies system met the social development tendency of ownership socialization as the burden of ownership. In modern society, the superficies system has become the crucial legal system in the real property right area. Its social and economic values will always be worth our studying conscientiously and treasuring carefully.

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Chapter 66

Game Analysis on Service Recovery of the Retail Company

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Abstract From the perspective of game thesis, abilities of the company, market condition and the cost of service recovery are the main factors that the retail companies should consider when thinking their system of service recovery. Government was suggested to consider the market condition when regulating the retail companies for service recovery.

Keywords: Game analysis · Service recovery · The retail company

66.1 Introduction

The retail company, as an important link to connect production and consumption, has become a vital magic weapon for multiple companies to cultivate customer loyalty, gain customer sustained consumption and hence strengthen their competitiveness in today's society with increasingly fierce market competition. However, how should the retail companies to implement service recovery? What factors are affecting the service recovery decisions of the retail company? All these are the problems for retail companies to solve urgently. Thus, it can be learned that studies on service recovery of the retail company are of important theoretical value and realistic significance.

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66.2 Related Literature Review

Hart et al. [1] mentioned that a good recovery could promote anger and depressed customers into loyal customers, and the satisfaction to service recovery could significantly increase the willingness of customers to praise the companies and their perception to the total service quality [2]. American service marketing expert Hocutt et al. [3] found that the perception of customers to service recovery was mainly reflected in compensation measure, timeliness and the company attitude. Stephen et al. [4] proposed a framework for continuous service recovery and customer satisfaction and maintained that customer satisfaction exerted a decisive role in the total customer satisfaction and would surpass the negative effect caused by the initial service failure after service recovery is implemented to service failure. The study of Andreassen was consistent with an existing theory, service recovery paradox, which was stated as the customer satisfaction experiencing service recovery much larger than the customer satisfaction without that. Michel and Ahmad provided empirical support for this point of view. In the in-depth study, Michel found that service recovery played the greatest impact when customer recovery expectation was satisfied with a bad grace. Meanwhile, scholar Smith and others concluded that excessive service recovery would make customer satisfaction lowered, which was also sustained from another perspective [5]. In the studies of scholars, the study models were generally established from the expectancy disparity and equity theory. There were some well-known models. For instance, Oliver proposed the expectation–performance model from the expectation inconformity theory; Christo [6] applied the difference between cognitive equity and customer expectation into customer satisfaction model and only took one dimension of equity into account, distributive justice; Collough et al. [7] discussed the satisfaction impact from two dimensions of equity and added the perceptive service quality into his model; Hesser and Klein [8] studied directly from the service recovery expectation; Maxham et al. [9] studied the impact of the equity three dimensions on the satisfaction.

As to the studies on service recovery, the research orientation in China was mainly classified into two types. One is to discuss and analyze the importance of service recovery for companies to keep competitiveness and propose recovery strategies from the standpoint of companies. Wei [10] thought that complaint handling was not equal to service recovery. And Xie [11] put forward that effective service recovery could improve the service quality and also was an important method for companies to acquire the differentiation competitive advantages. Bo et al. [12] mentioned that service recovery was the indispensable method for companies to rebuild customer satisfaction. And the other lays stress on the application of empirical analysis and evaluates the effectiveness and significance of service recovery from the perspective of consumers. Wen et al. [13] studied the impacts of consumers' feelings on service recovery and the relationship between the quality and equity of service recovery through a sample survey on the airline passengers of Guangzhou Baiyun Airport. Wei [14] analyzed the consumer attitude and behavior tendency from relationship, attribution and cognitive equity.

Yang et al. [15] specifically studied service recovery and the relationship between customers' second satisfaction and behavior tendency.

From the above, it can be learned that the rules of service recovery of retail companies can be analyzed and explored from the game perspective, and hence evidences can be provided for related companies for service recovery.

66.3 Gamed Based Analysis on Service Recovery of Retail Companies

66.3.1 Basic Assumptions

For the sake of easy study, this paper conducts game analysis on service recovery of retail companies. The first should be make three assumptions below.

Assume that all retail companies are rational economic men. This means these companies all pursue the maximum benefit. Namely, they all take the maximum benefit as the basis of decision making.

The retail companies X and Y can be regarded as two types of different retail companies abstracted from market. Their business mode and scope are similar to each other without common markets. Hence, there are competitions between them, and both sides can independently decide whether to implement service recovery.

When the both sides do not implement service recovery to service failure, the payoffs of both sides are G_0 . If only one of them carries out service recovery, its payoff is $G_1 - C$, in which C is the cost of service recovery implementation, while the payoff of the company without service recovery remains G_0 . If both retail companies implement service recovery to service failure, the payoffs of both sides are $G_2 - C$.

66.3.2 Establishment of Models

As market competition is fierce and changing over and each retail company independently makes decisions whether to implement service recovery to service failure, the two retail companies can be abstracted to do game (as shown in Table 66.1). Based on the above assumptions, the payoff matrix of the two companies (X and Y) can be obtained below.

Table 66.1 The payoff matrix of the two companies

	Implement service recovery	Do not implement service recovery
Retail company X	$G_2 - C, G_2 - C$	$G_1 - C, G_0$
Retail company Y	$G_0, G_1 - C$	G_0, G_0

66.3.3 Analysis on Models

From the above assumptions, it can be seen that the game among retail companies are static full of information. Under such an assumption, game equilibrium relies on relatively numerical values of G_0 , $G_1 - C$ and $G_2 - C$. Based on these numerical values, four cases can be concluded below.

$G_1 - C > G_0$, $G_2 - C > G_0$ %. In such a case, both companies providing service recovery is the only Nash equilibrium of this game based on the analysis on the above equilibrium strategies. Because the benefit by providing service recovery in such a case is larger than that without service recovery, the retail company pursuing the maximum benefit is bound to provide service recovery, which actually can be the best plan for both sides.

In such a case, it means market is highly “hot” with sufficiently large capacity. Then, the retail companies providing service recovery can set up a better image as giving better services to consumers, promoting them more willing to go shopping at the retail company with service recovery expectation. Sequentially, sale volume increases and makes up the additional cost generated from the implementation of service recovery. Hence, all retail companies provide service recovery to gain larger benefit, and this is one of the main reasons why retail company continuously improve their service qualities by service recovery and other methods at the increasingly mature markets. Obviously, this is the most ideal market status for retail companies.

$G_1 - C < G_0$, $G_2 - C < G_0$ %. In such a case, the providing of service recovery is uneconomical, and providing service recovery turns into a strict bad plan for both sides, while it becomes the best without it. Thus, none of them providing service recovery is the only Nash equilibrium of this game. This case exists when market scales are not large. As the providing of service recovery needs more men, funds and strengths, additional cost emerges, but its effect is not obvious, and hence the added benefit from the providing of service recover cannot offsets the cost. Obviously, all retail companies will not provide service recovery in such a case.

$G_1 - C < G_0$, $G_2 - C > G_0$ %, in such a case, the game has two pure-strategy Nash equilibriums. One is that the two retail companies provide service recovery, and the other one is that both do not. In this game, for consumers, it is obvious that both providing service recovery is the Pareto optimal Nash equilibrium. At the beginning of both providing service recovery, none of them are willing to deviate from this equilibrium, because one of them goes against this equilibrium without service recovery, its benefit will be reduced from $G_2 - C$ to G_0 and certainly make the other side’s benefit lowered from $G_2 - C$ to $G_1 - G_0$. This is “harm set, harm get.” If this does really happen, the other side is bound to change into no service recovery. Then, there will be no motivation for both sides to deviate from equilibrium, making the benefits of both side reduced to G_0 . Also, if both provide no service recovery at the beginning, both sides have no motivation to deviate from equilibrium, because the side secretly altering strategy will gain lower benefit.

Certainly, if both sides conclude an agreement that both provide service recovery, consumers will generate rational psychological expectation on consumption, hence enhancing the total welfare.

$G_1 - C > G_0$, $G_2 - C$, $t < G_0$: In such a case, the game has three Nash equilibriums: two pure-strategy Nash equilibriums and one mixed-strategy Nash equilibrium. The two pure-strategy Nash equilibriums are one retail company providing service recovery and the other one not. The mixed-strategy Nash equilibrium the two retail companies randomly decide whether to provide service recovery at a certain probability.

This is difficult to be understood: one of them providing service recovery can attain the maximum benefit exceeding the cost; instead, both cannot receive the cost benefit of making up service recovery if both providing service recovery. Then, does this case exist? It seems to be hardly understandable, but is really possible in reality.

66.4 Conclusions and Enlightenments

To sum up, the following conclusions and enlightenments can be acquired.

The business community of retail companies is still immature: Retail companies must not blindly enlarge investment to provide service recovery when the market capacity is not big enough. In this stage, what's most important is fostering market and enhancing their core competitiveness, and upgrading internal management. Otherwise, it is likely to suffer from negative effects caused by blindness. For example, the retail companies cannot the cruel price competition from other retail companies.

More retail companies are needed to provide service recovery when the market has been mature, while governments at all levels should offer supportive policies when the retail company condition cannot reach. For instance, tax reliefs or loan with low interest can be issued to push more retail companies to providing service recovery, bringing better consumption environment for consumers and making deserved contribution to the improvement on the happiness of consumers.

The governments must fully take the market situation into account, complete the related work based on market rules when regulating retail companies to provide service recovery and should not always force them to necessarily do that, but make selection based on the market maturity and the retail company actual conditions. Besides, governments should actively protect fair competition in the market and establish related sound rules and regulation, promoting retail companies to build fair competition between each other and jointly keep good market orders. Meanwhile, governments should instruct retail companies based on market situation, neither pursuing advancement nor too conservative, and offer service recovery in due course, allowing consumers getting more considerate service.

Retail companies must fully consider their internal and external economic environments when deciding whether to provide related policies of service

recovery, and construct scientific and rational service recovery system based on their actual strengths, market situation, cost of recovery, the development laws of things and other factors, to promote their competitiveness to be raised constantly and then to boost the sustained healthy and rapid development of retail companies.

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Part VIII
Bioinformatics and Applications

Chapter 67

Study of Biochemistry Experimental Teaching Reform

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Abstract Biochemistry experiment in the life sciences is an important basic experiment course, which has strong experimental base; through biochemistry experiment, students can verify the biochemical theory foundation and basic experimental technique and can develop independent operation experiment ability, for the future of the practical application and engaged in research work and lay a solid foundation. Biochemistry experimental teaching plays an important role in the training of students' comprehensive quality and innovation ability and it cannot replace any other teaching forms. But in the traditional experimental teaching of biochemistry experimental teaching mode, it is attached to the theory teaching, and the purpose is to deepen the students' understanding of theoretical knowledge and theoretical proof. In recent years, technology of biochemistry experiments makes a spurt of progress, and new theories and new technologies emerge in an endless stream which has gradually penetrated into all fields of life sciences. Biochemistry experimental teaching in the field of life sciences is more and more important to highlight, and biochemistry experimental course teaching puts forward higher requirements. From raise innovation talented person 's needs, in order to improve the quality of teaching, improve the undergraduate students' practice ability, satisfy the social needs of the talents, biochemistry experimental course reformation and construction be imperative.

Keywords: Biochemistry · Experimental course · Teaching reform

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67.1 Introduction

Along with social progress and the continuous development of science, teaching reform of our country is facing the huge challenge and the comprehensive promotion of quality education and cultivates a large number of innovative talented person in life sciences which becomes one of the important tasks to be solved [1, 2]. Biochemistry is the study of the phenomenon of life science, and it is essential for biochemistry experiment. Higher education in the new period is the primary task of cultivating high-level innovative talents, and the cultivation of innovative talents in universities is the key to students' innovation spirit and practice ability cultivation. High-school laboratory trains social need of all kinds of advanced specialized personnel, and how to improve the students' practice ability and innovation ability becomes the important thing [3, 4]. The teaching of biochemistry course construction is the basic construction of teaching core, and biochemistry experimental teaching reform is the effective training of senior innovative talents the Chongzhongzhi is heavy; the biochemistry experiment curriculum reform is to improve the teaching quality of biochemistry, the only way that must be passed [5, 6].

67.2 Biochemistry Experiment Course Teaching

In medical colleges, biochemistry is closely linked with the basic medicine and clinical medicine and is very practical and applied as an important subject in medical teaching mode, which plays a very important role. Effective experimental teaching reform is to improve university-independent innovation ability. The theory and the experiment teaching of biochemistry are in close contact; for biochemistry experiment, curriculum reform has played an important role; along with the biochemistry theory, in-depth experimental teaching is constantly updated; biochemistry experiment course plays an important role that appears to grow day by day. At present, biochemistry experimental teaching reform and construction in life sciences in our country faces the major problem that need to be solved urgently; cultivating practical ability and high-quality biochemical professional and technical personnel is the key step in the development of innovative talents; through the analysis at present our country biochemistry experimental course teaching situation, teaching content, teaching can be found method, experimental technology and many other aspects have disadvantages.

67.2.1 Biochemistry Experiment Course Teaching Present Situation

The traditional experimental teaching of biochemistry is primarily dependent on the biochemistry theory teaching, whether teachers or students in the biochemistry experimental course emphasis are not high. Biochemistry experiment teaching content is relatively old and focuses on deepening and enhances the student to understand the theoretical knowledge of the biochemical basis; so far, it cannot meet the current situation of the development of biochemistry; teaching of biochemistry experiment has been used for more than ten years; the experimental project is too single, ignoring students' ability and quality cultivation. Biochemistry experiment detecting methods have been seriously lagging behind, unable to effectively update, experimental and practice effective combination. Students in the biochemistry experimental course lack enthusiasm, and biochemistry experiment course also lacks systematic arrangement; the biochemistry experimental course teaching is far behind the teaching theory and did not favor the student to master a variety of experimental operation and can effectively foster students' innovation ability.

67.2.2 Biochemistry Experimental Teaching Mode

Traditional biochemistry experimental teaching method has seriously hindered the development of students' creative thinking; the old experimental course selects some common substances that were measured or simple experimental responses, such as CBB staining method for the determination of the protein content and ultraviolet absorption determination of nucleic acid content, and has detailed experimental instruction steps and has teachers with injection teaching method; we first introduce the principle, explain, explain the operation, students in a completely passive acceptance degree, is very passive, rarely preview before class, class of an active thinking process, only a single memory experiments and the experimental process of imitation, and can not fully understand the experiment in detail, also cannot explain the various reasons for the phenomenon. Biochemistry experimental teaching contents are mainly concentrated in the basic experiment phase and comprehensive experiment, and experiment is less in number.

67.2.3 Biochemistry Experiment Course Teaching Facilities

Biochemistry experiment course teaching venues and experimental equipment is not worth badly, in recent years various universities enlarging enrollment, students' capacity is growing, and biochemistry experiment of the need to use the

maintenance condition of equipment is more expensive, more demanding, the purchase of the number is limited, restricted a variety of experimental projects, many students cannot actually operation, only to observe the form of learning, greatly reduce the biochemistry experiment teaching effect.

67.2.4 Biochemistry Experiment Course Evaluation is Lacking Effective Incentive Mechanism

Biochemistry experiment course lacks effective incentive and punishment mechanism and mainly inspects the student attendance and experimental class reports; the investigation method is difficult to fully mobilize students' interest, not to mobilize their initiative learning initiative, individual students just watch without their own operation, and even copy others data and operations, serious impact on the effectiveness of teaching. Biochemistry experiment course and teaching curriculum proportion are unreasonable, and experiment with repeated verification requires the application of model experiments, and comprehensive experiments are very small and rarely have the design and not purely based on theory, thereby developing students and therefore seriously hinder students' creative development.

67.3 Biochemistry Experimental Course Teaching Reform

According to biochemistry experiment development trend, from the innovative talents cultivation aim, to the current experiment course and content as the basis, the rational use of the various kinds of large-scale instrument and equipment, integrated design experiment course and experiment verification of reduction, do proper adjustment and the necessary reforms; in order to enhance the biochemistry experiment teaching quality and teaching level, the curriculum group conducted a series of experimental teaching reform, increased the number of research-oriented experiment teaching reform of curriculum arrangement, reformed part of biochemistry experiment course, increased experimental contents, and the introduced new biochemistry experimental testing methods, with emphasis on biochemistry experimental course system and content, experimental teaching link, teaching method, and experimental teaching means.

67.3.1 Strengthen Biochemistry Experimental Course Construction and Promote the Biochemistry Experiment Teaching

Biochemistry laboratory is to biochemistry experiment course teaching and the scientific research important base, is also a technology development and extension of the experimental curriculum, is the theory and practice of the important method, is the school's teaching and research work important constituent, is the cultivation of students' professional quality and practical ability the important practice base. For the laboratory construction, first of all, we should increase the pair of biochemistry laboratory of educational investment and build a set of advanced equipment and conditions to have a complete biochemistry experiment center in our hospital; currently under active construction, with constantly updated equipment, upgrading the teachers' level still needs to be undertaken; the laboratory personnel will conduct regular training and improve the overall quality of the team.

67.3.2 In Order to Verify the Experiment as the Foundation and Improve the Students' Basic Skills Test

First of all, we have to break the professional laboratory models, in business in the comprehensive opening of equipment management and promote public share principle, thereby improving laboratory equipment use efficiency and making confirmatory experiment and science experiment base. Confirmatory experiment is used to verify the related theory knowledge; biochemistry experiment is an important component and is also used to carry out a comprehensive experiment and designing experiment base. Confirmatory experiment teaching focus is to emphasize the students' basic experimental skills, familiar with the biochemical experiments in common method using the apparatus. To promote and encourage students to write correctly in biochemistry experimental report, and to carry out biochemistry experiment class thought discusses greatly, give students exchange time, strengthen the experimental operation encountered in problem solving ability, to train the students' thinking ability.

67.3.3 Reform of Experimental Teaching, Training Students' Practical Ability, and the Ability of Autonomous Learning

According to biochemistry experiment demand, combining theory with practice, so that students can actively participate in the practice of teaching, will present the society more commonly used experimental techniques as the content of experiment

teaching and increase the new part of biochemistry experimental method and make the students to think and thereby raising its technology level. From the experimental course is ready to begin, make undergraduate students directly involved in experimental course preparation process, throughout the entire experiment preparation, operation, summary stage, use of after-school practice, undergraduate students can to the laboratory for scientific research, to assist teachers and graduate students to complete a variety of experimental study, can not only exercise their practical ability, but also learn things outside the classroom. Increase students outside of the classroom time for action, so that students can make full use of various time masters and be familiar with a variety of detection methods.

67.3.4 Strengthen Independent Experiment and Study of the Experimental Teaching, Cultivating Students' Ability of Independent Innovation

Independent experimental teaching mode to students' autonomous activity as the foundation, is a new mode of experimental teaching, student autonomy to design each link, including experimental design, experimental materials, independent preparation independent hands-on preparation of various experimental reagents, experimental process, independently arranged independently arranged experimental time process for comprehensive experiment and design experiment development. The independent experimental teaching and research in the course of experiment teaching can not only make students fully experience a variety of experimental skills and scientific research thoughts, but also the various experimental methods of the biochemistry were validated and exercised, so that each student can feel the importance of biochemistry experiment. The students' ability to analyze and solve problems is an increased and can form the good scientific accomplishment and effectively cultivate the spirit of innovation and help to improve experimental ability independently. Biochemistry experiment course is not completed in the laboratory of experimental teaching, experimental teaching activities should also be extended to the outside of the classroom, give full play to the students of the theory and practice of the practical ability, stimulating students' thinking and analytical skills, and problem solving ability, through the practice teaching can improve students' collective learning atmosphere.

67.3.5 Reforming Experiment Teaching Method and Content of Examination

The traditional biochemistry experiment teaching process, the experimental study report is the main check students' ability of teaching means, on students' study mainly lies in the experimental and theoretical results and experimental

Table 67.1 Comparison of before and after the reform in teaching effect

Time	Number	Mastery of knowledge		The practical ability of students		Clinical practice ability	
		Good	General	Strong	Weak	Good	General
Before the reform	60	43(71.7)	17(28.3)	34(56.7)	26(43.3)	31(51.7)	29(48.3)
After the reform	60	54(90.0)	6(10.0)	52(86.7)	8(13.3)	47(78.3)	13(21.7)
x2		6.508		13.297		9.377	
<i>p</i>		0.011		0.000		0.002	

examination of the experimental results, while ignoring the experimental process. According to the single form of examination does not possess the practical ability of students, not the actual understanding of students' practical operation level. Waste a lot of time in writing the experiment report, but not actively seriously practical hands-on experiments. In the original experiment report score based on the appraisal of students' practical ability, increase the means of detection, let students to independently draw, by teacher supervision, let the student independently to complete the whole experiment process, and given an appropriate scoring, to appear problem, timely correction is given and solved, so that the students can actively with the experiment, fully mobilize the enthusiasm of hands-on experiments.

In a class of 60 students for example, teaching reform teaching effect comparison before and after the display (see Table 67.1), teaching students mastery of knowledge, students' practical ability, the clinical practice ability increase apparently, difference has statistical sense ($P < 0.05$). Biochemistry experimental teaching reform in the course has a really good teaching effect.

67.4 Conclusion

Through biochemistry experiment curriculum reform and construction, training of undergraduate students' innovation consciousness has improved undergraduate students' innovation in both theory and practice, especially students' experimental ability are improved and the growing needs of the society are met. Establish standard biochemistry laboratory open management system, to ensure the efficient and orderly operation of Biochemistry laboratory. To establish a series of effective management system to protect the biochemistry laboratory's good operation, the public device sharing usage and management is orderly improved, and the effect is distinct. Build a modern educational philosophy and the spirit of innovation, teaching ability, familiar with the actual business process, have excellent technology, willing to teach and educate highly qualified teaching staff. Give full play to their advantages in scientific research, scientific research achievements into experiment teaching, strengthening the experiment teaching content updates, better training of undergraduate students' innovative consciousness and innovative ability.

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Chapter 68

Nutrition and Food Hygiene Experimental Teaching Reform and Construction

Qingzeng Qian, Xiangke Cao, Qian Wang, Dong Ma
and Guoying Zheng

Abstract Nutrition and food hygiene is a public health professional basic course in undergraduate specialty of food quality and safety and is also a professional foundation course. In order to improve the nutrition and food hygiene course experiment teaching, students' experimental ability and food safety detection means, the nutrition and food hygiene experimental teaching is confronted with new tasks, combined with the actual situation, and sets out from oneself advantage, experimental teaching reform. The use of modern means of teach and teaching methods, the establishment of a new experimental teaching, cultivating students' interests, advocating the spirit of innovation, cultivating excellent talents with innovation.

Keywords: Nutrition and food hygiene · Experiment course · Teaching reform

68.1 Introduction

The primary task of higher education is to cultivate high-level innovative talents and the students' innovative spirit, and practical ability is the key to cultivation of innovative talents in universities. Laboratory of higher education trains talents and improves the students' practical ability, innovation ability,

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implements quality education in the school teaching and scientific research work and improves the teaching quality and of engineering, knowledge innovation, and technology development. Course construction is the basic construction of teaching core, and experimental teaching trains high-level talents key, constantly updates and improves experimental teaching courses and improves the teaching quality of the only way which must be passed [1]. School of public health nutrition and food hygiene experimental curriculum reform and construction is not only to train high-level talents and to provide a base for the professional field, but also can provide decision-making advice, and is the school to achieve sustained stable and coordinated development important guarantee [2].

68.2 Application

Nutrition and food hygiene experimental teaching reform in the course of construction of current our country is faced with is the nutritional health and food safety is the major problem that solves urgently, cultivating practical ability and high quality professional nutrition and food hygiene of professional and technical personnel is the development of innovative talents the key steps, through the analysis at present our country nutrition and food hygiene test present teaching situation of the course, which can be found from the teaching content, teaching methods, experimental technology and many other aspects have disadvantages.

68.2.1 Nutrition and Food Hygiene Experimental Teaching Content Lag Behind the Current Situation of the Subject

Nutrition and food hygiene experimental teaching content is serious lag in nutrition and food hygiene course development present situation; the individual test has been used for more than ten years, even decades; detection methods have been the serious lag; college preparation of experimental curriculum has been used for more than ten years, without any changes, detection of content for the food in a variety of determination of nutritional components and the nutritional status and biochemical examinations, has also been completely lag behind at present stage in China the development of nutrition and food hygiene situation of experiment and practice, can effectively combine. As a food processing technology and the continuous development of food additive widely used, along with environmental pollution increasing, many harmful components in foods appears ceaselessly, and the new detection means solves urgently.

68.2.2 Traditional Nutrition and Food Hygiene Experimental Course Teaching Way Hindered Students' Creativity Development

Traditional nutrition and food hygiene experimental teaching mode has seriously hindered the development of students' creative thinking, and the old experimental course selects some common material for determination, including foods contain protein, fat, carbohydrate, vitamins, minerals, pigment, nitrite, and detailed experimental steps instruction, teachers teaching in pedagogy, we first introduce the principle, explain, explain the operation, students in a completely passive acceptance degree, is very passive, rarely preview before class, class of an active thinking process, only a single memory experiments and the experimental process of imitation, and cannot completely understand experiment in detail, also cannot explain the various causes, problems will not handle.

68.2.3 Nutrition and Food Hygiene Experimental Curriculum Evaluation is Lack of Effective Incentive Mechanism

Nutrition and food hygiene experimental curriculum evaluation is lack of effective incentive mechanism, mainly inspects the student attendance and experimental class experimental reports, and the investigation method is difficult to fully mobilize students' interest, not to mobilize their initiative learning initiative, individual students just watch without their own operation, and even copy others the data and operations, in nutrition and food hygiene experimental curriculum evaluation experiments are reported in which including the principle, steps, results, but the lack of experimental operation process problems encountered in the analysis, the single examination mode is unable to fully mobilize students to participate in the experimental course of enthusiasm, serious impact on the effectiveness of teaching.

68.2.4 Nutrition and Food Hygiene Experimental Curriculum and Subject Curriculum Proportion is Unreasonable

Nutrition and food hygiene safety necessity of experiment courses and teaching curriculum proportion is unreasonable, experiment with repeated experiment and verification experiments, require the application of model experiments and comprehensive experiments is very small, rarely have the design experiment, the

necessity of nutrition and food hygiene safety experiment course just to the theory teaching content validation, purely theory teaching is not so that students can fully develop, seriously hindered the development of students' creativity.

68.3 Nutrition and Food Hygiene Experimental Teaching Reform Countermeasures

According to the nutrition and food hygiene experiment curriculum development trend, from the innovative talents cultivation aim, to the current experiment course and content as the basis, the rational use of the various kinds of large-scale instrument and equipment, integrated design experiment course and experiment verification of reduction, do appropriate adjustment and necessary reform, ensure the nutrition and food hygiene experimental teaching quality and raise the level of curriculum, the group conducted a series of experimental teaching reform, increase the number of research-oriented experiment teaching reform of curriculum arrangement, reform part of nutrition and food hygiene experiment, experiment content, using a new experimental testing methods, emphasis is placed on nutrition and food hygiene course experiment system and content, experiment teaching, experiment teaching method, the link of experiment teaching means.

68.3.1 Nutrition and Food Hygiene Experimental Teaching Material Construction, Experiment Teaching Content Timely Adjustment

With reference to the new teaching program, combined with the actual situation of compile new teaching outline combine with the professional features, added new content of experiment teaching. For example, in the original experiment course based on the increase in trace element analysis and so on the basis of proportional, first of all to break the professional laboratory models, in business in the equipment management comprehensive opening, promote public share principle, thereby improving laboratory equipment use efficiency, make become confirmatory experiment and science experiment base. Combined with the students, laboratory equipment, social practice, enrich the course content, increase public emergencies emergency treatment content, making the experimental teaching and practice in the theory of knowledge closely, to meet the demand of the society, the cultivation of students' interest, enhance their autonomous learning initiative [3, 4]. School of public health through construction of a few years and gradually formed a new innovative experimental platform and achieved good effect in experimental teaching.

68.3.2 Reform of Experimental Teaching, Training Students' Practical Ability and the Ability of Autonomous Learning

According to the nutrition and food hygiene course experiment of demand, combine theory with practice, students can actively participate in the practice teaching, a variety of nutrients in food substances detection, quantitative analysis of substance content, test components whether exceed the standard, and can be used as the content of experiment teaching. From the experimental course is ready to begin, make undergraduate students directly involved in experimental course preparation process, throughout the entire experiment preparation, operation, summary stage, use of after-school practice, undergraduate students can to the laboratory for scientific research, to assist teachers and graduate students to complete a variety of experimental study, can not only exercise their practical ability, but also learn things outside the classroom. Increase the nutrition and food hygiene experimental teaching contents, increase students outside of the classroom time for action, so that students can make full use of various time masters and be familiar with a variety of organic compounds and elements of the qualitative and quantitative analysis methods and testing methods. Arrange students to school meals nutrition survey, by teachers making questionnaire, from students to carry out field investigation, after occurrence problem, from teachers to help solve, the problem and the corresponding solution methods can produce blackboard newspaper, conduct propaganda and so on. In the research process, can encourage undergraduate students actively involved in task group, to assist in experiments, can be rich in nutrition and food hygiene course content. One can also add foreign service window, in the recent years, emerge in an endless stream of various food safety issues, start all sorts of food substance detection means, service at the society, make undergraduate students to participate directly in the social practice, also can develop students' vision and increase its experimental courses outside of the knowledge and experimental testing method.

68.3.3 Experimental Teaching Site Diversity

The full expansion of nutrition and food hygiene course experiment teaching means and teaching method, experiment course is not completed in the laboratory of experimental teaching, experimental teaching activities should also be extended to the outside of the classroom, give full play to the students to link theory with practice ability, and with the local health supervision institutions to establish relations of cooperation, organize the students to the scene study of emergency treatment method, especially relates to practical ability process, a careful study of the professional law enforcement agencies on emergency treatment process, student exchanges, and communicate with teachers, students' various problems, stimulate

Table 68.1 Comparison of before and after the reform in teaching effect

Time	Number	Mastery of knowledge		The practical ability of students		Clinical practice ability	
		Good	General	Strong	Weak	Good	General
Before the reform	60	47(78.3)	13(21.7)	35(58.3)	25(41.7)	38(63.3)	22(36.7)
After the reform	60	56(93.3)	4(6.7)	51(85.0)	9(15.0)	49(81.7)	11(18.3)
χ^2		5.551		10.506		5.507	
p		0.018		0.001		0.025	

students' thinking and analysis ability, and problem solving ability [5], through the practice teaching so that the students can grasp the state of current food safety laws and regulations, improve students' collective learning atmosphere.

68.3.4 Reforming Experiment Teaching Method and Content of Examination

The traditional experiment teaching process, the experimental study report is the main check students' ability of teaching means, according to the single form of examination does not possess the practical ability of students, not the actual understanding of students' practical operation level. Waste a lot of time in writing the experiment report, but not actively seriously practical hands-on experiments. In the original experiment report score based on the appraisal of students' practical ability, increase the means of detection, let students to independently draw, by teacher supervision, let the student independently to complete the whole experiment process, and given an appropriate scoring, to appear problem, timely correction is given and solved, so that the students can actively with the experiment, fully mobilize the enthusiasm of hands-on experiments.

In a class of 60 students for example, teaching reform teaching effect comparison before and after the display (see Table 68.1), teaching students mastery of knowledge, students' practical ability, the clinical practice ability increase apparently, difference has statistical sense ($P < 0.05$). That experiment teaching reform in the course of nutrition and food hygiene has good teaching effect.

68.4 Conclusion

The school of public health nutrition and food hygiene experimental teaching reform and construction, training of undergraduate students' innovation consciousness, improve undergraduate students in innovation in both theory and

practice, especially to improve students' experimental ability, to meet the growing needs of the society [6]. Establish standard of nutrition and food hygiene laboratory teaching system, guarantee the nutrition and food hygiene laboratory efficient and orderly operation. Establishment of well-functioning Public Health Institute of nutrition and food hygiene experiment course, implementation of a multidisciplinary shared public experimental platform and cultivating high-level talents in the field of public health for the purpose of specialized experimental platform, establishing a series of effective management system to protect the nutrition and food hygiene laboratory in good operation, improve the public instrument sharing usage, management and orderly, effect is distinct. Establishment of nutrition and food hygiene laboratory innovation experimental platform running guarantee system, including organization management, operation management and system management. Build a modern educational philosophy and the spirit of innovation, teaching ability, familiar with the actual business process, have excellent technology, willing to teach and educate highly qualified teaching staff. Give full play to their advantages in scientific research, scientific research achievements into experiment teaching, strengthening the experiment teaching content updates, better training of undergraduate students' innovative consciousness and innovative ability.

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Chapter 69

Research on Constructing Innovative Experimental Platform for Public Health

Qian Wang, Yuping Bai, Fumin Feng, Weijun Guan, Yanshu Zhang, Qingzeng Qian, Nan Liu, Dong Ma and Guoying Zheng

Abstract The article introduced the school of public health discipline advantage, innovation talents cultivation as the main line, to carry out academic innovation experimental platform construction of development train of thought. On the innovation platform construction, we have to consider both public experimental platform construction and the development of discipline advantage platform construction. On the construction of teaching staff, we strengthened teacher's responsibility and arouse the enthusiasm of the teachers. In personnel training, fruitful results have been achieved.

Keywords School of public health · Innovation experimental platform · Graduate

69.1 Introduction

The project of innovation in postgraduate education was proposed by the Ministry of education in 2002 years. The Ministry of education on the implementation of Graduate Education Innovation plan, strengthening the innovation ability of graduate students, further improve raise quality of a number of observations, emphasize on cultivating innovative ability of postgraduate students [1]. Zhili Chen in the Academic Degrees Committee of the State Council-The twenty-two in the speech on conference points out further, from the national strategic height, build a batch of graduate education at play Backbone and exemplary role in cultivating the innovative talents 'base'. On the cultivation of Postgraduates' innovation ability

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platform research focus on construction mode exploration and practice. In theoretical level, some research on the establishment of public necessity basic experimental system and focuses on the study of engineering graduate public establishment of experiment system. Problem, and combining with the actual situation, clarifies the public experiment system in cultured High level innovative talents in the role of, “some research on practice base, to cultivate students creative consciousness, improve students’ theoretical innovation and Practice innovation level of training innovation ability of the platform construction Standard, construction mode, operation mechanism and so on are explored, as the Graduate Record New ability training platform construction and management to provide theoretical and practical framework”, ‘some research in the era of knowledge economy, talent demand Syndrome, discussed innovation talent incubator construction model, including based on Innovative talents incubation function goal establishment, four service function Construction and three basic supporting system construction’, with China “research Graduate education innovation plans” carry out in the round, in order to gather in Higher Schools The school outstanding scientific research strength, integrate advantages of resources, the advantage discipline and key areas related to making innovation achievement the Postgraduate Innovation Rowing toward in-depth focus on issues, some scholars from the building Postgraduate Innovation The team goals, focus on Graduate Education Innovation Center of The implementation of basic platform management, practice and incentive problem are discussed scholars have combined their subject characteristics, constructs the promotion division Excellent courses, teaching materials, information, science and technology innovation platform and base elements of the same Enhance discipline construction and scientific research combined with the innovative talent training Raise the system in addition, and scholars from a comparative perspective, produce learn together, angle and guiding relationship of doctoral training of graduate students Innovation ability training platform construction and practice problem has conducted some research The ‘package is known. In practice level, the postgraduate training units and the levels of graduate education management departments have established and the characteristics of the unit. Based on the cultivation of students’ innovation platform, main mode research Postgraduate Innovation Center, national doctoral academic forum, Graduate Summer School, courses, postgraduate training, International Federation of training mode and course Curriculum reform, doctoral school etc. [2–10].

69.2 Application

Since 1998, my courtyard established the central laboratory to strive the cultivation of innovative talents in the field of public health to build a platform. Below we will in public health graduate students innovative ability cultivation, experimental platform construction and open management of the practice and experience of doing a presentation, and counterparts to discuss.

69.2.1 Clear Postgraduate Innovation Experimental Platform Construction of the Guiding Ideology

69.2.1.1 To Meet Undergraduate Teaching and Postgraduate Training Requirements

The construction of the experiment center will be to become the undergraduate, postgraduate and strict style of work, scientific way of thinking and improve the ability of the important base of. Through the open laboratory experimental teaching from the traditional focus on imparting knowledge to pay attention to the ability and quality culture transformation during the experiment, students can improve the ability of analyzing and solving problems, so as to arouse the enthusiasm of students, to cultivate innovative consciousness, innovative thinking and innovative ability aim.

69.2.1.2 Creating a Good Research Environment and Provide Professional Technical Support to Meet the Undergraduate Teaching and Postgraduate Training Requirements

According to various disciplines that research needs various types of equipment is gradually improved, to complete the higher level of the scientific research and to create the conditions.

69.2.1.3 Opening to the Outside World and Social Services

To meet the normal teaching and research work of our Institute on the basis of the hospital and the school, in the face of open, in order to improve equipment efficiency, and for the community to provide services, expand famous degree, enhance the influence, the laboratory development enters benign loop.

69.2.2 Graduate Innovative Experimental Platform Construction and Management System

69.2.2.1 Graduate Innovative Experimental Platform Construction

First of all, to break the professional laboratory models, in business management in the comprehensive opening of equipment management, public share principle is promoted, thereby improving the laboratory and equipment use efficiency, in order to make confirmatory experiment and science experiment base. By the end of 2011, we had a total of 2,322 to about 16,400,000 college teaching and research

equipment, among them 78 pieces are large precision instruments (price 100,000 yuan/table above) (Table 69.1); the rapid growth of the instrument and equipment is the teaching scientific research condition that has improved significantly, and a large number of advanced instruments and equipment in personnel training and scientific research have played an important role.

School of public health through construction of a few years and gradually formed the following two types of Postgraduate Innovation Experimental platform:

Public Experimental Platform Construction: in some frontier disciplines and interdisciplinary field, select quantity bedding face is wide, shared strong experimental courses as a graduate student in the laboratory of public platform of experimental teaching, on the basis of the original equipment through scientific and rational integrated deployment, were established. “Genomics experimental platform” (PCR amplification instrument, Germany) uses multiple temperature control of real-time fluorescence quantitative PCR system (USA), gel imaging system (UK), chromatography freezer, electroporation apparatus, cell disrupter, low temperature and high-speed centrifuge shaker, electrophoresis apparatus and other equipments to undertake gene expression and regulation studies; “proteomics platform,” (two-dimensional electrophoresis system (the GE, USA), is a electric focusing electrophoresis apparatus, wet, half dry transfer instrument equipment instrument for protein expression analysis and so on; “physicochemical detection analysis platform” uses high-performance liquid chromatography, gas chromatography, amino acid analyzers, mass spectrometry, inductively coupled plasma mass spectrometry, continuous flow analyzer for analysis and detection of various organic compounds and elements in the environment, food and biologic materials.. These public experimental platforms are opened for our medical, pharmacy, biology, chemistry and other related disciplines to graduate students and research scholars.

Professional Practice and Application Platform Construction: School of public health in recent years in order to cultivate applied talents as the goal to build several sets of teaching and research of foreign service and other functions in one of the specialized experimental platform and application, since 2002, the central and local governments to build project special funds, were established including coal mine occupation safety and health environmental and biologic monitoring, coal mine, occupation such as epidemic specialty experimental platform, invested

Table 69.1 Contrast between 2002 and 2011 teaching instrument and equipment

	Teaching scientific research equipment gross/million yuan	Table number/table	Large-scale precision instruments
2002	420	1,052	21
2011	1,640	2,322	78
Growth rate (%)	290	120	271

about 13,000,000 yuan of funds, the purchase of 100,000 yuan of above equipment more than 20 Taiwan, more than 300,000 equipment 8. Bear the national natural fund project <TNF in Caspases dependent apoptosis of AMs promoter of pneumoconiosis research>, Ministry of science and Technology Fund Project <the pneumoconiosis incidence factors of Ministry of Coal Science Fund Project>, <coal miners work related diseases research>, <coal workers' pneumoconiosis patients quality of life>, the state production safety supervision and Management Bureau <pneumoconiosis genetic susceptibility study on>, science and Technology Department of Hebei province <radiation induced DNA damage, chromosomal aberrations and lipid per-oxidation studies>, <occupation tension pathogenesis and on human health research>, <sand and dust storms on the effect on human health and scientific research task number>. A number of awards of achievement of science and technology were obtained, published a value of more than 100 academic papers, graduate more than 100.

69.2.3 Share Platform Open Management System Construction

Construction of sharing platform of management system firstly is to want change idea, improve resource sharing consciousness, establish and improve the mechanism for sharing of information resources, through the school to increase investment to build resource reasonable configuration and use of large-scale instruments, to establish open fund, to solve the large-scale instrument and equipment repair and operation maintenance cost problem, usually I school teachers undertake important scientific research and teaching tasks require the use of our shared equipment, may apply for the open fund the fund according to the 50 % ratio test cost. To build the large-scale equipment resource sharing network information platform, the conditions for opening and sharing should be created. Network information platform was build to share resource for fluid equipment through information channels and to advance the scope of equipment sharing.

Scientific and standardized rules and regulations of the lab in good operation of an important guarantee, therefore in the laboratory management should set up a series of rules and regulations, including <the laboratory management rules>, <large apparatus using charges>, <laboratory instrument management rules and regulations on punishment in public>, <laboratory safety procedures, code> and <the laboratory technical personnel student's Handbook>. And these regulations are put on the laboratory webpage, so that it is useful for the teachers and students to browse and download. The implementation of special management of instrument and equipment, laboratory opening time according to the function of lab and the actual situation of reasonable and affirmatory, cell culture chamber and commonly used laboratory equipment can be open 24 h, and with the aid of monitoring networks and other modern tool management. Equipment management

system of job responsibility, the responsibility to the people, and strict equipment file management system, manual borrowing system, user equipment management system, access control system. The new students in the laboratory of pre-job training pass the examination and this can be achieved after the admittance qualification, and students in the laboratory should have chest card mount guard and ensure the health and safety operation of laboratory.

69.3 Construction of Graduate Students with High Quality of Experimental Teachers' Team

The teacher is the experimental system; experimental teaching staff and the level of ability in the whole experimental system play a decisive role. Must build a structure reasonable, capable staff, special combination of experiment teaching team, the team should be in training graduate students to experiment with innovative abilities play a leading role. The school should fully aware of the teachers in the experimental teaching and personnel training status. In order to give full play to a high level of teachers in experimental teaching superiority, the school made a series of help to improve the quality of experimental teaching and also improve security operation experimental teaching of overall environmental policies and actively encourage teachers to research and as well as teach. The school attaches great importance to the mechanism, system innovation makes the high level teachers participate in the experiment teaching, the experiment of core curriculum system construction, and clear course team by academic leaders or academic backbone led formation of teaching team. The construction of experimental teaching team is to set up a teaching; scientific research level has a outstanding strong responsibility of the experimental teachers' team; the task is not only to present the experimental teaching system design thought and the construction of experimental teaching platform, but also to really participate in the experimental teaching. Establishing high-level experimental teaching staff from the platform of experimental teaching, experimental teaching system construction maintains consistency and advanced sex, while the level of scientific research highlights a strong sense of responsibility of teachers in the experimental teaching, giving full play to their advantages in scientific research and scientific research achievements into experimental teaching, strengthening the experimental teaching content updates and better cultivating students' innovative consciousness and innovative ability.

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Chapter 70

Research on Sleeping Quality of Medical College Students in Tangshan

Zheng Wang and Yu Su

Abstract Objectives: This study is aimed at knowing the current situation of medical students' sleep quality. Methods: The multistage sampling survey on 1,250 medical students from a college in Tangshan is conducted by using the stratification—the cluster sampling method and adopting PSQI. Results: Among the 1,155 investigated students, 23.98 % of them have sleeping problems. The significant differences in subjective sleep quality ($t = -2.557$, $P < 0.05$) and sleep medication ($t = 3.076$, $P < 0.01$) were found in different genders; students in different grades gained different sleep scores and PSQI, and the significant differences were found; PSQI in grade one is lower than that of other grades, and the significant differences in sleep scores were found in different majors ($F = 13.564$, $P < 0.01$). Conclusions: Sleep quality of medical college students generally is not good.

Keywords Medical students · Sleep quality · Influencing factor

70.1 Introduction

Sleep is an active and complex physiological status which human vital movement required [1]. College students are in the intelligence development summit, sufficient time and high quality of sleep are the important condition to ensure their study, life and physical and mental health. Medical student is a special group in

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colleges. Because of the high professional major, narrow employment channel, heavy learning task and psychological pressure, they are more easily caused sleep disorders, which may lead to neurological and mental debility syndrome, so as to influences their learning and physical and mental health development. In order to understand the sleep status in medical students and to explore the impact of sleep quality in medical students of related factors, we conducted the survey research, so as to provide basis for college to carry out targeted health education, and to prevent and reduce sleep disorders.

70.2 Object and Method

70.2.1 Object of Study

In Jianshe Road campus of Hebei united university (past North China Coal Medical University), researcher adopts stratified cluster sampling method, extract 1,250 students in medical institutes as investigation object. The 1,250 students are in 1~5 grades of 5 different majors, which are clinical care, medical imaging, anesthesia and stomatology.

70.2.2 Method of Study

70.2.2.1 Assessment Tool

The Pittsburgh sleep quality index [2] (PSQI) was adopted to make evaluation. The scale consists of 19 self-assessments and 5 he comments on the form, is used for evaluating subjects 1 months' sleep quality. Eighteen self-assessments of the form can be combined into 7 components, which are sleep quality, falling asleep time, sleep time, sleep efficiency, sleep disorders, hypnotic drugs and daytime dysfunction. Each component was scored according to 0–3 grade. The total score composes the total range of PSQI, which is 0–21. The higher the score, said the sleep quality the lower. Domestic and foreign test results all showed that the scale had good internal consistency, test–retest reliability and validity. According to PSQI's national norm, sleep quality standard is sleep quality scores $\geq 8(\text{mean} \pm \text{SD})$.

70.2.2.2 Survey Method and Quality Control

The current situation survey is adopted. Researchers select instructors who contact close with students to be investigators. After training before survey, investigators

divide students into class or practice team as a unit and select students' after-school time to ensure attendance. Investigators describe in detail for students about the purpose and meaning of this investigation, and the matters needing to pay attention when fill up questionnaire. And also emphasize the importance of confidentiality to students, check the questionnaire and take back one by one on the spot.

70.2.3 Data Processing and Analysis

Researcher strictly check the questionnaire, and used Excel software to construct the questionnaire database and then check the data with the SPSS13.0 software to make statistical analysis. Statistical methods are general statistical description, two independent samples t test and analysis of variance. $P < 0.05$ indicates a statistically significance.

70.3 Result

70.3.1 Basic Situation

The present investigation issued a total of 1,250 questionnaires, recover 1,202. After deletion of invalid questionnaire, researcher gets 1,155 valid questionnaires. Effective response rates were 92.4 %. Age distribution: subjects aged 16–25 years old, the average age is 21.19 years ($SD = 1.61$), the number of male is 306 (26.49 %), female is 849 (73.51 %). Grade distribution: the number of people for the first grade is 254 (21.99 %), the second grade is 217 (18.79 %), the third grade is 244 (21.12 %), for the fourth grade is 234 (20.26 %), and the fifth grade is 206 (17.84 %). Major distribution: the number of people of clinical medicine is 250 (21.65 %), medical imaging is 238 (20.61 %), anesthesia is 205 (17.75 %), stomatology is 229 (19.82 %), and nursing science is 233 (20.17 %).

70.3.2 Overall Situation of Medical Students' Sleep Quality

The results on sleep quality of medical students in total and each component of statistical analysis are shown in Table 70.1.

The results showed that PSQI score for medical students is (5.60 + 2.98), which significantly higher than the normal people (2.67 + 1.70) points domestic and overseas, and also higher than some domestic survey about sleep disorders or insomnia [3]. Regarding PSQI total score >8 points as poor sleep standard, 277

Table 70.1 Each component score of sleep distribution, n (%)

Category	Great	Good	Poor	Very poor
Sleep quality	386(33.42)	548(47.45)	189(16.36)	32(2.77)
Falling asleep time	327(28.31)	487(42.17)	263(22.77)	78(6.75)
Sleep time	467(40.43)	505(43.72)	171(14.81)	12(1.04)
Sleep efficiency	602(52.12)	495(42.86)	33(2.86)	25(2.16)
Sleep disorders	214(18.53)	796(68.92)	137(11.86)	8(0.69)
Hypnotic drugs	1042(90.21)	71(6.15)	33(2.86)	9(0.78)
Daytime dysfunction	299(25.89)	410(35.50)	313(27.10)	133(11.51)

people in this survey score are of PSQI = 8–15 points, so that there are 23.98 % students have sleep quality problem. This result is different from other domestic scholars' study in medical students with nearly 5 years [4–7]. Compared with non-medical students in such similar survey, the presence of sleep quality problems hold higher proportion [8, 9]; take every component of PSQI which is ≥ 2 points as the standard of poor or very poor quality or quantity, this survey found that 19.13 % of the students are of poor sleep quality, 29.52 % of the students have difficulty in falling asleep, 12.55 % of the students have sleep disorders such as easy to wake up at night or wake up early, few students used hypnotic drugs, 38.61 % students have daytime dysfunction such as lack of energy and sleepy, which is similar with the domestic research [10], and 15.85 % of the students' sleep is less than 6 h. The result is higher than the result of China in 2002. In 2002, the result showed that there is 4.1 % China's 18- to 44-year-old residents sleep less than 6 h every day. Such difference is possibly because of the medical students' learning burden and pressure on employment is heavier and also related to that student surfing in internet or participated in recreational activities at night.

70.3.3 The Influence of Different Factors on Sleep Quality of Medical Students

70.3.3.1 Sleep Condition of Different Gender of Medical Students

On the sleep quality of each factor and total score of gender differences were studied by independent samples t test, the results are shown in Table 70.2.

The results showed that total sleep quality in medical students of gender difference was not significant ($P > 0.05$), which in accordance with such domestic research results [11, 12]. But for the subjective sleep quality, males were significantly lower than females ($P < 0.05$). For hypnotic drugs, males are significantly higher than those of females ($P < 0.01$). All other factors have no significant difference ($P > 0.05$).

Table 70.2 Sleep condition of different gender of medical students

Category	Male (n = 306)		Female (n = 849)		T test	P value
	Mean (\bar{x})	SD (S)	Mean (\bar{x})	SD (S)		
Sleep quality	0.78	0.79	0.92	0.76	-2.557	0.011
Falling asleep time	1.04	0.90	1.09	0.87	-0.861	0.389
Sleep time	0.70	0.70	0.78	0.74	-1.655	0.098
Sleep efficiency	0.56	0.63	0.55	0.67	0.179	0.858
Sleep disorders	0.10	0.62	0.93	0.56	1.764	0.078
Hypnotic drugs	0.21	0.58	0.12	0.43	3.076	0.002
Daytime dysfunction	1.17	0.99	1.27	0.96	-1.463	0.144
Total PSQI score	5.47	3.07	5.65	2.94	-0.922	0.357

70.3.3.2 Sleep Status of Students in Different Grades

On the sleep quality of each factor and total scores of grade differences were studied by independent samples F test, the results are shown in Table 70.3.

The results showed that there were differences in sleep quality, falling asleep time, sleep time, sleep efficiency, hypnotic drugs and daytime dysfunction between students in different grades. Such differences were statistically significant ($P < 0.05$); LSD analysis shows that the PSQI total score of the first grade student was lower than students from other grades, and that difference is significant ($P < 0.01$). And such difference is in upward trend with increasing grade, which may be associated with that high grade students face a series of problem such as probation, practice, graduation, employment pressure and new fixed position in a relationship. Those stressful events affect their sleep.

Table 70.3 Sleep status of students in different grades ($\bar{x} \pm s$)

Category	Grade 1 (n = 254)	Grade 2 (n = 217)	Grade 3 (n = 244)	Grade 4 (n = 234)	F	P
Sleep quality	0.75 \pm 0.71	0.84 \pm 0.78	0.98 \pm 0.80 ^a	0.92 \pm 0.77	3.410	0.009
Falling asleep time	0.79 \pm 0.79	1.04 \pm 0.92 ^a	1.24 \pm 0.90 ^b	1.24 \pm 0.87 ^b	11.595	0.000
Sleep time	0.50 \pm 0.66	0.54 \pm 0.71	0.81 \pm 0.70 ^{b, c}	0.98 \pm 0.69 ^{b, d}	27.046	0.000
Sleep efficiency	0.55 \pm 0.62	0.59 \pm 0.69	0.63 \pm 0.72	0.42 \pm 0.58 ^e	3.457	0.008
Sleep disorders	0.88 \pm 0.50	0.92 \pm 0.65	0.98 \pm 0.57	0.96 \pm 0.58	2.064	0.083
Hypnotic drugs	0.05 \pm 0.24	0.09 \pm 0.40	0.13 \pm 0.51	0.10 \pm 0.36	16.071	0.000
Daytime dysfunction	1.09 \pm 0.93	1.23 \pm 1.04	1.36 \pm 1.01 ^a	1.32 \pm 0.97	3.031	0.017
Total PSQI score	4.60 \pm 2.47	5.23 \pm 3.12 ^a	6.13 \pm 2.98 ^{b, c}	5.93 \pm 2.88 ^b	13.564	0.000

Remark compare with grade 1: ^a $P < 0.05$, ^b $P < 0.01$, compare with grade 2: ^c $P < 0.05$, ^d $P < 0.01$, compare with grade 3: ^e $P < 0.05$, ^f $P < 0.01$, compare with grade 4: ^g $P < 0.05$, ^h $P < 0.01$

Table 70.4 Sleep status of students in different majors ($\bar{x} \pm s$)

Category	Clinic (n = 250)	Anesthesia (n = 205)	Medical imaging (n = 238)	Nursing (n = 233)	F	P
Sleep quality	1.03 ± 0.80	0.87 ± 0.77	0.93 ± 0.78	0.77 ± 0.69 ^a	5.086	0.000
Falling asleep time	1.21 ± 0.92	1.13 ± 0.92	1.08 ± 0.86	0.97 ± 0.83 ^a	2.976	0.018
Sleep time	0.91 ± 0.73	0.89 ± 0.72	0.78 ± 0.74	0.70 ± 0.70 ^a	10.726	0.000
Sleep efficiency	0.59 ± 0.72	0.51 ± 0.60	0.55 ± 0.63	0.47 ± 0.62	1.772	0.132
Sleep disorders	1.03 ± 0.53	0.92 ± 0.58	0.93 ± 0.53	0.91 ± 0.63 ^a	1.627	0.165
Hypnotic drugs	0.14 ± 0.45	0.23 ± 0.60	0.08 ± 0.39 ^c	0.17 ± 0.52	3.521	0.007
Daytime dysfunction	1.41 ± 0.93	1.28 ± 1.03	1.32 ± 0.98	1.17 ± 0.90	5.788	0.000
Total PSQI score	6.33 ± 2.94	5.83 ± 3.18	5.68 ± 2.82	5.17 ± 2.85 ^b	8.081	0.000

Remark compare with clinic: ^a $p < 0.05$, ^b $p < 0.01$, compare with anesthesia: ^c $p < 0.05$, ^d $p < 0.01$, compare with medical imaging: ^e $p < 0.05$, ^f $p < 0.01$, compare with nursing, ^g $p < 0.05$, ^h $p < 0.01$

70.3.3.3 Sleep Status of Students in Different Majors

On the sleep quality of each factor and total scores of major differences were studied by independent samples F test, the results are shown in Table 70.4.

The results show that sleep total score of medical students in different majors had significant difference ($P < 0.01$). In addition to the sleep efficiency, sleep disorders, other factors in the major differences are statistically significant ($P < 0.05$). Discover through the analysis, the clinical students sleep overall condition is the poorest, which the best is students in stomatology major. This may be due to the different situation between different majors, such as disciplines setting, study pressure and the current employment situation.

70.4 Conclusion

In conclusion, medical students' sleep condition is not optimistic, and there is obvious difference of their sleep quality between different grades and majors. Therefore, medical colleges should improve the existing education and employment system, to strengthen sleep health education, to enable students to cultivate good sleep habits, to built same work and rest schedule between dormitory members, to improve the dormitory environment, so as to ensure that students have enough sleep time and good sleep environment. Medical colleges should conduct targeted sleep health guidance and psychological consultation for students, so that they could learn the right way to deal with interpersonal relationships, to understand the current employment situation, to relieve pressure from learning and living, and to maintain a good mood. Besides, colleges should offer positive psychotherapy and drug treatment for students who have serious sleep problem.

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Chapter 71

Study on Win–Win Doctor Training System Based on Subject Construction

Liqun Yu and Fumin Feng

Abstract How to use the institutional innovation to improve the quality and level of the doctoral training is an important issue to be solved for higher education reform and development. This paper begins from concentrating subject research direction, strengthen the continuity of research direction, builds doctor training system which based on the subject and build a platform where doctoral students can do their research, studying and communicate with each other by establishing the integration of resources which based on the discipline. Based on subject characteristic and the need of discipline construction and development, set up doctor training system which combine the discipline construction and the relative polices that doctoral students can take part in the discipline construction, curriculum building, teaching activities and academic exchange and so on.

Keywords: Doctor training system · PhD · Students' cultivation · Subject construction

71.1 Introduction

In recent years, doctoral education scale expands gradually in china. In 2010, 50,000 people were awarded a doctoral degree. The development of doctoral education trains a lot of high-level innovative talents for our country, vigorously

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promote the development of national economy, science and technology and many other fields. The continuous improvement of education levels, the increase in the number of high-level personnel, not only increases the academic competition, improve the students' quality, but also puts forward higher request on the current education model, system and the level of the research. How to use the innovation of system and mechanism and increase the quality and level of doctoral training totally is not only the reality needs of the education reform and development of our country, but also one of the big problems which higher education research must to resolve [1–3].

71.2 Relationship Between Subject Construction and Doctoral Training

Subjects are the center of college construction and the platform which bear the weight of teaching, research and social service. If colleges want to increase its education level, expand its influence, improve its reputation and make contribution to location and even the worldwide economy construction and social improvement, they must make and build a number of high levels of discipline, because this is the root of the great development in school. Course construction is the basic and premise of doctoral training and is relevance to improve the level of contents and education of a college. The core of course construction is direction, team gathering, base building, innovation strength improvisation and academic exchange promotion. All of the above are the prerequisite and guarantee to improve the quality of doctoral training.

71.3 Problems Existing in the Disciplines Development and the Doctoral Training

In the early 1980s, China's higher education has realized that if we want to reach the level that we can train a sufficient number of high-quality doctors, we must strength the leadership, step earnestly to the doctoral program construction and especially construct a group of domestic leading and international advanced level of doctoral discipline. However, after many years of practice, because a variety of restricting or influence factors, there is a degree of apart between the subject construction and doctoral education, which caused some unreasonable phenomenon to the doctoral education.

71.3.1 There Exists Deviation Phenomenon Among Doctoral Training and the Construction and Research Orientation of the Discipline

On the one hand, the selection of doctoral research topic has its autonomy, and it is vital to train doctoral independent research ability. It is very normal that if there exist deviation when a doctoral student choose his research area according to his own accumulation and interest or the main direction of his research discipline, or even the research direction of his tutor. However, this should not be a general situation within a subject. Existing doctoral education is basically based on the existing culture conditions of its specialized subject and the certain training program and course arrangement and based on the underway research direction of his tutor. But in the reality, part of the research direction of the teacher is often relatively scattered, which results in more decentralized research direction of the doctor and produce deviation between its main research direction and discipline development direction. However, the deviation condition in the original training pattern and discipline construction and the main attack direction of the subject will reduce the real benefits of the national education investment. Meanwhile, because doctoral students cannot work in the frontier fields, the possibility breakthrough in PhD thesis is greatly reduced [4].

71.3.2 Doctoral Education to Tutor as a Unit and Not to Discipline as a Unit

Doctoral postgraduate education training system has been set up, which proved to be successful. Tutors who are entrusted by national are responsible for doctoral education training. Therefore, the tutor plays a key role in the quality of doctoral post-education training. But the current “tutor system” emphasizes on specific guidance to doctoral student. It is absolutely necessary that each teacher recruits several doctors every year, and teacher and students meet regularly for guidance, however, the guidance of their tutor must be based on the subject. If the cultivation of doctoral student is completely decided by the personal decision of their tutor, it will limit the channels where doctoral student obtain knowledge, which not only make the doctoral students obtain knowledge through the narrow, but also bring negative affluence for the relative curing of the knowledge system their tutor and limited energy input [5].

71.3.3 External Mandatory of Training System is Strong and Inflexible and Cannot Adjust in Time According to the Requirement of Doctoral Training

To ensure the quality of doctoral training, the competent government department of our country is responsible for working out relative policy, and each college for concrete implementation. Because of the autonomy that a university runs its own school is being restricted, there practically lack flexible adjustment mechanism in the operation system, and the rigid characteristics of the system is outstanding. Since our national macro policy reform lags behind, the defects of training system itself restricted the actual work. For example, because the length of schooling of education training is relatively short, many doctoral students would not choose the difficult, heavy-workload, long research time but potentially significant innovation of the subject. This is a practical phenomenon that typical training system limits the cultivate practical, and to some extent, affects the quality of doctoral training.

China's current doctoral education system must be reformed or innovated further, and the basic way of the system innovation should combine the doctoral education and the discipline construction [6].

71.4 Establish a Win–Win Doctor Cultivation System Combining the Subject Construction and the Cultivation of Doctoral Candidates

71.4.1 Strengthen the Discipline Construction and Create a Good Atmosphere for Doctoral Students' Training

Colleges should increase capital injections, establish production, study and research united cultivation base and open the laboratory. Try to establish the subject which is well known in the international and the first-class in the domestic. Make efforts to produce scientific achievement of high caliber. Form a batch of remarkable achievements which have significant theoretical breakthroughs and can bring economic and social benefits to the local place. Cultivate a batch of subject leaders with high level. Establish a batch of high caliber and distinctive characteristic laboratory or experimental base. According to the need of local social economy development and the reality of sociality development, try to improve the multilevel and distinctive characteristic important subjects' constructive system. Make full use of important subjects' construction demonstration, radiation and leading function. Make an overall improvement of the level in subject construction. Propel the mechanism innovation of the important subjects' management. Optimize discipline structure; try to form distinctive characteristic and active disciplinary system, aim at important developmental local economic constructive

products and subjects' development frontiers. Based on the economic structural adjustment and the demand of labor market, adjust the structure of disciplines and specialties in real earnest and optimize discipline structure. Form new growing point of the subject, cultivate a batch of new branch of science and some cross-discipline academic subjects and construct a batch of leading and important disciplines. Devote major efforts to application branch of learning and increase the proportion of the application branch of learning. Take much count of the subjects that play an important role in the development of industrial and regional economic development. Colleges should give full support in order to bring in academic leader, set up scientific research project and subsidize finance in new subjects, frontier subjects, cross-subjects and involved basic subjects [7].

71.4.2 Bring Doctor Innovative Training into Doctoral Specialties Innovation System

The source of the doctoral innovation lies in whether the subject in which the doctoral specialties are entered its own discipline field's mainstream areas and the frontier. Therefore, colleges should guide the doctors to choose to bang on the fore realm that has a significant meaning on putting own discipline developments forward. The premise is to consider the doctoral as the main force of the subject construction point, and to put the doctoral education into the discipline construction planning and the layout of the direction of discipline research, then overcome the most of the free outside phenomenon of the doctoral research direction or content.

To build and strengthen the construction of system of discipline innovation system, first of all is to would subject direction. We must have an accurate and deep understanding and about the present situation and development prospects of the disciplines and master these aspects. On that basis, we must analyze the related position of the discipline in the domestic and international and its characteristic advantages, establish subject construction goal, and determine the subject development direction and the main attack direction according to the development trend and front of this discipline and the great need of the national economic construction and social development. Guide and arrange doctoral research topic around the subject direction to make the different grades of PhD that could have a deep and systemic research in related fields and create a good premise for a doctoral into the frontier and the mainstream field and obtain innovative achievements. For humanistic research into more fully and solid preparation, it can be also appropriate for absorbing the master. Based upon some progress in research direction, we must strive to bear the major subjects and fund projects of our country or the relevant departments, and combine the talents, the research results and cultivating scientific research strength for the purpose of laying the more broad foundation for formatting and establishing research characteristics and

advantages of the discipline. Therefore, we must work together that a doctor choose the research content autonomously and develop one subject connotation continuously, open new research field and create innovative work, give promise to the system, overcome all sorts of quick and short-term sexual behavior and prevent the dying of innovative subject resources and human resources [8].

71.4.3 The Subject Construction as the Basic Unit of PhD Innovation Training System

The basic relations of doctor training system involve three basic aspects—tutor, discipline and graduate school, which are in different positions of doctoral innovation training system and play different effect. Tutor is mainly responsible for the lead of the subject direction, which is as the basis for implementing training plan and guiding degree thesis work. Only in this way, we can realize the innovation in the dissertation research lead. Discipline is the foundation of the doctoral education and provides doctoral innovation training with channels and platforms of learning, research and communication. Graduate school makes macro rules and standards, implements target management, supervises doctoral education quality and awards doctoral degree from actual conditions. Because doctor education involves to subject research direction, tutor recruitment and selection, subject research, laboratory construction and other aspects of the work of the school, especially the core of doctoral innovation education is doctoral research training and ability training, closely relating to the school scientific research management work. Therefore, in the construction of PhD innovation training system, strengthening discipline construction is the inevitable way of combining the various elements organically [9].

71.4.4 Attach Importance to Course Crossing, Resource Integration and Academic Exchanges to Create a Good Academic Atmosphere

As far as characteristics of doctoral education research are concerned, paying attention to the communication between the doctoral thought and collision is the basis of innovative research and the cradle; The integration of resources, achieving sharing and providing a first-class platform for research, learning and communication, which is based on the subject, are important contents of a doctoral student training system innovation construction. Doctoral student learning should be based on the combination of the subject as the foundation and other subjects, and doctoral students should study and master appropriate knowledge and theory as broad as possible, improve the ability to master relevant knowledge and study and

master-related knowledge about subject-crossing. At the same time, doctoral students should enter every doctor research direction, and, as the researchers, doctoral students must aim at obtaining innovative achievements by working hard and enduring research, and improving their ability to do scientific research. Especially the key disciplines, which have the excellent teachers, high level of major projects and plenty of scientific research funds, advanced equipment and excellent laboratory condition, active international academic exchanges will really build a good academic atmosphere to broaden doctoral vision, cultivate the innovative thinking and provide strong foundation and support.

The historical experience and the present situation of higher education's development in China fully display that there exists an important relationship between the discipline construction and graduate education, especially creative doctoral student.

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Chapter 72

Research on Life Quality of Old Cataract Patients Based on Variance Analysis

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Abstract Cataract is a main reason to cause old people become blind. And this disease could influence patients' life quality significantly. This research is aimed to investigate cataract patients' life quality and provide the theory support to improve their life quality. In this research, 212 cataract patients were selected as subjects. And the inclusion criteria are elder patients who are more than 50 years old; most of them are from poor families and without medical insurance. A self-designed questionnaire was used as survey tool. It includes the Scale for Quality of Life-Damaged Vision Illness (SQOL-DVI) and some general information about patients. SQOL-DVI would reflect the life quality through four aspects. The effective recovery rate is 100.0 %. For symptoms and visual function, occupation, educational level, complicating disease, length of disease and visual acuity are the influencing factors with statistical significance ($p < 0.05$). For physical function, gender, age, occupation, complicating disease, length of disease and visual acuity are the influencing factors with statistical significance ($p < 0.05$). For social activities, gender, occupation, educational level, marital status, complicating disease and visual acuity are the influencing factors with statistical significance ($p < 0.05$). For mental health, occupation, educational level, marital status, complicating disease, length of disease and visual acuity are the influencing factors

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with statistical significance ($p < 0.05$). The results of this research showed that the life quality of old and poor cataract patients is not high and needs to be improved.

Keywords Life quality · Cataract patients · SQOL-DVI · Old patients

72.1 Introduction

Cataract is a main reason to cause old people become blind. By definition, a cataract is opacity in the lens. Light could not pass into intraocular, and then, vision would be influenced. Cataract disease could seriously influence not only patients' vision, but also their psychology, economy, daily work and so on [1]. More importantly, it could bring a negative effect to patients' life quality. At present, the incidence of cataract has been increasing globally. Statistics show that China's blind patients have already reached up to about 18 % of total number in the world. And cataract patients are around one-fifth of the total number in the world [2]. With the aging society increasing, there will be 50 million new cases annually in the next 50 years [3]. In China, cataracts occupied the major position in spectrum of disease in the elder people no matter in city or countryside [4, 5]. Therefore, in order to improve old cataract patients' life quality, to investigate the patients' living quality and its influential factors is extremely necessary.

72.2 Subjects and Methods

72.2.1 Research Subjects

Two hundred and twelve cataract patients are investigation object. The inclusion criteria are elder patients who are more than 50 years old; most of them are from poor families and without medical insurance.

72.2.2 Research Methods

Self-designed questionnaire, include general information and the Scale for Quality of Life-Damaged Vision Illness (SQOL-DVI), was used as survey tool. Two hundred and twelve questionnaires were provided for the cataract patients who are up to the standard. And effective recovery rate is 100.0 %. All data were processed by SPSS. Variance analysis was used to analyze the data.

72.2.3 Survey Tool

The questionnaire includes two parts:

The general information: gender, age, occupation, educational standard, marital status, visual acuity, intraocular pressure, the length of cataract disease and so on.

SQOL-DVI: the scale reflects the life quality through four aspects, which are symptoms and visual function, physical function, social activities and mental health. There are 20 questions in the scale. The scores of each question range from 0 to 10. 0 means the worst condition and 10 means the best condition. Total marks are 200. The higher scores mean the better life quality.

72.3 Results

72.3.1 The Demography Characters of Subjects

In this research, female patients' percentage is 54.7 % and is more than that of male. The youngest subject is 50 years old, and the oldest is 97 years old. The percentage of 65– age group is the highest, which is 34.9 %. 81.6 % of them are workers. 73.6 % of them were educated at primary school and lower. 65.5 % of subjects are divorced or widowed. Only 31.2 % of them do not have complicating diseases, diabetes and hypertension. The general information of the subjects can be seen from Table 72.1.

72.3.2 The Comparison of the Subjects' Results in Different Gender

Table 72.2 showed the results of different gender in four aspects. In physical function and social activities, the different results of different gender are statistically significant ($p < 0.05$). The physical function of male is better than that of female naturally. And influenced by traditional culture, male owns the higher social status, especially in village, so male showed the better social activities condition.

72.3.3 The Comparison of the Subjects' Results in Different Age Groups

Different age groups revealed the different results in each aspect. Especially, in physical function aspect, the difference between age groups is statistically significant ($p < 0.001$). And the results of physical function showed the trend that the condition would be decreased with the increase in age. This result was caused by

Table 72.1 The demography characters of subjects

Item	Groups	<i>n</i>	%
Gender	Male	96	45.3
	Female	116	54.7
Age (years)	≤54	26	12.3
	55–	42	19.8
	65–	74	34.9
	75–97	70	33.0
Occupation	Cadre	6	2.8
	Workers	33	15.6
	Peasants	173	81.6
	Retiree	0	0.0
Educational level	Primary school and lower	156	73.6
	Junior middle school	48	22.6
	Secondary school	8	3.8
	Junior college and higher	0	0.0
Marital status	Unmarried	0	0.0
	Married	73	34.4
	Divorced or widowed	139	65.6
Complicating disease	Diabetes	105	49.5
	Hypertension	41	19.3
	No disease	66	31.2
Length of cataract (years)	≤5	118	55.7
	6–	58	27.4
	10–	36	16.9

Table 72.2 Comparison the subjects' results in different gender ($\bar{x} \pm s$)

Life quality	Male (<i>n</i> = 96)	Female (<i>n</i> = 116)	<i>F</i>	<i>p</i>
Symptoms and visual function	22.13 ± 10.78	20.56 ± 9.49	1.106	0.236
Physical function	22.46 ± 5.58	19.37 ± 6.54	2.996	0.003
Social activities	29.45 ± 7.56	24.32 ± 7.21	0.012	0.009
Mental health	27.32 ± 8.66	26.98 ± 8.21	0.782	0.663

age. Older people's physical condition would be decreased especially patients. The comparisons between the subjects' results in different age groups are shown in Table 72.3.

72.3.4 The Comparison of the Subjects' Results in Different Occupation

Table 72.4 reveals the life quality of cataract patients in different occupation. The differences of four aspects between different occupations are all statistically significant ($p < 0.05$). Usually, cadre have higher educational level and social status,

Table 72.3 Comparison of life quality in different age groups ($\bar{x} \pm s$)

Age (years)	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
≤54	26	22.31 ± 12.34	25.34 ± 3.54	27.17 ± 5.04	30.21 ± 4.95
55–	42	25.36 ± 12.45	23.01 ± 5.24	28.46 ± 7.24	29.87 ± 6.45
65–	74	20.72 ± 13.48	20.86 ± 5.97	27.46 ± 6.94	29.02 ± 5.84
75–97	70	22.88 ± 13.45	18.26 ± 5.46	26.58 ± 6.45	28.45 ± 5.72
<i>F</i>		2.497	8.143	0.680	0.112
<i>p</i>		0.084	<0.001	0.527	0.380

Table 72.4 Comparison of life quality in different occupation ($\bar{x} \pm s$)

Occupation	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
Cadre	6	20.31 ± 9.46	22.39 ± 2.73	25.71 ± 5.27	29.60 ± 3.51
Workers	33	17.20 ± 8.64	20.46 ± 5.04	23.46 ± 6.81	27.61 ± 5.68
Peasants	173	15.94 ± 8.25	21.39 ± 4.60	20.94 ± 5.10	26.80 ± 4.09
Retiree	0	–	–	–	–
<i>F</i>		1.824	7.641	0.709	0.223
<i>p</i>		<0.001	0.013	<0.001	<0.001

which could help them to deal with terrible condition in a suitable way. They could adjust their mood appropriately. They could improve their life quality independently. So, cadre showed a better condition than other two groups. Oppositely, peasants usually have worse social status and financial situation. They might do have ability to see doctors, which would make them fell pessimistic. The disease would give them a heavy pressure on physical and mental. So, the score of them is the lowest. However, the different groups obviously have different sample size, which might influence the results.

72.3.5 The Comparison of the Subjects' Results in Different Educational Level

The comparison of cataract patients' life quality is shown in Table 72.5. In symptoms and visual function aspect, the scores were decreased along with the increase in educational level. In physical function, the highest score was reflected by subjects with secondary school degree, which is 21.73 ± 3.28 . The lowest score was showed by people with primary school and lower degree, which is 20.39 ± 2.91 . In social activities aspect, the trend is that the higher score was showed by subjects with lower educational level. In mental health aspect, the score was increased with the increase in patients' educational level. The differences of results in symptoms and visual function, social activities and mental health are statistically significant ($p < 0.05$). Education is a markedly influential factor for

Table 72.5 Comparison of life quality in different educational level ($\bar{x} \pm s$)

Educational level	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
Primary school and lower	156	19.23 ± 4.65	20.39 ± 2.91	22.37 ± 4.01	19.30 ± 2.75
Junior middle school	48	17.08 ± 3.89	21.39 ± 4.08	20.65 ± 3.23	21.68 ± 6.20
Secondary school	8	16.53 ± 6.29	21.73 ± 3.28	19.64 ± 6.83	22.94 ± 3.27
Junior college and higher	0	–	–	–	–
<i>F</i>		1.297	3.109	1.309	0.533
<i>p</i>		0.027	0.108	0.011	0.003

life quality. Patients with higher educational level could adjust their mood very well. In spite of facing disease, they could keep optimistic attitude to their future, which could improve life quality obviously.

72.3.6 The Comparison of the Subjects' Results in Different Marital Status

Patients with different marital status showed different results, which can be seen from Table 72.6. In this research, all subjects are more than 50 years old. And the oldest one is 97 already. One hundred and thirty-nine patients are divorced or partners have died. Compared with those patients who have partners, they obviously showed the worse life quality in both social activities and mental health aspects. The differences between these two fields are statistically significant ($p < 0.05$).

72.3.7 The Comparison of the Subjects' Results in Different Complicating Disease

Complicating disease could influence cataract patients' life quality significantly. In this research, the number of patients complicating with diabetes is the most. And they showed the worst life quality. Diabetes often complicated with cataract. So, the patients have to bear the double pain, which would decline their life quality. Cataract patients without any complicating disease revealed the best result in this research. In symptoms and visual function aspect, their score is 21.34 ± 3.23 , which is much higher than that of other two groups. In physical function aspect, their score is 21.96 ± 4.64 . In social activities aspect, their score is 22.38 ± 3.17 . And in mental health aspect, their score is 24.88 ± 3.47 . And all differences in each aspect of three groups are statistically significant ($p < 0.05$). The comparison can be seen from Table 72.7.

Table 72.6 Comparison of life quality in different marital status ($\bar{x} \pm s$)

Marital status	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
Unmarried	0	–	–	–	–
Married	73	19.76 ± 5.29	20.37 ± 5.41	22.37 ± 3.79	23.79 ± 4.97
Divorced or widowed	139	20.01 ± 4.28	20.81 ± 5.47	20.49 ± 2.76	20.73 ± 5.18
<i>F</i>		2.468	3.798	2.089	0.374
<i>p</i>		0.401	0.649	0.007	<0.001

Table 72.7 Comparison of life quality in different complicating disease ($\bar{x} \pm s$)

Complicating disease	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
Diabetes	105	18.39 ± 4.21	19.21 ± 3.27	21.39 ± 2.16	21.01 ± 3.72
Hypertension	41	20.73 ± 6.81	20.59 ± 4.23	21.76 ± 3.04	22.07 ± 3.65
No disease	66	21.34 ± 3.23	21.96 ± 4.64	22.38 ± 3.17	24.88 ± 3.47
<i>F</i>		3.106	4.012	3.714	0.196
<i>p</i>		0.006	0.038	0.019	<0.001

72.3.8 The Comparison of the Subjects' Results in Different Length of Cataract Disease

Length of cataract disease is an important influential factor for patients' life quality. Table 72.8 showed that the longer the patients be ill, the lower the life quality they have. In symptoms and visual function, the score of patients with cataract more than 10 years is 18.37 ± 5.75 . And the score of 6-year group is 21.54 ± 4.72 . The score of the group that is less than or equal to 5 years is 22.76 ± 3.58 . The difference between three groups is statistically significant ($p < 0.001$). Similar conditions were appeared in physical function and mental health aspects. The best result was showed by ≤ 5 -year group, that is, 23.84 ± 4.74 in physical function and 23.96 ± 5.73 in mental health. The differences between these two aspects are statistically significant ($p < 0.05$).

72.3.9 The Comparison of the Subjects' Results in Different Visual Acuity

Table 72.9 showed the comparison of patients' life quality in different visual acuity. Vision could influence cataract patients' life quality directly. If patients are blind, their life would be significantly inconvenient. The subjects, whose binocular vision is 0 degree, obviously showed the worst results, that is, 17.09 ± 3.45 in symptoms and visual function, 19.36 ± 4.87 in physical function, 20.69 ± 4.48 in

Table 72.8 Comparison of life quality in different length of cataract disease ($\bar{x} \pm s$)

Length of cataract disease (years)	<i>n</i>	Symptoms and visual function	Physical function	Social activities	Mental health
≤5	118	22.76 ± 3.58	23.84 ± 4.74	22.97 ± 4.53	23.96 ± 5.73
6~	58	21.54 ± 4.72	22.78 ± 4.48	21.45 ± 3.71	22.01 ± 4.45
10~	36	18.37 ± 5.75	21.87 ± 3.78	22.78 ± 4.47	19.20 ± 3.21
<i>F</i>		4.786	3.784	4.785	1.783
<i>p</i>		<0.001	0.049	0.105	<0.001

Table 72.9 Comparison of life quality in different visual acuity ($\bar{x} \pm s$)

Left		Right		Symptoms and visual function	Physical function	Social activities	Mental health
<i>D</i> *	<i>n</i>	<i>D</i>	<i>n</i>				
0	92	0	97	17.09 ± 3.45	19.36 ± 4.87	20.69 ± 4.48	20.91 ± 3.72
≤4.0	74	≤4.0	69	19.63 ± 3.78	20.45 ± 5.34	20.97 ± 4.14	22.73 ± 4.19
>4.0	46	>4.0	46	21.46 ± 2.49	20.89 ± 5.48	21.34 ± 5.47	23.41 ± 3.28
<i>F</i>				5.487	4.786	3.454	1.049
<i>p</i>				<0.001	0.039	0.068	0.027

*“*D*” means the degree of visual acuity

social activities and 20.91 ± 3.72 in mental health. The life quality would be improved with the improvement in visual acuity. Patients, whose vision is better than 4.0 degree, showed the best results. And the differences between the results of symptoms and visual function, physical function and mental health are statistically significant ($p < 0.05$).

72.4 Conclusion

The results of this research showed that the old cataract patients' life quality is not too optimistic. It extremely needs improvement. Most of the subjects are from poor families and without any medical insurance. Some of them did not receive suitable treatment timely just because of financial difficulty. That would be an important reason to such low scores. And at the same time, most of the subjects are peasants that are the group that lack social supports. So, to improve this kind of patients' financial situation and social status would be obviously help them receive treatment on time, which will improve their life quality significantly.

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Chapter 73

Forecasting Incidence Seniority of Coal Workers' Pneumoconiosis Based on BP Neural Network

Jianhui Wu, Xiaohong Wang, Xinlei Guo, Guoli Wang, Yu Su and Lei Zhou

Abstract Applying the value of BP neural network model is discussed in the occupational prediction in order to provide evidence for pneumoconiosis prevention of dust operators. The data of patients who have been diagnosed as coal workers' pneumoconiosis were collected, and then the selected cases samples were randomly divided into three parts by the ratio of 3:1:1 to establish the BP neural network model, the fitting results of test and the forecast accuracy of the model, respectively. There was no significant difference between the model predictions and true value ($P = 0.785 > 0.05$), and the coefficient of determination between the true value and predictive value of validation sample and stimulation sample were 0.875 and 0.859, respectively. The predicted relative error of validation sample and stimulation sample was 12.8 % and 14.8 %, respectively, both less than 20 %. The model is good to be used in analysis that predicts incidence seniority of the health of coal workers, and the predictions were reliable and were worth to be widely applied.

Keywords Coal workers' pneumoconiosis · Incidence seniority · BP neural network · Prediction

73.1 Introduction

Coal miners' works in the world have been plagued by occupational hazards. In China, this problem is more prominent, especially with the acceleration of industrial economic development [1]. Ministry of Health in National Occupational

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Disease Report for 2009 shows at the end of 2009 the national cumulative report of occupational 72 million cases, of which 653,000 cases of pneumoconiosis. New cases of pneumoconiosis up to 14,495, 50 % of patients with coal workers' pneumoconiosis in 2009. Because there is no drug which can completely cure this disease, we need to advance in coal workers' pneumoconiosis to make accurate predictions. For this, effective prevention and control strategies are particularly important.

Most of the studies focused on the incidence situation survey and analysis of the use of the traditional single forecasting model on the incidence, prevalence and so on [2, 3]. The model has its own application conditions and scope, and it is difficult for individuals to make accurate statistical inference [4]. In order to achieve higher prediction accuracy of pneumoconiosis, prediction of the target individual, it is necessary to carry out the research.

BP neural network is a kind of artificial neural networks, information processing system to imitate the human brain structure and function of any nonlinear optimization can be achieved between the input and output mapping function of information processing through the system with adaptive process better fault tolerance, etc., and there were no requirements on the type and distribution of the data. So, compared with traditional statistical forecasting methods, it has a better space and prospect of broader application [5].

Using BP neural network model to predict the incidence seniority in coal mine workers, it is established by setting appropriate parameters to realize relation mapping of the influencing factors and incidence seniority to forecast incidence seniority.

Table 73.1 Quantized methods for influence factors

Factors	Code	Quantized methods
Workers division	x1	1 = workers exposure only in rock dust, 2 = workers exposure mostly in rock dust, 3 = workers exposure only in coal dust, 4 = hybrid workers, 5 = auxiliary workers
Seniority of exposure in dust	x2	Years
Coal mines	x3	1 = A mine, 2 = B mine, 3 = C mine
Date of birth	x4	1 = 1910–1919, 2 = 1920–1929, 3 = 1930–1939, 4 = 1940–1949, 5 = 1950–1959, 6 = 1960–1969, 7 = 1970–1979, 8 = 1980–1989, 9 = 1990–1999, 10 = 2000–2009
Date of beginning to exposure in dust	x5	1 = 1910–1919, 2 = 1920–1929, 3 = 1930–1939, 4 = 1940–1949, 5 = 1950–1959, 6 = 1960–1969, 7 = 1970–1979, 8 = 1980–1989, 9 = 1990–1999, 10 = 2000–2009
Age of beginning to exposure in dust	x6	Years
Incidence seniority	y	Years

73.2 Principle and Steps of BP Neural Network Modeling

73.2.1 Principle of BP Neural Network

BP neural network is a kind of artificial neural network which was successfully and most widely used. It is a multilayered network of “backward” learning algorithm and is composed of the input layer, hidden layer and output layer [6].

The learning process includes the forward propagation and error back-propagation of the signal. Forward propagation, the input information from the input layer through hidden layer has to deal with the transfer to the output layer. The output layer results exceed the expectations of the error and when transferred to the second phase of the back-propagation process are about to error signal along the connection path back-propagation layer by layer to the input layer, by modifying the connection weight values between the layers of nodes, and repeatedly adjust the network parameters, the error is assessed to all cells of the layers, and ultimately makes the minimum error signal.

73.2.2 Basic Steps of BP Modeling

Simply speaking, there are five steps to construct BP neural network: 1. network initialization; 2. database division; 3. defining the architecture; 4. training; 5. simulation. Network initialization is to select some network parameters, such as the number of network layers, the number of neurons in each layer, speed of training and algorithm of training.

73.3 Materials and Methods

73.3.1 Source and Treatment of the Materials

Data from the prevention of occupational diseases of Kailuan provide a mining group’s three coal plant since 1988, confirmed all the coal workers’ pneumoconiosis patients with occupational returns, proof of the diagnosis of occupational, health medical examination table information, etc. This topic choose six factors affecting incidence seniority of coal workers’ pneumoconiosis: type of work production, seniority of exposing in dust, mines, date of birth, date of beginning to exposure dust and age of beginning to exposure in dust for analysis [7, 8].

73.3.2 *Dividing the Workers*

The workers were classified as workers exposure only in rock dust, workers exposure mostly in rock dust, workers exposure only in coal dust, hybrid workers and auxiliary workers, based on occupational history of coal workers' pneumoconiosis.

73.3.3 *Quantized Methods for Influence Factors*

The details of date of birth and the age of dust exposure as a continuous variable, re-encoding, in order to facilitate statistical analysis, are shown in Table 73.1.

73.3.4 *Database Division*

The sample was divided into three parts according to the ratio of 3:1:1 at random to determine the partition variable for the establishment of the BP neural network model to test the fitting results and the prediction accuracy.

73.3.5 *Contents of the Prediction*

Types of work, and exposure time, and mine do not birth years, begin to dust's dust age as input variables, the incidence of seniority as the output variable, construct BP neural network model to predict the incidence of coal workers' pneumoconiosis seniority.

Table 73.2 The main parameters of BP neural network model

Network structure parameters	Network training parameters
Hidden layers: 1	Training algorithm: gradient descent method
Neurons in hidden layer: 9	A total cessation of training iterations: 13
Neurons in input layer: 6	Learning speed: 0.1
Neurons in output layer: 1	Performance function: SSE
Activation function in hidden layer: Sigmoid	SSE of testing set when stop training: SSE = 0.922
Activation function in output layer: Sigmoid	SSE of simulation set when stop training: SSE = 0.255

73.4 Application

Excel table is used to establish a database, and SPSS 18.0 is used to do data modeling and statistical analysis.

73.5 Results

73.5.1 Results of BP Neural Network Modeling

A network model with both satisfactory generalization ability and fitting ability was selected after multiple training. The BP neural network model on forecast of incidence seniority of coal workers' pneumoconiosis was finally constructed (Table 73.2).

73.5.2 Testing Efficiency and Accuracy of the Mode

The regression line was fitted by using sample of testing and sample of prediction, and the effect is very good. On the incidence seniority of sample of testing and sample of prediction-paired sample t test, there was no significant difference between observed value and predictive value ($t = -0.273, P = 0.785 > 0.05$). Mean relative error (MRE) of predicting outcome of sample of testing and sample of prediction are 12.8 and 14.8 %. Output of the forecast results influenced by many factors, and it is difficult to do a complete statistical analysis. The predictions of the mean relative error of 13 % can be considered a good result. Performance of the model fitting and extrapolation is good, and the predicting result is reliable. The results are given in Tables 73.3 and 73.4.

Table 73.3 The outcome of observed value and predictive value of data set

Data set	Observed value $\bar{x} \pm s$	Predictive value $\bar{x} \pm s$	R	R ²	R _{adj} ²	MRE (%)
Testing set	36.76 ± 10.61	36.98 ± 10.01	0.936	0.876	0.875	12.8
Prediction set	38.55 ± 10.73	38.66 ± 9.54	0.928	0.860	0.859	14.8

Table 73.4 Comparison of observed value and predictive value of prediction set

Incidence seniority	\bar{x}	n	s	t	v	P
Observed value	38.55	119	10.725	-0.273	118	0.785
Predictive value	38.66	119	9.542			

73.6 Conclusion

Pneumoconiosis incidence analysis and forecasting is an extremely important role in the prevention of occupational diseases as the number one occupational hazards to workers health. In order to achieve the ultimate goal of the non-incidence of workers in the rest of their life, the model is good to be used in analysis that predicts incidence seniority of the health of coal workers. It has made considerable progress with the application and development of the methodology, the application of artificial neural network model for disease prediction. Compared with traditional statistical forecasting methods, the BP neural network model uses less applications, assume that the advantage be applied by the individual prediction of the influence of many factors.

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Chapter 74

Microscopic Evaluation of Emulsion Stability and Formula Optimization for Emulsified Acid

Honglan Zou, Xugang Wang and Yandong Chen

Abstract Emulsified acid has gradually become an acid system commonly used in deep-penetration acid fracturing because of its good retardation. However, it is difficult to evaluate the stability of under reservoir condition, which results in unreasonable acid fracturing design. A quantitative and intuitive method has been presented for evaluation of emulsified acid properties under field application conditions. The conductivity is tested under different formulas, temperature and acid/rock reaction time by use of conductivity meter. The lower electric conductivity values emulsified acid gets, the better emulsified property it is. Emulsified acid stability and the processes of emulsion and demulsification are observed under different conditions by use of microscopy. From the results, it is shown that the microscopic characteristics of emulsified acid have a determinative role on the emulsion stability. The acid with good emulsion performance has following micro-characteristic: even droplet sizes, tight placement and small diameter. Also, a new emulsified acid formula with optimum stability has been derived. It provides important guidance for the field application of emulsified acid in acid fracturing.

Keywords Emulsified acid · Acid fracturing · Acid system · Stability · Microscope

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74.1 Introduction

Acid fracturing is one of the key technologies for stimulation of carbonate reservoirs. The commonly used acid systems include ordinary acid (predominately as hydrochloric acid), gelled acid, emulsified acid, foamed acid and in situ cross-linked acid, etc. As the modes of exploration and development evolve in China, reservoir stimulation gets difficult increasingly. Depth acid fracturing technique in carbonate reservoirs has been more emphasized. Since the acid systems required by depth acid fracturing must have good retardation and the reaction velocity between emulsified acid and rock is only 1/10 of that for ordinary acid and 1/3 of that for gelled acid [1, 2], the field applications of emulsified acid are broadened gradually. Recently, the quality and stability of emulsified acid systems have been enhanced remarkably in China, being also one of the primary reasons for more and more field applications [3, 4]. In the oil fields in West China, obvious results have been gained recently in acid fracturing by use of emulsified acid [5]. However, the evaluation method and determination of the specific performances depend only upon the measurement of the released system after simply heating, offering a qualitative performance evaluation for emulsion only and not satisfying the requirement of job design [6–9]. Therefore, a quantitative method for performance evaluation of emulsion stability and demulsification of emulsified acid has been developed, and good emulsified acid system can be achieved through screening and evaluation microscopically, of importance for the optimization of new emulsified acid formulas.

Acid fracturing technique requires the emulsified acid to satisfy following requirements in performance:

Good stability: it will have longtime standstill stability (longer than 1–2 days) after preparation, good stability [10] at formation temperature (during acid fracturing) and stability in reaction with subsurface rock (during acid fracturing).

Good retardation: it is required to have a dynamic reaction velocity between acid and rock slower than those of ordinary acid and gelled acid.

Demulsification of spent acid: it will be demulsified during backflow after acid fracturing, featuring low viscosity and easy backflow.

74.2 Determination of Emulsion Performance

74.2.1 *Experimental Principle*

Emulsion performance is determined primarily by use of conductivity meter. Since an emulsified acid is an acid in oil liquid and the electric conductivity of oil is close to zero, the better is the emulsion performance, the lower is the electric conductivity. Therefore, the performance of acid in oil type emulsified acid can be evaluated quantitatively by measurement of the conductivity of emulsified acid.

Conductivity meter is used for measurement of emulsified acids prepared in different formulas.

74.2.2 Experimental Results and Discussion

For the convenience of comparison, the conductivity of # 0 diesel was measured, as 0.09 $\mu\text{s}/\text{cm}$, the of 28 % ordinary hydrochloric acid as 19,000 $\mu\text{s}/\text{cm}$, and the conductivity of gelled acid was the same as that of the ordinary hydrochloric acid. See Table 74.1 for the test results.

74.2.3 Optimization of Acid Concentration as the Internal Phase

It is shown theoretically that the greater is the difference between the specific gravities of the external and internal phases, the poorer are the emulsion performance and the stability. In the conductivity determination by use of hydrochloric acid at three different concentrations, 15, 20 and 28 %, respectively, the emulsion performance of 15 % emulsified acid is the best, measured as 0.16 $\mu\text{s}/\text{cm}$, and those of 20 and 28 % HCl are similar.

74.2.4 Optimization of Acid-Oil Ratios

The acid-oil ratios in emulsified acid fall in a certain range. It is shown from the theoretical calculation that the maximum acid-oil ratio is 74 % for the emulsion with liquid beads in circular form and sized identically in a tight placement. As oil is the external phase, small ratio is not favorable for acid emulsification and the stability of the emulsified acid; but higher ratio would lead to material waste. Therefore, it is very important to evaluate and optimize the ratio between phases in the emulsified acid.

Under same condition, emulsified acids were prepared with acid-oil ratio at 50:50, 60:40 and 70:30, respectively, and conductivity values were measured. It is indicated from the results that the initial emulsion performance at an acid-oil ratio as 70:30 is similar to that at 50:50, a few acid is released after 24 and 48 h, and the conductivity is slightly higher than that at 50:50. Therefore, the acid-oil ratio as 70:30 used currently is basically reasonable.

Table 74.1 Experimental results of conductivity test for emulsion performance

Item	No.	Formula of emulsified acid	Oil:acid	Preparation	Conductivity $\mu\text{s}/\text{cm}$		
					Post-preparation	After 24 h	After 48 h
Acid concentrations	4#	15 % HCl + 2.5 % emulsifier	30:70	High speed rotating	0.16	0.18	0.47
	5#	20 % HCl + 2.5 % emulsifier	30:70	High speed rotating	0.37	0.38	11
	1#	28 % HCl + 2.5 % emulsifier	30:70	High speed rotating	0.33	0.44	0.44
	6#	28 % HCl + 2.5 % emulsifier	50:50	High speed rotating	0.33	0.36	0.38
	7#	28 % HCl + 2.5 % emulsifier	40:60	High speed rotating	0.47	/	/
Oil-acid ratios	1#	28 % HCl + 2.5 % emulsifier	30:70	High speed rotating	0.33	0.44	0.44
	12#	28 % HCl + 2 % emulsifier	30:70	High speed rotating	0.48	/	/
	1#	28 % HCl + 2.5 % emulsifier	30:70	High speed rotating	0.33	0.44	0.44
	13#	28 % HCl + 3 % emulsifier	30:70	High speed rotating	0.41	/	/
Doses of calcium carbonate	14#	28 % HCl + 2.5 % emulsifier	30:70	1 g CaCO ₃ flour is added	0.41	/	/
	15#	28 % HCl + 2.5 % emulsifier	30:70	5 g CaCO ₃ flour is added	0.58	/	/
	16#	28 % HCl + 2.5 % emulsifier	30:70	10 g CaCO ₃ flour is added	0.59	/	/
	17#	28 % HCl + 2.5 % emulsifier	30:70	15 g CaCO ₃ flour is added	19	/	/
	18#	28 % HCl + 2.5 % emulsifier	30:70	20 g CaCO ₃ flour is added	1820	/	/

74.2.5 Optimization of Emulsifier Concentration

Emulsified acids were prepared at different concentrations of emulsifier: 2, 2.5 and 3 %, respectively. From the results, it is illustrated that the conductivity of emulsion prepared at an emulsifier concentration as 2.5 % is the lowest, having the best emulsion performance.

74.2.6 Effect of Reaction Between Acid and Rock

Calcium carbonate flour in different doses was added into 100 ml emulsified acid to simulate the reaction between acid and rock, and the conductivity of the emulsified acid was measured after reaction over 30 min. The results showed that the reaction was intensified, and the conductivity was increasing as more calcium carbonate flour was added continuously. After 10 g of calcium carbonate flour was added, the conductivity value increased little, indicating a stable emulsion performance. After 15 g of calcium carbonate flour was added, the conductivity increased greatly to 19 $\mu\text{s}/\text{cm}$, indicating an abrupt change in emulsion performance and the start-up of demulsification of the emulsified acid. After 20 g of calcium carbonate flour was added, the conductivity increased to 1,820 $\mu\text{s}/\text{cm}$.

74.3 Microscopic Observation of Emulsion Performance

74.3.1 Experimental Principle and Method

To fully understand the mechanism of emulsion and demulsification of emulsified acid, it is necessary to observe the changes in the microscopic behavior of emulsified acid under various conditions. Initially, environmental SEM was used. However, it was found from the experiments that the observation chamber in the environmental SEM had high vacuum (10⁻⁷ Pa), where the emulsified acid tended to vaporize very easily, observation was affected and its large magnification impaired the image clarity of the emulsified acid beads on the whole. For this sake, polarization microscope (with magnification as 100 and 200 times) is used for a thorough observation.

In this test, the emulsified acids prepared under various conditions had been observed. After the emulsified acid is prepared, a thin section is made on a carrier slide by a dropper and placed on the carrier stage of the polarization microscope. Examination is made through eyepiece at various magnifications, while the size of the liquid bead is read by use of the scale in the microscope. Each sample is examined at 5–10 different points, and photograph is taken at the selected representative point. Obviously, an emulsified acid with good emulsion performance

should have such microscopic features: uniform bead size, tight placement of beads and small bead diameter.

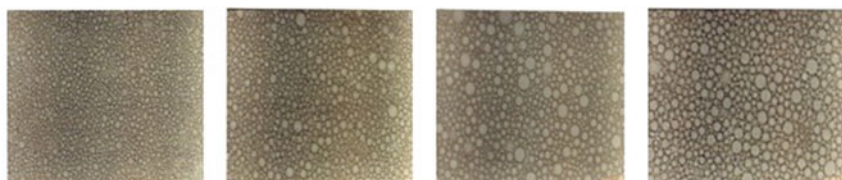
74.3.2 Experimental Results and Discussion

Similar to the samples of emulsified acid used for conductivity measurement, microscopic examination is made, while conductivity of the emulsified acid is measured. See Figs. 74.1, 74.2 and 74.3 for the examined photographs.

Emulsified Acids Two kinds of emulsified acids viewed microscopically had their liquid beads in circular form, sized uniformly in tight placement, indicating fairly good emulsion performance. The first kind of emulsified acid had its liquid beads in fairly uniform size of 10–20 μm , featuring good stability macroscopically. The second kind of emulsified acid had the bead size as 5–30 μm , mostly as small beads, not as homogeneous as the first kind, featuring standstill stability poorer slightly than the first kind, but having a greater viscosity. At a phase concentration of hydrochloric acid as 28 %, the microscopic behavior of the second kind of emulsified acid presented as extremely uneven sizes of beads, 10 μm at minimum and 110 μm at maximum, already stratified macroscopically.

Acid Concentrations Emulsified acids were prepared at three different HCl concentrations as 15, 20 and 28 %, respectively, and examined microscopically. From the microscopic images, it can be illustrated that the emulsified acid prepared by 15 % HCl showed the best tightness in bead placement, fairly good homogeneity of beads with the diameter smaller slightly than that prepared by 28 % HCl; the emulsified acid prepared by 20 % HCl had poorer homogeneity slightly and irregular bead forms had been found at a magnification of 600, featuring poorer emulsion performance and higher conductivity than those of the other two cases, and that prepared by 28 % HCl had good tightness in bead placement, with bead size equivalent to that in 15 % HCl case, but slightly larger. Since high acid concentration facilitates good effect of acid fracturing, emulsified acid prepared by 28 % HCl is chosen from the optimization.

Acid Oil Ratios Under same condition, emulsified acids at different acid-oil ratios as 50:50, 40:60 and 30:70 were prepared, respectively, and examined



150cp (droplet size 2~12 μm) 95cp (droplet 10~30 μm) 60cp (droplet 12~40 μm) 30cp (droplet 15~45 μm)

Fig. 74.1 Microscopic behaviors of emulsified acids prepared with different emulsifiers (28 % HCl + 2.5 % emulsifier, 200 times)

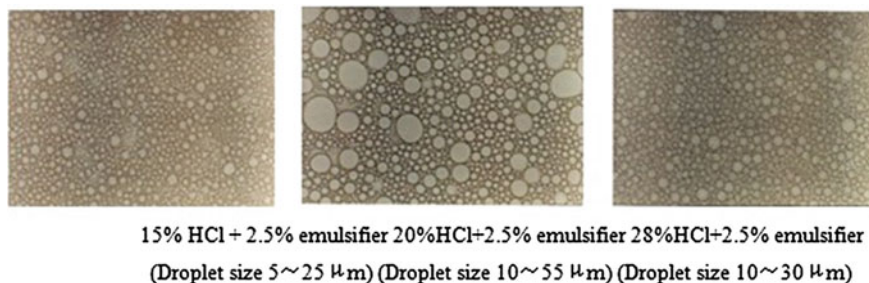


Fig. 74.2 Microscopic behaviors of emulsified acids at different acid concentrations (200 times)

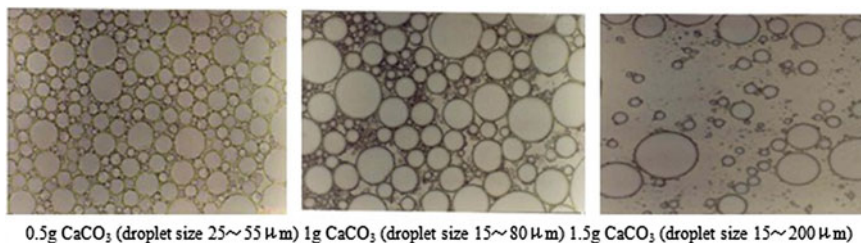


Fig. 74.3 Microscopic behaviors of emulsified acid (28 % HCl + 2.5 % emulsifier, 200 times)

microscopically. It is found from the observation that those at the ratios as 50:50 and 30:70 had fairly good emulsion performance, and the liquid beads were sized as 10–20 μm in tight placement.

Emulsifier Concentrations From the observation of emulsified acids prepared with emulsifiers at different concentrations as 2, 2.5 and 3 %, respectively, it is shown that the liquid beads of emulsified acid prepared at an emulsifier concentration of 3 % had uniform diameters in a range from 5 to 20 μm in tight placement, featuring good emulsion performance.

Effects of Various Durations at 90 °C The emulsified acids were heated at 90 °C for different durations such as 1, 15, 30 and 60 min, respectively, and then examined microscopically. It can be seen from the results that the beads had uniform size from 10 to 30 μm for a heating duration of 1 min, featuring tight placement and good emulsion performance; large beads had already appeared for a heating time of 15 min with the emulsion performance not affected; for a duration of 30 min, the beads had uneven sizes from 10 to 70 μm , also with the emulsion performance not affected yet; for a heating time of 60 min, the beads had their sizes in a range from 20 to 70 μm , with the emulsion performance impaired. Therefore, the performance of emulsified acid can be maintained for 30 min under static condition.

Effect of Calcium Carbonate Flour Calcium carbonate flour was added at different doses to simulate the effect of Ca ion during reaction between acid and rock. The test results revealed that the bead size was even in a range of 10–30 μm ,

featuring tight placement and good emulsion performance for the emulsified acid without addition of calcium carbonate flour; the bead size was even, but became large in a range of 25–55 μm , and good emulsion performance was still maintained for the emulsified acid with 0.5 g calcium carbonate flour added; the bead size was not so even, and continued to grow up to a range of 15–80 μm , but good emulsion performance was not impaired for the emulsified acid with 1 g calcium carbonate flour added; after 366.5 g calcium carbonate flour was added, bead size became 15–200 μm , and it had been already demulsified.

74.4 Conclusions

A quantitative evaluation and experimental method for emulsion performance of emulsified acids have been developed, including emulsion evaluation through conductivity test and microscopic observation of liquid droplet size and homogeneity by use of polarization microscopy.

The emulsion performances of various types of emulsified acid are basically similar. The optimum conditions for acid emulsification include optimum acid concentration as 15 % while that of acid prepared at a concentration of 28 % has fairly good emulsion performance; the acid-oil ratio of 30:70 can turn out a fairly good emulsion; high rotary speed facilitates to enhance the emulsion; the emulsifier concentration of 3 % is helpful to have good emulsion performance; and the emulsified acid begins to break when the dosed volume of calcium carbonate flour is over 15 g.

The microscopic analysis by use of microscopy has indicated that the emulsified acids with good emulsion performance have the features of even size, tight placement and small diameter. The microscopic behaviors have determinative role for the emulsion performance.

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Chapter 75

Study on Random Walk-Based Protein Function Prediction Method

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Abstract In recent years, as high-throughput methods have been developed and improved, a large number of protein interaction data have been generated. It is still a challenge to predict the function of these proteins because quite a few proteins remain functionally unknown in protein interaction network. Considering that the proteins with similar function have similar annotation patterns, a weighted random walk algorithm is used to find the global information of each protein in the protein interaction. We fuse the different experimental data to obtain protein interaction data with reliability. The annotation patterns are further extracted. Finally, K-nearest neighbour multi-label classification algorithm predicts multi-functions of the unknown proteins. The results show that the proposed method can improve performance.

Keywords Protein interaction network · Random walk · Protein function prediction · K-nearest neighbour

75.1 Introduction

A large number of high-throughput protein interaction data have been used to predict protein functions successfully, and many algorithms have also been developed and completed, such as the nearest neighbour voting method, chi-squared method,

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functional flow method [1], probabilistic analysis method [2], Markov random field Method [3] and correlation mining method [4]. The protein–protein interaction network can be described as a complex network of associated proteins [2]. The computational analysis of PPI network starts from the representation of PPI network structure, and the simplest is generally modelled by a graph whose nodes correspond to proteins and edges of interactions between proteins [5]. Based on this, various computational methods, such as data mining, machine learning and statistical methods, are used to reveal the structure of PPI network at different levels. The research on the graph corresponding to the network will have a different perspective, for example, the adjacent proteins in the graph are considered to have the same functionality or be related. Therefore, we can predict the protein function by investigating the proteins that interact with the target proteins or the protein complexes that they belong to [6].

We distinguish two types of the function predicting approaches based on protein interaction network, the module-assisted method and direct methods [7]. The module-assisted methods [1] perform a module-wide annotation by analysing the functional module of the interaction network, such as protein complex, for example, by using the graph clustering method, network distance-based hierarchical clustering [8] and Markov random field method.

The direct methods assume that the neighbour proteins have similar functional annotation in the interaction network. Most of the methods [9] consider the annotation between target protein and direct interaction neighbours. Another approach considers indirect neighbours [10] and distinguishes functional relationship between the direct and the indirect neighbours within the two layers. The functional flow method [1] is the simulation of the network flow from known protein to target protein annotation.

The common defect of the above two methods is their hypothesis that the proteins that have similar functions are topologically adjacent in the interaction network, but in real network, not all of the proteins meet with this. The direct methods limit the use of the information of some neighbours. So, they cannot predict the function of the proteins surrounded by unknown interactions.

The protein interaction network can be represented by graph theory naturally, so we can use random walk algorithm to characterize the affect of the whole protein interaction network to the protein function, using the converged probability distribution. A protein may have more than one function simultaneously, so the function prediction of the protein is a multi-label classification problem.

The rest of this paper is organized as follows. In [Sect. 75.2](#), we provide details of our proposed approach. [Section 75.3](#) describes the experimental results and analysis. [Section 75.4](#) draws the conclusions and discusses the future work.

75.2 Materials and Methods

The schema that we propose has three steps. Firstly, we can integrate multiple data sources from different experiments and obtain the data of protein interaction with reliability. Secondly, we can extract the annotation patterns in the protein

interaction network, using random walk algorithm. Finally, we can identify the unknown proteins from the protein sample sets by employing K-nearest neighbour multi-label learning algorithm.

75.2.1 Multiple Data Source Fusion

When traditional methods execute functional prediction of un-annotated proteins, using protein interactions, they often treat the different interaction samples as the same and seldom take account of the data quality of the protein interaction. But because of the limitation of the experiments and methods, the measured protein interactions have high false positive. The false-positive data will affect the performance of the protein functional prediction. If we distinguish the data according to the level of the reliability of the protein interaction data, and integrate the interaction data with different reliability, we can improve the protein functional prediction effectively. The experiments and results later in this paper prove the fusion can promote the effect of prediction.

The protein interaction data are usually obtained from different experimental methods. We can compute the reliability value by the methods such as Nabieva [1]:

$$r_i = s_i/n_i \quad (75.1)$$

where s_i is the number of protein interaction pair that has the same function in data source i and n_i denotes the total number of protein interaction in it. When we get the reliability of data source i , the reliability of the protein u and v is as follows:

$$r_{u,v} = 1 - \prod_{i \in E_{u,v}} (1 - r_i)^{n_{i,u,v}} \quad (75.2)$$

where $E_{u,v}$ is the data source set that has u and v interaction pair and $n_{i,u,v}$ is the number of interaction pair that contains u and v in data set i .

75.2.2 Protein Feature Encoding

In this paper, we call the functional annotation situation of all the protein that interact with protein P as protein P 's annotation pattern.

Usually, encoding the protein of the protein interaction network is based on such similar premise, taking account of the functional annotated situation of the protein that interacts with it. For protein i , its annotating pattern x_i can be denoted as:

$$x_i = [x_{i1}, x_{i2}, \dots, x_{im}] \quad (75.3)$$

where m denotes the number of classification in the classification catalogue and it is FunCat classification catalogue [11] and its value is 17. x_{ij} denotes the number of proteins that have function j interacted with protein i .

That is to say, if the annotation patterns are similar, the two proteins have similar functional annotation. Here, we introduce random walk algorithm [11] to get the proteins that are similar to the un-annotated functional proteins (they may be not directly adjacent in network). The random walk algorithm utilizes the global topological information of the network by simulating the random walk behaviour of the particle. The weighted random walk algorithm is described as follows:

Input: Network $G = (V, E)$

Starting point i ;

Restart probability α .

Output: Steady-state vector of vertex n .

X_i is the starting point of $n \times 1$, which denotes the initial state of the particle.

Except the i th factor corresponding to the starting point is 1, others are all 0;

M denotes the transfer matrix of graph G ;

Initiate vector S_i as X_i ;

While (S_i does not converge):

$S_i = \alpha X_i + (1 - \alpha)M_T S_i$;

End while

Output the final steady-state vector S_i .

The adjacent matrix of protein interaction network is expressed as $A = (a_{ij})$, $i, j \in V$. The general method represents the weight of the side in the graph as 1. In this paper, taking account of the reliability of two proteins interacting with each other, the probability is computed as the weight as follows:

$$a_{ij} = \begin{cases} r_{ij} / \sum_j r_{ij}, & j \in N(i) \\ 0, & \text{otherwise} \end{cases} \tag{75.4}$$

where $N(i)$ is the set of the proteins interacting with protein i .

Let D denote the diagonal matrix with $D_{ii} = 1/d(i)$, $d(i)$ is degree(i), then transfer matrix $M = DA$. The general value of α is 0.8 [11].

Let $s_{ij}(t)$ denote the probability that the particle starts from i and, after t steps of random walk, locates at point j .

$$S_i(t) = [s_{i1}(t), s_{i2}(t), \dots, s_{im}(t)]^T \tag{75.5}$$

where $S_i(t)$ denotes the probability distribution of all points located in the graph that starts from point i , after t steps of random walk.

According to the definition of random walk rule, after $t + 1$ steps of random walk, the probability of the particle appearing at various points is as follows:

$$S_i(t + 1) = \alpha X_i + (1 - \alpha)M^T S_i(t) \tag{75.6}$$

where α denotes the restart probability of each random walk step of the particle and X_i is vector of $n \times 1$ and it denotes the initial state of the particle. Except the i th factor corresponding to the starting point is 1, others are all 0. According to the above, after repeatedly random walk for some time, the probability that the particle

appears at all of the vertices will stabilize, that is to say $S_i(t)$ converges to vector S_i ; it is also called steady-state vector. The steady-state vector is closely related to the topological structure of the protein interaction network, and it can integrate the information of network global and local topological structure and measure the relation degree between target proteins i and some other proteins in the network. So, the time percentage that it spends on a vertex denotes the degree of how this point is close to the starting point. The proteins in the random walk results are the global neighbours of the initial protein; we call it neighbourhood profile of the initial protein, denoted by $S_i, i \in [1, n]$,

$$S_i = [s_{i1}, s_{i2}, \dots, s_{in}]^T \quad (75.7)$$

Let S_i denote the probability distribution of all of the vertices located in the graph that starts from point i after convergence.

We got all the protein global neighbours firstly, and then, we transferred the neighbourhood profile to function-based annotation pattern. Node i 's value S_{ij} can act as the similarity of node i to j . For simplicity, we have 3 proteins, among which protein 1 interacts with protein 2 and protein 3, respectively. Supposed that the random walk algorithm results that it executed on protein 1 is the neighbourhood profile is (0.7, 0.3), where 0.7 corresponds to protein 2, and 0.3 to protein 3. The protein 2 has function A and B , and protein 3 has function B and C . With the weights corresponding to these two proteins, we can get vector (0.7, 1.0, 0.3), which is corresponding to function A, B and C . Then by normalizing this vector, we finally got the functional annotation pattern (0.35, 0.5 and 0.15) of protein 1.

Based on annotation of protein, we define an annotation mark e_{ja} . When protein j has function a , its value is 1, otherwise its value is 0. Then, in the functional annotation pattern of protein j , the corresponded probability of function a is as follows:

$$S_i^f(a) = \sum_{j=1, j \neq i}^n S_{ij} e_{ja} \quad (75.8)$$

The corresponded probability vector of all of the function classification is as follows:

$$S_i^f = [s_i^f(1), s_i^f(2), \dots, s_i^f(a), \dots, s_i^f(m)] \quad (75.9)$$

where m denotes the number of function classifications. The normalized vector S_i^f is the functional annotation pattern of protein i .

75.2.3 Multi-Label Classification Method

In the introduction, we talked about that the function prediction of protein is a multi-label learning problem. Here, we employed ML-KNN Algorithm [12]. The algorithm is a method to handle multi-label learning problems. It combines KNN algorithm and Bayesian algorithm, and so it can classify multi-label data effectively. We treat the

annotation pattern sets of every protein obtained from 2.2 as a training sample. The algorithm firstly found the k -nearest neighbours in the training sample sets, as same as the traditional KNN algorithm, employing Euclidean distance measurement. Then, it travelled all of the classification labels, computed the prior probability of every label according to the classification label of the k -nearest neighbours and then computed the maximal posterior probability of every classification label having and having not to unclassified sample.

75.3 Experiments and Analysis

75.3.1 Experiments

The experiments in this section are mainly to predict the function of budding yeast protein and execute the annotation. Currently, there are mainly two annotation catalogues [11], the Gene Ontology and FunCat. Here, we select FunCat 2.1 as the function sets to be predicted. The FunCat function catalogue is organized hierarchically; the father node denotes the relation of 'is a', and it characterizes more 'general' function than the child nodes, and the function denoted by child nodes is more specific. The experiments select highest level of function class of FunCat as predicting class and 17 of them annotated the budding yeast protein. To facilitate the experiment design, we encode the ID of FunCat catalogue in order from 1 to 17 and get FunctionID.

The budding yeast protein interaction data can be downloaded from database BioGrid. The version we adopted is BIOGRID-ORGANISM-Saccharomyces_cerevisiae-3.1.76, which contains 259016 interaction information obtained from 27 kinds of high-throughput technology by experimental methods, respectively. We firstly integrate the data obtained from different experimental methods and then combine the data that are annotated by FunCat function and the integrated protein interaction data, as the function predicting data of the algorithm in this paper. Before the experiment, the algorithm will pre-process the data and delete the unannotated proteins, that is, the proteins that do not interact with other proteins and the redundant protein interaction data.

According to the computational method of 2.1, we can get the reliability of the data set used in our experiments from different experiments. The experiment from which we get protein interaction data is different; the reliability of the data set is different. The reliability of protein RNA is the minimal, that is, the interaction protein that have the same function obtained from this experiment accounted for about 78 %. The reliability of FRET is the maximal, that is, the interaction protein that have the same function obtained from this experiment accounted for about 99 %.

75.3.2 Evaluation Criteria

The data used in the experiment have been introduced above; here, we mainly introduce the related evaluation criteria. The evaluation criteria of multi-label classification are mainly divided into the following categories: the first one is to predict the sample of all of the test set and then to average according to the difference of result sets and actual real labels, which is called example-based evaluation criteria, which includes Hamming loss, classification accuracy, recall, precise, F1-measure and accuracy. The second one is label-based to assess and calculate every label and then to average all of the labels, which includes micro-averaged and macro-averaged. And the third one is as mentioned above, ranking-based class, which includes one-error, coverage, average precision, IsError, ErrorSetSize, ranking loss and mean average precision (MAP).

We also get micro-averaged AUC and macro-averaged AUC on the basis of traditional area under ROC curve AUC.

75.3.3 Experimental Results Analysis

We implement our experiments on the basis of Mulan, which is a Weka-based open source project. It achieves some multi-label classification and rank algorithms and provides open interfaces, which allows the users to achieve their own multi-label classification algorithm.

The protein interaction data are all from BioGrid. We exploit the different approaches that we have mentioned above to initial data. Here, we select the above indicators as the evaluation criteria to comprehensively evaluate and compare the results. The different experiments are described as follows:

Experiment 1: Protein interaction network data without weights and exploit traditional nearest neighbour voting-based method to compute the annotation pattern.

Experiment 2: Exploit the random walk method to compute the annotation pattern only.

Experiment 3: Take account of the reliability of different experimental sources and then combine random walk method to compute the annotation pattern.

We select a different parameter K to experiment. For the purpose of computation, we execute the experiment 1 and employ 10-fold cross-validation. The experimental results are shown as Fig. 75.1. The results show that the performance affect of K value is not so strong in the ML-KNN algorithm. So, we set the value of K to 10 in the rest of the experiment in this paper.

Comparing the results of experiment 1 and experiment 2, we employ nearest neighbour voting method as our annotation pattern in experiment 1 and only consider the function of the known protein that directly interacts with target protein to denote the annotation pattern of target protein and do not take account of the affect of the proteins that have indirect interactions. Experiment 2 uses random

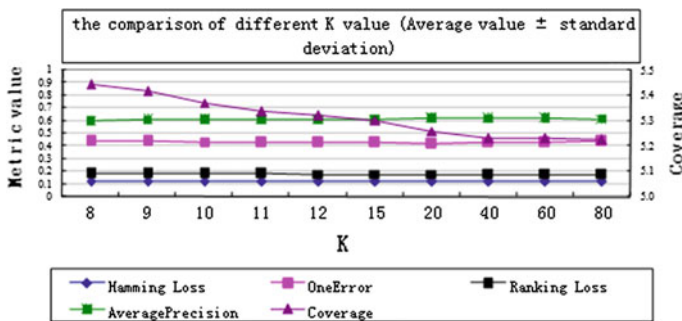


Fig. 75.1 The comparison of different k value (average value \pm standard deviation)

walk algorithm, taking account of the affect of the indirectly interacted protein, by integrating the global and local information of the interaction network topology, and significantly improves the prediction effect.

In experiment 3, we take account of the reliability of the protein interaction, with the comparison of experiment 2 without the reliability. The performance of our algorithm improves to some extent again. The introduction of the protein interaction reliability to interaction network can reduce the impact of the noise data and increase the weights of high reliability; thus, it can improve the performance of the algorithm predicting the protein function. Therefore, it is necessary to pre-process the data source, taking account of the reliability, when we predict the protein function.

75.4 Conclusions

The paper mainly introduces the multi-label function prediction method of protein based on a random walk algorithm. It integrates several data sources, based on the global topological information of the target protein in the protein interaction network, and also exploits the annotation information of the known protein in the network to implement the multi-label classification of protein. The results show that it can solve the multi-label function prediction problem effectively, and it also provides new solutions and frameworks for making use of the interaction network to execute the protein function prediction. The three steps mentioned in the paper are independent and flexible. We can employ other methods to make any step better and to improve the performance of the algorithm. In the future, we will take the integration of other sources, such as the information of integration of the protein domain and the protein sequence alignment, to further refine the reliability of the protein interaction; simultaneously, we will also consider the adoption of the other multi-label algorithms or the integration of different multi-label classification algorithms.

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Chapter 76

Creation of the Beauty of Product Functions

Jisheng Chen

Abstract Function is the core of the product design; how to create the products fulfilling the needs of the consumers on use functions and make an improvement to the quality of life is one of the most important duties of the product designers. In this paper, the creation of the beauty of product functions is discussed from several aspects such as life research, science and technology innovation, ergonomics and the differences between the function beauties of product design of different styles.

Keywords Beauty of functions · Life research · Science and technology innovation · Ergonomics

76.1 Introduction

Functions of a product comprise of the practical and humanistic values of the product. The beauty of product functions refers to the synthesis of multiple factors such as necessity, rationality, scientific quality, social role of a product. With the purpose of creating the products with the beauty of functions, it is necessary for the product designers to experience and observe life and look for the needs and differences of people in life and then carry out all kinds of designs, which are centered at people.

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76.2 Creation of the Beauty of Product Functions

In the modern times, society is a diversified environment, and the targeted objects in the product designs have already trended to be globalized. In the meantime, the competition between different enterprises has proven to be increasingly fierce all over the world. Therefore, to stand in an invincible position in the fierce international market competition, it is highly necessary for the enterprises to continuously make innovations and develop new products for fulfilling the needs of different countries, different regions, different cultures and different people [1].

Chinese giant home appliance enterprise Haier used to hold an exhibition for home appliance products at the domestic market, in which the home appliance products from Asia, Africa, Europe, America and other regions were displayed by categories. The designs of all kinds of white home appliance products were slightly different on this exhibition. For example, a Mike refrigerator which was produced in the United States for export to the markets of other countries was white entirely and externally shaped like a square (length, width and height all are 1.2 m), and the difference was that the length, width and height of its chilling chamber all were 1 m and took about 83 % of the entire refrigerator volume, while its fresh cabinet accounted for less than 17 %. This is because the semi-finished food products and meat are taken by most families in the United States, and also, fast food is quantitative in each meal and generally does not need to be preserved except eggs and a few of vegetables. However, in China's families, the demand on a refrigerator is on the fresh preservation. Therefore, the part of fresh preservation in a refrigerator is necessary to occupy more than 50 %.

The difference between product designers and product engineers in duties is that product engineers attach higher importance to the realization of the technical means of product functions, but product designers lay a stress on the studies of the people's life. In the design and development of products of the previous time, the first was to make a research on technology, and the second was to study how to apply technology in the production and life of people. However, at the present time, the design and development of a product is started from the studies of the production and life of people, and also, top priority is given to the needs of people, and then the supports in techniques are sought.

Although the premise for the design of product practical functions is getting a real understanding of the demands of people on life, the innovation of technologies can never be ignored. However, the work focus of the product designers is not the innovation of science and technology, but also it is necessary for them to pay attention to the current achievements of science and technology in the different areas and convert the innovations of science and technology to productivity timely and accurately, for the ultimate purpose of making an improvement to the feasibility of the creation of the beauty of the product practical functions. For example, cars of new models at present are designed with a function of automatic yaw correction. When the driver makes an adjustment to radio and even sneeze, it is possible that the change in the strength in arms makes the steering wheel turned

away, or the car burst into the adjacent lanes, or a serious accident happen unexpectedly. Therefore, the system of automatic yaw correction can play a role in correcting mistaken operations of drivers. Automatic yaw correction is also called as a lane departure warning system, which constantly collects the white marking dotted line through the camera and will send a prompt to the drivers through the vibration of the steering wheel or through a sound and light warning if the car departs from the original lane when the direction indicator lamp has not been started up yet. At present, BMW 5-series, Mercedes-Benz E-Class and Infiniti M-series have been successfully equipped with a system similar to the system of automatic yaw correction. The system of yaw correction in a small number of car models was more advanced, which has the ability to automatically exert an opposite-direction force on the steering wheel when sending a prompt to the driver. With such a system, the driver can still pull back the car on the track even if his two hands have left the steering wheel, and the operation only needs 8 s in total.

Functions of a product comprise of the practical and humanistic values of the product. For this reason, the beauty of functions of a product has a close relationship with many aspects of the product design [2]; it is necessary for a product to possess not only the beauty of practical functions, but also the humanistic values such as the visual beauty, auditory beauty and tactile beauty. The emphases on the embodiments of the functional beauties of different types of products are different as well. For example, in the hospitals, there are a large number of patients to need a transfusion more than once for a long time. The traditional transfusion system is designed to be disposable. However, in the real life, it is necessary for the patients in the hospitals to be transfused with all sorts of different medicines within the same day [3], or continuously for multiple days. In the process, needles are necessarily inserted into the patients over and over again. In this way, a needle is inserted into a patient when a medicine is necessarily inputted in him, and hence, it is necessary for the patient to receive multiple insertions within a day, making him very painful. In addition, a disposable transfusion system cannot be fixed stably and also makes it easy for the needle and the liquid medicine to have a problem. As a result, a needle is necessarily inserted into the patient, making him suffer the repeated insertion of needle. Therefore, the design and use of the needle-syringe injector make the pain suffered by the patients in transfusion reduced greatly. Infusion tube is allowed to be inserted into a needle-syringe injector circularly, and thus, needle-syringe injector can be inserted into blood vessel and applied repeatedly, making the pain suffered by patients from repeated insertion of needle. In addition, a needle-syringe injector can be fixed stably skillfully, and makes it difficult for the needle and the liquid medicine to have a problem; after a medicine is totally lost, the needle-syringe injector fixed on the arm of the patient can be retained and only the infusion tube is unloaded, and then other medicines can be easily used, and it is only necessary to insert the infusion tube on the joint of the injector. Therefore, repeated insertion of needle is avoided, and also, the relevant pains are cleared away. The painful experience of the patients is greatly eased.

Fig. 76.1 New electric drill design



Only the design of the needle-syringe injector is changed little, but brings about an extremely great convenience for the life of people.

The premise for the design of the tool products is to meet the needs of the practical functions, but their safety performance in use is the core of the beauty of functions. Therefore, it is highly necessary for the tool products to provide people with a safety performance in use. Safety is the most fundamental standard for the beauty of product functions; the products with a good safety performance have the ability to maintain the security interests of the consumers and also can be trusted by the consumers. However, the requirements on the beauty of humanistic value are relatively low in comparison with other types of products.

For example, new electric drill design is as shown in Figs. 76.1 and 76.2. As is known to all, when an electric drill is being used, the pin is rotating with high speed, making the operation risky to some extent. The dust spilled from the pin not only pollutes the environment, but also directly imposes threats to the health of the persons if the dust is breathed in.

Fig. 76.2 New electric drill design



However, in the design of the above new electric drill, the actual safety issues in the operations are seriously taken into account, making the operations more secured. In the electric drill, the way of pressing the back cover is used for controlling the rotating speed of the pin: the rotating will be faster if the greater strength is applied on the back cover. This special operation model can help effectively prevent the motor uncontrolled because of the sudden starting-up of the motor. In addition, this type of electric drill is equipped with a transparent protection cover in the front end, which can not only play a role in stabilizing the body of the drill, but also can prevent the dust splashing to all directions in the operation process and reduce the harms caused by the breathing of dust to operation personnel.

Therefore, under the premise that the realization of the basic functions of product is not affected, not only the safety performance but also the use quality of the electric drill is greatly improved.

The functional beauty of the tool products is basically reflected in two aspects (practicality and safety). However, the functional beauty of the products for everyday use is mainly embodied in the perfect combination of the practical functions with the humanistic value: the premise is to meet the needs of people on product practical functions, and simultaneously, the creation of humanistic value is very crucial.

Relevant data show that the products with the same functions can stimulate consumption and will make the added value of products increased by 10 % if they have the ability to attract more people in humanistic value. In the meanwhile, the products have greater commercial values, win market share and make an improvement to profits. Therefore, it can be seen that in the design of the products for everyday use, the products will occupy a market share and realize their commercial values only if product practical functions can be perfectly combined with humanistic value.

For example, the design of mobile phones, in addition to the basic functions of conversation and short messages, is necessary to give a consideration to the pursuit of different people on the humanistic value.

Also, it is necessary to give a reflection to the high-grade humanistic experience in the design of mobile phones, which are targeted at successful people.

However, if the mobile phones are targeted at women, it is necessary to give an embodiment to the pursuit of woman in soft colors and lines, portable feature and pure beauty. In short, it is necessary for the mobile phone products to accord with the esthetic feelings needed by the different groups of people.

In the auditory sense, it is necessary to add verisimilar polyphonic ringtones as well as rich and diversified auditory esthetic experience feelings for the young people. However, for the old people, the most important for the mobile phone products is that the volume of the bell should be louder properly for the sake of easy use.

Therefore, from above analysis, it can be known that in the creation of the humanistic value, it is necessary to give a full consideration to the esthetic pursuit of the users.

In the design of the practical functions of product, it is necessary to give a full consideration to the physiological characteristics of the different users. In other words, any product design, which is targeted at people, is necessary to meet the physiological characteristics of people.

The people from different countries, nationalities and regions not only have common characteristics, but also have unique characteristics. Besides, the people of different ages and genders are also different in height, physical condition, character and behavioral habits.

Therefore, in the design of products, it is necessary to give a full consideration to the physiological characteristics of the practical people and meet their physiological characteristics demands.

Ergonomics, as an independent subject, mainly studies the physiological and behavioral characteristics of human beings, making the problems between human and products solved with rationality and the designed products adapt to the people, but not people adapt to the products.

In a foreign design magazine, a cartoon was published, in which a "horse captain" in a flying plane was completely confused and did not know what to do in face of all the same-shape buttons. This was about obvious sarcasm on the design in which the factors of the ergonomics were not taken into account and also gave an expression to the importance of consciously using the ergonomics in the designing process of a product.

For example, in the design of the handheld products, it is necessary to give a consideration to the parameters of the ergonomics. The small handheld products can include shavers, hair dryer and mobile phones. The bigger includes cooking utensils, tennis racket, badminton rackets, table tennis shoot and all kinds of handheld electric tools. In the design of these products, the handle design is mainly taken into account. Also, in the process of designing these kinds of products, it is necessary to pay attention to the physiological and behavioral characteristics; the handling part should not have sharp and side edges; the surface and quality of the handles should be capable of enhancing the surface friction; if there is not a heavy groove designed for the handles, the artifice of the handheld products can be straight in use because the handles cannot match with the shapes of the fingers of all users. Thus, the fatigue of the wrist can be reduced. According to the requirements on the external force, the diameter of the handle can be determined, but it is necessary to avoid the polishing treatment of handheld parts. In the design of a handheld product, one of the most important factors necessary to be considered is the contact surface between product and hand.

After the development of multiple centuries, there have been easy-to-use and elegant and beautiful handles designed for a great number of manual tools now; the materials that are used for making handles are suitable for the contact with the hands of human.

76.3 Conclusions

Therefore, the design of handles plays a direct role in the exertion of the product functions and the reflection of product comforts. These effect factors have been widely researched by people in the modern times, and also, a large amount of relevant design data have been found.

Along with the rapid progress of the society, the development of science and technology, the constant change in the environment and the continuous practice in product design, the issues involved in the creation of the beauty of product functions and the focuses for considering the factors of product design will continue to develop and change as well, for the ultimate purpose of meeting the physical and psychological needs of the people.

In the meantime, the concept of product design will also attain a continuous development, and becomes mature with a gradual step, and ultimately changes into a new design philosophy.

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Chapter 77

Research of the Beauty of the Laws of Product Forms

Jisheng Chen

Abstract Everybody likes beauty when shopping. First, people need functions. Second, people pursue beauty of different forms. How to produce forms that satisfy people's psychological demands, and research consumers' need of beauty, elaborate on a beautiful law of form and hold the main stream of design is the main content of this paper.

Keywords The beauty of laws · Personal charm · Form · Elements · Relationship

77.1 Introduction

As a famous Chinese saying goes, “beauty” can only be sensed, but not explained. In fact, however, “beauty” can be explained specifically with words. The creation of the visual beauty of product forms owns a certain number of laws. The standards for the judgments of beauty involve many factors, but have a certain logic relationship. The beauty of laws is also the logic of visual image; the visual image in disorders is not beautiful. The beauty of laws is decided by the nature of human beings and also is a common standard of all human beings for the basic recognition on beauty. However, a unique beauty is decided by the difference between individuals in aesthetics. Unique beauty is a difference between individuals in pursuing beautiful things, and also a diversification of the creation of the beauty of product forms. Just as the beauty of music, the reason why it is called by people as

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music is that sounds can meet the demands of human beings on the beauty of the laws of sounds and also there are rhythms among different sounds that are not disordered. On the contrary, the sounds will be called as noises. However, different people like the different styles of music at different levels, giving an expression to the demands of individuals on the difference of musical beauty [1].

Human is part of nature. Therefore, the aesthetic orientation of human beings is influenced by nature.

If product forms are thought by people not to be beautiful, this suggests that the creation of product forms is in shortage of the beauty of laws and the beauty of rhythms, and also there are problems in product forms internally. If product forms can meet the pursuit of people on laws and also have the characteristics of the beauty of laws, people will still like them differently. This is an embodiment for the difference in the aesthetic demands of people on the creation of production forms [2]. Therefore, it is necessary to give a full consideration to both internal and external factors in the process of designing product forms. Only in such a way, the products, which meet the aesthetic demands of people, can be created in the world.

The creation of the beauty of product forms is an effective combination of the beauty of the laws of the internal causes of products with the unique beauty of the external causes. Therefore, to create the beauty of the laws of products, it is necessary to meet the basic demands of human beings on beauty. First of all, it is necessary to take the visual elements of product forms into account. If a product form comprises of only one visual element, the element is simple, and therefore, it is necessary to give a full consideration to the inherent characteristics and aesthetic feeling of this element. The beauty of simplicity will not give rise to a visual confusion. It is not only the beauty of the laws in visual sense, but also an embodiment for the beauty of the laws. However, if a product form comprises of multiple visual elements, it is also necessary to give a full consideration to the relationship between the visual elements, namely the beauty of the relationship between the elements of a product form. This is just like music, which owns not only the beauty of sounds, but also the beauty of tunes. The beauty of sounds is like the beauty of the elements of a visual image. This is also very applicable to the simple visual elements. The beauty of the tunes is like the beauty of the relationship between the elements of a visual image. It is necessary for any music works to own unique rhythms and rhymes, thus giving a reflection to the beauty of harmony of music. In the meantime, it is necessary to pay attention to the mutual relationship between different elements in the arrangement and combination, making it supported with a series of rhythms and rhymes. Hence, a beauty of harmony can be generated for the whole visual image [3]. The wonderfulness of music can be felt by people only if music is with rhythms and rhymes, and then, people can be enchanted by it and attain an enjoyment in spirit. Therefore, in the creation of music, it is necessary to not only pursue the beauty of sounds and the beauty of the relationship between different sounds, but also attach high importance to the characteristics of different sounds, know how to create the rhythms, rhymes and artistic conception, and put forth effort to researching the sense of hearing of people. A visual image, which comprises of a great number of visual

elements, also goes in this way: it is necessary to not only pay attention to the characteristics of visual elements and also lay a stress on the relationship between different elements, thus making visual image harmony as a whole and generating rhythms and rhymes as well as a whole visual artistic conception, etc. [4].

77.2 The Beauty of Elements

The beauty of a visual image that is composed only by one element can be reflected by the self-image of the element. It is necessary to emphasize that the beauty of elements is also a state of the beauty of product form, because regular order keeps consistent with the laws of beauty in itself. What the random form of a single accidental and natural regular visual element expresses is a kind of natural beauty, which is random, vivid and rich in human feelings and also includes an accidental beauty; what the rigorous form of a single irregular visual element relying on tools expresses is a regular beauty, which is formal and solemn and includes the beauty of manual work and high technologies. In life, a morphological beauty of the elements needs to be selected for expressing the beauty of the forms of some products sometimes. Next, the specific examples of product design will be used for giving a further introduction. For example, the designs of voice box and pot are shown in Figs. 77.1 and 77.2.

The forms of the above two products comprise of a single three-dimensional ellipse, respectively. And the forms give a reflection to the beauties of laws and rigorousness. This kind of beauty is fully reflected in its single and pure modelling form. Its overall visual image is nature to be harmonious and consistent and generates no mixed and disorder visual sense. This integral characteristics expression completely abides by the laws of beauty. The form is composed by curves, and the elements of the curves are with no sharp edges. Therefore, it shows a soft and beautiful visual sense and brings people a mellow and full sense and a relaxed feeling with no pressure. Also, it can be easily accepted by people, generating an inclusive but no rejection feeling. In addition, the composition of this

Fig. 77.1 Voice box



Fig. 77.2 Pot

elliptic form also gives an expression to a strong visual sense as well as a weight sense. The beauty of this three-dimensional elliptic form that is composed by simple curves is a kind of beauty of simple curves and can naturally give an expression to the form of a three-dimensional figure. It is so beautiful because of its orders.

In the designs of two products, as shown in Figs. 77.1 and 77.2, a single and regular curve element is utilized to the very point, making the inherent morphological characteristics of the elements of curve shown obviously, and bringing people a soft, beautiful and quality visual experience. Therefore, these designs are not only elegant, but also moderate. The whole product forms convey regular visual experience with laws and rigorousness, and also, a single visual image promotes the characteristics of the beauty of product form displayed with a different key point, thus demonstrating a natural and harmonious consistency and letting people feel comfortable. Harmony has a certain number of laws to follow, and naturally laws are beautiful, and vice versa. Such a single design makes it easy for people to avoid the disordered and mixed visual sense, and also the key points are highlighted skilfully, making the products extremely remarkable among the multiple products with the same functions. Therefore, this kind of elliptic geometrical form is simple, practical and generous and owns the characteristics (fashion and elegance) of the modern industrial products. The designs of the curves, on the basis of satisfying the practical functions, also give the best expression to the laws of the simple visual beauty.

77.3 The Beauty of the Relationship Between Elements

The beauty of a product visual image that is composed by multiple elements can give a good reflection to the beauty of the relationship between the visual elements composing product. In other words, there has to be a certain constitutive

relationship between elements. The beauty of the relationship between elements is also a state of the beauty of product form and can be commonly seen in the design of product. To make a research on the beauty of the relationship, it is necessary to comply with the senses of rhythm and rhyme visually, makes a distinction between the primary and secondary points conveyed by vision and give an expression to the laws. In the process, it is necessary to keep in minds that disorders are prohibited. Then, all sorts of visual elements in a product form can be in a harmonious coexistence, thus creating visual experience in the beauty of the relationship. This is because that no disorder complies with the laws of beauty in itself.

The relationship between different elements is diversified. In combination, the most important is to give a full consideration to the rhythm, rhyme and primary and secondary points that are produced in these elements. That is, it is necessary to grasp the laws of beauty, so as to make product form harmonious and ordered without chaos. In the following, the compositions of the beauties (i.e., the beauty of repetition, the beauty of gradual change and the beauty of proportion) of three relationships will be listed, for the purpose of giving a brief introduction to the beauty of the relationship between elements.

If a product form is composed by the same elements, the beauty of repetition will be reflected, and the relationship between elements is repeated.

For example, the whole shape of the cushion for the pan, as shown in the left of the Fig. 77.3, is composed by the multiple, single and identical forms (approximate to a diamond) rotated around the centre of axis. Also, the relationship between the visual elements is repeated, and a new three-dimensional form (flower shape) is composed after combination. The flower shape after the whole composition presents consistency as a whole, in which the laws of beauty are grasped skilfully. Overall, it is in an order state without any chaos. Therefore, the principle



Fig. 77.3 Cushion

of beauty is followed, and also the beauty of repetition is embodied. The form presented in the multiple identical diamond and three-dimensional elements after a newly repeated arrangement, and combination is no longer the simple geometric beauty of a diamond, but a newly flower image, which is beautiful, sweet and close to nature, and makes people feel beautifully in visual sense. Therefore, it allows people to naturally love it (as shown in Fig. 77.3).

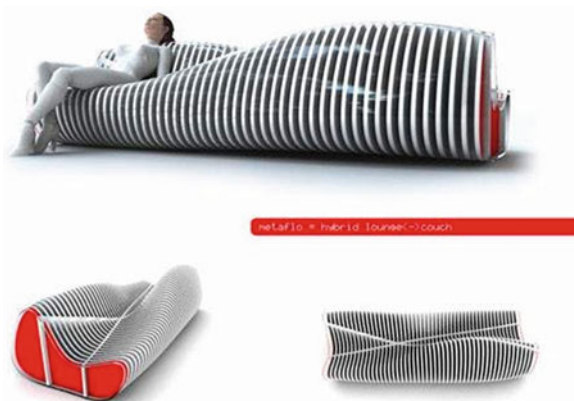
However, if the elements are composed by multiple single diamonds, they will look simple, earnest and have laws to follow from the visual sense. Therefore, after a repeated combination, the three-dimensional form of this flower will make people generate greater aesthetic feeling, vividly giving an expression to an elegant and dignified visual beauty. Therefore, it can be seen that what the design of the cushion for the pan expresses is the beauty of repetition.

If a product form is composed by multiple elements with gradual change, the beauty of gradual change will be reflected, and the relationship between elements changes with a gradual step.

For example, from the design of the sofa, as shown in Fig. 77.4, it can be known that the whole form is composed by multiple curved surfaces; there are changing relationships between different surfaces, and this make people generate a low and high rhythm from the visual sense. Also, the curved surfaces are kept in orders harmoniously in combination and also arranged according to certain rhythms. Therefore, it looks not messy from the visual sense, meets the laws of beauty and gives an expression to the beauty of gradual change between elements. Ultimately, a practical sofa product is composed by the multiple curved surfaces with a gradual change relationship. The skilful utilization of such a gradual relationship makes the form of the sofa variable and full of unique characteristics as a whole. Thus, it is specially beautiful and fashionable when giving a reflection to the senses of rhythm and rhyme (as shown in Fig. 77.4).

In the design of product form, the beauty of elements and the beauty of relationship between elements are not only the internal causes, but also a basic understanding of the beauty of the laws of product form. However, to create

Fig. 77.4 Sofa



increasingly more product forms that meet the aesthetic demands of people, it is still necessary for the designers to give a full consideration to the different demands of people (external causes). That is, it is necessary for product form to meet the unique beauty of different groups of people. As long as the differences of the unique beauties of different people are fully known, the creation of the beauty of product form as well as the diversification of product form can be accomplished.

The beauty of laws is actually the basic laws of creating the beauty of product forms and the specific application of the creation of unique beauty and product form beauty. The beauty of laws is a fundamental for human beings to pursue beauty and also an embodiment of the basic ability to create beauty. The creation of the beauty of laws is also a fundamental for the design of product form, and the unique beauty is the embodiment and diversification of the design of product form. To create the product forms that meet the psychological demands of consumers, it is necessary to give a full consideration to the needs on unique beauty at the premise of meeting the beauty of laws. The creation of product form is an internal cause deciding whether the product is beautiful or not; the aesthetic subjects of product form are external causes. As long as external and internal causes can be effectively combined, the creation of the beauty of products can be accomplished.

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Chapter 78

Study on Integrated Visualization of Traditional Chinese Medicine Diagnosis and Treatment Decision-Making Information

Qingyu Xie and Qinggang Meng

Abstract In this paper, starting from the study of the evidence knowledge of traditional Chinese medicine decision-making, the authors analyze the difficulties imposing restrictions on the integration and sharing of traditional Chinese medicine diagnosis and treatment decision-making information, propose the main direction of medical information platform intelligent development lies in the mathematical modeling and integrated visualization study of diagnosis and treatment decision-making information, and also specifically introduce the key problems in the study of the integrated visualization of traditional Chinese medicine diagnosis and treatment decision-making information in combination with the diagnosis and treatment practice of traditional Chinese medicine doctors, clinical guidelines, integrated diagnosis and treatment standards visualization, and dynamic feedback of advantageous treatment effect. Thus, this paper provides a new idea for the researches of the modeling of traditional Chinese medicine decision-making information. That is, from the perspective of the methodology research, a systematic theory framework suitable for the inheritance of original thinking of traditional Chinese medicine can be explored; from the perspective of science and technology, the comprehensively integrated approach from qualitative to quantitative can be used for optimizing and integrating traditional Chinese medicine diagnosis and treatment information, expert experience, and patients' diagnosis and treatment information. Thus, the information barriers among hospitals, scientific research institutions, and higher learning schools in different areas can be broken, and the interaction and sharing of diagnosis and treatment decision-making information are achieved in a real sense ultimately.

Keywords Traditional Chinese medicine diagnosis and treatment · Decision-making information · Clinical guidelines · Integrated visualization

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78.1 Introduction

Along with the development of science and technology in the modern times, the analytical researches under the guidance of original thinking make the essential problems in traditional Chinese medicine increasingly more objective. However, the theories of traditional Chinese medicine are also far away from the researches of clinical practices day by day, thus giving rise to the one-sidedness of research results in introducing theoretical problems and even misleading practical applications [1]. The combination of system science concept with the theories of traditional Chinese medicine provides an opportunity for the highest design of traditional Chinese medicine diagnosis and treatment process [2]. Meanwhile, the open, complex, giant, and systematic theories and methodologies (comprehensive integration method) play a very important role in guiding the researches of traditional Chinese medicine diagnosis and treatment thinking [3, 4].

78.2 Current Situation of the Researches of Traditional Chinese Medicine Decision-Making Evidence Knowledge

In evidence-based medicine, high importance is attached to the idea that the best evidences in the modern times should be applied carefully, clearly, and wisely, and thus, a right decision can be made for the individual patients. Meanwhile, a pyramid structure based on the different levels of evidence is proposed; the levels of evidence from high to low refer to system evaluation, strictly designed prospective randomized controlled trial (RCT), and non-randomized controlled trials such as case-cohort study and case-control study, case-series study, case report, and expert experience. The evidences of all these different levels constitute an evidence body [5]. In the process of making the Traditional Chinese Medicine Evidence-based Clinical Practice Guideline, the characteristics of traditional Chinese medicine evidence information were discovered by the researchers: (1) great numbers of literatures were oriented at description and observation, but few of them were made in strict accordance with the requirements of evidence-based medicine; (2) ancient experience books of clinical doctors were rich, but the levels of the evidences in these books were relatively low according to the evaluation by international evidence grading standards on ancient traditional Chinese medicinal books; (3) the characteristics of traditional Chinese medicine diagnosis and treatment could be reflected from the literatures of medical cases and notes, but the quantifiable standards for diseases and symptom diagnoses were few; (4) along with the development of new medicines at market, the design and implementation of Chinese patent medicine re-evaluation researches are gradually standardized, and also the quality of treatment evidences in the literatures researching Chinese patent medicines is relatively high [6].

In recent years, some foreign researches show that the decision-making information of authoritative experts in western medicine sourced from guidelines, clinical trials, and case reports [7]. When a doctor encounters a difficult case, he often acquires no guidelines to follow. However, some doctors choose to make a diagnosis and provide a treatment in strict accordance with the guiding principle in guidelines, and some will inquire the similar case reports.

In 2007, the result of the investigation made by the Statistical Information Center of the Ministry of Health on 3,765 hospitals showed that only 6.29 % of the investigated hospitals applied a clinical decision-making support system, 7.46 % used a clinical data warehouse, and 6.3 % used a knowledge management platform. In recent years, these systems are used by increasingly more hospitals, but the changes are not significant. Besides, the construction of traditional Chinese medicine information platform is necessary to be based on clinical practices and the way of thinking of traditional Chinese medicine, show respects to the cognitive laws and diagnosis and treatment experience of clinical workers in traditional Chinese medicine, protect the original diagnosis and treatment results of the clinical doctors, and establish a close connection between diagnosis and treatment work flow and IT project design flow. Thus, the intelligence and universality of the system can be improved, and also the advantageous treatment effects can be really communicated and promoted within the industry.

78.3 Decision-Making Information Sharing Cost Increased by the Construction of Hospital Information System Oriented at Information Island

At present, the primary task of the information construction of China's medicine and health industry is to set up regional cooperative medical and public service-integrated platform and operation mechanism, create new modern medical service mode, maximize the utilization of the limited medical and health resources, reduce health-care costs, and improve the quality of medical treatment through focusing on the medical institutions at various levels and applying the advanced information network technology [8]. In combination with the current situation, it is found that a large number of information resources have been accumulated by all hospitals, but the utilization rate of these resources is not high [9]. Therefore, to fundamentally make a change to this situation, it is necessary to formulate relevant industrial norms and reach a consensus.

78.4 Integrated Visualization of Diagnosis and Treatment Decision-Making Information

“Decision” refers to the optimal goal and treatment action solution sought and decided by people in the process of changing the world. The traditional Chinese medicine diagnosis and treatment decision-making process is a doctor’s self-perception and experience by contacting with patients and looking, listening, questioning, and feeling the pulses, but also a continuously revised and verified learning process of a doctor through practice and accumulated experience. The difference and evolution of the symptoms of the same disease are very complex in the nonlinear variables [10]. Under the guidance of systematic and scientific theory, the application of mathematical method and calculation model is an essential way for providing a strict interpretation for the inherent biological complexities [11]. In the highest design of the research of integrated visualization of traditional Chinese medicine diagnosis and treatment decision-making information, it is necessary to pay attention to several key points as follows.

78.4.1 Research of the Integrated Visualization of Clinical Guideline

Clinical guideline, also called as clinical practice guideline, refers to relevant statements and suggestions cooperatively made by multidisciplinary personnel by following the principle of evidence-based medicine, regarding the best evidences as basis, and abiding by systemic and normal methods, aiming at helping medical workers make the most appropriate medical and health service plans for the patients. In 2009, the data in the research of 11 published clinical guidelines show that the educational backgrounds of the personnel compiling the clinical guidelines of traditional Chinese medicine and integrated traditional Chinese and western medicine were relatively simple, and the suggestions from health economists, epidemiologists, statisticians patients were not fully considered, and thus, the guideline was with some limitations. Meanwhile, the evidences of high levels were in short, and recommended suggestions were not clearly marked according to the demonstrative degrees of evidences. Besides, relevant foreign research reports indicated that the researches of clinical guideline visualization provide new ideas for improving clinical guideline quality and aided clinical decision-making along with the popularity of digital medicine.

78.4.2 Report and Evaluation on the Data of Advantageous Curative Effect Cases

The dynamic observation on symptoms is an important premise for guiding clinical treatment and improving the curative effect of traditional Chinese medicine. For this reason, in the process of evaluating the clinical curative effect of traditional Chinese medicine, the degree of the improvement of symptoms is an important part of the evaluation indexes. The advantage of the curative effect of traditional Chinese medicine is to make an improvement to the imbalance of symptoms through a whole control. Under the guidance of this idea, the “curative effect of symptoms” has been extensively applied in the exploratory practices of traditional Chinese medicine treatment effect in recent years. However, there are problems in the evaluation standards for symptom improvement degree, the relevance between the end of symptom’s curative effect and the clinical indexes of modern medicine, and the dynamic monitoring of end indexes.

78.5 Conclusion

In the twenty-first century, developed countries have stepped into the conceptual age from the information age. This provides opportunities for the innovative development of traditional Chinese medicine laying a stress on the concept of wholism and the imagery thinking. The development of subjects is necessary to possess original thinking and relevant researches. The original results and advantages can be owned only if subjects with originality are available. The clinical thinking of traditional Chinese medicine is not only the crystallization of the collective wisdoms of traditional Chinese medicine doctors, but also the original thinking in a real sense. The clinical thinking of traditional Chinese medicine is always cored at the concept of wholism and the imagery thinking, which cannot only give expression to the integration between science and human, but also attach high importance to the consistency between nature and human and the equal position of the controls of body and mind. Therefore, the barriers of original thinking researches are likely to be broken only if breakthroughs can be made to clinical thinking research methods of traditional Chinese medicine. Open, complex, giant, and systematic theories and comprehensively integrated ideas play an important role in guiding the researches of the original thinking of traditional Chinese medicine. First of all, from the perspective of methodology research, the research methods in system science, cognitive science, and complexity science can be organically combined, and a systematic theory framework suitable for the inheritance of original thinking of traditional Chinese medicine can be explored. From the perspective of science and technology, the comprehensively integrated approach from qualitative to quantitative can be used for optimizing and integrating traditional Chinese medicine diagnosis and treatment information, expert

experience, and patients' diagnosis and treatment information; the key technology researches based on the comprehensively integrated support platform of traditional Chinese medicine diagnosis and treatment can be developed; the joint tackling mechanism constructed in different hospitals of areas can be established; the information barriers among hospitals, scientific research institutions, and higher learning schools in different areas can be broken. Ultimately, under the premise of information security, diagnosis and treatment decision information interaction and sharing can be realized in a real sense.

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Part IX
Mathematical Computation

Chapter 79

Heterogeneous Institutional Investors' Stock Investment Return Effect

FangFei Ding, JinHua Chen and Chan Gu

Abstract This paper uses the event study method and takes the institutional investors holding A-share listed companies from 2009 to 2010 as the research sample. According to the investment period, institutional investors are divided into long-term and short-term institutional investors. Studies have found that long-term institutional investors holding shares of stock can get higher excess rate than short-term institutional investors holding stock over the same period, and with the passage of time, long-term institutional investors holding the stock may still be able to gain significant excess payment effects, short-term institutional investors holding the stock would not be allowed.

Keywords The long-term institutional investors · The short-term institutional investors · Shareholding changes · Abnormal returns

79.1 Introduction

As institutional investors continue to grow and develop, the study of institutional investor has become a hot topic in academic circles, but in many of the studies, there is an outstanding problem which ignores the heterogeneity among institutional investors. In reality, different types of institutional investors in funding sources, investment objectives, performance evaluation, legal and supervision are all different. Institutional investors need to consider the impact of these factors in

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their investment policies, so that different types of institutional investors' investment philosophy and investment behavior characteristics are very different. Compared with the individual investors, institutional investors because of their own characteristics, they have more access to information channels, as well as more information mining capacity and processing power [1, 2], the institutional investors have strong information superiority to acquire non-public "soft information" [3], so that they can be able to gain great earnings from investing in the stock market.

Depending on the institutional investors' holding period, institutional investors will be classified as long-term and short-term institutional investors. We find that long-term institutional investors holding shares of stocks can obtain higher excess rate than short-term institutional investors holding over the same period, and long-term institutional investors holding stocks have the overcompensation effect for a long time, but short-term institutional investors holding shares do not have this effect.

The balance of the paper is organized as follows. The relevant literature is discussed in Sect. 79.2; Sect. 79.3 outlines theoretical analysis and research assumptions; Sect. 79.4 provides definitions of the variables and data processing; in Sect. 79.5, the empirical findings are illustrated; the conclusion is expressed in Sect. 79.6.

79.2 Literature Review

79.2.1 *Classification of the Institutional Investor*

With the diversification of types of institutional Investors, studying on the classification of institutional investors is one of the hotspots at home and abroad. In Brickley et al. [4], in accordance with whether there is a business relationship or investment contracts between institutional investors and the investment business, institutional investors will be divided into pressure-resistant and pressure-sensitive institutional investors. Pressure-resisting institutional investors are able to stick to their own investment philosophy and focus on long-term returns and are not affected by short-term goals, and they have motivations to involve in corporate governance, oversight the management and gain greater revenue from the company's governance activities, but pressure-sensitive institutional investors often do not want to ruin their relationships with the investment company, they usually adopt moderate attitude or support the company's decision-making. In Almazan et al. [5], according to the different monitoring cost, institutional investors are divided into the positive potential and negative potential of institutional investors. Compared with the negative potential institutional investors, positive potential institutional investors have the following characteristics: (1) have more of the technical staff, in order to collect information; (2) investment in the face of fewer

regulatory and legal constraints; (3) have less commercial relations with the company. In Chen et al. [6], which used institutional investors' holding time and the proportion of shares as the basis for division of institutional investors, results found only the high stakes and make long-term investments of institutional investors are able to implement supervision for the company and ease shareholder proxy conflicts, but the short-term and small percentage shares of the institutional investors are not to implement the investment company. Zhi-Hong et al. [7] argue that institutional investors are bounded by institutional investors' holding time for a year. Found that the ownership incentive-announced market reaction of listed company, the long-term institutional investors hold is better than the listed company's ownership incentive-announced market reaction that the short-term institutional investors hold and the long-term institutional investors can obtain a significant cumulative stock returns. Zhi-Hong et al. [8]; Zhang-Hua and Wei-Wei [9] divide the institutional investors into the pressure-sensitive and pressure-resistant, in accordance with the classification of Brickley in 1988 [4], and analyze the governance effect of different types of institutional investors from the perspective of pay performance and the ability. In Hai-Yan and Jian [10], in line with the concentration of ownership, investment objectives and holding time for institutional investors to research, results find that the higher agencies holding ownership concentration, an independent body and long-term institutional stakes, the lower cost of management agent and controlling shareholders agency, however, non-independent and short-term institutional investors have limited effect of two kinds of agency costs.

79.2.2 Effect of Stock Return on Investment for Institutional Investors

John [11], Gompers and Metrick [12] analysis suggests that institutional investors investing in the stock market are able to get a higher investment income, there is a strong positive correlation between institutional investors and investment return. In Sias and Starks [13], quarterly data for the study window within a short period of institutional investor's stake change and change of earnings during the period, results show that there is a weak positive correlation between them [12, 13]. They think this is due to large trading of institutional investors may push the stock price movements, and 80 % of the positive correlation occurs within the period. Binay [14], Chiao et al. [15] and Bae et al. [16] by analyzing the performance of institutional investors in different countries, argue that institutional investors make full use of their own advantages to get excess compensation. Zhi-Qi and Jie [17], Fang-Fei and Ke [18] study the relationship between institutional ownership changes and price-earnings ratio, find both have positive correlation.

To sum up, the study of literatures at home and abroad has demonstrated that there is the heterogeneity of institutional investors. Extent of supervision, market reaction and effect of agency costs of different types of institutional investors on

the company are all different. While many of the literatures are also verified that the institutional investors take advantage of their own superiority to get high share of overcompensation, but very little literatures consider the heterogeneity of institutional investors to affect their stock investments. Considering the heterogeneity of the different institutional investors, this article divides institutional investors into long-term and short-term institutional investors and, respectively, holds a further discussion on effect of stock return for these two types of institutional investors.

79.3 Theoretical Analysis and Research Assumptions

With the development of institutional investors, types of institutional investors are more and more abundant. So far, China has initially formed a securities investment fund as the main part, qualified foreign institutional investors, insurance companies, social insurance fund, securities firms, corporate pension and other institutional investors to be supplemented by the development of diversified landscape. But the institutional investor's investment philosophy is very different, the objective function and the investment period is vary, so not all the institutional investors are able to adhere to the rational investment and value investing. In theory, institutional investors' holding time is longer, the liquidity is lower and stability is constantly increasing. To protect their own interests, institutional investors are not "vote with their feet" to express dissatisfaction with management, but select "vote with their hands" the way to active participation company governance and improve company performance, so that they can get high income from company inner value of upgrade, rather than business deal with short-term speculation as their major source of income. Secondly, the institutional investors' holding time is longer, the greater motivation and ability to implement sustainable management of the company effective oversight [19–21], and get more private information to reduce the information asymmetry, so that they can get the economies of scale effects. In addition, the institutional investors' holding time is longer, the equity investment will be more cautious, they spend a significant amount of time and energy to collect information and value analysis in choice of investment companies and stock trading time, adhere to value investment concept [19], analysis of enterprise intrinsic value rather than price for benchmark, try to find the price deviation from the value of investing in companies, insist on value investing [20, 21]. While institutional investors' holding time is shorter, the more there is no power to collect information, in-depth analysis of corporate stock value and the future of the speculation. They often gain revenue psychologically. If an institutional investor is optimistic about a company, they will increase the company's stock and expect that the company's stock in the future can get excess return; on the contrary, if institutional investors look low at a company's stock, they will sell some or all stocks. Accordingly, we make the following assumptions:

Assumption 1 Long-term institutional investors holding stocks can get higher excess rate of return than short-term institutional investors holding stocks over the same period.

Assumption 2 With the passage of time, the long-term institutional investors holding shares of the stocks are still able to gain significant over-payment effects, but short-term institutional investors holding shares of stocks are not.

79.4 Research Design

79.4.1 Definitions of Variables

Table 79.1.

79.4.2 Model Construction

This paper calculates the top 10 flow shareholders of listed companies with institutional investors holding consecutive quarters in 2009–2010. The long-term institutional investors include funds and QFII; the short-term institutional investors include securities companies, insurance company, Social Security Fund, Trust Fund and enterprise annuity.

In order to verify the assumptions above, we establish the following models:

$$AR_t = \beta_0 + \beta_1 \Delta Ins_long_t + \beta_2 \Delta Ins_short_t + \beta_3 Size_t + \beta_4 Lev_t + \beta_5 Roa_t + \beta_6 Cash_t + \beta_7 Hhi_t + \varepsilon_1$$

$$AR_t = \beta_0 + \beta_1 \Delta Ins_long_{t-1} + \beta_2 \Delta Ins_long_{t-2} + \beta_3 \Delta Ins_short_{t-1} + \beta_4 \Delta Ins_short_{t-2} + \beta_5 Size_t + \beta_6 Lev_t + \beta_7 Roa_t + \beta_8 Cash_t + \beta_9 Hhi_t + \varepsilon_2$$

In the model, ε_1 , ε_2 , respectively, represent random error, ΔIns_long_{t-1} , ΔIns_long_{t-2} for the prior period and then a period of long-term institutional changes in the shareholding, and ΔIns_short_{t-1} , ΔIns_short_{t-2} for the prior period and then a period of short-term institutional changes in the shareholding.

79.4.3 Sample Selection and Data Sources

This article selects in 2009–2010 trading on the stock exchange A-share listed companies as research samples, in order to reduce errors, the initial samples are filtered according to the following principles: first, removal of data from the selected variable index is not full of company; second, it is due to the particularities of the financial industry, so financial industry is removed; third, it is the removal of all the ST and PT companies; fourth, it is the removal of apparent errors and exception data company; and finally, there are 3,777 observations.

Table 79.1 The variables list

Type	Name of the variable	Variable code	Variable meaning
The explanatory variables	Stock excess rate of return	AR	Stock real rate of return minus the average market rate of return
Explanatory variables	Long-term institutional changes in the shareholding	$\Delta\text{Ins_long}$	Long-term institutional investors from this half-year stake minus the first half stake
	Short-term institutional changes in the shareholding	$\Delta\text{Ins_short}$	Short-term institutional investors from this half-year stake minus the first half stake
Control variables	Size of the company	Size	The total assets of the natural logarithm
	Debt to asset ratio	Lev	Debt to total assets ratio
	Accounting performance	Roa	Total assets income rate
	Ratio of net cash flow	Cash	Net cash flow per share
	Ownership concentration	Hhi	Sum of the squares of top five shareholders' stake

We carry out sample checks on the data in order to ensure the reliability of the data. The data of institutional investors are from the Wind database, and other financial data are from the CSMAR database.

79.5 Empirical Results and Analysis

79.5.1 Descriptive Statistics and Analysis

From Table 79.2, we can see that the mean and median of AR are very close to zero, indicating that the selected samples of stock returns close to market average. The gap between median and mean of $\Delta\text{Ins_long}$ is very large, standard deviation is also quite large, while the $\Delta\text{Ins_short}$ is exact reverse. It just goes to show that the different institutional investors' investment behavior change has great difference. The long-term institutional investors' investment behavior change is large, while the short-term institutional investors' investment behavior is relatively stable.

79.5.2 Correlation Analysis

Table 79.3 shows that in addition to $\Delta\text{Ins_short}$, Cash and Hhi, the correlation between explanatory variables and the explanatory variables AR is significant. Only Lev is in the 10 % levels significantly, and the others are all in the 1 % levels significantly. At the same time, The multicollinearity of regression models of explanatory variables examination revealed that the VIF values of the explanatory variables in the regression model are less than 2, which explains the multiple among variables are relatively small, linear regression analysis can be entered. Analysis software used in this article is SPSS17.0.

79.5.3 Regression and Analysis of the Results

The Table 79.4 shows that the coefficient of $\Delta\text{Ins_longt}$ is positive, and in the 1 % level. While the coefficient of $\Delta\text{Ins_shortt}$ is only in the 10 % level significantly,

Table 79.2 Variables of the descriptive statistical analysis

	AR	$\Delta\text{Ins_long}$	$\Delta\text{Ins_short}$	Size	Lev	Roa	Cash	Hhi
Mean	0.014	6.306	-0.177	9.580	0.465	0.054	0.230	0.180
Median	-0.017	3.635	-0.080	9.495	0.474	0.047	0.128	0.153
Std. dev	0.259	7.703	1.523	0.557	0.216	0.049	0.664	0.129
Minimum	-0.562	-25.090	-12.070	8.020	0.011	-0.242	-2.347	0.005
Maximum	1.429	60.73	10.580	12.219	2.186	0.664	17.279	0.756

Table 79.3 Correlation analysis of variable results

	AR	$\Delta\text{Ins_long}$	$\Delta\text{Ins_short}$	Size	Lev	Roa	Cash	Hhi
AR	1.000							
$\Delta\text{Ins_long}$	0.157	1.000						
$\Delta\text{In_short}$	0.062		1.000					
Size	-0.093	0.038	-0.022	1.000				
Lev	-0.028	-0.107	-0.019	0.487	1.000			
Roa	0.144	0.267	0.049	-0.048	-0.400	1.000		
Cash	0.018	0.072	-0.019	-0.088	-0.337	0.332	1.000	
Hhi	-0.021	-0.049	0.006	0.336	0.050	0.098	0.017	1.000

Indicating that long-term institutional investors holding stock can acquire higher excess rate than short-term institutional investors hold shares over the same period. At the same time, the coefficients of $\Delta\text{Ins_longt-1}$, $\Delta\text{Ins_longt-2}$, $\Delta\text{Ins_shortt-1}$ and $\Delta\text{Ins_shortt-2}$ are all greater than zero, and the coefficients of $\Delta\text{Ins_longt-1}$ and $\Delta\text{Ins_longt-2}$ are significant, while the coefficients of $\Delta\text{Ins_shortt-1}$ and $\Delta\text{Ins_shortt-2}$ are not significant. It can be concluded that, with the passage of time, long-term institutional investors investing in the stock market are still able to gain significant effect overcompensation, but short-term institutional investors investing in the stock market are not, this validates Assumptions 1 and 2.

79.6 Conclusions

This study has in-depth analysis of heterogeneous institutional investors' stock investments. Empirical results show that long-term institutional investors holding shares of stock can get higher excess rate than short-term institutional investors holding stock over the same period, and with the passage of time, long-term institutional investors holding the stock may still be able to gain significant excess payment effects, short-term institutional investors holding the stock would not be allowed. This describes that the different types of institutional investors' return is different, long-term institutional investors can better play their own advantages, more rational and mature. To a certain extent, this supports the Chinese government's policy of developing institutional investors; in particular, we will vigorously develop the long-term institutional investors, in order to enhance the efficiency of capital markets.

The main contribution of this research is that this text combines with our institutional investors own characteristics. Depending on the holding time, institutional investors are divided into long-term and short-term institutional investors, respectively, to research the stock investment paid effect of this two institutional investors. It extends the perspective of China institutional investor research to certain extent, and on our country's reform, development and structural optimization of institutional investors, development of regulatory policies all have some reference value.

Table 79.4 Heterogeneous institutional investors' abnormal returns rate testing

AR								
Intercept	3.899 (0.600)	3.908 (0.949)	4.239 (0.556)	3.771 (0.532)	2.171 (0.647)	3.411 (0.991)		
Δ Ins_longt	6.311 (0.006)							
Δ Ins_shortt		2.368 (0.022)						
Δ Ins_longt-1			4.093 (0.004)					
Δ Ins_longt-2				3.098 (0.003)				
Δ Ins_shortt-1					0.974 (0.012)			
Δ Ins_shortt-2								
Sizet	-4.008 (-0.071)	-4.291 (-0.119)	-4.794 (-0.072)	-4.505 (-0.072)	-2.581 (-0.089)	0.949 (0.011)		
Levt	2.014 (0.100)	3.095 (0.259)	3.697 (0.147)	3.748 (0.167)	3.363 (0.348)	-3.671 (0.120)		
Roat	1.025 (0.200)	3.886 (1.331)	6.271 (0.956)	6.987 (1.271)	2.851 (1.161)	1.756 (0.725)		
Casht	-0.626 (-0.010)	0.356 (0.004)	-0.015 (0.000)	(-1.848) (-0.030)	(0.359 (0.010)	0.904 (0.012)		
Hhit	1.420 (0.091)	0.352 (0.036)	0.233 (0.013)	0.274 (0.016)	-0.288 (-0.036)	0.189 (0.025)		
R2	0.227	0.293	0.244	0.264	0.228	0.303		
F	10.284	5.336	14.760	14.557	2.778	3.608		
N	1,143	342	1,401	1,170	310	221		

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Chapter 80

Teaching Quality Evaluation Based on Intuitive Fuzzy Information

Dan Su

Abstract The comprehensive evaluation of classroom teaching quality is an important part of teaching quality evaluation. At present, the commonly used methods for teaching quality evaluation have some shortcomings in system, objectivity, rationality, etc. Applying the intuitive fuzzy set in the evaluation of classroom teaching quality and merging the number of the students not expressing their opinions in quality questionnaires (blank and unreturned questionnaires) in the “hesitation degree” information of the intuitive fuzzy set solve the problem of the incomplete information in questionnaire, and also, the effectiveness and correctness of this method are verified through real examples.

Keywords Teaching quality · Intuitive fuzzy set · Comprehensive evaluation

80.1 Introduction

In China, there are standardized and scientific requirements on the teaching quality evaluation in universities and colleges; in the undergraduate courses teaching quality evaluation of the Ministry of Education, the selective examination of the classroom teaching quality by experts is one of the necessary items [1]. Therefore, it is necessary for universities and colleges to pay high attention to the comprehensive evaluation of classroom teaching quality [2]. Because the classroom teaching quality has a direct relationship with the educational quality of a school and the quality of personnel training, how to more reasonably and objectively make an

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evaluation on the classroom teaching quality of a teacher has been proven to be an issue, which is necessary for general universities and colleges to confront with.

80.2 Shortcomings of Conventional Teaching Quality Evaluation Methods

At present, the classroom teaching quality evaluation method mainly used by general universities and colleges is issuing questionnaires or scales. In this method, the teaching quality evaluation group comprising of students, teachers, experts and leaders anonymously fill in the form of evaluation; the evaluation indexes include teaching attitude, teaching content, teaching methods, teacher's literacy, teaching effect. In Table 80.1, the simplified contents of the Classroom Teaching Quality Evaluation Form made by the Department of Computer Science and Information Engineering of Heike University are shown. The evaluators give scores to all indexes of the evaluated objects and then solve the score values with weighted summation [3, 4]. Thus, the teaching quality of the evaluated objects is measured with the score values.

The basic idea of this teaching quality evaluation method is making the fuzzy things quantified and taking the "quantification" as a major method of evaluation. It is impossible for the design of quantitative indexes to include all aspects, and also, the scores given by the evaluators in the quantification process are with subjectivity. For this reason, the comprehensive scores cannot be completely and accurately corresponding to the quality of teaching. If the score values of two evaluated teachers are of little difference, the teacher with higher scores is often thought to have good teaching quality. Thus, the differences between evaluated teachers are artificially exaggerated, affecting the accuracy of evaluation and losing fairness. The main shortcomings of this method can be concluded as follows.

Table 80.1 Classroom teaching quality evaluation form (used among students)

No.	Evaluation items	Evaluation scores	Score value of a teacher
1	Teaching is conducted according to the teaching plan; teaching contents are accurate and correct	25	
2	Language is succinct, blackboard writing is clear, and teaching methods are reasonably applied	15	
3	Key and difficult points of teaching are highlighted; high importance is attached to the comprehensive application of knowledge	25	
4	A good model of virtue for others; concerning about students; strong sense of responsibility	15	
5	Serious to provide counseling and answers to the questions of students and correct students' assignments	20	

First, the evaluation index system is not perfected, which cannot comprehensively give a reflection to the actual teaching quality of a teacher. The teaching quality is reflected not only in the classroom teaching of a teacher and the teaching means and methods of training the students' skills, but also in the exchange and interaction between teachers and students after class. If the evaluation of the classroom teaching quality does not give a reflection to these important aspects, the objectivity and integrity will certainly lose.

Second, evaluation method is not scientific, and the randomness is too large. Because the evaluation index system is too general and not enough meticulous, it is difficult for the evaluators to accurately control the evaluation. Thus, the randomness of giving scores is very large. At the same time, the factor that the evaluation standards used by students are not consistent is not taken into account. For example, a teacher gives a lecture to students from two classes, and the scores two classes give to teacher are different; the score difference between two classes is too large, and thus, it is hard to fairly and objectively evaluate the teaching quality of the teacher.

Third, the evaluation between peer teachers is conducted only for finishing a task and becomes superficial. In the meantime, because of personal relationship, a great number of teachers cannot treat evaluation seriously. For this reason, there is a problem in the reliability and validity of this evaluation method at present.

Fourth, the operations of the evaluators are difficult, and especially, the students feel difficult when giving quantification scores to teachers. Nowadays, the difference between students in values is large. For this reason, the relationship between teachers and students and the rigorous degree of the attitude of teacher toward teaching can play an effect on scores, giving rise to the low credibility of operation results.

Just because of shortcomings of the existing evaluation method, the teaching quality evaluation results taking quantification as means lose objectivity and fairness and are difficult to play a role in promoting teachers to improve teaching methods and quality. Therefore, in the actual work, although the teaching quality of a teacher is measured with this method, the evaluation results are seldom used as the main basis for the evaluation of teaching quality and cannot play an evaluation function.

80.3 Classroom Teaching Quality Evaluation Based on Intuitive Fuzzy Set

80.3.1 Intuitive Fuzzy Set

Definition 1 Assume X is a non-empty set, and then, $A = \{ \langle x, \mu_A(x), \nu_A(x) \rangle \mid x \in X \}$ is an intuitive fuzzy set, in which subordinate function $\mu_A(x) \in [0, 1]$ and non-subordinate function $\nu_A(x) \in [0, 1]$ meet the following conditions:

$0 \leq \mu_A(x_j) + v_A(x_j) \leq 1, x_j \in X$, which are simply expressed as $A = (\mu_A(x_j), v_A(x_j))$.

$A(x_j) = 1 - \mu_A(x_j) - v_A(x_j)$, which means the “hesitation degree” of the element x_j in X to A .

For convenience, $\alpha_x = (\mu_x, v_x)$ is called as intuitive fuzzy numbers, in which there are $\mu_x(x) \in [0, 1], v_x(x) \in [0, 1]$ and $\mu_x + v_x \leq 1$.

To compare intuitive fuzzy numbers, a sorting method is given in the following.

Definition 2 Assume $\alpha_1 = (\mu_1, v_1)$ and $\alpha_2 = (\mu_2, v_2)$ are intuitive fuzzy numbers; $s(\alpha_1) = \mu_1 - v_1$ and $s(\alpha_2) = \mu_2 - v_2$ are the score values of α_1 and α_2 , respectively; $h(\alpha_1) = \mu_1 + v_1$ and $h(\alpha_2) = \mu_2 + v_2$ are the accurate degrees of α_1 and α_2 , respectively; α_1 is less than α_2 if $s(\alpha_1) < s(\alpha_2)$ and $s(\alpha_1)$ is equal to $s(\alpha_2)$ if $\alpha_1 < \alpha_2$.

$$\alpha_1 = \alpha_2 \quad \text{if } h(\alpha_1) = h(\alpha_2) \tag{80.1}$$

$$\alpha_1 < \alpha_2 \quad \text{if } h(\alpha_1) < h(\alpha_2) \tag{80.2}$$

$$\alpha_1 > \alpha_2 \quad \text{if } h(\alpha_1) > h(\alpha_2) \tag{80.3}$$

80.3.2 Establishment of the Evaluation Index System

The purpose of classroom teaching quality evaluation is to promote the improvement of teaching quality. For this reason, the setting of the index system should follow this purpose, and the design of indexes should closely focus on the classroom teaching. According to the main parts and contents involved in classroom teaching, the classroom teaching quality evaluation indexes, which are used in this paper, are determined in combination with the application personnel training objective system based on the contents in Table 80.1, as shown in Fig. 80.1.

80.3.3 Establishment of Evaluation Factors Set and Comments Set

After the evaluation index system is determined, a weight value should be given to each index. Generally speaking, an accurate method for determining the weight values of indexes is analytic hierarchy process. However, absolute accuracy is not pursued in this paper. Therefore, according to the teaching characteristics of Heike University and in combination with the suggestions from school leaders, review experts and part of teachers, reasonable factors index system and evaluation set are gained, as shown in Tables 80.2 and 80.3.

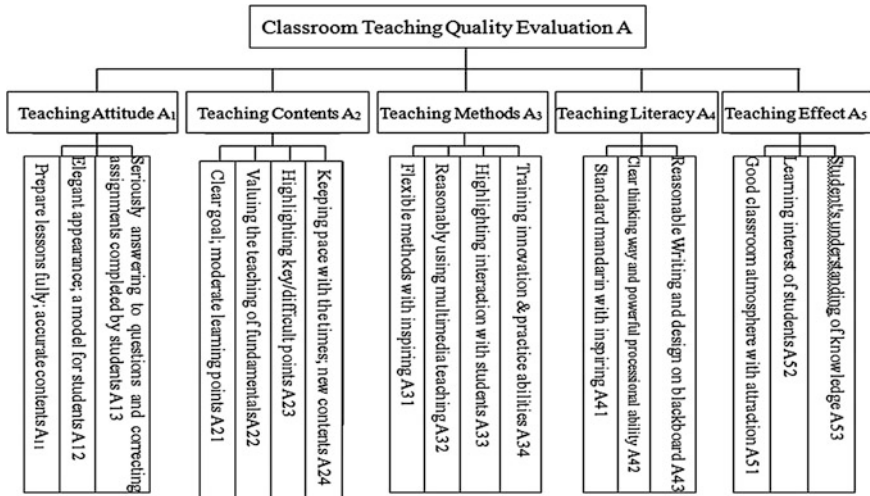


Fig. 80.1 Classroom teaching quality evaluation index system

Table 80.2 Weight values of the primary indexes

Index	A ₁	A ₂	A ₃	A ₄	A ₅
Weight Value	0.15	0.25	0.25	0.15	0.2

Table 80.3 Weight values of the secondary indexes

Index	A ₁₁	A ₁₂	A ₁₃	A ₂₁	A ₂₂	A ₂₃	A ₂₄	A ₃₁	A ₃₂	A ₃₃	A ₃₄
Weight value	0.4	0.2	0.4	0.2	0.25	0.4	0.15	0.2	0.2	0.3	0.3
Index	A ₄₁	A ₄₂	A ₄₃	A ₅₁	A ₅₂	A ₅₃					
Weight value	0.25	0.4	0.35	0.2	0.2	0.6					

80.3.4 Establishment of Fuzzy Set

1. Define the set of the primary evaluation indexes as $X = (X_1, X_2, \dots, X_n)$ in which n is the number of the primary indexes, and their corresponding weight values set is $A = (a_1, a_2, \dots, a_n)$ in which $a_k (k = 1, 2, \dots, n)$ is the proportion $\sum_{k=1}^n a_k = 1$ of index X_k in X .
2. Define the set of the secondary evaluation indexes as $X_k = (X_{k1}, X_{k2}, \dots, X_{km})$ in which m is the number of the secondary indexes, and their corresponding weight values set is $A_k = (a_{k1}, a_{k2}, \dots, a_{km})$ in which $a_{ki} (i = 1, 2, \dots, m)$ is the proportion $\sum_{i=1}^m a_{ki} = 1$ of index X_{ki} in X_k .
3. Division of comments set: $p = (p_1, p_2, \dots, p_n)$ is the number of comments; $p = (p_1, p_2, \dots, p_n)$ are the comments of different levels from high to low; the grades of comments can also be divided with specified scores.

80.4 Case Study

Through the above analysis, the principle of applying fuzzy set in classroom teaching quality evaluation is known to some extent. Now, the course Public Fundamentals of College Computer in the Department of Computer Science and Information Engineering of Heike University is taken as an example in this paper. To help teachers and teaching management department more meticulously know about teaching situation, a teacher was randomly selected and his classroom teaching quality was investigated and analyzed. The investigation is as follows. Questionnaires were distributed at classroom (questionnaire contents are shown in Fig. 80.1); 40 copies of questionnaire were distributed to students, but 38 were returned and 2 were blank. According to the definition of intuitive fuzzy set, the 2 unreturned or blank questionnaires can be seen as hesitation rolls, and thus, hesitation degree was 0.1. After the classification and summarization of questionnaire and the normalized processing of comments set, the results are shown in Table 80.4.

Fuzzy evaluation calculation process is shown below:

1. According to the data in Table 80.3, the weight values set of the secondary evaluation indexes set are as follows:

$$A_1 = (0.4, 0.2, 0.4)$$

$$A_2 = (0.2, 0.25, 0.4, 0.15)$$

Table 80.4 Student questionnaires and result

Content	Weight value	Content	Weight value	P ₁	P ₂		P ₃		P ₄		
A ₁	0.15	A ₁₁	0.4	34	0.89	2	0.05	2	0.05	0	0
		A ₁₂	0.2	36	0.95	2	0.05	0	0	0	0
		A ₁₃	0.4	36	0.95	1	0.03	0	0	1	0.03
A ₂	0.25	A ₂₁	0.2	34	0.89	3	0.08	1	0.03	0	0
		A ₂₂	0.25	30	0.79	6	0.16	2	0.05	0	0
		A ₂₃	0.4	35	0.92	2	0.05	0	0	1	0.03
		A ₂₄	0.15	33	0.87	0	0	5	0.13	0	0
A ₃	0.25	A ₃₁	0.2	38	1	0	0	0	0	0	0
		A ₃₂	0.2	30	0.79	8	0.21	0	0	0	0
		A ₃₃	0.3	32	0.84	3	0.08	2	0.05	1	0.03
		A ₃₄	0.3	36	0.95	1	0.03	0	0	1	0.03
A ₄	0.15	A ₄₁	0.25	33	0.87	4	0.11	1	0.03	0	0
		A ₄₂	0.4	34	0.89	3	0.08	1	0.03	0	0
		A ₄₃	0.35	28	0.74	5	0.13	3	0.08	2	0.05
A ₅	0.2	A ₅₁	0.2	35	0.92	2	0.05	1	0.03	0	0
		A ₅₂	0.2	32	0.84	2	0.05	2	0.05	2	0.05
		A ₅₃	0.6	33	0.87	2	0.05	1	0.03	2	0.05

$$A_3 = (0.2, 0.2, 0.3, 0.3)$$

$$A_4 = (0.25, 0.4, 0.35)$$

$$A_5 = (0.2, 0.2, 0.6)$$

2. From the set of the secondary evaluation indexes to the fuzzy matrix of comments set and according to Table 80.4, the following equation can be gained:

$$R1 = \begin{bmatrix} 0.89 & 0.05 & 0.05 & 0 \\ 0.95 & 0.05 & 0 & 0 \\ 0.95 & 0.03 & 0 & 0.03 \end{bmatrix}$$

Similarly, R_2 , R_3 , R_4 and R_5 can be solved.

3. According to fuzzy matrix formula, the subordinate degree B_k of the secondary index X_{kj} to P is solved as follows:

$$B_1 = A_1 \circ R_1 = (0.926, 0.042, 0.02, 0.012)$$

$$B_2 = A_2 \circ R_2 = (0.874, 0.076, 0.038, 0.012)$$

$$B_3 = A_3 \circ R_3 = (0.895, 0.075, 0.015, 0.018)$$

$$B_4 = A_4 \circ R_4 = (0.833, 0.123, 0.03, 0)$$

$$B_5 = A_5 \circ R_5 = (0.874, 0.05, 0.034, 0.04)$$

$$A = (A_1, A_2, A_3, A_4, A_5) = (0.15, 0.25, 0.25, 0.15, 0.2)$$

4. According to the weight values of the primary evaluation indexes, $A = (A_1, A_2, A_3, A_4, A_5) = (0.15, 0.25, 0.25, 0.15, 0.2)$ can be known, and thus, the subordinate vector of the primary evaluation index X to P is solved as follows:

$$V = (0.881, 0.073, 0.028, 0.018) \times [94, 80, 64, 58.5]^T = 91.499$$

5. Through the value of W , the value of V can be calculated; the value of W can use the average of excellent, good, middle and poor as benchmark. Therefore, according to the formula $V = B \cdot W^T$, the following value can be solved.
6. $V = (0.881, 0.073, 0.028, 0.018) \times [94, 80, 64, 58.5]^T = 91.499$. The results show that the evaluation made by students on the teacher was excellent (the excellent numerical value was assumed to be higher than 90); in the actual evaluation process, a diversified evaluation system should be available. For example, the evaluation can be made from various levels such as expert group evaluation and peer teacher evaluation.

80.5 Conclusion

Through the above analysis, it can be seen that the evaluation method based on intuitive fuzzy set can make a correct evaluation according to the incomplete information appearing in the result of questionnaire; the hesitation degree in intuitive fuzzy set makes use of the evaluation information to the maximum, making the results of evaluation more comprehensive, scientific and reasonable. Therefore, this method can be applied in the teaching quality evaluation of teachers in universities and colleges and thus promotes the improvement of education and teaching qualities.

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Chapter 81

Study of Improving Accounting Teaching for Non-Accounting Majors

Qunli Qiang

Abstract Accounting course is the required course for developing the quality of accounting for the students who major in economic management. They are the non-accounting majors. The teaching of the accounting course for the non-accounting majors who major in economic management has a great amount of problems. Among them, the teaching target is not clear. This has caused the design of the teaching content as well as the selection of the teaching methods to be hard to adapt to the need of talent training. Therefore, in order to improve the teaching quality of the accounting course for non-accounting majors, the subject teaching target should be adjusted. The teaching content should be integrated. The teaching methods and means should be renewed. In this way, it enables the goal clear, the content to be optimized and the method to be scientific.

Keywords Non-accounting majors · Accounting · Course reform · Teaching reformation

81.1 Problem Introduction

Along with the gradual improvement in the socialist market economic system in our country, accounting has played an increasingly important role in the micro-economic management and macroeconomic management learning and mastering knowledge on accounting is very important to the students who are majoring at

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economic management non-accounting majors. In the contemporary society, the teaching of the financial accounting for the students who major at economy and management in institutions of higher learning has a great amount of problems. The students are of non-accounting majors. The problems are shown as follows: the teaching objective is far from being clear. In particular, financial accounting teaching for non-accounting majors fails to distinguish its differences from the professional accounting course [1]. In order to improve the teaching quality of the accounting course for non-accounting majors, the subject teaching target should be adjusted. The teaching content should be integrated. The teaching methods and means should be renewed. In this way, it enables the goal clear, the content to be optimized and the method to be scientific. The teaching content design and the teaching method selection can hardly meet the needs of talent training.

81.2 The Adjustment of the Teaching Objective of the Curriculum

Course teaching goals not only determine the type of talents training and training direction, but also decide the design of teaching content. Strictly distinguish the difference between the accounting majors and the non-accounting major. This very important for accounting majors accounting teaching goal as it is to cultivate the key to accounting major with the economic law and accounting management aspects [2]. As for senior specialized talents in the teaching mode on the outstanding accounting theory and practice teaching and train students in economic activities, collect processing and produce the ability of accounting information as accounting majors implementation of accounting education purpose of students. It is to make them set up accounting thought and the way of thinking, through the accounting course teaching, the students can read (not prepare) accounting statements, can understand the accounting information economy connotation and can use accounting information forecast decision, and through the understand accounting for its professional service to the purpose.

But, from the perspective of the cultivation of the students' ability, only above cognition seems to be enough for that. US accounting education goals inspiration may change the traditional accounting education mainly as it is the certified public accountant cultivate reserve force. However, in 1990, the United States accounting institute (AAA) by the United States in a eight accounting company funded studies of accounting education goals in the report puts forward new ideas and points out that the purpose of the accounting education is not in cultivating students after graduation in a qualified as a professional. But in training of its qualified professional ability, ask the notice cultivate the students' self-learning ability, make it a lifelong learning [3].

To sum up, as accounting majors accounting course teaching includes two aspects: one is through the accounting course of accounting professional students understand

the generation of accounting information system, familiar with accounting language, and based on this, the training they understand the accounting information analysis of accounting information accounting information for economic management forecast decision provides basis for training students' ability of two is according to need to keep learning relevant accounting knowledge ability.

81.3 The Integration of Curriculum Teaching Content

It is the primary task to determine the teaching content according to the teaching objectives in a reasonable manner. This is the first task to be performed for the reformation of the financial accounting teaching for the non-accounting majors.

In terms of the traditional teaching of the financial accounting for the non-accounting majors, they would either choose the manner of "two integrate into one" or the manner of "three integrate into one." From the perspective of "two integrate into one," the integration refers to both the basic accounting and the financial accounting. These two parts of content are simple. From the perspective of "three integrate into one," the integration refers to the basic accounting, the financial accounting and the cost and management accounting. However, both the manner of "two integrate into one" and the manner of "three integrate into one" share the same characteristic. The same characteristic lies in the key to the teaching [4]. The key to the teaching pays close attention to the determination and measurement of the accounting elements. The key to the teaching attaches high importance to the data source of the information. However, the key to the teaching has ignored the analysis and utilization of the accounting information. In this way, the teaching content can hardly have any effect on the students whose major is not accounting. The teaching content does not focus on the non-accounting majors. When the students have learned the accounting knowledge, it is a normal situation for them that they do not quite understand what the accounting knowledge is talking about. Currently, in terms of most of the accounting course, the teaching content confuses the students in the same way. This type of course does not work. Therefore, the following improvements should be done on the teaching content of the financial accounting. The following improvements are shown here:

81.3.1 Teaching Content

In the first place, in terms of the financial accounting content of the current accounting course, most of them are based on the teaching material of accounting professional financial. That is to say, they compile the teaching materials for the financial accounting of the accounting major based on the following compilation ideas: the assets, the liabilities, owner's equity, revenue, fees and profits. In this way, they introduce the determination of the accounting, the quantity and the

method. The strength of this compilation method is that it has strong professional characteristics and it is relatively systematic. For the students who are majoring in the accounting, as they have already learned the basic accounting course, they have some basic knowledge on accounting in the first place. As the financial accounting is set as the single set curriculum, and there is a great amount of time, it would not be so hard for the students to learn the accounting knowledge in this case. In addition to this, through the learning of the particular curriculum, the students can have a deeper knowledge on the previous course (the basic accounting). On this basis, they have made good preparation for the learning of the successive course (senior accounting). However, this is not the case for the students that are not major in accounting. For the students who are of non-accounting majors, it is generally hard to learn the accounting science. Under this circumstance, according to the reality of the students that are of non-accounting majors, things should be changed. Part of the content of the financial accounting should be based on the requirements of the business circulation rules as well as the management requirements. In this way, the methods of accounting record should be taught. The specific contents have included the following courses. They are as follows: the cash circulation accounting and cash management, the circulation accounting of financing and management, the accounting records and management of fixed assets and the project under construction, the accounting record and management of purchasing business cycle, the accounting record of production cycle and its management, the accounting and management of sales cycle as well as the formation and distribution of business accounting.

81.3.2 Compilation and Utilization of the Teaching Materials

In the second place, it is about the compilation and utilization of the teaching materials. The teaching content is mainly shown in the teaching materials. The compilation and utilization of the teaching materials are as well one of the important aspects of the accounting teaching. As the teaching materials for the teaching of accounting for non-accounting majors, there is no need to have a great amount of theoretical introduction. Some of the theories and methods of accounting can be shown in the common language, vivid cases and the circulate exercises and so on. In order to expand the knowledge scope of the students as well as to stimulate the learning interests of the students, it is a good idea to add some expansion knowledge concerning the content of the chapter at the end of each chapter. In addition to this, accounting is a subject with relatively strong application property; it cannot be grasped until a great amount of training. Therefore, it is a good idea to provide a great amount of exercises that are of multiple forms at the end of each chapter in the teaching materials.

81.4 The Improvement of the Teaching Method and Ways of the Curriculum

In the teaching activity, the teachers should be advocated to lead the students. The students should be taken as the main subject. In terms of the teaching method, the teaching method that is of inspiration and interaction should be actively advocated. In addition to this, the case teaching method should be promoted in a wide area. In terms of the teaching methods, the modern information technology should be made use of in a full manner. The multimedia teaching methods are used.

81.4.1 Actively Carry Out the Teaching of Inspiration and Interaction

In the first place, actively carry out the teaching of inspiration and interaction. Using the teaching of inspiration and interaction can greatly motivate the learning enthusiasm, the learning activity and the creativity of the students. In this way, the teaching of inspiration and interaction really initiates the learning enthusiasm of the students. Considering this situation in the process of learning activities, the teachers should pay attention to the learning method. The teachers should transform the teaching methods from the merely attention to “teaching” to “direction.” On this basis, the teachers should guide the students to actively participate in the teaching process. In addition to this, the teachers should as well actively guide his or her students to think actively and also to learn with enthusiasm. From the perspective of the teachers, they can assign some extracurriculum reading content to the students after class. The teachers and the students can discuss over the set topics and share their views. Teachers are able to put forward some questions and the guidance work. Or they are able to talk about their opinions on the discussed topics. In terms of the students, they should write down their point of views or even write dissertations on the topic.

81.4.2 Actively Advocate the Case Teaching Method

In the second place, actively advocate the case teaching method. The case teaching method has played a significant role in the training of the comprehensive qualities of the students that are of non-accounting majors. However, in order to let this kind of teaching method to work and achieve the real effect, the following problems should be paid attention to. They are as follows:

Firstly, the designed case should meet the teaching objective of the curriculum. The accounting case content of the non-accounting majors should be simple and easily compared to the accounting profession. Be sure to make it clear and concise and avoid long-windedness.

Secondly, the designed case should have shown certain level. In terms of the teaching case of the accounting curriculum, it can be divided into the independent case and the comprehensive case. From the perspective of the independent case, it should mainly focus on certain chapters or the case of certain problem. The independent case is usually descriptive. From the perspective of the comprehensive case, its content is relatively complicated. The comprehensive case has covered a wide area. It is a kind of analytical case.

Thirdly, in the process of carrying out the case teaching, one thing should be paid special attention to, that is, the teaching and the direction role played by the teachers. Before carrying out the case discussion, the teachers should have designed very well the content of the case. In addition to this, the teachers should as well teach the knowledge on the teaching materials and also the important points in a systematic manner. During the process of case discussion, teachers should base on the circumstances and lead the students to a certain extent. After the case discussion, teachers should make a summary. They should link to the case and make a summary and conclusion of the knowledge.

81.4.3 Make Full Use of the Contemporary Information Technology and Adopt the Multimedia Teaching Method

In the third place, make full use of the contemporary information technology and adopt the multimedia teaching method. The modern teaching is built on the modern scientific technology. The modern scientific technology serves as the basis of the modern teaching. With the rapid development in the information technology, we have gained progress on the teaching activities. The rapid development in the information technology has provided us with a great amount of possibilities of adopting the modern teaching ways in the teaching activities. Multimedia teaching is a kind of important means to realize the modernization of the teaching method as well as the scientific performance of the teaching method. From the perspective of a great amount of teachers, the utilization of multimedia teaching is able to greatly increase the amount of teaching information. In terms of the students, multimedia teaching is so vivid and has so many images that it inspires the students to learn and think. The originally dull atmosphere of the classroom can be changed, and the originally boring content can be improved. The learning interest of the students is increased to the content that they have learned. The image thinking ability of the students is strengthened. In this way, the teaching quality can be improved and the goal of achieving efficiency can be obtained.

81.4.4 Attach High Importance to the Accounting Curriculum Experiments

In the fourth place, attach high importance to the accounting curriculum experiments. Vernon L. Smith shared the 2002 Nobel Memorial Prize in Economic Sciences. There is a second key contribution of his influential paper *Microeconomic Systems as an experimental science* though that goes beyond adaptation of the concepts of mechanism design. Smith describes the technique of induced values. This is the method used in controlled laboratory experiments in economics, political science and psychology. This technique is what allows experimental economists to create a replica of a market in a laboratory. His views have opened a new page for the economic management and the experimental research. In addition to this, his views have promoted the further progress of the economic management experimental teaching. In terms of the accounting course of the non-accounting majors, it has covered the content of the primary accounting and the middle grade accounting. In terms of the learning time, the accounting course of the non-accounting majors spends much less time than the professional accounting. The curriculum experiences should be paid much attention to if one have to grasp the curriculum within a short period of time. Through the experiments, one should allow the students to fully understand the application of debit–credit bookkeeping and well understand the process of vouchers–books–reports.

The combination of the knowledge, the content and the method as well as the ways forms comprehensive training and cultivation of the knowledge, ability and quality of the students. The qualified talents are trained so as to meet with the requirements of the economic management.

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Chapter 82

Numerical Simulation Method for Surrounding Rock Stability Analysis of Surge Chamber Under Seismic Conditions

Xin Li, Lin Zhang, Jiawen Zhou, Xingguo Yang and Yuanyuan Lin

Abstract Underground engineering has broad prospects for development, but its surrounding rock stability is related to the project construction security as well as operation security. In this paper, quasi-static method is adopted, and based on the surge chamber at the Liuping Hydropower Station, the overall three-dimensional model is established to analyze the surrounding rock stability of surge chamber in complex geological areas under seismic conditions. The compute results show that the overall stability of the surge chamber surrounding rock and the lining structure is good, but the safety factor near the left side wall and right spandrel is small. So, it is necessary to take the key reinforcement measure and pay the key attention in the construction.

Keywords Numerical simulation · Surge chamber · Stability · Surrounding rock · Seismic

82.1 Introduction

The Osaka Kobe earthquake of Japan in 1995, the 1999 chi-chi earthquake and so on had caused heavy damage to underground engineering. In 71 tunnel projects with rock grounds that are affected by the earthquake fluctuation in places such as American California, Alaska, Japan and so on, there are cracking until collapsing seal happened in 42 tunnel projects. It is shown that underground structure

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earthquake stability is directly related to underground chamber deformation and failure evolution under seismic load [1].

China's water resources are mainly concentrated in the southwest, and a number of hydropower stations are constructed. These are all located in mountain gorge areas with strong new tectonic movement, extremely unstable geological environment, in performance of the strong seismic activity and frequent landslides, avalanches, and other geological disasters. Diversion development method is adopted in many large-scale hydropower projects, and a large number of surge chamber have been built. Surrounding rock stability of surge chamber in complex geological areas under seismic conditions has become one of the key issues and key technologies in hydropower project construction [2].

In this paper, numerical simulation method is adopted to study the dynamic properties and response characteristics of surge chamber at the Liuping Hydro-power Station. The compute results are valuable for underground engineering design or construction, and recommendations provide a basis and reference for similar projects [3].

82.2 Numerical Simulation Method

Seismic analysis method Static method in the seismic design and seismic stability checking in, the structure of the gravity, the design earthquake acceleration and the ratio of gravitational acceleration, coefficient of dynamic distribution of a given product as the design seismic force among the static analysis. In determining the earthquake will be followed as a static load imposed on building structure, and static loading, the load will increase as the construction of static structures, and static loads for structural analysis as in the case.

Static method used when acting on the particle along the building height of horizontal earthquake inertia force F_i can be calculated as the representative,

$$F_i = a_n \xi G_i a_i / g \quad (82.1)$$

where a_n is the design level of intensity corresponding to the representative value; ξ is the earthquake response reduction factor; G_i is the representative value of gravity; a_i is the dynamic distribution coefficient of point i ; g is the acceleration of gravity.

Constitutive model for rock mass The tensile strength Mohr–Coulomb constitutive model is adopted for rock masses to carry out the numerical simulation, the shear yield criterion and the tensile yield criteria as follows:

$$F = \sigma_1 - \sigma_3 N_\phi + 2c\sqrt{N_\phi} \quad (82.2)$$

$$f_t = \sigma_t - \sigma_1 \quad (82.3)$$

where σ_1 and σ_3 are the first and the third principal stress; c is the cohesion; N_ϕ is a function of friction angle; (ϕ) is the tensile strength of the rock mass.

82.3 Numerical Simulation Model and Parameters

Engineering geology The Liuping Hydropower Station is developed by diversion; a diversion tunnel is arranged upstream, surge chamber at its end, and three pressure pipes are arranged surge chamber downstream. According to the results of geological survey and exploration data, upper part and dome of surge chamber are located in rock of weak weather and weak unloading; the stability of the surrounding rock is poor [4].

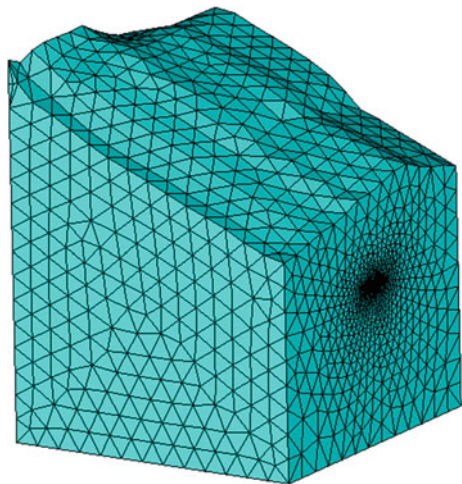
Three-dimensional simulation model According to geological data, we establish three-dimensional numerical model of LiuPing hydropower station surge chamber region. In order to ensure the accuracy of numerical calculation, the compute element of surge chamber is used hexahedral element. Figure 82.1 shows the overall three-dimensional compute mesh, and Fig. 82.2 shows the mesh of surge chamber.

In the numerical simulation process, two sections are selected to analyzed, and their coordinates are $x = 130$ (sections I–I) and $y = 204$ (sections II–II), receptively.

Rock masses mechanics parameters. Mechanics parameters of rock masses and concrete are referring to the criterion suggestion and design value, as shown in Table 82.1.

Support form of surge chamber is as follows: hanging mesh anchor bolt-spray support, hanging mesh steel bar $\Phi 12$, inter-row spacing of steel bar @ 20×20 cm; anchor bolt $L = 4.5(\Phi 28)$ and $L = 6.5$ m cross-arranged, inter-row spacing is 1.5 m, sprayed C20 concrete thickness of 12 cm.

Fig. 82.1 The overall numerical mesh



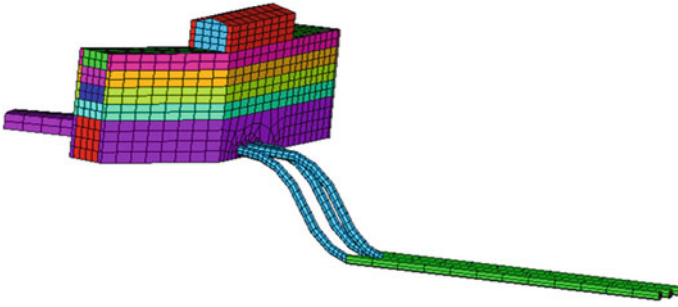


Fig. 82.2 Compute mesh of surge chamber

Table 82.1 Mechanics parameter value

Material type	Elastic modulus [GPa]	Poisson's ratio	Friction coefficient	Cohesion [MPa]
Surrounding rock	3.0	0.35	0.55	0.30
C20 concrete	25.5	0.17	–	–
C25 concrete	28.0	0.17	–	–

The support method for cracks, faults and fracture zones and other special parts of poor geological conditions are: as follows timely hanging mesh anchor bolt-spray support, while to reduce inter-row spacing of anchor bolt from 1.5×1.5 to 1.0×1.0 m.

Seismic loading condition The stability analysis for surge chamber under seismic loading is mainly concerned about stress, deformation and safety factor after surge chamber excavated and the support method is carried out.

The seismic intensity for Liuping Hydropower Station surge chamber is VIII, and seismic peak acceleration is 0.25 g.

82.4 Numerical Simulation Results

Displacement analysis Figure 82.3 shows the displacement vector at sections II–II under seismic loading condition. Figure 82.4 shows the displacement distribution of surrounding rock mass at the sections II–II.

The compute results show that both sides of the surge chamber performed to be horizontal deformation to the inside. Maximum horizontal displacement of the left wall is about 60 mm, maximum horizontal displacement of the right wall is about 50 mm, and both sides of the wall displacement are not completely symmetrical; maximum vertical displacement can reach 50 mm and appears in the surge chamber bottom, mainly for bottom rebound deformation. The vertical displacement of surge chamber crown is not large; the maximum value is about 20 mm, which is mainly for the main chamber crown structure design conducive to the chamber stability [5].

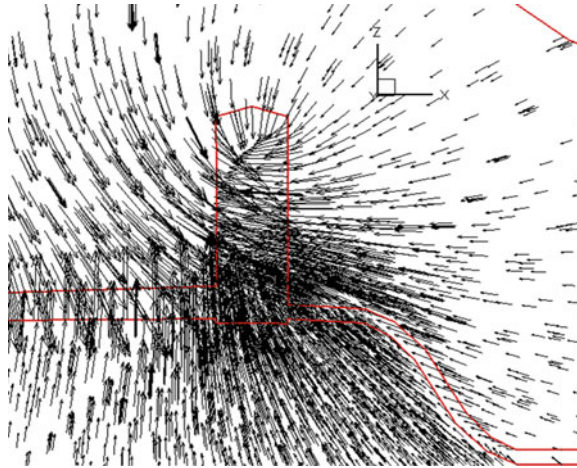


Fig. 82.3 Displacement vector of surge chamber at the sections II-II

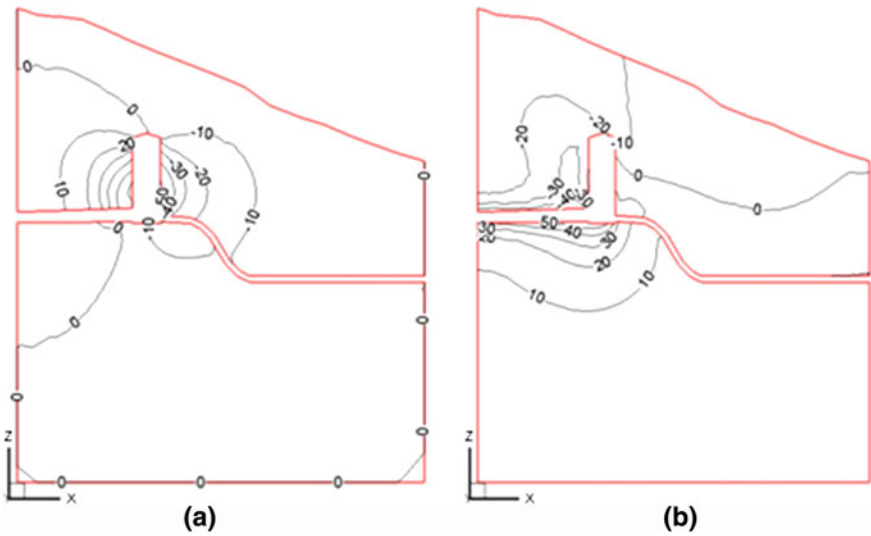


Fig. 82.4 Displacement contours of the sections II-II: **a** Horizontal displacement, and **b** Vertical displacement (unit: mm)

Stress analysis in Fig. 82.5 shows the stress calculation result at the sections I-I under seismic loading condition.

The compute results show that there is only compressive stress appeared with the surge chamber surrounding rock and the maximum principal stress of not more than 10 MPa. The minimum principal stress is likely to be local tensile stress that

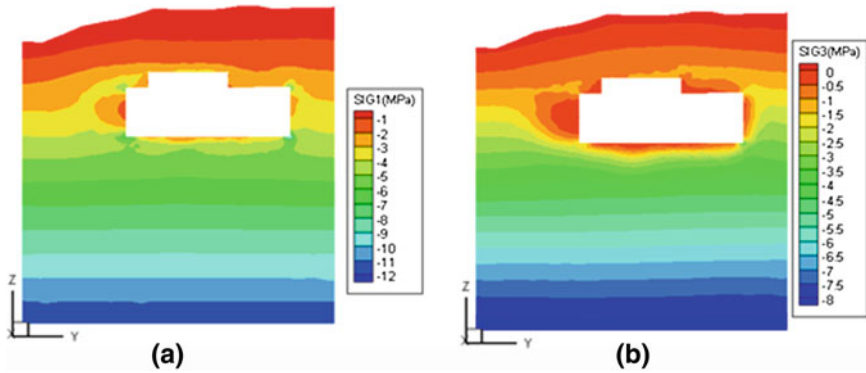


Fig. 82.5 Stress contours at the sections I-I: **a** First principal stress, and **b** Third principal stress

appeared at the two sides of surge chamber wall, but not great, the strained condition of surge chamber in a relatively secure state [6].

The maximum stress and safety factor are analysed for the various parts of surge chamber, and stability of surge chamber under seismic conditions is evaluated. Table 82.2 shows the maximum first principal stress and safety factor at different parts of surge chamber.

The compute results show that the first principal stress ranges between 1.7 and 8.4 MPa. The safety factor of all parts are greater than 1.0, which meet the seismic requirements, and the maximum of the crown and the bottom are between 1.8 and 2.0, both greater than that of the left and right side [7].

Axial displacement discipline of surge chamber The displacement discipline of surge chamber at the Liuping Hydropower Station under seismic load is analysed, considering the displacement distribution change of the crown, the lower with the horizontal coordinates, and the left and right side, at the vertical section (sections I-I) of the surge chamber.

The maximum displacement absolute value of the left side is distributed in X and Y direction, that is, the maximum of the left wall distributed in the horizontal direction. The maximum displacement absolute value of the bottom is distributed in Z direction, behaved as a rebound deformation.

Figure 82.6 shows the vertical displacement distribution discipline with the coordinates at the bottom of surge chamber under seismic conditions. Figure 82.7 shows the horizontal displacements distribution discipline at the right side of the surge chamber.

Table 82.2 Numerical simulation results

Position	First principal stress [Mpa]	Safety factor
Crown	-3.1	2.0
Bottom	-7.5	1.8
Left side	-6.7	1.1
Right side	-8.4	1.6

Fig. 82.6 Vertical displacements at the bottom of surge chamber

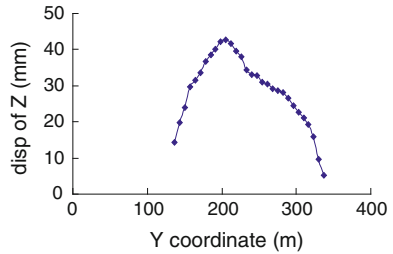
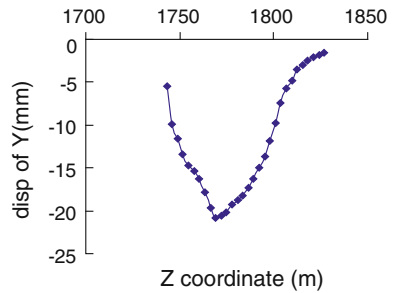


Fig. 82.7 Vertical displacements at the right side of surge chamber



The compute results show that maximum displacement change mainly focuses on the left side and bottom of the surge chamber; the maximum horizontal displacement is about 45 mm, larger than that of the right side (22 mm); the maximum displacement of the bottom is about 43 mm, larger than that of the crown (30 mm). The main reasons are as follows: left side is closer to the valley and the rock mechanics parameters are decreased under seismic loading conditions. Meanwhile, the direct impact on the bottom of vertical seismic waves from deep underground makes the displacement deformation of the bottom much greater than that of the crown.

For the crown and bottom, the displacement absolute values are $Z > Y > X$ direction; for the side surrounding rock, the displacement absolute values are $Y > X > Z$ direction.

The vertical displacement of the surge chamber bottom appeared to be rebound deformation, and the displacement of the middle is much larger than that of both sides.

Stability analysis Figure 82.8 shows the stability of the compute results of the surrounding rock of surge chamber (sections II–II) under seismic conditions.

The compute result shows that the minimum safety factor of surrounding rock can be maintained above 1.0 under seismic loading conditions, surrounding rock is stable.

Figure 82.9 shows the safety factor compute results at the left and right side (series 1 is the left side; series 2 is the right side).

Figure 82.10 shows the safety factor compute results at the crown and bottom (series 1 is the crown; series 2 is the bottom).

Fig. 82.8 Stability of compute results at sections II-II

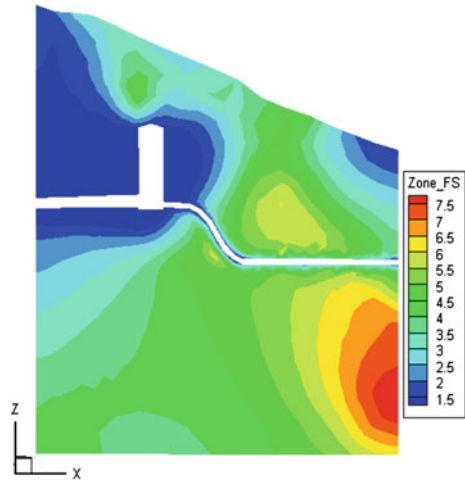


Fig. 82.9 Safety factor compute results of the side wall rock

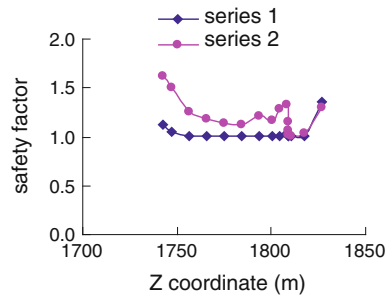
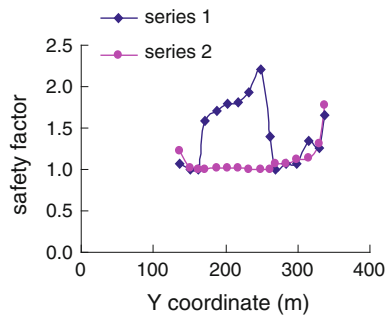


Fig. 82.10 Safety factor compute results at the crown and bottom



The compute results show that safety factor of crown changed greatly with the coordinate's change, while that of bottom changed little, the safety factor of that near the corner of wall relatively large, close to 1.5. Safety factor of the left side and crown are all just over 1.0, and therefore, it is necessary to take the key reinforcement measure and pay more attention on the construction process.

82.5 Conclusions

- (1) Both side walls displacement of surge chamber is not completely symmetrical under seismic loading; vertical displacement of crown is not very large; and maximum vertical displacement occurs in the surge chamber bottom, which is mainly the bottom bounce deformation.
- (2) Surrounding rock of surge chamber is only compressive stress and the maximum principal stress is not exceeding 10 MPa.
- (3) Left side wall displacement absolute value in the horizontal direction is maximum, mainly because the left side is near the valley and there is overhead free surface in the inner side (right side); bottom absolute value in the z direction is maximum displacement of Z direction, and its middle part is much bigger than both sides, mainly because inside bottom (Z direction) has overhead free surface and longitudinal seismic waves rebound.
- (4) Displacement absolute value of crown and bottom in the X, Y and Z directions is $Z > Y > X$; side wall is $Y > X > Z$.
- (5) If minimum safety factor value of surrounding rock and lining structure of surge chamber maintains at above 1.0, it indicates that surrounding rock and lining structure stability of surge chamber are good, but the safety factor near the left side and crown is small. So, it is necessary to take the key reinforcement measure and pay more attention in the construction process.

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Chapter 83

Study on the Pricing Model of Equity-Indexed Annuities

Yang Yu

Abstract As an innovative enterprise annuity product, the equity-indexed annuity guarantees the lowest return to its holders in bear markets. In order to provide a better choice for the investors who want to invest in stock markets while not bearing too much risk, the paper studies the pricing model of equity-indexed annuities and analyzes the calculation method of the point-to-point return rate.

Keywords Equity-indexed annuities · Pricing model · Point-to-point return rate

83.1 Introduction

Equity-indexed annuity was a new annuity product attaining a development in the 1990s. A lowest return guarantee is available in this annuity product, thus not only guaranteeing the principal, but also making the acquired income from investment not to suffer a loss. Meanwhile, on the basis of the lowest return guarantee, the rate of return actually paid by the annuity product to enterprises was associated with some predefined stock index or bond index. Therefore, this type of annuity product can not only participate in the growth of the capital market, but also suffers no market downside risks. For this reason, it has become highly popular among investors, and also has attained a very fast development since it was promoted at Europe and American markets. At present, there has been no such an annuity product in China yet. However, along with the development of enterprises' annuity market, this type of annuity product will be firmly recognized by investors [1].

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83.2 Establishment of the Model

When the market conditions are presented not like the expectations of the investors, it is possible that the changes of loss will increase. This will make investors unable to the largest investment losses, which are possible to happen. In order to solve the potential problems caused by the changes of loss, another option is provided by portfolio insurance. For the portfolios of different bases, the greatest feature of the portfolio insurance is that it can guarantee the portfolio values not to be lower than a certain level at least on the expiry date when the whole market is depressed. And this lowest level refers to as the lower limit. Generally speaking, the lowest level will be set as the initial value of annuity portfolio. However, because the return acquired by annuity portfolio is better than that of the portfolio with no strategies, the investors have to abandon part of benefits when making a profit. Thus, in the operation of portfolio, it is necessary to find out a certain proportion when the lower limit value is decided. Then, the real return of investors can be calculated by using the lower limit to multiply by the proportion. However, the proportion will make investors not to acquire all return, and it is called as upside capture (α). Although the return of portfolio insurance is lower than general portfolio under the good market condition, this strategy provides the lowest return under the poor market condition, and simultaneously allows the investors to definitely know the distribution of return [2].

Mathematical expressions can be applied as follows. The portfolio value of the portfolio insurance on the expiry date is assumed to be V^* ; the initial portfolio value is K ; the actual portfolio value on the expiry date is S^* ; the expiry date is t .

$$\begin{aligned} V^* &= \max(K, \alpha S^*) \\ &= K + \max(0, \alpha S^* - K) \\ &= K + \alpha \max\left(0, S^* - \frac{K}{\alpha}\right) \end{aligned} \quad (83.1)$$

From the above equation, it can be known that portfolio insurance comprises of two parts. The one is lending Ke^{-rt} RMB, which can acquire the principal value (K RMB) in portfolio insurance on the expiry date if calculated according to the compound interest of risk-free return (r). The other is buying α number of European calls using $\frac{K}{\alpha}$ as strike price and expiry date is t , so as to provide investors with the returns from profitable investment.

After knowing well portfolio insurance is composed by lending Ke^{-rt} equal to the principal value and buying α number of European calls, the value of α can be deduced and calculated with Black–Scholes formula, so as to obtain the correct value of α .

From Black–Scholes formula, it can be known that the price of European call can be expressed as follows.

$$C = SN(d_1) - Ke^{-rt}N(d_2) \quad (83.2)$$

In above, $d_1 = \frac{\ln(S/K) + (r + 0.5\sigma)t}{\sigma\sqrt{t}}$, $d_2 = d_1 - \sigma\sqrt{t}$.

- C Theoretical value of European call.
- S Current stock price.
- K Strike price.
- r Risk-free interest.
- t Length of expiry date.
- σ Return fluctuating degree of stock price.

Portfolio insurance's value on the expiry date is $V^* = K + \alpha \max(0, S^* - \frac{K}{\alpha})$, and thus its current value can be expressed as follows.

$$V = Ke^{-rt} + \alpha \left[\text{SN}(d_1) - \frac{K}{\alpha} e^{-rt} N(d_2) \right]$$

$$d_1 = \frac{\ln(S/K) + (r + 0.5\sigma)t}{\sigma\sqrt{t}} \quad (83.3)$$

$$d_2 = d_1 - \sigma\sqrt{t}$$

- V Theoretical value of portfolio insurance.
- K Principal of portfolio insurance.
- α Upside capture (the degree of participation in the stock market based on combining preservation return).
- S Actual portfolio insurance's value on the expiry date.

There is $t = 0$ at the beginning. If the principal amount is equal to portfolio insurance's current value ($V = K$), and also the current value of portfolio insurance (i.e., the cost of reproducing this strategy) is equal to the basic portfolio value S ($V = S$), $V = S = K$ can be solved finally. Under the condition that risk-free interest (r), length of expiry date (t) and upside capture (α) have been known, the value of α can be deduced and solved with Black–Scholes formula.

83.3 Calculating the Rate of Return

Part of the rate of return of equity-indexed annuities is decided by the rate of stock price index return associated with it. In general, there are three methods of calculating the rate of return, namely point to point, reviewing point to point, and averaging. However, the point-to-point method is the most direct and has been applied the most extensively [3].

The point-to-point method is also called as end point method, and its calculation on the rate of return depends on two time points: (1) the starting date in investment period; (2) the termination date in investment period. The increasing rate of stock price index can be solved if the stock price index at the termination

date subtracts the stock price index at the starting date first and then divides it. Thus, the return rate finally necessary to pay can be solved by using the increasing rate to multiply the participation rate stipulated in equity-indexed annuities management contract. The market environment where the point-to-point calculation method can be applied the most appropriately is bull market, and thus a higher return rate can be acquired with this calculation method under the condition that market tends to uptrend. Conversely, if stock price index is in a repeated oscillation, only considering the stock price index on the expiry date may make the return of annuity holder worse than expected [4].

In the actual operational flow, there is a term guaranteeing the lowest return rate in enterprise’s annuity management contract; if the calculation result of portfolio’s return rate is smaller than the guaranteed lowest return rate, annuity holder is allowed to use the guaranteed lowest return rate as calculation basis. Therefore, the return annuity holder can obtain can be expressed as follows.

$$\text{Max} \left((1 + i)^n, 1 + \alpha \left(\frac{S_n - S_0}{S_0} \right) \right). \tag{83.4}$$

Meanwhile, if an upper limit is stipulated for return rate in enterprise’s annuity management contract and also the return rate obtained by portfolio is larger than the result calculated according to the compound interest of the upper-limit return rate, it is necessary to subtract the exceeding part, as shown below.

$$\alpha \left(\frac{S_n - S_0}{S_0} \right) - ((1 + r_c)^n - 1) \tag{83.5}$$

$$\begin{aligned} &\text{Max} \left((1 + i)^n, 1 + \alpha \left(\frac{S_n - S_0}{S_0} \right) \right) \\ &= (1 + i)^n + \text{Max} \left(0, 1 + \alpha \left(\frac{S_n - S_0}{S_0} \right) - (1 + i)^n \right) \\ &\quad - \text{Max} \left(0, \alpha \left(\frac{S_n - S_0}{S_0} \right) - ((1 + r_c)^n - 1) \right) \\ &= (1 + i)^n + \alpha * \text{Max} \left(0, \frac{S_n}{S_0} - \frac{\alpha + (1 + i)^n - 1}{\alpha} \right) \\ &\quad - \alpha * \text{Max} \left(0, \frac{S_n}{S_0} - \frac{\alpha + (1 + r_c)^n - 1}{\alpha} \right) \\ &= (1 + i)^n + \frac{\alpha}{S_0} \text{Max} \left(0, S_n - S_0 \left(\frac{\alpha + (1 + i)^n - 1}{\alpha} \right) \right) \\ &\quad - \frac{\alpha}{S_0} \text{Max} \left(0, S_n - S_0 \left(\frac{\alpha + (1 + r_c)^n - 1}{\alpha} \right) \right) \end{aligned} \tag{83.6}$$

Therefore, the actual return rate of portfolio can be solved if the above two parts are considered together.

According to the finally simplified result, the return rate of the point-to-point equity-indexed annuities on the expiry date is obtained by using the compound

sum of the guaranteed lowest return rate to add the numerical value solved by the subtraction between the maturity values of European calls taking $S_0\left(\frac{\alpha+(1+i)^n-1}{\alpha}\right)$ and $S_0\left(\frac{\alpha+(1+r_c)^n-1}{\alpha}\right)$ as strike prices. Therefore, according to the Black–Scholes call option pricing formula, the current value of the point-to-point equity-indexed annuities can be expressed as follows.

$$1 = \frac{(1+i)^n}{e^{rn}} + \frac{\alpha}{S_0} * C_1 - \frac{\alpha}{S_0} * C_2 \quad (83.7)$$

In above: $C_1 = S_0N(d_{11}) - K_1e^{-rn}N(d_{12})$, $C_2 = S_0N(d_{21}) - K_2e^{-rn}N(d_{22})$

$$K_1 = S_0\left(\frac{\alpha + (1+i)^n - 1}{\alpha}\right), K_2 = S_0\left(\frac{\alpha + (1+r_c)^n - 1}{\alpha}\right)$$

$$d_{11} = \frac{\ln\left(\frac{S_0}{K_1}\right) + (r + 0.5\sigma)n}{\sigma\sqrt{n}}, d_{21} = \frac{\ln\left(\frac{S_0}{K_2}\right) + (r + 0.5\sigma)n}{\sigma\sqrt{n}}$$

$$d_{12} = d_{11} - \sigma\sqrt{n}, d_{22} = d_{21} - \sigma\sqrt{n}$$

83.4 Conclusion

From the deduction of the model, it can be found that enterprise's annuity manager offers the return rate of equity-indexed annuities through buying bonds and participating in investment option of stock market. The bonds can be used to properly pay the guaranteed amount on the expiry date; the investment option of stock market (i.e., stock price index option) is in charge of offering equity-indexed annuities' returns associated with stock price index. Therefore, the bonds and the cost of the option will play an effect on the participation rate. According to the above analysis, the following conclusions can be drawn up.

First, the participation rate has an inverse relationship with the guaranteed lowest return rate. Because the guaranteed lowest return rate increases, the cost of the guarantee will be higher, making annuity manager unable to acquire an equal stock market investment proportion in the same condition. Thus, the participation rate decreases.

Second, stock price fluctuation has an inverse relationship with the participation rate. Because stock price fluctuation gets greater, the price of call option will rise, and relatively the number of contracts bought by annuity manager will be reduced. Then, annuity manager is unable to acquire more returns from call option when stock prices go up. Thus, the participation rate decreases.

Third, the increase in risk-free interest rate as well as the longer deadline will make the guarantee cost of annuity manager reduced. Therefore, call option can be bought by annuity manager with the reduced cost, and then more returns will be obtained when stock prices go up. Thus, the participation rate becomes higher.

In short, in the process of specifically designing equity-indexed annuities products, it is necessary to give a comprehensive consideration to market interest rate, investment deadline and capital market price changes, and deliberate with the clients of enterprise equity-indexed annuities on the designed guarantee for the lowest return rate and the calculation of associated stock investment return rate in enterprise annuity management contract, aiming at realizing value maintenance/addition and professional management of equity-indexed annuities in enterprises on the basis of guaranteeing the security and liquidity of the assets.

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Chapter 84

Dynamics Analysis of the MRF Rectangular Sandwich Plate Based on ANSYS

ZhengXin Zhang and FangLin Huang

Abstract Magnetorheological fluid (MRF) is in liquid when there are no external stimuli. However, when they are subjected to an applied magnetic field, their physical appearance changes from viscoelastic body to viscoelastic plastic body and eventually becomes like a solid gel. During this transformation, the vibration characteristics of the MRF rectangular sandwich plates change as well. For the simple MRF rectangular sandwich structure, the natural frequency and loss factor can be obtained by theoretical derivation method. The large complex MRF sandwich structure is difficult to deal with, and the experimental study has great effect on the experimental conditions. What is more, the experiment load condition is also very limited, so the use of the finite element analysis software to simulation is necessary. In this paper, a theoretical calculation method of MRF rectangular sandwich plate simply supported on four edges has been proposed to calculate natural frequency. Based on the ANSYS, this paper proposes several methods to simulate MRF rectangular sandwich plate and obtains the best modular model by comparing with the theoretical result.

Keywords Magnetorheological fluid · ANSYS · Complex shear modulus · Viscosity · Natural frequency

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84.1 Introduction

Magnetorheological fluid (MRF) is in liquid form, with low viscosity, when there are no external stimuli. However, when they are subjected to an applied magnetic field, their physical appearance changes to a solid gel. During this transformation, their rheological properties, such as apparent viscosity and complex shear modulus, change significantly [1, 2]. Under external magnetic field, MRF exhibits a certain shear yield stress, which is considered to be the main sign of MR effect [3]. Using this characteristic, MRF sandwich beams, plates and shells have been developed for improving the damping and stiffness of structure.

At present, there are not many researches in analyzing dynamic characteristics of MRF sandwich with finite element method at home and abroad. Li et al. [4] adopted finite element method to deduce natural frequency and loss factor of MRF sandwich plate under different magnetic field intensity. Snamina et al. [5] studied on the vibration characteristics of MRF sandwich plate and applied research results in continuous system's semi-active control. For simple MRF sandwich beams and plates, their natural frequency and loss factor could be calculated by the theoretical deduction. However, large and complex MRF sandwich structures were difficult to deal with; the experimental conditions, such as boundary conditions and impact scale model, had a significant effect on experimental study; the loading status which can be realized in the experiment was still very limited. Therefore, adopting the large-scale finite element analysis software to carry out numerical simulation is necessary. The author analyzes MRF sandwich beam based on ANSYS, advanced FEM software, using Visco89 and Fluid80 to simulate MRF sandwich layer [6].

This article adopts different element combinations to simulate MRF sandwich plate based on ANSYS and obtains sandwich plate's natural frequency and loss factor at different magnetic field intensity. Moreover, to compare with the theoretical values, this paper attempts to get the most effective element combination.

84.2 Natural Frequency's Theoretical Calculations of MRF Rectangular Sandwich Plate with All Edges Simply Supported

84.2.1 Fundamental Assumptions

The MRF sandwich plate, studied in this paper, is one kind of viscoelastic material, which is isotropic material and whose upper and lower surface layers are very thin and their thickness are equal, while its MRF sandwich layer is rather thick. Based on the classical sandwich plate theory, the fundamental assumptions used in this research are as follows:

1. Materials are subordinated to Hooke’s law.
2. When bending deformation happens, surface plate abides by straight normal assumption, and no slipping is assumed between the elastic upper and lower layers and the MRF layer.
3. Consider rotation of the sandwich layer around the x- and y-axes.
4. Not consider the damping of the surface plate while only consider the core layer’s damping effect and express core layer’s damping characteristics in the form of the complex stiffness.
5. Do not take in-plane moment of inertia into account.

84.2.2 Calculation of MRF Sandwich Plate’s Free Vibration Natural Frequency

Based on the above assumptions, any point of the sandwich plate’s displacement is as follows:

Upper surface layer:

$$u_1 = u + \frac{1}{2}h_0\varphi_x \quad v_1 = v + \frac{1}{2}h_0\varphi_y \quad \omega_1 = w \tag{84.1}$$

Sandwich layer:

$$u_2 = u + z\varphi_x \quad v_2 = v + z\varphi_y \quad \omega_2 = w \tag{84.2}$$

Lower surface layer:

$$u_3 = u - \frac{1}{2}h_0\varphi_x \quad v_3 = v - \frac{1}{2}h_0\varphi_y \quad \omega_3 = w \tag{84.3}$$

where u_i, v_i and w_i ($i = 1, 2, 3$) denote the displacement of every point in all three layers in x, y and z directions, respectively. u, v and w denote the displacement of every point at the centroid of rectangular sandwich plate in x, y and z directions, respectively. h_0 is the distance between the middle plane of upper and lower layers. φ_x and φ_y denote the angle of middle surface normal in the xz and yz planes (Fig. 84.1).

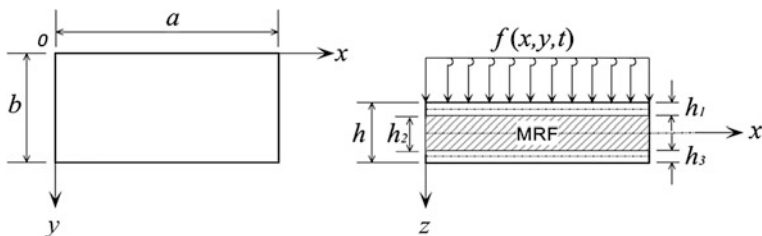


Fig. 84.1 The coordinate and geometry size of MRF sandwich plate

According to the elastic strain energy formula, the sandwich plate’s strain energy, after deformation, can be represented by:

$$\begin{aligned}
 U = & \frac{D_1 + D_3}{2} \iint_s (\nabla^2 w)^2 dx dy \\
 & + \frac{D}{2} \iint_s \left[\left(\frac{\partial \varphi_x}{\partial x} \right)^2 + \left(\frac{\partial \varphi_y}{\partial y} \right)^2 + 2\nu \frac{\partial \varphi_x}{\partial x} \frac{\partial \varphi_y}{\partial y} + \frac{1 + \nu}{2} \left(\frac{\partial \varphi_x}{\partial x} + \frac{\partial \varphi_y}{\partial y} \right)^2 \right] dx dy \\
 & + \frac{G_2 h_0}{2} \iint_s \left[\left(\varphi_x + \frac{\partial w}{\partial x} \right)^2 + \left(\varphi_y + \frac{\partial w}{\partial y} \right)^2 \right] dx dy
 \end{aligned}
 \tag{84.4}$$

where $D_i = \frac{E_i h_i^3}{12(1-\nu_i^2)}$ ($i = 1, 3$), $D = \frac{E h_0^2 h_1}{12(1-\nu^2)}$, G_2 is the complex shear modulus of sandwich plate.

The kinetic energy of sandwich plate can be represented by:

$$T = \frac{1}{2} \iint_s \sum_{i=1}^3 \rho_i h_i \left(\frac{\partial w}{\partial t} \right)^2 dx dy
 \tag{84.5}$$

The work done by external forces can be represented by:

$$W = \iint_s f(x, y, t) w dx dy
 \tag{84.6}$$

This paper deduced MRF sandwich plate’s motion differential equation based on energy method. The Hamilton’s principle is invariant with respect to the coordinate systems used and is presented in the form:

$$\delta \int_0^t (U - T - W) dt = 0
 \tag{84.7}$$

The terms in the above equation are explained as follows: U is the total potential energy of structure, T is the kinetic energy of system, and W is the work done by external forces.

Substituting the energy terms in Eqs. (84.4)–(84.6) into Eq. (84.7), the natural frequencies of the sandwich plate structure under free vibration can be calculated by the form:

$$\omega_{mn} = \sqrt{\frac{(D_1 + D_3) \frac{D}{G_2 h_0} \left[\left(\frac{m\pi}{a} \right)^2 + \left(\frac{n\pi}{b} \right)^2 \right]^3 + (D_1 + D_3 + D) \left[\left(\frac{m\pi}{a} \right)^2 + \left(\frac{n\pi}{b} \right)^2 \right]^2}{\sum_{i=1}^3 \rho_i h_i \left\{ \frac{D}{G_2 h_0} \left[\left(\frac{m\pi}{a} \right)^2 + \left(\frac{n\pi}{b} \right)^2 \right] + 1 \right\}}}
 \tag{84.8}$$

In the above equation, both m and n are positive integers.

For the shear modulus of MRF sandwich that is expressed in the form of complex shear modulus, the natural frequency amplitude and the loss factor can be obtained as follows:

$$\omega_{mn} = |\omega_{mn}|(1 + i\eta_{mn}) \quad (84.9)$$

where

$$|\omega_{mn}| = \sqrt{\text{Re } \omega_{mn}^2 + \text{Im } \omega_{mn}^2} \quad (84.10)$$

$$\eta_{mn} = \frac{\text{Im } \omega_{mn}^2}{\text{Re } \omega_{mn}^2} \quad (84.11)$$

84.2.3 The Dynamic Equation of Sandwich Plate Structure Under Free Vibration

For MRF sandwich plate, the free vibration equation with N discrete degrees of freedom can be represented by:

$$M\ddot{u}^* + K^*u^* = 0 \quad (84.12)$$

where

$$K^* = K + iK' \quad (84.13)$$

In the above equations, M = (N by N) mass matrix and K^* = (N by N) complex stiffness matrix. Where K and K' are the real part and imaginary part of K^* , respectively. u^* is N-dimensional node displacement vector, which is complex.

For the free vibration, let $\mathbf{u}^* = \phi^* e^{i\omega t}$, then Eq. (84.12) can be simplified as:

$$K^* \phi^* = \lambda^* M \phi^* \quad (84.14)$$

where ϕ^* is the complex eigenvector; λ^* is the complex eigenvalue, $\lambda^* = \omega^{*2}$, ω^* is the complex frequency.

The complex eigenvalue λ^* can be represented by the form:

$$\lambda^* = \lambda + i\lambda' \quad (84.15)$$

Then, the n th mode loss factor can be obtained by:

$$\eta_n = \frac{\lambda'_n}{\lambda_n} \quad (84.16)$$

where λ_n and λ'_n are the real and imaginary parts of λ^* , respectively.

84.3 Simulating Vibration Characteristic of MRF Sandwich Plate Based on ANSYS

ANSYS has no suitable element to describe MRF's viscoelastic characteristic accurately; therefore, to simulate MRF sandwich plate is very difficult. This paper uses SOLID45 and VISCO89 to simulate MRF layer and adopts SHELL63 and SOLID45 to simulate upper and lower layers and then carries out the comparison of effectiveness with different simulation methods. Among them, VISCO89 is a quadratic isoperimetric element. The element is defined by 20 nodes having three degrees of freedom at each node. The element has thermorheologically simple viscoelastic and stress stiffening capabilities, adopting the generalized Maxwell's model to define material properties of the element. There are four element combinations as follows:

- NO. 1 uses SOLID45 to simulate upper and lower layer and MRF layer;
- NO. 2 uses SOLID45 to simulate upper and lower layer, while uses VISCO89 to simulate MRF layer;
- NO. 3 uses SHELL63 to simulate upper and lower layer, while uses SOLID45 to simulate MRF layer;
- NO. 4 uses SHELL63 to simulate upper and lower layer, while uses VISCO89 to simulate MRF layer

The MRF sandwich plate studied in this paper is $a = 200$ mm in width and $b = 300$ mm in length. Both elastic upper and lower layers thicknesses are 0.765 mm, and the MRF layer thickness is 2 mm. The upper and lower layers' elastic modulus, density and Poisson's ratio are 70 GPa, 2,800 kg/m³ and 0.3, respectively. The MRF layer's density and Poisson's ratio are 3,450 kg/m³ and 0.3, respectively, and complex shear modulus is calculated by a set of nonlinear relationship, which is measured and fitted by Xi'an Jiaotong University's Qing Sun et al. with a large amount of experimental data. The magnetic field levels are of 0, 800 and 1,500 Oe. The theoretical value of frequency can be calculated by Eq. (84.8). The finite element analysis results and the theoretical values are listed in (Tables 84.1 and 84.2).

Figure 84.2a illustrates the comparison of natural frequency's change curves with the finite element analysis results and the theoretical values under different magnetic field. Figure 84.2b illustrates the comparison of different order of natural frequency's change curves with the finite element analysis results and the theoretical values under the same magnetic field. As we can see from these figures, the finite element analysis results are consistent with the theoretical values, and the natural frequency variations in MRF rectangular sandwich plate increases as the magnetic field strength increases. Moreover, their vibration modes are the same. However, the finite element analysis results of four element combinations show some deviations, as follows:

Table 84.1 The values of finite element and theoretical in different unit combination (first 4 order frequency)

Magnetic field intensity	Order	NO. 1	NO. 2	NO. 3	NO. 4	Theoretical value
0 Oe	1	57.17	56.89	49.78	49.40	53.57
	2	95.51	94.48	87.08	85.40	91.80
	3	142.11	139.93	133.27	130.99	138.81
	4	157.50	154.99	148.40	145.71	154.41
800 Oe	1	67.84	67.88	56.40	56.16	62.25
	2	108.94	108.42	95.10	94.42	102.04
	3	157.42	156.10	142.21	140.86	149.93
	4	173.35	171.84	157.66	156.05	165.72
1,500 Oe	1	80.71	81.21	64.69	64.52	73.29
	2	126.10	126.05	105.67	105.22	115.86
	3	177.55	176.81	154.23	153.35	165.49
	4	194.22	193.37	170.05	169.02	181.67

Table 84.2 The results of finite element simulation and theoretical in different element combination (loss factor)

Magnetic field intensity	Order	NO. 1	NO. 2	NO. 3	NO. 4	Theoretical value
0 Oe	1	0.004727	/	0.004564	/	0.004643
	2	0.003193	/	0.003055	/	0.003099
	3	0.002273	/	0.002163	/	0.002185
	4	0.002078	/	0.001975	/	0.001989
800 Oe	1	0.006184	/	0.006027	/	0.006125
	2	0.004623	/	0.004460	/	0.004536
	3	0.003499	/	0.003352	/	0.003410
	4	0.003237	/	0.003096	/	0.003148
1,500 Oe	1	0.007229	/	0.007093	/	0.007207
	2	0.005938	/	0.005779	/	0.005873
	3	0.004799	/	0.004597	/	0.004716
	4	0.004507	/	0.004347	/	0.004421

1. Under different magnetic field, when the MRF sandwich plate is simulated by element combination NO. 3 and NO. 4, the simulation results are very similar. Meanwhile, when the MRF sandwich plate is simulated by element combination NO. 1 and NO. 2, the stimulation results of natural frequencies are also very close. However, when upper and lower layers select different elements, the results have large difference. As both upper and lower layers adopt SOLID45 to simulate, natural frequency's simulation result is higher than theoretical value. This is because the MRF layer considers independent field function φ_x and φ_y in theory calculation; therefore, upper and lower plates consider strain energy induced by these independent field functions. However, SHELL63 is a plate element based on the classical theory of elastic plate, and it does not consider strain energy induced by these independent field functions, while SOLID45 considers the strain energy caused by the shear deformation in each direction.

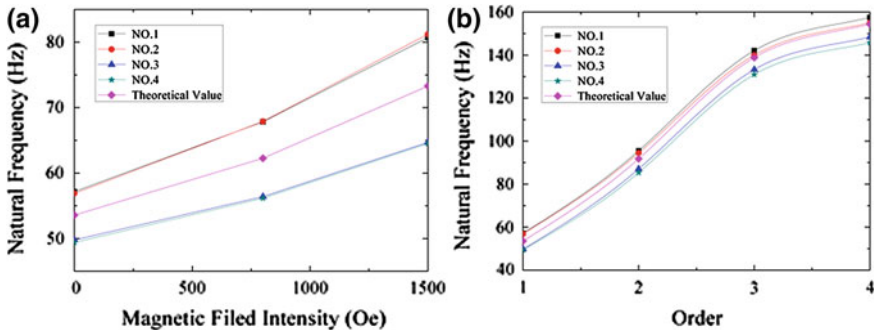
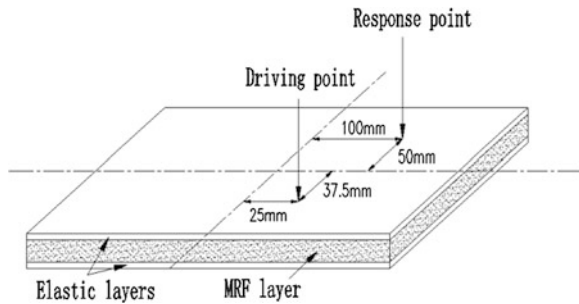


Fig. 84.2 The values of the finite element and theoretical

Fig. 84.3 MRF sandwich plate model



2. Under the same magnetic field, the calculation result curves of sandwich structure's natural frequency show that, when both upper and lower surface plates are simulated by SOLID45 and sandwich layer is simulated by VISCO89, the simulation results are more close to the theoretical calculation result.
3. Using SOLID45 to simulate MRF layer can obtain structural loss factor, and the results are consistent with the theoretical values, while the VISCO89 is incapable of obtaining.

Through carrying out harmonic response analysis by ANSYS, this paper obtains steady-state response of the sandwich plate under sinusoidal excitation, which is located in right side at a distance from the center of plate 25×37.5 mm (illustrated in Fig. 84.3), and the excitation frequencies are in the range of 0–200 Hz with 1 Hz increments. After calculation, this paper extracts the dynamic response of measuring points which are located at the distance from the center of plate 50×100 mm. As can be seen from the figures, resonant frequency increases as the magnetic induction intensity increases. The transfer function curves display that the high natural frequency is easier to be discerned when uses VISCO89 to simulate MR fluid.

84.4 Conclusions

This paper adopts four element combinations to simulate rectangular sandwich plates' inherent-free vibration and harmonic response characteristics based on ANSYS. After detailed research, we can conclude that:

1. Adopting four element combinations to simulate rectangular sandwich plates' inherent-free vibration and harmonic response characteristics, the simulation results are coincident with theoretical values. Under different magnetic field, when both upper and lower layers are simulated by SHELL63, and the MRF layer is either simulated by SOLID45 or by VISCO89, two simulation results are very similar. Meanwhile, when both upper and lower layers are simulated by SOLID45, and the MRF layer is either simulated by SOLID45 or by VISCO89, the stimulation results of natural frequencies are also very close. However, when both upper and lower layers select different elements, the results have large difference.
2. Under the same magnetic field, the calculation result curves of sandwich structure's natural frequency show that when both upper and lower surface plates are simulated by SOLID45 and sandwich layer is simulated by VISCO89, the simulation results are more close to the theoretical calculation result.
3. The high natural frequency is easier to be discerned when VISCO89 is used to simulate MR fluid.
4. Using SOLID45 to simulate MRF layer can obtain structural loss factor, and the results are consistent with the theoretical value, while the VISCO89 is incapable of obtaining.

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Chapter 85

A Mathematical Model for Sugar Refineries Acidification Process Based on Masses Balances

Yingji Luo

Abstract In the present work, a mathematical model of acidification process water used for diffusion beet sugar refinery action developed. The model is based on the quality of the balance main chemical reaction. The purpose of this work is modeling acidification of the water used for extracting installation from beet sugar. The model is validated the behavior of the simulation, the workshop, and various interferences may produce in its operation.

Keywords Mathematical model · Sugar refineries · Masses balances

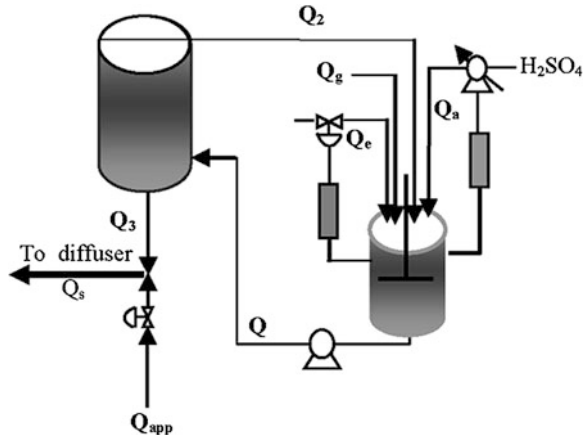
85.1 Introduction

PH value of the process is great base in the chemical industry. In fact, the control of the pH value has been received and the past years, considerable depth [1–5]. Generally speaking, this control is difficult to detect, and the difficulty lies in modeling process pH value. However, good model pH value must be based on an accurate description of the reaction happened. Therefore, it must be mathematical model. From the extraction of sugar, beet sugar is very popular as a relatively low acid water diffusion. Therefore, the water pH value must be precisely controlled. However, due to high nonlinear pH value and maintenance difficulties of the pH sensors installed in sugar refineries acidification, pH control performance is not always satisfactory.

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Fig. 85.1 Acidification installation of water process for sugar extraction from beet



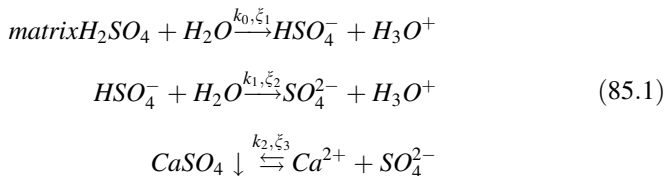
85.2 Description of Acidification Installation of Water Process for Sugar Extraction from Beet

The acidification installation Fig. 85.1 is constituted of two agitated tanks. The water is to extract the first tank in added to fresh water sulfuric acid solution describes the use ratio of the pump. In order to improve the quality of the beet pulp pressing, a water–gypsum mixture has introduced tanks. In order to reduce interference effect of fresh water feed spread installation, a second tank for so full of fill allow water to the first acidification tank. PH value and level in the latter is to use two digital PID controls of regulatory agencies. Because gypsum deposited electrode and pH value strongly nonlinear factors on the pH value of properties, pH control is not always satisfactory and worth being improved.

Where Q_a , Q_e , Q_g , Q_s , Q_2 , Q , and Q_3 are, respectively, the flow of sulfuric acid, fresh water, water–gypsum, a raking flow, return flow, internal flow, and output flow of the second tank plug.

85.3 Mathematical Model of Process

The principal reactions likely to occur into the two tanks constituting the acidification installation are the dissociation reactions of the sulfuric acid and the gypsum in water [6]:



The modeling of the acidification installation of water used for sugar extraction was based on the equations of masse balances taking into account the main chemical reactions occurring.

The two tanks of this installation are supposed perfectly mixed.

The mathematical model of the studied system is described by three equations of masses balance and an equation of total masses balance (H_2SO_4 , Ca^{2+} , and H_3O^+), and this relative with each of the two tank of the installation (Fig. 85.1)

Equation of total masse balance

$$\rho \frac{dV}{dt} = \rho_a Q_a + \rho_g Q_g + \rho_e Q_e + \rho Q_2 - \rho Q
 \tag{85.2}$$

where:

- ρ_i is the density of the flow i
- ρ is the density of the acidulous water flow
- V is the volume of the acidification tank

The equations of partial masse balance, respectively, in relation to H_2SO_4 , Ca^{2+} , and H_3O^+ are:

$$V \frac{d[H_2SO_4]}{dt} = Q_a [H_2SO_4]_a + Q_2 [H_2SO_4]_1 - Q [H_2SO_4] - V k_0 [H_2SO_4]
 \tag{85.3}$$

$$V \frac{d[Ca^{2+}]}{dt} = Q_g [Ca^{2+}]_g + Q_2 [Ca^{2+}]_1 - Q [Ca^{2+}] + V k_2 - V k'_2 [Ca^{2+}] [SO_4^{2-}]
 \tag{85.4}$$

$$\begin{aligned}
 V \frac{d[H_3O^+]}{dt} &= Q_e [H_3O^+]_e + Q_a [H_3O^+]_a + Q_2 [H_3O^+]_1 - Q [H_3O^+] \\
 &+ V k_1 [HSO_4^-] - V k'_1 [SO_4^{2-}] [H_3O^+] + V k_0 [H_2SO_4]
 \end{aligned}
 \tag{85.5}$$

For the plug tank, the equations are:

$$\rho \frac{dv_1}{dt} = \rho \cdot Q - \rho \cdot Q_2 - \rho \cdot Q_3
 \tag{85.6}$$

$$\begin{aligned}
V_1 \frac{d[\text{H}_2\text{SO}_4]_1}{dt} &= Q([\text{H}_2\text{SO}_4] - [\text{H}_2\text{SO}_4]_1 - V_1 k_0 [\text{H}_2\text{SO}_4]_1) \\
V_1 \frac{d[\text{Ca}^{2+}]_1}{dt} &= Q([\text{Ca}^{2+}]_g - [\text{Ca}^{2+}]_1) + k_2 V_1 - V_1 k'_2 [\text{Ca}^{2+}]_1 [\text{SO}_4^{2-}]_1 \\
V_1 \frac{d[\text{H}_3\text{O}^+]}{dt} &= Q[\text{H}_3\text{O}^+] - [\text{H}_3\text{O}^+]_1 + V_1 k'_1 [\text{H}_3\text{O}^+]_1 [\text{SO}_4^{2-}]_1 + V_1 k_1 [\text{HSO}_4^-]_1
\end{aligned} \tag{85.7}$$

where $[i]$, $[i]_1$, $[i]$ are the concentrations of component i , respectively, in the acidification tank, in the tank plug, and in the effluent j $k'_1 = \frac{k_1}{K_A}$ and $k'_2 = \frac{k_2}{K_S}$. The constants speed of the reactions (85.1), (85.2), and (85.3) at 40 °C.

We have:

$$\begin{aligned}
[\text{H}_3\text{O}^+] &= [\text{H}_3\text{O}^+]_0 + \frac{1}{Q}(\xi_1 + \xi_2) \\
[\text{Ca}^{2+}] &= [\text{Ca}^{2+}]_0 + \frac{1}{Q}\xi_4
\end{aligned} \tag{85.7}$$

$$\begin{aligned}
[\text{HSO}_4^-] &= [\text{HSO}_4^-]_0 + \frac{1}{Q}(\xi_1 - \xi_2) \\
[\text{H}_2\text{SO}_4] &= [\text{H}_2\text{SO}_4]_0 - \frac{1}{Q}\xi_1 \\
[\text{SO}_4^{2-}] &= [\text{SO}_4^{2-}]_0 + \frac{1}{Q}(\xi_2 + \xi_4)
\end{aligned} \tag{85.8}$$

This allowed to obtain the equations system that forms the model of the acidification installation:

$$\rho \frac{dV}{dt} = \rho_a Q_a + \rho_g Q_g + \rho_e Q_e + \rho(Q_2 - Q) \tag{85.9}$$

$$V \frac{d[\text{H}_2\text{SO}_4]}{dt} = Q_a [\text{H}_2\text{SO}_4]_a + Q_2 [\text{H}_2\text{SO}_4]_1 + Q [\text{H}_2\text{SO}_4] - V k_0 [\text{H}_2\text{SO}_4]$$

$$\begin{aligned}
V \frac{d[\text{H}_3\text{O}^+]}{dt} &= Q_e [\text{H}_3\text{O}^+]_e + Q_a [\text{H}_3\text{O}^+]_a + Q_2 [\text{H}_3\text{O}^+]_1 - Q [\text{H}_3\text{O}^+] \\
&\quad + V k_1 (a - [\text{H}_2\text{SO}_4] - [\text{H}_3\text{O}^+]) + V k_0 [\text{H}_2\text{SO}_4] \\
&\quad - V k'_1 [\text{H}_3\text{O}^+] ([\text{H}_3\text{O}^+] + [\text{H}_2\text{SO}_4] + [\text{Ca}^{2+}] - [\text{H}_3\text{O}^+]_0 - [\text{H}_2\text{SO}_4]_0)
\end{aligned} \tag{85.10}$$

$$\begin{aligned}
V \frac{d[\text{Ca}^{2+}]}{dt} &= Q_g [\text{Ca}^{2+}]_g + Q_2 [\text{Ca}^{2+}]_1 - Q [\text{Ca}^{2+}] + V k_2 \\
&\quad - V k'_2 [\text{Ca}^{2+}] ([\text{H}_3\text{O}^+] + [\text{Ca}^{2+}] + [\text{H}_2\text{SO}_4] - [\text{H}_3\text{O}^+]_0 - [\text{H}_2\text{SO}_4]_0)
\end{aligned} \tag{85.11}$$

$$\frac{dV_1}{dt} = Q - Q_2 - Q_3 \tag{85.12}$$

$$V_1 \frac{d[H_2SO_4]_1}{dt} = Q([H_2SO_4] - [H_2SO_4]_1) - ([H_2SO_4]_1 V_1 k_0) \tag{85.13}$$

$$V_1 \frac{d[H_3O^+]}{dt} = Q[H_3O^+] - [H_3O^+]_1 + (k_1 V_1 (\alpha - 2[H_2SO_4]_1 - [H_3O^+]_1)) + (V_1 k_0 [H_2SO_4]) - \left(\left(\begin{matrix} V_1 k'_1 [H_3O^+]_1 \\ [Ca^{2+}]_1 + [H_3O^+]_1 + \\ [H_2SO_4]_1 - [H_3O^+]_0 - [H_2SO_4]_0 \end{matrix} \right) \right) \tag{85.14}$$

$$V_1 \frac{d[Ca^{2+}]_1}{dt} = Q([Ca^{2+}] - [Ca^{2+}]_1) + k_2 V_1 - (V_1 k'_2 [Ca^{2+}]_1 ([H_3O^+]_1 + [Ca^{2+}]_1 + [H_2SO_4]_1 - [H_3O^+]_0 - [H_2SO_4]_0)) \tag{85.15}$$

Where V_1 is the volume of the plug tank and α is:

$$\alpha = \frac{Q_a}{Q - Q_2} ([H_3O^+]_a - 2[H_2SO_4]_a + [HSO_4^-]_a) \tag{85.16}$$

85.4 Results and Discussions

The nonlinear system of Eqs. (85.15, 85.16) was solved in steady state using the Newton-Raphson method. We observe that if we vary Q_e and we keep other variables constant, we could not observe any change of pH.

Figure 85.3 shows that the racking flow has great effect on the pH. Indeed, if Q_s increases, Q_3 also increases. And consequently, the flow Q_2 decreases. This causes a reduction in the return flow from the acidification tank what did it the reduction in acidity in this tank.

Figure 85.4 translates the great influence of Q_a on the pH, since the value of Q_a determines the quantity of H_2SO_4 , which dissociates to give H_3O^+ .

Figure 85.5 shows that the pH increases according to the output flow of the acidification tank, Q , and passes by a maximum beyond of which it falls slowly. Indeed, when Q increases, acidity decreases in the first tank. But when the pH in the plug tank becomes more acid than that in the acidification tank, and since the variation of Q is equal to that of return flow, Q_2 , this causes an augmentation of the H_3O^+ concentration in the acidification tank.

The curve (a) of Fig. 85.6 shows the effect of the volume of the acidification tank on the pH. The variation of the plug tank volume, V_1 , does not produce any

Fig. 85.2 Variation of pH with Q_e

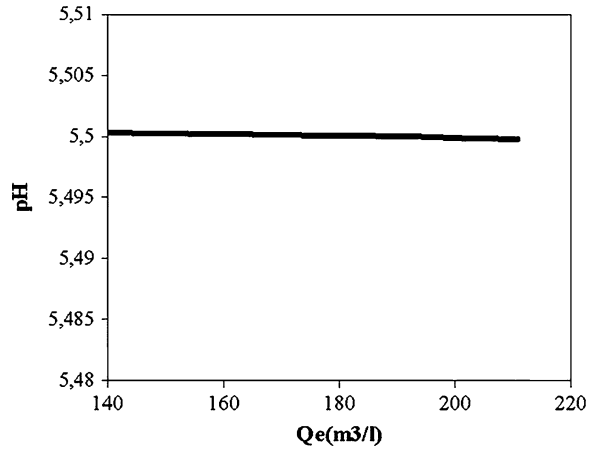
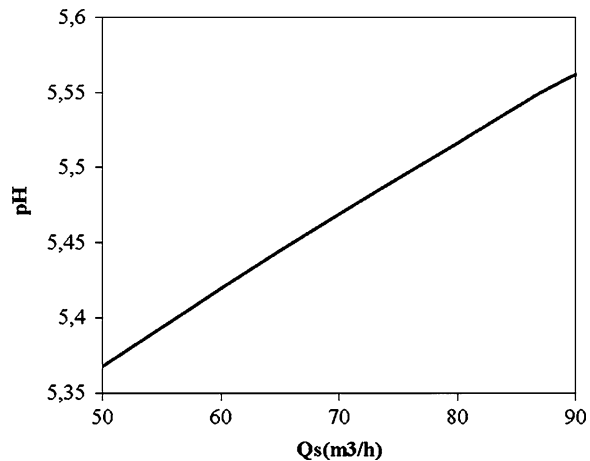


Fig. 85.3 Variation of pH with Q_s



change on pH (curve (b) in Fig. 85.6). Indeed, by decreasing VI, the return flow Q_2 becomes null; therefore, its effect on pH is canceled too.

The selected operation point is presented in Table 85.1. The Table 85.2 presents the results of the steady-state simulation obtained for this selected operation point.

The nonlinear system of differential equations was solved in dynamic state using the Runge-Kutta method.

Disturbance on x_a Fig. 85.7 presents the experimental and theoretical results of pH response for a disturbance of 5 % carried out on the valve opening fraction of the sulfuric acid flow x_a .

It is remarkable that the theoretical curve has the same evolution as that of experimental curve. The response using the model presents a relative average error

Fig. 85.4 Variation of pH with Q_a

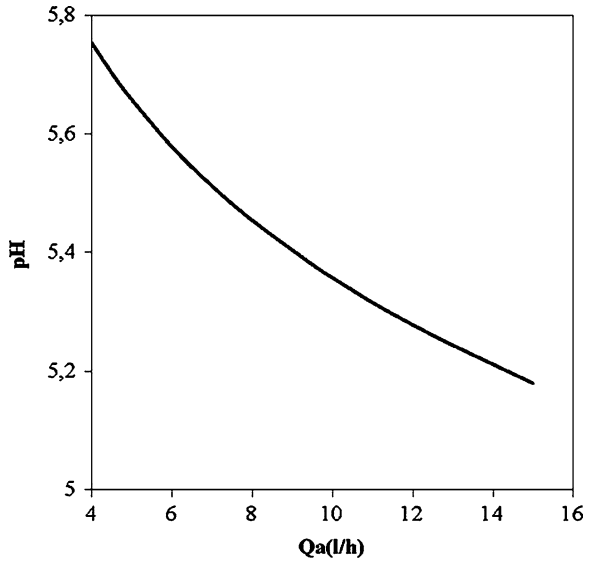
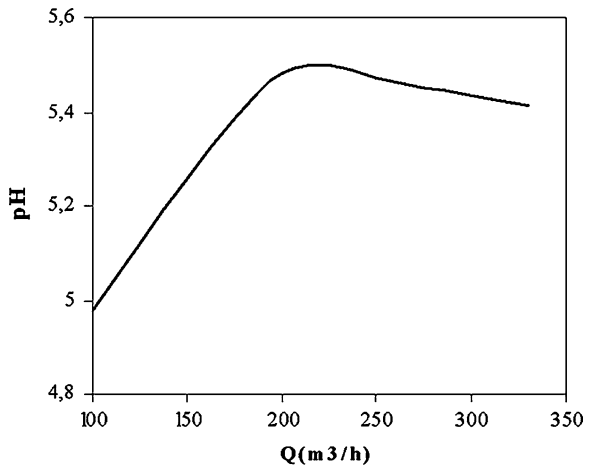


Fig. 85.5 Variation of pH with Q_a



equal to 1.54 % and a maximum error equal to 2.24 %, with a standard deviation of 0.1.

Disturbance on x_s the Fig. 85.8 illustrates the pH response to a disturbance equal to -10% affected on the fraction of the racking flow. According to this figure, we observe that the experimental results have being in agreement with those calculated by the mathematical model. Indeed, the relative average error is equal to 0.12 % with a maximum error equal to 0.29 % and with a standard deviation of 0.03.

Fig. 85.6 Variation of pH with V and V_1

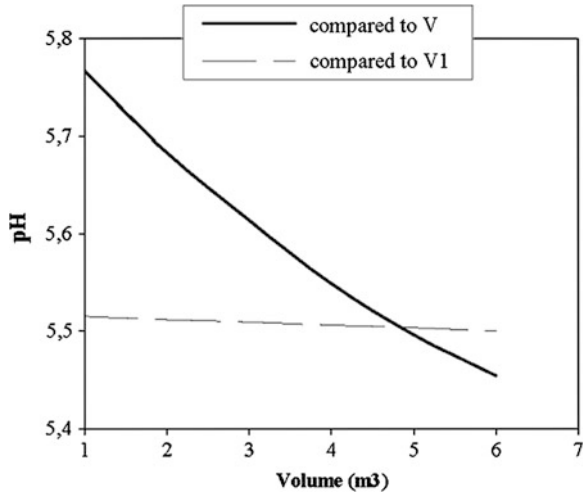


Table 85.1 The selected operation point

X_a	X_c	X_s	X_g	$V(m^3)$	$V_1(m^3)$	$[H_3O^+](Mol/l)$	$Q(m^3/h)$
12 %	70.4 %	76.5 %	23.3 %	5.026	6.283	0.035	225

Table 85.2 The results of the steady-state simulation

In the acidification tank (pH = 5.5)			In the plug tank (pH = 5.27)		
$[H_3O^+]$ (Mol/l)	$[H_2SO_4]$ (Mol/l)	$[Ca^{2+}]$ (Mol/l)	$[H_3O^+]$ (Mol/l)	$[H_2SO_4]$ (Mol/l)	$[Ca^{2+}]$ (Mol/l)
$3.16 \cdot 10^{-6}$	$5.56 \cdot 10^{-4}$	$4.61 \cdot 10^{-3}$	$5.28 \cdot 10^{-6}$	$5.538 \cdot 10^{-4}$	$6.71 \cdot 10^{-3}$

Fig. 85.7 Experimental and theoretical responses of pH to a x_s disturbance (5 %)

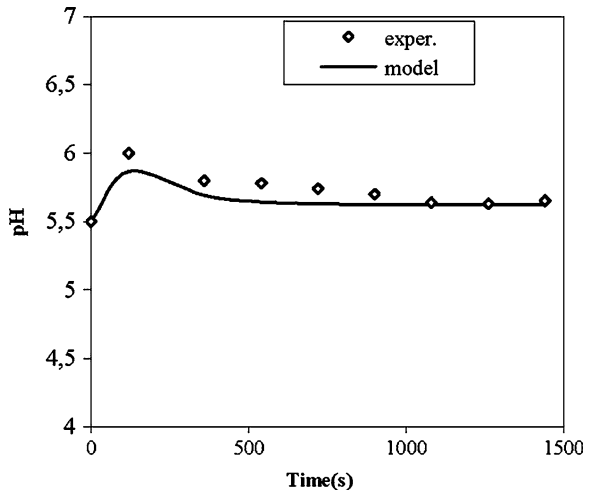
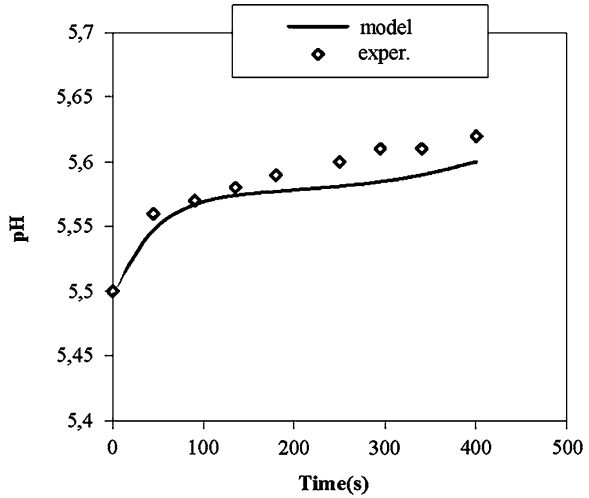


Fig. 85.8 Experimental and theoretical responses of pH to a x_s disturbance (10 %)



85.5 Conclusions

The results obtained from various tests carried out on the process showed that the developed mathematical model is valid and can describe in a satisfactory way the static and dynamic behavior of the studied process. The model can thus be used for the pH control of acidulous water used in the sugar extraction.

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Chapter 86

Study of Analysis Data Mart in Library Borrowing

Jishen Tang

Abstract The aim of this paper is to apply the diagram data warehouse technology and the online analytical processing (OLAP) technology to the library readers' borrowing analysis, to adopt multi-dimensional modeling techniques and data warehouse technology, to design, and to realize a reader analysis data mart. Through the OLAP online presentation tool reveals the potential law of readers' information from multi-angles and deep levels. It is the hope of the author that this paper would provide decision basis for the library books procurement and books structural optimization.

Keywords Data warehouse · Data mart · Multi-dimensional modeling · OLAP analysis

86.1 Introduction

Currently, the automated library management system is generally based on relational database design. Due to the characteristics of the highly structured relational database data, the system can meet the automation needs of the library business. However, how to carry out the complex computing requirements on the vast amount of data from a multi-level and full orientation in-depth analysis remains to be a problem. The system provides very limited functions. The appearance of the data warehouse and data mining technology makes the solutions to the above problems possible.

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The data warehouse is a data collection that is subject-oriented, integrated, time-related, and non-modified [1]. The data mart is a subset of the enterprise data warehouse. It is an analytical environment created to meet specific user needs for a particular topic. It is able to quickly solve some specific problems. Data warehouse construction period is long, and the construction is of high cost. Compare to the university libraries, the manpower, material, and financial resources are unbearable for the university Library. Therefore, as an effective method to quickly solve the weak analytical function of the library management system, the construction of the independent data marts becomes operational and most economic.

The article uses the Hechi Library totem system database of historical data as the research object in SQL Server 2005 BI environment. The multi-dimensional modeling techniques and data warehouse integration technology are used to design a readers analysis data mart. Restructuring the mass circulation of the library to borrow the relevant data through data mart consolidation, the formation of an available multi-angle, multi-level, high-efficiency online analytical processing (OLAP) online analytical data cube collection provides full support for the readers who borrow the inherent law of protection.

86.2 Design Flow of Readers' Borrowing Analytical Data Mart

First, the "Readers" as the theme through the multi-dimensional data model methods to build data marts dimensional model. Then, in the SQL Server 2005 Business Intelligence Development Studio [2–4] Environmental Readers analysis of the data mart, data extraction, cleaning, transformation, and loading. Readers analysis data mart data source in SQL Server 2005 Business Intelligence Development Studio environment to create the Analysis Services For the OLAP project, the establishment of multi-dimensional cube, the use of OLAP pivot tool to conduct a comprehensive analysis of the multi-dimensional cube, and gives decision-making recommendations. Process is shown in Fig. 86.1.

86.3 The Modeling Design of Readers' Borrowing Analytical Data Mart

Multi-dimensional data modeling is to organize data and support high-performance data access in an intuitive way. More multi-dimensional data model is composed of a fact table and a dimension table. Multi-dimensional model is the most common in the star schema. Being center in a star schema fact table, multiple dimension tables showed the radial distribution of its four weeks, and even with the fact table [5–8]. Readers' data mart multi-dimensional star model is shown in Fig. 86.2.

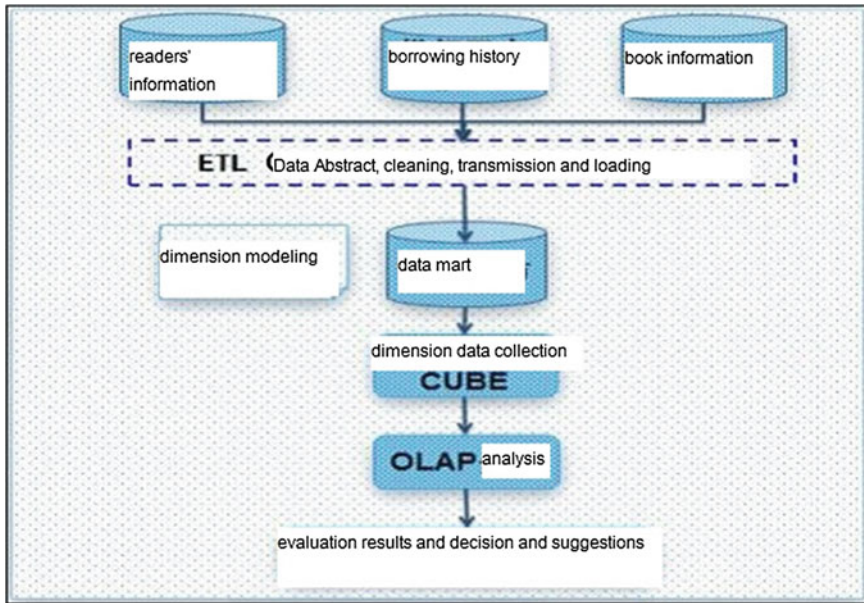


Fig. 86.1 The design process of readers' borrowing data mart

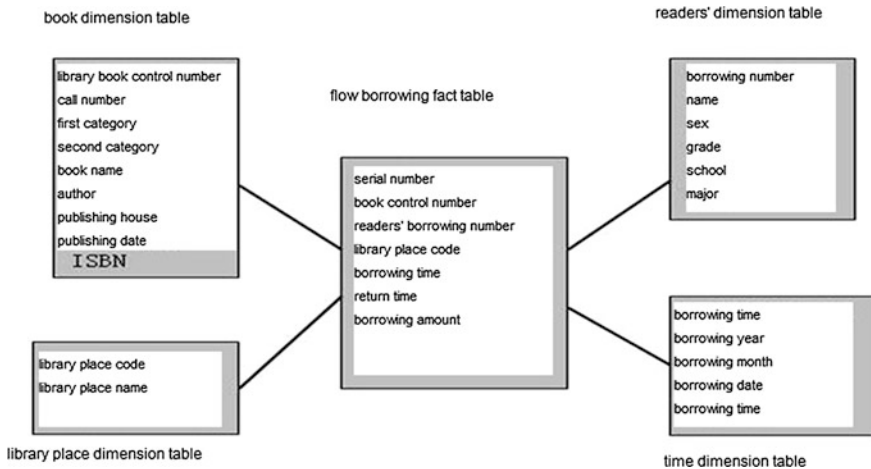


Fig. 86.2 Readers' multi-dimensional star model analysis of data marts

86.3.1 The Fact Table Design

The fact table to the history of the circulation to borrow as the factual basis for the analysis of indicators to increase the borrowing amount to extract the original data table at the same time, the measure corresponding to each row in the data table is

always 1. Directly by summing the SUM () function when the user roll (roll-up) operation, cumulative.

86.3.2 The Dimensional Table Design

According to the readers' topic needs analysis, the dimension table design consists of books, the reader dimension table, the collection of ground-dimensional table, the time dimension table, four-dimensional table to meet the full range from less than angle to establish a data observation points. In addition to the collection of ground-dimensional table, the book dimension table, the reader dimension table, the time dimension table to take the hierarchy of design, to determine the dimension table stratified according to the size of the data granularity, the smaller, finer level of granularity, for the analysis of the degree of the deeper; the greater the granularity level is thicker, the more shallow for analysis. Particle size is determined according to the size of the data mart and analytical decision-making needs, such as the hierarchy of the time dimension table for the year, month, date, and time. This can analyze a series of questions such as the peak period of readers in the day and low peak.

86.4 The Realization of Readers' Borrowing Data Mart Analysis

The generation of the readers' borrowing data mart analysis adopts data integration tools in SQL Server 2005 SQL Server Integration Service implementations. In the intelligent development platform of Business Intelligence Development Studio for SQL Server 2005, Integration Services project is created and the ETL operations such as extract, cleaning, transform, and load on the source data are carried out. The processed data are loaded to the data mart.

86.4.1 Source Data Abstraction

Data mart data source comes from the Hechi library automation system Chongqing totem system. In the DBMS data source, data include all library business data stored in relational tables up to 30. Analysis of needs is based on the theme of "Readers" borrowing history table extracted from the totem management system, the reader information table, collection information table, and the transfer of three tables to SQL Server 2005 in the temporary database for further processing.

86.4.2 Data Cleaning

The purpose of data cleaning is to deal with “dirty data” of the original data source and to filter those that do not meet the requirements according to certain rules. According to the data mart, data model has been designed, by deleting information that has nothing to do with the subject, for example, the deleting unnecessary fields in the table of borrowing history, and keep only the serial number, books control reader Zhenghao, the collection number, processing time, and other properties. Null and noise statement processing: the school library book cataloging the work of specification, data in the database are relatively complete, and only a small amount of property value vacancy enter the wrong situation, such as call number, bibliography table letter “O,” mistakenly entered the number “0,” the letter “T,” mistakenly entered the number “7.” Existence of null values for attributes, data entry, misuse of data to sort the classified according to the actual situation using the SQL statement or manual filling, replace.

86.4.3 Data Transmission

86.4.3.1 Statute of the Book Class Attributes

There is a category in the book information in the table fields to store books’ call number information. The call number is usually the books’ words and number. Words according to the Chinese Library Classification take a number; we can see the Call Number of Book obvious hierarchy. For ease of analysis, two additional fields in the book information sheet, books, a category Books two categories, generalizability, mainly through the call number in the table generated. For example, the call number of the books “XML Essentials” TP312XM/G47 by the SQL statement to generate a category T, the two categories TP.

86.4.3.2 The Statute of the Reader Unit Properties

Readers’ information table in the reader unit of information is stored in a flat field, such as the 08 Department of Chinese news (2) classes. According to the subject from grade, the Department of Professional different dimensions for analysis, so the SQL statement to achieve the unit’s field is split into grades, departments, professional three fields.

86.4.3.3 The Statute of the Borrowing Time Property

Borrow time is recorded in the borrowing history table, the easy readers' behavior from the time dimension, the time attribute conversion to increase the borrowing years, borrow months and borrow the Japanese borrow time properties. The transformation process can be implemented through SQL.

86.4.4 Data Loading

Data loading work using SQL Server 2005 Integration Services integration tools to achieve loaded into the data cleaning and conversion of data from the data mart model to establish the database of readers, to complete the establishment of a data mart to create a cube for the next OLAP analysis, and data sources. For management purposes, we use the SQL Server 2005 as a data warehouse management tools.

86.5 Multi-Dimensional Data Set and OLAP Multi-Dimensional Analysis

86.5.1 The Foundation of Multi-Dimensional Data Set

Multi-dimensional data set is the data cube. Cube is the data cube stored in a subset of the main data warehouse or aggregator. Multi-dimensional OLAP analysis can be achieved through the cube. The reader through the SQL Server 2005 analysis services platform to borrow the analysis of the data warehouse cube as a data source. The steps are shown in Fig. 86.3.

86.5.2 OLAP Multi-Dimensional Analysis

Figure 86.3 shows the analysis of services cube browser OLAP user interface after the establishment of the cube, and you can use the OLAP analytical tools to slice the cube, drill-down, rotate, roll, and other operations, to achieve comprehensive and rapid analysis of the data. In SQL Server 2005 analysis services, through the data table service, you can also notify external applications. SQL Server 2005 analysis services are used for external applications to access data table service API, OLEDB, FOR the OLAP, for example, the Excel and other applications through this API cube OLAP. In the analysis services cube browser, users can choose to explore the dimensions of a biopsy, drill, rotate, roll, and other multi-dimensional analysis.

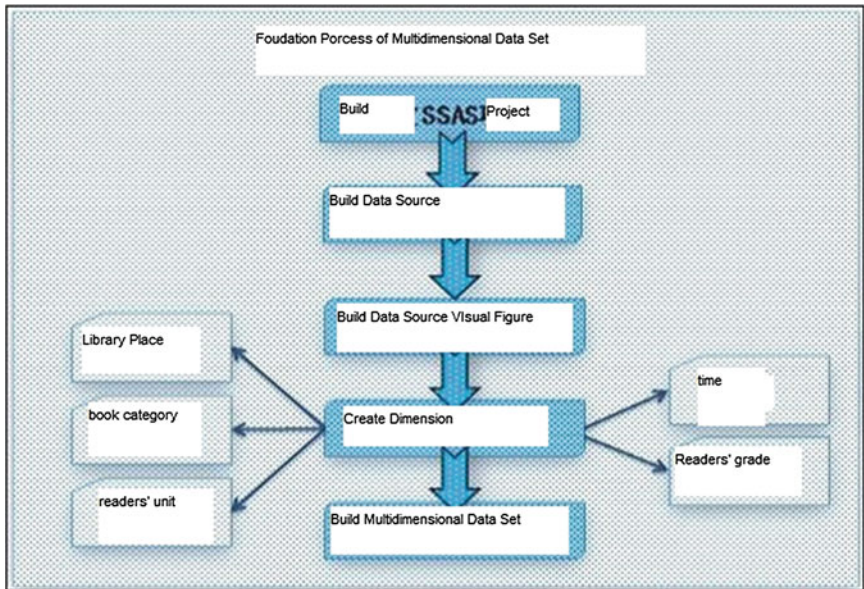


Fig. 86.3 The foundation of multi-dimensional data set

86.6 Conclusion

Data warehouse technology is applied in the library of the Hechi University, and flow business data are integrated. Analysis data mart is built for readers. Relying on the efficient, portable, and fast multi-dimensional data analysis capabilities of the data mart, it effectively solves the problem that the existing library management system in the library of Hechi University can only provide regular reporting query and that the query is of low efficiency. Make use of the data warehouse OLAP to present the tool, which will be able to quickly analyze the utilization of various types of collection of books, the use of all library books, the popular borrowed books of readers, the peak trends of book borrowing, and so on. The library literature procurement and personality service development are provided with a strong basis for decision-making.

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Chapter 87

A Mathematical Model for Higher Education Input–Output Efficiency Analysis

Fengan Wen

Abstract After the preliminary analysis, principal component analysis (PCA) provides a method or a framework for studying input–output of higher education. By using PCA, a mathematical model including multiple indicators of education can be built to make further quantitative analysis. PCA also provides a possible solution for comparing and analyzing input–output efficiency among different areas. The analytical results show that the input–output efficiency of areas with higher input or output ranks behind many areas with lower input or output in the efficiency ranking list. For example, Beijing ranks first both in the input ranking list and in the output ranking list, but it ranks eleventh in the efficiency list. The developed areas such as Beijing, Shanghai, Jiangsu and Guangdong have more education input than the developing areas, and their high output is the result of high input, actually the input–output efficiency is lower than the developing areas. Of all the 31 areas, Hunan makes good use of education input resource and makes good achievements in higher education input–output efficiency although the actual value of input and output did not rank high in the list. As a result, education input and output have no positive correlation with input–output efficiency.

Keywords Higher education · Input–output efficiency · PCA

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87.1 Introduction

Nowadays, the situation of higher education resource shortage is very serious in our country, and the growth of higher education input is far behind the development of higher education, and what is more, this situation will stay long [1]. Especially with the tendency of higher education being in a popular style, the increasing number of college students makes the limited resource more deficient. It is very important to study how to make use of existing education resource and to expose its inherent capacity. Thus, how to make the most of higher education resource is a problem that should be evaluated objectively. In this paper, attention is concentrated on evaluating the efficiency of higher education input and output by using a statistical method called PCA [2].

87.2 Method

Because of the variety of higher education input and output, the research on input–output analysis can hardly be carried out by traditional analysis methods for enterprises such as production functions and ROA. Multivariate analysis, especially principal component analysis (PCA), will be employed in this paper to illustrate the correlation between the input–output elements. PCA simplifies multidimensional variables to a few synthetic variables called principal components, and they can be used to compare and analyze input–output efficiency of 31 provinces, autonomous regions and municipalities directly under the central government in China. Extracting principal component includes the following four steps:

87.2.1 To Standardize the Original Variables

Assumed that there are n samples and p indicators, then a data matrix X can be

built as following:
$$X = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1p} \\ x_{12} & x_{22} & \cdots & x_{2p} \\ \cdots & & & \\ x_{n1} & x_{n2} & \cdots & x_{np} \end{pmatrix}.$$

All the variables will be standardized to eliminate the adverse impacts that dimension and order of magnitude are different for different variables. One method named Z-score can be used for data standardization, and the formula is as follows:

$$z_{ij} = (x_{ij} - \bar{x}_j) / s_j. \quad (87.1)$$

In the formula,

$$\bar{x}_j = \sum_{i=1}^n x_{ij}/n, s_j^2 = \sum_{i=1}^n (x_{ij} - \bar{x}_j)^2/(n - 1), i = 1, 2, \dots, m; j = 1, 2, \dots, p$$

After the transform, the mean value is 0 and the variance is 1. The transformation can be completed automatically by using statistical package for the social science (SPSS).

87.2.2 To Evaluate the Covariance Matrix of Data and Indicators

The following formula shows how to compute the covariance matrix of data and indicators. $R = (r_{jk})_{p \times p}$ denotes a covariance matrix.

$$r_{jk} = \frac{1}{n - 1} \sum_{i=1}^n z_{ij} \times z_{ik} \tag{87.2}$$

In the formula, r_{jk} is correlation coefficient of indicator j and indicator k , and $i = 1, 2, \dots, n; j, k = 1, 2, \dots, p$, thus $r_{ii}=1$ and $r_{jk} = r_{kj}$.

87.2.3 To Evaluate Characteristic Roots of Covariance Matrix and Corresponding Characteristic Vectors

λ_g ($g = 1, 2, \dots, p$) stands for the characteristic root of covariance matrix R . P characteristic roots λ_g can be computed according to characteristic equation $\lambda_g E - R = 0$. These characteristic roots will be sorted by values ranging from large to small, that is, $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_p \geq 0$. The characteristic roots are the variance of principal components, which describe the functions of principal components in the object awaiting evaluation. According to characteristic equation, one characteristic value corresponds to one characteristic vector, which is denoted as $(l_{g1}, l_{g2}, \dots, l_{gp})$. The following third formula converts standardized indicator variables into principal components:

$$F_g = l_{g1}z_1 + l_{g2}z_2 + \dots + l_{gp}z_p \tag{87.3}$$

87.2.4 To Acquire Number of Principal Components and Criteria of Principal Components

Actually, the number of principal components is equal to the number of original indicators. PCA chooses m ($m < p$) principal components to give an overall evaluation and tries to loss as less information as possible. In normal conditions, there are two criteria of choosing principal components.

The components whose cumulative contribution rate is up to more than 85 % will be chosen as principal components.

The components whose characteristic values are greater than 1 will be chosen as principal components.

The forth formula shows how to compute the principal components synthesis model. The linear weighted value for each principal component is denoted as F_g in the formula.

$$F = \sum_{g=1}^m (\lambda_g / \sum_{g=1}^m \lambda_g) F_g \quad (87.4)$$

87.3 Empirical Research

Because there is a strong interdependency between education condition and economic position, higher education input-output data of 31 areas, which stand for education condition in our country, are chosen from Compilation of Science and Technology Statistical Data for Institution of Higher Education 2008 to guarantee comparative studies to make sense. Thirty-one areas include most of the provinces, autonomous regions and municipalities directly under the central government in China.

87.3.1 Input Analysis

Because of the variety of higher education input, eight indicators are selected, they are as follows: x1 stands for senior research specialist staff; x2 stands for research specialist staff; x3 stands for personal services (M RMB); x4 stands for operation costs (M RMB); x5 stands for acquisition expenses of fixed assets (M RMB); x6 stands for number of institutions; x7 stands for number of projects; and x8 stands for number of hosting international meetings (times). Table 87.1 shows the input data of all the 31 areas including the above-mentioned indicators.

The data in Table 87.1 can be analyzed using principal components analysis function of SPSS. From the correlation matrix of input indicators, which is show in Table 87.2, many input indicators have strong correlation and overlapping information. Thus, data and indicators are especially suitable for PCA.

Table 87.1 Summary table of input

Area	x1	x2	x3	x4	x5	x6	x7	x8
Beijing	20,186	34,287	986,005	3,932,025	1,013,133	303	28,691	231
Tianjin	6,328	11,711	259,123	746,260	224,838	125	5,695	54
Hebei	9,175	15,330	79,537	427,112	186,314	81	5,765	23
Shanxi	4,540	8,043	110,679	182,671	101,287	57	3,451	25
Inner Mongolia	3,468	6,214	21,630	112,783	39,849	55	2,250	7
Liaoning	14,196	20,311	389,791	1,229,461	363,105	307	10,530	67
Jilin	8,889	14,573	138,892	512,821	130,503	151	4,945	53
Heilongjiang	11,714	17,017	280,523	998,498	272,256	147	8,891	65
Shanghai	14,025	24,807	950,494	2,727,034	838,038	179	14,795	316
Jiangsu	16,041	26,634	747,964	1,995,281	109,9208	278	15,409	87
Zhejiang	9,647	19,728	374,586	1,146,310	524,061	111	15,270	92
Anhui	8,541	18,636	232,942	618,285	343,763	128	6,917	28
Fujian	4,448	8,957	88,654	247,498	145,724	99	6,022	20
Jiangxi	5,087	10,524	101,444	189,592	190,450	81	4,227	40
Shandong	14,340	22,622	235,372	558,889	333,468	230	9,458	87
Henan	8,524	18,948	67,787	425,292	140,949	73	4,893	23
Hubei	15,091	23,334	287,687	1,201,392	506,710	189	12,575	73
Hunan	10,553	15,314	199,800	1,081,568	200,928	95	9,016	42
Guangdong	13,687	28,335	524,068	778,957	420,874	176	16,242	94
Guangxi	3,944	9,790	136,249	196,412	49,168	60	4,575	50
Hunan	970	2,166	6,368	19,395	36,879	14	670	6
Chongqing	5,177	8,281	189,705	311,071	264,568	122	5,061	34
Sichuan	10,332	19,389	532,701	1,013,525	542,655	203	13,032	64
Guizhou	2,947	5,347	39,360	67,796	36,632	23	1,951	2
Yunnan	4,211	7,369	59,665	105,819	17,763	43	3,041	18
Xizang	99	261	6,579	2,275	87	2	44	1
Shanxi	11,049	17,443	36,858	1,681,263	309,995	135	10,536	40
Gansu	3,038	1,178	47,665	2,90,975	44,442	49	2,966	9
Qinghai	1,199	2,395	20,588	8,520	7,467	14	225	2
Ningxia	1,382	2,670	9,242	15,055	5,753	21	1,231	0
Xinjiang	3,260	7,936	19,930	33,457	19,691	16	981	19

Table 87.2 Correlation matrixes of input indicators

Correlation	x1	x2	x3	x4	x5	x6	x7	x8
x1	1.000	0.971	0.829	0.835	0.850	0.917	0.904	0.716
x2	0.971	1.000	0.842	0.812	0.857	0.871	0.920	0.732
x3	0.829	0.842	1.000	0.938	0.943	0.805	0.913	0.887
x4	0.835	0.812	0.938	1.000	0.892	0.764	0.908	0.858
x5	0.850	0.857	0.943	0.892	1.000	0.831	0.901	0.792
x6	0.917	0.871	0.805	0.764	0.831	1.000	0.835	0.640
x7	0.904	0.920	0.913	0.908	0.901	0.835	1.000	0.783
x8	0.716	0.732	0.887	0.858	0.792	0.640	0.783	1.000

Table 87.3 Of input principal component extraction

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	Percentage of variance	Cumulative %	Total	Percentage of variance	Cumulative %
1	6.946	86.820	86.820	6.946	86.820	86.820
2	0.522	6.529	93.349			
3	0.181	2.257	95.607			
4	0.149	1.867	97.474			
5	0.101	1.260	98.734			
6	0.060	0.745	99.480			
7	0.031	0.386	99.865			
8	0.011	0.135	100.000			

Extraction method: Principal component analysis

The second criterion of extracting principal components is used in this paper, that is, the components with characteristic values greater than 1 will be extracted, because characteristic values can be looked upon as an indicator showing influence of principal components. The fact that a characteristic value is less than 1 means the explanatory function of a principal component is even smaller than the explanatory function of the original variable.

Table 87.3 shows that only one principal component needs to be extracted to reflect most information of the eight variables. One new variable can be used to take the place of the original eight variables. The result of dividing data in the component matrix by square root of the corresponding characteristic values of principal components is the coefficient of each indicator in a principal component. According to this method, the characteristic vector that corresponds to the principal component is (0.358, 0.357, 0.364, 0.357, 0.360, 0.340, 0.365, 0.326). The final input principal expression is shown as following by multiplying characteristic vector and standardized variables:

$$P_{in} = 0.358Z_{X_1} + 0.357Z_{X_2} + 0.364Z_{X_3} + 0.357Z_{X_4} + 0.360Z_{X_5} + 0.340Z_{X_6} + 0.365Z_{X_7} + 0.326Z_{X_8} \tag{87.5}$$

In formula (87.5), P_{in} stands for input principal component, and $Z_{X_1}, Z_{X_2}, \dots, Z_{X_8}$ stand for eight standardized input variables.

87.3.2 Output Analysis

There are also a variety of outputs of higher education. Six indicators are selected from Compilation of Science and Technology Statistical Data for Institution of Higher Education 2008 [3]. They are as follows: y_1 stands for scientific or technical awards; y_2 stands for academic writings; y_3 stands for academic theses; y_4 stands for national research projects; y_5 stands for number of patents granted;

Table 87.4 Summary table of output

Area	y1	y2	y3	y4	y5	y6
Beijing	376	896	54,955	465	1,711	3,69,855
Tianjin	122	277	16,024	41	566	3,730
Hebei	145	336	18,252	31	237	46,212
Shanxi	122	238	9,651	4	121	1,990
Inner mongolia	43	134	5,315	5	28	1,150
Liaoning	295	693	25,221	51	868	37,460
Jilin	176	272	15,488	21	208	26,678
Heilongjiang	298	452	22,461	160	471	17,428
Shanghai	331	580	40,397	85	1,971	50,251
Jiangsu	405	822	48,465	85	1,516	97,179
Zhejiang	243	353	30,438	98	1,360	58,323
Anhui	128	353	18,153	81	211	88,612
Fujian	89	122	8,811	2	162	7,929
Jiangxi	40	235	13,334	19	69	70,747
Shandong	324	516	29,520	51	698	64949
Henan	190	923	24,714	19	236	21,587
Hubei	333	501	46,537	7	919	46,181
Hunan	203	323	25,631	146	294	39,803
Guangdong	202	575	33,152	50	697	45,205
Guangxi	80	95	11,961	7	72	1,066
Hunan	16	26	1,47	2	3	630
Chongqing	107	204	13,741	56	248	60,536
Sichuan	192	534	33,875	130	469	22,610
Guizhou	39	40	5,055	0	42	3,800
Yunnan	108	150	6,626	3	112	3,400
Xizang	3	2	157	2	0	0
Shanxi	236	579	34,055	279	711	1,21,173
Gansu	102	171	7974	17	90	2,248
Qinghai	4	13	1580	1	0	0
Ningxia	1	9	1,819	1	3	400
Xinjiang	43	53	5,753	24	18	1,410

y6 stands for income of technology transfer. All the six output indicators of 31 areas are shown in Table 87.4.

The method and steps of analyzing output are just the same as input [4]. The result shows that one output principal component is extracted to stand for most information of the original six variables. The characteristic vector that corresponds to the principal component is (0.425, 0.412, 0.444, 0.378, 0.411, 0.375). The final output principal expression is shown as following by multiplying characteristic vector and standardized variables:

$$\begin{aligned}
 P_{out} = & 0.425Zy_1 + 0.412Zy_2 + 0.444Zy_3 + 0.378Zy_4 \\
 & + 0.411Zy_5 + 0.375Zy_6
 \end{aligned}
 \tag{87.6}$$

Table 87.5 Summary table of input–output efficiency

Area	Score of input	Input ranking list	Score of output	Output ranking list	Input–output efficiency	Efficiency ranking list
Beijing	7.766	1	6.967	1	0.897116	11
Tianjin	-0.298	14	-0.561	16	1.88255	4
Hebei	-0.7	16	-0.38	15	0.542857	26
Shanxi	-1.7	22	-1.301	20	0.765294	21
Inner Mongolia	-2.242	25	-1.944	25	0.867083	13
Liaoning	2.208	5	1.423	7	0.644475	25
Jilin	-0.327	15	-0.616	17	1.8839792	3
Heilongjiang	0.807	11	0.998	10	1.236679	5
Shanghai	5.316	2	3.867	3	0.539315	27
Jiangsu	4.583	3	3.652	2	0.796858	19
Zhejiang	1.642	8	1.588	6	0.936663	9
Anhui	0.155	13	-0.012	14	-0.07742	30
Fujian	-1.326	20	-1.567	22	1.18175	6
Jiangxi	-1.245	19	-1.099	19	0.882731	12
Shandong	1.524	9	1.407	8	0.923228	10
Henan	-0.751	17	0.694	12	-0.9241	31
Hubei	2.104	6	2.003	5	0.951996	8
Hunan	0.191	12	0.484	13	2.534031	1
Guangdong	2.524	4	1.05	9	0.416006	29
Guangxi	-1.493	21	-1.634	24	1.094441	7
Hunan	-2.902	29	-2.351	28	0.8101361	18
Chongqing	-0.888	18	-0.669	18	0.763378	23
Sichuan	1.957	7	0.99	11	0.505876	28
Guizhou	-2.486	28	-2.105	27	0.846742	14
Yunnan	-2.068	23	-1.579	23	0.76354	22
Xizang	-3.201	31	-2.482	31	0.775383	20
Shanxi	1.243	10	2.524	4	2.030571	2
Gansu	-2.173	24	-1.497	21	0.688909	24
Qinghai	-2.947	30	-2.423	30	0.822192	17
Ningxia	-2.859	28	-2.393	29	0.837006	15
Xinjiang	-2.414	26	-1.987	26	0.823115	16

In formula (87.6), P_{out} stands for output principal component, and Zy_1, Zy_2, \dots, Zy_6 stand for six standardized output variables.

87.3.3 Input–Output Efficiency Analysis

Through PCA, all the input–output indicators are summarized as one principal component, respectively, which definitely simplifies the research object. According to the following formula of input–output efficiency, the index of higher education efficiency, which is denoted as E_f in the formula, will be calculated by dividing output (P_{out}) by input (P_{in}). In the formula, Zx_i and Zy_j stand for standardized input and output variables, respectively, and a_i and y_j stand for coefficient of input and output variables n stands for the number of input variables, and m stands for the number of output variables.

$$E_f = \frac{P_{\text{out}}}{P_{\text{in}}} = \left(\sum_{j=1}^m b_j Zy_j \right) / \left(\sum_{i=1}^n a_i Zx_i \right) \quad (87.7)$$

The score of principal component is equal to the result of multiplying square root of corresponding characteristic value and score of factor that usually saved as a variable such as `fac1_1` when using PCA method of SPSS. When putting the input–output principal component scores into the fifth formula, the input–output efficiency of 31 areas is shown in the following Table 87.5.

In Table 87.5, the scores of some areas are negative, which means that the indicators of these areas are lower than the mean level of the target group. It does not mean that their actual education input or output is negative.

87.4 Conclusions and Suggestions

The analytical results suggest that at present, education input–output of colleges and universities is still in an extensive stage of growth, which means pursuing benefits by expanding. In the input indicators of higher education, the outlay inputs, manpower inputs and material inputs have not significant difference for output. Higher input usually leads to higher output but does not lead to higher input–output efficiency. Operational mechanisms should be set up to ensure the close connection between input and output.

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RETRACTED

Chapter 88

Mathematics Education and Employment Quality Cultivation

Dongmei Song and Xiaoqian Zhang

Abstract The paper expounds the key role that mathematics education plays in employment quality cultivation from three aspects. They are advantages of mathematics education in employment, existing problems in mathematics education and methods to solve problems and promote employment.

Keywords Mathematics education · Employment quality · Cultivation

88.1 Introduction

Since our higher education expands enrollment, institutions of higher learning have more and more diversified graduates. However, college graduates are faced with severe employment situation, as employers and the society are not only satisfied with graduates' excellent scores and class cadre, but also lay stress on graduates' overall quality and competence. Therefore, training students' with high overall quality and strong overall competence is the fundamental goal of higher education and an issue badly in demand of solving. As an indispensable part of higher education, mathematics education plays a key role in training students' employment quality and competence. Mathematics teachers with working experience should fully be aware of the heavy burden they shoulder, try hard to

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improve mathematics education, improve students' overall quality and help students lay a solid foundation for successful employment [1].

In order to succeed in employment, students should be equipped with good employment quality. What is employment quality? It refers to good scientific culture, humanistic culture and morality, strong social adaptability, continuous learning ability, organization and management ability, teamwork spirit, responsibility, creativity, pattern, behavioral norm, value orientation, ideal pursue and so on in man's mathematics interpersonal skills and good psychological quality in addition to solid professional and basic knowledge. According to research, employers lay stress on the following employment qualities: professional dedication (73 %), teamwork spirit (70.1 %) and problem-solving ability and adaptability (68.4 %) [2]. However, these problems generally exist in college graduates, which result in hard employment. Therefore, institutions of higher learning should comprehensively improve students' employment quality to dominate competitive advantages in employment.

88.2 Advantages of Mathematics Education in Students' Employment Quality Training

Firstly, mathematics education is universal in basic education of colleges and universities. Currently, either in district with high-tech information or in remote area, institutions of higher learning are able to open college mathematics course as long as they have basic infrastructure. Mathematics teachers can train students' geometrical intuition ability, judging and choosing ability, exploring ability, problem-solving ability from different aspects. Undoubtedly, college mathematics education is important for training students' abstract thinking, logic reasoning ability, rational thinking and flexibility. These qualities and abilities are required by modern high technology talents and managers. The above abilities play a key role in training students' employment quality.

Secondly, college mathematics education can train students' mathematics spirit. Mathematics spirit is the concentrated reflection of human beings' psychological intention, such as thinking activities. Meanwhile, college mathematics education is the product of human beings' continuous summarization and internalization of mathematics experience, knowledge, methods, ideas, awareness and valid values.

Thirdly, college mathematics can train students' psychological quality of social intercourse and teamwork spirit. Their strong mathematics problem-solving ability can stimulate people's courage to pursue the truth and enhance people's self-confidence. Meanwhile, it can train student's ability to explore the truth and solve problems independently and further lay a solid foundation for their own employment qualities [3].

Finally, college mathematics can promote students' overall development. Mathematics is closely related to many subjects. It provides basis for other subjects learning. College mathematics is the main course for students to master

mathematics, an important carrier to train rational thinking and improve learning abilities, and also a way for students to receive exposure to esthetics. People who truly understand mathematics know that mathematics can promote man's perfect development and improve his overall quality. As people step into knowledge economy age, the popularity of computers facilitates the universal application of mathematics. Mathematics and its application play a role different from its previous essence. College graduates who studied college mathematics have advantages in employment.

88.3 Problems of Mathematics Teaching Existing in Higher Education

Firstly, with the expansion of college enrollment in recent years, the number of students enrolled in institutions of higher learning increases sharply. Because of differences of regional teaching resources and teaching levels, there are relatively big differences existing in most of students' mathematics bases, learning attitudes, abilities and initiatives. But syllabus and textbooks are unified, and lessons are given in a large class and lectures, so teaching results are bad. Meanwhile, final tests are universally closed book examinations, which bring great pressure for students with low starting point and weak foundation.

Secondly, in terms of teaching contents, textbooks are severely disjoint with college development. In order to meet market and social demands, colleges and universities generally add professional and actual course contents and cut down class hours of basic courses. Too many course contents and few class hours have become a critical paradox. In basic courses teaching mathematics, in order for one-sided emphasis on "enough usage" and professional service, mathematics class hours are cut down and teaching contents are compressed. Teachers accelerate teaching process for realization of teaching tasks. They no longer introduce deducting and proving process. Instead, they directly instill application-oriented formula, theorem and conclusion from textbooks into students. Thus, students lack logical deduction and analytical abilities in mathematics learning and cannot understand application background and requirements for formula, theorem and conclusion. They mechanically memorize formula, theorem and conclusion, but do not know how to flexibly put them into analyzing and solving actual problems. Students put all time and energy to pure mathematics computing skills training. As a result, some students are fed up with mathematics learning, and some even give up mathematics [4].

Thirdly, mathematics education is exam-oriented. Mathematics education does not truly reflect its application orientation. In current high vocational colleges, schools and students emphasize on teaching quality, but schools measure and assess teaching quality by seeing whether students can understand lessons in classrooms, whether they can do homework without review and whether they can pass exams. Thus, teachers teach for exams while students learn for exams. For

example, in class teaching of advanced mathematics, teachers only emphasize on teaching of mathematics concept, theorem, formula and examples and those contents that will be tested.

Finally, educational core in colleges and universities is to cultivate students' practical ability and creativity to cultivate managers and technical talents in production line for the society. The goal of talents cultivation is practical-oriented cultivation instead of academic or theoretical-oriented education. Therefore, we should change general requirements of logical and thinking stringency by colleges and universities and take application-oriented contents, thinking openness and problem-solving initiative as an important task in mathematics education reform in colleges and universities.

88.4 Solve Problems, Improve Qualities and Promote Employment

Firstly, reform of mathematics educational contents. Teaching contents of mathematics in colleges and universities should be decided according to overall goal of education in institutions of higher learning. Teaching contents should be centered on students, provide necessary basic services of mathematics for students' further learning and take improvement of students' mathematical quality and practical problem-solving abilities in mathematical method as the fundamental goal. In the first place, we should flexibly arrange teaching contents based on actual and professional needs, make applicable transformation of past theorized teaching contents and recombine teaching contents according to different degrees and subjects to realize the integration of mathematics course and professional courses. In the second place, mathematics teaching contents should fully reflect the basic principle of "aim at application, measure by enough use and take concept-mastering and application-strengthening as the key point." They should stress the application and using value of the knowledge, try to avoid profound logical deducting process of theorem and explain using meaning in actual problem-solving, for example, computing in architectural design, technical analysis in stock, storage and processing in information, statistics in national economy, design in different financing and insurance, weather forecast, key science decisions. As long as we transform these actual problems into mathematical model, we can compute and get results from computers. Therefore, quantification and matematization are the inevitable trend in social and economic development. As a thinking method and an expressive language, mathematics has penetrated into different fields. It should be guided by teachers in lesson-teaching. In the third place, fun, popularity and application of mathematics teaching contents should be emphasized to stimulate students' learning interest and cultivate their mathematical character. In the fourth place, mathematical experiments and model should be enhanced, and application of mathematics in actual life should be introduced

through modern educational technology. The setting of teaching contents should be transformed from “take school courses as the main part and emphasize scientificity” to “emphasize construction in professional fields and pay attention to the consistency of college learning and working experience, value employment instead of knowledge in book.” In the fourth place, for classes with big differences, teaching according to different levels can be applied to solve the problem of complicated graduates [5].

Secondly, reform of teaching methods should transform from taking classrooms, laboratories, libraries as main learning places and basing book learning to integrated design of classrooms and intern place. We should emphasize the combination of intern and learning as employment is an important drive for learning. Teaching methods should reflect the application of mathematics (cultivate students' ability to solve actual problems in mathematical method), fun (help students to come over fear of learning mathematics and to appreciate the fun and beauty of mathematics), experiments (stimulate students' initiative to participate and facilitate them to emphasize on direct experience). The following principles should be complied by. The first one is the principle of creativity. Teaching methods of college mathematics should be continuously innovated while old teaching methods should be abandoned to create new teaching methods which can help students fast mater knowledge. The second one is easily understandable principle. Teaching aims to let most students acquire much and accurate knowledge in the rapidest speed. The third one is open principle. Comprehensive application of different teaching methods is an effective way to improve teaching quality. The fourth one is to improve teachers' professional quality. Teachers of basic courses should have certain professional knowledge to provide better service.

Finally, through the nurture of learning spirit of mathematics, students' employment quality and professional characters are shaped. The key point is to explore mathematical thinking pattern and thoughts, such as direct thinking, logical deduction, simple computing, accurate conclusion and so on in mathematical contents. Through it, students can develop the habit of intellectual activities, plan their work, find and select rational way to accomplish their work and criticize and judge results.

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Part X
Multimedia Technology and Applications

Chapter 89

Research of PE Information Teaching Design System

Jian Ping Xi

Abstract In this paper, the physical education information teaching design system is researched and developed based on VB6.0 optimization platform. According to the national physical education and health course standards and the fundamental theories of the constructivism, the author adopts the modular design development method to design two functional areas which are the displaying of the teaching design contents and the online information database (nine modules in total) on the basis of the PE teaching design flow. Importantly, this system features the compatibility, scalability and practical applicability and can effectively improve the ability of PE teachers to design their teaching and hence provides a guarantee for the improvement of teaching quality and efficiency.

Keywords Information teaching design · System · PE · Constructivism

89.1 Introduction

The PE information teaching design system is researched and developed with the VB6.0 optimization platform and modular design according to the national physical education and health course standards and the fundamental theories of the constructivism and is a teaching design tool which can be used to collect, search and import information and aid decision making [1].

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89.2 Problems in Current PE Teaching Designs

In recent years, it is found that the new teachers as well as those who just touch upon the “new standards for courses” all attempt to conduct the teaching designs by themselves through the observation on the teaching practices of the interns and new teachers majoring in physical education, after the implementation of the new “new standards” at primary and middle schools. However, in the design process, the contents in the teaching designs are often incomplete; it is hard to collect information; the utilization and arrangement of the fields and equipments are insufficient; the initial and latter class designs are separate from each other; the understanding of the students is incomprehensive, or classes are too many to be distinct; the applications of the organization, measures and methods in the practical teaching process are few; the time and resources are wasted, etc.

89.3 Implementation and Characteristics of PE Information Teaching Design Under the Constructivism Environment

89.3.1 Implementation of PE Information Teaching Design Under the Constructivism Environment

In the constructivism, it is believed that the learning is a process to construct the internal mental representations; the learners do not carry the knowledge from the external world to their memories, but acquire and construct new knowledge through the interaction with the external world based on the existing experience. In accordance with the requirement of the general objective for the pilot physical education and health course as well as the fundamental explanation of the constructivism to the learning, the physical education teaching design can be defined as “a process to use the systemic method to do detailed plans and arrangements on the learning behavioral objectives and environment, teaching strategy and evaluation and others, and then create the teaching and learning systems, for the purpose of constructing the cognitive structure for students to learn the physical education and health knowledge and skills.” In accordance with the above definition on the meaning of the physical education teaching design, the author thinks that the physical education information teaching design flow can be expressed as shown in Fig. 89.1.

In order to realize the information technology in the physical education teaching design, the author fully integrates the PE teaching design flow with the information technology under the constructivism environment and simultaneously proposes the PE information teaching design.

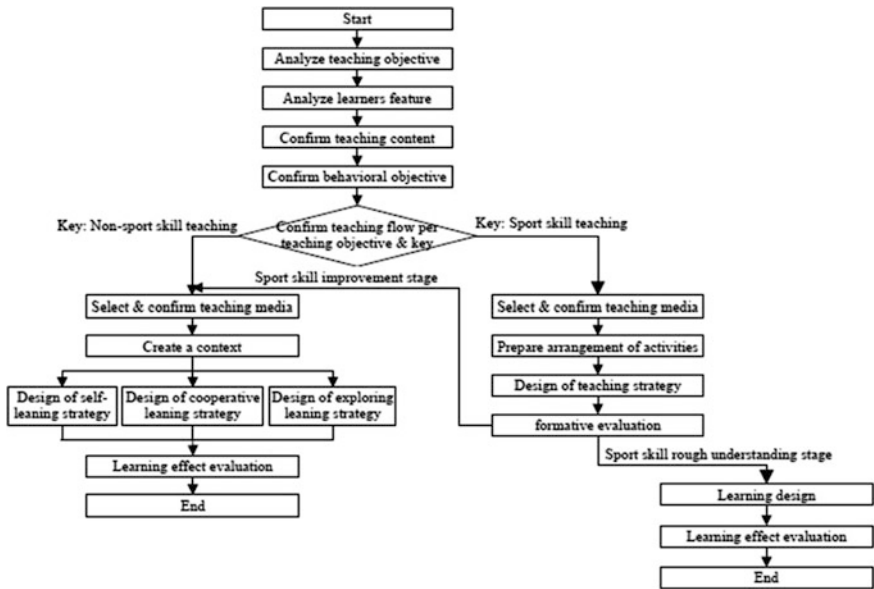


Fig. 89.1 The physical education information teaching design flow under the constructivism environment

89.3.2 Characteristics of the PE Information Teaching Design

Compared with the manual teaching design, the PE information teaching design owns its advantages and characteristics: (1) fully using the network technologies to support design and ensuring the teaching design to meet the needs of all resources; (2) relying on the information technology and adequately applying the crossed disciplines to innovate and make the teaching contents; (3) the formation related to the design content can be collected rapidly, comprehensively and purposefully; (4) the teaching is highly systemic as a unit is used as a teaching cycle; (5) the design clue is clear, and the contents are all-round.

89.4 Design of the PE Information Teaching Design System

89.4.1 Objective of the System Design

The objective of the system design is to provide the PE teachers with a teaching design tool which can be used to collect, search and import information and aid decision making. Specifically, (1) in the design of the modular, to be easy to use, the PE and health course teaching design flow is seriously complied with

(see Fig. 89.1); by integrating the fundamental requirements of the system design and application, the teaching objective analysis, learners' features, teaching content confirmation, media design, teaching context creation, teaching strategy design and evaluation, the teaching plan base and teaching references and other online databases all are designed to be independent functional modules, making the layers clear and easy to use. (2) In the design of the command button, the "add, delete, back and search" buttons are designed in the windows of all modules of the system, to make it easy for the teachers to add new contents, delete the unsatisfactory contents, go back to the last operation and search the records, etc. (3) In the design of the export system, the statistics and collection of part or all the fields of all kinds of information can be realized, to make it easy for the teachers to know more information of the design, hence providing a foundation for the teachers to write and analyze teaching plans and make scientific decisions.

89.4.2 Principles of the System Design

Five principles are necessary to be accorded with the system design as followings [2, 3].

1. Completeness principle: This teaching design system possesses a set of complete functions (collect, search, edit and display and export).
2. Compatibility principle: The system features a powerful compatibility in the import and export aspects and is able to execute the conversions between different formations.
3. Scalability principle: In view of the development of the teaching design system, the modular structural design is applied to the system design. The independence of all modules is highly powerful, so the adding, reducing or modification of the modules exerts a small impact on the whole system, which is convenient for improving, expanding and perfecting the system.
4. Hierarchical principle: The system design is a multistory structure, and the functions of all layers in the whole system can be clearly seen.
5. Scientific and practical principle: The system is established based on the concept and method of the software engineering to ensure the system structure to be scientific and reasonable. Meanwhile, all functions of the system accord with the needs of the teaching design.

89.5 The System Development Environment

89.5.1 VB6.0

VB6.0 is a rapid and visual programming development tool and owns distinct features as well as powerful functions. The object-oriented programming design

method is used in VB and greatly increases the reusability of the programs and hence simplifies the programming design. Besides, multiple ActiveXs are given by VB and increases the programming efficiency.

89.5.2 Database

Access is a database management system and has powerful functions enough to cope with the management of general data and the needs of processing. Its advantages include easy to use, easy to transfer, simple operating environment and the good effect to manage the databases of small-scale Web sites.

89.5.3 Operating Environment

Windows 98/2000/XP is used as the operating software environment of system; Pentium 2 or above is used as the hardware environment.

89.5.4 System Functional Modules

Based on the above design ideas and the PE teaching design flow, the author adopts the flow modular development method to integrate the VB's powerful functions and the needs of the teaching designs and design the two functional areas which are the displaying of the teaching design contents and the online information database (nine modules in total) as shown in Fig. 89.2.

89.5.5 Displaying Area of the Teaching Design Contents

In the content displaying area, seven links in the teaching design are included, which are the teaching objective analysis, learners' features analysis, teaching content confirmation, media design, teaching context creation, teaching strategy design and evaluation [4].

1. Teaching objective analysis module: This includes the selections of a series of sports items and the unit teaching objective. The function realized in this module is exporting the teaching objective that a sport item necessarily reaches in the current class based on the national "new standards for courses." Also, all items and the corresponding objectives are defined through the numbers, which makes it easy to add contents and retrieve, manage and search information.

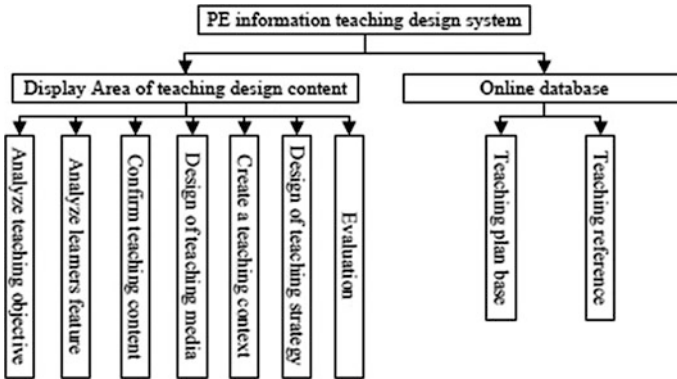


Fig. 89.2 The functional modules of the PE information teaching design system

After the users arrive in this module, they only need to click the desired contents and confirm the operations. The basketball item can be taken as example to explain this as shown in Fig. 89.3.

- 2. Learners' features analysis module: This includes the class selection, student feature information and the specifics of a feature. The function realized in this module is automatically generating a series of feature information export based on the class selection function which has been set in the system. The information includes the statistical table of the student physical health test data, and the learning attitude

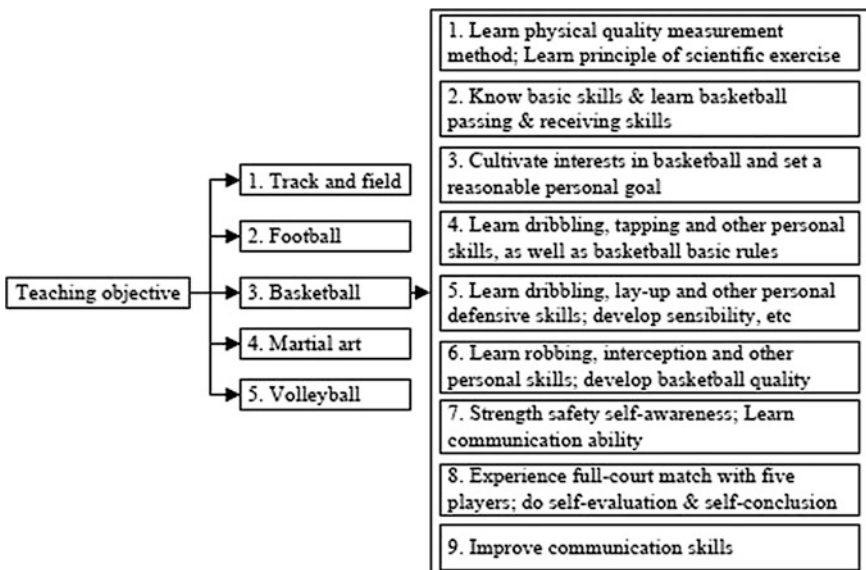


Fig. 89.3 The teaching objective analyzing flow

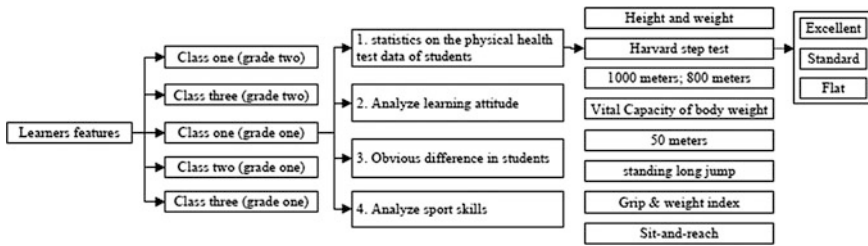


Fig. 89.4 The learners' features analysis flow

analysis table, the students' obvious difference (e.g., physiology and psychology) table and the sport skills analysis table. The specific flow is as shown in Fig. 89.4.

3. Teaching content confirmation module: This includes the class hours, teaching content references and teaching key points selection. The function realized in this module is designing and exporting the class hours, teaching contents and teaching keys.
4. Teaching media design module: This mainly provides the existing teaching media and the teaching media secondary contents which are necessary to be developed. The users can select the media by directly clicking it.
5. Teaching context creation module: This includes the context creation sub-modules of the story, question, simulated experiment and cooperation. The clicking button of each sub-module is attached with the instructions of the specific plans, methods and concepts. The users can directly click the confirmation button after viewing the instructions.
6. Teaching strategy design module: This includes three sub-modules which are the self-learning strategy, cooperative learning strategy and exploration learning strategy. Also, the clicking button of each sub-module is attached with the instructions of all concepts and methods. The users can also directly click the confirmation button after viewing the instructions.
7. Teaching evaluation module: This includes two sub-modules which are the formative evaluation and summative evaluation. The formative evaluation is set to reach the requirement of teaching objective better and achieve the better effect in the teaching of an item and can help teachers know the results in a teaching stage as well as the development and problems of students' learning in time, based on which the teachers can timely make adjustment and improve the teaching. The summative evaluation is also called as the "post evaluation" and is implemented to know the ultimate effect of a teaching activity after a teaching cycle ends. In this module, the users can do self-conclusion based on the contents of the teaching objective analysis module and take the conclusion as the starting point of next class or unit.

89.5.6 Online Database

The online database mainly includes the teaching plan and teaching reference sub-modules. Each sub-module provides the most direct and most rapid network information for the users through the network connection. The users can view a great number of excellent teaching plans after entering into the teaching plan base module by a click.

89.6 Conclusion and Discussion

The users can obtain a comprehensive, specific and complete teaching design flow only by selecting and confirming the links of this design system. This paper provides a foundation for the formulation of the teaching plans and also can ensure the optimization of teaching. VB6.0 flow modular design was selected for the PE information teaching design system researched and developed under the environment of constructivism, not only complying with the fundamental requirements of designing an information system, but also integrating the implementation of the teaching design and the actual condition of the search work, which can effectively enhance the efficiency and level of the teaching design. In the teaching process, this system can fully meet the needs of teachers to collect, save, update, search and import and export all kinds of information. As for the new teachers as well as those who just touch upon the new standards for courses, this system is really a good assistant in the teaching design. However, as the information age is always full of never-ending changes and improvements, the online teaching effect evaluation of this system is still necessary to be developed and enhanced further.

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Chapter 90

Study on Effect of Internet on English Learning

Peng Jing

Abstract It is generally accepted that network plays an important role in aiding English learning as it provides a virtual learning environment and extends resource sharing, making English learning develop toward individualization and autonomy. This paper seeks to investigate the effect of the Internet on English learning of English majors out of the classroom and to help students to learn independently in authentic and global environments. Hopefully, this study will give English teachers some new inspiration in their teaching.

Keywords Internet · English learning · Effect · Independent learning

90.1 The Importance of Internet

The Internet has brought about a profound change in the access to educational resources, the presentation of teaching materials, the learning mode, and the interaction between teacher and student. The online learning had broken the way which the students seek the knowledge passively. The network causes the personalization to education into one kind of possibility. It has provided the possibility for the engineering factor and caused the teaching method becoming an information based on society and changed teacher's and students' contact way.

How to take advantage of online resources available via the Internet to facilitate language learning has also been a critical issue discussed by numerous researchers [1]. The researcher indicated that we do not need to question whether to utilize

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electronic technology in foreign language instruction, but we need to give much attention as to how to control it and guide our students to use it. Many EFL instructors are taking advantage of technology to provide students with opportunities to continue learning outside the classroom because, for instance, technology allows learners to work at their own pace and to have the freedom to choose their own materials [2]. Moreover, technology and multimedia resources and Web-based learning environments provide students with authentic and global environments and interesting tools to achieve learner autonomy or learner independence and offer them an opportunity to learn, practice, and communicate with others in the target language outside the classroom [3].

Findings from Warschauer intercultural keypal projects indicate that keypal exchanges across cultures can be effective and a motivating factor for developing intercultural communication. Warschauer further suggests that EFL teachers can use their home pages to design e-mail exchange projects. Muehleisen also argues that e-mail exchanges can motivate language learners by giving them a chance to develop language skills while, at the same time, forming a relationship with a person from another culture. Muehleisen [4] offers a theoretical frame—Hsu: Building Language-Learning Environments to Help Technological University Students...The JALT CALL Journal 2005 [Vol. 1.2]—55 work and practical applications of the e-mail tandem in foreign language learning and suggests the appropriate use of the international e-mail tandem for motivating students to develop learner autonomy. Robb [5] provides suggestions for finding keypals and concludes that keypal exchanges can be worthwhile for students, but notes that they might not be very successful the first time someone undertakes an exchange. The researcher points out that in the initial stages of e-mail exchanges, students may encounter difficulty because they do not have much experience in written exchange. As a result, they may not know what to write in follow-up letters. It is clear that keypal instructors should provide topics for e-mail discussion, by specified dates, in printed or online syllabi.

90.2 The Advantages and Disadvantages

90.2.1 Advantages

Research results indicate that Internet use increases language use and acquisition of second language. For example, it was found that interaction in language helps learners to gain input in language learning process. Specifically, it increases synchronous and asynchronous communication of ESL learners [6] and then to use language in real communication situations. In other words, the Internet motivates learners to use English in their daily lives and provides functional communicative experiences. Communication with native speakers allows learners to practice specific skills such as negotiating, persuading, clarifying meaning, requesting

information, and engaging in true-life, authentic discussion. Additionally, the Internet gives the opportunity to construct knowledge together by expressing themselves in print and then assessing, evaluating, comparing, and reflecting on their own views and those of others. In sum, it is a useful medium for communication with native speakers in real situations, improving writing skills, teaching of culture and learning about the target culture.

It is also useful to retrieve access and use information in the context of second language learning. The Internet is a platform for experiencing and presenting creative works such as essays, poetry, and stories and for providing supplemental language activities in specific areas of language learning. Additionally, the Internet promotes higher thinking skills.

It helps students to improve their computer skills, such as keyboarding skills, opening and storing files, Internet searching, and technical and conceptual experiences. It increases the participation when it is used in classroom environment. For instance, it was found that the ESL learners produce more sentences when it was compared to the situation in classroom environment [3].

It is also useful not only for the quantity but also for the quality of language: Learners have a great variety of speech discourse and use more complex language.

According to the research activities, the Internet changes the interaction between learners and teachers [7]: There is less teacher and more learner talk in computer classes. Furthermore, it changes teacher and students' roles [5] and makes learning more student-centered. The Internet is a source of supplemental resources and authentic materials.

Finally, the studies indicate that the Internet has positive effects on motivation, provides means for creative works, and gives opportunities for collaboration and socialization in learning process.

90.2.2 Disadvantages

First, although there are many advantages of computer, the application of current computer technology still has its limitations and disadvantages. The researcher indicated that the first disadvantage of computer and its attached language learning programs is that they will increase educational costs and harm the equity of education. When computers become a basic requirement for student to purchase, low budget schools and low-income students usually cannot afford a computer. It will cause unfair educational conditions for those poor schools and students. On the other hand, expensive hardware and software also become the big obligations for schools and parents.

Second, it is necessary that both teachers and learners should have basic technology knowledge before they apply computer technology to assist second language teaching and learning. No student can utilize computer if he or she lacks training in the uses of computer technology. Unfortunately, most teachers today do not have sufficient technological training to guide their students exploring

computer and its assisted language learning programs. Therefore, the benefits of computer technology for those students who are not familiar with computer are inexistent [7].

Third, the software of computer assisted language learning programs is still imperfect. Current computer technology mainly deals with reading, listening, and writing skills. Even though some speaking programs have been developed recently, their functions are still limited. Warschauer pointed out that a program should ideally be able to understand a user's "spoken" input and evaluate it not just for correctness but also for "appropriateness." It should be able to diagnose a student's problems with pronunciation, syntax, or usage and then intelligently decide among a range of options.

Fourth, computers cannot handle unexpected situations. Second language learners' learning situations are various and ever changing. Due to the limitations of computer's artificial intelligence, computer technology is unable to deal with learners' unexpected learning problems and response to learners' question immediately as teachers do. The reasons for the computer's inability to interact effectively can be traced back to a fundamental difference in the way humans and computers utilize information. A researcher also expressed that computer technology with that degree of intelligence do not exist and are not expected to exist for quite a long time.

In a word, today's computer technology and its attached language learning programs are not yet intelligent enough to be truly interactive. People still need to put effort in developing and improving computer technology in order to assist second language learners.

90.3 Difficulties and Problems Encountered

Regardless of the students' rich online experience, before going to University, they said they had never thought of chatting with someone online in English and had no experience in using English to communicate with others, specifically foreigners, in both spoken and written forms. Almost all of the students reported that they experienced the feeling of being shocked when they first used English to chat with others, especially with foreigners. Many stated they felt especially frustrated when there were language barriers. Some of them reported that they did not know how to talk online or what to talk about online at the onset of class.

In the initial stages, linguistic problems were major roadblocks for students who felt frustrated by the learning process. Some students reported that they lacked the vocabulary, reading, and listening skills necessary to understand ESL Web sites quickly and efficiently. Some claimed to be intimidated by Web pages that featured only English text.

Besides linguistic problems, there were some other difficulties, such as not being able to download sounds and getting disconnected while communicating with others online. Furthermore, some students did not have personal computers

and there were not enough computers at the University for Students to access the Internet. In addition, some students complained that it was quite time-consuming to learn online.

Regardless of all of these problems and difficulties, after one or two years of campus life, almost all the students reported that they overcame their fears, built up their confidence, and acquired some keypals from many countries to communicate with regularly. Many responded that they would continue to learn and use the target language to communicate with others in technology-based environments because they found it interesting and useful to learn through these venues.

90.4 Strategies to Learn English Online

It was interesting to find that most students were very dependent and did not possess any learning habits at all at the beginning of their university life. However, many students gradually changed and acquired learner autonomy and learner independence. It was also interesting to find that many students' attitudes toward the target language changed from negative to positive. For example, some students reported that: "I used to hate English," but now "I like English" or "I love English." Many stated it was great to have opportunities to learn to communicate with people from other counties in English through MSN, Yahoo Messenger, or e-mail. They believed that doing so was an efficient way to help develop language skills, computer skills, and communication skills.

There are some other strategies students used to create their own language learning activities and environments for developing independent learning. Most of them stated that they enjoyed watching movies to learn English. Usually, I change the subtitles into English. It is hard for me to understand the whole movie the first time because the actors speak English very fast. Now, I can understand the movies better and I am happy my English keeps progressing. I always write down the words I do not know and look them up in the dictionary after watching a movie. As I know more idioms, slang, and vocabulary in this way, it is easier for me to learn more.

Some other activities were reported as effective for independent learning including listening to English songs, listening to English programs on the radio, and reading English novels. All of them agreed that independent learning was an important way to learn more. In the interview, when asked about their recollections of the experience, most students stated it was a positive experience. Most appreciated the Web sites' rich content and variety of materials. Some said the best thing the Web sites offered was the possibility of interacting with people from different countries and cultures. These findings suggested that students' attitudes toward independent learning were positive. Motivation, self-confidence, and taking responsibility for learning were also found to play very significant roles in language learning.

In summary, Internet-based environments can be rich, authentic, global, interesting, and useful resources that offer students opportunities to practice and use their integrated target language skills and to communicate with others outside the classroom. This study supports the opinion that Internet-based environments can be beneficial for developing independent learning outside the language classroom. However, all participants encountered difficulties to some degrees by using the technology-based environments for the first time. Fortunately, the teacher offered immediate and necessary support and encouragement sufficient to prevent the students from being overwhelmed by difficulties. Afterward, most students had an overall positive attitude toward independent learning in Internet-based environments and were interested in continuing to learn and use the target language to communicate with others in these venues even after the class ended.

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Chapter 91

Cultivation of Technology Talents in Network English Teaching Mode

Li-min Su and Mi-qian Zhai

Abstract In order to ameliorate the problems existing in traditional English teaching mode, enhance English teaching level, cultivate technology talents required by society, the application of network techniques in English teaching has been presented in this paper, which proposes a complete network English teaching system by using tremendous network resources and campus hardware and software network resources to provide a highly efficient network teaching and information sharing platform for teacher, with the purpose of significantly improving the teaching and learning effects during English lessons.

Keywords Network · English · Teaching mode · Cultivation

91.1 Introduction

With the rapid development of computer and network information technology, network teaching has been highly accounted by education world for its interactivity, virtuality, openness and individuality [1–3]. It has been emphasized in “National English curriculum standards for general high school” that teachers should make full use of modern teaching technology to develop English teaching resource, broaden students’ learning channel, improve students’ study method and enhance their learning efficiency; teachers should make use of computer and multi-media teaching software, explore new teaching mode and promote the individual learning of each student. Combine with the characteristics of English curriculum, teachers can take full advantage of tremendous information resources in internet, band

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together the multi-media network teaching with traditional teaching mode skillfully, focus on the cultivation of students' learning ability and practically enhance students' English listening, speaking, reading and writing skills [4]. It is a kind of new English teaching mode based on network environment, which can provide different teaching patterns according to students' personal conditions, such as instruction mode, self-learning mode, interaction mode and cooperation mode. This new modern teaching mode made teachers have to change ideas, renew teaching patterns and improve personal accomplishment constantly. Only with the changes, teachers can help students to develop their self-learning potential under network environment and enhance their comprehensive application level of English [5].

91.2 Network English Teaching Mode

91.2.1 Environmental Necessities of Network English Teaching Mode

Compared with traditional English teaching mode, the new English teaching mode under network puts forward higher environmental necessities and specifically reflects in the following aspects [6, 7]:

1. Provide sufficient knowledge base for English teaching. The knowledge base mainly includes the related references, updated information and resources, English topical materials, and it should be assorted, stored, updated regularly, and it should have the operation deck for users to search, browse and download.
2. Establish a modern network education and management platform. This platform should include a complete multi-media network-teaching environment, learning platform, instant messenger for students' intercommunication and videoconference system service. The modern network education platform is the basic platform for teaching online and internet interaction. It provides students with a highly centralized interactive learning platform and provides a rich and effective teaching tool for teachers. In addition, it should also include evaluation of teaching effectiveness.
3. Possess good computer operation skills. Either teachers or students must be able to operate and use the basic functions of computer and can use it freely.

91.2.2 Characteristics of English Teaching in the Network Environment

By using plenty of Internet resources and creating scenarios, English language teaching will much closer to real life. Sources of information in a network environment is rich and colorful, while also providing the most flexible information

organization, which can combine texts, images, graphics, sound, video, animation and other multi-media information organically and create real scenarios according to the different needs of users to make teaching and learning more realistic and intuitive. For example, when learning a Senior English Students' Book 2A Unit 11 "Hurricane", the students cannot imagine hurricane madness raging state and also cannot have a clear impression on the shape and extent of the hurricane, therefore the understanding of the content of the article may be affected. In this situation, teachers can use the pictures of the hurricane on the network, with the sound and animation, so that the students will have an immersive and feeling on the scene of farmland being eroded, homes being destroyed, thus deepening the understanding of the article.

Wider English teaching space for listening, speaking, reading and writing by using network tools. In network English teaching mode, teachers can teach listening, speaking, reading and writing by using multi-media computers, varieties of beautiful music screen, wonderful pictures, video recorders, VCD, a wide variety of multi-media educational software and other tools.

The application of network technology can develop students' divergent thinking and cultivate students' creative potential. With the entering of modern network educational technology into classroom teaching of English, the capacity of classroom teaching increased exponentially, which is helpful to open up the horizon of students? The clever use of interaction of network technology in the classroom teaching can significantly enhance students' awareness of independent thinking, and students can participate in discussion actively to improve the ability of applying the knowledge to ask questions, analyze problems and solve problems. This modern network-teaching mode can help teachers to impart knowledge to students effectively, while the interaction between teachers and students and within students made the information be shared, so that students' problems can be resolved in the shortest time, which greatly improves the effectiveness of learning.

91.2.3 Demand Analysis of Network English System

Different from ordinary classroom-style education, network English teaching has its advantages: (1) teaching contents can be designed according to the learning ability of students, truly individualized; (2) the time and space constraints in the ordinary teaching mode can be broken through; (3) a more relaxed learning environment can be provided, so that students can express their potential easier, and it also helpful for the exchange and inspiration among students; (4) during online learning, it will be more convenient for comparing and sharing information, brainstorming, avoiding weaknesses and getting better understanding of what they learned easier, paving the way for deeper knowledge; (5) students can choose different learning methods and curriculums according to their personal requirements and developments, and it also help to develop students' interest in learning; (6) meet the needs of the society much better. Topological structure of network English teaching system is shown in Fig. 91.1.

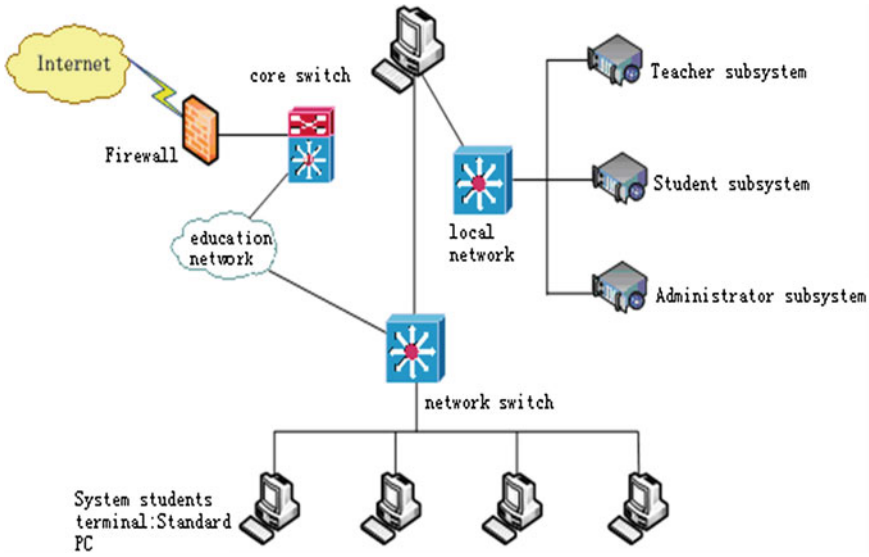


Fig. 91.1 Topological structure of network English teaching system

The design of this system meets the following requirements:

- Provided an information exchange and sharing platform, students can express their ideas and opinions on it;
- Provided an information resource download platform, students can download learning materials required;
- Provided an online test platform, students can log on this platform for online learning and assessment.

91.2.4 Environmental Requirements of System Development

Server: High-performance PC with configuration of P2 or better devices, network interface cards (NICs), the memory should be more than 512 MB, hard drive more than 160 GB. IBM DB2 can also choose to backup server.

Client: High-performance PC with configuration of P2 or better devices, NICs, the memory should be more than 128 MB, hard drive more than 20 GB. Windows 98 above operating system, install IE browser.

Network: server and client should have network connectivity. Configure TCP/IP protocol.

91.2.5 The Main Function of Network English Teaching

The main function of network English teaching includes three parts: teacher education subsystem, student learning subsystems and administrator subsystem, this various modules can cooperate with each other to form a comprehensive network English teaching system. The design contents are shown in Fig. 91.2.

1. Teacher subsystem and student subsystem

The function of teacher subsystem and student subsystem is phase response, including the following modules:

Online operation: This link is mainly used to strengthen the knowledge the students have learned in class.

Online test: In this session, teachers can add questions, modify and delete questions.

Discussion Q and A: Q and A process is asynchronous, students publish the problems encountered in their study with the form of messages in the system, and teachers answer those questions through this module. Of course, teachers can also release discussion subjects on the system and guide the student’s in-depth study and discussion.

Examination management: In this session, teachers can conduct questions management (including add, modify, delete).

Online communication: in this module, the main function is to provide a platform of information exchanging for students and teachers, to answer difficult questions and information sharing.

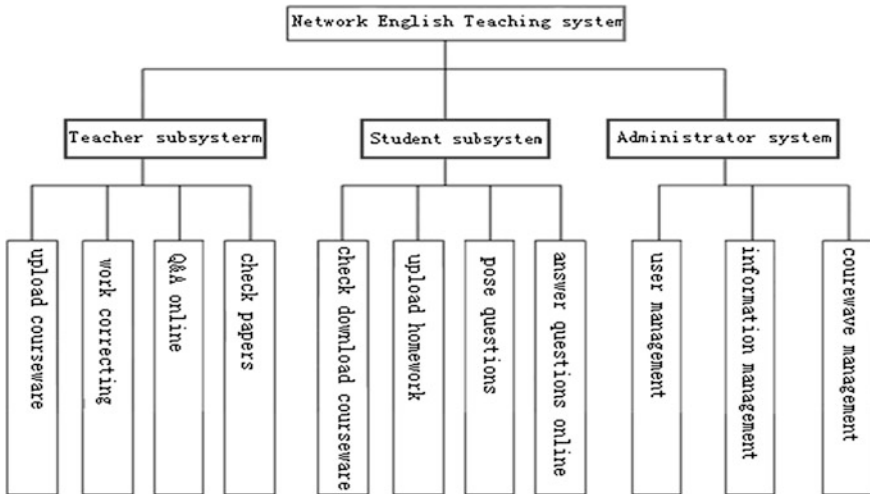


Fig. 91.2 Function list of network English teaching system

2. Teaching management system

It includes sub-members of member management, curriculum management, job management, communication management and test management.

Member management: it includes the management of system administrator, teacher and student. The system administrator can add, modify, delete and query all personnel, allocate and manage teacher's permission.

Curriculum management: it includes add, modify and delete courses operations.

Job management: layout and correction operations.

Communication management: It means managing the exchange of information; teachers or students can reply questions published in the platform. Administrator can delete inappropriate information.

Test management: questions and exam time management.

3. User rights: search data, view work, download data

Ordinary user login: ordinary users can register personal information to network English teaching system, and then to be the ordinary user.

System administrator can log and maintain resources, increase or shield function, and conduct other operations in network English teaching system.

Search for information, view the work and download information: ordinary user can login to the system and search, view, download learning materials.

4. Other basic functions

User registration, login, modify personal information, delete and so on.

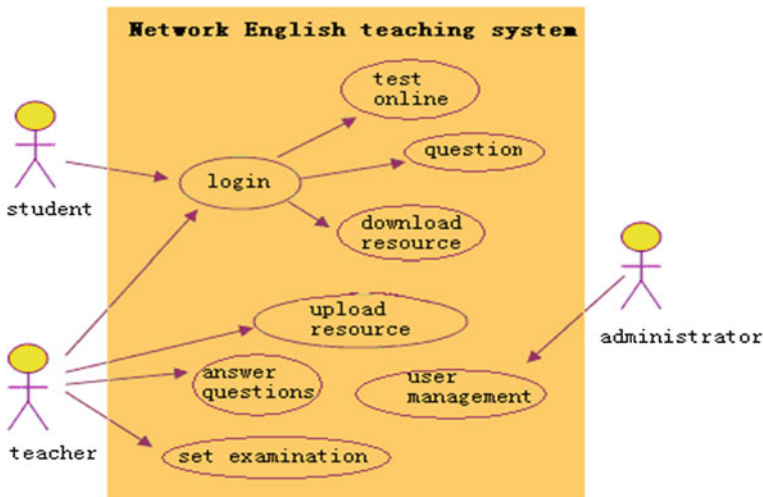


Fig. 91.3 Role assignment in network English teaching system

91.2.6 System-Related Roles

System administrator: manage all users, role and permission assignments in this system and ensure the system running smoothly.

Teacher: release learning resources (such as video, courseware), answer questions online, manage online questions and exam questions.

Student: download learning materials, post questions, share information with students and teachers, as well as online evaluation.

Shown in Fig. 91.3 are the roles in network English teaching system and its main functions.

91.3 Problems Need to be Noted in Network English Teaching Mode

91.3.1 Optimize Instructional Design

Instructional design is the key link in the creation of overall teaching plan, plays a navigation role in teaching process and directly determines whether the process of teaching and teaching effectiveness has been optimized or not. During the instructional design, autonomy of network learning needs to be focused and emphasizes that the teaching resources are used to support learning, emphasis on requirements analysis, teaching objectives analysis, teaching content analysis, learning outcomes assessment and information exchange feedback, especially for the emphasis on the creation of web-based learning scenario and design of teaching methods and strategies. Web-based English teaching mode requires more autonomous learning from student, so the creation of scenarios is very important.

91.3.2 Strengthen the Skills of Teaching and Learning

Network teaching used network technology and modern information technology for teaching and learning. Thus, it requires that the teachers and students must possess necessary computer skills, proficiency in the use of network technology, hardware and application software. Teachers need to design proper courseware for teaching according to the characteristics of the students' prior knowledge, so that students can independently use the computer to complete the network learning content. Therefore, the skills training need to be strengthened for teachers and students to operate on the Internet.

91.3.3 Integration of Network Teaching and Traditional Classroom Teaching

The objective of traditional teaching and network teaching is the same that is providing teaching information to student and let them gain knowledge. This two teaching mode can be coexist, and we can make full use of each advantage and use them comprehensively. Network technology provides a more personalized choice and a richer way for teaching. Through the network, we have greater flexibility to integrate a variety of patterns, which can expand the ideas and means of teaching. Introduce new ideas such as “Student is the main” and “teacher led” from network teaching into teaching and make full use of the technical advantages of multi-media network teaching. After got the learning task, students can analyze the problem, use Internet to obtain relevant data and sort them, get in touch through the network with teachers or server, or in discussions between the students to express their views and can also listen to other students’ viewpoint, and then consider comprehensively obtaining solutions and organizing the data. During the whole learning process, students can search information initiatively, and under the correct guidance of teacher, problems can be resolved, so that the students’ independent learning initiative has been brought into full play, which helps students better accomplish their task.

91.4 Conclusion

With the popularization of Internet applications, international communication has become more frequent; as an important part of educational mode reform, the reform of English teaching model and establishment of learning evaluation system are crucial. By using the advantages of network technology, building a network English teaching system, not only with the advantages of flexible time and space, but also helpful for the conduct of all interactions, it can better make up the defects of interactive insufficient knowledge base existed in traditional education, play a significant role in promoting students’ independent learning ability and improve the quality of teaching.

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Chapter 92

Flash-Based Multimedia Courseware's Production and Implementation

Huixin Zhang

Abstract With the in-depth usage of computers in college teaching, multimedia courseware for teaching has become a more popular modern teaching method. Multimedia courseware is not only colourful and rich in resources, but also able to fully mobilize the enthusiasm of the students, broaden students' horizons and add more auxiliary learning tools, such as multimedia player. It not only helps students to absorb knowledge, but also greatly improves the teaching efficiency of teachers. There are many ways and means of multimedia courseware's production, including the Flash, which is an extensive way of production of courseware. This paper mainly introduces the concept of multimedia courseware and steps of producing multimedia courseware based on Flash.

Keywords Flash · Multimedia courseware

92.1 Introduction

The computer has been deepened into all walks of life. The computer brings us ever-changing in working life, and at the same time, it gradually moves into the teaching activities of teachers [1, 2]. Multimedia courseware for teaching realizes books in many science fiction movies can play a video scene, stimulates the enthusiasm of the students, makes students more interested in the course and promotes the teaching activities of teachers [3–5]. Multimedia courseware not only provides very intuitive presentation of a variety of multimedia video and audio, but also can simulate the micro even macro things and simplify the reproduction

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responsible for the process. This article selects Flash as courseware authoring software. Flash can be used to import a variety of pictures, audio, animation, video and other media and be linked with teaching contents that can be presented vividly, which is unmatched with traditional teaching.

92.2 Multimedia Courseware Overview

Media, the general concept, refers to the carrier of transmission of information. Multimedia is a variety of media elements collectively [4, 6, 7]. That is to say, it is a new integrated media which comes from an organic combination of kinds of media. Generally speaking, multimedia is the scope of the computer. Multimedia technology, a new type of computer technology, can integrate a variety of text, graphics, images, audio, 2D and 3D animation and video and other multimedia data effectively and then be integrated into the interaction of an IT. In traditional teaching, the blackboard, textbooks and other static resources are owned by the media. However, computer multimedia includes text, static and dynamic graphic image, sound and video.

Multimedia courseware is tailor-made for the course content of secondary teaching software. It utilizes all kinds of multimedia technology, combines with the course content and enriches the teaching presentation [8, 9]. It combines the relevant text, graphics, images, sound, animation and the video with knowledge points, makes the combination interact with each other and integrates various elements and then shows a colourful multimedia application courseware. Students can deepen their understandings of knowledge points through images, audio and video showed in multimedia courseware and greatly improve their interests to acquire knowledge. What a big feature of multimedia courseware is that if students do not understand some of the teaching content, we can play the video in the multimedia courseware repeatedly until the students understand it.

92.3 General Steps of Multimedia Courseware

92.3.1 Clearing Teaching Objectives

First, multimedia courseware contents should be in accordance with the requirements of syllabus to stress focused points and show students more basic contents that must be mastered rather than less important contents. Second, we must break through the difficulties. A major advantage of the multimedia courseware is that the difficulty in the course which is not easy to understand can be showed visibly by more popular pictures, animations, photo albums and other effects. The first step of multimedia courseware is to clear teaching purposes, hope what kind of effects that the courseware will eventually reach, and how to make that to help

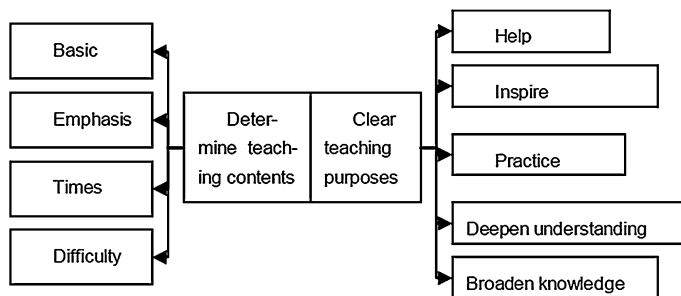


Fig. 92.1 The figure of the primary task of multimedia courseware

students deepen understandings of knowledge, assist memory, deepen impression, and how to help students broaden their knowledge, inspire imagination and practise creativity. These are all worth considering before producing and determining the problem. Only when teaching purposes are to be determined, the production of courseware can proceed objectively. The objective is to make a multimedia courseware according to the teaching requirements and it can better assist teaching, as shown in Fig. 92.1.

92.3.2 To Prepare Material

After determining the teaching contents and teaching purposes, we begin to produce Flash courseware. We start to search for relevant materials. The selection of multimedia courseware materials should be based on teaching materials, follow the teaching objectives and teaching tasks and enrich courseware sufficiently. A good courseware needs to increase the number of vivid and intuitive multimedia materials rather than to play the material contents just like the slide, so the preparation of the material in the production of multimedia courseware is crucial. During selecting material, we can start it in the Multimedia Material Library to find the right and then find the richer materials on the Internet-related courses' Websites. Under normal circumstances, the format of the material we prepared is jpg, gif, RMVB, AVI and so on. If the Flash software does not support the downloaded format, then we have to convert it into the format we can use based on a variety of format conversion software.

92.3.3 The Design of Creative Script

The production of multimedia courseware is also a creative project. The so-called script refers to the idea of multimedia courseware need to just like the script showed on films and television, and we need some of the script like that. The role

of these scripts is how to combine the teaching contents and preparation of material and then to describe the presentation orders and ways of the text, images, video and so on. These scripts also describe a variety of significant guiding contents like the layout of the courseware, text structure and manifestation of the interface. The conception of these scripts needs to be revised and improved repeatedly.

92.3.4 To Achieve the Script

After having determined the courseware contents, collected enough materials and designed script, we can begin to create multimedia courseware. There are a variety of ways to produce and achieve multimedia courseware. The enabling technologies are as follows: Flash basic animation techniques, such as techniques of frame by frame animation, mask, action, guide, forms; Photoshop is a technology that is used for picture processing. Multimedia courseware process requires being familiar with basic computer operation and the usage of related-software.

Under normal circumstances, production of courseware will not only need an authoring tool, but also need a variety of software, the higher requirement of mastery in computer software. As to graphics and image processing, we need to be able to use Photoshop and other software. As to the sound, we need to use the audio clipping software. If it still has animation, Flash and other software is needed. Only by flexibly using different kinds of software and having a good aesthetic ability, an excellent courseware can be produced.

92.3.5 Feedback and Modify

In order to apply produced Flash courseware to the teaching process, we still need to modify and improve it repeatedly. We need to modify student's feedbacks much. If the multimedia courseware cannot arouse students' interests and aid teaching better, we need to completely modify it based on the views of teachers and students. I believe, after repeatedly effectively modifying, a good courseware will be born.

92.4 Use of the Flash in Multimedia Courseware Production

The main interface of the Flash software consists of the menu bar, toolbar, timeline, stage, actions and attributes. Timeline includes scenes, layers, frames and play head. Frame is equivalent to a picture in films; layers consist of many frames,

which are equivalent to a film; scenes consist of many layers, which are equivalent to a story.

First, you should build a new film document in the Flash and then set the attribute background dark green, the size of 800×600 pixels. The document can be set to full screen size which makes the picture fill the entire screen to achieve the best viewing experience. On the first frames of the main scene setting “fscommand (\” full screen \ “, \” true \ “)”, we can fulfil the full screen size settings. It should be noted that we you would better set up a layer to write the scripting language at the top layer of the main scenes. Before writing a scripting language, you must select the frames to enter. All script input can only be written on the button, frames and movie clips.

Secondly, input the relevant materials to the library.

Finally, compile the courseware program. Open the File menu, select Insert “scenes” and enter “Scene 1”, “Scene 2” and “Scene 3” or according to the teaching content to name the scene different names.

1. “Scene1”, mainly introducing the production of picture’s playback
 - (a) To set up three new video clip components in the library, name them as “Picture 1”, “Picture 2” and “Picture 3” or name them so as to associate with the image content or teaching content, here with pictures 1, picture 2 and picture 3. The following names can be changed according to Flash elements. Another thing to be noted is that the size of the three images should be exactly the same; if not, you need to deal with by Photoshop and other mapping software.
 - (b) To make these pictures scroll animation. Create a new layer in the scene named “Picture Play”.
 - (c) To drag and drop video clip component—“Picture 1” to the first frame of “Scene 1”, “Picture 2” to the fifteenth frames and “Picture 3” to the thirtieth frames.
 - (d) Add a stop action to the “Picture Play” layer. The method to stop adding is to add the “Stop” instruction to the fourteenth frames and the thirtieth frames.

Then we can achieve the effects of playback picture.

2. “Scene 2”, mainly introducing display methods of the image playback on the base of “Scene 1”
 - (a) In “Scene 2”, set up a new layer and name it “Effects Show”.
 - (b) To input “Show 1” to the first frame in the layer and save it as the components, and set the action “Sliding into”; To input “Show 2” to the fifteenth frames in the layer and save it as the components, and set the action “getting big at middle”; To input “Show 3” to the thirtieth frames in the layer and save it as the components, and set the action “Rotating bottom to fly into”. The action effects can be set based on the design situation.
 - (c) To drag and drop the components of “Show 1”, “Show 2” and “Show 3” to the layer of “Effects Show” and adjust the display position.

- (d) Finally, to add the action “Stop” to the fourteenth frames and the thirtieth frames.

After the above steps, we can set different text effects in Flash.

3. “Scene3”, mainly introducing adding the video control buttons
 - (a) To produce buttons in the component library. To add a button component to the library, and establish a “Scene 3” layer, and draw a rectangular box, size of 100×80 , black colour (the button to lift the colour), in the first frame of the layer, and then draw a blue rectangle, size 90×70 . This will make the button a three-dimensional image. Alignment: centre. To make the second frame and the third frame a key frame, the method is to select the second frame and the third frame, right click to insert a key frame; In the key frame in the second frame, change the blue rectangle’s colour to green (mouse pointer over the button colour) and the third frame’s colour to dark green (the button is pressed). To copy four times “the video playback button 1”, which makes the size and the colour of the buttons consistent, and the four buttons are named “Scene 2”, “Scene 3”, “Back” and “Next”.
 - (b) In the first frame in the “Scene 1” into the “scene”, to put into “Scene 1”, “Scene 2” and “Scene 3” three buttons, and adjust the position. To select the button “Scene1”, click “action—button/action/movie control (select standard mode)/double-click the” on “”, and select “press”/double-click the “goto”, and then select “Go and play”. “Scene 1” needs fill in the scene in order, the type frame label. To add to “Scene 2” and “Scene 3”, it needs to mark the first frame of the two scenes so that this mark can be found. The marking is to right click to add a frame label in the scene and input the frame label name. So, when adding the button to jump action, you can choose the frame label name and make it possible to jump to the first frame at a scene. The button’s action set of “Step” and “Next” is similar to the above. Do not describe it here.
4. Courseware publishing

First, to save all the files above, and then open “the menu bar” in the File menu, and to choose “Export Movie” or “publish” to save the file as SWF or.exe format. So that you can operate Flash courseware program independently away from the editing page of the Flash development tools.

92.5 The Broad Prospect of Flash Courseware Applications

With the rapid dissemination of multimedia courseware, Flash-based multimedia courseware is also developing rapidly: from the stand-alone version to the network version, from simple text effects to a rich display of word, picture, sound and video, from the Automatic Demonstration to interactive type, from the secondary teaching to secondary self-study. Flash animation in courseware can easily realize

auto scaling, discoloration, distortion, deformation, rotation, and interaction design with other material. Gradual improvement in the design of multimedia courseware makes teachers get rid of manual writing on the chalkboard of traditional teaching methods and can turn some traditional boring conceptual knowledge into action, vivid screen image displayed; students get rid of the boring abstract books, and a variety of Flash animation and material will firmly seize the eyes of students, provide students with a pleasant image and video experience and invisibly can master knowledge imperceptibly. These are the traditional textbooks that cannot match.

The design of Flash multimedia courseware will give full consideration to the age, characteristics and psychological factors of students, fully stimulate students' interest in learning, appropriately use multimedia material and mobilize the enthusiasm of students to appreciate music, develop students' imagination and creativity and create a strong learning and teaching study atmosphere. Flash multimedia courseware has a variety of characteristics, such as rich content, innovative technology, timely material, vivid images, simple operation and friendly interface. These features are constantly improving, and Flash multimedia courseware making will be more loved by teachers and students.

92.6 Conclusion

In the process of producing Flash multimedia courseware, key points of multimedia courseware production are language, logicity of code and practicality. At the same time, we synthetically apply Flash, Photoshop and other software. In order to enrich the courseware content, we also apply a variety of components, script, animation and other elements. With the continuous application of multimedia courseware in teaching, the Flash-based multimedia courseware is used more widely. Because of its strong performance and compatibility, it becomes an increasingly important proportion of the teaching activities. The Flash-based multimedia courseware helps students get rid of the boring theoretical knowledge, greatly enhances students' intellectual curiosity, activates classroom atmosphere and masters the knowledge easily. With the continuous development of computer technology, Flash-based multimedia courseware is becoming increasingly popular and mature.

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Chapter 93

Sports Research and Sports Economy Based on Computer

Xing-Dong Yang

Abstract Taking advantage of computer high-tech means, we can input the parameters, which affect the sports economic activity into the computer, and change these parameters to simulate the process of the unknown economic trends. This article is about the computer applications in the research of sports competition tickets information systems and tickets sale system, which has integrated computer technology into the field of sports, increased economic efficiency, greatly accelerated the development of the sports economy, and played a very important role in promoting the development of sports.

Keywords Computer · Sports research · Sports economy

93.1 Introduction

The speed of development of the computer is very amazing, which has developed from the first generation to the fourth. The application of computer in the field of sports was from the 1960s Winter Olympics; at that time, the computer is primarily used on the statistics of sports score. Then, the application of computer has developed rapidly in the field of sports. The applications of computer have developed from the simple statistics of sports score to assist the coaches to guide training, be the “staff member” of the game, the effect of it continues to expand.

In traditional sports training, training and advising for athletes depended on the own experience of the coach. The experience of coach played a decisive role in the

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training of athletes [1]. In order to win the game, some coaches also had used the camera to record the training of athletes, and then analyzed, but quantitative analysis was very difficult. When computer technology came into competitive sports and sports training, this situation had been changed fundamentally [2].

93.2 Overview of Sports Research and the Sports Economy

93.2.1 Sports Research

Research on sports science is an important part in school sports teaching. In a narrow sense, research on sports science is the specific operating methods and skills to complete a sports research. Broadly speaking, it is the accumulated operating methods and skills, which with scientific theory as a guide, using scientific knowledge to transform sports. It is the general term of ways, means, tools, and approaches to understand and reveal the objective laws of sports development, such as for further validation and promotion of sports achievements, and the creation of new equipment, new materials, etc. [3].

There are many ways of sports research, such as the method of documentation and data, classification, induction, hypothesis, innovative principles, investigation, transplanted, control theory, etc. [4].

93.2.2 Sports Economy

Sports economy is from the point of sports revenue and is a special field of sports branch, which combines sporting events and a variety of related economic behaviors together. The economic benefits of sports include the direct economic benefits and indirect economic benefits. The direct economic benefit is the benefits from sports activities, such as stadium fees, supplies revenue for sports training, ticket sales of sports competitions and advertising revenue, and so on. Indirect economic benefits refer to the indirect benefits from sports activities, such as the income from the influence of sporting events and related tourism, etc. Which is shown in the chart below? (Fig. 93.1)

93.3 Computer Applications in the Sports Research

In the research of sports science, application of computer technology can be seen everywhere. In the following, we will mainly analyze systems of bone age information assessment and sports coaches systems.

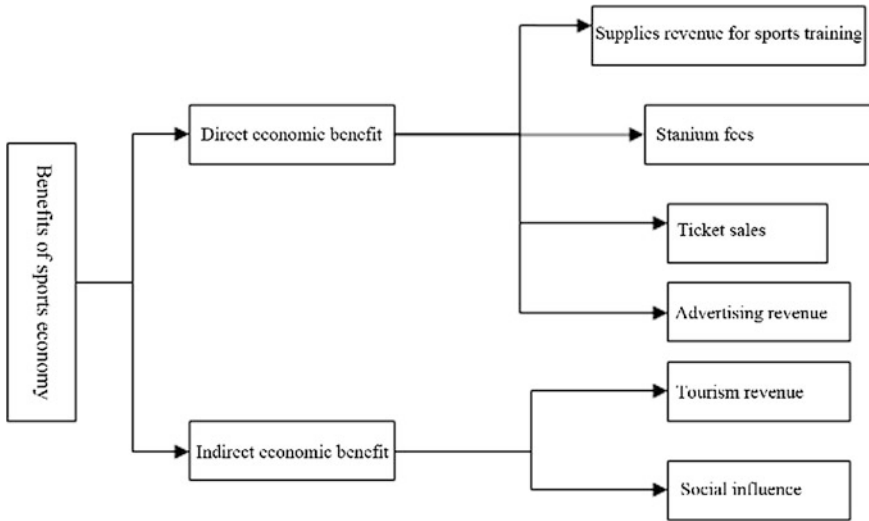


Fig. 93.1 Composition diagram of sports economy

93.3.1 Computer System of Bone Age Information Assessment

For athletes, the bone age assessment is essential for their sports career. And bone age judgment needs to depend on computer technology. Sports research experts can predict the potential of athletes and their sports career according to bone age test report, and the report also can be used as a factor in selection of quality athletes.

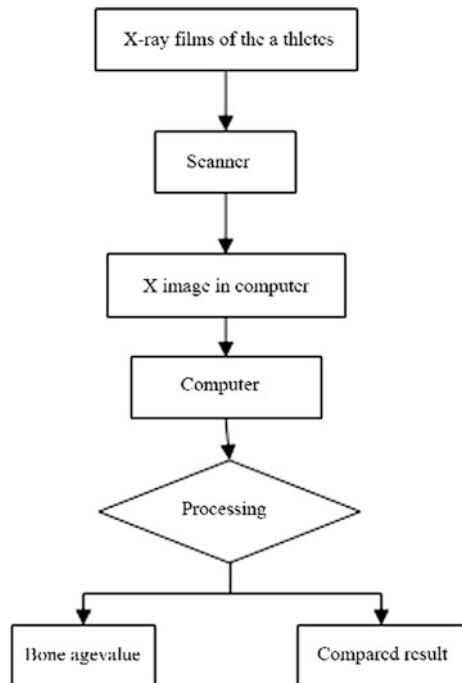
System implementation: We program the system with C programming language, and it runs in WINDOWS system. First, we need to scan X-ray films of the athletes and change it into the computer image, then store them into the computer, the computer will process the scanned X image, display it on the monitor, and calculate the registration figures of each block of bones and bone age values; printer can print out the measurement results. The chart is shown below:

Computer system of bone age information assessment start-up steps:

First, start the system, input the athlete’s age, gender, country of origin, sports, and other relevant information. Then, drive the scanner, put the X-ray film into the scanner, close the transmission adapter, and select the image acquisition from the drop-down menu. After getting the image, it is necessary to process it. Sometimes it is not obvious to distinguish the bone and the bone around, we need to use computer image processing technology to process them, such as contrast adjustment, brightness adjustment, filter technology, and highlight the bone sites needed to focus on. Secondly, assess the bone age. For every bone of the athletes scanned, the computer will assess, rate, and make the appropriate message. Finally, print the output. According to user’s requirements, print out the results or the bone X-ray film images.

Bone age measurement system has a lot of advantages, such as high precision, simple operation, easy to save, contrast predictability, and so on. The so-called high precision refers that cause of light the normal bone X-ray film will be in a low detail resolution, it is difficult to observe by the naked eyes, which will bring a certain influence on the ratings results. But after the sub-standard images processed by computer, the bones highly concerned can be highlighted and the clarity of the images will be improved, so that the accuracy of the assessment is guaranteed. The so-called simple operation refers that the bone age measurement system has friendlier user interface; the operation is relatively simple, user can use it by simple training, or even without training. Easy to save and contrast refers that bone scores of different athletes can be saved and compared, the computer can print out the contrast parameter, and the saved information will be permanently preserved for the relevant personnel to view at any time. Predictability refers that according to the characteristics of bone development, the system can forecast athletes' bone growth, recovery time, recoverability probability, and so on. It can also predict the athletes' sporting achievements according to the bone assessment scores (Fig. 93.2).

Fig. 93.2 Bone age measurement system



93.3.2 Computer System of Sports Coaching

There are many applications of sports coaching system. For example, the special test and integrated test system of basketball, by recording the basketball pitch count and time according to pitch counter and hour meter by the computer, and with the corresponding interface circuit and its sensor to design basketball scoring system, according to dribble number and shooting number within a certain period of time, analyze athletes' status of that time. By comparing and predicting the state of motion in the different periods, this will be the reference to later training and can continuously improve their basketball skills.

Another example is diagnostic system of discus. The system is developed by California research center of the United States at the very beginning. First, shoot the whole process of throwing by high-speed VCR, and real-timely testing out the trajectory of the discus, the angular velocity, acceleration, three-dimensional speed, and other exercise parameters during the movement; the computer records the situation of throwing and input it to the database each time; coaches can export an athlete's throwing results and contrast parameters at any time, analyze throwing potential and throwing defects of each player, correct the athlete's throwing posture or hand movements, and to improve throwing scores. The chart is shown below (Fig. 93.3):

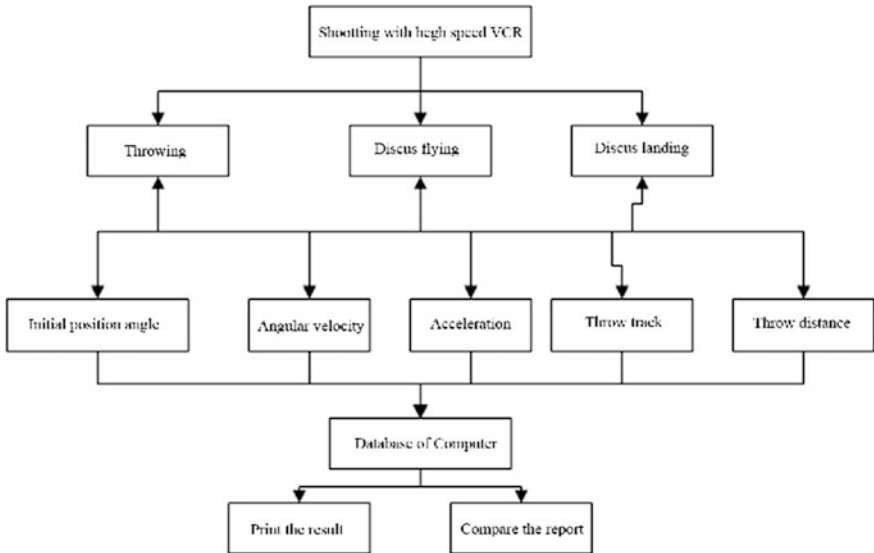


Fig. 93.3 Diagnostic system of discus

93.4 Applications of Computer in Sports Economy

The forth putting of computers for the study of sports economy has greatly accelerated the development of the sports economy. The combination of computer and sports economy is that computer establishes mathematical models to simulate sports economic activity, after inputting the parameters affect the sports economic activity into the computer, and we can change these parameters to simulate the process of the unknown economic trends. We will mainly introduce the tickets information system and ticket sales system of the sports event.

93.4.1 The Tickets Information Systems of Sporting Events

The tickets information systems of sporting events are mainly statistics of tickets sales in sports events, recording race time, events, and game players. It can also show which game is most popular, and ticket sales of different sports star. The system can appropriately increase the show times of games according to the masses' loving; if the ticket sales are not ideal, it can reduce the price to maximize the benefits of sports economy.

The tickets information systems of sporting events are divided into several main modules: athlete's information module, ticket sales module, ticket prices level module, and event-related matters modules; the chart is shown below (Fig. 93.4);

Athletes information module: It mainly record the overall strength of each team, athlete information, the role of the various players in the team, the award of sporting events, the number of fouls and punishment, etc. The system can print out the information statements for the overall competition, and also information report for an athlete.

Ticket prices level module: In this module, ticket prices level of sports competition is divided into student price, the elderly price, the military price, group price, first-class seat price, the second seat price, third-class seat price, etc.

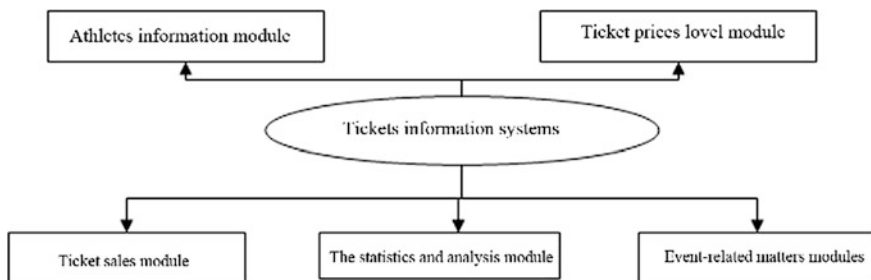


Fig. 93.4 Tickets information system modules composition

Ticket sales module: It records the situation of tickets sales and gathers the statistical information on different kinds of fares.

Events-related matters module: It records the event time, location, game parties, the main contractor units, and other related matters to the events.

The statistics and analysis module: This module is the main processing module of the system. Depending on the sport event, this module will get the information of ticket sales statistics, compare the ticket sales of various events, and automatically show which event and which team are the most popular to the masses; it is a very important reference to arrange later events and pricing the tickets.

93.4.2 Ticket Sales System of the Sports Event

Ticket sales system and tickets information systems can be combined into one system, ticket sales system is used before the start of the sporting events, and tickets information systems are used after the competitions completed. Ticket sales system records the information of tickets sales before the start of the sporting events. The system can be a real-name system for ticket sales. The main reason for real name in ticket sales is in order to reduce the unfair loss of tickets; if the tickets bought by the men who peddle tickets, they will increase the price according to their wishes, resulting in the loss of sports economic interests and cause incorrect results in comparing various statistical economic interests of the sporting events later. The real-name system can also remind and recommend the sports events and preferential policies to the members who frequently watch the game.

The function of ticket sales system is relatively simple, just selling tickets of sporting event, and recording the situation of sales. There are several key tables in database design: the user ticket table, the event information table, and remaining tickets information table.

The fields of user ticket table: the valid identification number, the name, tournament coding, age, gender, fares, ticket classes, and seat number. The user ticket data table is designed as following (Tables 93.1 and 93.2):

Table 93.1 User ticket table

Field name	Field type	Limiting conditions
Valid identification number	Number	Primary key is not NULL
Name	Text	Cannot exceed 10
Tournament coding	Number	
Age	Number	
Gender	Text	“male” or “female” can be NULL
Fare	Number	
Ticket classes	Text	
Seat number	Text	

Table 93.2 Event information table

Field name	Field type	Limiting conditions
Event coding	Number	Primary key
Game time	Data time	
Game venue	Text	
Teams participate in	Text	
Organizer	Text	
Contractor units	Text	

Table 93.3 Remaining tickets information table

Field name	Field type	Limiting conditions
Events coding	Number	Primary key
Rating of remaining tickets	Text	
Number of remaining tickets	Text	
Number of sold tickets	Text	

The fields of event information table: event coding, game time, game venue, teams participate in, the organizers, the contractor units, etc. Event information data table is designed as following:

The field of remaining tickets information table: events coding, rating of remaining tickets, number of remaining tickets, number of sold tickets, etc. The remaining tickets information data table is designed as following (Table 93.3):

93.5 Summary

Since the first microprocessor was born, the field of computer applications expands increasingly, and people pay more and more attention to it. Computer applications in the field of sports start late opposed to other industries, but its subsequent development is recognized by the insiders. The computer technology means have improved the level of sports scientific research continuously, play a very important role in office automation, scientific sports training, sports economic standardization, etc., and have broad prospects. This article just introduced a part of application of the computer systems in sports scientific research and sports economy, and there are a lot of blank is still in studying; the computer will play more and more important role in the field of sports.

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Chapter 94

Efficient Technological Talents Cultivation Scheme Based on Network English Teaching Mode

Dong Zhang, Dinghui Wang, Xiquan Ren and Yingqi Hou

Abstract In order to ameliorate the problems existed in traditional English teaching mode, enhance English teaching level, cultivate technology talents required by society, the application of network techniques in English teaching has been presented in this paper. Establishing a complete network English teaching system by using tremendous network resources and campus hardware and software network resources provides a highly efficient network teaching and information sharing platform for teacher, with the purpose of significantly improving the teaching and learning effects during English lessons.

Keywords Risk assessment and management · Fuzzy comprehensive evaluation

94.1 Introduction

This research investigated the assessment and detection methods of the risk in administrative security prevention project and tried to introduce the risk management theory into the daily management procedure of the administrative security in prison, so as to make up for the deficiencies and defects in theoretical study of prison management in China [1].

Setup the risk assessment index system of the administrative security prevention project [2].

This research took in the following indexes and formed the factor set:

1. Personal danger possibility of criminals.
2. Tendency of high-risk behavior of criminals.

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3. Comprehensive performance management of the prison administration staff.
4. Hardware conditions of the prevention in prison.

In summary, the comprehensive evaluation index system of the report on the risk of administrative security prevention can be shown in Table 94.1.

94.2 Setup the Risk Assessment Evaluation Language Set and Measurement Scale Vector of the Administrative Security Prevention Project

See Table 94.2.

94.3 Determine the Weights of the Risk Assessment Factors of the Administrative Security Prevention

The author adopted the Delphi method, give the appropriate weight to each factor according to the normalization requirement [3, 4]. The content is shown in Table 94.3.

From Table 94.3, the author learned that the weight matrix of each factor in the social inquiry reports of minors is

Weights of first grade index: $A = \{0.27, 0.26, 0.288, 0.182\}$;

Weights of the second grade indexes:

$A1 = \{0.15, 0.21, 0.22, 0.19, 0.23\}$

$A2 = \{0.21, 0.19, 0.18, 0.20, 0.22\}$

$A3 = \{0.18, 0.25, 0.29, 0.28\}$

$A4 = \{0.24, 0.26, 0.22, 0.28\}$

94.4 Experiments

Assume that the author obtained the membership of each factor in the risk assessment of administrative security prevention project by group sampling, random sampling and other investigation methods, which can be shown in Table 94.4.

1. Determine the membership matrixes of the second grade indexes.

The factor of fuzzy relation matrix $R = (r_{ij})$ = number of people investigated/the total number of people investigated.

From Table 94.4, the author saw that the membership matrixes of the second grade indexes are as follows:

Table 94.1 Comprehensive evaluation index system of the report on the risk of administrative security prevention

First grade index	Second grade index			Condition of crime causes
Danger possibility	State of crime	Natural conditions	Experience conditions	Physiological and psychological conditions
Tendency to high-risk behavior	Tendency to escape risk	Tendency to violence risk	Tendency to suicide risk	Tendency to sabotage to gang behavior
Comprehensive performance management of the prison administration staff	Law enforcement capacity	Law enforcement behavior	Security performance	Safety awareness
Hardware conditions of the prevention in prison	Detention facilities reach the standard	Maintenance of prison facilities	Sound detection technology within the prison	Reasonable detention layout of the prison

Table 94.2 Correlation tables of risk assessment grades in administrative security prevention project and the scores

Assessed grades	Percentile range	Group value
(V1) Least dangerous	90–100	95
(V2) Little dangerous	70–90	80
(V3) Dangerous	50–70	60
(V4) Very dangerous	30–50	40
(V5) Extremely dangerous	Below 30	15

Table 94.3 Weight distribution table of each risk assessment factor of the administrative security prevention project

First grade index		Second grade index	
Index entries	Weights	Index entries	Weights
Personal danger possibility of criminals	0.27	State of crime	0.15
		Natural conditions	0.21
		Experience conditions	0.22
		Physiological and psychological conditions	0.19
Tendency of high-risk behavior of criminals	0.26	Tendency to gang behavior	0.23
		Tendency to escape risk	0.21
		Tendency to violence risk	0.19
		Tendency to suicide risk	0.18
		Tendency to sabotage	0.20
Comprehensive performance management of the prison administration staff	0.288	Tendency to gang behavior	0.22
		Safety awareness	0.18
		Law enforcement behavior	0.25
		Security performance	0.29
Hardware conditions of the prevention in prison	0.182	Law enforcement capacity	0.28
		Detention facilities reach the standard	0.24
		Maintenance of prison facilities	0.26
		Sound detection technology within the prison	0.22
		Reasonable detention layout of the prison	0.28

$$R_1 = \begin{pmatrix} 0.00 & 0.00 & 0.00 & 0.39 & 0.61 \\ 0.08 & 0.13 & 0.27 & 0.17 & 0.35 \\ 0.00 & 0.01 & 0.11 & 0.30 & 0.58 \\ 0.02 & 0.26 & 0.15 & 0.30 & 0.27 \\ 0.00 & 0.00 & 0.00 & 0.28 & 0.72 \end{pmatrix}, R_2 = \begin{pmatrix} 0.04 & 0.24 & 0.12 & 0.28 & 0.32 \\ 0.06 & 0.05 & 0.23 & 0.40 & 0.26 \\ 0.01 & 0.12 & 0.13 & 0.22 & 0.52 \\ 0.03 & 0.06 & 0.21 & 0.20 & 0.50 \\ 0.00 & 0.00 & 0.00 & 0.35 & 0.65 \end{pmatrix} \tag{94.1}$$

Table 94.4 Membership of each factor in the risk assessment of administrative security prevention project in a prison

Second grade index	Number of people investigated					The proportion the people investigated accounted in the total amount of people				
	Extremely dangerous	Very dangerous	Dangerous	Little dangerous	Least dangerous	Extremely dangerous	Very dangerous	Dangerous	Little dangerous	Least dangerous
State of crime	0	0	0	39	61	0.00	0.00	0.00	0.39	0.61
Natural conditions	8	13	27	17	35	0.08	0.13	0.27	0.17	0.35
Experience conditions	0	1	11	30	58	0.00	0.01	0.11	0.30	0.58
Physiological and psychological conditions	2	26	15	30	27	0.02	0.26	0.15	0.30	0.27
Tendency to gang behavior	0	0	0	28	72	0.00	0.00	0.00	0.28	0.72
Tendency to escape risk	4	24	12	28	32	0.04	0.24	0.12	0.28	0.32
Tendency to violence risk	6	5	23	40	26	0.06	0.05	0.23	0.40	0.26
Tendency to suicide risk	1	12	13	22	52	0.01	0.12	0.13	0.22	0.52
Tendency to sabotage	3	6	21	20	50	0.03	0.06	0.21	0.20	0.50
Tendency to gang behavior	0	0	0	35	65	0.00	0.00	0.00	0.35	0.65
Safety awareness	1	5	22	23	49	0.01	0.05	0.22	0.23	0.49
Law enforcement behavior	2	11	15	20	52	0.02	0.11	0.15	0.20	0.52
Security performance	6	4	16	21	53	0.06	0.04	0.16	0.21	0.53
Law enforcement capacity	1	12	11	43	33	0.01	0.12	0.11	0.43	0.33
Detention facilities reach the standard	0	0	17	34	49	0.00	0.00	0.17	0.34	0.49
Maintenance of prison facilities	0	7	12	49	32	0.00	0.07	0.12	0.49	0.32
Sound detection technology within the prison	0	0	7	17	76	0.00	0.00	0.07	0.17	0.76
Reasonable detention layout of the prison	11	42	3	3	41	0.11	0.42	0.03	0.03	0.41

$$R_2 = \begin{pmatrix} 0.04 & 0.24 & 0.12 & 0.28 & 0.32 \\ 0.06 & 0.05 & 0.23 & 0.40 & 0.26 \\ 0.01 & 0.12 & 0.13 & 0.22 & 0.52 \\ 0.03 & 0.06 & 0.21 & 0.20 & 0.50 \\ 0.00 & 0.00 & 0.00 & 0.35 & 0.65 \end{pmatrix}, R_4 = \begin{pmatrix} 0.00 & 0.00 & 0.17 & 0.34 & 0.49 \\ 0.00 & 0.07 & 0.12 & 0.49 & 0.32 \\ 0.00 & 0.00 & 0.07 & 0.17 & 0.76 \\ 0.41 & 0.03 & 0.03 & 0.42 & 0.11 \end{pmatrix} \tag{94.2}$$

Conduct a first grade comprehensive evaluation. The author worked out that the evaluation result of “personal danger possibility of criminals” is

$$B_1 = A_1R_1 = \{0.15 \quad 0.21 \quad 0.22 \quad 0.19 \quad 0.23\} \begin{pmatrix} 0.00 & 0.00 & 0.00 & 0.39 & 0.61 \\ 0.08 & 0.13 & 0.27 & 0.17 & 0.35 \\ 0.00 & 0.01 & 0.11 & 0.30 & 0.58 \\ 0.02 & 0.26 & 0.15 & 0.30 & 0.27 \\ 0.00 & 0.00 & 0.00 & 0.28 & 0.72 \end{pmatrix} \\ = \{0.5095 \quad 0.2816 \quad 0.1094 \quad 0.0789 \quad 0.0206\}$$

Similarly, the author drew out.

The evaluation result of “tendency of high-risk behavior of criminals” is

$$R = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} b_{11} & b_{12} & \dots & b_{1m} \\ b_{21} & b_{22} & \dots & b_{2m} \\ b_{31} & b_{32} & \dots & b_{3m} \\ b_{41} & b_{42} & \dots & b_{4m} \end{pmatrix} \\ = \begin{pmatrix} 0.5095 & 0.2816 & 0.1094 & 0.0789 & 0.0206 \\ 0.4532 & 0.2914 & 0.1343 & 0.0935 & 0.0276 \\ 0.4643 & 0.2727 & 0.1543 & 0.0817 & 0.0270 \\ 0.4828 & 0.2548 & 0.0958 & 0.1358 & 0.0308 \end{pmatrix} \tag{94.3}$$

$$B_2 = A_2R_2 = \{0.4532 \quad 0.2914 \quad 0.1343 \quad 0.0935 \quad 0.0276\}$$

The evaluation result of “comprehensive performance management of the prison administration staff” is

$$B_3 = A_3R_3 = \{0.4643 \quad 0.2727 \quad 0.1543 \quad 0.0817 \quad 0.0270\}$$

The evaluation result of “hardware conditions of the prevention in prison” is

$$B_4 = A_4R_4 = \{0.4828 \quad 0.2548 \quad 0.0958 \quad 0.1358 \quad 0.0308\}$$

Conduct second grade comprehensive evaluation. Which is?

The weights of first grade indexes multiplied by the fuzzy matrix of first grade indexes make the comprehensive risk evaluation result B of the administrative security prevention project:

$$\begin{aligned}
 B = AR = \{0.27 \quad 0.26 \quad 0.288 \quad 0.182\} & \left\{ \begin{array}{ccccc} 0.5095 & 0.2816 & 0.1094 & 0.0789 & 0.0206 \\ 0.4532 & 0.2914 & 0.1343 & 0.0935 & 0.0276 \\ 0.4643 & 0.2727 & 0.1543 & 0.0817 & 0.0270 \\ 0.4828 & 0.2548 & 0.0958 & 0.1358 & 0.0308 \end{array} \right\} \\
 & = \{0.476985 \quad 0.2767072 \quad 0.12633 \quad 0.0938582 \quad 0.0261196\}
 \end{aligned}$$

2. Comprehensive evaluation of the calculated scores.

From the previous study of the second grade comprehensive evaluation, the author can draw the comprehensive risk evaluation result of the administrative security prevention project $B = \{0.476985 \quad 0.2767072 \quad 0.12633 \quad 0.0938582 \quad 0.0261196\}$; in addition, according to Table 94.2, the author learned that the grade matrix $V = \{V1, V2, V3, V4, V5\} = \{95, 80, 60, 40, 15\}$. B, the comprehensive risk evaluation result of the administrative security prevention project of a prison, multiplied by grade matrix V makes the comprehensive risk score W, of the prison’s administrative security prevention project:

$$\begin{aligned}
 W = BV^T &= \{0.476985 \quad 0.2767072 \quad 0.12633 \quad 0.0938582 \quad 0.0261196\} \{95 \quad 80 \quad 60 \quad 40 \quad 15\}^T \\
 &= 79.176073.
 \end{aligned}$$

From Table 94.2 “Correlation Table of Risk Assessment Grades in Administrative Security Prevention Project and the Scores,” the author saw that the percentile scores 95 correlates to “least dangerous,” 80 to “little dangerous,” 60 to “dangerous,” 40 to “very dangerous,” 15 to “extremely dangerous,” respectively, while the comprehensive volume of 79.176073 locates in the “little dangerous” range, which means this prison has little risk in the administrative security prevention.

The author should point out here that during the process of comprehensive evaluation, more people should be investigated. Because according to the general principles of statistics, the more people involved, the better the results can reflect the objective laws, and the more consistent the evaluation results are, the more scientific and reliable they will be.

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Chapter 95

Efficient Modern Physical Education Scheme Based on Network Application

Lin Gao

Abstract In order to meet the requirements of modern physical education, raise the level of sports teaching, by exploring the applications on the computer network in physical education teaching, this essay will analyze the defects of traditional sports teaching mode and then discuss the changes of teaching pattern after introduction of network, show its features and advantages. And also on the basis of drawing on traditional teaching mode, the article gives the specific mode of application and construction and promotes the development of physical education teaching by using the network better.

Keywords Physical education teaching · Online teaching · Application

95.1 Introduction

With wide application and development of computer technology in various industries and fields, the network has gradually become a part of modern life. In the education of modern school, physical education is an essential key link to improve the integrated physical quality of students. But in traditional teaching, the content is boring; the teaching process is complexity, etc. These are big challenges for both teaching and students. Therefore, in modern physical education, we began to look for the point of integration of computer networks and traditional physical education, and we hope to serve for sports teaching better by the rational utilization of the network [1].

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The so-called online teaching refers to the teaching mode which makes time and occasions of teaching unlimited by using the Internet as a teaching and learning transmission line. It will disseminate and explain the knowledge for students in an infinite and vast space at any time. Taking the advantages of the prolific resources, high interaction of Internet, the online teaching will create new learning environment and platform for students, and it is a new teaching mode to achieve the teaching objectives better [2].

95.2 Application Research of Computer Network of Modern Sports Education

95.2.1 Defects of the Traditional Physical Education

The traditional teaching mode of physical education is the spoon-feeding education like many other disciplines, the main means of which is a teacher teaches basics knowledge through speaking or writing on the blackboard, and also the students follow the demonstration of teacher in the operation of extracurricular sports education. The biggest flaw of this way is that the teacher's teaching is limited, so that the students can only accept the contents mentioned in the textbook passively. In such circumstances, the awareness and innovative thinking of students cannot be improved. And due to the limited teaching time, if the content taught is not so interesting, it is difficult to mobilize the enthusiasm of the students, and even the content may be boring, the ability and potential of learning independently of the students are completely unable to play [3].

95.2.2 The Teaching Mode Using Computer Network in Physical Education

Physical education teaching is different from other disciplines; it has its own particularity: the teachers not only need to explain the theoretical knowledge, but also need to show decomposed action for students as presentations. Gifted education includes athletics, ball games, gymnastics, martial arts and other subjects, some of the actions are quite complicated. It is a very difficult work for the teachers to react the actions in order to enhance students' impression and to show the actions of each project precisely and beautifully. If we can use the computer network and also the multimedia projectors, computers, video recorders and other technology integrally, make some of the complex movements in sports teaching process into animation and add narration and easy-to-understand text, so that the students can learn standard actions effectively by watching the videos over and over again. It can provide students online video resources which can be downloaded to learn the essentials of action on the campus network; they can also learn

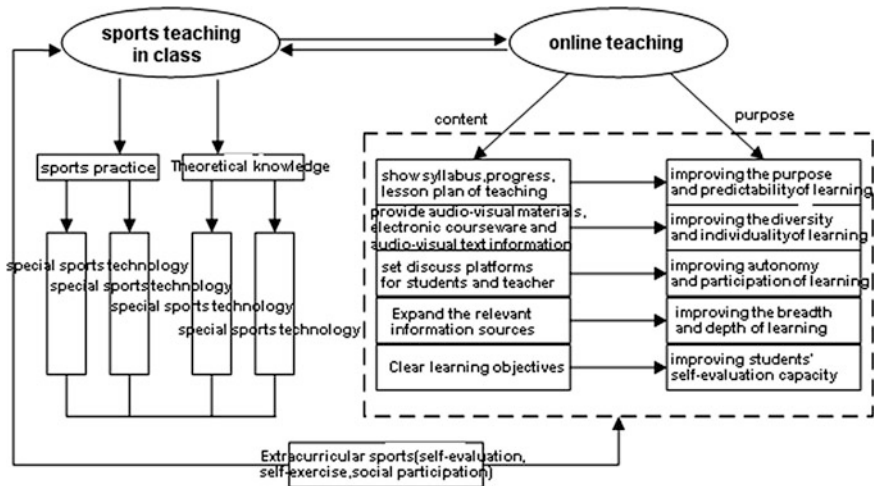


Fig. 95.1 The teaching mode using computer network in physical education

extended knowledge according to their own conditions. As shown in Fig. 95.1, by combining the computer network with the traditional teaching mode in the physical education, we can improve the purpose and predictability of learning, improve the diversity and individuality of learning, improve autonomy and participation of learning, improve the breadth and depth of learning, improve students' self-evaluation capacity in order to reach learning goals better [4].

95.2.3 The Construction of Information Environment of School Sports Network

95.2.3.1 The Structure of the Information Environment of the School Network

Improving the information environment of school education, setting school sports teaching network environment, building a new mode-based network platform for gifted education so that students can learn more and richer sports resources after class, with the network as a carrier, we can raise the sports teaching level and improve the studying effect of students [5].

95.2.3.2 Sports Department Providing Related Facilities and Equipments

The main responsibilities of the school sports department are to enhance the physical fitness of students, provide basal sports knowledge teaching. With the

purpose of serving student, in online teaching process, the sports departments need to provide the appropriate infrastructure, including physical education teaching information systems, multimedia equipments (including projectors, microphones, cameras, animation tools, etc.), education resources platform, students physical evaluation system, information exchange platform (e.g., BBS, etc.), education management system.

95.2.3.3 Design of the Multimedia Network Courseware

Gifted education teaching is different from other disciplines, the most important point is teaching technical movements after class. So in the design process of network courseware, both teaching methods design and course content design must be included, this is a higher demand for teachers. By making full use of the school network environment and multimedia devices the sports departments provided, we can design more reasonable and more interesting sports courseware, coordinating the theory teaching indoor and activity teaching outdoor better.

95.2.3.4 Creating Sports Teaching System

The Ministry of Education or government can synthesize sports teaching resources of each campus, establish a physical education web site of a certain type of school or provincial, municipal and even national and provide links of professional sports resource web site to it; all levels of the web site can share information and resource and gradually form a large national sports teaching network.

95.2.3.5 Focus on Management of the Network Curriculum and Application

The curriculum selectivity of traditional physical education is bi-directional behavior of teachers and students, if we elective online, it becomes three directional behavior of teachers, students and the network. Students have username and password to log on the online eliciting system; they can view and count the teaching situation and assessment truly and accurately. Student's eliciting standard can be accordance with the relevant network which provides help information of courses, including the name of the course, learning content, teaching arrangements, brief introduction of teachers, selected numbered.

95.2.3.6 Improving the Overall Quality of Teacher

Computer networks are the new products of a high-tech information age, only if we are familiar with computer and Internet skills, able to operate network

skillfully, we can communicate between man and machine, man and man by computer. Moreover, the information of Internet sports teaching is complex, and therefore it is a higher demand on the overall quality of teachers; first of all, they need to know network culture, and secondly, they need to screen and classify the online sports information efficiently in order to provide suitable and appropriate information resources for students. Based on this, schools or education sector can organize teachers to participate in professional training of the network information. Only if the ability of teachers improves, it is possible for them to guide students to find the most suitable network resources for their development [6].

95.2.4 Features and Advantages of Sports and Teaching Based on Network

By the explanation of the teaching process of network teaching mode in Fig. 95.2, as well as it compared with traditional physical education mode in Table 95.1, the effect of network teaching methods is more significant for students. Students have more channels and methods to obtain sports information before class, in class and after school. And their enthusiasm of independent learning increases a lot, the communication of information in the study is more often.

Summing up, the following are characteristics and advantages of online sports teaching mode:

95.2.4.1 Enhancing Self-Learning Ability of Students

The introduction of computer network technology and multimedia technology is a complete innovation to the traditional teaching mode. In this new mode of teaching, the student is the subject of teaching, they are provided a wealth of available resources, their initiative and enthusiasm of learning can be fully mobilized, and they will explore new knowledge, new areas and new skills proactively.

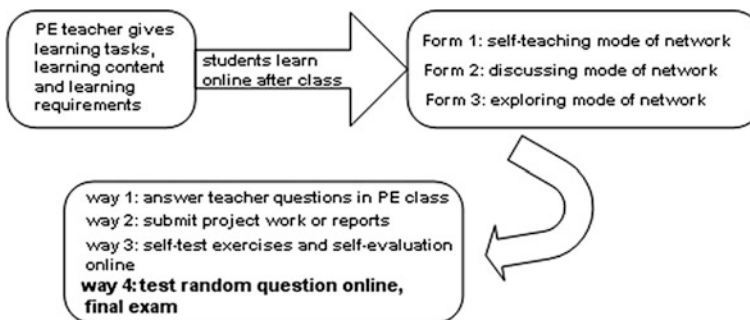


Fig. 95.2 Network teaching mode diagram

Table 95.1 Comparison of traditional sports teaching mode and network teaching mode

	Traditional physical education mode	Interactive network teaching mode
Before class	The students know nothing about the learning content; basically they do not have clear learning objectives	The students preview the teaching content online. They have clear learning objective, an intuitional and vivid impression of sports skill will be learned
In class	Teacher explained and demonstrated, students can only imitate actions and exercises synchronously, and they do not have enough time to practice effectively. It cannot meet the needs of individual development for students. It is poor for autonomy, hierarchy and direction of learning	The students can imitate the action of teachers alternatively according to the impressions they already have. They can also choose their own level to learn but not following the teachers. The effective time of practice is enough. It can meet the needs of individual development for students. It is good for autonomy, hierarchy and direction of learning
After class	Waiting for the next course	Go on communicating online, students practice by themselves according to the methods online. They can prepare for the learning content next step, communicate the learning experience with classmates and teachers, and feedback teaching advice

95.2.4.2 Provide a Personalized Learning Environment

The interactive teaching methods of network solved the problems that students received knowledge passively in the traditional mode. It enables students to acquire the latest knowledge of sports, and also to obtain the “personalized,” “professional” skills guidance by network. It is useful for the students to play their creative thinking and potential fully in order to achieve the individuation of sports learning. It provides vast amounts of information on computer networks, including animations, pictures, sound, videos and other teaching resources made by virtual reality technology and multimedia technology. These are power sources to stimulate the learning interest of students. In this learning environment, the subjective initiative of students can be fully played. And because this interest can maintain a long period, the students can discover their own strengths and weaknesses in the learning process and find a solution. This is another side of individuation.

95.2.4.3 Implementing the Interactive Learning Mode

In online sports education mode, students can interact with the teacher and classmates by modern instant messaging tools, such as BBS, QQ, MSN, e-mail, chat rooms. They can also consult the experts on the network and express their views on forum.

95.2.4.4 Sharing Network Resources and Information

The classification of sports teaching resources library is quite complex; the contents including are rich full and colorful, such as sports news, statistics information of sports teaching, sports research papers, sports questions, sports courseware, sports online examination, sports teaching institutions, sports teaching software, sports teaching picture, sports teaching animation, sports teaching video, knowledge of health, discipline lesson plans. Therefore, they can decide the way to select the information and how to use the information according to the specific circumstances of the schools, teachers and students, so the space of choice is great. And these resources libraries are the crystallization of the wisdom of schools or sports organizations, and they share the resources with users while providing resources to them.

95.2.4.5 Improving Innovation Ability of Students

After computer network is introduced to physical education teaching, the students can dispose their learning time, space and the learning process better. According to comprehensive analysis and evaluation of their own situation, they can decide the direction of learning and make learning programs, play their potential of self-learning and innovation mostly, have personalized insights in the process of learning. By querying, sorting, analyzing and summarizing the online sports information to form self-contained learning methods, it is also a reference and guide for the learning of other disciplines.

95.2.4.6 Leading the Innovation of College Physical Education

With the explosive growth of science and technology, in traditional sports teaching, the content of textbook is not only old, but also not suitable for modern teaching standards. The advanced nature and feasibility of network teaching mode have been validated for a long time, it is considered to be the only way of college physical education innovation, so the more colleges and universities use such modern teaching mode, the more quickly the comprehensive development of the entire sports teaching is driven.

95.3 Summary

Practice has proved that combining the network with traditional physical education and establishing Internet-based teaching mechanisms can enhance self-learning ability, innovation ability, personality and exploring ability of students, and simplify the difficulty of teaching. The network provides a platform for interacting and sharing resources, so the existing resources can be developed and used more efficiently, and the overall effect of physical education can be significantly improved.

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Chapter 96

Computer-Assisted Instruction Scheme of Basketball Special Course in Sport Major

Ling-feng Meng, Li-jun Kang and Qi-hua Zhang

Abstract Computer-assisted instruction (CAI) is one modern information technology of the core content and important techniques that applying in education. This article aims at basketball theory teaching and brings CAI technology into the practice courses. This is in favor of improving teaching approach and system. Moreover, it can develop students' learning initialization, intensify learning pertinence, increase teachers' teaching level, and accelerate sports knowledge upgrade.

Keywords Computer · Basketball · Computer-assisted instruction (CAI)

96.1 Introduction

Computer-assisted instruction (CAI) is loved by the majority of students for the intuition, visualization, and vivid character [1]. The boring theory courses become easy comprehend after adding CAI courseware. CAI courseware combines knowledge, various characters, vivid images, video, audio, and other different multimedia. It has the character of simple language, distinct image, abundant content, easy operation, and liable understanding as well as the deformational key point of present college theory teaching. The Chinese Ministry of Education pays much attention to the CAI courseware and places it to the key index of undergraduate course.

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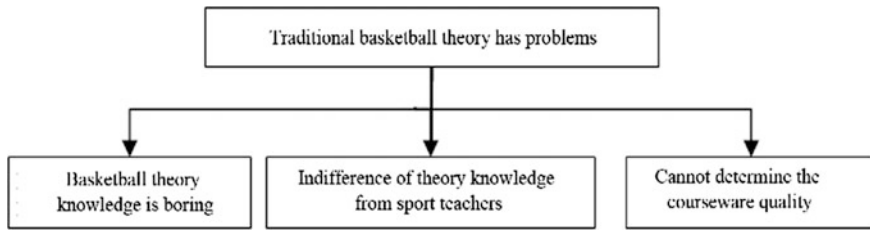


Fig. 96.1 Traditional basketball theory has problems

96.2 Problems in the Teaching of Traditional Basketball Theory

Basketball is the most common sport subject that nearly all the colleges and universities open basketball course. Basketball is the team ball game with five players in each team [2, 3]. The target is to score through shooting balls into the opposite basket and restraint the opposite side to score. The player can pass, shoot, pat, roll, or move the ball with the rule limitation [4]. Basketball game has the various forms. The most popular is three player basketball match as well as three versus three game, which devote particular care to the individual skill. At present, the highest level of basketball game is the National Basketball Association (NBA). Basketball was included in the exhibition event of the Olympic Games since 1904. In 1936, this event had been the official item of Berlin Olympic Game [5, 6]. The woman basketball had been the official event of Montreal Olympic Game until 1976.

In the traditional basketball theory course, the teacher makes manual courseware and teaches the theory knowledge. The common courseware quality depends on teachers' computer ability, serious degree, creation level, and other own factors. Moreover, people easily ignore the common basketball theory courses. Even some teachers never make courseware. They teach while learning in the outside class. This will forget much theory knowledge. Students will grasp the basketball theory unsystematically and uncomprehensively. Although some teachers make the courseware, the knowledge is boring. Teachers only read the teaching materials during the class that students cannot input their interests.

In a word, the facing problems of traditional basketball theory course are in the following (Fig. 96.1):

96.3 CAI Courseware Advantage in the Basketball Course

CAI courseware overview: CAI is the abbreviation of Computer-assisted Instruction. CAI courseware is one kind of teaching system. It has the main function of teaching. Therefore, it includes teaching content, teaching expression, teaching process, and the control of teaching target. At the same time, CAI courseware is one kind of computer software. For this reason, the CAI

Table 96.1 Comparison between traditional basketball theory teaching and CAI courseware teaching

Traditional basketball theory teaching	CAI courseware teaching
Boring knowledge	CAI courseware adds lots of video, image with vivid multimedia materials
Cannot determine the teacher made courseware	CAI courseware is manufactured by the computer specialist that can determine the quality
Indifference of basketball theory, mixed outdoor course and theory class	CAI courseware fixes theory teaching and separates outdoor course and theory class
Students cannot understand the comprehensive knowledge	CAI courseware includes the comprehensive basketball theory
Students do not like to have basketball theory class	Students expect the basketball theory class

development, application, and maintenance follow the software organization and management.

CAI courseware advantage: In the first place, bringing CAI courseware into sport course teaching is the good news to the sport teacher. Many sport teachers are not the expert in computer, and they are unfamiliar with the basketball theory courseware. The computer specialist that can determine the quality designs CAI courseware.

In the second, CAI courseware brings sport teachers’ attention about the basketball theory course. CAI courseware has various materials that can abstract the students’ attention as well as the teachers [7, 8]. Moreover, CAI courseware can comprehensively introduce and express the basketball theory and ensure students to grasp the knowledge.

In the last, CAI courseware has the special advantage. CAI courseware starts from the student mental character, age, and cognitive laws. It can fully use modern education technology, through CAI courseware, and design the situation to realize the best-optimized teaching process. The vivid courseware design can adjust class atmosphere, create learning situation, and place important function to build harmonious moral environment. In CAI courseware, we can bring the video of model illegality during the basketball games. Students can understand the illegality correctly while raising their learning interests. Students can based on the design of CAI courseware to set suspense when explaining and let students to grasp the basic basketball knowledge unconsciously. Although teachers read the CAI courseware, it will not bore when having the theory class. Traditional basketball theory teaching and CAI courseware teaching have the following comparison (Table 96.1).

96.4 CAI Courseware Manufacture of Basketball Class

In the general, CAI courseware manufacture has the following steps: preparing materials, processing materials, designing courseware, scoring courseware, and perfecting courseware. During the process, we need to have clear thinking and design around the teaching target. The details are in the following (Fig. 96.2):

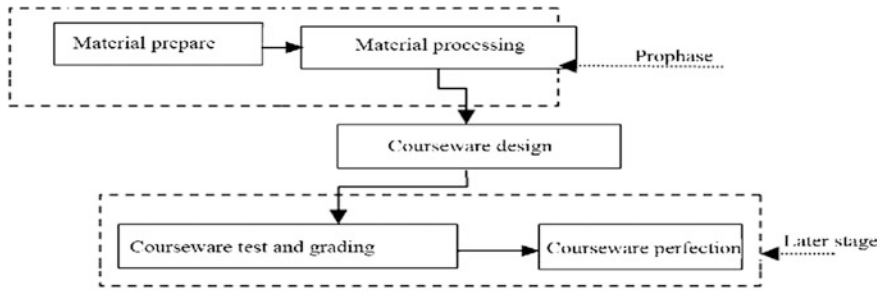


Fig. 96.2 CAI courseware manufacture process

96.4.1 Preparing Materials

Preparing materials for basketball theory course is the important step to realize the CAI courseware as well as the first step that places important position during the CAI courseware manufacture. Computer specialists have knowledge limitation about basketball, and they need to communicate with sport teachers at this circle.

The course materials of basketball theory include textbook, teaching program, and various CAI manufacture materials. In the first, selecting materials need to follow the teaching program and expand the basic knowledge points. Based on these knowledge points, we can find the relative materials. At the same time, we can reference from other books about basketball to take example through the useful information. CAI courseware selects the materials of image, video, audio, and other media materials.

Sport teachers and sport professional can provide some competition videos of some knowledge points or some introductions that courseware manufacturer can research. For example, the illegality theory knowledge, teachers can provide the illegality video of one special player and the presentation or evaluation of a basketball game by the famous person. These can assist students to raise the learning interests and grasp the theory knowledge. Students can understand the knowledge points during the relaxed process. If there are no correct image or video and audio materials, computer professional can manufacture the imitated FLASH by software.

96.4.2 Materials Process

After collecting materials, we need to process these materials. For example, we need to fix the image size, color, cut out video or audio, and split the fragments. The main software has Photoshop, Flash design software, Adobe Premiere, and other software to cut out or process. It is mainly included text formatting process, image material processing, voice material processing, and video material processing.

96.4.3 Courseware Design

Courseware structure design means the courseware content layers and structure arrangement. This is similar to the book directory structure. We need to select the courseware structure and operation process before design it. The CAI courseware operation has autoplay and manual control. The ordinary teaching we can use manual control. Manual control means the operator can interactively select the play item. Autoplay means the computer plays CAI courseware automatically that does not control by the outside user.

After designing the structure, we need to design the screen of CAI courseware. This is relative to the teaching content reasonability, students’ acceptance, and the teaching effect. Therefore, screen design is the important step. Screen design needs to follow three principles: color collocation reasonable, emphasis extruded, and use the image and audio materials as far as possible.

Color collocation reasonable: The reasonable color collocation can make people feel comfortable and abstract their attention through color matching and shading variation.

Extrude the emphasis can make students understand the main content and minor content. We can use flash, underline, character size to process the main content and minor content that students can remember more easily.

Apply image and audio as far as possible: Basketball theory is abstracted that hard to understand and express. We use image, sound, and video to present the abstracted knowledge will vivid the boring content and abstract students’ attention.

96.4.4 Courseware Test Score

After manufacturing the courseware, we need to score them. The score team is combined with sport teacher, manager, and some students. We can apply trial teaching is the section ages. Score rules have various bases. We will introduce some important rules in the following (Table 96.2).

Table 96.2 Mark sheet of courseware test

Judging criteria	Marking criterion	Score	Remark
Courseware content (60’)	Topic prominence, closely to the core (30’) Properly content, level clear (20’) Innovation, unique view (10’)		
Courseware form (20’)	Correspond with the given subject (10’) Courseware technical content (10’)		
Effect scores (20’)			

96.4.5 Courseware Perfection

Based on the score condition in 96.4.4, we need to modify the imperfection. This step includes some reworks. We might need to redo the knowledge design. Perfecting the courseware not only modifies the insufficient, but also maintains the courseware. If the teaching program is modified a little, also the courseware content needs to be modified, just like the basketball rules or score rules variation.

96.5 Advice of CAI Courseware Manufacture

CAI courseware manufacture is the complicated process. It needs grasping sports subject and lots of computer software. The manufacturer needs high logic ability, clear orderliness, innovation, and some art skill. During the CAI courseware manufacturing, we have to pay attention to material selection. Moreover, we need to attach importance to the completeness, indication, and conciseness. A good job of the design instead of exaggerating the manufacture method or software platform is needed.

96.6 Summary

The CAI courseware of basketball special needs support from not only the leader of colleges and universities, it also needs the sanction of Ministry of Education. Moreover, the CAI courseware needs more time and human power to develop. However, it can apply to many colleges after the successful manufacture. The courseware needs the unified perfection with the leaders' support that can determine the development and accomplishment of CAI courseware manufacture. The CAI courseware application makes the sport special education step the innovation. It can satisfy the college training of colleges and universities as well as the urgent requirement for the reformation of sport special course.

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Chapter 97

Sport Theory Exam Scheme Based on Computer Questions Database

Yi Bie

Abstract In recent years, computer technology obtains widely application in colleges and universities. Most computer management software determine computer firewall, and local are network of colleges and universities. For the college education, the computer technology greatly improves the multimedia courseware design, school educational administration, and teaching website during the daily life. It can promote teaching efficiency, learning initiative and express the learning interest of students. Computer intervention brings college management into modernization. It can develop working efficiency and reduce the teacher and student work amount. The general test of sport education, teachers need to make out the test paper, inspect the papers with lots of work.

Keywords Sport theory · Computer questions

97.1 Introduction

In recent years, computer technology obtains widely application in colleges and universities. Most computer management software determine computer firewall, and local are network of colleges and universities [1, 2]. For the college education, the computer technology greatly improves the multimedia courseware design, school educational administration, and teaching website during the daily life. It can promote teaching efficiency, learning initiative and express the learning interest of students [3]. Computer intervention brings college management into

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modernization. It can develop working efficiency and reduce the teacher and student work amount. The general test of sport education, teachers need to make out the test paper, inspect the papers with lots of work. In order to reduce the workload, we design the computer question bank to make the test management more modernization [4, 5]. This can help teachers save more time to research in education, scientific research and reduce the workload.

97.2 Question Character of Sport Theory

The test question of sport theory is different from the other subjects. Its content divides into basic theory and various classes' theories. The basic sport theory is the relative basic knowledge. Various classes' theories mean the knowledge and necessary ability theory that under different sport subjects. The general college sport subjects include basketball, soccer, tennis, aerobic dancing, taekwondo, track and field, dancing, shot, long jump, and other subjects. Each subject has different basic knowledge [6]. For example, basketball has basic knowledge, rules, and test. However, aiming at the different subjects, the sport theory test is steadily in each year. The sport theory questions have the characteristic of unique answer, few open questions, and fixed type. These characters provide important condition for the question bank of sport theory test. We have the necessary to build the perfect computer question bank that can include multiple subject test questions. Every theory test in each year, the teacher can abstract questions. Computer makes the test paper automatically, inspects papers automatically, and grades automatically. The series automatic test management system will replace the traditional method.

97.3 Research Step of Sport Theory Question

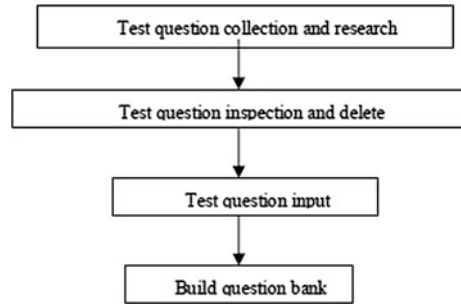
The question bank establishment of sport theory test is the once work for all. We can use it one after year. The operation is easy. Computers can finish the work of making out test paper, inspecting paper, and grading automatically. This can greatly reduce human power and avoid the un-fairness and human error. The system can grade students' test questions with fairness.

The establishment process is in the following (Fig. 97.1).

97.3.1 Test Question Collection and Research

The first and the most important step of establishing the question bank is to collect and research test questions. The test paper collection has two directions. One is the suitable questions in the books that include completion, choice test, and judgment

Fig. 97.1 Establishment process of sport test question bank



test. The other is all the paper questions that have tested in the past years. This includes questions in different departments or tests of other academies. Moreover, we can use the test questions of national grade. It is better to combine with the detailed condition with difficulty and course plan.

97.3.2 Question Inspection and Selection

There need to inspect and select all the collected questions. In order to build the question bank, we can select practiced sport teachers that responsible for the test selection and inspection from the beginning. Otherwise, we can make unite selection with other academies. This can improve the work efficiency and develop the test question reliability. Moreover, we can share and apply the test questions with each academy. We need to consider about the difficulty, quality, and tricky question. We realize the standardization with topic, difficulty, correctness, pattern, and number.

97.3.3 Test Question Input and Build the Question Bank

After selecting the test questions, we need to input them. Input work is the great workload. However, we only need special input workers to finish it. Put these questions into the database, and then, we can start the efficiency management.

97.4 Question Bank Design

The question bank of sport theory test divides into the three parts: test propbank, answer database, and test programming database. Figure 97.2 shows details.

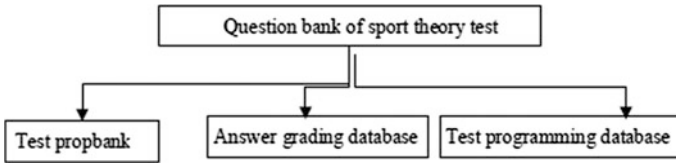


Fig. 97.2 Question bank combination of sport theory test

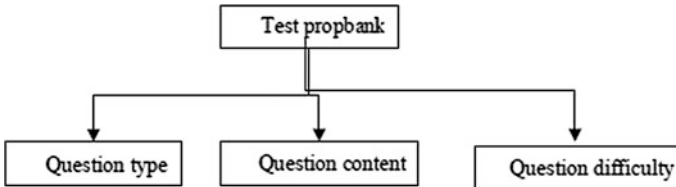


Fig. 97.3 Test propbank structure

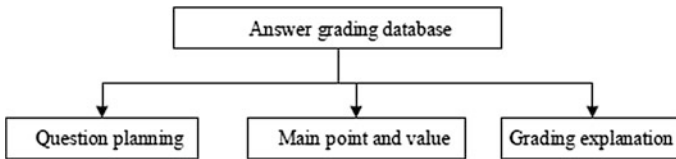


Fig. 97.4 Combination of answer grading database

The test propbank includes question type, question content, and question difficulty. Question type divides into choice question, judgment tests, noun explanation, and question-and-answer drills. The question content divides into sport knowledge, theory of track and field, balls, dancing theory, and kongfu theory. The question level divides into *A*, *B*, *C*, *D*. *A* is the most difficult, and *D* is the lowest grade. The following is the structure (Fig. 97.3).

Answer grading database divides into question planning, main point, value, and inspection explanation. Question planning explains question type proportion, difficulty proportion, and value proportion. After establishing the question bank, there will automatically form the relative answer bank, and each type has the uniform value description. Answer and grading has the uniform requirement and form. The following figure is the main combination of answer database (Fig. 97.4).

Question planning database divides into statistical data, difficulty index, and validity index. We can base on the selected test to calculate statistic data, difficulty index, and validity index. Based on these values under the question difficulty, evaluate student performance, teach correctness, improve education pertinence, and promote teaching efficiency. The combination structure is Fig. 97.5.

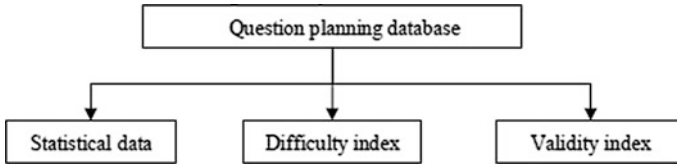


Fig. 97.5 Combination structure of question planning

Table 97.1 User entry table

Filed name	Data type	Length
ID	Auto number	–
User name	Text type	10
Password	Password type	20

97.5 Database Design

97.5.1 Login Restriction

First, the question selection needs to be sport teachers or higher-level leaders. Students do not have the restriction. Therefore, we need to design the login restriction from the beginning. Different login people have the different operate restriction. Database has a user login table (Table 97.1).

97.5.2 Other Table Design

Database has many tables. Based on the different question types, there has judgment test, completion test, and question-and-answer drills. Each table has the different design filed. The limited text content leads us to evaluate the design of judgment test. Based on the ordinary test, the filed has question ID, question content, answer, and difficulty index and knowledge point. We can add the required filed. The table design is in the following (Table 97.2).

Table 97.2 Structure of judgment test table

Filed name	Data type	Length
Question ID	Auto number	–
Question content	Text	255
Answer	Bool	1
Difficulty index	Enumeration	4
Knowledge point	Text	100

97.5.3 Key Code of Database Operation

We can select the common database such as Microsoft visual basic, Microsoft SQL server, oracle, and MySQL of Open Source. We select the suitable database under the detailed condition. This article uses MySQL of Open Source. It can save the cost. Moreover, the database is small and exquisite that can satisfy the requirement of sport theory test.

1. The key code that java connect with MySQL database

```
String url = "jdbc:mysql://localhost:3306/web";
String username = "teacher1";
String password = "123456";
//Upload drive to connect database
Class.forName("org.gjt.mm.mysql.Driver");
connection = DriverManager.getConnection(url, username, password);
//If successful connect with database, build GUI
//SQL Sentence
String test="SELECT * FROM data";
inputQuery = new JTextArea(test, 4, 30);
submitQuery = new JButton("Inquire");
```

2. Random value production

Based on the question difficulty index, question type will randomly select one set of examining paper. Therefore, the random value is the important part. Java.util. Random provides various random values. It can produce int, long, float, double, and Gaussian random value. This is the biggest difference that compares with the Random () method from java.lang.Math. Math only produces double random number. The java random number must be different, and the key code is in the following.

```
//include the required class
import java.util.Set;
import java.util.TreeSet;
//produce the different random number
int numberCount = 10;
Set set = new TreeSet();
while (set.size() < numberCount) {
int number = (int) (Math.random() * 10);
if (!set.contains(number)) {
set.add(number);}}
```

TreeSet is one kind of data structure from java. It has not repeat data and has high efficiency to produce different random number.

97.6 Summary

After the long-term hard work, the computer question bank of sport theory test can apply into the subject test in each university. This can replace the traditional brainwork to make out test paper and the sport labor to inspect the papers. The traditional method needs teachers under the teaching experience and outlines requirement to organize the test paper, deliberates time after time. Then, the test paper can be made out. Build the question bank, each test will randomly form the test paper that can fully mobilize the teaching enthusiasm. Moreover, it can release teachers from the huge workload at the end of semester. The computer can automatically form the test paper and gradually build the effective question bank. The management of question and test papers will become high efficiency and convenient. The test paper management places important function to improve the working efficiency. Make out the examine paper become vivacity that reduces traditional work and saves more time for the teachers to research teaching methods.

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Chapter 98

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Fengan Wen

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