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Preface

The present book includes extended and revised versions of a set of selected papers from the 2011 International Conference on Computing, Information and Control (ICCIC 2011) held in Wuhan, China, September 17–18, 2011.

The ICCIC is the most comprehensive conference focused on the various aspects of advances in computing, information and control providing a chance for academic and industry professionals to discuss recent progress in the area. The goal of this conference is to bring together researchers from academia and industry as well as practitioners to share ideas, problems and solutions relating to the multifaceted aspects of computing, information and control.

Being crucial for the development of this subject area, the conference encompasses a large number of related research topics and applications. In order to ensure a high-quality international conference, the reviewing course is carried out by experts from home and abroad with all low-quality papers being rejected. All accepted papers are included in the Springer LNCS CCIS proceedings.

Wuhan, the capital of the Hubei province, is a modern metropolis with unlimited possibilities, situated in the heart of China. Wuhan is an energetic city, a commercial center of finance, industry, trade and science, with many international companies located here. Having scientific, technological and educational institutions such as Laser City and the Wuhan University, the city is also an intellectual center.

Nothing would have been achieved without the help of the Program Chairs, organization staff, and the members of the Program Committees. Thank you.

We are confident that the proceedings provide detailed insight into the new trends in this area.

August 2011 Yanwen Wu

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The Research on Grid Capacity Test Based on Load*

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Abstract. To test the grid performance, determine the grid capacity, and factors such as management node, support node and link bandwidth are also taken into consideration, a model of grid capacity test based on load is proposed. The Client\Server model is adopted, the different test suites is developed. By changing load of grid,the grid performance is tested, bottleneck is found out, optimal load and maximum load are determined and reference is provided for grid optimization. An application case of storage grid simulation system tested performance of support node and management node, validated the effectiveness of detemining grid capacity and grid optimization.

Keywords: Grid, performance, capacity, grid optimization load.

1 Introduction

There are more and more resources on the Internet with the spread of the network and development of computer technology in 1990's. These resources are located in different geographical location, tend to have different management mechanisms and functions. People are trying to achieve a comprehensive connectivity of all resources on the Internet [1], which prompted the birth and development of grid technology. The current grid system can be divided into computation grid and data grid.Computation grid achieves computing resources sharing, it provides users with a good interface to shared resources, Data grid achieves data sharing, mainly to solve the storage and sharing of data [2].

Grid performance is an important factor to take into account for the designer in the process of forming grid system. When a grid system is complete, it must take effective measures to analyse performance of the grid through a series of tests. Performance testes includes capacity test, function test, security test, robustness test, etc [3].

The main function of capacity test is to test the system performance under different load conditions for discovering design errors or verifying system load capacity. It can be used to predict the system behavior, to determine performance, expansibility and

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reliability and to find out bottlenecks before real deployment of the system. In this test, it will test the performance and the ability to continue normal operation in different conditions [4]. Capacity test is to determine the limits of the grid load or load range. Test indicators often involve response time, bandwidth, throughput, etc.

2 Capacity Test Basic Mechanism

2.1 Basic Indicators

Capacity test is mainly to test effects on the system performance under different load. These effects are reflected by means of some indicators. Commonly used indicators are: throughput, delay, response time, etc [5].

2.2 Test Process

1. Determining the load
Different systems are corresponding to different loads, thus confirming the load is the first step for the capacity test. For a general e-commerce site, which provides business information to users to browse, so the user is the load. For the computational grid, the work handed by grid is the load.

2. Determining the maximum load expected
The maximum load the system can bear is the maximum load of system under the conditions of ensuring the system performance. When load is more than the maximum load , the network performance dropes significantly. A typical case is a hacker attack, hackers use hardware or software method to send large amounts of data stream to an established site, resulting in performance degradation of site, and the site response is very slow so that other users can not normally access the site[6].

3 Analyzing the test results
Collecting ,collating and analyzing a variety of data that includes response time, data transfer rates is to find out bottlenecks. For example, when the load is at a normal level, the system response time is great, then the network bandwidth shall be bottleneck. Therefore, the analysis of test results can determine the network bottlenecks, optimize network design, improve the network performance.

3 Storage Grid Load Test Research

Grid system can be mathematically abstracted as a chart, formed by the nodes and links. Nodes can be divided into management nodes and support nodes. Management node is responsible for adding,deleting nodes, receives the initial request from the grid client, ensures the security and authentication and distributes tasks. Support Node takes different roles based on the type of network. For the computational grid, the support node is the computing node, mainly considering CPU processing power. For the storage grid, support node is storage node, mainly storing and retrieving information.

3.1 Test Content

Network performance is mainly determined by the performance of the nodes and links. Therefore, the main contents of the test includes following aspects:

1. Management node test: the main task of management node is responsible for distributing jobs to each grid node according to node availability and load balance, management node is the core component of the grid [7]. As the user's jobs must be distributed out from the management node, so the speed of the task distribution has a strong impact on the throughput of the entire grid. If the management node can not quickly distributed jobs to other storage nodes, even if the link bandwidth is large, storage nodes is powerful,it will cause the entire grid performance dropped significantly. Therefore, it is necessary to test the distribution speed of the management node.

2. Storage node test: in order to avoid overloading of the management node, the current storage grid system commonly used direct access method that client obtains the storage node location information from the management node,then carries out exchange of information directly with the storage node. Storage nodes's storing, retrieving information will directly affect the response time of client. Therefore, it is necessary to test the Throughput of the storage node.

3. Link detection: since grid is a distributed system, resources are often distributed in different geographic locations, so, the actual physical link between these resources is very important for grid performance. Wired links (fiber, coaxial cable, twisted pair, etc.) and wireless links are commonly used. The grid designer should make network bandwidth and processing power of management nodes and storage nodes match. Too much bandwidth can make a waste of resources, too low can lead to grid performance degradation and even paralysis.

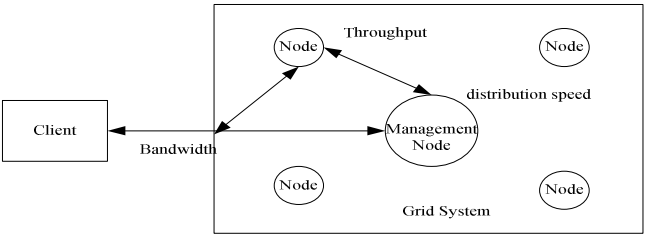

Fig. 1. Test data flow

3.2 Test Model Design

1. Determining the load

Storage grid is to store and retrieve information and its core is the exchange of information between system components. The user's storage and retrieval requirements can be think as job, and thus the job can be used as the load. The storage grid is different from computational grid ,its jobs involves a lot of information exchange without complex logic computing requirements .So test content includes speed of distribution, node throughput and link bandwidth.

2. Test software design

There are some basic indicators (such as throughput, response time)for grid design and these indicators are basis for test software design. The central idea of software design is to design the smallest load test case, the average load test case and the maximum load test case separately, then obtain data under different test cases, and determine the existence of the bottleneck.

The test is carried out in the video store grid. The system has two functions: one is to store video files and the other is to retrieve video files. Test software structure is divided into client and server side. Client soft is composed of GridClient, GridRequest and Instruction;Server soft is composed of GridServer and GridProcess.Soft functions are introduced briefly as follows:

Instruction: it defines the main contents of job such as storage of a video file, or a video file retrieval. It record the time required to complete the job. Since the content of Instruction can be different, so the ID of each instruction also is defined..

GridRequest: it is a class came with grid, mainly used to submit a request to the grid. The specific content of the request in the Instruction are defined and GridRequest can encapsulate multiple Instructions.

GridClient: it is a Java RMI client, the main function is to find, connect to the GridServer and send the request to the GridServer.

GridServer: it is a Java RMI server, the main function is to select the appropriate resources and distribute job based on the needs of users .It creates a new GridProcess to deal with one or more of GridRequest.

GridProcess: the concrete realization of job is done by GridProcess.

Test software can be divided into many functional roles.The grid system designed in this paper is based on laboratory conditions ,the link bandwidth can meet the requirements, so there are two roles: one is to test the distribution speed of the management node, the other is to test processing speed of storage node. Of course, these two function roles can also be placed in a software, but it should be recorded separately in different stages of processing of data (time, throughput). Load testing process is as follows:

1. Construction of the load: a single load is to store a video file.The size of a load to store the same video file is 20MB, and each load defines the file name and author information, is completed by the class Instruction.

2. Job submission: To determine the capacity of the grid, each job is composed of multiple loads. Iterative and parallel methods can be used by the class GridRequest, the code is as follows:

```
GridRequest request = new GridRequest();
    for(int m=0;m<100; m ++)
       {
          for(int n=0;i<100;i++)
             {
Instruction instruction = new IterationInstruction(filename,filesize,);
request.addInstruction(instruction);
             }
          GridClient client = new GridClient();
GridResponse response = client.testGrid(request);
}
```

Code shows the 100 iterations is done for each test program, each iteration simultaneously does 100 jobs.

3. Connecting Grid Manager: it is completed by the class GridClient, using Java RMI mechanism.

```
String url = "//" + hostname+ "/GridServer";
IGrid grid = (IGrid) Naming.lookup(url);
```

4. Distributing jobs: it is done by class GridServer. the main function of GridServer is to select the appropriate resources based on the needs of users, and distribute jobs to the resource. Because the state of the storage node changes frequently in grid, so storage space and load balance are consided by the grid manager [8]. Speed of the distributing job is decided by the grid manager performance ,it is the main content of test. GridServer records the time to receive job submission and distribute job to the storage node. The code is as follows:

```
……
GridResponse response = new GridResponse();
StartTime = System.currentTimeMillis();
response.setTime(StartTime);
distribution (GridRequest request);
StopTime = System.currentTimeMillis();
response.setTime(StopTime－StartTime);
return response;
```

5. Implementing jobs: it is done by class GridProcess and the efficiency of execution is decided by the storage node performance. GridProcess returns result to GridClien. The main content is measurement of storage node throughput.

The system throughput and response time are very important for the client. Response time is decided by the distributing speed of the management node, the storage node throughput and link bandwidth. The pseudo-code is as follows:

```
startTime = getTime()
  for (int i = 0; i < loadnumber; i++);
       runTest;
endTime = getTime();
time = endTime-startTime:
throughput = total bytes of data/time:
```

3.3 Analysis of Test Results

1. System throughput

Data processing capacity of the system is examined .The test uses iteration and concurrent method. Each iteration includes 10 concurrent loads and each load is about 20M video files. The number of iteration can be different .Table 1 shows the number of iterations is 10,100,1000 respectively and the corresponding total load is 2G, 20G, 200 G. Test results are as follows:

Table 1. System throughput

Average throughput (Kb/s)	Load (GB)	Test 1 (Kb/s)	Test 2 (Kb/s)	Test3 (Kb/s)
840	2	860	820	840
423	20	460	400	410
45	200	43	48	44

From Table 1 it shows that the system throughput drops with increase in load. In addition the distribution speed of grid manager and storage node capacity are test at the same time, it is a basis for future optimization of the grid.

2. Determining system capacity

After Storage grid completed,it must carryout capacity test that determines the optimal load and maximum load before the actual application of grid. To test the overall capacity of the grid, the grid designer must define the base such as 400 Kb / s for the throughput (according to the link bandwidth, the grid manager performance , storage node performance and the number of nodes), In a given load, if the throughput is greater than 400 Kb / s, it thinks that the grid is working correctly. If the throughput is less than 400 Kb / s, the load is too large.

From Table 1 it shows that the system throughput begins to decrease with increase in the load, When the load is in a certain range, the throughput keeps a little change. When the load increases to certain value, the throughput decreases quickly . Continue to increase in the load, the system is on the verge of collapse. Therefore, it can determine the optimal and maximum load according to change of throughput based on the load ,as shown in Figure 2:

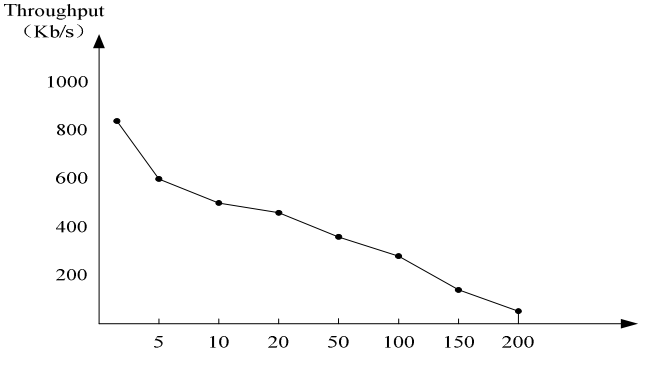

Fig. 2. Capacity testing

Figure 2 shows that the throughput keeps a little change, and is larger than the base when the load is in the range of 15 to 25GB. So 20GB is the optimal load .When the load exceeds 50GB, the throughput is less than the base, 50GB is maximum load.

3. Grid Performance Optimization

After the completion of the grid system, the corresponding optimal load and maximum load have been identified. With the development of economy and popularity of networking, the number of users access to the system is gradually increasing, the load of system is more heavy and often exceeding the maximum load, it results in a significant drop in grid performance. To meet the growing demand, there are two methods :one is to develope a new grid system, but it is too expensive, and can not fully use of the original resource. The other is to optimize the grid, it modifies the original design for improving the maximum load to meet demand growth, this method is relatively low cost and easy to implement.

The system throughput depends on the distribution speed of grid nodes, the storage node capacity and link bandwidth. The prerequisite to grid optimization is to determine the key factor leading to decline in throughput with increase in the load. The testing process is as follows:

（1）Increasing load. Load from 20GB to 200GB, the system throughput is less than 50 Kb /s when the load is in the range of 20 to 200GB,

（2）Testing the distribution speed of management nodes.

（3）Testing the throughput of the storage node.

（4）Analysing the data and finding out the key factory leading to decline in throughput

The test results are as follows:

Table 2. The distribution speed of management nodes

Average distributionrate	Load(GB)	Test 1	Test 2	Test3
46	20	48	44	46
44	200	44	46	42

Table 3. The throughput of the storage nodes

Average throughput (Kb/s)	Load (GB)	Test 1 (Kb/s)	Test 2 (Kb/s)	Test3 (Kb/s)
549	20	560	540	546
70	200	66	80	70

Analysis of data shows that the distribution speed of management nodes drops from 46 operations per second to 44 operations per second when the load increases from the 20GB to 200GB,and it has a little change. But the throughput of the storage nodes drops from the 549 Kb / s down to 70 Kb / s. From this, the storage node's processing capacity is a key factor leading to decline in performance Therefore, there are two methods for the optimization: the first is to improve the storage node's processing capacity, for example, using high-performance computers; the second is to increase the number of storage nodes, reduce the load on a single node.

4 Concluding Remark

The capacity test based on the load is essential for formation of a grid, it can determine the optimal load and maximum load according to changes in performance caused by the load, and also to determine system performance bottlenecks by increasing the load. This approach is conducive to optimizing grid.

Testing mechanism described in this paper is based on storage grid that usuall is small-scale. It test data throughput, distribution speed of node and storage capacity of node. In the actual grid system,the capacity testing mechanism described in this article is still applicable, only need to consider many factors such as link bandwidth, heterogeneous resources, and different geographical distributions.

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SQUID-Based Internal Defect Detection of Three-Dimensional Braided Composite Material

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Abstract. The main advantages of three-dimensional braided composite material are its better impact toughness and fatigue resistance. It is used in key components of China's first lunar probe satellite "Chang'e-1", and the testing for it is in secret stage in the foreign. Therefore, the research of testing method is specially significant. The main research contents included the state of internal fiber distribution, fiber breakage, material crack, internal bubble size and location, etc. Research topic provides a theoretical basis for the impact of the different inherent defects to the magnetic field of SQUID, and a test method of inherent defects for SQUID-based three-dimensional braided composite materials. The results show that the larger defects are, the stronger the magnetic signal SQUID detected in this region is, namely eddy current in this location is changed significantly. In general, for the deep defects, the lower excitation frequency should be used, while for surface defects the high excitation frequencies should be used.

Keywords: Three-dimensional Braided Composite Material, SQUID, Internal Defect, Frequency Characteristics.

1 Introduction

Three-dimensional braided composite material is a new type of material in recent years [1], which is a new type of composite material enhanced by the three-dimensional braided preform, which is a product of the combination of three-dimensional weaving technology and modern composite material technology. It has a large difference from the traditional composite material, first, the three-dimensional braided composites is characterized by a prominent increase of the mechanical properties along the thickness direction. Second, different from the traditional laminated composites, three-dimensional braided composite materials is a space interlocking mesh structure consisted of multiway yarn, essentially to overcome the stratification and has better impact toughness and fatigue resistance. Third, the three-dimensional braided composite materials can directly shape the structure of many complex shapes, especially in combination with RTM technology, making its potential advantages to reduce manufacturing cost. The experts of Chinese Society for Multiple Materials pointed out that the composite material technology has emerged as one of the three key technologies of the large aircraft [2].

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It's also been used in key components of China's first lunar probe satellite "Chang'e-1" [3], marking the three-dimensional braided composite materials in China's aerospace industry to the application stage.

The internal defect detection application for three-dimensional braided composite materials has become an important research topic. Currently, three-dimensional braided composite test has not a separate test standards, using the same test technology as other materials, such as ultrasonic testing, acoustic emission detection, eddy current testing technology, X-ray detection and v-ray detection technology, and microwave detection technology [4]. These means can initial describe the internal features of three-dimensional braided composite material only by the second development. As the three-dimensional braided composite material is mainly used in aerospace and military, the test for it in the foreign is in secret stage [5], so the research of advanced internal defect detection methods for three-dimensional braided composite material has high practical value, providing quality assurance for three-dimensional braided composite material applications in China's aerospace and aviation.

SQUID (Superconductivity Quantum Interference Device) is a highly sensitive magnetic detection device, is a flux-voltage conversion device based on macroscopic quantum mechanical effects with high sensitivity, is by far the most sensitive weak magnetic field detection devices in the magnetic sensors family [6].

2 Developing Situation

Due to restrictions on importing SQUID device by western countries and SQUID instrumentation used for the aerospace, military field is prohibited materials, the relevant departments of China carried out the in-depth research and application development for SQUID with the support of National 863 Program and National Natural Science Research Fund, the current level of technology has among the world leaders [7].

A decade ago, there are reports about SQUID NDT used on inner non-magnetic conductor plate in the international, while in China this work is empty [8]. In the field of composite materials, Hatta used SQUID technology to detect 2 layer laminated composite material in 2005 [9]; In 2003, the SQUID signal features of the multi-layered composite materials in the loading states have been studied by Carr [10]; At present, there is successful detection technology using SQUID on the internal defects detection for 70cm depth laminated composite abroad [11], but SQUID detection technique for three-dimensional braided composites is not reported.

3 SQUID Measurement System of Three-Dimensional Braided Composite Workpieces

The NDT system consists of SQUID and its electronics systems, mobile scanning and data acquisition systems, incentives and phase-locked detection system etc., as shown in Fig. 1. Mobile system is a scanning platform driven by two stepper motors that enables X and Y direction scanning and be made of non-magnetic materials. Data acquisition system includes 16-bit A/D converter card and data acquisition and processing software written in the LabView environment. In scanning process, the

capture card puts the output voltage of SQUID to A/D conversion and rushes to the computer, the computer records the voltage value of each point and the location coordinates which each value corresponds to, and then real-time displayed on the screen. Data acquisition and processing software includes the basic functions of controlling the direction, range of scanning platform and the scanning length of every step, real-time data acquisition, real-time display of two-dimensional color diagram, preservation of data and graphics, etc.

4 SQUID Signal Extraction for Internal Defects of Three-Dimensional Braided Composite Workpieces

SQUID NDT works from conventional eddy current NDT. The difference of them is that conventional eddy current NDT detects the changes of chart impedance due to the changes of eddy current distribution, and as the distribution of eddy current in the material has skin effect, the surface or near surface can only be detected. The sensitivity of SQUID magnetic field is up to 10^{-13}-10-^{15}T $\sqrt{Hz}$, which has high sensitivity and greater penetration under the DC and low frequency and could probe much deeper than eddy current sensor.

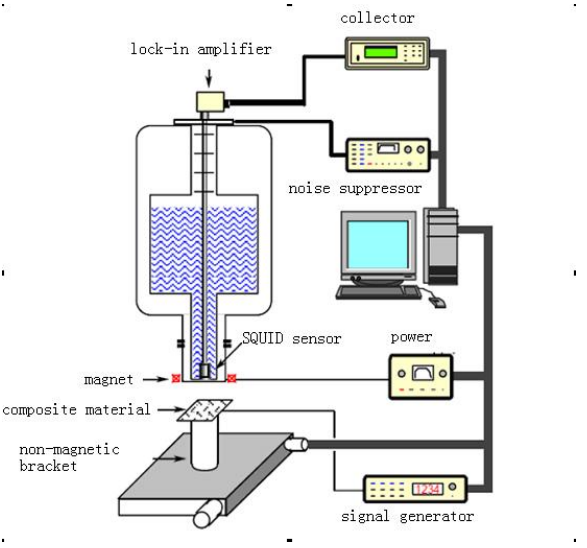

Fig. 1. SQUID-based the NDT equipment drawing of three-dimensional braided composite material

Shown in Fig. 1, the different locations of the sample on the horizontal scanning platform can be scanned by changing the location of the platform. Under the scanning platform is a drive coil, when the electromagnetic waves spread in three-dimensional braided composite materials, it will generate the vortex current, whose distribution and size are related to the conductance characteristics of materials. If there are defects in the three-dimensional braided composite materials, it will seriously affect the

electrical conductivity. For example, eddy currents in three-dimensional braided composite materials with defects will flow around the crack and re-distribution. By re-detecting the magnetic field generated by eddy currents, you can get information of defects. Generally a drive coil into which a specific frequency signal is imposed placed near the tested sample. Since the coil will produce an alternating electromagnetic field and excite eddy current in the three-dimensional braided composite materials, the magnetic signal generated by eddy current can be detected by SQUID. The signal related to excitation frequency will be extracted using phase-locked detection method, so as to achieve the purpose of testing.

5 SQUID Signal Processing

SQUID measures the internal weak defect magnetic field of three-dimensional braided composite material, using ultra low-noise amplifier SA-230F5 to signal amplification, using 2-channel, 16-bit, 125 M/s ATS660 acquisition card to signal conversion, and using LabVIEW to signal digital filtering and spectrum analysis.

Subject processes the SQUID signals using wavelet technology. Wavelet packet analysis technology has a unique advantage in the characterization of the signal time-frequency characteristics, which not only reflects the signal frequency components, but also reflects the trends and laws of the signal frequency components with the changing of time. SQUID signal feature extraction using the following steps:

A. The wavelet packet decomposition for SQUID signal of the internal defects of three-dime sional braided composite materials

By analyzing the different wavelet base applications, Daubechies was used as a wavelet base of SQUID signal in the experiments, and extract and analyze the characteristic quantity using LabVIEW. The signals are divided into the detail signals $d_1, d_2, \cdots, d_n$ and smoothing signal c_n by the wavelet decomposition algorithm. Let F_s be the sampling frequency of original signal and $F_0 (=\frac{F_s}{2})$ be the maximum frequency, and get smoothing signal c_1 (frequency range $0\sim\frac{F_0}{2}$) and detail signal d_1(frequency range $\frac{F_0}{2}\sim F$), and go on to get c_1 (frequency range $0\sim\frac{F_0}{4}$) and d_1(frequency range $\frac{F_0}{4}\sim\frac{F_0}{2}$)…, the more frequency is decomposed, the more it become fine. By Wavelet transform the signal is decomposed into several frequency channels, whose bandwidth changes to be narrow with binary mode with the increases of the decomposition series. Before and after filtering the results are shown as Fig. 2(a) and (b).

B. The wavelet analysis feature extraction for SQUID signal of the internal defects of three-dimensional braided composite materials

The approximate coefficients by wavelet packet decomposition contain the outlined characteristic information of the original signal, and detail coefficients also contain details of the original signal. Types of defects are judged according to experience, the

experiment uses the following two coefficients characterizing the waveform characteristics as characteristic quantity:

Waveform Factor: $$K_F = \frac{\sqrt{\frac{1}{N}\sum_{i}^{N} cA_j(i)^2}}{\frac{1}{N}\sum_{i}^{N} cA_j(i)} \quad (1)$$

Wave crest Factor: $$K_p = \frac{\max\{cA_j(i) | i = 1,2,...,N\}}{\sqrt{\frac{1}{N}\sum_{i}^{N} cA_j(i)^2}} \quad (2)$$

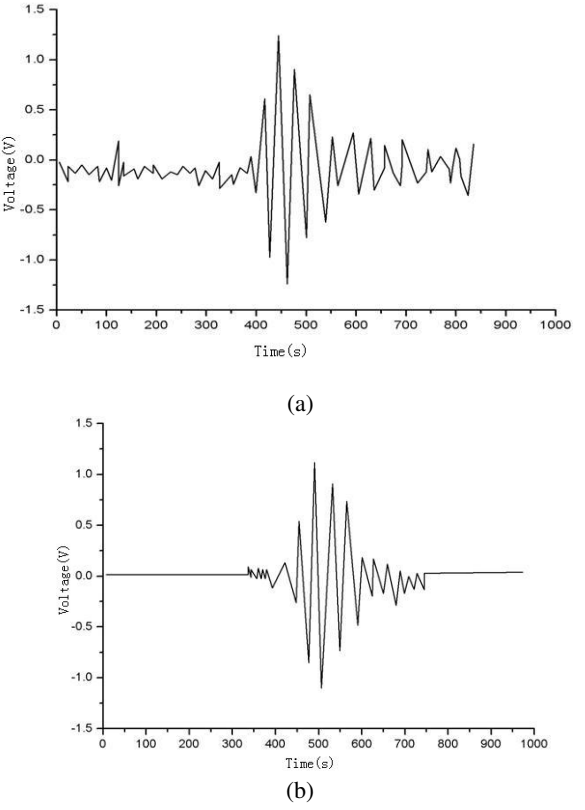

Fig. 2. (a) SQUID signal before filtering, (b) SQUID signal after filtering

In order to more accurately describe the detailed characteristics of defect signals, the following three statistics in the node coefficients are used as characteristic quantity:

$$S_1 = \frac{1}{N}\sum_{i=1}^{N} cD_j(i) \tag{3}$$

$$S_2 = \frac{1}{N}\sum_{i=1}^{N} cD_j^2(i) \tag{4}$$

$$S_3 = \frac{1}{N}\sum_{i=1}^{N} (cD_j(i) - S_1)^2 \tag{5}$$

S_1、S_2、S_3 indicate the average value of coefficient node, energy and energy distribution respectively.

6 Some Common Mist Experimental Results and Analysis

In the experiment, we have detected and analogy the defects with same shape and different size under the 700 Hz excitation frequency, shown as Fig. 3(a), and we can

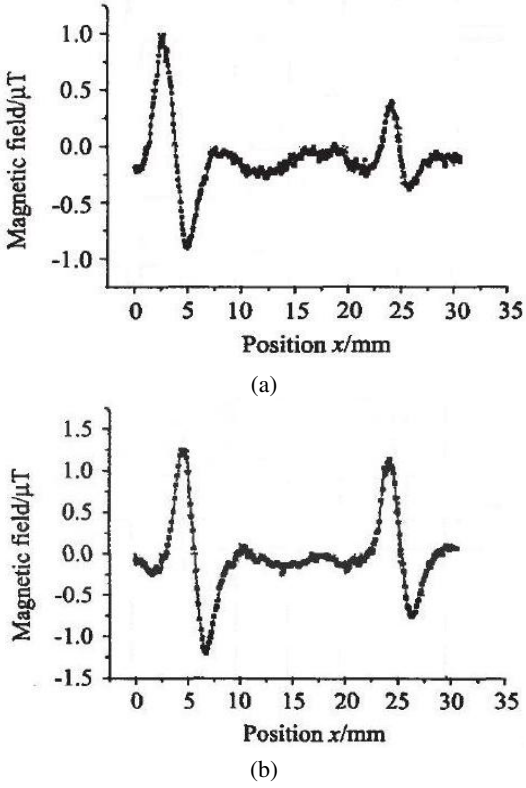

Fig. 3. (a) The response signal of the defects with the same shape and different size under the 700 Hz excitation frequency, (b) the response signal of the defects with the same size and different depth under the 700 Hz excitation frequency

see that the larger defects are, the stronger the magnetic signal SQUID detected in this region is, namely eddy current in this location is changed significantly. In the SQUID NDT, the responses of signal are significantly different using a different frequency for a defect of the same depth. Fig. 3(b) shows the different responses for the same size and different depth defects under the same excitation frequency (700 Hz). In the experiment we systematically study the corresponding relationship between the excitation frequency and the depth of defect using three-dimensional braided composites, and get a more reliable result. In general, for the deep defects, the lower excitation frequency should be used, while for surface defects the high excitation frequencies should be used. In order to get the maximum response signal, the relationships between the depth of defect and skin depth need to be considered [12], and so as to determine the optimal excitation signal.

7 Conclusion

SQUID detection for three-dimensional braided composites plays an important role for the application of composites and the analysis of mechanical parameters. As the complexity of the SQUID signal, according to noise signal features generated by different material, more accurate acoustic emission signals could be got by using different noise reduction methods in practical applications. With the development of computer and electronic technology, SQUID NDT can widely be used to detect surface defects or deep defects of three-dimensional braided composites. Although this method is still in research phase, its development and application will become fairly widespread in the future.

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Discuss on THOEL Learning System Applied to Teaching Design in Higher Education*

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Abstract. Thoel learning system supports a variety of teaching methods and provides high quality learning environment for learners' self-directed, cooperative and individualized learning. In the paper, learning goals, learning content, learning strategy, learning evaluation and interactive learning system are set up concretely basted on THOEL learning system.

Keywords: THOEL learning system, learning design, localization.

1 Introduction

THOEL learning system is developed by considering different needs of teaching management, resource sharing, information exchange in higher education which provides a high quality comprehensive online education and learning environment. Different users including system administrators, faculty administrators, professional managers, evaluation experts, teachers and students could acquire personal space through THEOL learning system. The functions provided by THOEL learning system such as online teaching, discussion, assignment, course questionnaires, research-based teaching, test-bank, online testing and course management are strong support for teaching construction in higher education.

2 Principle of Teaching Design under THOEL Learning System

A. Make Personalized Learning

As initiative bodies, students should explore in great depth and identify and solve problems in the process of learning so that unique knowledge structure consistent with their trait can be formed.

B. To Multimedia Learning Content

As early as 1960s', the psychological test proved that: 80 percents of the information acquired by human being was from vision, 11 percents from hearing. The multimedia carries information mainly by the ways of vision and hearing. The multimedia has the

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characteristic of integrating voice, flesh, pictures and words, which makes the teaching contents vivid so that the students' interest was increased and the knowledge was easier to be comprehended. With the high-speed development of networks, it is possible for the transmission of multimedia.

C. To Learn Interactively

The interaction in teaching and learning process is mainly reflected as following: communication between students and teachers, exchanges between students and students, interacting of teachers and students to materials. According to different type of interaction, corresponding rules, ways and means should be adopted.

D. Enhance Openness of Learning System

Through learning system, references and the corresponding Web site should be provided. According to the same knowledge, explanations and descriptions should be done from different angle, and students having different views should discuss between each others, so that the ability of analyzing and solving problems can be improved.

E. Pay Much Attention to the Design of Feedback System

The teaching content and learning objectives can be flexibly designed according to timely feedback on students' learning. And objective assessment is good for teachers to keep track of students so that appropriate training could be designed.

3 Design of Teaching Model under THOEL Learning System

Under THOEL system, teaching process may be divided into the following sections, that is, resource integration in THOEL system, teaching situation construction, problems formation, evaluation and feedback, which is depicted as in figure 1.

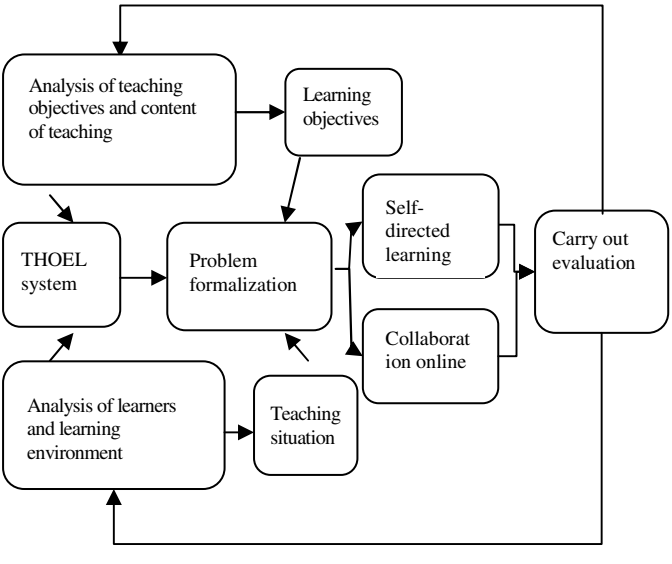

Fig. 1. Teaching flowchart under THOEL learning system

In this teaching model, the students could choose learning contents according to their interests and their knowledge structure, and multi-level exchanges and cooperation can be achieved, and better feedback is obtained.

The advantage of this teaching model is that reflection and evaluation is made in every stage of teaching, and necessary adjustments are made according to the results of reflection and evaluation so that teaching design could be continually improved and perfected.

4 Things to Note in Teaching Design under THOEL Learning System

A. Make Purpose and Mission Definite

The fundamental purpose of curriculum construction is to improve the quality of teaching, so the duty of teachers is to grasp crucial and difficult problems should be resolved through network according to the characteristic of teaching contents and students, to organize and design targeted practicable resources, to enrich students' professional knowledge and skills by expanding various resources in network plat. Therefore, technical issues in network platform should be solved by technologists and teachers should pay more attention to professional courses and students.

B. Considerate Individual and Collaborative Learning

Individual learning emphasize on the activities of students who are taken as cognitive subject, which has the advantage of stimulating students to explore issues with great initiative and enthusiasm, but can not help students to changes their weakness and strength their ability to adapting. Collaborative learning between teachers and students, students and students can improve and deepen individual to understand and master the information by using collective intelligence. In teaching design under THOEL, cooperation between the individual learning and collaborative learning should be achieved so that students could study together under the guidance of teachers through computers, which makes up the deficiencies of separate learning.

C. Focus on Integration of Different Kinds of Teaching Resources

Under THOEL learning system, the principles of "strengthening guidance, assisting learning and promoting learning" is present in every parts of teaching so that quality of teaching is improved. Currently, the teaching materials have exceeded the scope of curriculum and textbook, and learning software, network platform, search engine also have been included. Therefore, comprehensive construction of web-based teaching resources is a huge systematic project.

5 Teaching Design in Higher Education under THOEL Learning System

A. Design of Teaching Objectives

Teaching objectives are expected results should be achieved in scientific teaching activities, which are characteristics of clarity, specificity, rationality and feasibility. Teaching objectives not only are the foundation of curriculum design, but also determine teaching content, teaching process and teaching quality assessment. In

THEOL learning system, teaching objectives are reflected through syllabus, teaching calendar and lecture notes. In the design of objectives, teaching contents should be extended according to syllabus, and teaching and learning tasks should be illustrated in instructional program.

B. Design of Teaching Contents

In classroom teaching, teaching content is constructed with relatively static explanation of knowledge and information, and teaching content is only taken as the media of specific knowledge. In network platform, teaching content is integrated with knowledge, experience, culture, skills and attitudes, which suits the students' needs better. In THEOL learning system, teachers can compile materials by using the functions of online editor, uploading files, adding URL and importing resources, and also can make share by using the functions of setting up teaching notes and learning notes. Moreover, research-based teaching can be developed in THEOL learning system, where teachers not only can create new topics, display information and evaluation index, but also can make the group's management.

C. Design of Teaching Strategy

Teaching strategy generally takes teaching procedures, methods, forms and media in consideration to accomplish specific teaching objectives, which is the core of curriculum design. In the design of teaching programs, a true learning situation should be created as far as possible, and students should be led into this situation with assignment so that their knowledge, experience and cognition can be integrated to make cognitive structure more reasonable. In THEOL learning system, substantial information and multi-media forms should be made full use to set up world scenarios and context of action for students.

D. Design of Interactive Teaching

Classroom communication has the advantages of high-efficiency, but is limited by the condition of time and space. Interactive teaching tools provided by THEOL system is an important support to the communication between teachers and students, students and students. The functions of program notice, Q & A discussion, course questionnaires, teaching mail and course forums enhance the width and depth of interaction.

E. Design of Teaching Evaluation Mechanisms

Objective, scientific and fair evaluation is extremely important, which could help students understand themselves well. THEOL system provides more channels for evaluation, including giving assignments, self-training, online testing and performance statistics. Comprehensive evaluation composed of traditional evaluation and evaluation in network platform makes the evaluation more objectivity, comprehensiveness, and impartiality.

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A New Framework for Evaluating IT Projects

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Abstract. In this paper, traditional methods of measuring projects are reviewed and advantages and disadvantaged of them in measuring IT projects are specified. Then new techniques that are specialized in evaluating IT projects are introduced and IT-BSC as an appropriate method that its information is available is selected. As COBIT framework is defined for IT projects, from the combination of COBIT and IT-BSC, a framework for evaluating IT projects is proposed**.**

Keywords: IT-BSC, COBIT, IT project, project evaluation.

1 Introduction

In today competitive business environment, there is strong need to control costs and returns on investment along with lower risk of capital investment. Understanding the potential impact of IT on strategic power of organizations and increasing payments of IT projects, has made the evaluation and control of capital investments in IT projects very important and critical [1,3]. According to studies, only 18% of organizations use proper methods of calculating benefits of capital investment in IT [1] and at least 22% of investments in IT is going to waste. Also, 34 to 40 percent of IT projects have no benefit to be obtained [4, 5]. Reasons for this failure are complex. Technical factors, environmental, organizational, managerial and human resources are contributed to this failure. In some studies [1, 2, 3] lack of correct evaluation and control of IT projects is the main factor of failure of these projects.

In this paper, different methods of evaluating investments of IT projects are classified. In Section 2 the traditional assessment methods of projects are investigated and their advantages and disadvantages for evaluating IT project are expressed. Section 3 introduces new ways to evaluate IT projects. They are specific methods of IT projects assessment. Among these methods IT-BSC and COBIT are selected as they are specified for IT projects and their information are available. With merging these two frameworks, a framework for evaluating IT projects for organizations is presented in Section 4.

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2 Traditional Methods Of Project Evaluation

Many studies investigated the benefits and drawbacks of traditional methods. Main goal of the organization is to increase profits and wealth of project stakeholders. To calculate profit and loss of a project, operational methods of assessment are needed like traditional methods. Also these methods are known and understandable and are based on accepted principles [9,13,14]. But there are a lot of disadvantages too. Disadvantages of using traditional methods in evaluating IT projects can be categorized in two groups: conceptual reasons and operational reasons.

Conceptual reasons: When a company invests in the IT project, five different partners will be involved: Main Organization (project owner), users, project teams, sponsors and shareholders. Each of the partners follows different objectives to meet outputs of the project. If mentioned methods are used, only the goal of project manager that is the implementation of project in time, budget and provided description will satisfy [15,16,17,18]. Also these methods are naturally conservative and suitable for low-risk projects and they are considered to have quick cost returns [2, 7, 10, 19].

Operational reasons: Benefits of IT projects are classified in three categories: tangible benefits that are quantitative, intangible benefits that are qualitative and difficult to measure, hidden benefits that may be considered very important or to be ignored [8]. For IT projects, proportion of advantages of tangible benefits to intangible and hidden benefits are less. Because IT investments usually have supporting state and their benefits are hidden. Traditional methods only measure the tangible benefits. Although the costs are more measurable than benefits, significant amounts of capital cost of investment in IT projects are intangible or hidden [14, 19]. Approximately 40% of the costs spent on IT projects do not be considered in traditional budget estimates. 65% of IT managers are not able to calculate the full cost of the project through traditional methods [19, 22]. There are many risks in IT capital investments, Such as risk assessment, technical risk, project risk, operational risk, internal political risks, and external environmental risks. By using traditional methods, the risks must be reflected in the discount rate [14, 20]. But only 7% of organizations consider discount rate in IT projects [9]. Even when managers are interested to consider discount rate, the level of risk is usually calculated experimentally or based on numbers [7]. Not considering Discount rate in projects lead to high-risk projects and highly considering it result to conservative projects.

3 New Methods Of Evaluating It Projects

As it is shown in Table1, many studies have acknowledged that traditional methods are not appropriate for evaluating IT projects. Consequently lots of efforts have been

done to replace these methods. These efforts take two different approaches. The first approach is based on traditional methods and decides to improve and resolve the major criticisms of traditional methods. The second approach does not accept the traditional methods and use new methods for evaluating IT projects. Many new methods for evaluating IT projects are still in the conceptual phase and are implemented limitedly [14]. These methods introduced here generally and they are categorized base on the solutions they provide.

Strategic approach: the strategic approach was first introduced by Porter. He proposed strategic dimensions to create competitive advantages clearly. Investments in IT projects should create competitive advantages for organizations [23, 24]. The main tool for understanding the role of technology in competitive advantage is Porter's value chain that makes alignment between capital investment of IT projects and company goals. There is no explicit attention to financial analysis in this approach [24]. This method provides the guidelines for selecting different investments, but it is not appropriate when the organization wants to choose between two incompatible projects.

Information economics: Parker and Benson developed the information economy framework and published it in 1987 [25, 26]. Information economy benefits from the allocation of point-rating scores process for evaluating the benefits of capital investment and strategic alignment with IT. Information economy introduces a range of procedures which must be performed in specified order [7, 26]. Drawback of this method is that it needs public consensus.

Options model: options model not only are used for improving traditional methods but some new evaluation method have been developed based on theses models. Origin of such evaluating methods is in evaluating complex financial transactions such as buying and selling stocks and currency transactions. These models not only pay attention to financial tracking, storage and analysis of processes but also analyses what occurs in the case of using other options. This model changes dynamically its structure and coefficients to improve the chances in the decision [27].

Multilayered evaluation process: This method uses assessment methods that more or less are hierarchical. Usually a combination of traditional methods and strategic approach is used. it is believed that the evaluation of capital investment in IT projects will be effective only when the evaluation process is included in the higher levels of business processes [21, 28] and so traditional methods are not completely put away because they can create many benefits [6, 28].

IT-BSC: As mentioned in previous sections, IT projects have specific characteristics which using traditional criteria that evaluate solely based on financial criteria, are insufficient for evaluating them. So BSC for IT projects is specialized as IT-BSC. Use of IT-BSC from its early concept began since 1985 [29, 30]. In 2005, designing

performance management system aimed at monitoring and promoting the use of IT through IT-BSC was investigated [31]. Other similar research with the aim of using the BSC in the evaluation of organizational system performance has been done [32]. In that study all aspects that the researchers of IT has added to general BSC model to evaluate the performance, have been investigated and the framework for IT-BSC is presented based on measures and strategies used in them. Thus it is shown that aspects of BSC should be changed as follows in the field of IT [32, 33, 34].

1. Company contribution: means that how much value the capital investment in IT projects creates to business and organization.
2. Users and customers: the evaluation of stakeholders from IT facilities which are created in the project.
3. Operational excellence: the promotion of IT products and services which are created by the assessed project, how much depend on processes that develop and deliver software applications and information systems.
4. Future orientation: how much opportunities from the perspective of human resources and technology have been created to respond to future needs of organization in the evaluated project.

Each of these aspects must be translated to indicators and measurable criteria related to the leading project to evaluate the current state. This evaluation should be periodically repeated and objectives already determined by using information of the best models, should be compared [35].

COBIT Framework: COBIT framework is designed as a tool for managers in the field of IT governance to understand and consider risk management and benefits from IT and related technologies. This model is independent from technical IT infrastructure that is used in each organization. It's an open standard for IT control that has developed by the "Institute of IT governance". This framework provides substantial approach for implementing leading projects related to IT in a controlled environment [36]. COBIT framework was presented first by ISACA and ITGI in April 1996. Its goal is providing best IT functions for IT staff, auditors and users. Then other versions are presented by development of managerial guidelines. In May 2007, Version 4.1 has been introduced that in relation to previous versions have more simple definition of goals and includes waterfall development of processes and communications between business, IT goals, and IT processes [37]. Many organizations have used COBIT to manage or control IT. This framework is a set of 138 control objectives, a set of guidelines for auditors and collection of implementing tools [36]. IT Sources in COBIT framework include: 1) Application programs: include automated systems and procedures for information processing, 2) Information: contains organization's data such as inputs, processing and output of mechanized systems that is used by business, 3) Infrastructure: include technology and equipments used for the empowerment of processing in application programs,4) People: include staff required for planning, organizing, acquisition, implementation, presentation, support, monitoring and assessment systems and internal, outsourcing or contract information services.

COBIT conceptual framework includes three aspects of "IT processes", "IT criteria", and "IT resources". Among those in the IT processes aspect, 34 processes in the management of IT in four main areas, including "planning and organizing", "Acquisition & Implementation", "delivery and support" and "monitoring and evaluation" has been determined. In the second aspect or aspects of information criteria, security, quality and control needs are responded by proposing seven criteria that can be defined as what the organization wants of IT in general. These criteria include: effectiveness, efficiency, confidentiality, integrity, availability, compliance and reliability. In the third aspect or aspects of IT resources, five different types of sources for IT including data, software systems, technology, facilities and human resources has been defined [37].

4 Presenting Integrated It-Bsc and Cobit Framework to Evaluate It Projects

To provide integrated IT-BSC and COBIT framework, 4 aspects including "Company contribution", "users and customers", "operational excellence" and "Future orientation" which were referred in various studies [32, 33, 34] was considered for IT-BSC. To extract goals and measures in each aspect, goals and measures in the first level of COBIT IT processes has been used and they are allocated to different aspects of the framework. For allocating goals to each aspect, the Delphi method is used. Thus, a complete list of all goals in the COBIT IT processes (including 34 goals) are given to IT experts and managers to be prioritized separately for each aspect. 7 first priority objectives in each aspect have been selected as the main goals in each aspect, because when organization can plan to achieve its goal that have limited and distinguished objectives (5 to 7) to be able to extract the key success factors among its goals [38]. After determining related objectives of each aspect, by using metrics of first level objectives in COBIT, appropriate measures of objectives in each aspect are determined. The framework is shown in Table 1.

Table 1. Combined Framwork of IT-BSC And COBIT

aspect		
Company contribution	**objectives**	1- Respond to business requirements align with business strategy, 2- ensure integrating of application programs with business processes, 3- IT share in business profitability, 4- ensure automating of business transactions and reliability of information transfer, 5- Ensure cause and effect relation of control and functional requirements with effective automated solutions, 6- Clarify the effects business risks in IT objectives and resources, 7- Clarify expenses, benefits, strategies, policies and level of IT services
	measures	degree of approval of business owners from IT strategic and operational programs//degree of alignment with governance and business requirements// satisfaction level of business from current state of projects and programs// percent of IT investment or provision of predetermined business benefits// percent of IT value drivers mapped to business value drivers// percent of IT expenses that are stated by value drivers of business// percent of IT projects that provide business expectation in determined timeline

Table 1. *(continued)*

Customers and users	**objectives**	1- Ensure end users satisfaction from presented level of services, 2- Ensure service availability, 3- Decrease defects of service delivery and solutions, 4- Delivery of services in required time and budget and quality standards, 5- Clarify expenses, benefits, strategies, policies and level of IT services, 6- Ensure appropriate use and performance of technology and application's solutions, 7- Optimize using of information
	measures	percent of user's satisfaction from information model and data availability// percent of satisfied IT personnel// percent of satisfied stakeholder from quality of IT services, suppliers and data integration in new systems// percent of users that are satisfied by achieved performance// percent of satisfied stakeholder from service delivery in agreed level// percent of satisfied users from service delivery in agreed level// number of discontents from service contracts// percent of user satisfaction increment from services, systems and new technologies// degree of user's improvement in result of better understanding of systems
Operational excellence	**objectives**	1- Respond to employers governance requirements, 2- Protect IT assets, 3- Create agility in IT processes, 4- Protect achieved objectives, 5- Ensure confidentiality of critical information 6- Ensure resistance of services and IT infrastructure from failure, delivered attack and disaster , 7- Ensure minimum effect of defects and changes of IT services in business
	measures	percent of IT investment or provision of predetermined business benefits// percent of IT value drivers mapped to business value drivers// percent of IT expenses that are stated by value drivers of business// amount of IT personnel transactions// percent of critical IT objectives that are covered by risk evaluation// percent of IT risk evaluation integrated with IT risk evaluation approach// number of instances were confidential information was formed number of business errors in result of IT services errors// level of understanding from expenses, benefits, strategies, policies and IT service level// number of changes in objectives due to efficiency and effectiveness of IT processes
Future orientation	**objectives**	1- Optimize IT infrastructures, resources and capabilities, 2- Ensure continuous improvement and readiness for change in future, 3- Ensure appropriate use and performance of technology and application's solutions, 4- Create and maintain IT skills that are able to respond to strategies, 5- Create and maintain standard and integrated IT infrastructure, 6- Create and maintain standard and integrated application systems, 7- Ensure IT compliance with rules and contracts
	measures	percent of satisfied business owners from training of application programs and supporting issues // number and type of deviations from infrastructure plan// level of stakeholder satisfaction from personnel's IT skills // number of supported business processes by old infrastructure// number of systems that cover security requirements// percent of IT compliance with rules, regulations and contracts// degree of senior satisfaction from internal and external monitoring reports// percent of spend expenses from competitive procurement

5 Conclusion

IT projects have specific characteristics such as high risk, limited return on investment, having intangible results, high costs and hidden benefits that make the use

of traditional methods to measure the benefits of the project very difficult. This article provided a framework for evaluating IT project with combining IT-BSC and COBIT framework. Aspects of proposed framework are chosen from IT-BSC and objectives and related measures extracted from COBIT and validated by using Delphi and survey of experts in the field of information and communication technology. Since strategic alignment issue is one of the most important concerns of today's IT managers, this framework is greatly contributed to alignment of IT and business in the organization. These measures can be used to evaluate all IT projects and assess the value of various projects to each other in an organization.

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The Early Warning of Life Insurance Company Based on BP Artificial Neural Network

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Abstract. Life insurance solvency is the focus of insurance supervision. This article employed BP neural network model to the solvency early-warning system for life insurance, and improved the traditional BP algorithm. We used the improved BP network to predict the solvency of Life Insurance Company. The research results indicate that the prediction accuracy and sensitivity of improved BP neural network are higher compared with the traditional BP network.

Keywords: Life insurance, Solvency, BP neural network, Improve.

1 Introduction

In recent years, high growth of the life insurance in our country has attracted worldwide attention, but there is also a huge hide risk. In the development of our life insurance, there are many issues such as excessive reliance on traditional products which with high fixed interest rate, lack of expansion size and capital, poor corporate profitability and so on, therefore, analysis and research on how to deal with the existing solvency shortage by the industry and academia have been very urgent, to find the preventing and solving methods.

Early warning is a measure of a state which diverge from early warning line and send early warning signals. Early warning system is to identify the warning state and send supervisory signal, it is in constant development and improvement process. However, the current warning system still has some problems, such as that early warning state emphasis on quantitative indicators, ignore the qualitative indicators, easy to lost early warning information. Early information and knowledge acquisition is indirect, time-consuming, inefficient, and have other problems. This article carries on a research about early warning of solvency of the life insurance company , aims to find a relatively scientific, effective early warning monitoring method, from a different perspective on the whole process of operational activities in life insurance company, timely detect and "alarm" bad signs, to prevent the occurrence of the financial crisis, then relieve the risk in infancy.

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2 Routine Method for Early Warning

1) Sentiment index: It uses the method of integrating warning signs into some kind of index to reflect the alarm early warning. Shortcomings: simplely use the synthetic composite index to analyse the fluctuations of economic condition changes, lack of mature theoretical foundation support.

2) Econometric models: It set up structured model with the economic theory, simulate and predict economic performance, speculate possible value of economic development to achieve early warning purposes. Limitations: the model uses a random error to denote the impact of unknown factors which lead to miss turning points in the cyclical movement in the process.

3) Expert experience: with the help of personal experience of expert and his knowledge of warning signs, take comprehensive analysis and comparative studies on favorable and unfavorable factors in the environment, then combine intuition, experience and other relevant estimates to make judgment and forecast. Inadequacies: judgments are always very subjective, and different expects often have different views.

3 Benefits of Neural Network Early Warning

Compared with traditional statistical analysis model, artificial neural network have better fault tolerance and adaptability, it is more applicable in forecasting, classification and pricing. It is not only with better pattern recognition ability, but also can overcome limitations of statistical early warning and other methods. Because it has a fault tolerance, data distribution requirements are not strict, and have the ability of deal with data loss or errors. Most valuable, it has learning ability, and do self learning and trainning at any time according to new prepared data information, adjust its inner storage weight parameter to correspond to the changing economic environment, so it can be used as an important tool of early warning.

4 Improvement of BP Algorithm

BP algorithm is not a very perfect algorithm, there is two main limitations: (1) learning convergence is impacted greatly by initial value, when the initial value selected not very well, network convergence speed is very slow; (2) It is very easy to fall into local minima. Improved L-M algorithm is used to overcome these two problems.

At present, L-M algorithm is the fastest algorithm to train the neural network. As to the progress of training, when near the minimum point of objective function, gradient descent method is used. Therefore, many studies use L-M optimization method to deal with several optimization problems. But main drawback of the standard L-M algorithm is the storage requirement, the algorithm needs to store matrix, with large overhead.

A. standard L-M algorithm

Object function is defined as following:

$$F(w,\theta)=\frac{1}{2}\sum_{l=1}^{p}\sum_{n=1}^{o}(y_n^l-d_n^l)^2 \quad =\frac{1}{2}E^TE. \tag{1}$$

Where $(w,\theta)=[\omega_{1,1}\cdots\omega_{k,m}\cdots\omega_{I,H}\quad \omega_{I+1,1}\cdots\omega_{I+O,H}$ $\theta_1\cdots\theta_m\cdots\theta_H\ \theta_{H+1}\cdots\theta_{H+j}\cdots\theta_{H+O}]$ is the weight of network and threshold value E is defined as

$$E=[e_{11}\cdots e_{O1}\ e_{12}\cdots e_{O2}\ \cdots\ e_{1p}\cdots e_{Op}]. \qquad e_{nl}=y_n^l-d_n^l; n=1,2,\cdots,O; l=1,2,\cdots,p \tag{2}$$

According to formula (1), then

$$\nabla F(w,\theta)=J^TE. \tag{3}$$

Jacobian matrix J in formula (3) is defined as:

$$\begin{bmatrix} \frac{\partial e_{11}}{\partial w_{10}^p} & \frac{\partial e_{11}}{\partial w_{11}^p}\cdots\ \cdots & \frac{\partial e_{11}}{\partial w_{nb}^o} \\ \frac{\partial e_{21}}{\partial w_{10}^p} & \frac{\partial e_{21}}{\partial w_{11}^p}\cdots\ \cdots & \frac{\partial e_{n1}}{\partial w_{nb}^o} \\ \cdots\ \cdots & \cdots\ \cdots & \\ \frac{\partial e_{nq}}{\partial w_{10}^p} & \frac{\partial e_{n1}}{\partial w_{11}^p}\cdots\ \cdots & \frac{\partial e_{n1}}{\partial w_{nb}^o} \end{bmatrix}. \tag{4}$$

$$(w^{t+1},\theta^{t+1})=(w^t,\theta^t)+(\Delta w^t,\Delta\theta^t). \tag{5}$$

$$(\Delta w^t,\Delta\theta^t)=-[(J_t)^TJ_t+\lambda_t I]^{-1}(J_t)^TE_t. \tag{6}$$

The update of weight values and thresholds is given by equation (5) and (6).

B. improved L-M algorithm

Because the standard L-M algorithm uses square of error sum as the objective function, this paper choose equation (7) as the objective functions to revise, so that reduce the computation of Jacobian and approximate Hessian matrix (J^TJ) for each iteration process.

$$F(w,\theta)=\frac{1}{2}\sum_{n=1}^{o}\left[\sum_{l=1}^{p}(y_n^l-d_n^l)^2\right]^2. \tag{7}$$

According to formula (1), formula (7) could be rewritten as

$$F(w,\theta)=\frac{1}{2}\widehat{E^T}\widehat{E}. \tag{8}$$

Derivative of the objective function can be rewritten as

$$\nabla F(w,\theta)=\widehat{J^T}\widehat{E}. \tag{9}$$

Where $\widehat{E}=[\widehat{e_1}\ \ \widehat{e_2}\cdots\widehat{e_n}\ \cdots\widehat{e_O}]$; $\widehat{e_n}=\sum_{l=1}^{p}(y_n^l-d_n^l)^2$; $n=1,2,\cdots,O$

For the BP network which the hidden layer use hyperbolic tangent function and the output layer use linear functions, partial derivative of Jacobian matrix can be represented as:

$$\left[\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{O+j,m}}\right]_{j=n}=2\sum_{l=1}^{p}(y_n^l-d_n^l)b_m^l\ ,\ \left[\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{O+j,m}}\right]_{j\neq n}=0 \tag{10}$$

$$m=1,2,\cdots,H;n=1,2,\cdots,O;j=1,2,\cdots,O.$$

$$\left[\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{k,m}}\right]_{j=n}=2\sum_{l=1}^{p}(y_n^l-d_n^l)\omega_{mn}\left[1-(b_m^l)^2\right]x_k^l\cdot \tag{11}$$

$$k=1,2,\cdots,I;m=1,2,\cdots,H;n=1,2,\cdots,O$$

$$\left[\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{H+j}}\right]_{j=n}=2\sum_{l=1}^{p}(y_n^l-d_n^l),\left[\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{H+j}}\right]_{j\neq n}=0\cdot \tag{12}$$

$$n=1,2,\cdots,O;j=1,2,\cdots,O$$

$$\frac{\partial\widehat{e_n}(w,\theta)}{\partial\omega_{k,m}}=2\sum_{l=1}^{p}(y_n^l-d_n^l)\omega_{mn}\left[1-(b_m^l)^2\right]. \tag{13}$$

$$m=1,2,\cdots,H;n=1,2,\cdots,O$$

Then formula (6) could be rewritten as

$$(\Delta w^t,\Delta\theta^t)=-[(\widehat{J}_t)^T\widehat{J}_t+\lambda_t I]^{-1}(\widehat{J}_t)^T\widehat{E}_t. \tag{14}$$

Assume matrix X satisfies

$$X=B^{-1}+CD^{-1}C^T. \tag{15}$$

Then $$X^{-1} = B - BC(D + C^T BC)^{-1} C^T B \ . \tag{16}$$

Define $$X = \hat{J}_t^{\ T} \hat{J}_t + \lambda_t I \ . \tag{17}$$

$$B = \frac{1}{\lambda_t} I \ . \tag{18}$$

$$C = \hat{J}_t^{\ T} \ . \tag{19}$$

$$D = I' \ . \tag{20}$$

Substitute formula (17)~(20) into formula (16), the

$$\left(\hat{J}_t^{\ T} \hat{J}_t + \lambda_t I \right)^{-1} = \frac{1}{\lambda_t} I - \frac{1}{\lambda_t^2} \hat{J}_t^{\ T} \left(I' + \frac{1}{\lambda_t} \hat{J}_t \hat{J}_t^{\ T} \right)^{-1} \hat{J}_t \cdot \tag{21}$$

Substitute formula (21) into formula (14) , then we get

$$(\Delta w^t, \Delta \theta^t) = -\left[\frac{1}{\lambda_t} I - \frac{1}{\lambda_t^2} \left(\hat{J}_t \right)^T \left(I' + \frac{1}{\lambda_t} \hat{J}_t \left(\hat{J}_t \right)^T \right)^{-1} \hat{J}_t \right] \left(\hat{J}_t \right)^T \hat{E}_t \tag{22}$$

When improved L-M algorithm is used , network training processes are as following:

*1)*Input all training samples into the network and compute network output and the corresponding error, use formula (7) to compute error square sum;

2) According to formula $\hat{J}$, compute jacobian matrix;

3) Compute network weight value and update value of threshold according to formula (14);

4) Use new weight value and threshold from formula (22) to compute error again, suppose new error is smaller then the error which gain from step 1), then $\lambda_{t+1} = \lambda_t / \mu$ is the damping factor value of this iteration, compute $(w^{t+1}, \theta^{t+1}) = (w^t, \theta^t) + (\Delta w^t, \Delta \theta^t)$ then return to step 1); suppose error don't decrease, then damping factor value need to be added, viz $\lambda_{t+1} = \mu \lambda_t$, return to step 3) compute again, untill error is decreased, commonly, the value of μ is 10;

5) When $\nabla F(w, \theta)$ is smaller than the given precision or error, and satisfy preliminary standard , then stop the algorithm.

By changing the objective function to modify standard L-M algorithm can speed up the training speed of network, in particular for BP network which own a large sample and complex topology structure, its training effect is more visible.

5 Selection of Early Warning Sample

In this paper, we select China life insurance company as the study object, select ten indicators X1 to X10 as the input of network, they are: *1) recognized ratio of asset and total asset:* it reflects actual solvency of life insurance company. *2) net ratio of asset and total asset*: it reflects that the shareholders provided account in the total assets in life insurance company. *3) radio of net asset and keep premium*: the more capital, the stronger insurance capacity and solvency. *4) Interest rate return of all right*: the index is an important measure of profitability of the life insurance company, it is commonly used to measure the business results. *5) met profit margin*: it is the ratio of its own section in the total contribution, it reflects the efficiency of business. *6) Premium growth rate*: it is a measure of development speed of a life insurance company. *7) rate of return on investment*: if this ratio of the life insurance company is higher, its solvency is higher. *8) pay rate*: it reflects the cost of life insurance company. *9) operating expenses rate*: this measure reflects expenses rate of life insurance company to maintain insurance policy and company's operations. *10) surrender rate*: it depends on the capital market and the entire economic changes as well as satisfaction degree about applicants on life insurance company.

In this article, we divide warning degree of this early warning system to four situations such as solvency well, solvency general, solvency risk and solvency crisis. The corresponding expectation of network is divided into four categories, if the output is (1 0 0 0), which the solvency is very well, the life insurance company in that period has the strong solvency, if the output is (0 1 0 0), which the solvency is general, the life insurance company in that period has normal solvency, if the output is (0 0 1 0), which the solvency is in risk, solvency of the life insurance company in that period is week, if the output is (0 0 0 1), that is, the solvency is in crisis, the solvency of the life insurance company in that period occurres crisis. Sample data is shown as table 1:

Table 1. Financial Statements of China Life Insurance Company From 1997 to 2006

Year	Input										Output
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	
1997	0.6661	0.0327	0.0634	0.0334	0.0019	0.8412	0.6268	0.1948	0.2677	0.0215	0100
1998	0.8064	0.0507	0.0906	0.0924	0.0079	0.3690	0.7747	0.1657	0.2527	0.0184	0100
…	…	…	…	…	…	…	…	…	…	…	…
2004	0.8713	0.0362	0.1152	0.0296	0.0034	0.1143	0.9186	0.0401	0.1262	0.0333	0010
2005	0.8761	0.0306	0.1170	0.0092	0.0011	0.0536	0.9300	0.0291	0.1270	0.0449	0100
2006	0.8747	0.0096	0.0415	0.1590	0.0067	0.1053	0.9348	0.0426	0.1317	0.0390	0100

6 Predicted Results and Analysis

Based on above analysis, the select neural network model has 10 nodes in input layer, 8 nodes in hidden layer, 4 nodes in output layer. Select 8 groups of data from 1997 to 2004 in the original samples as training sample, set X1 ~ X10 as input, the last arrange of the original sample as the output. Do simulation experiments with matlab7, set sample learning rate as 0.05, the training error as 10-2 , training times as 50.

From the training error curve in figure 1 and figure 2, we can see that after using improved L-M algorithm four times, the training error is less than 0.001, the convergence speed of this algorithm is very fast, training time is less than 4 times, and the final error is 0.000297494, it is much less than the objective error, and less than the training error of the standard L-M algorithm which is 0.000895803.

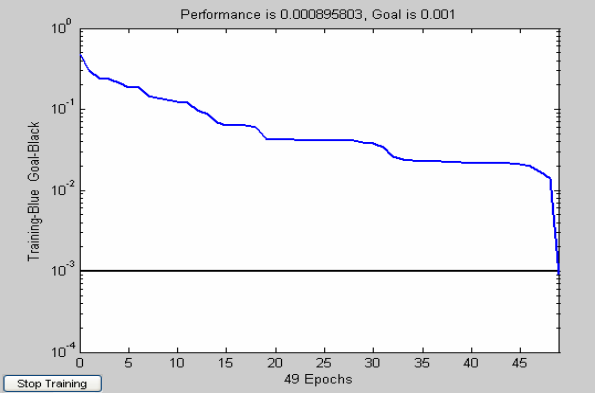

Fig. 1. Training error curve of the standard L-M algorithm

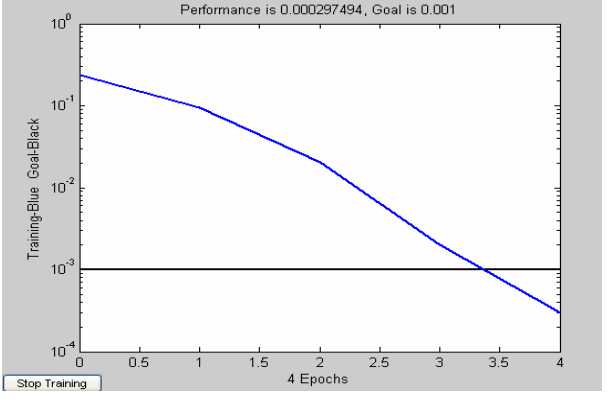

Fig. 2. Training error curve of the improved L-M algorithm

Table 2. Comparison of Predicted Results

Test group	Actual output		Objective output
	Improved L-M algorithm	L-M algorithm	
2005	0.010746 1 2.2182e-076 2.7426e-007	8.4818e-037 0.98004 0.0024152 0.00033337	0 1 0 0
2006	0.036511 0.9989 3.8632e-006 1.2644e-005	8.4685e-037 2.7417e-007 2.2148e-076 1	0 1 0 0

As we can see from table 2, when we use the improved L-M algorithm to supervise solvency of China life life insurance company in 2005 and 2006, the actual outputs are (0.010746 1 2.2182e-076 2.7426e-007) and (0.036511 0.9989 3.8632e-006 1.2644e-005), they close to the outputs of (0 1 0 0) and (0 1 0 0), which indicated that solvency is general, correct prediction rate is 100%. There is also certain error between the actual output and objective output, mainly because that the select indexs are not complete, training sample is very little, but the deviation is not large, the error control is in a certain range, is acceptable. The actual outputs of BP network are (8.4818e-037 0.98004 0.0024152 0.00033337) and (8.4685e-037 2.7417e-007 2.2148e-076 1), the correct prediction rate is 50%, which shows that the prediction accuracy of improved L-M algorithm is higher than BP network.

7 Conclusion

In this article, BP neural network model is used in early warning monitor of solvency in the life insurance company, methods and steps of integrated early warning and monitoring for solvency in the life insurance company are put forward, and empirical study has been given too. The study result shows that the method can guarantee accuracy and sensitivity of early warning signals, can provide reference for life insurance companies and insurance regulators. The application of network in early warning of life insurance company is a broadening and a breakthrough for traditional economy early warning both in thought and technically, form a basis for practicality of economic early warning.

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Research on Energy Conservation Route Maintenance of Multiple AUVs

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Abstract. In order to reduce the energy consumption to make the AODV route protocol possible to be used in underwater network, this paper enhances the function of its "hello" message. It optimizes the route by adding some information of active line to the "hello" message. Besides the nodes in the active line, some other nodes which meet certain condition will also send "hello" message in order to optimize some non-optimal route. The result shows that the given theory can meet the exception, and is helpful for improving the performance of AODV.

Keywords: AODV, HELLO message, Route maintenance, Energy consumption.

1 Introduction

Along with the increasing development of ocean exploitation, the underwater acoustic network has been used in more and more implements. For example, it which is constructed in AUVs and sensor networks can be used to reconnoiter and collect information, operate campaign underwater and command or schedule reconnaissance swarms in military. And in civilian utility, it can be used to research the ocean environment and meteorology, exploit and protect ocean resource, survey the pollution, prospect for the seabed and so on. But underwater acoustic communication is more complex than space communication. Considering the implementation of underwater acoustic network, such as AUVs and sensor networks, it is very important to conserve the energy, except for the noise, multi-path effective, long time delay, Doppler shift and so on. Because the nodes in the network are always equipped with batteries, it is very difficult to recharge or change it.

In the point of feature, the underwater acoustic network with AUV node is a kind of Ad Hoc network. Generally, the Ad Hoc network is a mobile wireless network, and the nodes are constructed by mobile host. So the architecture can change dynamically. Also in the AD Hoc network, the communication range of the host is finite. And when two hosts are in the range of each other, they can interact directly. Otherwise, the data should be transmitted by relay node. So, in Ad Hoc network, hosts may be also routers, which response the route searching and data transmitting. In this case, data is always transmitted to the target through certain node. That is why Ad hoc network is called Multi-hop wireless network, which has wide foreground in military, emergency rescue, exploration and so on.

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Routing protocol is one important topic in Ad Hoc network. Nice routing protocol can reduce the response time and the energy consumption in process. This is very important for network with the feature of long time delay and limited energy node. From the point view of logic, routing protocol in Ad Hoc network has two type of architecture: plane and hiberarchy. And plane architecture is most researched recently. The post famous classifications of routing protocol are proactive and reactive, which is also called table-driven and on-demand driven. In more detail, the table-driven protocol contains DBF(Distributed Bellman-Ford), DSDV(Destination-sequenced Distance-vector Routing), WRP(Wireless Routing Protocol) and so on. And on-demand driven contains DSR(Dynamic Source Routing), AODV(Ad Hoc On-Demand Distance Vector Routing), TORA(Temporally-Ordered Routing Algorithm) and so on.

Generally, AODV routing protocol, which has the feature of low communication, low consumption, low bandwidth and fast convergence when topology changes, has been paid much more attention. But it should be improved when used in underwater acoustic network, in which the energy consumption is considered firstly. Recently, researchers focused on the routing repair in AODV protocol. In this paper, the HELLO message is considered and is used to improve the route maintenance dynamically.

This paper is organized as follows: the HELLO message in AODV route protocol is discussed in section 2. Then the problems of route maintenance in AODV are analyzed in section 3. According to this problem mentioned in section 3, the improved route maintenance in AUVs network is proposed in section 4. At last in section 5, the simulations and the analysis based on method proposed here are given.

2 The HELLO Message in AODV

The routing maintenance in AODV is different with that in table-driven routing. Because each node doesn't need broadcast its information periodically, only the nodes in active link response the maintenance.

HELLO message in AODV is a response message(RREP) with the TTL value of 1. In every HELLO_INTERVAL microsecond time interval, the node checks whether the date is sent to its subsequence node in nearest HELLO_INTERVAL time or not. If not, the HELLO message will be broadcast from it. So the HELLO message from neighbor node can be used to make sure whether the route is failure or not. If the node in the past DELETE_PERIOD time received the HELLO message of next hop of active link, while no message is received from the same neighbor beyond the time of ALLOWED_HELLO_LOSS * HELLO_INTERVAL, it is considered that there is some failure in this link.

Because the HELLO message in AODV only effects the node in related active link. The number of nodes is much smaller than other protocol. So the bandwidth is smaller than others.

3 The Problem of Routing Maintenance in AODV

In underwater acoustic network, the broken link may be caused by AUV fault, energy exhaustion because of complex environment. Also the obstruction by large halobios, submerged rock and so on will be caused the link broken.

When the link breaks off, the routing repairing algorithm of AODV protocol will try to repair the route autonomously. But the repaired route will not be the optimal one because the best route is already found in the process of route lookup.

Fig. 1 shows the non-optimal route found by routing repairing. In Fig.1(a), the initial optimal route $S \rightarrow A \rightarrow B \rightarrow D$ from the source node S to the destination node D is produced in route lookup. When the link $A \rightarrow B$ breaks off, the repaired route $S \rightarrow A \rightarrow C \rightarrow B \rightarrow D$ is created(shown in Fig.1(b)). If the link $A \rightarrow B$ recovered, so the repaired route is not the best one.

In addition, in the underwater acoustic Ad Hoc network, AUV can move autonomously. The topology of the system will change dynamically, which also cause the initial route become redundant. This situation is showed in Fig.2. The initial route from S to D is $S \rightarrow A \rightarrow C \rightarrow B \rightarrow D$. After a short time, node D moves to A for some task requirement. When D arrives in the communication range of A, the route between A and B are redundant. Because the node A can send data to D directly.

So the routing maintenance is needed here. And HELLO message in AODV can be used to detect the connectivity of the link, and optimize the optimal route.

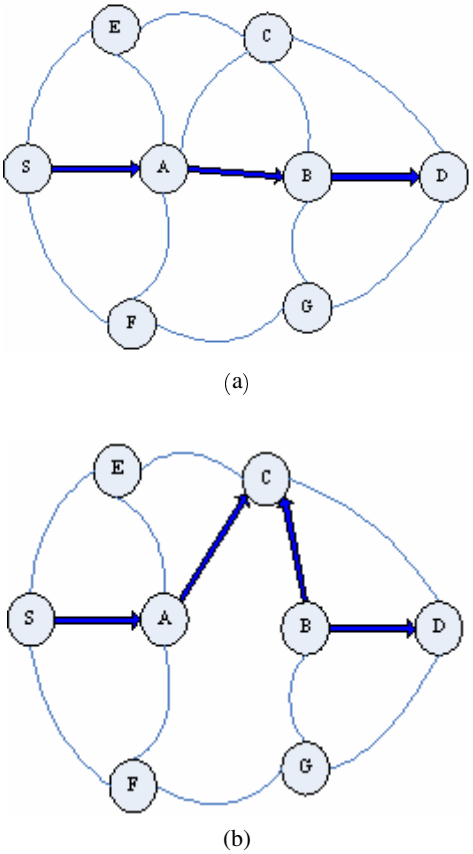


Fig. 1. Non-optimal route caused by routing repairing

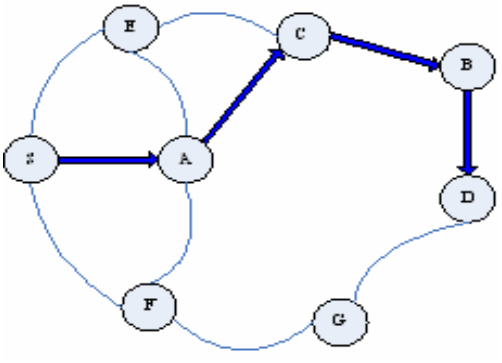
4 Improved Route Maintenance in AODV

A. Route maintenance in active link

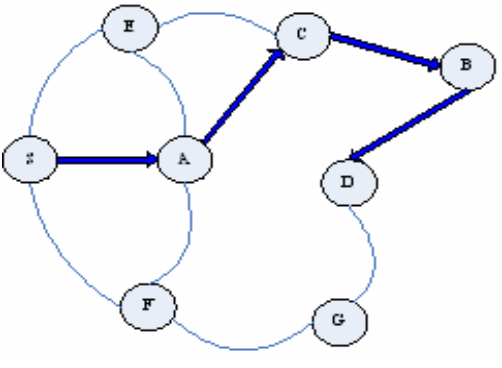
In AODV protocol, the connectivity among nodes can be detected by HELLO message. Once there is a disconnection, the route repairing will work. If the route message is written in HELLO message, it also can solve the problems mentioned above.

The distance from current node to the destiny node is represented by Hop in AODV. Generally, the Hops from one node to the destiny node is 1 larger than that of its subsequence node. When the node finds the value is 2 or larger than that token by HELLO message, the current link is not the optimal one. Then the route table is changed, and the next hop of this node is pointed to the node which sends the HELLO message.

For example in Fig.1, when the link $A \rightarrow B$ recovers, both of the two nodes will send HELLO message, because B and C are in this active link. Then A will receive the HELLO message from both B and C. And the hop count is 3 from A to D through C. But the hops count from HELLO message of B is 1. This means that current route is not the best one. So the route table of A will modified, and its next node is B. Finally, A will change the route table of its previous nodes by HELLO message, and the route maintenance completes. Also this process will solve the problem shown in Fig.2.



(a)



(b)

Fig. 2. Non-optimal route caused by movement of AUV node

B. Route maintenance in inactive link

The method mentioned above can handle the situation shown in Fig.1 and Fig.2. But it can't do anything in the problem shown in Fig.3. In this figure, the route(the blue path) is given after the system runs some time. There are 5 hops in this route $S \to A \to B \to C \to F \to D$ from S to D. But it obvious that there is a better route $S \to A \to E \to F \to D$, in which there are 4 hops from S to D. But the node E is not in the active link, so it will not response for HELLO message in this link. This causes the route not to be optimized.

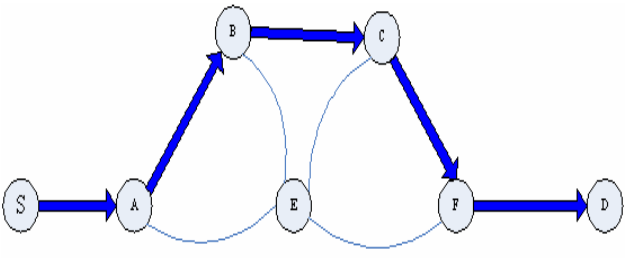


Fig. 3. Route maintenance in inactive link

The method presented in this paper is that the node in inactive link can send HELLO message if necessary. This can optimize the route dynamically. If there is no route to target node taken by HELLO message in route table of the node in inactive link, it will add an item about it. Otherwise, it will compare the hop count in its table with that in HELLO message. There are three cases: (1)if the count is 2 or more greater than that in HELLO message, the next hop is pointed to the node with HELLO message; (2) if 1 greater, smaller and equal, the route will not modified; (3) if 2 or more smaller, the node with the HELLO will modify its route table, because this route maintained by it is not the best one. Its next hop is set to itself.

This process can be explained by Fig.3. When node E receives HELLO from F, it will add the route to D to its table. The node E will do nothing when it receives HELLO from B or C, because the count difference is more than one. But when it gets HELLO from A, it found that there are 4 hops from A to D, which is 2 larger than that of itself. This means the route is not the best one. Then E will send a HELLO message with the hop related to target to its neighbor. When A receives this HELLO message, it will find that E is a next hop in the better route. So it modifies the route table. And the route is maintained dynamically.

So the route maintenance is solved in two situations: nodes in active and inactive links. For the nodes in active links, there are three cases about the difference between the hop count from it to target and that contained in HELLO message: (1) more than 2, means there is some better route; (2) 1, means good route; (3) 0 or less than 0, means the route need to be repaired.

5 Simulations and Analysis

In order to prove the method presented in this paper works as considering. A multiple AUVs system is simulated by VC++, in which each AUV node can move

autonomously, and it can communicate will the other nodes in certain range(here its radius is set to 100). Although the node can keep related distance to each other like in a formation, there still is some node moves itself by some reason in task.

Fig.4 shows a link produced after some running time(the dot line), and the AUV node(circle with number). Node 1 is try to send message to target node 3. At the beginning, the link from node 6 to node 8 is broken off. When it recovers, node 8 can get HELLO message from node 6. So according to our method, current route is not the best one. Then the next hop of node 8 is set to node 6. So the active route optimization is completed, as shown in Fig.4(b).

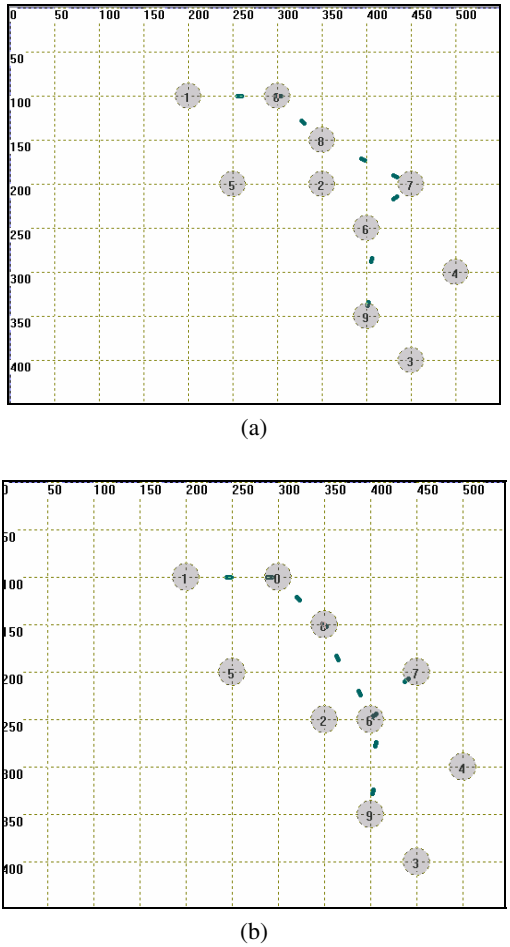
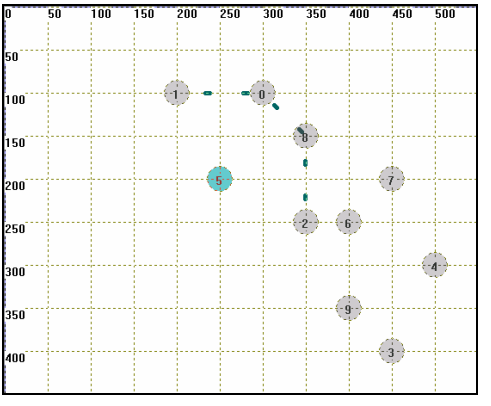


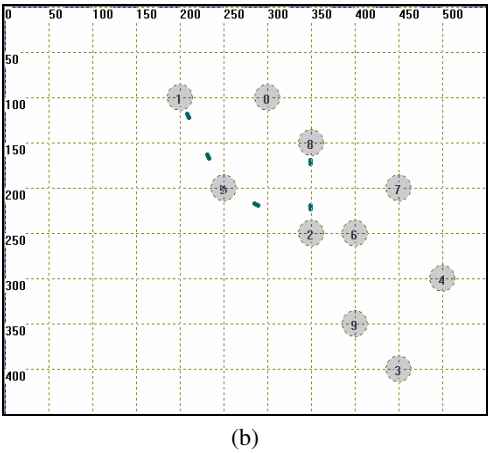
Fig. 4. The maintenance in active link

Also the nodes in inactive links were tested in experiments. In the AUVs system, the route from node 1 to node 2 was created, when node 5 was fault. So the route was around node 5 in Fig.5(a). When node 5 was recovered as shown in Fig.5(b), it

received HELLO messages from node 1, 0, 8, 2. From out experiment, it updated its route table after getting HELLO from node 0, 8, 2. And when it received HELLO from node 1, it can calculate and consider the route from A is not the best one. so it sent a HELLO message. When node 1 received this message, it changed its route table and set the next hop to node five. Finally, the route in inactive link was maintained, which satisfied our message.



(a)



(b)

Fig. 5. The maintenance in inactive link

It can be seen that our method in route maintenance is implemented by local node. This means that not all of the nodes from source to the target are needed. So it can conserve a lot of energy, which is important in AUVs system. Fig. 6 shows the energy consumption evolution along with the number of nodes in different method. The results shows that the method proposed here can reduce more energy consumption that initial AODV.

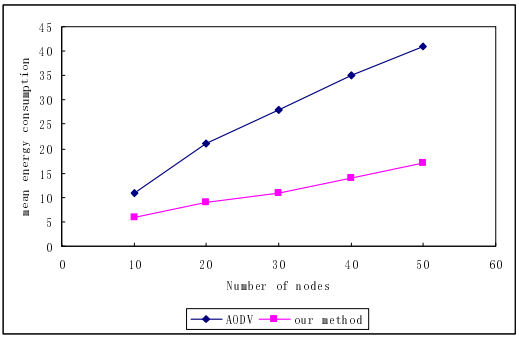


Fig. 6. Energy consumption in different method along with the number of nodes

6 Conclusions

AODV is the most researched route protocol in Ad Hoc network. This paper analyzes some basic situation in routing maintenance, and then modifies the maintenance process in AODV. The HELLO message is used more completely. Through adding the information of nodes in active links and sending HELLO by nodes in inactive links, the route can be maintained dynamically. And this satisfies the high requirement on energy consumption in AUV network. Finally, the experiments proved our method can achieve the results as expected.

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Improved AODV-Based Local Recovery Mechanism in Multiple AUVs System

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Abstract. This paper focuses on the recovery mechanism in AUVs system based on AODV protocol. The given mechanism is based on the theory that "hello" message which is used in the route maintenance. Firstly, the local recovery which constrains the TTL works when link is broken. Then, in order to balance the energy consumption and response time, the idea of "slow start" in TCP/IP is introduced into the recovery algorithm which is used in retreated recovery in the route hops. The experiment results show our method can reduce the energy consumption in the same requirement on response time.

Keywords: AODV, Route recovery, Slow start, energy consumption.

1 Introduction

Ad Hoc network is a kind of mobile network with wireless basic infrastructure, which is firstly used in military field. And In Ad Hoc network, each node can move autonomously. Along with the increasing development of ocean exploitation, the underwater acoustic network has been used in more and more implements. For example, it which is constructed in AUVs and sensor networks can be used to reconnoiter and collect information, operate campaign underwater and command or schedule reconnaissance swarms in military. And in civilian utility, it can be used to research the ocean environment and meteorology, exploit and protect ocean resource, survey the pollution, prospect for the seabed and so on. But underwater acoustic communication is more complex than space communication. Considering the implementation of underwater acoustic network, such as AUVs and sensor networks, it is very important to conserve the energy, except for the noise, multi-path effective, long time delay, Doppler shift and so on. Because the nodes in the network are always equipped with batteries, it is very difficult to recharge or change it [1].

In the point of feature, the underwater acoustic network with AUV node is a kind of Ad Hoc network. Generally, the Ad Hoc network is a mobile wireless network, and the nodes are constructed by mobile host. So the architecture can change dynamically. Also in the AD Hoc network, the communication range of the host is finite. And when two hosts are in the range of each other, they can interact directly. Otherwise, the data should be transmitted by relay node. So, in Ad Hoc network, hosts may be also

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routers, which response the route searching and data transmitting. In this case, data is always transmitted to the target through certain node. That is why Ad hoc network is called Multi-hop wireless network, which has wide foreground in military, emergency rescue, exploration and so on.

In Ad Hoc network, the aim of route recovery is to reduce the transmitting delay, data losing and other bad influence caused by types of route failure. This means more stable serve quality can be obtained.

This paper presents a route recovery method in multiple AUVs, which requires the energy consumption of each node. The method introduces the "slow start" mechanism into the rollback route recovery method. So the balance between energy consumption and response time can be well coordinated.

This paper is organized as follows: the local recovery strategy and relative research in AODV is introduced in section 2. And then according to the problems of the local recovery in AODV, the improve method is proposed in section 3. At last in order to proof the method proposed here, some experiments and analysis are shown in section 4.

2 Local Recovery in AODV Route Protocol and Relative Research

AODV protocol is a kind of on-demand route protocol. It has the advantages of low energy consumption, loop avoidance, low computing, high expansibility and so on. AODV protocol consists of three processes: route lookup, route recovery and route maintenance. Because the dynamic topologic architecture of Ad Hoc network, the link break often occurs. In this situation, AODV provides a route recovery algorithm. In this algorithm, when the link is broken off, the up-link node of broken site will implement local recovery, if the distance to target mode from this site is less than the maximum value. The node which starts recovery adds the serial number about target node, and then broadcast a RREQ message. In route discovery cycle, it will wait the RREP message related to RREQ, and store the data received in this phase. If there is no RREP message, then it will send RERR message about target node to the source node, which will start the route discovery again. If there are one or more RREP message, the node will compare the hop count in new route to that related to the same target in route table. If the new hop count is larger than initial value, then the node will send RERR message about target node to the source node, which will start the route discovery again.

From this process, there is some problems of local recovery in AODV. In [2], a new mechanism is presented. The pre-node stores the data firstly, and then sends RERR message to detect whether there is some data from source. If there is some data needs to be sent, the source node will start discovery again. Otherwise, this pre-node will start route discovery as a new source. [3] proposed a method that all RREP message(except relate to itself) is intercepted and the route information to each node is stored. Experiments show that the method can improve the performance of system. In [4], a new local recovery mechanism is proposed. The route table is maintained by neighbor and extended route information. The HELLO message in AODV is extended by adding table of neighbors in certain hops and is broadcasted in period. In this way, each node can get their neighbors in certain hops. Once a link breaks off, local

recovery starts. In order to reduce length in local recovery, there are two steps: firstly, the instituted node is chosen by the count of hops in its neighbors. The nearer the neighbor is, the earlier it is considered. Secondly, if there are some nodes had the same hops, then the instituted node is chosen by the count of hops from the next node to the target. The smaller the value is, the earlier it is chosen firstly.

3 Improved Local Recovery in AODV Route Protocol

A. Local route recovery

It is well known that the break in links is local. So it can recovered in limited hops. But this may cause the increase of its downlink, and nothing changes in up-link. In this way, some route which can be recovered will be abandoned. In this paper, the HELLO message is used to reduce the process of route recovery, which is inspired by that is used in route maintenance.

Because the broken link can be recovered by local operation, and the range of local recovery is related to the node density in network. So LOCAL_REPAIR_HOP is used to limited the hops used in local recovery. When the break is found, downlink node will quit the active link, and increase its serial number to the target(this is used to avoid loops in recovery). The up-link node of broken site also increases the serial number to the target, and starts a route discovery with the TTL value of LOCAL_REPAIR_HOP. So the downlink node and the neighbor nodes in two hops of current node will response to this discovery message. If a RREP message is received in discovery cycle, the recovery is completed. If there are more than one RREP message, more optimal route is chosen by hop counts.

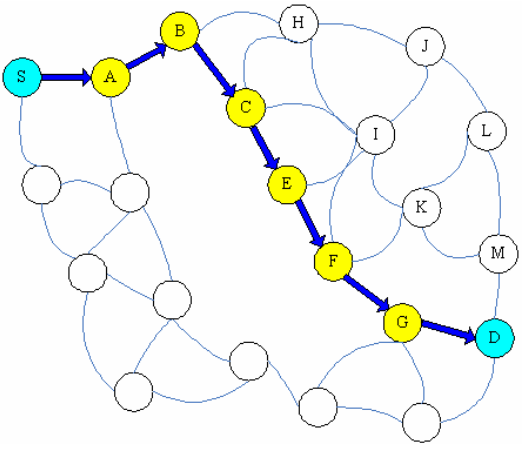


Fig. 1. The route produced in running time

In order to explain this process, Fig.1 gives more clear description. In the route from source node S to the target node D, the link CE breaks off some time. In initial AODV protocol, the distance from node C to S is farther than that to D. So

S will send the RERR message and start route discovery again. But in the recovery method proposed here, assuming the value of LOCAL_REPAIR_HOP is 2, so the downlink nodes E and F which are in the range of two hops to C will response RERR. At this moment, both E and F will through node I to complete the recovery. After comparing the route distance to the target, the RERR message from F is related to more optimal route, so the recovery is implemented by chosen I to F. At last, the route distance from S to D is the same to former one, so the up-link node will do nothing.

But the link BC breaks off, the route tuned by local recovery can arrive C through H only. This increases the length to target node of S, A, B. So the dynamic route maintenance works firstly, and then the recovery will be completed.

In this process, it is seen that fewer nodes is contained in recovery by local recovery strategy. So the energy and time consumption will be reduced obviously. In order to improve the adaptation of our method, LOCAL_REPAIR_HOP can be adjusted by node density in networks dynamically by this equation:

$$\text{LOCAL\_REPAIR\_HOP} = \text{K/Density} \tag{1}$$

where Density is the AUV node density of the network, and K is adjustable factor. This means the higher the density of the network is, the longer the link contained in recovery is. So the LOCAL_REPAIR_HOP is adapted to the network dynamically, and can be extended easily.

B. Retreated recovery

Local recovery mentioned above can solve almost all broken links. But there is still some drawbacks. When the local recovery failed, the recovering node will send a RERR message to source node. But this process is not necessary in most situations.

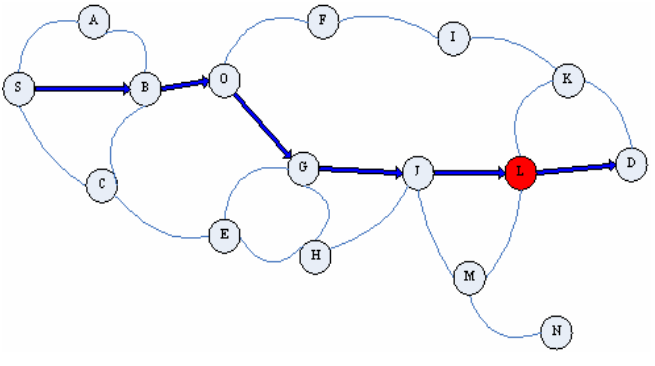


Fig. 2. The route when node L is fault

For example in Fig 2, there is a link S->B->O->G->J->L->D from source node S to the target node D. If the node L fails, the pre-node J will start local recovery in AODV. If the recovery fails, the source S will start route discovery and the route S->B->O->F->I->K->D is found finally. But in this new link, it is seen that nodes B and

O is also included in previous link. This means each of these two node can recover the route successfully. To solve this problem, a retreated route recovery is proposed in [5]. In there method, all node from the recovering node to source node is tried to recovery the route. But it cost too much time and energy. The author in [6] believes the recovery try of up-link node is implemented by node density. But it also costs much more in obtaining the node density. In order to balance the energy consumption and response time, the "slow start" in TCP/IP is introduced to retreated recovery.

The main idea of "slow start" is that : if a new link is built, the congestion window is set to the size of one message. The send point will send data according to congestion window size. When a message is confirmed, the congestion window size increases one time. In this paper, the idea of "slow start" can be used in retreated recovery. When a link breaks off, and the local recovery of its one up-link node fails, the recovery task will be tried by the node of 2 hops before current node. If fails again, the node of 4 hops before current node is chosen to recover the link. This process will work until some node succeeds or the source node is met.

Also in Fig.2, if node J in recovery, the node O is chosen. And it can find a route O->F->I->K->D, and local recovery is completed.

But there is one problem in retreated recovery called repeated route recovery. In Fig.2, the retreated recovery may make J and G implement the recovery. For these two nodes, H is the neighbor of both nodes. So H will response twice in their recovery process. This is not necessary. So it is called repeated route recovery.

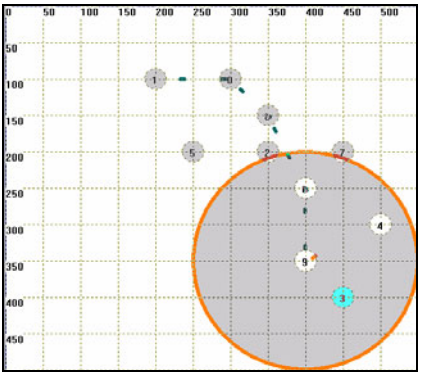
In the process of route discovery in AODV, to avoiding repeated transmission, when a RREQ is received, a timer is used to record the RREQs which are dealt with. But this can manage the situation with one broken site. It is not suitable to multiple broken sites. Here a Triples is added to the timer. This Triples contains three elements: the source node, the node staring recovery, and the target node. So the difference of broken sites can be distinguished, and the repeated transmission with multiple broken sites can be avoided.

4 Simulations and Analysis

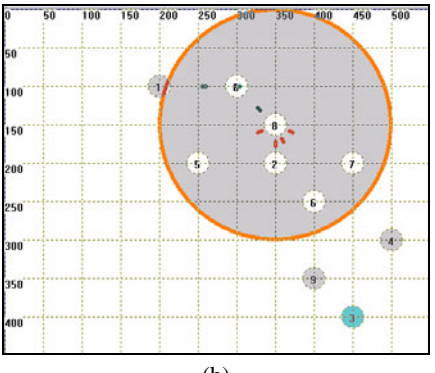
In order to prove the method presented in this paper works as considering. A multiple AUVs system is simulated by VC++, in which each AUV node can move autonomously, and it can communicate will the other nodes in certain range(here its radius is set to 100). Although the node can keep related distance to each other like in a formation, there still is some node moves itself by some reason in task.

Fig.3 gives the process of route recovery in AUVs system. At the beginning, AUV 1 is sending data to AUV 3 for task requirement. But AUV 3 fails at one moment. In the next time, AUV 9 which is the up-link node of AUV 3 starts the local recovery(Fig.3(a)). Because AUV 3 is the target node, local recovery can't work. When the time is up, AUV 9 send RERR message to its up-link node. In this time, the TTL value of AUV 9 is 2. So AUV 6(up-link node of AUV 9)will compare its hops count(here 1) to AUV 9 and TTL received(here 2). It is found that the two value are not the same. So AUV 6 transmits RERR to its up-link node AUV 8. By repeated the same process, AUV 8 can't recover the route also(Fig.3(b)). The TTL is set to 4 and RERR is transmitted again, until to the source node(Fig.3(c)).

When UAV 3 recovers in the retreating process, the recovery is completed right now and the time is saved. At this time, AUV 3 can get the order from UAV 1. So all AUVs move in cohesion in a formation. This can make sure the success of AUVs task.



(a)



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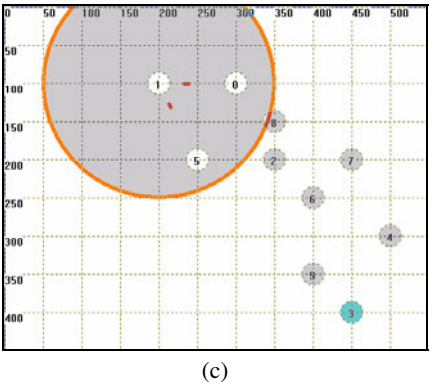

(c)

Fig. 3. The route recovery process of our method

In order to proof the effect of our method, a simulation in OPNET is implemented. The energy consumption model is first order radio mode. The bandwidth of the channel is set to 1Mbps. The time delay in process is set to 1 minute. The node distribution is set the same as that shown in Fig.2. In this experiment, the energy consumption is given by our method and initial AODV, shown in Fig.4. It can be seen that the method proposed here reduces the energy consumption much more that initial AODN protocol, so the system lives much more time.

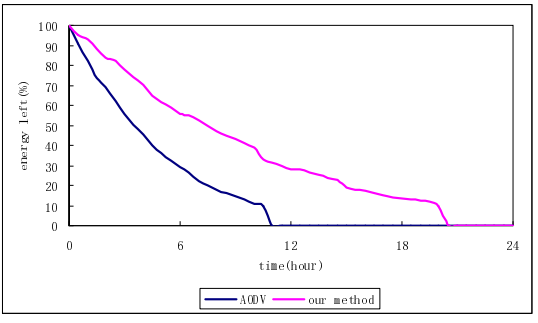

Fig. 4. Energy consumption in different method

5 Conclusions

This paper focuses on the recovery mechanism in AODV. The given mechanism is based on the theory that "hello" message is used to maintain the route. In order to balance the energy consuming and response time, this paper introduces the idea of "slow start" in TCP/IP into the recovery algorithm which is going to recover the route hop back hop. Experiments show that our method can conserve energy consumption efficiently.

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Environment Characteristics, Top Management Styles and Organizational Outcomes: A Fit Perspective

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Abstract. From the perspective of "fit as gestalts" proposed by Venkatraman (1989), top management styles are viewed as gestalts or non-gestalts. With the survey data from 112 Chinese firms, three gestalts and the non-gestalt pattern of top management styles are identified by cluster analysis. The predictive validity of gestalts is verified and gestalts are significantly better than non-gestalt pattern with respect to organizational innovation. However, gestalts do not show the obvious superiority in organizational performance compared with the non-gestalt pattern. Then, the "fit" relationship between top management styles and environment characteristics is discussed by ANOVA analysis and the results show gestalts are in higher environment uncertainty, heterogeneity and hostility than the non-gestalt pattern.

Keywords: Top management styles, Organizational outcomes, Environment characteristics, Fit as gestalts.

1 Introduction

Upper echelon theory states that the organization is a reflection of its top managers [1]. Top managers' perception of environment and unique management style influence the formation of corporate strategies, organizational design, management system and organizational culture [2]. Usually, top managers refer to the executives who are chiefly responsible for developing and implementing the firm's strategy, such as CEO, vice president, boards of directors etc. [3]. As the key nodes linking the outside and inside of an organization, top managers provide a breakthrough point to understand the relationship between external environment, organizational behaviors and outcomes.

Although many literatures have discussed top management, previous studies seldom explored the relationship between top management styles, environment characteristics, and organizational outcomes from the perspective of "fit". In this paper, referring to the concept of "fit as gestalts" from Venkatraman [4], an empirical

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study is conducted to: (1) identify the gestalts of top management styles; (2) explore the effects of the gestalts on organizational outcomes; (3) contrast the environment characteristics between these gestalts. Based on the empirical study, some findings are discussed.

2 Theory and Hypotheses

*A. Top management styles: fit as gestalt*s

A top management style is "the distinctive way in which an organization makes decisions and discharges various functions, including goal setting, formulation and implementation of strategy, all basic management activities, corporate image building, and dealing with key stakeholders" [4]. In nature, it reflects top managers' attitudes to people and things that rely on their basic assumptions about human nature. Schleh also states that a management style is "the philosophy or set of principles by which you capitalize on the abilities of your people. It is not a procedure on 'how to do,' but is the management framework for doing. It is a way of life operating throughout the enterprise [5]." Usually, as a whole, a top management team has certain management style of its own. Although there may be differences in perception, value, and risk attitudes among TMT members, it is easy to detect that each TMT presents different operation modes and unique management styles of their own [2].

A variety of top management styles have been described in previous studies. Khandwalla identifies some top management styles, such as entrepreneurial, professional, and conservative, based on five top management dimensions – risk taking, technocracy, organicity, participation, and coercion [6]. Two basic top management styles – proactive and reactive – are discussed by Wu, Chiang and Jiang based on nine pairs of opposite semantic descriptions about top management characteristics, such as risk taking versus conservative, innovative versus traditional, etc [2].

From the perspective of "fit", the different top management dimensions of an appropriate top management style should be matched. With more than tow top management dimensions, fit may be explored in terms of gestalts, which represent "a set of relationships which are in a temporary state of balance" or "feasible sets of internally consistent and equally effective configurations" [7]. In other words, gestalts of top management styles represent some certain balance status or configuration ways of top management dimensions. In contrast, "non-gestalt" top management styles are those patterns with internal inconsistent and inflexible top management dimensions. According to [7], gestalts are very different form one to another, both in terms of the scores of, and relationships among, variables; the distinct of gestalts and non-gestalts also is usually obvious. Thus, "gestalt" and "non-gestalt" patterns are observable. This leads us to the following hypothesis.

H1*: There are "gestalt" and "non-gestalt" patterns of top management styles with obviously different scores of and relationships among top management dimensions.*

B. Top management styles and organizational outcomes

The impact of a top management style on organizational outcomes can be explained from knowledge and culture perspectives. From the view of knowledge, top managers' cognitive style and behavior orientation is decided by their knowledge structures. So, top management styles can be looked on as the reflection of top managers' knowledge structures that have a strong influence on the development of the organizational knowledge structure. Lyles and Schwenk also suggest that the shared perspective of top managers could be described as a general knowledge structure and represent shared dominant general management logic [8]. They stated "the key decision-makers' schemata closely reflect the 'core area' of the knowledge structure and they influence the attitudes and beliefs of others in the organization by communicating and networking. Once the key decision-makers have determined that the change challenges the core elements of the knowledge structure, they make changes in the knowledge structure and communicate these changes to others in the organization." A top management style also plays a key role in shaping and controlling organizational culture. In general, different top management styles have different cognitive styles and behavior modes that are likely to lead to different management orientations. In turn, variations in the management orientations contribute to the creation of different organizational cultures. For example, on the basis of an empirical study, Berson, Oreg and Dvir find that top managers' self-direction values are positively associated with innovation cultures and in turn contribute to firm outcomes [9].

In present study, we consider a top management style of an organization as a particular configuration of different top management dimensions. Feasible sets of internally consistent configurations (i.e., gestalts) should lead to more effective organizational cultures and knowledge structures than "non-gestalt" patterns (i.e., internal inconsistent and inflexible configurations). And then, different organizational cultures and knowledge structures lead to different organizational outcomes (innovation and performance). Following the arguments presented above, we hypothesize that:

H2a*: As to top management styles, gestalts will outperform non-gestalts with respect to organizational innovation.*

H2b*: As to top management styles, "gestalts" will outperform "non-gestalts" with respect to organizational performance.*

C. Top management styles and environment characteristics The environment is important to the success of an organization. Environmental characteristics are generally proposed as three dimensions: uncertainty, heterogeneity and hostility [6]. Khandwalla lists several phenomena about environmental uncertainty: felt uncertainty about future events, uncertainty about the causes or consequences of events, uncertainty about what responses to make to events. Environmental uncertainty is a fundamental problem modern organizations have to face. Environmental heterogeneity reflects how different in events or states the environment of an organization is. To face to environmental heterogeneity, organizations must adapt by differentiating themselves. Environmental hostility is a condition of perceived threat to an organization's primary goals. For a firm this may mean a serious threat to its profitability, liquidity, or market share.

As to the impact of the environment on organizations, there are two main viewpoints in literatures: one is "determinism", which proposes organizational evolutions are forced by environment; the other is "autonomism", which states the organizational evolutions are decided by top managers' strategic choices rather than environment. Synthesizing the two viewpoints, we consider that a top management style is the result of the environment and top managers' autonomic choice. Thus, under different environment characteristics, top management styles may be different. Based on the arguments above, we hypothesize that:

H3a*: Environmental uncertainty is significant different between different top management styles (including "gestalts" and "non-gestalts").*

H3b*: Environmental heterogeneity is significant different between top management styles (including "gestalts" and "non-gestalts").*.

H3c*: Environmental hostility is significant different between top management styles (including "gestalts" and "non-gestalts").*

3 Methodology

A. Sample and data

A structured questionnaire was compiled in English and later translated into Chinese. Then, the questionnaire was translated into English by a back-translation procedure to examine its accurate reflection of the original meanings in the Chinese context. To enhance the quality of questionnaire, a test in a small range was implemented (n=20). According to the feedback, the questionnaire was adjusted to form final edition.

Data was collected with two steps. First, a majority of data was collected by E-mail. 1099 MBA/EMBA students or graduates from listed excellent universities in China formed the sample frame of this step, and 364 members were selected randomly. A second mailing to the initial non-respondents was conducted. 93 valid questionnaires were retrieved in this step. Second, 30 questionnaires were sent to top managers of 30 firms in Xi'an and Shanghai by face-to-face visit. 19 valid questionnaires were provided in this step. Finally, a total of 112 valid questionnaires were used and the response rate was 28.43%.

The sample profiles of respondents are as follows: there are 54 manufacturing/machining firms (about 48.21%), and 58 service firms (about 51.79%), including 17 industries such as manufacture, IT, trade, food, hospital, advertising, chemistry, mining, construction etc. About 72.32 percent of the sample firms have staff numbers above 100. All respondents are bachelor degree or above. Their average service time is 4.75 years.

B. Measures

To improve the reliability of measures, we examined the existing instruments and carefully selected those measures that had been validated in former studies. When an item had to be modified or developed, we did that by carefully referring to related literatures and consulting with experienced managers. All items are operationalized using a seven-point Likert scale.

1) Environmental characteristics (ENVC). The scale of environmental uncertainty (EU) is adapted from Achrol and Stern [10], which seek to capture competitor

uncertainty (ENVC1), customer uncertainty (ENVC2), and market uncertainty (ENVC3). A three-item scale of environmental heterogeneity (EHE) is adapted from Miller and Friesen to capture industry innovation diversification (ENVC4), customer require diversification (ENVC5), and competition diversification (ENVC6) [11]. A three-item scale of environmental hostility (EHO) from Covin and Slevin [12] is adopted to capture the threat of external environment (ENVC7) and pressure from external environment (ENVC8).

2) Top Management Styles (TOPMS). The dimensions of the TOPMS mainly are adapted from [3]. A semantic differential measurement instrument consisting of nine seven-point bipolar scales is used to measure different top management dimensions including: risk-taking (TOPMS1), growth (TOPMS2), innovation (TOPMS3), empowerment (TOPMS4), consensus decision (TOPMS5), fast reaction (TOPMS6), team efficiency (TOPMS7), long-term orientation (TOPMS8) and ability orientation (TOPMS9),.

3) Organizational innovation (INNOV). A scale of organizational innovation is adapted from [21], including six items — trying out new ideas (INNOV1), seeking out new ways to *do* things (INNOV2), creative in methods of operation (INNOV3), first to market with new products and services (INNOV4), increasing new product introduction over the last 5 years (INNOV5), and receiving innovation risk (INNOV6).

4) Organizational Performance (PERF). Baker and Sinkula's measure of performance is adopted to capture the level of market *share* (PERF1), sale revenue (PERF2) and profit (PERF3) relative to the largest competitor [13].

4 Analysis and Results

A. Factor analysis and reliability test

To verify the dimensionality and reliability of the research constructs, a purification process including factor analysis and Cronbach's α analysis was conducted in this study. The results of analysis are shown in Table 1. Generally, the Cronbach's α of a construct should be larger than 0.70. Table 1 shows the reliability of the research constructs is acceptable. Convergent validity was tested by factor analysis to determine whether all items of an individual construct load on a single factor using the eigenvalue greater than one rule. The results shows all constructs exhibit convergent validity.

According to factor analysis, three components of a top management style are identified and the cumulative percentage of variance explained is 69.078% (see Table 1). Component 1 shows the entrepreneurship characteristics of top management, labelled "risk-taking, innovativeness, agile, and efficient". So Component 1 is named "Entrepreneurial Orientation (EO)". Component 2 shows the top management propensity to consider for future implications of decision-making and emphasize competence development for future. Thus, Component 2 is named "Long-term Orientation (LO)". Component 3 shows the participative management characteristics like "empowerment and democracy". Hence, Component 3 is named "Participative Orientation (PO)".

Table 1. Factor analysis and reliability test

Construct		Operational Variables	Factor Loading	Variance Explained	α
ENVC	EHE	ENVC4	0.813	27.620%	0.811
		ENVC5	0.882		
		ENVC6	0.829		
	EU	ENVC1	0.802	55.002%	0.792
		ENVC2	0.819		
		ENVC3	0.867		
	EHO	ENVC7	0.912	76.982%	0.801
		ENVC8	0.870		
TOPMS	EO	TOPMS 1	0.846	29.569%	0.798
		TOPMS 2	0.617		
		TOPMS 3	0.713		
		TOPMS 6	0.638		
		TOPMS 7	0.695		
	LO	TOPMS 8	0.812	50.711%	0.839
		TOPMS 9	0.912		
	PO	TOPMS 4	0.701	69.078%	0.701
		TOPMS 5	0.914		
INNOV		INNOV 1	0.869	66.066%	0.897
		INNOV 2	0.885		
		INNOV 3	0.831		
		INNOV 4	0.857		
		INNOV 5	0.765		
		INNOV 6	0.643		
PERF		PERF1	0.894	83.003%	0.897
		PERF2	0.918		
		PERF3	0.921		

A. Identification of "gestalts" and "non-gestalts"

According to Venkatraman, the cluster analysis technique is used to find the gestalts of top management styles [7]. In this paper, cluster analysis is conducted by two steps. Firstly, the hierarchical cluster technique is adopted with Ward's linkage method and the squared Euclidean distance. The agglomeration coefficients are used to determinate the appropriate number of clusters. The analysis of agglomeration coefficients shows the percentage change in the agglomeration coefficient is rather large from four to three clusters (21.33%), three to two clusters (33.50%), and two to one cluster (53.88%) (see table 2). Based on the percentage change in agglomeration coefficients, the appropriate number of clusters is four, three and two. However, the use of the agglomeration coefficient as a stopping rule has a tendency to indicate too few clusters [14]. To find different gestalts of top management styles, the number of clusters is decided to be four. Secondly, a K-Means non-hierarchical analysis technique is conducted for the validity check. The result is similar to the hierarchical cluster analysis. Either the hierarchical or the K-means method could be used. For the

sake of convenience, the result of K-Means cluster analysis is adopted. table 3 shows the result of cluster analysis.

Table 2. Analysis of agglomeration coefficients

Number of clusters	Agglomeration coefficients	Differences in coefficient	Change in coefficient in next level (%)
10	60.47	5.93	9.81
9	66.41	8.54	12.85
8	74.94	10.18	13.59
7	85.12	13.00	15.28
6	98.13	15.02	15.31
5	113.15	20.46	18.08
4	133.60	28.49	**21.33**
3	162.09	54.30	**33.50**
2	216.40	116.60	**53.88**
1	333.00		

Table 3. Cluster analysis

Top management styles		Mean (Std.D)		
		TOPMS-EO	*TOPMS-LO*	*TOPMS-PO*
Non-gestalt	Cluster 1 (n= 20)	***2.96*** (1.04)	***2.65*** (1.03)	***2.03*** (0.90)
Gestalts	Cluster 2 (n= 27) Moderate	4.46 (0.65)	3.74 (0.78)	4.35 (1.01)
	Cluster 3 (n= 37) Autocratic entrepreneurial	5.01 (0.91)	4.99 (0.93)	2.72 (0.81)
	Cluster 4 (n= 28) Democratic entrepreneurial	**5.44** (0.97)	**6.21** (0.60)	**5.23** (0.84)
F (P)		33.27 (0.000***)	81.87 (0.000***)	71.58 (0.000***)

*P<0.05; **P<0.01; ***P<0.001.

The four clusters are named as follows:

1) "Non-gestalt" pattern (Cluster 1)

This cluster ascribes significantly lower scores of variables compared to other clusters. This cluster is named "non-gestalt pattern" for its low and inflexible configuration of entrepreneurial, long-term, and participative orientation components. The "non-gestalt pattern" appears to be conservative, short-sighted and arbitrary.

2) Moderate "gestalt" (Cluster 2)

This cluster is named "moderate gestalt" for its medium scores of entrepreneurial, long-term, and participative orientation. The "moderate gestalt" seems to be mild, middle-of-the road, but balanced.

3) Autocratic entrepreneurial "gestalt" (Cluster 3)

This cluster is named "autocratic entrepreneurial gestalt" for its high rankings of entrepreneurial and long-term orientation, but low participative orientation. The "autocratic entrepreneurial gestalt" seems to be having the traits of entrepreneurs, but lacking empowerment and democracy.

4) Democratic Entrepreneurial "gestalt" (Cluster 4)

This cluster is named "democratic entrepreneurial gestalt" for their highest rankings of all three top management components. The "democratic entrepreneurial gestalt" seems to be not only possessing entrepreneurial traits like risk-taking, innovativeness, proactiveness, and vision, but also having the features like equality and democracy.

The F-statistics indicate strong evidence that one or more of the cluster means differed from another on all three top management components, at the 0.001 level of significance. Thus, hypothesis ***H1*** is supported.

C. Top management styles and organizational outcomes

To examine whether the gestalts outperform the non-gestalt pattern with regard to organizational outcomes, average scores for organizational innovation and performance across gestalts and non-gestalt pattern are reported in table 4.

Table 4 shows that the average organizational innovation degree of gestalts are significantly better than non-gestalt pattern (F=14.85, P<0.001). So, hypothesis ***H2a*** is supported. The distinction between gestalts and non-gestalt pattern with respect to organizational performance is not significant (F=0.21, ns). Hence, hypothesis ***H2b*** is not supported.

Table 4. ANOVAs for organizational outcomes across gestalts and non-gestalt pattern

	Mean (Std.D)	
	INNOV	*PERF*
Gestalts (n= 92)	**4.56** (1.06)	**4. 34** (1.21)
Non-gestalt (n= 20)	3.56 (1.01)	4.20 (1.50)
F (P)	14.85 (0.000***)	0.21 (0.645)

*P<0.05; **P<0.01; ***P<0.001.

D. Top management styles and environment characteristics

To explore the relationship between top management styles (including gestalts and non-gestalt pattern) and environment characteristics, individual ANOVAs and descriptive statistics for each gestalt and non-gestalt pattern are presented in table 5.

Table 5 shows that the non-gestalt pattern manifests the lowest levels of environment uncertainty and hostility, and the second lowest level of environment heterogeneity. Democratic entrepreneurial gestalt shows the highest levels of all environment characteristics. Table 4 also shows the significant differences in environment uncertainty (F=2.74, P<0.05) and heterogeneity (F=2.83, P<0.05) among top management styles (including gestalts and non-gestalt pattern). Thus, hypothesis ***H3a*** and ***H3b*** are supported. However, the difference in environment hostility among top management styles is not significant and hypothesis ***H3b*** is not supported.

Table 5. ANOVAs for environment characteristics among gestalts and non-gestalt pattern

Top management styles		Mean (Std.D)		
		EU	*EHE*	*EHO*
Non-gestalt	Cluster 1 (*n*= 20)	***2.57*** (1.03)	5.02 (1.28)	***3.52*** (1.15)
Gestalts	Cluster 2 (*n*= 27) Moderate	3.22 (1.11)	***4.98*** (1.02)	4.09 (1.36)
	Cluster 3 (*n*= 37) Autocratic entrepreneurial	3.33 (1.01)	5.19 (1.08)	4.29 (1.11)
	Cluster 4 (*n*= 28) Democratic entrepreneurial	**3.36** (1.11)	**5.70** (0.71)	**4.42** (1.32)
F (*P*)		2.74 (0.047*)	2.83 (0.042*)	2.36 (0.075)

*P<0.05; **P<0.01; ***P<0.001.

5 Findings and Implications

This study makes three important contributions to the study of the relationship between top management, external environment and organizational outcomes. First, the study identifies gestalts and non-gestalts of top management styles. Cluster analysis shows the significant differences in top management entrepreneurial, long-term and participative orientation among each gestalt and non-gestalt. Democratic entrepreneurial gestalt is the most balanced top management style with the highest scores. On the contrary, non-gestalt manifests inflexible and rigid in all three top management components with the lowest scores.

Second, the study shows the predictive validity of gestalts and non-gestalts. Data reveals that the gestalts are significantly better than non-gestalt pattern with respect to organizational innovation. However, gestalts do not show the obvious superiority in organizational performance compared with the non-gestalt pattern. Maybe, organizational innovation can be impelled by top managers by an appropriate management style, but organizational performance is determined by more complex external factors, such as external environment and industry features (70% of the 20 firms with non-gestalt pattern are in Monopoly industries with loose and lenient external environment).

Third, the relationship between top management styles (including gestalts and non-gestalt pattern) and environment characteristics is explored. The non-gestalt pattern shows low environment uncertainty, heterogeneity and hostility. On the contrary, most gestalts demonstrate higher environment uncertainty, heterogeneity and hostility than non-gestalt pattern. Meanwhile, democratic entrepreneurial gestalt shows the highest levels of all environment characteristics. To some extent, the result seems to show there is a kind of "fit" relationship between top management styles and environment characteristics. Different environment characteristics bring forward different top management styles. Conversely, different top management styles adapt to different environment characteristics.

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The Identification of Knowledge Flow Influence Factors of Enterprises Based on Rough Sets

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Abstract. Based on the research of knowledge management and knowledge flow this paper take the factors which influences the flow of knowledge among the enterprises as the mainly research objects. It uses the Knowledge Absorptive Capacity, Knowledge Matching Degree, Industry Openness Degree as the total input, Knowledge Flow Effects as the total output. Using survey data for example design, and using Rough Sets Theory method calculating and analysis the data. Through the upper approximation and lower approximation describing the relationship between the totle input and knowledge flow effects. Then provide a meaningful guidance for knowledge flow smoothly in the supply chain, enhancing the overall knowledge ability ,and improve efficiency and knowledge ultimately benefit.

Keywords: Supply chain management, knowledge management, Rough Sets, knowledge flow, influencing factor.

1 The Overview of Rough Sets Theroy

Rough Sets Theory is a data analysis theory which proposed by Poland mathematicians Z.Pawlak in 1982. In 1991, Z.Pawlak's Monograph,"Rough Sets——Theoretical Aspects of Reasoning about Data"came out, it marks of Rough Sets theory and its application research enter into the active period. In 1995, ACM Communication placed the Rough Sets as a new computer science research subject. Currently, the Rough Sets Theory has become one of the most active research filed in the information science.

Rough Sets Theory is a new mathematical tool to deal with the ambiguity and uncertain knowledge. Its main idea is to extract decision rules by attribute reduction and value reduction in the premises of keeping the ability of classification. In network information era, how to tap potential and valuable information from so many disorderly and strong interference data is a huge problem. The Rough Sets Theory and method is quite an efficient ways to deal with complex system, this is because that unlike other theories to solving inexplicit problems, Rough Sets Theory is unnecessary to offer any transcendent information except the demanding data set to processing. Of course, owing to this theory does not contain inaccurate raw data, it has very strong complementary sex with other theories to deal with uncertain problems.

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2 The Related Research Comments and Element Confirmation

On the flow of knowledge, the current study focused on the knowledge transfer and value- added inside enterprises, few articles dicuss the knowledge flows among enterprises. On the basis of studying the ralated documents and research fruits of predecessors, this paper try to analysis from the following two aspects, one is the effects of knowledge transfer process, the other is the difficulty level of knowledge transfer, and use the following three elements as the main elements in knowledge flows.

A. Knowledge Matching Degree

As the supply and demand side of knowledge, it must exist different knowledge types between them. This is because of the highly social division of labor specialization. The higher knowledge matching dgree between supply chain enterprises, the better study abilities and results that enterprises can obtain. Knowledge matching degree in knowledge chain reveals that, when the supply chain enterprises carry out their business activities, they not only management center around logistics, but also around the knowledge innovation. So we use Knowledge Matching Degree as one of the main elements which effect knowledge transfer and knowledge sharing among supply chain entrprises.

B. Knowledge Absorptive Capacity

Enterprises' absorptive capacity means that enterprises active learning and obtain knowledge. When uising absorbing knowledge ability as the evaluation criteria to determine and evaluation, the enterprise is a capacity unit, it is a kind of intellectual property or intellectual capital, including patent technology, codes of practice, learning, innovation capability. And in Core Expertise Theories, this capacity means that the skills which enterprises can obtain knowledge, and the implicit knowledge and critical knowledge in enterprises, we call it, Absorptive Capacity.

C. Industry Opening Degree

The main factors of industry opening degree is information infrastructure construction, related legal system, such as intellectual property rights further improved, and the enviroment factor, community knowledge management system. The industry opening degree is expanded with the content of knowledge of the enterprises improves. The higher the overall supply chain knowledge level improved, the more openness of the industry can reach. At the same time, the industry opening degree can react up on the overall level of knowledge in supply chain, they promote each other. Therefore, when the supply chain industry opened highly, the greater possibilitiies of knowledge sharing can reach between enterprises.

3 Research Method

In this model, it take Knowledge Flows Effect elements as Condition Attribute, and take Knowledge Flows Effectiveness as Decision Attribute. The BASIC MODEL of Decision Table is shown in table 1.

Table 1. The Basic Model of Decision Table

Domanin U	Condition attribution C			Decision attribution D
	a	b	c	
x1	f(x1,a)	f(x1,b)	f(x1,c)	f(x1,d)
x2	f(x2,a)	f(x2,b)	f(x2,c)	f(x2,d)
x3	f(x3,a)	f(x3,b)	f(x3,c)	f(x3,d)
x4	f(x4,a)	f(x4,b)	f(x4,c)	f(x4,d)
x5	f(x5,a)	f(x5,b)	f(x5,c)	f(x5,d)

Introduct three influential elements among supply chain enterprises knowledge flows as the Condition Attribute of the Decision Table, that is Knowledge Matching Degree (C_1), erntereprises Knowledge Absorptive Capacity (C_2), and Industry Opening Degree (C_3), Knowledge Flow Effectiveness (D) as the Decision Attribute. The Attribute Value is get from the investigation of enterprises.

The influential elements are composed of the folllowing 3 parts:

First, Knowledge Matching Degree (C_1), it represents the match condition of knowledge between the enterprise supply and its partners demeand, and measure the diffculty-level of exchange and obtain knowledge between the partners.

Second, Knowledge Absorptive Capacity (C_2), it represents the subjective positive extent of knowledge communication between enterprise and its partners, obtain experience and learning ability of enterprise.

Third, Industry Opening Degree (C_3), it represents the objective environment of knowledge outputs and inputs in the Supply Chain.

Knowledge Flow Effectiveness (D), it represents in the presence of the above elements, which impact on the knowledge flow in supply chain networks finally.

A. Simple Classification of Decision Table

Algorithm P:

P1.[Initialize] Set 1→i,1→j,1→s. $V_1 = \{u_1\}$.

P2.[Is $i = |U|$?] If $i = |U|$,then the classification is completed,and we have $U / a = \{V_1, V_2, ..., V_s\}$.If $i < |U|$,then go to P3.

P3.[Increase i] i+1→i,1→j,go to P4.

P4.[Is j=s?] If j=s,then establish a new class $s+1 \to s, V_s = \{u_i\}$ and go to P2 to input the next object (if any).If j<s,then go to P5.

P5.[Increase j] j+1→j,go to P6.

P6.[Is $a(u_i) = a(V_j)$?] If $a(u_i) = a(V_j)$,then $u_i \in V_j$,go to P2. Otherwise,go to P4 to check the next V_j (if any).

B. Intersection Calculation

Algorithm I:

I1.[Initialize] Set 1→i, 1→j, 0→r.

I2. [Is $V_{1i} \bigcap V_{2j} = \emptyset$?] If intersection $V_{1i} \bigcap V_{2j} = \emptyset$,then go to I3 to check the next intersection.Otherwise,set r+1→r and establish a new class $V_r = V_{1i} \bigcap V_{2j}$ for U/ab.go to I3 check the next intersection.

I3.[Is j=t?] If j=t,then go to I5 to check next i. Otherwise,go to next step I4 to see next j.

I4.[Increase j] Set j+1→j. go to I2.

I5.[Is i=s?] If i=s,then the classification is completed,and we have $U/ab = \{V_1, V_2, ..., V_r\}$.Otherwise,go to I6.

I6.[Increase i] Set i+1→i,1→j.go to I2.

C. Supporting Subset Calculation

L1.[Initialize] Set 1→j, $\emptyset \to L$.

L2. [Is $V_j \subseteq W$?]If $V_j \subseteq W$,then $L \bigcup U \to L$ .Otherwise,go to L3 to check the next V_j （if any）.

L3.[Is j=s?] If j=s,then the algorithm is completed,and we have $W^{(U/a)^-} = L$. Otherwise,go to L4 to check the next V_j .

L4.[Increase j] Set j+1→j,go to L2.

4 Modeling

A. Model Design and Effectiveness Analysis

Take the datum from ten enterprises of a knowledge supply chain as this model calculus datum. Working as follows, collect u_i (i=1,2,3,4,5,6,7,8,9,10) groups'datum, and introduct the four elements, Knowledge matching degree (C_1) , Knowledge Absorptive Capacity (C_2) , Industry Opening Degree (C_3) ,and Knowledge Flow Effectiveness (D) . The expert evaluating result table and expert evaluating reference table is shown in table 2 and 3.

Table 2. Expert Evaluating Result Table

Enterprise supply chain u_i	Knowledge matching degree C_1	Knowledge Absorptive Capacity C_2	Industry opening degree C_3	Knowle-dge flow effectiveness D
u_1	0.1	0.7	0.1	0.5
u_2	0.8	0.3	0.7	0.2
u_3	0.1	0.7	0.1	0.5
u_4	0.1	0.3	0.1	0.2
u_5	0.5	0.7	0.3	0.8
u_6	0.5	0.7	0.9	0.8
u_7	0.8	0.3	0.7	0.2
u_8	0.5	0.7	0.3	0.8
u_9	0.1	0.7	0.1	0.5
u_{10}	0.8	0.3	0.7	0.2

Table 3. Expert Evaluating Reference Table

Evaluation	Meaning
0.1	The effect is very low
0.3	The effect is very low
0.5	The effect is medium
0.7	The effect is high
0.9	The effect is very high
0.2, 0.4	The medium between the neighbour evaluation,
0.6, 0.8	for example, 0.2 means the effect between very low and low

The data collection will be used to analysis the identification of influentiial elements and its important-level by using the rough set.

B. Example Calculate

Application of the above algorithm P, calculated equivalence classes as follows,

$$U/C_1 = \{\{u_1, u_3, u_4, u_9\}, \{u_2, u_7, u_{10}\}, \{u_5, u_6, u_8\}\}$$

$$U/C_2 = \{\{u_1, u_3, u_5, u_6, u_8, u_9\}, \{u_2, u_4, u_7, u_{10}\}\}$$

$$U/C_3 = \{\{u_1, u_3, u_4, u_9\}, \{u_2, u_7, u_{10}\}, \{u_5, u_8\}, \{u_6\}\}$$

$$U/D = \{\{u_1, u_3, u_9\}, \{u_2, u_4, u_7, u_{10}\}, \{u_5, u_6, u_8\}\}$$

Application of the above algorithm I, calculated indistinguishable relationship, that is the basic knowledge of U and C as follows,

$$U/ind(C) = \{\{u_1, u_3, u_9\}, \{u_4\}, \{u_2, u_7, u_{10}\}, \{u_5, u_8\}, \{u_6\}\}$$

$$U/ind(C - C_1) = \{\{u_1, u_3, u_9\}, \{u_4\}, \{u_2, u_7, u_{10}\}, \{u_5, u_8\}, \{u_6\}\}$$

$$U/ind(C - C_2) = \{\{u_1, u_3, u_4, u_9\}, \{u_2, u_7, u_{10}\}, \{u_5, u_8\}, \{u_6\}\}$$

$$U/ind(C - C_3) = \{\{u_1, u_3, u_9\}, \{u_4\}, \{u_2, u_7, u_{10}\}, \{u_5, u_6, u_8\}\}$$

Application of the above algorithm L, calculated each positive field of C, C_1, C_2, C_3, $C - C_1$, $C - C_2$, $C - C_3$.

$$pos_C(D) = \{u_1, u_3, u_9\} \cup \{u_4\} \cup \{u_2, u_7, u_{10}\} \cup \{u_5, u_8\} \cup \{u_6\}$$
$$== \{u_1, u_2, u_3, u_4, u_5, u_6, u_7, u_8, u_9\ u_{10}\}$$

$$pos_{C_1}(D) = \{u_2, u_7, u_{10}\} \cup \{u_5, u_8\ u_6\} = \{u_2, u_5, u_6, u_7, u_8, u_{10}\} \neq pos_C(D)$$

$$pos_{C_2}(D) = \{u_2, u_4, u_7, u_{10}\} \neq pos_C(D)$$

$$pos_{C_3}(D) = \{u_2, u_7, u_{10}\} \cup \{u_5, u_8\} \cup \{u_6\}$$
$$= \{u_2, u_5, u_6, u_7, u_8, u_{10}\} \neq pos_C(D)$$

$$pos_{(C-\{C_1\})}(D) = \{u_1, u_3, u_9\} \cup \{u_4\} \cup \{u_2, u_7, u_{10}\} \cup \{u_5, u_8\} \cup \{u_6\}$$
$$= \{u_1, u_2, u_3, u_4, u_5, u_6, u_7, u_8, u_9\ u_{10}\} = pos_C(D)$$

$$pos_{(C-\{C_2\})}(D) = \{u_2, u_7, u_{10}\} \cup \{u_5, u_8\} \cup \{u_6\}$$
$$= \{u_2, u_5, u_6, u_7, u_8, u_{10}\} \neq pos_C(D)$$

$$pos_{(C-\{C_3\})}(D) = \{u_1, u_3, u_9\} \cup \{u_4\} \cup \{u_2, u_7, u_{10}\} \cup \{u_5, u_6, u_8\}$$
$$= \{u_1, u_2, u_3, u_4, u_5, u_6, u_7, u_8, u_9\ u_{10}\} = pos_C(D)$$

(1) Indentify Important Elements

The parameters and final terms of the results indicate that, $pos_{(C-\{C_1\})}(D) = pos_{(C-\{C_3\})}(D) = pos_C(D)$, and $pos_{(C-\{C_2\})}(D) \neq pos_C(D)$, so we can conclued that, C_1 and C_3 is redundent elements, and C_2 is non-droppable element, that is to say, Knowledge Absorptive Capacity is indispensable in enterprise, relatively, Knowledge Matching Degree and Industry Opening Degree is redundent. However, the redundant elements are not only one, so it is necessary to identify the dependence degree of Knowledge Flows Effectiveness on the whole condition attribut. So that we can get the decision table. Therefore, in accordance with formula (4.1), we can calculate the result.

$\gamma_C(D) = \left|pos_C(D)\right| / \left|U\right| = 10/10 = 1$ (It means that Knowledge D fully dependent on knowledge C);

$\gamma_{C_1}(D) = \left|pos_{C_1}(D)\right| / \left|U\right| = 6/10 = 0.6$ (It means that Knowledge D partly dependent on knowledge C_1);

$\gamma_{C_2}(D) = \left|pos_{C_2}(D)\right| / \left|U\right| = 4/10 = 0.4$ (It means that Knowledge D partly dependent on knowledge C_2)

$\gamma_{C_3}(D) = \left|pos_{C_3}(D)\right| / \left|U\right| = 6/10 = 0.6$ (It means that Knowledge D partly dependent on knowledge C_3)

$\gamma_{C_1C_2}(D) = \left|pos_{C_1C_2}(D)\right| / \left|U\right| = 10/10 = 1$ (It means that Knowledge D fully dependent on knowledge $\{C_1, C_2\}$)

$\gamma_{C_1C_3}(D) = \left|pos_{C_1C_3}(D)\right| / \left|U\right| = 6/10 = 0.6$ (It means that Knowledge D partly dependent on knowledge $\{C_1, C_3\}$)

$\gamma_{C_2C_3}(D) = \left|pos_{C_2C_3}(D)\right| / \left|U\right| = 10/10 = 1$ (It means that Knowledge D fully dependent on knowledge $\{C_2, C_3\}$)

The results showed that the decision attribute to condition attribute, the dependency level is 1, to C_2, the dependency level is 0.4, to $\{C_1, C_2\}$, the dependency level is 1, to $\{C_1, C_3\}$, the dependency level is 0.6, and to $\{C_2, C_3\}$, the dependency level is 1. This demonstrates that C_2 must be preserved, and either C_1 or C_3 can be cancled out, to maintain the denpendecy level of Decision Attribution to Condition Attribution is 1, or so to speak, to keep the category capacity does not change, then we can get the Decision Table 4 and 5.

(2) The importance of each attribute

From formula 4.2, we can calculate the importance of C_1、C_2、C_3 respectively.

$$\sigma_{CD}(C_1) = \gamma_C(D) - \gamma_{C-C_1}(D) = 1 - 10/\ 10 = 0$$

$$\sigma_{CD}(C_2) = \gamma_C(D) - \gamma_{C-C_2}(D) = 1 - 6/\ 10 = 0.4$$

$$\sigma_{CD}(C_3) = \gamma_C(D) - \gamma_{C-C_3}(D) = 1 - 10/\ 10 = 0$$

The results of calculation shows, the important level of C_1 and C_3 is zero, and the important level of C_2 is 0.4. Thus it can be seen that, in decision table 5.1, only C_2 is the most important, C_1 and C_3 are both unimportant.

From the aforementioned decision-making rules we can see, the knowledge absorptive capacity occupy a dominant position and its role should not be overlooked.

Table 4. Decision Table Expressed by Reduct $\{C_1, C_2\}$

Supply chain enterprise u_i	Knowledge matching degree C_1	Knowledge Absorptive Capacity C_2	Knowledge Flow Effectiveness D
u_1	0.1	0.7	0.5
u_2	0.8	0.3	0.2
u_3	0.1	0.7	0.5
u_4	0.1	0.3	0.2
u_5	0.5	0.7	0.8
u_6	0.5	0.7	0.8
u_7	0.8	0.3	0.2
u_8	0.5	0.7	0.8
u_9	0.1	0.7	0.5
u_{10}	0.8	0.3	0.2

Table 5. Decision Table Expressed by Reduct $\{C_2, C_3\}$

Supply chain enterprise u_i	Knowledge Absorptive Capacity C_2	Industry Opening Degree C_3	Knowledge Flow Effectiveness D
u_1	0.7	0.1	0.5
u_2	0.3	0.7	0.2
u_3	0.7	0.1	0.5
u_4	0.3	0.1	0.2
u_5	0.7	0.3	0.8
u_6	0.7	0.9	0.8
u_7	0.3	0.7	0.2
u_8	0.7	0.3	0.8
u_9	0.7	0.1	0.5
u_{10}	0.3	0.7	0.2

5 Data Analysis Conclution

The Rough Sets Theroy emphasis to resduct knowledge in the situation that keep the category capacity does not change. By this method, this paper reflect objectively the key elements and their mutual relationships among the supply chain enterprises, and it is just overcome the deficiencies of the former research that conclued by subjective feelings and lack of theoretical basis. Of course, the paper also has deficiencies, it still need to expand samples, and further enhance the validity of data.

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Research on Knowledge Partner of the Enterprise Selection and Evaluation with BP Neural Network

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Abstract. This paper mainly demonstrates how to make the optimal choice on selecting enterprise's knowledge partner with BP neural network. In the paper, firstly, based on the literature review, it established the evaluating system of knowledge partner selection based on BP neural network. Secondly, the paper gave an evaluation model of BP neural network and used an example to analyze. The model does not only enhance the scientific nature of knowledge partner evaluation, but also provides the policy-making support for the enterprise.

Keywords: Knowledge partner, partner selection, BP neural network.

1 Introduction

Now the environment which the enterprises is in has taken place major changes: the information explosion, resource scarcity and technological uncertainty, the uncertainty of market demand, consumers becoming more rational, economic globalization and complexity, rapid development of the network technology, which forced the firm to transform from competition to cooperation. In the knowledge economy era knowledge has become a strategically significant resource. The importance of knowledge was affirmed by the U.S. economist Paul M.Romer and Peter F. Drucker. It was an important source of economic resources which could make enterprises gain a continuing competitive advantage. Nowadays, collaboration is an important way of acquiring new knowledge. Therefore learning from knowledge partners can enhance business competitiveness and how to evaluate and select knowledge partner has a great significance to the development of enterprises.

2 The Theory of Knowledge Partners

A. Knowledge Cooperation

In general, knowledge that companies acquire from the cooperation includes: new technological expertise, new marketing expertise, product development, knowledge about cultures and tastes, managerial techniques and manufacturing processes [2]. Some knowledge and information are about to technical aspects, mainly referring to the patent, copyright and other intellectual property rights; some knowledge is measured by the carrier of the material--the human brain; the rest are hidden in the company's organizational structure, management systems and production systems.

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Accordingly, knowledge cooperation between enterprises is: co-participation in R & D projects (including studying on new products), the introduction and learning new management mode, market knowledge sharing and so on.

B. Literature Review

There are many literatures exploring about partner selection. Yannis A. studying on partner selection in international joint ventures had adopted a quantitative model which can achieve the target of partner selection. Tien-Chin Wang thank that Human thoughts were full of uncertainty, so decision makers could not accurately compare partners, the fuzzy preference could solve this problem in order to select appropriate partners. Li Lin and Yan Wang had introduced fuzzy theory to establish a partnership selection model. Ruihua Huang considered the existence of asymmetric information about the intellectual property right when selecting partners, so dynamic game model was used to analyze the conditions for choosing high-quality partners. But in the domestic and foreign literatures, limited papers study on selecting knowledge partner. A number of studies only related to select and evaluate knowledge partners based on knowledge alliance and knowledge chain partners, or explored knowledge sharing among the enterprises. Morten T Hansen highlighted knowledge sharing between the enterprises. Hongjun Xiao、Qi Liu and Li Lin separately studied about choosing the knowledge partners in the knowledge alliance. Shaobo Wu analyzed that relation ties of knowledge partners could greatly influence cooperation efficiency in the knowledge chain.

In general, knowledge cooperation is very different from other cooperation forms, because its critical resource is knowledge and knowledge has many special features. Enterprises choose knowledge partners for the learning and achieving knowledge from the partner in order to innovate and enhance the competitiveness of enterprises. It is a new area and there are little articles for enterprises in terms of selecting and evaluating knowledge partners. Many focus on the supply chain, strategic alliances, knowledge chain, knowledge sharing, and cooperation mechanism and so on. So this paper explores the selection of enterprise's knowledge partners.

As the enterprise selects knowledge partner, on the one hand the enterprise has had relative knowledge cooperation experience with other enterprises. On the other hand there are qualitative and quantitative indices in index evaluating system. The BP neural network is a method combining qualitative and quantitative aspects, it do not need to make sure the relationship between various factors and has a non-linear adaptive information processing capability and can learn more experience of the samples, so it is one of the most suitable methods for selecting knowledge partner. Therefore, this article constitutes an effort to evaluate and select knowledge partners with BP neural network.

3 Evaluation System of Knowledge Partner

As early as 1965, Pegram set up the evaluation system about partners, listing the credit and financial situation, the product line situation, partner reputation, co-market coverage, sales, marketing power, management and partners' channel membership and other indicators. Subsequently, many scholars explored the selection of partners. Keith D. Brouthers (1995) thank that when choosing partners it should take into account complementary skills, cooperative cultures, compatible goals and commensurate levels of risk. With the development of social and economic, knowledge becomes an important factor considered by scholars. Wann Yih Wu, His

An Shih (2009) presented two of the five indicators relate to knowledge, which are marketing knowledge capability and intangible assets. They measure intangible assets with the trademarks, patents, licenses or other proprietary knowledge, reputation, experience and the proficient technical level of the employees.

In our country many scholars explored partners' selection in different circumstances. For instance, Weiqun Xiao、Dan Wang highlight the role of three knowledge cooperation indices such as the value of collaboration, cooperation and risk under studying the literatures. Hongjun Xiao and Qinhua Yuan provided an evaluation system by the Delphi method in the knowledge alliance. They drew a pattern of significant indices of enterprises partner selection including compatibility, complementarily, credibility, knowledge absorptive capacity and intellectual property through giving scores by experts.

Table 1. Criteria in the knowledge partner selection

Criteria	Sub-criteria	Author
Knowledge evaluation C1	Complementary of knowledge C11 Value of knowledge C12 Knowledge stock C13	Keith（1995）; Ruihua Huang（2004）; Qinhua Yua（2007）;Yuming Xiao（2007）
Resources and equipments evaluation C2	Knowledge database C21 Human resources C22 R&D equipments C23	Wann YihWu（2009）;Qinhua Yuan（2007）
Evaluation of trust and relationship C3	Reputation C31 Brand value C32 The relationship between C33	Morten（1999）; Mario（2005）; Wann YihWu（2009）; Qinhua Yuan（2007）
Fusion evaluation C4	Culture C41 The common goal C42 Willingness to share knowledge C43	Keith（1995）; Morten（1999）; Wann YihWu（2009）; Hongjun Xiao（Qinhua Yuan（2007）; Yuming Xiao（2007）
Capabilities C5	The level of knowledge encoded C51 The types and number of owned partners C52 Management C53	Morten（1999）; Wann YihWu（2009）; Weiqun Xiao（2009）

This paper is mainly to study how to select the knowledge partner in the process of cooperation. Knowledge partners are different from other partners. Based on previous studies and taking into consideration the characteristics of the knowledge this paper makes the evaluation system.

4 Knowledge Partner Selection Based on Bp Neural Network

The research about neural network began in 1943, WS McCulloch and WA Pitts, the physiologist of Chicago University, presented the neuron model. After development of several decades, there are several types of neural networks, like forward networks, feedback networks and so on. They are applied in the different aspects.

BP neural network is a kind of multiple-layer feedback networks and a nonlinear dynamic system, which is adopted to find out inner relationships. So its structure includes input layer, middle layer (hidden layer) and the output layer. The structure is shown in Figure 1.

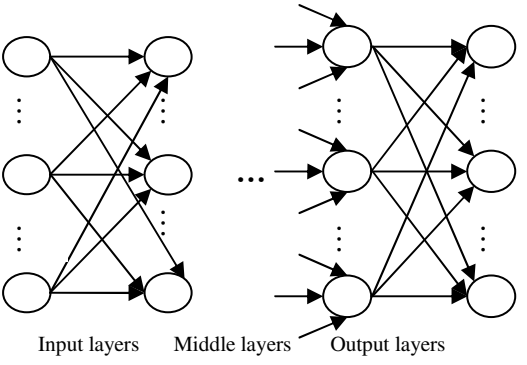

Fig. 1. The structure of BP network

BP neural network processes information by simulation of the human brain function. Companies can choose the right knowledge partners according to their own or other business partners' successful experience. If there are many partners and indices, it is not possible to select the partner with experience of human brain alone. However the artificial neural network can learn to get knowledge outside and storing the knowledge into the network, then deal with the existing problems.

5 The Simulation

It supposes that there is an enterprise selecting partners based on this index system. The company has five options to be selected. According to past data, experience and evaluation of the experts, the value of knowledge, knowledge database, human resources, research equipments, the type and quantity of partner use quantitative analysis. The other indexes use expert scoring method with percentile. Eight groups will be used to train the network with the data of typical knowledge partners.

Drawn from the target index system, it has fifteen input layers and one output layer in the network.

There are several ways in the middle layer (hidden layer) design. (1) The first method is the Kolmogorov theorem; there are n processing units in the input layer, 2n +1 processing units in the middle layer and m processing units in the output layer. (2) It is to be resolved according to the formula $\sum_{i=0}^{n} C_{n_i}^{i} > k$, k is the sample size, n_1 is the number of hidden units, and n is the number of input cell. If $i > n_1, C_{n_i}^{i} = 0$. (3) It is to be resolved by $n_1 = \sqrt{n+m} + a$, m is the number of output neurons, n is the number of input units, and a is a constant ($a \in [1, 10]$) to determine the number of hidden units. (4) The fourth method is $n_1 = \log_2 n$, in which n is the number of

input units. In general, most of scholars use the first method, but with the first method, the number of training and training time will increase. So it should combine the second, third and fourth methods together to determine the hidden layer. Based on the method above and taking into consideration about the situation of partner selection, the number of neurons should be 4 ~14. Therefore, firstly we must compare the error of training network to determine the network's hidden layer and training functions.

Table 2. The Error of Training Network

The number of neurons	The error of network
4	0.0483
5	0.0449
6	0.0505
7	0.0275
8	0.0634
9	0.0296
10	0.0429
11	0.0391
12	0.0827
13	0.0157
14	0.0411

Table 1 show that after training, when the number of hidden layer neuron is 13, the error is 0.0157 which is the least number, so BP network with 13 neurons is the best for closing in on the function. Then we select 13 hidden layers. Through 4 times after training in Figure 2, the network reached the required target error.

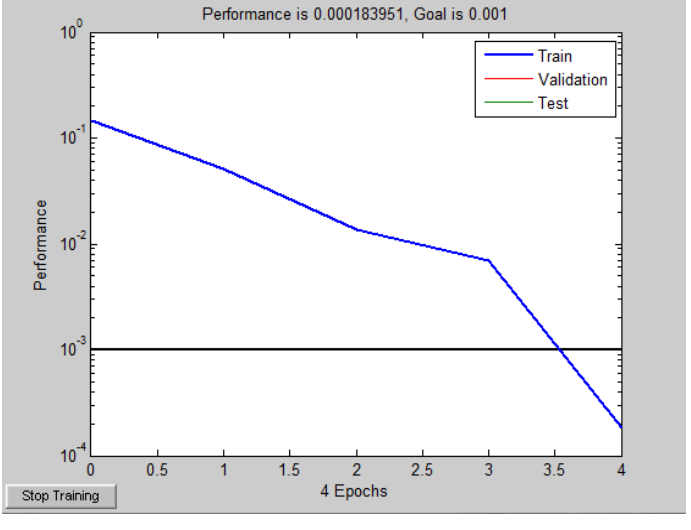

Fig. 2. Training Result（Training function：trainlm）

The quantitative indicators use enterprises' data directly, the qualitative indicators use a method of experts scoring. The data of the cooperative enterprises selected normalizes. The result is as follows:

Table 3. The data of the cooperative enterprises

Partner 1	Partner 2	Partner 3	Partner 4
0.3800	0.4200	0	1.0000
0	1.0000	0.3400	0.6800
0.7200	0	0.6800	1.0000
1.0000	0.4300	0	0.7200
0.5700	1.0000	0	0.3800
1.0000	0.3400	0.8200	0
1.0000	0.4200	0.7800	0
0	0.5700	0.6200	1.0000
0.4300	1.0000	0.7200	0
0.3900	0	1.0000	0.8400
0.4200	0	0.7300	1.0000
0.2100	0.7300	0	1.0000
0.1800	0	0.7400	1.0000
1.0000	0.5700	0	0.3600
0	0.7100	1.0000	0.4200

These results were 0.1697、0.2394、0.8669、0.9603, after inputting data into the network, learning and training it, we can see the forth partner is the best partner.

Thus, BP algorithm to select business partners can make knowledge evaluation system with learning ability and can provide the basis for subsequent decision-making based on previous experience. It avoids the subjective calculation of index weight, which is favorable for enterprises to choose. On the other hand it also enhances the results more objectivity and reliability.

6 Conclusions

With the coming of knowledge economy, in the development process enterprises more and more incline to knowledge cooperate with other enterprises in addition to the past cooperation forms. It will make knowledge continuously updated and the enterprise gains a sustainable competitiveness. This article discusses that the business can use BP neural network to select the knowledge partner in the actual operation for using better of corporate experience and expert resources. Supply chain and strategic alliances are the most critical enterprise cooperation networks, which involves a considerable co-operation of knowledge. The choice of partners is also particularly very important. Therefore, this method can be used into enterprises in supply chain or strategic alliances in order to provide reference for the development of enterprises.

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E-Learning Resources Organization Based on Topic Maps

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Abstract. Topic Maps standard (ISO-13250) has been gradually recognized as an emerging standard for information exploration and knowledge organization. With the Topic Maps as infrastructure, the architecture of the e-learning resources organization based on Topic Maps is designed in this paper. It is composed of three levels: Topic Maps generation, Topic Maps merging and topics clustering. Topic Maps generation is the core technology to deal with the distributed e-learning resources. Topic Maps merging describes the process of integrating the local topic maps into a global topic map. Topics clustering provide the effective navigation and browsing mechanism for users. Finally, a demonstration is given to display the e-learning resources organization system based on Topic Maps.

Keywords: Topic map, E-learning, Knowledge organization.

1 Introduction

E-learning is defined as all forms of electronic supported learning and teaching, which are procedural in character and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner [1]. The purpose of e-learning is to provide benefits for the learner, such as improved performance, increased access, convenience and flexibility to learners [2] and to ensure that learners have the digital literacy skills required in their discipline, profession or career [3]. Today, many technologies can be used in e-learning, from blogs to collaborative software, ontology, and virtual technology. The efficient and effective organization and management of e-learning resources is of critical importance to the success and learner acceptance of e-learning. The mode of most of existing e-learning resources organizations are based on file, which is a coarse granularity service. It is difficult to satisfy the multi-level, multi-granularity knowledge acquisition demand of users. For example, when users want to get a certain knowledge paragraph from a big file (e.g., several MB) on the internet, they have to download the whole file first, and read one by one to find out that paragraph, resulting in the waste of network bandwidth and the increased burden of learning. Furthermore, the resource service based on file level is difficult to express the chapters, sections, paragraphs, concepts, knowledge elements in knowledge resource.

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Thus, this paper addresses three problems: (1) How do we organize complex e-learning resources effectively? We organize e-learning resources based on Topic Map (TM), which describes knowledge structures and associates them with information resources. TM establishes a semantic web above the resource level [4]. So, it implemented the semantic organization and joining between the physical resource entities and the abstract concepts. (2) How do we design the e-learning resources organization system? With the TM as infrastructure, the architecture of the e-learning resources organization system is designed. It is a multi-level architecture. (3) How do we provide efficient user-oriented knowledge navigation service? We design the model of knowledge navigation service based on TM. In order to provide the effective navigation and browsing mechanism for users, we process the topics by clustering analysis.

2 Topic Map

Topic Map is an ISO standard [5] that describes knowledge and links it to existing information resources. The basic structure of Topic Map consists of topics, associations and occurrences [6, 7]. The structure of TM is depicted in Fig. 1.

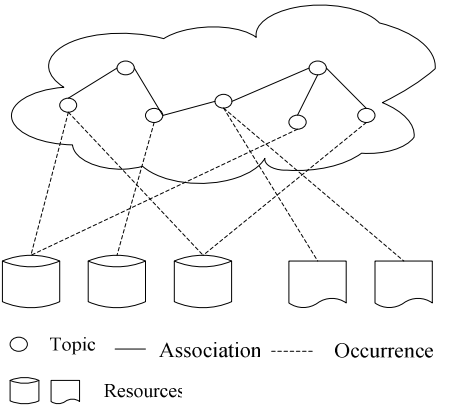

Fig. 1. The structure of Topic Map

- Topic: representing any concept, from people, countries, and organizations to software modules, individual files, and events.
- Association: representing the relationships between topics. The structure of interconnected topics allows learners to easily understand the relationships between terms appearing in studied disciplines and to navigate in resources meaningfully.
- Occurrence: representing information resources relevant to a particular topic.

TM works with topics, the relationships between topics, and links the corresponding resources to those topics. Because TM is independent of the resources, it can establish the relationship among unstructured information resources, and allow

concrete objects to be joined with abstract concepts. TM is designed to solve the problem of large quantities of unorganized and heterogeneous information in a way that can be optimized for navigation. Topic maps are finding increasing application as the foundation for websites and portals, as well as in Knowledge Management (KM), e-learning, etc. The knowledge logical organization framework based on extended topic maps is presented [8]. With the extended topic map as infrastructure, the framework of knowledge collaborative building in distributed scenario is achieved by the following four stages: knowledge extraction, local extended topic map generation, similarity computation and global extended topic map generation [9]. By studying the critical factors in knowledge learning, a system framework of the knowledge learning based on extended topic map is designed and implemented. It embodies the multi-level, multi-granularity and inherent relevant characteristics of knowledge and realizes knowledge visualization display [10]. Moreover, TM merging enables each learner to build his or her own individual maps. According to individual preferences, we can searching and querying maps using standard predefined queries or queries defined by user and customizing visualization of maps, etc [11].

3 The Architecture of E-Learning Resources Organization Based on Topic Maps

The architecture of e-learning resources organization based on topic map provides a semantically interactive environment for the learner, which is composed of three levels, TM generation, TM merging and topics clustering respectively from bottom to top. It is shown in Fig. 2.

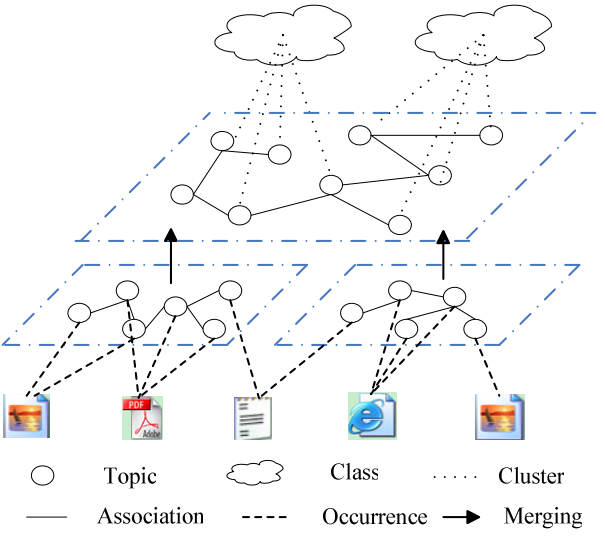

Fig. 2. The architecture of e-learning resources organization based on Topic Maps

A. TM Generation

TM generation is the core technology to deal with the distributed e-learning resources. We define two stages, i.e., knowledge extraction and TM generation.

1) Knowledge extraction: Knowledge extraction includes the topics and the relationships between topics. Topic acquisition may be regarded as the issue of sequence tagging, we use sequence data labeling technique to obtain the terminologies. Relationships between topics extraction is a classification problem. All possible pairs of relational words are listed, and a classifier is used to determine which pairs of relational words are really needed. The following text clips are regarded as an example to show the relationship between topics [9].

No matter which *protocol* is used, such as *IP*, *IPX*, …

Data link layer includes *LLC* and *MAC*…

Routing protocols include *RTMP*, *OSPF*…

FCS field includes a *Cyclic Redundancy Check* (*CRC*)…

The above text clips contain relations is shown Table 1.

Table 1. The text clips contain relations

	Relation type		
	Synonymous relation	Instance of relation	Part of relation
Relation	Cyclic Redundancy Check and CRC	protocol and IP, protocol and IPX, Routing protocols and RTMP, Routing protocols and OSPF	Data link layer and LLC, Data link layer and MAC, FCS and Cyclic Redundancy Check, FCS and CRC

2) TM generation: For the relationships between topics are established, then the new topics are layer-by-layer extended based on these relationships. Moreover, the relationships between topic and resource are also established. The algorithm is as follows:

Step 1: choosing an initial topic *t* arbitrarily.

Step 2: Searching all the topics which are associated with *t*, the results are stored in $setT_1$, which is a HashSet.

Step 3: Searching all the topics which are associated with the topics in $setT_1$, and then using them as the center of knowledge unit circle respectively, the knowledge radius is equal to 1. The results are stored in $setT_2$.

Step 4: Continue searching new topics which are associated with the topics in $setT_2$, and then using them as the center of knowledge unit circle respectively, the knowledge radius is equal to 1, until all topics are searched.

Step 5: Searching the occurrences which are associated with the topics.

The knowledge radius is the number of topics traversed in a knowledge path which is a sequence t_p, t_1, t_2, ..., t_m, t_q, and there are association between (t_p, t_1), (t_1, t_2), ..., (t_m, t_q) respectively in TM.

B. TM Merging

Merging between topic maps describes the process of integrating two topic maps into a new one. Merging operation TMM (Topic Map Merging) is defined as the following expression:

$$TMM : TM_a \times TM_b \rightarrow TM_c \tag{1}$$

TM Merging is divided into two parts: First, how the similarity of each pair of topics may be calculated. Second, how two topic maps are merged in accordance with the rules.

1) Similarity calculation: We adopt a similarity measure algorithm for topics which called Subject Identity Measure (SIM) [12]. This algorithm is used to calculate the syntactic similarity by analyzing the character composition of topics. For a topic pair **(t_1, t_2)**, we calculate the similarity as follows:

$$SIM(t_1, t_2) = \frac{2c}{|t_1| + |t_2|} \tag{2}$$

The c denotes the number of characters of the largest common substring contained in two topics. We can calculate how many words are matched between t_1 and t_2. If the value of SIM (t_1, t_2) is higher than a threshold, it would be considered that t_1 is same as t_2.

2) TM Merging: If t_1 has high similarity with t_2, they would be merged into a single one. When two topics are merged, the corresponding association merging would be considered. For example, an association A_a (t_1, t_3) exists between t_1 and t_3, an association A_b (t_2, t_4) exists between t_2 and t_4. If t_1 has high similarity with t_2, the merged topic t_1 has two associations, i.e., A_a (t_1, t_3) and A_b (t_1, t_4) [13].

C. Topics clustering

Clustering analysis is the assignment of a set of topics into subsets (called clusters) so that topics in the same cluster are similar in some sense. It can provide the effective navigation and browsing mechanism for learners. The algorithm is as follows:

Step 1: initializing each topic node $Tnode_i$,

$\forall i \in I, I = \{ j = 1, 2, ..., N \}$, and corresponding to an initial class Γ_i.

Step 2: Searching a pair of cluster set in $\{\Gamma_k \mid k \in I\}$,

which satisfies $\Delta(\Gamma_{k1}, \Gamma_{k2}) = \underset{\forall j1, j2 \in I}{Min} \Delta(\Gamma_{j1}, \Gamma_{j2})$.

$\Delta(\Gamma_{k1}, \Gamma_{k2})$ denotes the distance between two topic clusters. We select the nearest distance:

$$Max(r_{i1,i2}), \quad \forall Tnode_{i1} \in \Gamma_{k1}, \forall Tnode_{i2} \in \Gamma_{k2}$$

Step 3: If the nearest distance $\Delta(\Gamma_{k1}, \Gamma_{k2}) > \Delta_{thre}$, ending the calculation; otherwise, incorporating Γ_{k1} into Γ_{k2}, and deleting Γ_{k1}.

Step 4: removing k_1 from the target set. If I>2, ending the calculation; otherwise, jumping to Step 2 to continue.

TM provides a good knowledge logical organization model for e-learning.

4 Demonstration

We built two topic maps about the domain of "Data Structure", which are depicted in Fig. 3 and Fig. 4.

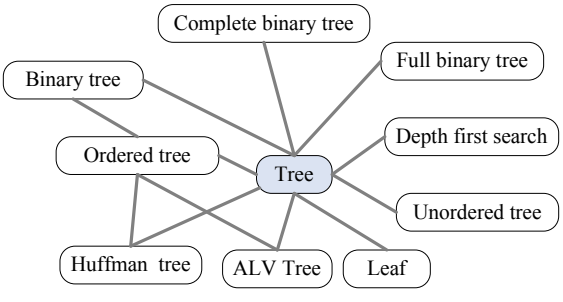

Fig. 3. Local topic map A of "Data Structure"

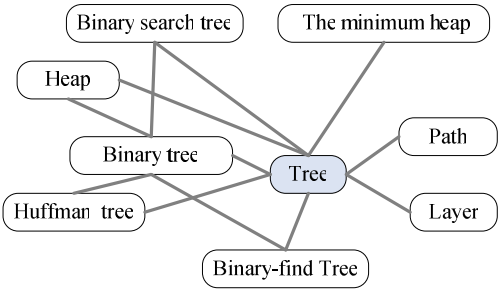

Fig. 4. Local topic map B of "Data Structure"

We merged these two local topic maps into a new topic map, which is shown in Fig. 5.

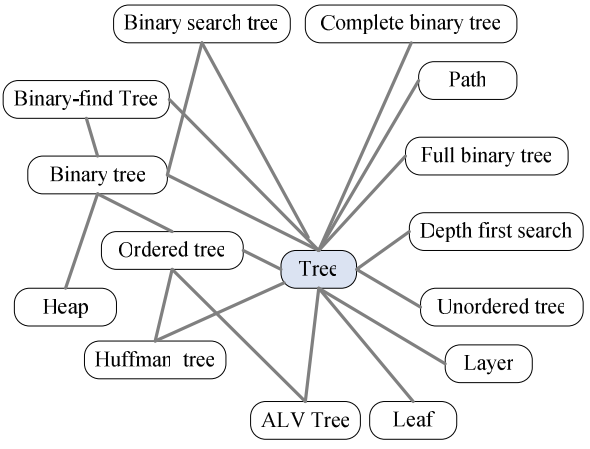

Fig. 5. Topic map C of "Data Structure" after merging

5 Conclusions

TM provides a simple and powerful method for e-learning resources logical organization, which not only expresses the knowledge, but also fully reflects the associations between the knowledge and establishes a semantic web above the resource level. TM strictly separates stored knowledge from associated unstructured information resources, thereby allowing to link heterogeneous, unmodified resources of information semantically by creating a homogeneous layer of knowledge structure in the form of topic map. It can provide visual knowledge navigation mechanism. TM based e-learning supports for classification, navigation and exploration of concepts, instances, relationships and resources in the considered subject domain.

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Knowledge Creation Model of Multinational Technological Innovation

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Abstract. Multinational technological innovation is an effective way to obtain to technical knowledge, improving technical capability, and knowledge management, in the 21st century, becomes the popular topic in the field of knowledge. The thesis, which focuses on the researching of the knowledge management, the model of SECI and the technology innovation, tries to put the knowledge creation pattern of multinational technological innovation for the limitation of the SECI model in practical application.

Keywords: Technological innovation, knowledge management, knowledge creation, SECI.

1 Introduction

Being the commitment and organizers of technical innovation, Multinational corporations, the investment entity, is the inevitable production of the accelerating development of economic globalization, and the increasing international competition of globalization strategy, whose around 5%-20% of annual revenue is used as investment of technological research and development. Currently, multinational companies, in the world, dominated 70% of technology transfer and 88% of the new technologies and techniques [1]. Therefore, multinational companies must find various innovative ways to enhance its innovation capability and rapid response capacity on the market, who can utilize the knowledge, information and resources which get from the internet to upgrade the technology and create their own core competencies.

2 Review of the Literature

About the theory of multinational technological innovation, Louis T. Wells (1977) presented the "small scale technology theory" which emphasizes that developing countries have competitive advantage on some products because of low cost, similar culture and approach to the market [2]. According to trace developments in the model of industrial innovation from the simple linear model to the "integrated" model, Roy Rothwell (1992) came to the "fifth-generation innovation model" which involves systems integration and networking model [3].

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About the theory of knowledge creation, Nonaka and Takeuchi (1995) proposed a SECI model which consists of four modes such as socialization, externalization, combination and internalization to analyze the knowledge creation effectively. And they thought that the new knowledge creates resulted from the interaction between tacit and explicit knowledge [4]. Scharmer (2000) posited a double spiral of SECI processes: Nonaka's familiar process, of shared reflection on tacit-embodied knowledge, and a second, intersecting one of involving a "shared formation of will" pulling not-yet-embodied knowledge into the cycle [5].

3 The Limitation of the SECI Model in Practical Application

According to Nonaka's view, the four processes of knowledge creation are done step by step, and each field only supports one form of knowledge creation process(Shown in Figure 1). Combining with the practical application of SECI model, it is thought that the theoretical concept about the SECI model and Ba, in Nonaka's theory, has some problems:

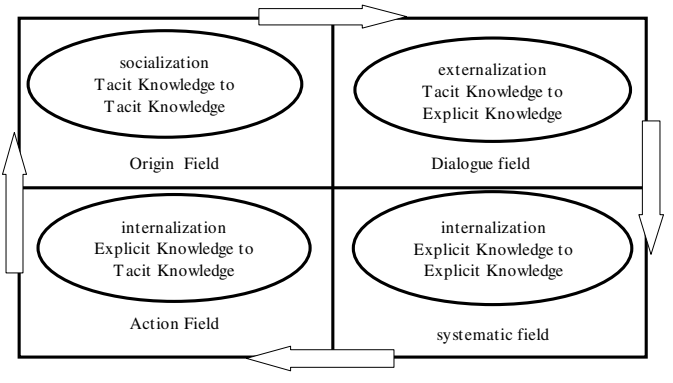

Fig. 1. Four fields matching SECI model

A. The Process of Knowledge Creation is not a Four-stage Process of Spiral Necessarily

Taking the apprenticeship system as an example, Tanaka takes a chief baker in some hotel as his teacher to study the kneading technique as the core technology. After the baker's knowledge turns into Tanaka's knowledge, Tanaka tries to express the knowledge in the written form as the dominance knowledge. It seems that, in the SECI model, the baker's recessive knowledge → Tanaka's recessive knowledge → non-system dominance knowledge of making bread machine. However, there is another possibility, if the baker does not teach Tanaka, he does it by himself. In the other words, the knowledge turns to the dominance knowledge directly without being socialized. In this case, the theory which is proposed by SECI model is not so correctly. It is obvious that a four-stage process of spiral cannot include variety of knowledge translation and creation in modern society [6].

Therefore, the knowledge conversion of knowledge creation process does not have the necessity.

B. Nonaka's Ideas is Incompatible with the Actual Process

Looking at Figure 1,still use the apprenticeship system as an example, the apprentice learns the knowledge by observing and imitating the master's work and practices it without using verbal language or books. It shows that there is a socialization practicing and training process, only improved by this way. It is also to say that the recessive knowledge has been shared assimilated, or not. Therefore, the process of socialization needs the support which comes from "action field". And in the process, the language cannot express their all recessive knowledge, but they also cannot deny the existence of a dialogue field completely, for example, if the master finds his students have mistakes in using the tools, he must correct it, this refers to "dialogue field"; the disciples imitate the teacher, mixing the dominance knowledge (language) which their teacher says, so the process of socialization needs the support of the systematization. Similarly, in the externalization, combination, and internalization processes, we still need the support of other Ba [7].

Therefore, Nonaka believes that the knowledge transformation of specific types is supported only by a special kind of Ba, which is against the given examples and explanations.

4 The Improved Ba-SECI Model

There are many things in common between inter-organizational knowledge creation and knowledge creation within the organization,which can be said almost exactly the same, but it is important that all are providing a suitable "field" [8].

According to the problems which are argued in the passage about application in practice of the SECI model, combining with the characteristic of the multinational corporations, the thesis points out some reformative methods. Shown in Figure 2:

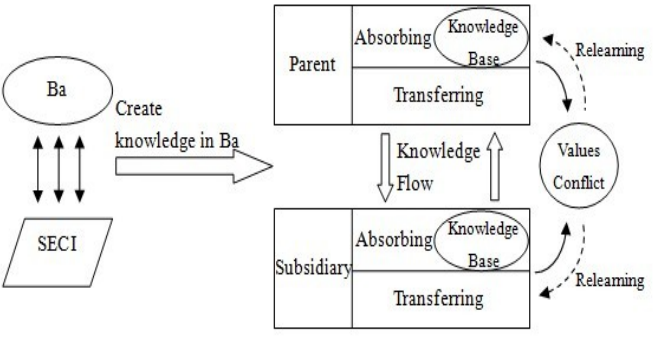

Fig. 2. Improvement of Ba-SECI model

First, the model is still adhering to the four knowledge conversion process, and each conversion result is still composed by the existence of recessive knowledge and dominance knowledge, but in fact, each process includes recessive knowledge and dominance knowledge; the knowledge of creation and translation in each phase is still recessive knowledge and dominance knowledge, therefore the proportion is different.

Second, Ba is still the place to support knowledge creation, recessive knowledge and dominance knowledge with each other in Ba coversion and creation, but all have a significant qualitative leap. The very reason why multinational corporations exist and succeed is that they are efficient vehicles for creating and transferring knowledge between headquarter and subsidiary (Gupta and Govindarajan, 1991) [9]. In this model, Ba is no longer divided in four separate areas, but a unity around. The model of knowledge creation, which makes local and host companies far behind in both level and height of innovation knowledge, is more suitable for innovative knowledge of multinational parent and subsidiary companies. As the scale and strength of multinational corporations are generally better than other companies, they have the capability to alloy with universities, research institutions or other businesses, utilizing the advantage of globalization division of labor to obtain the superior resources in different areas.

Third, the knowledge created by parent and subsidiary companies in different countries can be spread within inter-company knowledge networking to achieve knowledge sharing and a new round of knowledge creation through values learning. Recently, the subsidiary is not just the recipient of the knowledge from parent company; it also makes use of the host's resource advantages and employs the best technical talents to create its own innovative knowledge. And then the subsidiary delivers the new knowledge to the parent in the form of text, language or code through inter-company knowledge networking. Consequently, because of the transnational knowledge structure, the multinational corporations have a more economic knowledge integration mechanism compared with the local companies [10].

Forth, when company and its branches pass each other in the innovation of knowledge, with conflicts of values between the two sides appearing, it provides further learning opportunities. In conflict, the conflict is in the control of the leader, the correct guidance to conflict is what the high-level leaders need to solve. If the subsidiary conflicts with the parent company in transferring knowledge, on the one hand, the parent company can not be anything but self-centred, one-sided approach to deny the subsidiaries. It should listen carefully to the subsidiaries' real intentions and purposes; on the other hand, the subsidiaries don't try to rebut the debate, intensely compete and want to know how to explain to make more rational analysis. So both can finish the work together and achieve substantive results. Finally, company and its branches should rethink and learning hard, slow the process of thinking, and discuss how to improve.

Fifth, about the importance of the organizational learning, it includes imitation learning and innovative learning between parent and subsidiaries. On the basis of existing knowledge, the former imitation learning aims to digest, absorb and share knowledge so as to serve for the company. The purpose of the latter is to develop a new unique knowledge and improve its own comprehensive strength, and this process occurs mainly in the internal of parent and subsidiaries [11]. Therefore, the process of learning in figure 2 is not only indicating the learning between the subsidiary and

parent company, but more important thing is strategic alliance among corporations which is a durative and multistage process of organizational learning. That is a process of learning from imitation to innovation and cycles each other.

5 Conclusion

In economical knowledge era, technological innovation, knowledge management, and knowledge creation are affecting core competencies and management strategies of multinational companies, and there is a new problem that is how to use the researching of the impetus of investment increasing and accelerating scientific and technological innovation. Whether subsidiary creatively absorb and utilize local knowledge has become a important aspect improving local responsiveness,and has become an importantl part of the global learning[12]. In order to maximize diversity, transnational business, whether the parent company or the subsidiary, should ensure that all members access the most extensive information necessary in the fastest way through the most convenient way [13]. However, due to structural instability, opportunism, relations risk, the conflict between companies and other negative factors, Unionn enterprises often can not be pre-set target of interest, and lead to high rates of union dissolution,moreover, many Western literature Alliance reported the high levels of 30% failure rate to 70% .Furthermore, the strategic alliance is considered to be an inherently unstable and a transitional structure in essence[14].

For a multinational, the first problem which needs to clear is to create knowledge and build model, and based on this to hunt a way from internal and external aspects to solve the problem. (1) In order to construct the internal operational conditions of knowledge creation mode of multinational companies. It can begin from setting up information systems, human resources, organizational culture and internal resources, and other aspects of system construction. (2) In order to construct the external operational conditions of knowledge creation mode of multinational companies, for the host country resources and the environment, policy environment and industrial environment, to predict in advance and evaluated.

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Research on Structure Characteristics of Innovation Organization in Service-Enhanced Manufacturing Enterprises

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Abstract. The rapid development of IT enables manufacturing enterprises to quickly access market terminals and adjust their products and services to enhance the competitiveness of enterprises. This requires manufacturing enterprises to change existing innovation organizational structure based on the features of service innovation. Firstly, this article defined the concept of innovation organization in service-enhanced manufacturing enterprises. Secondly, we proposed a four-dimensional model of the organizational structure for this kind of innovation organization including four factors: power centralization, self-management, interdependence and border infiltration. Finally, we analyzed the relationship between innovation performance and organizational characteristics of innovation organization in service-enhanced manufacturing enterprises using the method of factor analysis.

Keywords: Service-enhanced Manufacturing, Innovation Organization, Characteristics of Organizational Structure.

1 Introduction

The rapid development of IT enables manufacturing enterprises to quickly access market terminals and adjust their products and services to enhance the competitiveness of enterprises. This requires manufacturing enterprises to change existing innovation organizational structure based on the features of service innovation.

It is called by western scholars as "service enhancement" that manufacturing enterprises using service to enhance the competitiveness of their products and services and to acquire a new source of value. Berger & Leister[1] definitely put forward the concept of "service-enhanced manufacturing" in study of the difference in manufacturing industrial productivity of Hong Kong, United States and Japan. They argued that production-based manufacturing can not meet the "new economy", and should be transformed to "service-enhanced manufacturing (SEM)". In some extreme cases, manufacturers will be transformed into pure services and solutions provider, and service enterprises in the new environment will gradually adopt "manufacturing enhanced services" strategy.

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Service enhancement phenomena are widely spreading in the manufacturing sector, from household appliances industry, automobile industry to the IT, machinery manufacturing industry and pharmaceutical industry. Different levels of service enhancement can be observed in different parts of product manufacturing sector with different levels of knowledge capacity measure. Famous manufacturers such as IBM, GM,GE, Ford, Hitachi and Mitsubishi have also show a quite significant trend of service[2]. Chinese enterprises such as Haier and so on have also begun to use the service enhancement measures to improve the competitiveness of products. The phenomenon of services enhancement expresses a strong signal to the people: manufacturing companies begin to carry out extensive service competition, trying to use service as a new value sources to enhance the competitiveness of products.

At present, some scholars believe, SEM is different from traditional manufacturing companies and need to have new organizational mode of operation management. But the research on innovation organizations in SEM enterprises is far from needed, not to mention research on the conception of SEM enterprise's innovation organization and the analysis of relationship between organization structure and innovative behavior. Considering the importance of SEM enterprises' innovation organizations in manufacturing industrial upgrading and country's innovation capability enhancement, issues related to SEM enterprises' innovation organizations are of great significance both in theory and in practice. This paper intends to reveal the connotation and structure characteristics of innovation organization in SEM enterprise, and analyze the relationship between its structure and its innovation performance through empirical study.

2 Definition and Organizational Characteristics of Innovation Organization in SEM Enterprise

A. Definition of Innovation Organization in SEM Enterprise

As service plays an important role in the strategic development of SEM companies, their innovation organizations must have some characteristics of service-oriented enterprises. According to the literatures on this field, the definition of SEM innovation organization can be made in two ways. Firstly, it is from the view of formalization of innovation organization. To complete the whole process of innovation at all stages, enterprises can set up a formal innovation organization; or they may make different departments of respective functions cooperated together to complete the whole stage of innovation process. Olson and other studies have found, a over formal communication will hinder integration of innovative ideas, therefore, innovation organization in SEM firm usually is not a formal R & D department, and shows the characteristics of informal organization. Secondly, is from the view of innovation organization's form. Sundbo [3] claimed that the set up of a cross-sector innovation team or a specialized department in service-oriented enterprise can significantly promote service development. Through the research on professional service company, Mills found that there are different special forms of innovation organizations for corresponding different innovation activities that exist within a form. Such forms of organizations are basic operation units in service companies. Therefore, SEM innovation organization is still in form of cross-functional team.

Combined with the formal degree of innovation organization and organizational form, we defined SEM innovation organization as: A formal department or an informal sub-unit of innovation function embedded in a SEM enterprise or enterprises' network, which usually in the form of a cross-functional or multi-functional innovation team.

B. The Structural Characteristics of SEM Innovation Organization

Organizational structure is defined by organizational theory as the distribution of tasks, responsibilities and power which determines organization's standardization, complexity and degree of centralization and plays an important role in organizational efficiency. Organizational structure includes not only the hardware components, such as individuals, groups, teams and departments, but also various software components, such as relationship between organizational elements. Hage[4] first proposed in 1965 the four dimensions of organizational structure: standardization, hierarchy, centralization and complexity. Then three widely used dimensions gradually formed on this basis of structure study: organizational complexity, standardization and centralization/decentralization level. These three dimensions reveal the characteristics of organization structure and determine the appearance of organization structure.

The characteristics of SEM innovation organizations include not only these general organizational features, but also some particularities, mainly in tem cooperation, flexible organization forms and flat structure, which are the distinct comprehensive characteristics of cross-functional teams. Therefore, the research on characteristics of SEM innovation organization can learn from the relevant results of team's structure research. "Team level" variables are adopted in organization theory to describe team's structures such as team size, clear goals member role, specific code of conduct, mission control and leadership style. Campion et al identified two important structural elements: interdependence and self-management. Cohen also regarded "team's self-management" and "interdependence" as the basis for team task planning. Therefore, the organizational structure of SEM innovation organization can be analyzed by three structural dimensions: self-management, interdependence, centralization of power.

In addition, as the source and transmitters of knowledge innovation, innovation organization in SEM enterprise has a strong synergy and interaction with different departments. In SEM enterprises, different kinds of service enhancement face with different external customers environment, and requires different degree of customer interaction, and therefore the permeability degree of innovation organization's boundaries is different. Therefore, "boundary infiltration" is adopted in this article as the fourth structural dimension of SEM innovation organization.

3 Model of Relationship between Structural Characteristics and Innovation Performance of SEM Innovation Organization

A. Measurement of Innovation Interaction Behavior and Innovation Performance of SEM Innovation Organization

According to classic organization theory, organizational structure is bound to impact organizational performance, and this effect is often through the organization's interactions with the members. Therefore, in order to study the relationship between

organizational structure and innovation performance, we must adopt the interactive mediator dealing with innovation interactions. According to Hackman's definition of task interaction behavior and interpersonal interaction behavior, task interactions include communication, coordination and balance among the contributions of members, and interpersonal interactions include mutual support, effort and cohesion. Therefore, we use "task interaction" and "interpersonal interaction" to describe interaction activities of SEM innovation organizations in the service innovation process. Herein, task interactions refer to those interactions directly interact with team's tasks, and can be measured by 4 indicators including task coordination, information sharing, straight communication and unstructured communication; and interpersonal interactions mean the relationships processing in a team or a group which can be measured by 4 indicators such as strong cohesion, equality membership, mutual support and constructive debate.

There has been a lot of research on measuring the performance of innovation. For instance, Faraj and Sproull[5] separated it into task-related outputs (such as: quality, budget and work efficiency, etc.) and member-related outputs (such as: team member's satisfaction, team viability, etc). Others also considered that the performance of innovation included both internal and external dimensions. Internal dimensions refer to self-assessment of the team performance and member satisfaction; external dimension is about the speed to market of innovative products, innovation, quality and market performance, etc). Therefore, we can measure the innovation performance of SEM innovation organization from two dimensions: task performance and behavioral performance. Task performance can be measured by effectiveness and efficiency indicators. Effectiveness refers to how quality level of team's output meets the expected; efficiency refers to project's ergonomics, such as whether to schedule, whether controlled cost as planning. This article chooses indicators such as customer's satisfaction, the proportion of innovative projects in past 5 years in total profits and input-output ratio of innovative projects to measure the performance of the task. Correspondingly, behavioral performance is consisted with team members' satisfaction and learning. Job satisfaction of team members can high-level their enthusiasm in future projects; and cooperation with other members provides them with plenty of learning opportunities. Therefore, this article chooses three indicators to measure behavioral performance of innovation organization such as team member satisfaction, member knowledge increase and member ability upgrade.

B. The Relationship Between Structure Characteristics and Innovation Interactions of SEM Innovation Organization

The following is an analysis on the relationship between the innovation interactions and two of four organizational structure characteristics such as self-management, boundary infiltration. These features will affect the interactions in innovation organization, and thus ultimately affect the organization's innovation performance.

1) Relationship Between Self-Management and Innovation Interactions

Self-management of organization means members work together to make decisions such as: hiring, firing, scheduling, and operating procedures. Campion defined self-management as the degree of power and freedom that team have to let it independent

to external oversight. he stressed that team members should responsible for the acts and authority of their own, and make decisions by themselves rather than by supervisors.

Self-management in innovation organization can bring positive impact on innovation performance. First of all, self-management can directly affect the organization's effectiveness. In the innovation organization, members often face uncertain customer feedback and market information, which may lead to information distortion or a lot of information can not be codified. In order to respond rapidly to customer perception, the members of interaction need to be able to make timely changes in handling the situation. In this way they can set up a mutual trustable relationship. Second, self-management can also indirectly improve organizational effectiveness. High level of self-management may lower the status of core leadership and lead to a decentralized communication network. Although sometimes this decentralized network may lead to a disorder of shared information, it is strongly sported by most evidence that decentralization may encourage open communication and then develop a long-term solution to the conflict of organization members. The indirect effects of self-management on organizational effectiveness are by organization interactions. Self-management causes changes in the power structure within the organization at first, which can lead directly to the changes in mutual relations between members and the way and the scope of members' action.

According to Stewart's study on the relationship between groups' structure and performance, the type of team tasks buffers the relationship between structure and performance. According to Goodman's view, types of team tasks can be divided into two extreme types: conceptual task and operational task. Team that usually engaged in operational tasks can easily program work, collect information, and interaction of members is seldom. It has clear goals and program and do not spend much time in planning, decision-making and negotiation among the members. Members do not have too much on-site decision-making capacity. So its self- management level is low. But, when a team engages in conceptual tasks, goals and means is not clear. In order to generate conception and make decision, team members need to have decision-making authority and capability and to respond to changes in objectives and approaches. This can caused a high level self-management embodied in the structure. For SEM innovative organizations, the task types show more of the conceptual features. Therefore, information for innovation decision-making is often collected by the interaction with customers. All in short, the self-management level of members of innovation organization has an impact on task interaction and interpersonal interaction during the process of innovation.

2) Relationship Between Boundary Infiltration and Innovation Interactions

The conception of boundary infiltration of organization is derived from biology, used to describe the absorption and release ability of film on the external material and energy. Film works in a selective way of penetration. External materials consistent with organizational values and resource requirements can be selectively absorbed into the interior; and information material can release to the outside under the conditions of corresponding organizational mechanism. As to SEM innovation organizations, boundary infiltration refers to the release, absorption and delivery of material and energy between the borders of interaction units.

The boundary of SEM innovation organization has a high degree of infiltration to market information, therefore, external information of customer feedback can more successfully reach the innovation enterprise and then be capture, analyze and absorption by innovative organizations. This is an important source of innovation. The difference in the manner and attitude of external information collection represents the different infiltration level of organizational boundary. Some SEM innovation organizations have special departments and organizational mechanisms controlling the access and direction to those sources of information, so that shows a high level of selective absorption. Other SEM innovation organizations shows a high infiltration level in the way of collecting information through multi-channel and with good grasp of non-planned "accidental" information resources. Boundary infiltration of SEM innovation organization can not only affect communication and coordination on innovation organization's boundaries, but also can impact on mutual support, personal effort, etc. So boundary infiltration has a both positive impact on those two kinds of interactions.

4 Empirical Study on Characteristics of SEM Innovation Organization

A. Data Collection

This study selected managers ever participated in service innovation in manufacturing enterprise to collect data by questionnaire. Before the questionnaire was finalized, a preliminary interview was made with MBA students at first and asked them to pre-test it in class. This pre-test mainly concerned the rationality and clarity of expression of questionnaire. Then, questionnaires of students in non-manufacturing field were screened, and the final questionnaire was revised to form based on feedback received on the questionnaire. This questionnaire includes three parts. The first part is on organization structure of innovation organization. The second part is about interaction during the process of innovation. The third part is about innovation performance dimension. The answer is divided by five scales, from "not fit" to "very much fit" and scored as 1,2,3,4,5.

MBA students who participated in a service innovation program in last two years were asked to complete questionnaires. The survey total send out 138 questionnaires and received 124 copies including 102 effective copies. The reclaim rate was consistent with the requirements of statistics analysis.

B. Factor Analysis

Exploratory factor analysis was used to analyze those three part of questionnaire including innovation performance part, innovation interaction part and organization structure part. By this way we can examine whether those constructed indicators are compliance with the requirements of validity. The factor analysis results are shown in Table 1, Table 2 and Table 3.

Table 1. Factor Analysis of Indicators on Innovation Performance

Factor	Index	Factor Load		a
		1	2	
task performance V1	V11	0.214	0.892	0.821
	V12	0.251	0.796	
	V13	0.398	0.729	
behavioral performance V2	V21	0.871	0.216	0.815
	V22	0.815	0.468	
	V23	0.807	0.215	

KMO value is 0.852, and significance probability of Bartlett sphericity test is 0.000. The result indicates that the sample is suitable for factor analysis. From output results of factor analysis, the supposed six indicators of service enhancement performance are grouped into two factors, which can explain 72.714% of the overall variance.

Table 2. Factor Analysis on Innovation Interaction of SEM Innovation Organization

Factor	Index	Factor load		a
		1	2	
interpersonal interaction W1	W11	0.221	0.863	0.886
	W12	0.225	0.787	
	W13	0.437	0.677	
	W14	0.306	0.825	
task interaction W2	W21	0.796	0.328	0.895
	W22	0.785	0.327	
	W23	0.832	0.211	
	W24	0.813	0.247	

KMO value is 0.891, and significance probability of Bartlett sphericity test is 0.000. Two factors explain the overall variance in the 69. 738%.

Table 3. Factor Analysis on Characteristics of SEM Innovation Organization

Factor	Index	Factor load				a
		1	2	3	4	
Boundary infiltration U1	U11	0.763	0.213	0.121	0.124	0.795
	U12	0.732	0.144	0.217	0.151	
	U13	0.653	0.132	0.101	0.211	
Centralization U2	U21	0.136	0.857	0.126	0.114	0.836
	U22	0.221	0.794	0.142	0.104	
	U23	0.183	0.638	0.282	0.137	
Self management U3	U31	0.231	0.132	0.748	0.104	0.869
	U32	0.148	0.171	0.835	0.102	
	U33	0.281	0.157	0.732	0.126	
Interdependence U4	U41	0.236	0.193	0.281	0.539	0.764
	U42	0.183	0.194	0.173	0.638	
	U43	0.147	0.261	0.209	0.594	

KMO value of 0.859, and significance probability of Bartlett sphericity test is 0.000. Four factors explain the variation of the overall variance of 71.215%.

5 Future Directions

There future work we anticipate can follow several tracks. One is to investigate in more depth the interrelationship between those four factors of organizational structure characteristics of SEM innovation organization. Another direction for future work would be to expand our measures of organization structure beyond those subjective items, by adding some objective items. Finally, future research can apply our framework to, and test it on, a given enterprise, to see how organization structure in the industrial environment influences the innovation performance.

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Trade Credit and Bank Lending under Asymmetric Information*

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Abstract. In trade credit, supplier allows retailer delay payment with some interest rate, which has become another financing resource just as bank lending. For retailers have private information, supplier and bank should provide different contracts to retailers with respect to their type. We analysis the trade credit and bank lending contract under the condition that the supplier and the bank can observe imprecise signal of the retailers' type, and give the contracts which the supplier and bank should provide respectively.

Keywords: Trade credit, bank lending, supply chain, financial constraint.

1 Introduction

Trade credit arises when a supplier allows a retailer to delay payment, which is one of the most important sources of short-term external financing for firms in many countries [1]. Even in the Unite States, with its extremely well-developed financial markets, trade credit is the largest single source of short-term financing [2]. In less-developed countries, where formal lender are scarce, trade credit plays an even more significant role in funding firms' activities[3].Trade credit has been used widely because its informational advantage[4]. The sales effort of suppliers makes it easier for them to assess their customer's credit risk [5] . And there has been some results about trade credit [6].

And bank lending is always considered as the most important financing source for borrowers. And there have been many literature containing banking performance studies [7]. Banks adopted data envelopment analysis as the principal method for assessing bank efficiency which has been used as a tool for assessing corporate banking performance [8] Since bank lending is a major source of external capital for borrowers, especially for enterprises, there is a growing literature which has explored the relationships between firms and their banks [9].The bank collects information and seeks signal from borrowers for asymmetric information.

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We assume that there exists two types' retailer(high operations cost and low operations cost's retailers) and two types' products(high quality versus poor quality). The retailers are budget-constrained and could borrow funds from two channels: trade credit from supplier and bank lending from the bank. As a result, the supplier and bank should design the right contracts to screen the high or low operations cost's retailer to optimize his payoff. In this paper, we build adverse selection models to conduct our analysis.

2 Model

We consider a supply chain with a supplier who sells to a retailer, and the retailer in turn sells to a market in which demand is uncertain. The retailer is financially constrained, and can borrow from the supplier or from the bank. The retailer price is fixed at p, and the salvage value of unsold inventory is assumed to be negligible. There are two types of goods for the retailer to select, noted by G_H and G_L, the signal of the good type is denoted by G .The demand in the end market are nonnegative random variables, D_H for G_H and D_L for G_L respectively. The distribution functions are $F_H(\cdot)$ for D_H and $F_L(\cdot)$ for D_L, $F_H(x) \le F_L(x)$, for all $x \ge 0$, density functions, $f_H(\cdot)$ for D_H and $f_L(\cdot)$ for D_L.

We consider two types of retailers: good retailer ($R = H$)who operations the business with a low cost and bad retailer($R = L$) with a higher operations cost, where the fraction ofgood retailers in the market is $\lambda \in (0,1)$. And the operationscost for good retailer is denoted by C_H, and C_L for bad retailer. It is reasonable to assume $C_H \le C_L$. Consider the reservation profit in the market for retailers, the opportunity cost with π_H^0 for H retailer and π_L^0 for L retailer, $\pi_H^0 \ge \pi_L^0$.

In this paper, we assume that retailers know their own type, and the supplier does not have the acute information about retailer's type. However, the supplier observes an imprecise signal about the type of a retailer in the market. Let $\alpha \in (0,1)$ denote the signal observed by a supplier. When $R = H, \alpha = 1$ with probability1; when $R = L, \alpha = 1$ with probability μ_s .That is only when the signal $\alpha = 1$, the suppler need design the trade credit contracts to distinguish retailers. Similarly, in bank lending contract, the bank can observe an imprecise signal about the retailer in the market which is independent of the supplier. Let $\beta \in (0,1)$ denote the signal observed by a bank. When $R = H, \beta = 1$ with probability 1; $R = L, \alpha = 1$ with probability μ_B.

In bank lending setting, the bank offers credits to the retailer, and the retailer purchases products from the supplier. To control the risk of credits, the bank should define the usage of funds from loans. Without loss the generality, we assume that the bank should require the retailer to invest the high quality product. However, the bank can not have the acute information whether the retailer really invest funds on high products. In this case, we assume that the bank can observe an imprecise signal about the type of products. Then we suppose the probability that the retailer invests high

quality product G_H is τ , and the probability that diverts to other high risk project, low quality product G_L, is $1-\tau$ .Let $\gamma \in (0,1)$ denote the signal observed by a bank. $G=G_H,\gamma=1$ with probability 1; $G=G_L,\gamma=1$ with probability η. That is when $\gamma=0$, the bank knows the type of the goods is G_L, so will not support funds.

3 Trade Credit

A. Symmetric Information Scenario

We firstly investigate the decisions of trade credit when the product is high quality and the retailer is of high efficient (low operations cost). The supplier should offer trade credit contract (Q_H, d_H), where Q_H denotes order quantity and d_H as the interest rate of trade credit. We assume the production cost of supplier is C_s and the wholesale price is w. The profit of supplier is $(w-C_s)Q_H(1+d_H)$.

The profit of the retailer is $\pi_H(Q_H)-wQ_H(1+d_H)$

$$\pi_H(Q_H)=p\int_0^{Q_H} xf_H(x)dx+pQ_H(1-F_H(Q_H))-C_HQ_H$$

Then we have the optimal problem below,

$$\begin{aligned}&\max_{(Q_H,d_H)} f(w-C_S)Q_H(1+d_H)\\&s.t.\pi_H(Q_H)-wQ_H-wQ_Hd_H\geq\pi_H^0 \quad (IC)\\&Q_H\geq 0\end{aligned} \tag{1}$$

with the constraint (*IC*) that the profits in trade credit of the retailer must greater than the opportunity cost π_H^0. Then under symmetric information scenario, when the retailer is of high efficient, the supplier should offer $(\hat{Q}_H,\hat{d}_H)$. while the supplier should offer $(\hat{Q}_L,\hat{d}_L)$ to low efficient retailer, $\hat{Q}_L=F_H^{-1}\left(\frac{p-C_L}{p}\right)$ $\hat{Q}_H=F_H^{-1}\left(\frac{p-C_H}{p}\right)$

$\hat{d}_L=\frac{\pi_H(\hat{Q}_L)-\pi_L^0}{w\hat{Q}_L}-1$ $\hat{d}_H=\frac{\pi_H(\hat{Q}_H)-\pi_H^0}{w\hat{Q}_H}-1$.

B. Asymmetric Information Scenario

Since the information of operations cost to the retailers is private, and the supplier offers different trade credit menu $(Q_H,d_H),(Q_L,d_L)$ with respect to the type of the retailer. The supplier can observe the imprecise information of the retailer type α, and only if $\alpha=1$, he should offers trade credit contract menus. Furthermore, with $\alpha=1$ the probability of high operations cost type's retailer L is followed by $P(R=L\mid\alpha=1)=\frac{\mu_s(1-\lambda)}{\mu_s(1-\lambda)+\lambda}$.

To sell the product to high efficient retailer, the supplier realize a profit by $(w-C_s)Q_H(1+d_H)$. But he should get the profit $(w-C_s)Q_L(1+d_L)$ from the business with low efficient retailer.

$$\pi_H(Q_H)=p\int_0^{Q_H}xf_H(x)dx+pQ_H(1-F_H(Q_H))-C_HQ_H$$

$$\pi_L(Q_L)=p\int_0^{Q_L}xf_H(x)dx+pQ_L(1-F_H(Q_L))-C_LQ_L$$

the high efficient and low **efficient** retailer have the reservation profits π_H^0,π_L^0 respectively. Then we can get retailers' *Participation constraints* (IR).Under the asymmetric information, the supplier hope the retailer to choose the contract which is prepared for her. Consequently, the supplier should design the contract menu to stop the adverse selection problems. Because of the presence of the *Incentive compatibility constraints* (IC), the retailer can not improve her profit through selecting the contract which is not prepared for her. So we have the incentive compatibility (IC) constraints.

Based on the *revelation principle*, there is an optimal contract menu under which the retailer will choose the contract that is intended for this type. According to revelation principle, the supplier will solve the following problem to maximize his expected profit.

$$\begin{aligned}
&\max_{(Q_H,d_H),(Q_L,d_L)}(1-P(R=L\mid\alpha=1))(w-C_s)Q_H(1+d_H)\\
&\qquad+P(R=L\mid\alpha=1)(w-C_s)Q_L(1+d_L)\\
&s.t.\pi_H(Q_H)-wQ_H(1+d_H)\geq\pi_H^0;\qquad(IR1)\\
&\quad\pi_L(Q_L)-wQ_L(1+d_L)\geq\pi_L^0;\qquad(IR2)\\
&\quad\pi_H(Q_H)-wQ_H(1+d_H)\geq\pi_H(Q_L)-wQ_L(1+d_L);\quad(IC1)\\
&\quad\pi_L(Q_L)-wQ_L(1+d_L)\geq\pi_L(Q_H)-wQ_H(1+d_H);\quad(IC1)\\
&\quad Q_H\geq 0;Q_L\geq 0
\end{aligned}$$

Next we solve the optimal problem in three cases:

*Case*1*: Aggressive high operations cost retailer*:

$$0\leq\pi_H^0-\pi_L^0<(C_L-C_H)\hat{Q}_L;$$

*Case*2*: Moderate retailer*:

$$(C_L-C_H)\hat{Q}_L\leq\pi_H^0-\pi_L^0\leq(C_L-C_H)\hat{Q}_H;$$

*Case*3*: Aggressive low operations cost retailer*:

$$(C_L-C_H)\hat{Q}_H<\pi_H^0-\pi_L^0.$$

1) Case 1.: In this case, the L type retailer having high operations cost, has a high reservation profit, which is close to that of the H type retailer with low operations cost. Then, we can conclude this subsection by the following theorem, **Theorem 1** The optimal trade credit contract menu offered by the supplier is

$$\left\{\left(\hat{Q}_H,\frac{\pi_H(\hat{Q}_H)-\pi_L^0-(C_L-C_H)Q^*{}_L}{w\hat{Q}_H}-1\right);\left(Q_L^*,\frac{\pi_L(Q_L^*)-\pi_L^0}{wQ_L^*}-1\right)\right\}\qquad(2)$$

where $\pi_L(Q_L)$ is concave and $\pi_L(Q_L)=\pi_L^0$ has two roots $\tilde{Q}_L, \overline{Q}_L$.

$$
\begin{aligned}
Q_L^* &= \begin{cases} F_H^{-1}\left(\dfrac{-C_L+C_H+P(R=L\mid\alpha=1)(p-C_H)}{pP(R=L\mid\alpha=1)}\right), \\ if\ \nu \le \dfrac{-C_L+C_H}{F_H\left(\max\left\{\overline{Q}_H, \dfrac{\pi_H^0-\pi_L^0}{C_L-C_H}\right\}\right)p-p+C_H}; \\ \max\left\{\tilde{Q}_H, \dfrac{\pi_L^0-\pi_H^0}{C_H-C_L}\right\}, otherwise\ . \end{cases} \\
d_H^* &= \frac{\pi_H(\hat{Q}_H)-\pi_L^0-(C_L-C_H)Q_L^*}{w\hat{Q}_H}-1; \\
d_L^* &= \frac{\pi_L(Q_L^*)-\pi_L^0}{wQ_L^*}-1
\end{aligned}
\tag{3}
$$

We can intuitively interpret Q_L^* the following. To satisfy the high operations retailer's reservation profit, the supplier must order more than or equal to $\tilde{Q}_L L$. If this order quantity is not sufficiently large, the high efficient retailer may imitate the low efficient retailer. To void this, the supplier must should design ordering level at least $\frac{\pi_L^0-\pi_H^0}{C_H-C_L}$ .In addition, the supplier offers $F_H^{-1}\left(\frac{-C_L+C_H+P(R=L\mid\alpha=1)(p-C_H)}{pP(R=L\mid\alpha=1)}\right)$ maximize his profit, if this quantity is more than the low efficient retailer must order more than $\tilde{Q}_L$ and $\frac{\pi_L^0-\pi_H^0}{C_H-C_L}$ .L

2) Case 2.: In this case, the opportunity costs of retailers satisfy $(C_L-C_H)\hat{Q}_L \le \pi_H^0-\pi_L^0 \le (C_L-C_H)\hat{Q}_H$ .We can solve the optimal problem, and give the result below.

Theorem 2. The supplier's profit maximization trade credit contract is $\{(\hat{Q}_H, d_H^*), (\hat{Q}_L, d_L^*)\}$, $d_H^*=\frac{\pi_H(\hat{Q}_H)-\pi_H^0}{\hat{Q}_H}-1, d_L^*=\frac{\pi_L(\hat{Q}_L)-\pi_L^0}{\hat{Q}_L}-1$ The theorem shows that when the difference between the two types of reservation profits is in a certain range, the supplier can offer the same trade credit contract as the one under symmetric information no matter what type the retailer is. And each type of retailer get her reservation profit under the trade credit contract menu.

3) Case 3.: In this case the difference between the two types reservation profits is large.

Theorem 3. If $(C_L - C_H)\hat{Q}_H < \pi_H^0 - \pi_L^0$, the optimal trade credit contract is

$$\left\{\left(Q_H^*, \frac{\pi_H(Q_H^*) - \pi_H^0}{wQ_H^*} - 1\right), \left(\hat{Q}_L, \frac{\pi_L(\hat{Q}_L) - \pi_H^0 + (C_L - C_H)Q_H^*}{w\hat{Q}_L} - 1\right)\right\}, \tag{4}$$

where $\pi_H(Q_H)$ is concave $\pi_H(Q_H) = \pi_H^0$ has two roots $\tilde{Q}_H, \overline{Q}_H$

$$\begin{aligned} Q_H^* &= \begin{cases} F_H^{-1}\left(\frac{-C_L + C_H + P(R = L \mid \alpha = 1)(p - C_H)}{pP(R = L \mid \alpha = 1)}\right), \\ if \quad v \le \frac{-C_L + C_H}{F_H\left(\max\left\{\overline{Q}_H, \frac{\pi_H^0 - \pi_L^0}{C_L - C_H}\right\}\right)p - p + C_H}; \\ \max\left\{\tilde{Q}_H, \frac{\pi_L^0 - \pi_H^0}{C_H - C_L}\right\}, otherwise \quad . \end{cases} \\ d_H^* &= \frac{\pi_H(\hat{Q}_H) - \pi_L^0 - (C_L - C_H)Q_L^*}{w\hat{Q}_H} - 1; \\ d_L^* &= \frac{\pi_L(Q_L^*) - \pi_L^0}{wQ_L^*} - 1 \end{aligned} \tag{5}$$

4 Bank Lending

A. Symmetric Information Scenario

In this case, the bank has the information about retailer's type and product's type. We firstly consider how to design the bank lending contract to the high efficient retailer. And in this paper, we assume that the bank offer loan only to high quality product. We regard bank's revenue under bank lending contract to high efficient retailer as the following $wB_H(1+r_H)$; where B_H denotes retailer's ordering level, r_H as loan's interest rate. The retailer's profit is

$$\pi_H^H(B_H) - wB_H(1+r_H),\ \pi_H^H(B_H) = p\int_0^{B_H} xf_H(x)dx + pB_H(1 - F_H(B_H)) - C_H B_H$$

Then the optimal problem can be expressed by,

$$\begin{aligned} &\max_{(B_H, r_H)}(1+r_H)wB_H \\ &s.t. \pi_H^H(B_H) - wB_H(1+r_H) \ge \pi_H^0; \\ &\quad B_H \ge 0. \end{aligned} \tag{6}$$

We can get the optimal contract for supplier in this case as $(\hat{B}_H, \hat{r}_H)$, where $\hat{B}_H = F^{-1}\left(\frac{p - C_H}{p}\right)$ and $\hat{r}_H = \frac{\pi_H^H(\hat{B}_H) - \pi_H^0}{w\hat{B}_H} - 1$ The bank should offer low efficient retailer by contract $(\hat{B}_L, \hat{r}_L)$, where $\hat{B}_L = F^{-1}\left(\frac{p - C_L}{p}\right)$, $\hat{r}_L = \frac{\pi_L^L(\hat{B}_L) - \pi_L^0}{w\hat{B}_L} - 1$.

B. Asymmetric Information Scenario

The bank does not have the complete information about retailer and product's type. However, the bank can observe a signal λ or β to deduce product type or retailer's

type respectively. And the bank should order credit contract $(B_H, r_H), (B_L, r_L)$ to retailers and push the retailer to choose the one which is designed for her type. The bank should offer bank lending if only $\gamma = 1$, and the low quality product type's probability can be described by,

$$P(G = G_L \mid \gamma = 1) = \frac{\eta(1-\tau)}{\tau + \eta(1-\tau)} \tag{7}$$

With information β, we can give the profit of bank,

$$(1 - P(R = L \mid \beta = 1))(1 + r_H) wB_H + P(R = L \mid \beta = 1)(1 + r_L) wB_L \tag{8}$$

where $P(R = L \mid \beta = 1) = \dfrac{\mu_B(1-\lambda)}{\mu_B(1-\lambda) + \lambda}$

The profit of H and L type retailers can be listed below.

$$\begin{array}{l} (1 - P(G = G_L|\gamma = 1))\pi_H^H(B_H) \\ +P(G = G_L|\gamma = 1)\pi_L^H(B_H) - (1 + r_H)wB_H, \\ (1 - P(G = G_L|\gamma = 1))\pi_H^L(B_L) \\ +P(G = G_L|\gamma = 1)\pi_L^L(B_L) - (1 + r_L)wB_L, \end{array} \tag{9}$$

$$\begin{array}{l} \pi_H^H(B_H) = p\int_0^{B_H} xf_H(x)dx + pB_H(1 - F_H(B_H)) - C_H B_H, \\ \pi_L^H(B_H) = p\int_0^{B_H} xf_L(x)dx + pB_H(1 - F_L(B_H)) - C_H B_H, \\ \pi_H^L(B_L) = p\int_0^{B_L} xf_H(x)dx + pB_L(1 - F_H(B_L)) - C_L B_L, \\ \pi_L^L(B_L) = p\int_0^{B_L} xf_L(x)dx + pB_L(1 - F_L(B_L)) - C_L B_L. \end{array}$$

If the expected profit of retailer is larger than or equal to her reservation profit, the retailer will participate in the bank lending. The bank should make the mechanism by which the retailer should choose the contract corresponding to his own operations type.

$$\begin{array}{ll} \max\limits_{(B_H, r_H), (B_L, r_L)} & (1 - P(R = L|\beta = 1))(1 + r_H)wB_H \\ & +P(R = L|\beta = 1)(1 + r_L)wB_L \\ s.t. & \\ & (1 - P(G = G_L|\gamma = 1))\pi_H^H(B_H) \\ & +P(G = L|\gamma = 1)\pi_L^H(B_H) - (1 + r_H)wB_H \geq \pi_H^0, (IR1) \\ & (1 - P(G = G_L|\gamma = 1))\pi_H^L(B_L) \\ & +P(G = G_L|\gamma = 1)\pi_L^L(B_L) - (1 + r_L)wB_L \geq \pi_L^0, (IR2) \\ & (1 - P(G = G_L|\gamma = 1))\pi_H^H(B_H) + P(G = G_L|\gamma = 1) \\ & \pi_L^H(B_H) - (1 + r_H)wB_H \geq (1 - P(G = G_L|\gamma = 1)) \\ & \pi_H^L(B_L) + P(G = G_L|\gamma = 1)\pi_L^L(B_L) \\ & -(1 + r_L)wB_L + (C_L - C_H)B_L, (IC1) \\ & (1 - P(G = G_L|\gamma = 1))\pi_H^L(B_L) + P(G = G_L|\gamma = 1) \\ & \pi_L^L(B_L) - (1 + r_L)wB_L \geq (1 - P(G = G_L|\gamma = 1)) \\ & \pi_H^H(B_H) + P(G = G_L|\gamma = 1)\pi_L^H(B_H) \\ & -(1 + r_H)wB_H - (C_L - C_H)B_H, (IC2) \\ & B_H \geq 0, B_L \geq 0. \end{array}$$

Next we solve the optimal problem in three cases:

*Case*1*: Aggressive high operations cost retailer*:

$$0 \le \pi_H^0 - \pi_L^0 < \hat{B}_L(C_L - C_H);$$

*Case*2*: Moderate operations cost retailer* :

$$\hat{B}_L(C_L - C_H) < \pi_H^0 - \pi_L^0 < \hat{B}_H(C_L - C_H);$$

*Case*3*: Aggressive low operations cost type retailer* :

$$\hat{B}_H(C_L - C_H) \le \pi_H^0 - \pi_L^0.$$

1) Case 1.: In this case, the L type retailer having high operations cost, has a high reservation profit, which is close to that of the H type retailer with low operations cost. We give the result in the theorem below.

Theorem 4. The optimal bank lending offered by the bank is $\left\{\left(\hat{B}_H, r_B^*\right), \left(B_L^*, r_L^*\right)\right\}$,where $(1-P(G=G_L \mid \gamma=1))\pi_H^L(B_L) + P(G=G_L \mid \gamma=1)\pi_L^L(B_L)$ is concave $(1-P(G=G_L \mid \gamma=1))\pi_H^L(B_L) + P(G=G_L \mid \gamma=1)\pi_L^L(B_L) = \pi_L^0$ has two roots $\tilde{B}_L$ and $\overline{B}_L$,

$$B_L^* = \begin{cases} F^{-1}\left(\frac{-P(R=L|\beta=1)(p-C_L)+(1-P(R=L|\beta=1))(C_L-C_H)}{P(R=L|\beta=1)p}\right), \\ if\vartheta \le \vartheta_0, \\ \max\{\tilde{B}_L, \frac{\pi_H^0-\pi_L^0}{C_L-C_H}\}, otherwise, \end{cases}$$

$$r_L^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^L(B_L^*)+P(G=L|\gamma=1)\pi_L^L(B_L^*)-\pi_L^0}{wB_L^*} - 1,$$

$$r_H^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^H(\hat{B}_H)+P(G=G_L|\gamma=1)\pi_L^H(\hat{B}_H)}{w\hat{B}_H} - \frac{\pi_L^0+(C_L-C_H)B_L^*}{w\hat{B}_H} - 1.$$

2) Case 2.: In this case, the opportunity costs of retailers satisfy $\hat{B}_L(C_L - C_H) < \pi_H^0 - \pi_L^0 < \hat{B}_H(C_L - C_H)$. We can conclude this subsection by the following Theorem.

Theorem 5. In this case, the bank's profit maximization contract is $\left\{\left(\hat{B}_H, r_H^*\right), \left(\hat{B}_L, r_L^*\right)\right\}$, where

$$r_H^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^H(\hat{B}_H)+P(G=G_L|\gamma=1)\pi_L^H(\hat{B}_H)-\pi_H^0}{w\hat{B}_H} - 1,$$

$$r_L^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^L(\hat{B}_L)+P(G=G_L|\gamma=1)\pi_L^L(\hat{B}_L)-\pi_L^0}{w\hat{B}_L} - 1.$$

3) Case 3.: In this case the difference between the two types reservation profits is large.

Theorem 6. If $\hat{B}_H(C_L - C_H) \le \pi_H^0 - \pi_L^0$,the optimal bank lending contract is $\left\{\left(B_H^*, r_H^*\right), \left(\hat{B}_L, r_L^*\right)\right\}$,where $(1-P(G=G_L \mid \gamma=1))\pi_H^H(B_H) + P(G=G_L \mid \gamma=1)\pi_L^H(B_H)$ is concave an $(1-P(G=G_L \mid \gamma=1))\pi_H^H(B_H) + P(G=G_L \mid \gamma=1)\pi_L^H(B_H) = \pi_H^0$ has two roots $\tilde{B}_H, \overline{B}_H$.

$$B_H^* = \begin{cases} F^{-1}(\frac{(1-P(R=L|\beta=1))(p-C_H)+P(R=L|\beta=1)(C_L-C_H)}{p(1-P(R=L|\beta=1))}), \\ if\vartheta \leq \vartheta_0; \\ \min\{\frac{\pi_H^0-\pi_L^0}{C_L-C_H}, \bar{B}_H\}, otherwise, \end{cases}$$

$$r_H^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^H(B_H^*)+P(G=G_L|\gamma=1)\pi_L^H(B_H^*)-\pi_H^0}{wB_H^*} - 1,$$

$$r_L^* = \frac{(1-P(G=G_L|\gamma=1))\pi_H^L(\hat{B}_L)+P(G=G_L|\gamma=1)\pi_L^L(\hat{B}_L)}{wB_H^*} - \frac{\pi_H^0-(C_L-C_H)B_H^*}{wB_H^*} - 1.$$

5 Conclusion

Trade credit and bank lending are two important resources of financing for company,especily in supply chain with financing constraint. In this paper, we compared these two ways under symmetric and asymmetric information, and give the result that defferent retailer will select different finacing way. And the supplier and the bank can provide different contracts to retailers with their type and can distinguish retailer through design contract with the profit optimizing.

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Exploration of Policy and Mode of Autonomous Learning under the Network Environment

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Abstract. Learning on Network is new way for students. The paper is discussing the autonomou slearning policy and mode in the Network environment.

Keywords: Autonomous learning, Network Environument, Learning Policy.

1 Introduction

It comes to be a hot program that network teaching mode bases on the autonomos learning.The multimedia and network teaching create a new road to autonomous learning. Along with spreading of the multimedia and network technology, the new mode of network teaching is popular now. The multimedia and network technology can provide messages with multisense stimulation. It also can organize different study material by the hyper text and the hyperlink. It makes out that the internet becomes the biggest information resource. In support of many counties, the network teaching has a huge developpment. With the fast popularization of home PC, the multimedia and network teaching mode is becoming more and more common all over our county, which will instead of the traditional way. But this mode should not neglect the importance of developing students' autonomous learning ability. And it's very necessary to supply them with the guidance to use the abundance study material on internet.

2 The Meaning of Autonomous Learning in the Network Environment

It has been more than ten years since we researched on autonomous learning. The definiton on autonomous learning is given by several ways. Generally, the concept of autonomous learning can be simply summarized by using different means, guidance from teachers, being initiative to solve problems, being passion to achieve one's study goals.

In the network environment, the meaning of "auton _omous learning" is developed. The network applies in teaching is base on the construct ism theory. The construct ism theory stresses students' central station, and tries best to exert students' positive and independence. Considering that in certain condition students need teachers' help, using

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essential material, through meaningful construct to complete learning. The role of teacher is not knowledge transfer any more but guider. So the "autonomous learning" in the network environment is a mode which is in virtue of the multi-media and internet and with the guidance from the teachers to learn.

3 The Characters of the Autonomous Learning in the Network Environment

The autonomous learning base on the internet is that the learner is positive to use the internet according to their motive and to learn what they want to. It has hereinafter characters:

(1) Self-determination

The learning mode base on internet is a self-determined learning mode, and it's also an action that the students manage their own learning passion and positive. In the network environment, the students can determine what 、 how and when to learn according to their condition. The learning action is began and done by students' own management.

(2) Independence

Independence is contrast to dependence. In network learning, the learner is not dependent on teachers or other people. In this case, they don't have any pressure and request from outside. Besides, they don't have direct social oversee. Whether their learning succeed or not just depend on their own learning ability and self-discipline ability.

(3) Variety

The resource of the network learning is various. The rich and colorful study material is come from different groups. Different argument and different views are existed on the internet, and they advance each other. On the other hand, NET study material appears in the form of video 、 audio and flash etc. It's totally different from traditional study material. Therefore, before the students using the material , they ought to analysis、 judge and absorb it.

(4) Communize

The students' study is similar to their future social movement, which also need team work. The internet makes the world smaller, and it connects different students in different areas. So it makes team work come true. And it helps a lot that students share their views with other persons on the internet. Even you can discuss problems with scientists equally through the internet. Also you can check your own study then. All these are better than traditional study mode.

4 Design for the Internet Autonomous Learning Mode

The development of online education is led to a profound revolution in learning. First, the tradition purpose to learn is to obtain a diploma, but now the purpose to learn is to

improve their comprehensive ability. Second, because of the computer and the NET , learning is not mechanical and passive any more. It becomes elastic, efficient and interesting. Third, learning media change from plane to three-dimensional multimedia. Forth, the form of learning changes from classes teaching to autonomous learning and cooperative learning. Fifth, a shift to learning management is from utilitarian to the whole process. Base on the motivation of online education development and creating a learning society, huge changes happen in study purpose and study psychology. So a new design for autonomous learning mode is a top priority now. The new design for autonomous learning is base on educational philosophy, educational psychology, education, communi _cation, manageement psychology etc. The objective of the new design is to improve the learner's overall quality and enhance their learning efficiency. There are several modes such as online interactive learning, structure learning mode, the original cognitive learning mode, comparatively study mode, social and practical application of learning. According to the students' own condition, different modes need to be cooperated, so as to enhance learning efficiency.

(1) Online interactive learning mode

Online interactive learning is an important means to online education. Everybody in everywhere at anytime can learn by oneself or interactively. Therefore, online interactive learning must inspire students' study interesting and emotion. To begin with students' request and well-design and good-combinations of teaching element are very important to inspire students' learning interesting. "Linking to the internet, let's begin to study, if you want to, you can make it in everywhere at anytime." These words can be the gold rule in the E-learning field. It has been six years since E-learning were brought in. And it has been pushed into a higher level in both education and business fields.

(2) To raise the initiative of the autonomous learning

Strong desire to learn can enhance students' study efficiency, which also can raise students' study interesting. Success experience in study can enhance student's progress. Pay more attention to showing learning policy in teaching: First, concerning to the content try your best to teach students common and specific study policy. Secondly, providing many examples, let them practice as much as possible. Then they can do better in control the initiative of the autonomous learning. With the help from net information, students' image ability will be raised.

(3) *The expression of the autonomous learning*

Science knowledge from internet is combined with social practice ability, which will help raising students' power of judgment or understanding and expression. Though online education is more or less virtue, knowledge is real. Real knowledge will practice in living. In the online education, teachers must get use of students learning positive, theory goes with practice. In order to catch up the pace with the world, we must mix teaching、learning and practicing up as a whole.

(4) *The contact between online education and autonomous learning*

Presently, online-learning is changing people's learning means and study content stealthily. It's reported that the number of accepting online education is increasing by more than 300 percent. The long-distance education is a huge market, along with

supportive country policy and investment. Currently, many online education colleges have came into existence in many important universities in our country. They established long-distance training center, absorbed more students. The long-distance education has been the hot program. Due to the influence of the long-term traditional education, the students are not fit for online education in the study psychology, learning customs, and self _discipline. Besides, the resource of online education is not plenty. And there are some obstacles on the learning road, they are maze to students. In a word, students must strengthen their own self-discipline ability, in the autonomous learning mode in the network environment.

(5) Strengthen students' time management

If the students' can make good use of their study time, it will raise their study efficiency. Time management is to solve the time distribution problem. We must try our best to distribute time in the scientific way, because all-time working makes tome a dull dog. Dividing up or being concentrate on are good method to manage study time. Make sure that using the best time to solve the most difficult problems. Make study out as a habit. Strengthen self-determine learning consciousness. Raise autonomous learning efficiency.

5 Conclusion

The internet is convenience, inter, and beyond the space and time. And it shares a great huge number of information with the world. It is a revolution that brought it into our physical teaching. The goal of the current education reformation is to change the teacher center mode. And establish a new system which teachers play a guidance part and students have self-determine right. And then the content of teaching and means of teaching are informed. At last the education for all-around development is realized. The fast development in information technology provides a totally new teaching mode---online education. It injects new blood into our country's teaching project. With the ideal of education for all-around development and guidance of modern learning theory, make good use of network technology. Design a good study policy and learning mode in the network environment. Establish a network and digital stage. Provide students with autonomous learning mode in network environment. The students can explore, discover and create on the internet, which will strengthen students' confidence an study interesting. Make the students to be the hosts in study.

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Research on Electronic Commerce in Lowincome Countries

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Abstract. As global electronic commerce becomes a larger part of the world economy, low income countries face the "digital divide": the lack of information and communication technologies necessary for e-commerce. As defined by the Organization for Economic Cooperation and Development, the digital divide: Refers to the gap between individuals, households, businesses and geographic areas at different socio-economic levels with regard both to their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a variety of activities. The digital divide reflects various differences among and within countries. The ability of individuals and businesses to take advantage of the Internet varies significantly across the OECD area as well as between OECD and non-member countries.

Keywords: Electronic Commerce Lowincome Countries.

1 E-Readiness

In addition to the digital divide, there are other factors that influence a nation's ability to provide the climate for participation in electronic commerce; these factors are commonly referred to as "e-readiness." There have been several published lists of e-readiness criteria. One of the most prominent is the Economist Intelligence Unit (2003) annual readiness' ranking. The EIU ranks a country's e-readiness according to the following criteria:

1) Connectivity and technology infrastructure: access to fixed and mobile telephony, personal computers, and the internet.

2) Business environment: strength of the economy, political stability, regulatory environment, taxation, and openness to trade and investment.

3) Consumer and business adoption: prevalence of e-business practices.

4) Social and cultural infrastructure: literacy, education, experience with the internet, technical skills of the workforce, and business innovation and entrepreneurship.

5) Legal and policy environment.

6) Supporting e-services: consulting and IT services and technology standards for platforms and programming languages.

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Of the 60 countries measured in 2003, low income countries ranked in 6 out of 10 last places. The United Nations Development Programs (2000) summed up the challenges to developing countries as follows:

1) Awareness: a lack of awareness and knowledge of e-commerce.

2) Infrastructure and access: lack of telecommunications and internet connectivity, lack of access hardware and software.

3) Human capacity and skills: computer literacy and internet-related skills.

4) Legal and regulatory framework.

5) Taxation.

6) Financial institutions and intermediaries: fraud prevention and secure and reliable online transactions.

The overall legal climate that a country provides plays a significant role in e-readiness. According to a recent study by Oxley and Yeung 2001: The integrity of the institutional environment, particularly with respect to the "rule of law," is important. Only in such an environment can participants in e-commerce transactions have confidence of satisfactory performance-or adequate legal recourse should the transaction break down.

The areas of taxation and commercial law provide examples of the challenges for low income countries. For low-income countries, tax issues for internet-based transactions include the following considerations:

Tax administration systems would need to be revamped, requiring substantial investments in IT hardware, development of specialized software, intensive high-quality training for existing tax officials, and modifications in personnel policies to secure requisite manpower comfortable with new technologies. The governments would need transparent, consistent, and realistic policies for taxing e-commerce. The entire field of global electronic commerce law has become an area of concern. ARD, Inc. (2000), has developed Model Computer Commerce Laws (MCCL) for developing nations. These model laws include "regulations, policies, and guidelines that reduce the barriers to increased electronic commerce in developing countries." The United Nations Commission on International Trade Law (UNCITRAL) has addressed legal issues through the UNCITRAL Model Law on Electronic Signatures (2002) and the UNCITRAL Model Law on Electronic Commerce (1996). The World Intellectual Property Organization (2001) has addressed the issues of patents, trademarks, etc., in ecommerce in developing countries, stating that:

It is important that each country have in place a framework of intellectual property laws and regulations, and a supporting infrastructure of intellectual property services, to reassure intellectual property owners and commercial enterprises that their assets will be protected in an online environment. This legal infrastructure will encourage private sector investment, accelerate economic development and provide a secure foundation on which electronic commerce can build.

2 Examples of Electronic Commerce in Low-Income Countries

When low-income countries start e-commerce initiatives, local entrepreneurs usually follow the path of setting up internet cafes or cyber cafes in major cities. Other ecommerce ventures include export promotion websites for local handicrafts and

products such as woodcarvings, pottery, textiles and knit goods, and baskets. Export promotion websites are found in such low-income countries as Bangladesh, Ghana, Indonesia, Moldova, Nepal, Pakistan, Vietnam, and Zambia. These websites may be mounted by government agencies, crafts collectives, or private commercial firms.

An additional factor in electronic commerce development is the role of expatriates from low-income countries living in high income or middle-income nations. Expatriates, also referred to as the "diaspora" market, provide both expertise and ready markets that stimulate the growth of e-commerce in low-income countries. There are several ecommerce enterprises that fill the niche market of servicing expatriates wishing to send products to families in their homelands. The most widely cited example of such an ecommerce enterprise is EthioGift, an e-commerce company founded by four entrepreneurs in Addis Ababa. Expatriates can order gifts online, and EthioGift delivers them to family members in Ethiopia. The founders used a website in Canada and a bank in Maryland to initiate their project.

In terms of electronic commerce in low-income countries, size may matter. Larger nations, such as Bangladesh and Pakistan, have more extensive e-commerce websites. Bangladesh has launched electronic yellow pages: the *BD Yellow Pages*. The *BD Yellow Pages* (2002) list Bangladeshi firms both alphabetically and by product categories. Typical entries include company name, address, telephone and fax numbers, email and URL addresses, and business category (e.g., product or service).

3 Initatives to Develop Electronic Commerce in Low-Income Countries

The long-term effects of the digital divide, including the lack of participation in electronic commerce, are a cause of concern to international organizations. Efforts to develop electronic commerce in low-income countries are occurring on the international, regional, and national levels. On the international level, such agencies as the International Telecommunication Union, other agencies of the United Nations, and the World Bank have funded initiatives to provide the infrastructure and training for countries to establish e-commerce capacity. The International Telecommunication Union launched the Electronic Commerce for Developing Countries (EC-DC) Project in 1998. The EC-DC provides assistance in these areas:

A. Infrastructure development

- coordinating the planning, design, development and implementation of electronic commerce projects;
- performing feasibility studies to determine the technical and financial requirements for building an e-commerce infrastructure;
- developing approaches to enable cost effective integration of e-commerce into available information and communication technology (ICT) infrastructure.

B. Capacity building and technology transfer: training workshops to:

- provide an overview of e-commerce issues and how they are related to the use of technology;
- identify and explain technology requirements to provide trust, network payments, and transaction and security services;

- discuss e-commerce technology components and their integration into available ITC infrastructure and services.

C. National policies and raising awareness

- assist decision-makers to understand the need for adopting policies that will enhance the development of e-commerce infrastructures and service;
- recommend adoption of policies that will enable e-commerce to have an important role in the national infrastructure and economic development strategy;
- raise public awareness of e-commerce issues and technology.

The ITU has begun to address the infrastructure needs of low income countries and has established a relationship with Wise Key and the World Trade Center to expand ecommerce with software and hardware and consulting services to protect the security of electronic transactions (International Telecommunication Union 2000). The United Nations Conference on Trade and Development (2001) through its Global Trade Point Network is also involved in promoting electronic commerce in low-income countries. In addition to supporting export initiatives, UNCTAD has focused on the impact of ecommerce on tourism in developing countries. UNCTAD has also done several studies of e-commerce through the Commission on Enterprise, Business Facilitation and Development of UNCTAD's Trade and Development Board (2000).

The World Bank Group (2000) has funded the Information for Development Program (infoDev)—an initiative to promote ICT for social and economic development for low income communities in developing countries. InfoDev has funded e-commerce projects in Uganda and Tanzania. The Organization for Economic Cooperation and Development has also addressed this issue, holding a conference on e-commerce in emerging markets in Dubai in January, 2001, and issuing a technical paper on e-commerce readiness.

An international public-private initiative is the Digital Opportunity Taskforce (DOT Force). DOT Force was created out of the G-8 summit of industrialized nations held on Okinawa in 2000; the summit issued the Okinawa Charter on the Global Information Society. One of the provisions of the Okinawa Charter was for the creation of the DOT Force to encourage governments and international agencies, private companies, and foundations to assist in bridging the digital divide in developing nations. In May 2001, DOT Force issued a proposed plan of action that included a provision to encourage participation in global e-commerce (DOT Force 2001). A private organization participating in the DOT Force is the Global Business Dialogue on Electronic Commerce (2001). The GBDe is an organization of chief executives of ICT firms in industrialized nations. In 2001 the GBDe issued "Digital Bridges," an outline of its objectives and accomplishments. Among them were contributions to the development of suitable ecommerce policy frameworks in developing countries, participation in the DOT Force and the World Economic Forum, and participation in the e-ASEAN Task Force recommendations on the development of e-commerce in ASEAN countries, the APEC Business Advisory Council, and the South African Green Paper on e-commerce development.

On the regional level, there are also initiatives to facilitate the development of electronic commerce. The United Nations Economic and Social Commission for Asia and the Pacific (1999) has been addressing the issue of e-commerce, including the national, regional, and international dimensions of e-commerce, national legislation,

and the UNCITRAL Model Law on Electronic Commerce. The Trade Promotion and Facilitation Section of the International Trade and Industry Division of ESCAP (2001) has begun providing advisory services on electronic commerce to Mekong River region countries.

The Association of Southeast Asian Nations (2000) has been active in promoting electronic commerce in its member nations. ASEAN has established the e-ASEAN Initiative to promote collective efforts to complement national strategies through the e-ASEAN Framework Agreement. Asia-Pacific Economic Cooperation has established an APEC Electronic Commerce Steering Group (1998) and issued an APEC Blueprint for Action in which member nations agreed to a set of principles and to establish a work program to facilitate the growth of electronic commerce in the region. On the national level, initiatives to expand electronic commerce in low-income countries come from two directions: assistance from individual developed nations and initiatives by the low-income countries themselves. The US government has assisted in the development of e-commerce through several initiatives, including the US Agency for International Development and the Peace Corps. These include the United States Agency for International Development's Internet for Economic Development Initiative, founded in 1998, "to help accelerate the spread of the Internet and electronic commerce to developing nations." It emphasizes four areas: policy, private sector, capacity development, and programs.

4 Advantages and Disadwantages of Electronic Commerce in Low-Income Countries

To the advocates of electronic commerce, its benefits for low-income countries are many. According to Catherine L.Mann (2001) of the Institute for International Economics: Electronic commerce and its related activities over the internet can be the engines that improve domestic economic well-being through liberalization of domestic services, more rapid integration into globalization of production, and leap-frogging of available technology…. Electronic commerce and the Internet represent the opportunity to leap forward to the next stage of economic development, where value is created not just by resource endowments or manufacturing might, but also by knowledge, information, and the use of technology.

Leaders of international organizations also favor increased participation in electronic commerce by low-income countries. Writing in an annual report of the United Nations Conference on Trade and Development (2002), Secretary-General Kofi A.Annan states: E-commerce is one of the most visible examples of the way in which information and communication technologies (ICT) can contribute to economic growth. It helps countries improve trade efficiency and facilitates the integration of developing countries into the global economy. It allows businesses and entrepreneurs to become more competitive. And it provides jobs, thereby creating wealth.

However, not everyone is convinced that electronic commerce will be beneficial for low income countries. According to one study:

What remains unclear is whether the "digital opportunities" stressed by optimists will ever amount to more than a handful of anecdotes. While it is clear that e-commerce is making it easier for artisans, musicians and other artists in developing countries to

access business-to-consumer world markets, cutting out layers of middlemen and improving the creators' bargaining power, the Internet is so new that there is little historical evidence on which to base projections of future trends.

Speaking at a conference on the internet and developing countries in Malaysia, Uwe Afemann (2000) of the Computer Center of the University of Osnabrück (Germany) described what he termed "the shady side of the Internet" as encompassing the following concerns:

1) environmental damage due to the dumping of old computers and their polluting components;

2) censorship: government restrictions on access to the internet;

3) culture clash: the internet is another "Trojan horse" that threatens cultural identity and national values and identity;

4) increase of inequality between the rich and poor in these countries. I concluded that technology cannot solve social problems by itself and that social implications need to be considered.

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Research on Team Knowledge Creation Support for Product Development

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Abstract. In knowledge economy, new product development becomes a key factor of corporation's survival and development. Corporations generally use teams to develop new product. Team knowledge creation for product development is a complicated process. However, now effective management method is lack for team knowledge creation. In order to solve a series of problems encountered in team knowledge creation, we design team knowledge creation support system (TKCSS) to support the whole process of team knowledge creation. TKCSS includes four main functions which are task-oriented recording of team creation knowledge, creative idea recognition based on information retrieval, idea selection by three phases and visualization of team knowledge.

Keywords: Knowledge Creation, Product Development, Idea Generation, Knowledge Visualization.

1 Introduction

In knowledge economy era, new product development is the base of corporation's competitive advantages. In an increasingly competitive global market, in order to adapt to competition corporations have to increase creation ability.

Now corporations generally use teams to develop new product. Team knowledge creation for product development is a complicated process. However, existing researches about using information systems to support team knowledge creation usually focus on one or several phases of team knowledge creation. For example, group support systems support team's meeting and decision; creation support systems support idea generation; knowledge management system focus on knowledge acquire, storage and sharing. Very little research is about how to support the whole process of team knowledge creation.

Team knowledge creation is a complicated process. In this process team members need generate ideas and then iteratively consider, continually improve and implement ideas until creative task is complicated [1]. This creation cycle is a process that team members continually solve problem and complete subtask until finish the whole task. In order to support team knowledge creation, we design Team Knowledge Creation Support System (TKCSS) to support the whole process of team knowledge creation.

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2 The Knowledge Creation Process and Functional Requirements

Reformer Graham Walls (1926) outlines the creative process in his book, The Art of Thought. Summarizing his own and other people's work in this area, Wallas describes four stages of creation—preparation, incubation, illumination and verification [2].

Many researchers propose new creative process model based on Wallas' model. In these researches creativity is not regarded as mysterious ability anymore, but as a set of processes: individuals even without high creativity can create new product using this process.

The Creative Problem Solving Process (CPS) was developed by Alex Osborn and Dr. Sidney J. Parnes in the 1950s. CPS is a structured method for generating solutions to problems. CPS is a six-step method. The total six stages are: objective finding, fact finding, problem finding, idea finding, idea evaluation, idea implementation [3].

Research about using information system to support team knowledge creation process usually focus on creative problem solving. Present software and tools usually support some specific phases of team creation, such as idea generation, group decision and workflow guidance. For example, some information systems support idea generation through stimulate cognition: CyberQuest uses image and voice to stimulate cognition; Inspiration tools visualize relationship of concept, so as to support idea generation; Axon serves as an electronic sketchpad for visualizing, generating and organizing ideas [4-6].

Present systems supporting team creation mostly support only one or several phases in team creation. In this paper we design a team knowledge creation support system (TKCSS) to support the process of idea generation, evaluation, improvement and implementation. Functions of TKCSS includes: (1) recording and searching related knowledge in digital library; (2) supporting idea generation (3) visualizing knowledge and its changing processes; (4) supporting selection of most appropriate idea; (5) thinking by free associations; (6) consulting and discussing with peers and stakeholders. In the next we realize four main functions of TKCSS which are knowledge recording, idea recognition, idea selection, and knowledge visualization.

3 Main Functions of TKCSS

A. Task-oriented team creation knowledge recording

Team knowledge creation process is a process of team members completing creative task. In the process of team knowledge creation, team members break down complicated creative task into a series of subtasks firstly; then aiming at one subtask they generate, select and implement idea; until the subtask is finished they face other subtasks in succession. This creation cycle is a process that team members continually solve problems until the whole creative task finished.

We record and organize team knowledge task-orientedly which can make it orderly and easy to be used by team members. Information and knowledge obtained by team members not only include knowledge from outside the team, such as internet and book, but also include knowledge and information that team members generate. In the process of team knowledge creation, team members generate large amount of information and knowledge. Record of team knowledge can be separated into two

classes. One class is formal files, such as report, conference record and mail. The other class is informal material, such as an informal essay and a personal note.

We use a uniform mode to store these two classes of knowledge into knowledge base. Every document that record knowledge includes information which are task that knowledge subjects, knowledge name, knowledge abstract, knowledge content, and source of knowledge. According to the item of "task that knowledge subjects", we can realize task-oriented knowledge organization.

B. Creative Idea Recognition Method Based on Information Retrieval

In the process of team creation, team members generate too much knowledge. The most important knowledge is ideas that team members generate to solve their task. However, many ideas are not creative and valuable. In information age, corporations can acquire abundant knowledge. In order to get valuable fact we have to use information retrieval technology to deal with knowledge.

In our research, we use Latent semantic analysis (LSA) to calculate document similarity. Based on document similarity we realize automatic information ranking, so as to support team members to recognize whether an idea is creative or not.

In task-oriented team creation knowledge recording, we use a uniform mode to store knowledge which includes task that knowledge subjects, knowledge name, knowledge abstract, etc. In these items, "knowledge abstract" can express central opinion of knowledge, so we use this item to calculate similarity between knowledge. We use latent semantic analysis (LSA) to calculate similarity, and only retrieve knowledge abstract during information retrieval. This can increase retrieval speed greatly, and don't have much affect to retrieval result.

Latent semantic analysis is a theory and method for extracting and representing the contextual-usage meaning of words by statistical computations applied to a large corpus of text [7]. Steps of automatic document ranking are: document preprocessing, document representing, term weighting, singular vector decomposition, similarity calculation. At last, we rank documents based on similarity, and provide document list to experts.

In our research, we select a product development project of an institute—"develop a plastic injection mold design system"—to verify our system and explain how to recognize idea using our system. The institute organizes seven personnel to form a team for this project. After getting the task, team members obtain related knowledge from internet, and store knowledge in knowledge base. First team members decompose the task into three-level subtasks.

In order to solve one subtask—"automatic determination of parting direction", team members generate five ideas. Using our information retrieval system, team members input an idea as a query into our system and rank knowledge according to similarity of knowledge and idea. In order to verify our system, we select ten pieces of most similar knowledge ranking by our system, and then we let experts of mold development to rank these ten pieces of knowledge. After ranking, we use Kendall coefficient to measure the correlation between ranks of our system and experts [8]. The Kendall coefficient takes values from the interval [-1, 1]. If lists are identical, it is equal to 1; if the lists are in reversed order, it is equal to -1. When the lists are not correlated, it is equal to 0.Ranks of our system and experts are listed in table 1.

Table 1, results of ranking by system and experts.

Table 1. Results of Ranking by System and Experts

Paper number	1	2	3	4	5	6	7	8	9	10
System ranking Q	10	9	4	1	3	5	8	2	7	6
Experts ranking R	6	7	2	2	2	3	5	1	2	4

The correlation between ranks of our system and experts is $\tau(Q,R)=0.710$. We also separately rank related knowledge of other four ideas by our system and experts, and calculate the correlations. At last we have average Kendall coefficient—0.715. This denotes that our information retrieval system can support idea recognition in team creation.

With support of our system experts complete idea recognition at last. In the above example of creation task, we invite three experts and seven team members to recognize creative idea together. Supported by our system, experts and team members carefully read papers which are most similar to idea. They believe that the idea is new and creative solving method of the task. At last idea recognition is completed. And experts consider that automatic ranking of knowledge can help them to be absorbed in the most related knowledge of idea, so as to saving time greatly.

C. A Three Phase Idea Selection Approach

After idea generation, team members may have a large amount of ideas. It is unfeasible to select the most appropriate idea using one method in one time. So we establish an idea selection model which has three phases to screen ideas step by step.

The first phase: idea classification. Most idea generation method, such as brainstorming, pays more attention to the quantity of ideas than the quality, which results in generation of many low quality ideas. Team members will waste a lot of time if they synthetically evaluate every idea. So in our idea selection model, firstly team members themselves separate ideas into three classes: ideas of low quality, misappropriate ideas, appropriate ideas. We use Support Vector Machine (SVM) to realize idea classification.

Low quality ideas are entirely deleted in idea database. Ideas having quality but not suitable to team task are stored in idea database as for other team members' reference. Appropriate ideas will be hopefully selected, which enter next phases of idea evaluation and group decision. If the quality of ideas is prevalently low, the team leader can guide team member to go back to previous phase of idea generation.

In order to classify ideas using SVM, we should select the features of idea firstly. The target of idea selection is to eliminate ideas very quickly, so the features we selected should be synthetic and can reflect ideas' characters. In our approach, we select five features of ideas which are task fitness, technical feasibility, and creative degree, custom satisfactory and financial opportunity. Idea classifier of the team needs to grade each idea with score by these five features.

Here we have an example. The team task is "developing an injection mold design system". We select 85 ideas as samples. Team leader grades sample ideas from the five features. And then we use LIBSVM to train these samples. LIBSVM is a software pack developed by Lin Chih-Jen professor in Taiwan University. Then we use the trained SVM to classify 20 ideas in idea database, the accuracy rate is 95% which indicates that SVM is able to classify ideas very accurately.

The second phase: comprehensive idea evaluation according to team task. In this phase, team leader or a deputy of team members, field experts and stakeholders together evaluate the rest ideas based on team task. Field experts and stakeholders of team creation begin to be involved in the phase of comprehensive idea evaluation based on team task, in order to more effectively use these experts' time.

Participators of idea evaluation should build the criteria system of comprehensive idea evaluation based on the task's domain, target and characters. The criteria system is specific to a particular team task. Then we use Analytic Hierarchy Process (AHP) to derive priorities of each criterion, and then use Fuzzy Comprehensive Evaluation Method to evaluate ideas.

During the process of idea evaluation, we should not only pay attention to the best idea according to comprehensively considering all criteria, but also to the best ideas according to some important criteria (such as most creative ideas or ideas having biggest financial opportunity). Team members can use the outstanding ideas on some aspect for reference.

So firstly comprehensively considering all criteria we select the best idea-I1. And then only considering one class of criteria (such as technical criteria) we select the best idea- I2. Only considering one important criterion we select the best idea- I3. Offering I1, I2 and I3 to the experts they can make further discussions and argumentation to these ideas in the next phase.

The third phase: group decision based on team task. Team task is highly creative, so experts' subjective judgment is very important to idea selection. Accordingly in the third phase a group including many experts discusses about ideas selected in phase two, and makes the final decision. Group members participated in this phase include deputy of team members, field experts and stakeholders together.

In this phase, based on idea classification and idea evaluation, experts discuss about ideas. The discussing questions including:

- Comparing and analyzing the advantages and disadvantages of idea I1 and I2, I3
- Determining whether the idea I1 can entirely satisfy the requirements of stakeholders. If not, team members must improve or replenish idea I1;
- Using idea I2 and I3 for reference to improve or replenish idea I1, based on these improvement team members can generate new ideas.

The purpose of group decision is to discuss about advantages and disadvantages of ideas, select the most appropriate idea, and give opinion about idea improvement and implement.

D. Knowledge Visualization

Knowledge visualization is the use of visual representation to improve the transfer or creation of knowledge [9]. There are some researches about knowledge visualization method supporting team creation. The most famous visualization methods are mind map and concept map. These visualization methods usually are used to stimulate idea generation in team creation [10, 11]. There are no corresponding visualization methods to support other stages of team creation.

Team knowledge creation process is the process of team members completing creative task. In the process of team knowledge creation, team members break down complicated creative task into a series of subtasks firstly; then aiming at one subtask

they generate, select idea; after team members select appropriate idea, they should sufficiently discuss and demonstrate the idea, then improve the idea, propose a detailed scheme based on the idea, implement the scheme, at last finish the creative task.

In this paper, we research about how to use visualization to dynamically exhibit team knowledge creation process, thereby support knowledge creation process.

We use node-link format to visualize knowledge. Node denotes knowledge in team creation. In our research, we visualize four kinds of knowledge which are idea, improvement opinion, scheme and outcome. Improvement opinion is proposed by team member and pertinent experts aiming at a specific idea. Scheme is a mature solution plan of a task which can be implemented which engenders through multi-staged idea improving. Outcome is the achievements that team gets by implementing the scheme aiming at a task.

These four classes of knowledge are orderly generated in the process of team knowledge creation. So in node-link format, link denotes relation between nodes. If node i and node j has relation and node i is generated before node j, there is link from node i to node j.

Figure 1 is an example of team creation knowledge visualization. In the figure, ellipses denote ideas; triangles denote improvement opinions; squares denote schemes; diamonds denote outcomes which are not included in this figure. Figure 1 shows the process of multi-staged idea improvement and scheme generation. Ideas of number1, 2, and 3 are selected in idea selection phase. Team members and experts propose idea 4 based on these three ideas. Ideas of number5, 7 and 9 are proposed based on improvement opinion, but not adopted at last. Detailed information of a node can be showed if it is selected.

Using the scheme forming figure, team members and team outside users can see all improvement opinions and new ideas in idea improvement process, so as to understand the whole process of idea improvement in detail. In this figure, we can eliminateideas and opinions which are not adopted so as to exhibit key points in process of scheme forming. We can exhibits knowledge creation process of several subtasks, by which team members can know evolution process of all ideas in one task, and thereby understand teamwork holistically. After scheme forming it need to be implemented. Selecting one scheme, we can also exhibit detailed process of scheme implementation by a flow chart in a window.

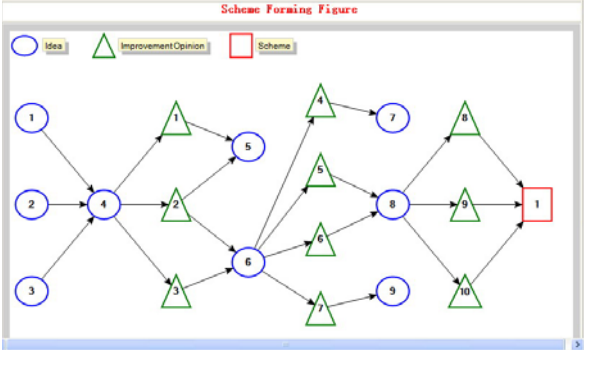

Fig. 1. Scheme forming figure

4 Performance Test

In an empirical study TKCSS was used for a team completing a creative task. The team includes seven employees. Their task is to develop a die mold design system. This project lasts two years. We select two months to investigate application effect of TKCSS. At the first two weeks, team members work without the support of TKCSS. At the third week, team members began to use TKCSS.

Without the support of TKCSS, team members conserve knowledge in their personal computer without sharing, knowledge is dispersed in team; idea selection is decided by the team leader which is very subjective; the process of the whole task is not clearly, team members can't understand the status of each subtask.

We use a questionnaire to survey team members' satisfaction degree of TKCSS after one month (when team members have used TKCSS for two weeks) and at the end of two months of performance test. In the first two weeks of using TKCSS, team members are not familiar about TKCSS. Information acquired by team members is not plentiful. So team members' satisfaction degree of TKCSS is not high. After several weeks of using TKCSS, team members are more and more familiar about TKCSS. They use TKCSS to support the whole process of idea improvement and implementation. In the second survey, team members' satisfaction degree of TKCSS greatly increases. Of course this system is not perfect. It should be improved in the future. But as a whole the initial empirical study of this system is successful.

5 Conclusion

Team knowledge creation is a complicated process. In this process team members need generate ideas and then iteratively consider, continually improve and implement ideas until creative task is complicated. In this paper we design a system –TKCSS– to manage the whole process of team knowledge creation. TKCSS includes three four functions: knowledge recording, creative idea recognition, idea selection, and knowledge visualization. Performance test of TKCSS indicates that it can support team knowledge creation effectively.

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Price, Quality and the E-Business Market

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Abstract. The shoddy commodities in the online has become a serious challenge for Chinese E-business. This paper employs the game theory and develops a dynamic model to analysis the commodity quality and price in e-business market. According to the results, it implies that shoddy will reduce the market efficiency. Meanwhile, even though the market does not contain shoddy commodities, the efficiency will also lower. In order to counterfeit the bad commodities to the good commodities, the sellers should pay the extra cost, it indicates that the government should strengthen the supervision and the consumers should collect more information about the commodities.

Keywords: e-business, commodities, quality, price.

1 Introduction

In the process of Chinese economic transition, there have emerged some new transaction models, such as online trade. Compared with the traditional transaction model, the online market introduces more risks. The shoddy commodities on the e-business market undoubtedly are the key obstacle to the further development of Chinese e-business.

Increasing literature have employed different methods and studied this issue, such as Jarvenpaa *et al.*[1], Gefen[2] and so on. Jarvenpaa *et al.* [1] examined the trust in the online transaction and considered that trust is an important factor for the consumers to purchase on the online market. Gefen[2] developed a simple model and evaluated the adaptation of the consumers' trust. Moreover, Gefen[2] identified the adaptation of the consumers' trust is positively relative the sellers reputation and the price of the commodity. Many Chinese scholars have also devoted much attention to this problem. Jiang Yongbo and He Jingyin[3] employed a game model under a static framework and studied the trust in the e-business market. Based on the behavior of group-buying, Yao Lei *et al.*[4] discussed the behavior of the sellers and the consumers. They constructed a game model and found that the group-buying can mitigate the trust crisis in the e-business market. Dong Zhi and Li Ying[5] analyzed the issue which result of the trust. They detected that asymmetric information between the sellers and the consumers is the right reason results of trust crisis in the e-business market.

However, even though many studies have been paid much attention to the issues which are relative to the e-business market, little literature examines the price cheating of the commodity on the e-business market. Based on this consideration, this

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paper will develop a dynamic game model and study this problem. The paper is organized as follows. Section 1 is a short introduction. In Section 2, we will build a simple model. And Section 3 we will examine the Nash Equilibrium of the model. Finally, we conclude the paper in Section 4.

2 The Model

In this section the behavior of the sellers and the consumers will be studied. Considering an e-business market that provides a certain commodity. The market contains different sellers and consumers. The consumers purchase the commodity through this on-line market. For simplicity, we make the following assumptions:

(1) There exist two kinds of commodities: the good and the bad. The good commodity values V for the consumer, the bad commodity values W . Both the sellers and the consumers know V and W;

(2) The sellers can sell both kinds of commodities in the e-business market. Whether provide the good commodity or the bad is the outcome of the sellers' choice;

(3) The cost of the good commodity and the bad commodity are C_g and C_b individually. Moreover, if the sellers provide the bad commodity, the sellers have to counterfeit the bad commodity. The cost is C ;

(4) The consumers can not tell the difference between the good commodity and the bad commodity (It rightly reflects the imperfect information in this model). Meanwhile, the consumers only know the probability of the good commodity and the bad commodity in the market. Suppose that the probability of the good commodity is p ;

(5) The price of the good commodity is P_h . For the bad commodity, the sellers can choose the price P_h or P_l . If the sellers provide the bad commodity at the price P_l , we define it as dishonest behavior;

(6) The consumers maximize their payoffs. If the payoffs is greater than 0, the consumers choose the strategy that buy the products.

Following the above assumptions, the sellers choose their strategy firstly in this game and then the consumers choose their strategy. Since the sellers and the consumers have the information about payoffs of both sides, this game can be treated as a complete information dynamic game. However, because the consumers do not know the commodity information, this game is a complete but imperfect dynamic game. The payoffs of the sellers and the consumers in corresponding situation are shown in Table 1.

It is evident that $V > W$ and $P_h > P_l$ from Table 1. Suppose that $P_h - C_g > 0$ and $P_l - C_b > 0$. It means that the sellers can get profit if they can sell their products. Meanwhile, for simplicity, we also assume that $V - P_h > W - P_l > 0 > W - P_h$. It shows that the consumers buy the good commodities are more than the bad commodities. They can also gain profit by buying the bad commodity under a low price. However, if they buy the bad commodity under a high price, they will experience monetary loss.

Table 1. Payoff Matrix of the game model

	Commodity	Price	Consumer	
			Buy	Not buy
Seller	Good	High price	P_h-C_g,V-P_h	-C_g,0
	Bad	High price	P_h-C_b-C,W-P_h	-C_b-C,0
		Low price	P_l-C_b,W-P_l	-C_b,0

3 Discussion

In order to find the Nash Equilibrium of this model, we will discuss the behavior of the sellers and the consumers in the following section. Specifically, we will study five different cases according the sellers' profit situation.

Case 1: $P_h - C_g < P_h - C_b - C$, and $P_h - C_g < P_l - C_b$. In this case, the profit of bad commodities is greater than the good commodities. It also shows that the profit from the good commodities under a high price is less than the profit from the bad commodities under the low price. In this case, the market only exist the bad commodities. Therefore, the consumers only buy the low price commodities and gain the consumer surplus $W - P_l$ .Even $P_h - C_b - C > P_l - C_b$, the sellers will provide their commodities at the price P_l . This outcome is the unique Nash Equilibrium.

Case 2: $P_l - C_b < P_h - C_g < P_h - C_b - C$. This assumption means that the profit from the good commodities under a high price is greater than the profit form the bad commodities under a low price. However, $P_h - C_g < P_h - C_b - C$ means that the profit from the bad commodities under a high price is greatest. It is evident that the sellers will only choose the bad commodities and sell them at a high price. The consumers only can choose the bad commodities under the high price. They achieve the consumer surplus $W - P_h < 0$. Therefore, the consumers will not buy the commodities at high price. In this case, the sellers will sell their commodities under a low price and the market does not include the good commodities. The sellers achieve the profit $P_l - C_b$. The consumers gain the consumer surplus $W - P_l$ .In this situation, the good commodities will not appear in the market. The market is the typical Lemon Market.

Case 3: $P_h - C_g > P_h - C_b - C$,and $P_h - C_g > P_l - C_b$ .In this case providing the good commodities at a high price is a strict dominated strategy. Hence, the market does not contain the bad commodities of a high price. Because the profit from the good commodities under a high price is greater than the profit from the bad commodities under a low price, the sellers will only provide the good commodities and the consumers choose the good commodities. This outcome is the unique Nash Equilibrium. The sellers achieve the profit $P_h - C_g$, and the consumer surplus

is $V - P_h$. The e-business market has the highest efficiency.

Case 4: $P_l - C_b > P_h - C_g > P_h - C_b - C$ .According to the assumption, the sellers will not provide the bad commodities at a high price. Moreover, the profit from the bad commodities under a low price is greater than the profit from the good commodities under a high price. Therefore, the sellers will only provide the bad commodities and the consumers purchase the bad commodities at a low price. This is the unique Nash Equilibrium in this case. The sellers get the profit $P_l - C_b$ and the consumer surplus is $V - P_h$ .Because the consumers do not achieve the greatest profit, the market does not have the highest efficiency.

Case 5: $P_l - C_b = P_h - C_g = P_h - C_b - C$. In this case if $W - P_l > 0$ and $p(V - P_h) + (1 - p)(W - P_h) > 0$, the consumers will purchase all the commodities in the market. According to the assumption, it is evident that $W - P_l > 0$. For $p(V - P_h) + (1 - p)(W - P_h) > 0$, it needs that $1 - p$ and $W - P_h$ is small enough. In this case, the sellers choose sell all kinds of commodities under a certain probability. The consumers purchase all of the commodities. However, the benefit of the consumers is experienced loss. The efficiency of the market is not best.

Based on the above analysis, we have identified the Nash Equilibrium in each case. We also examined the corresponding conditions. From the Nash Equilibrium and the condition, we can generalize two important propositions.

Proposition 1: If there have bad commodities in the market, it will blemish the benefit both of the sellers and the consumers.

This proposition implies that the bad commodities on the market will reduce the efficiency of the market, even if the market only has the latent threat from the bad commodities. In an extreme case, if the profit from the bad commodities under a high price is greatest, the seller has no incentive to provide the good commodities. The market becomes the typical Lemon market. The efficiency is lowest.

Notice the fact that the bad commodities have the extra counterfeit cost C .We did not closely concerned such a cost in the above section, however. In fact, the severity which is caused by the bad commodities is also determined by this cost. Based on this reality, we get the second proposition.

Proposition 2: The severity which is caused by the bad commodities is also influenced by the counterfeit cost C .If the government supervises the market seriously and the consumers have sufficient knowledge about the commodities, it will enhance the counterfeit cost and therefore improve the market efficiency.

4 Conclusions

Accompanying the transition of economic in China, the commodity market has exited different dishonest behavior. It also includes the e-business market. As a new purchase model, this market is even facing the most seriously credit risks. The market has appeared many dishonest phenomena. How to solve these problems is a key factor that determines the advanced development of the e-business market in China.

In this paper, we examined how the different commodities and the price influence the behavior of the sellers and the consumers. Specifically, the paper employs the game theory and constructs a model to study the e-business market under a dynamic framework. The main results are concluded in two propositions. The propositions imply that the bad commodities in e-business market will not only blemish the benefit of the consumers, but also the benefit of the sellers. The market in this situation will not have the highest efficiency. In order to mitigate the negative effect resulting from the bad commodities, the government should strengthen the supervision and the consumers should improve the distinguished ability of the commodities.

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The Analysis of Online Insurance Investment Strategy Based on Duopoly Game Model

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Abstract. Online insurance is the tendency of insurance marketing method. Currently, the on-line insurance is still in the primary stage in China, as an oligopoly market, investment strategies of the leading insurance companies are the major factors that affecting the development of on-line insurance. In this paper, a duopoly game model will be established to analyze how the on-line insurance investment strategy of insurance company would be affected by the potential customers scale and maturity of related technologies. The analysis shows that optimal response strategy for both insurances companies is keeping a low level of investment in on-line business no matter what their competitor's decision is. Once the scale of potential market and technical maturity reached a critical level, their investment in on-line insurance would increase rapidly. These conclusions point out the restriction and future trend of domestic on-line insurance.

Keywords: On-line insurance, duopoly game model.

1 Introduction

By Internet and e-commerce tecnology, online insurance is able to network the whole insurance process, including consulting insurance information, designing insurance prospectus, insuring, payment, underwriting, querying policy information, alteration of insurance right, renewal payment,, payment claim and so on[1].As an actual application of information technology on insurance marketing, On-line insurance has innovated and supplemented the traditional off-line insurance agent mode. In this mode, the insurance company can provide interactive service and develop multiple additional services for customers, expand sales channels and reduce the unit cost of insurance sales for themselves.

Since on-line insurance starts late in China, domestic scholars have paid inadequate attention to on-line insurance, their researches are lack of empirical and mathematical analysis and stay on an easy level. In contrast, the relevant researches in western countries are systematical and standardized, their analysis are performed mainly from the perspective of insurance marketing channel, price competition and customer

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services[2], but no perspective of investment strategy. Currently, the on-line insurance is still in the initial stage in China, as an oligopoly market[3], investment strategies of the leading insurance companies become the major factors that constraint of limited resource, the more resources are invested in on-line business, the more significantly the competitiveness of the original business will be weakened. On the other hand, On-line insurance has a small market share owe to the immature technology platform, the corporate profits will not be effected greatly and immediately even if the company increased its investment in the on-line business. Therefore, in order to achieve maximum of profit, the insurance companies should make the decision based on weighing the benefits and costs of all aspects and consideration of the strategy of their competitors. In the following chapter, a duopoly game model[4] will be established to analyze how the decision would be made, which will contribute to fill the domestic gaps of the research on on-line insurance and provide a theoretical foundation for the development of domestic on-line insurance market.

2 Model, Hypothesis and Result

Suppose there are two insurance companies provide the same insurance product in the market. The cost of insurance products is composed of two parts, cost of compensation and cost of management and marketing. Both companies can choose either the off-line agent mode or on-line marketing mode. In order to maximize profits, what they most concern about is the investing proportion of the on-line business to off-line business. Let $r_i (0 \le r_i \le 1)$ represents the investing proportion of on-line insurance business for company i （i =1,2）, accordingly, $1-r_i$ represents the proportion of off-line business; $\overline{q_i}$ is the traffic of on-line insurance business and $\underline{q_i}$ is that of off-line business; M and Q denote the total number of potential customers of on-line insurance and off-line insurance. Variable $\overline{\delta}$ represents the rate of changing from potential customers to actual customers, it is determined by the total investment in on-line business from both companies and the transfer efficiency $\overline{\delta} = (\sum r_i)^k$, here k is the transfer efficiency. Obviously, a greater k will inspire more potential customers under the same investment proportion. Similarly, the transfer efficiency in off-line market is $\underline{\delta} = (\sum 1-r_i)^k$. The market share of on-line insurance for company i can be expressed as $\overline{s_i} = \frac{r_i}{\sum r_i}$, while that of off-line insurance is $\underline{s_i} = \frac{1-r_i}{\sum 1-r_i}$. Then $\overline{q_i} = \overline{s_i} * \overline{\delta} * M$ and $\underline{q_i} = \underline{s_i} * \underline{\delta} * Q$. Moreover, how much the investment in on-line insurance business contributes to reduce the unit cost of sales depend on three factors, the investment proportion r_i, the maturity of related technologies d and

$m = \frac{M}{Q}$ -the ratio of potential on-line insurance customers to potential off-line customers. Let the cost of company i takes the form $c_i = p - r_i^{d\frac{M}{Q}}$, set up the decision-making equation of company i as follows,

$$\begin{cases} \overline{q_i} = \overline{s_i} * \overline{\delta} * M \\ \underline{q_i} = \underline{s_i} * \underline{\delta} * Q \\ c_i = p - r_i^{d\frac{M}{Q}} \\ Q_i = \overline{q_i} + \underline{q_i} \end{cases} \tag{1}$$

$$\pi_i = (p - c_i)Q_i \quad (i = 1, 2) \tag{2}$$

According to the principle of profit maximization, each company have an optimal response curves considering each other's investment proportion of on-line business to off-line business, they will be obtained from the following process.
Solving the equation

$$\begin{cases} \frac{\partial \pi_1}{\partial r_1} = 0 \\ \frac{\partial \pi_2}{\partial r_2} = 0 \end{cases} \tag{3}$$

yields

$$\begin{cases} r_1 = r_1(r_2, k, d, m) \\ r_2 = r_2(r_1, k, d, m) \end{cases} \tag{4}$$

That is,

$$\begin{cases} \frac{1}{r_1}(2 - r_1 - r_2)^{k-2} * [(dm + k) * r_1^2 + (dm + 1)r_1 * r_2 - (3dm + k + 1) * r_1 \\ -dm * r_2 + 2dm] + m(r_1 + r_2)^{k-2}[(dm + k)r_1 + (dm + 1)r_2] = 0 \\ \\ \frac{1}{r_2}(2 - r_1 - r_2)^{k-2} * [(dm + k) * r_2^2 + (dm + 1)r_2 * r_1 - (3dm + k + 1) * r_2 \\ -dm * r_1 + 2m] + m(r_1 + r_2)^{k-2}[(dm + k)r_2 + (dm + 1)r_1] = 0 \end{cases}$$

To simplify the process, the calculation will be carried out at $k = 2$, this will not affect the final conclusion. Solving the equation

$$\begin{cases} \frac{1}{r_1}[(dm+2)*r_1^2+(dm+1)r_1*r_2-(3dm+3)*r_1 \\ -dm*r_2+2dm]+m[(dm+2)r_1+(dm+1)r_2]=0 \\ \\ \frac{1}{r_2}[(dm+2)*r_2^2+(dm+1)r_2*r_1-(3dm+3)*r_2 \\ -dm*r_1+2dm]+m[(dm+2)r_2+(dm+1)r_1]=0 \end{cases}$$

Functions of optimal response curves are obtained,

$$\begin{cases} r_1=\frac{3+3dm-r_2-mr_2-dmr_2-dm^2r_2}{2(2+2m+dm+dm^2)} \\ -\frac{\sqrt{4dm(2+2m+dm+dm^2)(r_2-2)+(dm^2r_2+dmr_2+mr_2+r_2-3dm-3)^2}}{2(2+2m+dm+dm^2)} \\ \\ r_2=\frac{3+3dm-r_1-mr_1-dmr_1-dm^2r_1}{2(2+2m+dm+dm^2)} \\ -\frac{\sqrt{4dm(2+2m+dm+dm^2)(r_1-2)+(dm^2r_1+dmr_1+mr_1+r_1-3dm-3)^2}}{2(2+2m+dm+dm^2)} \end{cases}$$

3 The Impact of Parameters on Investment Decisions

A. Parameter m

Suppose d=1 is a constant, the optimal response curves at different value of m are shown in Figure 1.

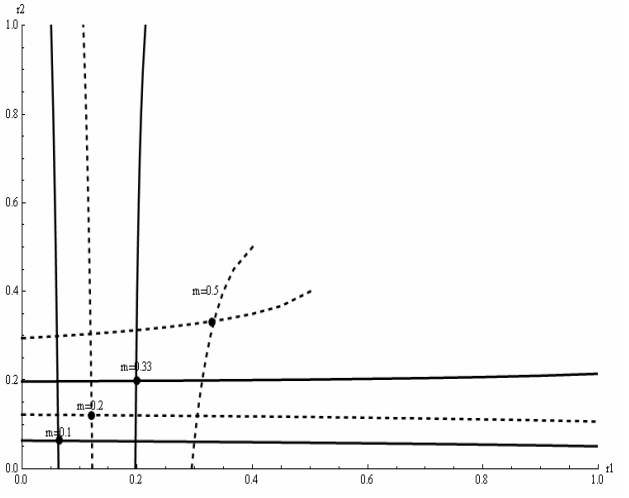

Fig. 1. Optimal response curves at different value of m (d=1)

Figure 1 shows that regardless of competitor's decision, the optimal response strategies for each company are keeping a low level of investment in on-line insurance when the value of m is small. Only if m increases to a certain value, each company will increase investment in the on-line business in line with the increasing investment of its competitor. That is because the small amount of potential customers makes the benefits from the costs declined is not enough to offset the losses from off-line business shrinking caused by investing in on-line insurance. From Figure 2, it can be seen that the equilibrium value increases slowly with m. Only when m reaches a certain threshold value, i.e. d=1 and m is around the value of 0.4, the trend of equilibrium value will transfer from marginal increase to marginal decrease (shown in Figure 3). At this point, the increase in m will cause a rapid growing investment in on-line insurance.

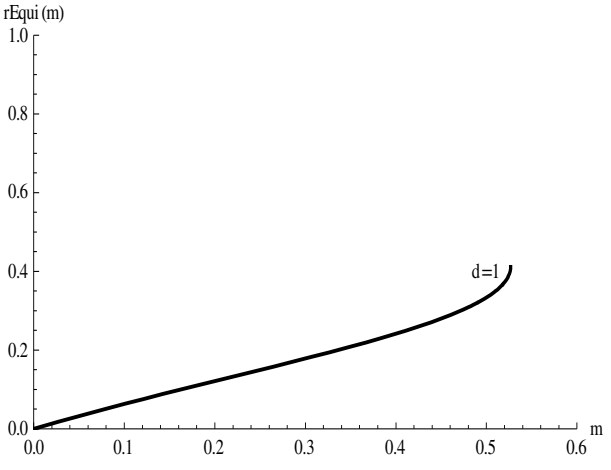

Fig. 2. Trend of equilibrium value (d=1)

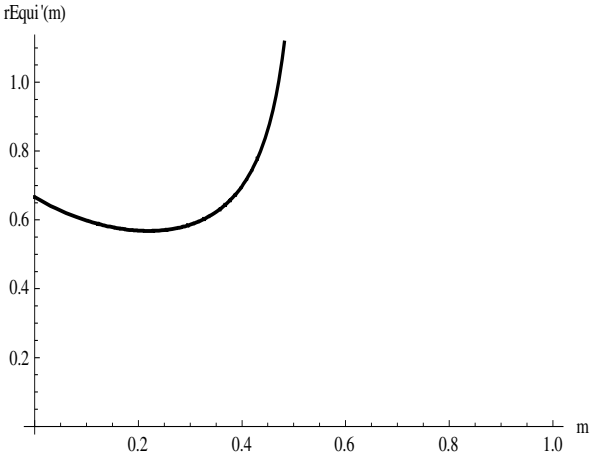

Fig. 3. Change rates of equilibrium value

B. Parameter d

Suppose m is a constant, under the optimal response strategy, there is an upward trend of equilibrium value along with increasing d which represents the technical maturity in on-line insurance, as shown in Figure 4. Obviously, the more mature related technology is, the sharper marginal cost will decline and more resources are preferred to invest in on-line business. Similarly, Figure 5 shows a threshold value of d, which correspond to the technical bottleneck. It is possible for on-line insurance to develop rapidly only if the related technology advanced enough to break through this bottleneck.

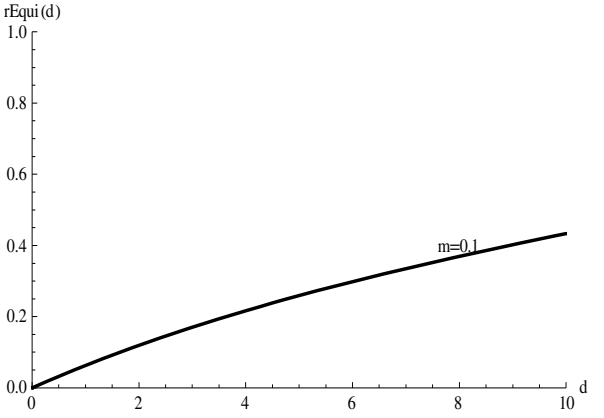

Fig. 4. Trend of equilibrium value with increasing d (m=0.1)

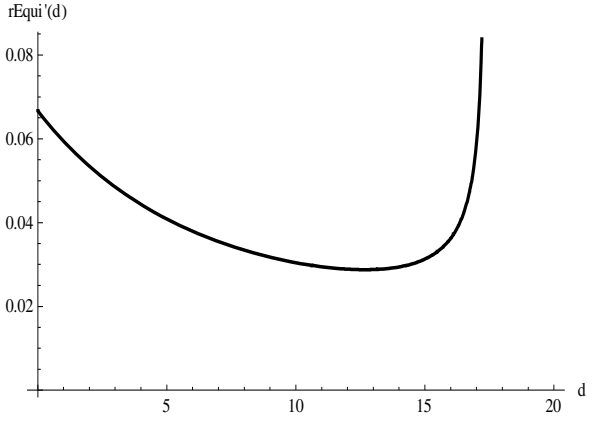

Fig. 5. Change rate of equilibrium value (m=0.1)

Figure 6 shows the combine effect on equilibrium investment strategy when m and d are both variable.

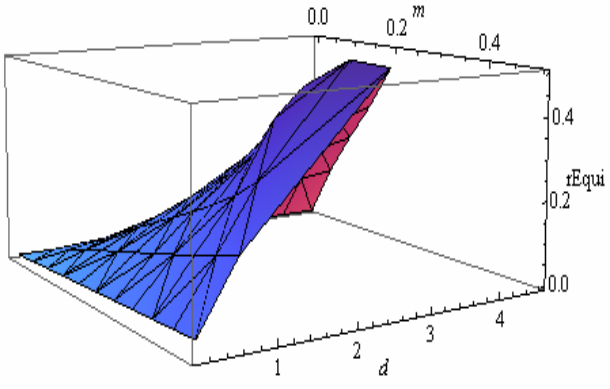

Fig. 6. The combined effect of d and m on the equilibrium value

4 Conclusion

In the cases of small scale of potential customers, neither company would invest much resource in on-line insurance. If they want to succeed in on-line business, a lot of money and energy should be used to develop potential on-line market, however, this will not bring about actual effects immediately. To overcome these difficulties, the current companies should take some effective measures like exploit the real potential users group based on widespread and detailed marketing survey. Besides, more accurate and detailed classification and targeted publicity are necessary for potential users to find out their own insurance needs and insurance companies to develop appropriate insurance products according to users' characteristics.

Current insurance companies are not willing to invest much in on-line business owing to the immature technology. Fist, in this case investment in on-line insurance is confronted with high risks. Second, immature technologies have little effect on reduction of sales and management costs. The existing websites of insurance sales can't support all service sectors of on-line insurance, such as inquiry, parity, premium calculations, on-line application, submitting orders, and payment, some of which must be operate off-line. Under the technical constraints, insurance companies should cooperate with third-party provider of professional insurance trading platform to achieve specialized division of labor and save expense of development. In this way, insurance companies can focus on the development of insurance product, while the third-party trading platform provider can also make full use of their professional strengths to speed up the upgrading of related technologies.

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A Network Security Risk Fuzzy Clustering Assessment Model Based on Weighted Complex Network

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Abstract. This paper puts forward the concept of risk conductivity and uses this as edge-weight to construct a weighted complex network. In addition, the concepts of node strength coefficient, weighted clustering coefficient and the computing method are offered to construct the fuzzy C-means clustering model based on weighted complex network characteristics. Finally, this paper analyzes the assessment result of the model.

Keywords: Risk Conductivity, Node Strength Coefficient, Weighted Clustering Coefficient, Fuzzy C-Means Clustering, Complex Network.

1 Introduction

Network risk assessment is to identify, analyse and evaluate network security risk, which assesses network security from the point of risk control[1,2]. Because of the variety and connection of the complexity, security threat and security factors of computer network and its behaviour dynamics, although the assessment on network security risk is widely used, there has not been an integrated assessment criterion up to now. Usually a general report is offered. Meanwhile, different assessment agencies and different approaches will draw different assessing conclusions on the same assessment of network.

In any assessment theory, mathematical approach is an indispensible basis. The common mathematical approaches are seen as the following: Linear Programming Techniques for Multidimensional Analysis of Preference (LINMAP), Analytic Hierarchy Process (AHP), Data Envelopment Analysis (DEA), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS), Fuzzy Evaluation (FE), and Fuzzy Clustering (FC), etc.

In recent years, because of the unique capability in describing mechanism, evolving law and integrative behaviour, complex network is gradually becoming the hot research. The subject complex network researches includes computer Internet, WWW, social relationship network, animal prey network, article cited research network and Scientists cooperation network, etc. which involves many subjects.

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In computer network and its security area, complex network research also draws much attention and a fruitful result has been got. In 1999, Barabasi and Albert put forward the Internet security model which is still widely used now. In ref. [3], based on the Internet security model by Barabasi and Albert, Paster-Satorras made research on the transmission mechanism of computer virus in network. He holds that as long as the network scale reaches a certain degree, the threshold value of the spread of computer virus is zero. As a result, Internet offers a good environment to the spread of computer virus. In ref. [4], Newman made research on the transmission mechanism of computer virus in network based on Internet security model, and put forward the model (SIR model) of the spread of computer virus in Internet. In ref.[5], Moreno and other researchers found that in communication network which possesses free-scale network characteristics, once the transmitting flow exceeds a certain value of phase transition, the communication jam will influence the whole network, resulting in the drop of the whole communication capability of network to zero. In addition, ref.[6-9] have also made research on network security by using complex network theory and got an important conclusion.

Considering integrated weighted complex network characteristics and fuzzy c-means clustering, this paper puts forward the concept of risk conductivity. Based on this, a new model of network security risk fuzzy assessment is suggested.

2 Theory Basis

A. Weighted Complex Network and Related Characteristics

The so-called weighted complex network refers to the complex network with different edge-weights. In real world, in the transportation network in a city, the passing capacity is much bigger than that in an ordinary street. In Internet, the flow of important nodes far exceeds the flow of ordinary nodes. In 2004, the weighted free-scale network model (BBV model)[10] put forward by Barrat, Barthelemy and Vespignani is the most influential research in weighted network realm.

In complex network research, many important characteristics closely associated with this paper: node strength and clustering coefficient.

1) Node strength and Clustering Coefficient

In non-weighted network, Node degree refers to the number of the edges each node possesses. Generally speaking, the bigger the node is, the more the connected nodes are, and visually the more important the node is.

In weighted network G=<V,E>, $V=\{v_1,v_2,\cdots v_n\}$ is the set of nodes. $E=\{e_{ij},i,j=1,2,\cdots n,i\neq j\}$ is the set of edges, $w_{ij}>0$ is the weight value of e_{ij}, $w_{ij}=0$ shows that there is not a direct edge between v_i and v_j, Say:

$$s_i=\sum_{j=1}^{n} w_{ij} \text{ is the node strength of } v_i.$$

$WD_i = \frac{s_i}{n}$ is the node strength coefficient of v_i

2) Clustering Coefficient

In non-weighted network, say $R_i = \{v_j \mid w_{ij} > 0\}$ is the neighbourhood set of v_i. If degree of v_i is k_i, there are k_i nodes in R_i. There may be direct-connected edges between nodes in R_i. Apparently, there are $\frac{k_i(k_i-1)}{2}$ edges at most between nodes in R_i. If there exists actually $E_i (\le k_i(k_i-1)/2)$ edges between nodes in R_i, say $C_i = \frac{2E_i}{k_i(k_i-1)}$ is the clustering coefficient of v_i.

Apparently, $C_i \le 1$, $C_i = 1$ if and only if all the neighbouring nodes of v_i are connected.

In weighted network, the weight clustering coefficient of v_i is:

$$WC_i = \frac{2 \sum_{v_j, v_k \in R_i} w_{jk}}{k_i (k_i - 1)} .$$

The $\mathrm{WD_i}$ of v_i reflects the connected degree of v_i with other nodes. The $\mathrm{WC_i}$ of v_i shows the interconnected density and intensity of v_i in local area.

B. Fuzzy C-Means Clustering Principle

Numerical value clustering analysis is the basis of many classifications and system modelling. The purpose is to find out the inner characteristics from lots of data so as to get the brief expression of system behaviour. Traditional clustering is a kind of hard-division, classifying strictly an object needed to be identified into certain category. This kind of clustering possesses the characteristics of either this or that one. While in fact, many objects do not possess strict properties. They often possess the character connected to each other. Therefore, fuzzy mathematics is introduced into clustering analysis to form a more reasonable fuzzy C-means clustering method (FCM) [11-15].

Suppose sample space $X = \{x_1, x_2, ...x_n\}$, X is divided into C types. The classification result is expressed in fuzzy matrix $\mu = (\mu_{ij})$. μ_{ij} is the membership grade of x_i to j type in X, which meets the following condition:

$$\mu_{ij} \in [0,1], \ \sum_{j=1}^{c} \mu_{ij} = 1, \ \forall i = 1,2,..n; \ j = 1,2,...c$$

The objective function $J(\mu, A)$ is called:

$$J(\mu, A) = \sum_{j=1}^{c} \sum_{i=1}^{n} {\mu_{ij}}^{b} \left\| x_i - A_j \right\|^2$$

among which, b （b>1） is fuzzy index, $A_j (j = 1, 2, ..c)$ is clustering centre.

In fact, FCM method is the iteration converge process of the minimizing of objective function. In iteration process, the formula of getting value is:

$$\mu_{ij} = \begin{cases} 1 & \|x_i - A_k\|_2 = 0, \text{且} k = i \\ \dfrac{\left(\dfrac{1}{\|x_i - A_j\|_2^2} \right)^{1/(b-1)}}{\sum_{k=1}^{c} [\dfrac{1}{\|x_i - A_k\|_2^2}]^{1/(b-1)}} & \|x_i - A_k\|_2 \neq 0 \\ 0 & \|x_i - A_k\|_2 = 0, \text{且} k \neq i \end{cases}$$

among which, $A = \dfrac{\sum_{i=1}^{n} \mu_{ij}^{b} x_i}{\sum_{i=1}^{n} \mu_{ij}^{b}}$, （1≤j≤C）

$\left\| x_i - A_j \right\|_2$ is the Euclid distance between *j*th clustering centre and *i*th sample.

3 Security Risk Assessment Model

A. Risk conductivity

In real world, the security risk of network nodes is not only connected with the hidden danger of security existing in itself but also with the security events of other nodes in network.

On one hand, when a node with security problem is connected to network, the security risk may be passed on to the neighbouring nodes of this node and finally spreads within this network. On the other hand, a certain cause-effect relationship may exist between two different security events. One security event may be the fuse of the other one.

Suppose there are n nodes and m kinds of risk types, $d_i = (t_{1i}, t_{2i}, \cdots t_{mi})$ is the risk vector of v_i, $t_{ki} \in [0,1]$ is the risk value of *k*th security factor of v_i, Call $Risc(d_i, d_j)$ is the risk conductivity between v_i and v_j.

$$Risc(d_i, d_j) = \frac{\left\| d_i \otimes d_j \right\|_1}{\max_{t=1}^{n} (\sum_{k=1}^{m} t_{kt})},$$

$d_i \otimes d_j = (t_{1i} \otimes t_{1j}, t_{2i} \otimes t_{2j}, \ldots t_{mi} \otimes t_{mj})$ among which, $\otimes$ is arithmetic operators:

$$t_{ki} \otimes t_{kj} = \begin{cases} (t_{ik} + t_{jk})/2 & if\,(t_{ik} \times t_{jk} > 0) and ((t_{ik} \to t_{jk}) or (t_{jk} \to t_{ik})) \\ 0 & else \end{cases}$$

B. Model Procedure

1) To choose samples for assessing and find physical topology.
2) To compute the risk conductivity between neighboring nodes.
3) The non-neighboring nodes are supposed as zero. The risk conductivity is used as the edge-weight between neighboring nodes to form topology matrix. Computing the eigenvalue of weighted complex network of each node.
   First, compute node strength coefficient(WD_i)

   Second, compute weighted clustering coefficient(WC_i)

   Lastly, WD_i and WC_i are the bestowed weight to α and 1- α among which α is the parameter which can be regulated. Usually 0.5 is chosen.
4) The vector $(\alpha WD_i, (1-\alpha)WC_i)$ is used as a unit to form data set. According to the set clustering C, C clustering centers are chosen.
5) C nodes chosen are used as the vector of initial clustering centers. The method mentioned in 2.2 is adopted to iterate to form clustering.
6) If the clustering result meets the need, stop. Otherwise, return to 5, regulate C and repeat the iterating process.

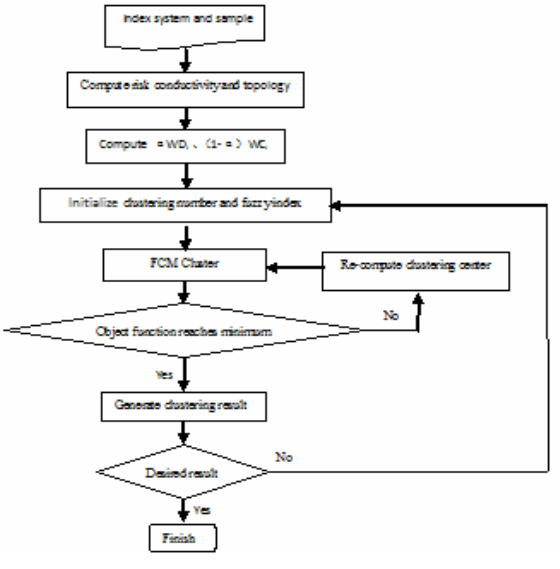

Fig. 1. Flow-process Diagram

4 Example and Analysis

A. Sample Selection

In order to examine the effectiveness of assessment model put forward in this paper, the campus network that the author works in is chosen as the assessing object. Different types of sample (totally 251 samples) are chosen according to the proportion from student-region, laboratory-region, teaching-region and administration department so as to reflect wholly and objectively the security situation of campus network.

B. Assessment Index System

There are many factors [16, 17] influencing network security. So is the chief security factors of the network directed at different users. Considering the characteristics of campus network users and their behaviour, and based on what experts investigate, the index system is set up to be used in assessing campus network security risk. There are three levels altogether:

Assessment norm level: 5 indexes, including "network management", "technological security", "network resources", "hardware equipment" and "network ethics and culture", etc.

First-class index level: 11 indexes (omitted)

Second-class index level: 17 indexes (omitted)

Based on what experts investigate, extension-analysis is used to bestow weight on each index.

C. Clustering Assessment and Analysis

To realize the model mentioned above in Matlab and input the index weight and various samples, the iterating is happening. When the maximum iteration time is reached or the improved amount of successive two-time iteration of the objective function is smaller than the designated minimum improved amount (namely, to meet the stopped error norm), the clustering process ends. The clustering result is illustrated in Fig. 2 and Fig. 3:

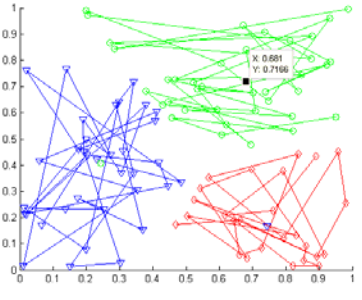

Fig. 2. Clustering results diagram

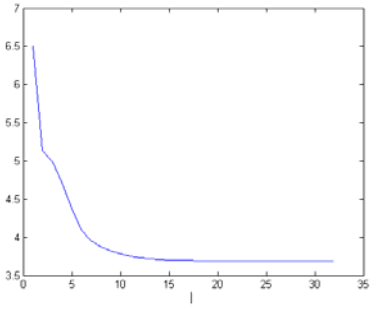

Fig. 3. FCM objective function curve

Based on the clustering results, the brief analysis is shown as the following:

Risk analysis: the farther the clustering centre is away from the origin, the higher the network security risk the clustering centre belongs to is. While in sharp contrast, the nearer the clustering centre is from the origin, the lower the network security risk the clustering centre belongs to is.

Risk deviation analysis: Risk deviation is composed of degree deviation type and weighted clustering coefficient deviation type. As to the former type, the security risk mainly comes from neighbouring nodes. The influence on security risk of the interconnection between neighbouring nodes is smaller. As to the latter type, the risk mainly comes from the interconnection between neighbouring nodes.

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Automated Essay Scoring Using Multi-classifier Fusion

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Abstract. The method of multi-classifier fusion was applied to essay scoring. In this paper, each essay was represented by Vector Space Model (VSM). After removing the stopwords, we extracted the features of contents and linguistics from the essays, and each vector was expressed by corresponding weight. Three classical approaches including Document Frequency (DF), Information Gain (IG) and Chi-square Statistic (CHI) were used to select features by some predetermined thresholds. According to the experimental results, we classified the test essay to appropriate category using different classifiers, such as Naive Bayes (NB), K Nearest Neighbors (KNN) and Support Vector Machine (SVM). Finally the ensemble classifier was combined by those component classifiers. After training for multi-classifier fusion technique, the experiments on CET4 essays about same topic in Chinese Learner English Corpus (CLEC) show that precision over 73% was achieved.

Keywords: Automated essay scoring, feature selection, text categorization, multi-classifier fusion.

1 Introduction

While English writing is an essential part of the educational process, many raters find that assessing students' writing is one of the most expensive and time consuming activities for assessment programs. And one of the most difficulties is subjectivity in the grading process. Many researchers claimed that the subjective nature of essay assessment leads to variation in grades awarded by different human assessors, which is perceived by students as a great source of unfairness [1]. With different people evaluating different essays, reliability becomes a concern in the assessment process. Even with evaluating the same essay, differences in the background training and experience of the raters can lead to subtle but important differences in grading [2].

This issue may be faced through the adoption of automated assessment tools for essays. A system for automated assessment would at least be consistent in the way it scores essays, and enormous cost and time savings could be achieved. Using different methods, related works include PEG, the earliest AES system developed by Page et al [3]. The IEA system, developed in the late 1990s based on latent semantic analysis (LSA) [4]. Burstein et al. developed the E-Rater system [5] based on Microsoft parsing

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tools for the ETS. BETSY is developed by Lawrence M. Runder [6]. In China, research on automated essay scoring slightly delayed, the first person who researched on it was Professor Liang Mao-Cheng [7].

This paper presents an approach to essay scoring that builds on the text categorization literature and incorporates multi-classifier fusion technique. Section 2 describes the corpus organization, essay representation and feature selection. Section 3 describes the classifiers for essays scoring. Section 4 describes multi-classifier fusion technique method. Section 5 presents the experiments and the results and discusses the major findings. Section 6 summarizes the conclusions.

2 Courpus of Ganization and Feature Selection of Essays

A. Transform the Essay Scoring to Categorization

Several studies have reported favorably on computer grading of essays. The current systems have returned grades that correlated significantly with human raters. With our approach, we extracted the essays of the same theme (*Global shortage of Fresh Water*) from the *Chinese Learner English Corpus*. According to the different scores of essays, we observe that the sizes of the top and bottom groups were extremely small, so six categories from 230 essays between 7 to 12 points have been extended for our research. Forty-six essays from each group were randomly selected to be used as the trial sample. The remaining 221 essays were used as training corpus. The numbers of each score essays were distributed as follow.

Table 1. The Number Distribution of Essays

Score	7	8	9	10	11	12	Total
Training Set	24	28	40	35	31	26	184
Test Set	4	8	12	11	6	5	46
Total	28	36	52	46	37	31	230

B. Essay Representation and Feature Selection

The essays in their original form are not suitable to learn from. They must be transformed to match the learning algorithm's input format. Because most of the learning algorithms use the attribute-value representation, this means transforming each essay into a vector space.

First of all, essays need to be pre-processed. Then the transformation takes place. The vector space model can be represented as follow:

$$d_j = (w_{1j}, w_{2j}, w_{3j}, \ldots, w_{mj}) \tag{1}$$

Here, d_j denotes the jth essay, and w_{ij} denotes the weight of the ith feature in jth essay. w_{ij} can be deemed to the weight of features. We have extracted the features of contents and linguistics from the essays.

Content-based features include words and phrases and so on. Considering of the themes and contents, the more features which are helpful for assessment will be extracted if they are consistent with requirement of writing. Linguistics-based features include the superficial linguistic features (such as: the number of essays' words, the number of sentences, word lengths, etc. and complex linguistic features (such as: syntactic structure, part of speech, the number of spelling errors, syntax errors, etc), and 25 types of linguistic features have been collected in our research.

The dimensionality of the vector space mentioned above may be very high, which is disadvantageous in machine learning (complexity problem, over learning). And also in order to get more effective features, dimension reduction techniques are necessary. Document Frequency (DF), Information Gain (IG) and Chi-square Statistic (CHI) methods [8] are included in this study, each of which uses a feature-goodness criterion threshold to achieve a desired degree of feature elimination from the full features of an essay.

We have taken Naïve Bayes(NB), K-Nearest Neighbor (KNN)and Support Vector Machine (SVM) as classifications for our research.

3 Multi-classifier Fusion Method

Traditional text classification systems usually use one specific classifier, and it difficult to obtain good classification results if there are a large number of categories. Multi-classifier fusion method used to obtain better results. Its basic assumption is: given a task that requires expert knowledge to be performed, k experts may be better than one if their individual judgments are appropriately combined [9].

We have observed the different advantages and disadvantages of NB, KNN and SVM methods from the descriptions given by Section 3. And also, there are certain complementary relationships between them. So, in this study, we have combined those three classifications to hope them learn from each other.

A. Model of Multi-classifier Fusion

Multi-classifier fusion technique is based on the outputs of component classifiers. The overall probability of producing output y is then the sum over all the processes according to [10]:

$$P(y \mid x, \Theta^0) = \sum_{r=1}^{k} P(r \mid x, \theta_0^0) P(y \mid x, \theta_r^0) \tag{3}$$

Here $\Theta^0 = [\theta_0^0, \theta_1^0, \theta_2^0, ..., \theta_k^0]^t$ represents the vector of all relevant parameters. Figure I shows the basic architecture of an ensemble classifier whose task is to classify a test essay $\boldsymbol{x}$ into one of c_i (i=1, 2, … , M) categories.

The mixture of experts architecture consists of k component classifiers or "experts," each of which has trainable parameters θ_i, i=1,…, k. For each input essay $\boldsymbol{x}$, each component classifier i gives estimates of the category membership $g_{ir} = P(\omega_r \mid x, \theta_i)$.

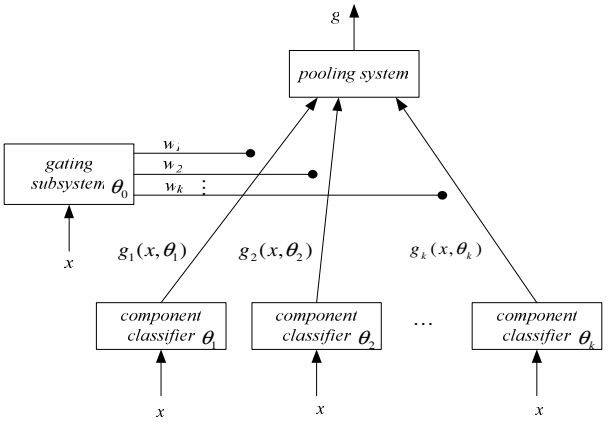

Fig. 1. The Figure of Multi-classifier Fusion

A test essay $\boldsymbol{x}$ is presented to each of the k component classifiers, each of which emits c scalar discriminant values, one for each category. The c discriminant values from component classifier r are grouped and marked $g(x,\theta_r)$ in the figure, with

$$\sum_{j=1}^{c} g_{rj} = 1 \text{ for all } r \tag{4}$$

All discriminant values from component classifier r are multiplied by a scalar weight gating w_r, governed by the *gating subsystem*. The mixture-of-experts architecture is trained so that each component classifier models a corresponding process in the mixture model, and the gating subsystem models the mixing parameters $P(r \mid x, \theta_0^0)$ in Eq.3. The outputs are weighted by the gating subsystem, and pooled for ultimate classification.

We would take an example for describe the details for the procession of multi-classifier fusion technique. For the problem of classification about M classes C_t ($t = 1, 2, \ldots, M$) and K classifies θ_r ($r = 1, 2, \ldots, K$). We assume X_r is measurement vector for classifier θ_r and a test essay x, x will be put into the category whose posteriori probability is maximum. The formula has been expressed as follow:

$$x \to C_j, \text{when } P(C_j \mid X_1, \ldots, X_K) = \max_{t=1}^{K} P(C_t \mid X_1, X_2, \ldots, X_K) \tag{5}$$

We can deduce the formula (6) as follow using (3).

$$x \to C_j, \text{when} \sum_{r=1}^{K} (P(X_r)P(C_j \mid X_r)) = \max_{t=1}^{M} \sum_{r=1}^{K} (P(X_r)P(C_t \mid X_r)) \tag{6}$$

B. The Weight of Component Classifiers

The results of each component classifier will change with the features of the composites, so we need to combine a kind of classifies and adjust the weight of features

in consideration of different essays. Considering the weights of component classifiers increase with precision of them in direct proportion, besides, removing the classifiers which precision is too low [11], the weight of each component classifier can be constructed after the confusion matrix which is calculated as follows:

$$P(X_r) = Acc_i = \sum_{j=1}^{M} r_{jj}^{(i)} \Big/ \sum_{j=1}^{M} \sum_{l=1}^{M} r_{jl}^{(i)} \tag{7}$$

Here, $r_{ji}^{(i)}$ is one of elements of confusion matrix, it denotes the probability of which we divide the essays which in category C_j into category C_l using classifier i. We will get final result of classification if $P(X_r)$ in Eq.7.

4 Results and Analysis

A. Performance Measures

Categorization effectiveness is usually measured in features of the precision and recall. These probabilities may be estimated by features of the global contingency table [9].

Table 2. The Global Contingency table

Category set $C=\{c_1,c_2,c_3,\ldots,c_{\|C\|}\}$		Expert Judgments	
		YES	**NO**
Classifier Judgments	**YES**	$TP=\sum_{i=1}^{\|C\|} TP_i$	$FP=\sum_{i=1}^{\|C\|} FP_i$
	NO	$FN=\sum_{i=1}^{\|C\|} FN_i$	$TN=\sum_{i=1}^{\|C\|} TN_i$

Here, TP_i is the number of test essays correctly classified under c_i; FP_i is the number of test essays classified category c_i while their actual categories are not c_i; FN_i and TN_i are defined accordingly. Estimates of precision and recall may thus be obtained as [12]:

$$\text{Precision: } p = \frac{TP}{TP+FP} = \frac{\sum_{i=1}^{\|C\|} TP_i}{\sum_{i=1}^{\|C\|} (TP_i + FP_i)} \tag{8}$$

$$\text{Recall: } r = \frac{TP}{TP+FN} = \frac{\sum_{i=1}^{\|C\|} TP_i}{\sum_{i=1}^{\|C\|} (TP_i + FN_i)} \tag{9}$$

$$F_1 \text{ Measure: } F_1 = 2 \times p \times r / (p+r) \tag{10}$$

Two methods are used to calculate the precision, recall and F_1 measure called micro-average and macro-average. Micro-average has been used to denote the standard of each point essays, and the macro-average for whole test set.

For evaluating the same essay, it's common that different raters can lead to subtle but important differences in grading. In this study, we hold that the results obtained with one point difference between the true values are also correct.

B. *Primary Results*

After experiment, the KNN classifier got the highest macro precision of 71.74% among other component classifiers, SVM classifier got the higher macro precision of 69.57%, and the macro precision of NB classifier is 63.04%. After in the proper fusion of these classifications, the macro precision increased to 73.91%. The detailed experimental Results of micro-average are given by Table 3. In the Table 3, "Def" denote the data can't be calculated because of none of essay be divided into a category.

C. *Discussion and Analysis*

Automated essay scoring works well. Normally a classifier is doing the job of inferring whether a document is about something or relevant to something. One expects the core of a category to be characterized by a few key concepts, and some larger number of highly associated concepts. The job of feature selection is to find these key concepts and so on. In contrast, in essay scoring, the classifier is trying to determine whether an essay is "good" or not.

Table 3. The Micro-average of Results

Score	Precision				Recall				F_1 Measure			
	NB	*KNN*	*SVM*	*Fusion*	*NB*	*KNN*	*SVM*	*Fusion*	*NB*	*KNN*	*SVM*	*Fusion*
7	*Def*	0.00	*Def*	*Def*	0.00	0.00	0.00	0.25	*Def*	0.00	*Def*	*Def*
8	1.00	1.00	*Def*	0.50	0.75	0.38	1.00	1.00	0.86	0.55	*Def*	*0.67*
9	0.63	0.57	0.67	0.71	0.75	0.92	1.00	1.00	0.68	0.70	0.80	0.80
10	0.73	0.77	*Def*	1.00	0.73	1.00	1.00	1.00	0.73	0.87	*Def*	*1.00*
11	0.50	0.14	*Def*	0.75	0.50	0.40	0.00	0.00	0.50	0.20	*Def*	*0.45*
12	0.20	*Def*	*Def*	1.00	0.20	0.00	0.00	0.00	0.20	*Def*	*Def*	*0.33*

Because we have exacted the essays of same theme; the characters of them are very similar. That causes the result of trial is not very well, although many methods about feature selection have been used for exacted the essays' features. And the feature selection is also the difficulty for essay scoring. Another reason for lower precision is the distributions of the essays are not symmetrical. In the corpus, the numbers of 7, 8, 11 and 12 points compositions are much less; the much more essays have been marked the 9 or 10 points. This led the inadequate training for high and low scores essays model, we found that the test essays with middle points got the much better effect than essays in marginal points.

According the output of experiment, the method of automated essay scoring using text categorization is feasible. But the performance of each component classifier is different, and they are not stable, such as when we take KNN classifier for test, the precision of 10 points and 11 points scores are 77% and 14%. So we combine the component classifiers by the techniques, and then get the final result by fused classifiers. The experimental results show that combination is an effective and stable method to enhance the performance of component classifiers.

5 Conclusion and Future Work

We presented the multi-classifier fusion technique to do essay scoring based on the well developed text categorization literature. Our evaluation of the approach based on words, phrases and lots of linguistic features and six categories is quite good. With fusing the different classifiers, we were able to achieve 73.91% precision.

We emphasize that this is a preliminary investigation. In next phase of our research, we will do our best to take measures to get more effective features with different methods to improve our accuracy. As the initial corpus of scored essays is very small, we will try to get larger corpus. And we will adjust and improve our fusion technique according to the characters of automated essay scoring.

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Design and Implementation of Status Monitoring System for E-Learning Web Service

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Abstract. This paper is based on the "National Elaborate Course Integration Project", aiming to monitoring the service status of distributed elaborate course web servers across the nation. An evaluation index system is developed and a comprehensive evaluation method is applied to evaluate the web server's connectivity. This paper also proposes a monitoring strategy management method to optimize the regular monitoring. Detailed system design and historical implementation results are provided to prove the feasibility and effectiveness of the system.

Keywords: Elaborate course, status, monitor, evaluation.

1 Introduction

Technological developments like web and internet have profound effects on education [1]. Nowadays, e-learning and distant education becomes more popular and feasible with the help of modern information technology. In 2003, the Ministry of Education of China started the construction of National Elaborate Course and a great number of university-level elaborate course websites have been set up since then. In this way, students get access to high quality study material easily and can communicate with teachers with great convenience.

Although great achievements have been made in e-learning and elaborate courses, there are still some problems to solve. One of these problems is the service quality and stability of websites of elaborate courses. As we know, the websites of elaborate courses is the key channel connecting study material and users all over the country. In the National Elaborate Course Sharing System [2], some of material is in lack of maintainance and the connectivity cannot be guaranteed. This situation leads to waste of education resource and loss of users: For one thing, those high quality materials which have cost big investment cannot be well shared across the country; on the other hand, bad user experience caused by poor service quality will reduce the utilization of elaborate course resource.

In this paper, we aim to monitor the service status of distributed elaborate course web servers and provide a comprehensive evaluation method based on the monitoring

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data. This evaluation result can be used directly in improving user experience and service quality of elaborate course websites. The rest of this paper is organized as follows: Section 2 introduces the evaluation index system and the comprehensive evaluation method of analytic hierarchy process. Section 3 describes the monitoring strategy to optimize the monitoring process and regular schedule. In Section 4, we introduce the design of the java-based monitoring system together with the application effect of this system. Section 5 draws the conclusion.

2 Evaluation Index System and Comprehensive Evaluation Method

A. Evaluation index system

To evaluate the connectivity of those elaborate course websites, we have to first develop an evaluation index system to evaluate different aspects of connectivity [3]. These aspects include availability, connection speed and stability.

The first aspect is availability. It means the success ratio when users try to connect to certain websites. It is the basis of high quality service. If the websites are not available, then it is meaningless to discuss about the quality of the service.

The second aspect is connection speed. Naturally, connection speed can be evaluated by the response time of website. The response time of certain website will have some randomness caused by randomness of the environment. We could use statistic like mean response time to reduce the effect of this randomness. Since we care more about the present connectivity than historical data, we should put more weight on new monitoring data. Assume the speed index is A_i after i times of measuring and the result of the next time is B, then we can calculate A_{i+1}:

$$A_{i+1} = aA_i + (1-a)B, (0 < a < 1)\tilde{} \tag{1}$$

Here a is the weight of historical result and the weight of B will reduce as time goes.

The last aspect is stability. The statistic we used will be useless if the randomness of connection speed is highly random. So we need an index to evaluate the level of randomness. Here we use standard deviation:

$$\sigma(X) = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}\tilde{} \tag{2}$$

Because the result we get from monitoring is unbiased estimate of standard deviation, we should use sample standard deviation as follow:

$$\sigma(X) = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x_i - \bar{x})^2}\tilde{} \tag{3}$$

B. Comprehensive evaluation method

Based on three aspects we mentioned above, we have to provide an overall judgment about the connectivity of elaborate course websites. Before we come to a comprehensive evaluation result, we have to do number normalization [4] and transfer all the indicators to positive indicators with the value between 0 and 1.

Then we use analytic hierarchical process (AHP) for comprehensive evaluation. AHP is a measurement method through pairwise comparison [5]. Here we have already structure the decision hierarchy and construct the pairwise comparison matrix in Table 1.

Table 1. Pairwise comparison matrix of connectivity

	Speed	**Stability**	**Availability**
Speed	1	3	1/2
Stability	1/3	1	1/5
Availability	2	5	1

The numbers in the table indicate the priority between two criteria. This priority relies on judgment of expert and its value range from 1 to 9. 1 means same importance and 9 means the former criterion is extremely more important than the latter one. For example, the number in column 2 row 1 is 3, which means speed is a little bit more important than stability. Consequently, the number in column 1 row 2 should be 1/3 for consistency. We know that pairwise comparison is much easier to human beings than overall comparison. In this way, we can get the weight of different criteria easily.

It can be proved that unified eigenvector corresponding to the biggest eigenvalue $\lambda_{\max}$ of pairwise comparison matrix is just the weight vector of the criteria [6]. Here the unified eigenvector is $W = (0.31, 0.11, 0.58)^T$.

Before we use the weight vector to calculate the comprehensive evaluation result, there is still one job to finish. We use a_{ij} to denote the comparison matrix element on column i row j and use n to denote the matrix dimension. If our judgment on pairwise priority is strictly consistent, then

$$a_{ij}a_{jk} = a_{ik}, \forall i, j, k = 1, 2, ..., \tilde{n} \tag{4}$$

Usually, this equation cannot be strictly obeyed. We have to check the consistency of the comparison matrix. The consistency indicator (CI) can be calculated use

$$CI = \frac{\lambda_{\max} - n}{n-1} \tag{5}$$

Then we find out randomness indicator (RI) from Table 2. Here we use 0.58 as n =3. Consistency ratio (CR) is

$$CR = \frac{CI}{RI} \tag{6}$$

Table 2. Randomness indicator for AHP

n	RI
1	0
2	0
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45

Usually, we regard the comparison matrix as consistent when $CR < 0.10$. In our case, $\lambda_{\max} = 3.0037$, $CI = 0.0019$, $CR = 0.0033$.

3 Monitoring Strategy Management

Monitoring websites' status is something that happens frequently. Due to the large number of elaborate course websites and their heterogeneous technical characteristics, the monitoring efficiency could be largely affected. In order to solve this problem, some methods were proposed in this part to optimize the monitoring process.

A. Monitoring process optimization approach

The optimization of monitoring process mainly consists of three parts.

First, remove from monitoring list those websites which are no longer working according to the statistical data of their reliability. From section 2 we know that reliability plays a very import role when evaluating a website's status. For those websites which are unavailable for a long time, it will make no sense to discuss their response time or stability. For websites which act unconventionally and could not have themselves restored after a period of time, the monitoring program will stop connecting them and invoke some manual intervention. An obvious advantage of this action is that it will reduce the unnecessary waste of time during monitoring.

Second, dynamically adjust the response timeout according to different connection speed. In order to get an accurate result, the response timeout has to be set long enough. As a result, during the monitoring process, we found that most of the time was wasted on waiting for the response of websites not available. One obvious fact is that, it is unreasonable to set the same response timeout for a website whose average response time is 10 milliseconds and for another whose average response time is 10 seconds. So here we propose another strategy: Dynamically adjust the response timeout for a website according to its statistic of response time. For example, we could use average response time plus standard deviation as response timeout. Also we usually set a lower limit of timeout in order to increase the monitoring accuracy.

Third, dynamically determine the monitoring frequency of a website according to its stability. Among the websites which are monitored, we found some of them had very stable response time. For this kind of websites there was no need to measure their response time frequently. Here the stability of a website is not indicated by standard deviation of response time, but by the ratio between stand deviation and mean value.

B. Application effect

We carried out an experiment on 10 websites. Table 3 shows the response time we got from these websites. From the result we see that after optimization, the total response time added up to 250 milliseconds, compared to the response time of 10765 milliseconds (website 2 was in fact unavailable) before optimization. After applying the optimized strategy, different websites would have different monitoring frequency, so some of the websites tested were not monitored (marked with "-"). The monitoring efficiency is significantly increased in two ways: First, the number of websites to be monitored each time is reduced; second, the long time wasted on unavailable websites is avoided.

Table 3. Result of different monitoring strategies

No.	1	2	3	4	5	6	7	8	9	10
Before	0	10^4	16	172	0	187	15	16	16	343
After	15	-	-	-	15	188	-	16	-	16

The unit here is millisecond.

4 System Design and Implementation Result

In this section, we will describe the design of the monitoring system and then briefly present the implementation result.

Fig. 1 shows the function flow of the system. Data recording and analyzing stand in the center of the functions.

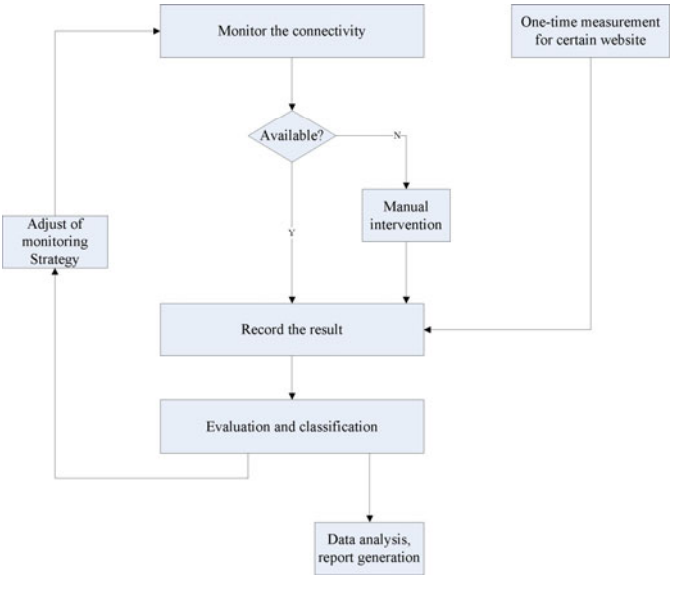

Fig. 1. Function flow diagram of status monitoring system

Basically there are two different ways of data acquisition. The first one is one-time measurement for certain website. System administrator can access this function through web-based management platform and he can choose whether to put the result into database. The second way is regular monitoring through java-based application. If there are any exceptions when monitoring, manual intervention can be invoked to improve the availability and service quality of websites.

After data recording, the system evaluates and classifies all the elaborate course websites through historical records. The evaluation result is then used to adjust the monitoring strategy to improve efficiency. Statistical report can be generated when necessary.

The architecture of the whole status monitoring system is showed in Fig. 2. It can be divided into 4 tier including supportive bottom tier, data tier, logic tier and appearance tier. The supportive tier provides fundamental hardware and software environment like data base, monitor server, network and monitor module. The data tier contains all historical monitoring data acquired from lower tier which can be used in evaluation and analysis. It is the bridge between supportive tier and logic tier. The logic tier is the core of the whole system. Its main job is data processing, calculating and optimization action. The last tier is appearance tier, by which the users and administrators access and manage the monitoring system. And the system should be in good network environment and connected to distributed elaborate course websites all across the country.

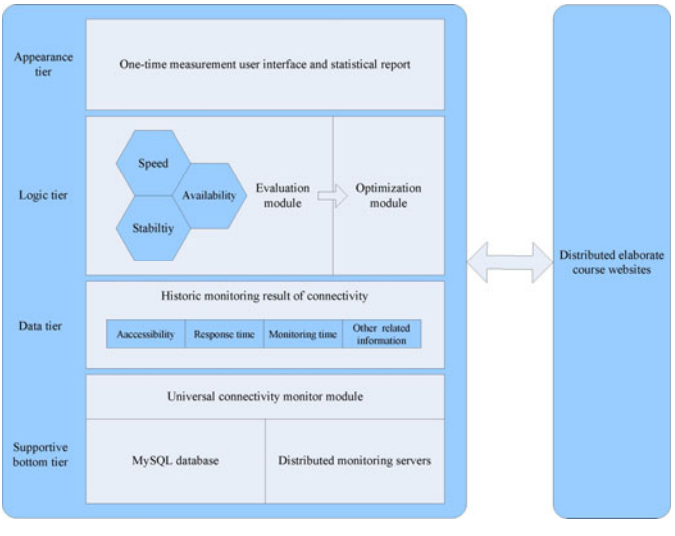

Fig. 2. Architecture of status monitoring system

We started running the monitoring system since 2008 summer. Meanwhile, our system provides search and navigation function for elaborate courses and their websites. The service quality of different websites is partially revealed to users. Now there is information of around 4000 elaborate courses in our system and most of them have their own websites. These websites have got over 1,222,000 clicks totally from

our system. And our search function receives 1,240,000 search requests from 163,000 different IP addresses.

We can also see that websites with good performance got more clicks. Here we pick three national elaborate courses with the same course name and denote them as A, B and C. The historical monitoring data is showed in Table 4.

The response time in Table 4 is the mean value of the measurement data of recent 10 times. Obviously, course A got more clicks as its connection speed is the most fast among three courses.

Table 4. Historical data of elaborate course websites

Course	Clicks	Response Time/ms
A	1653	18.70
B	771	407.80
C	1023	88.90

From above discussion, we see that our system regularly monitors the status of elaborate course website and helps to improve the service quality. And the implementation effect is positive.

5 Conclusion

From the practice of National Elaborate Course Integration Project, we see that monitoring service status of websites is very important for improving the quality of elaborate course construction and utilization of education resource.

We developed evaluation index system including availability, stability and connection speed based on real requirement and engineering practice. In order to provide a comprehensive evaluation result of websites' connectivity, AHP is used in the system. Also, we design several optimization methods for high efficient monitoring. These methods are applied in our system implementation.

In the future, further challenges should be conquered. First, the evaluation index system could be improved to better reflect the real status and service quality of certain elaborate course website. For example, web traffic is indicator of the popularity of websites and it can reflect the service quality from other side. But it needs further work to monitor web traffic. Second, the monitoring system faces the risk of single point failure in monitoring servers and related network. More distributed servers should be set up and different statistical results from these servers have to be integrated.

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Multi-flow Attack Resistant Interval-Based Watermarks for Tracing Multiple Network Flows

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Abstract. Interval-based watermarking technique was developed for the traceback of malicious traffic in the presence of natural and/or deliberate repacketization and perturbation of the traffic timing by an adversary. However, it is vulnerable to multi-flow attack, which uses the dependent correlations among the flows marked with the same watermark to recover the secret parameters, and remove the watermark from a flow. This paper proposes a Multi-flow Attack Resistant Interval-Based Watermarking (MAR-IBW) scheme for tracing multiple network flows, which survives multi-flow attack by randomizing the location of the embedded watermark across multiple flows and therefore, effectively removing the correlations between the flows. Theoretical analysis and empirical evaluation demonstrate that this new technique, robust against multi-flow attack, is effective and efficient in detecting multiple interactive traffic.

Keywords: Network flow watermarking, Interval-based watermarking, Multi-flow attack, Stepping stones, Anonymous communication.

1 Introduction

The rapid growth of the Internet not only brings the global connectivity to the general public, but also offers malicious users an opportunity to hide their traces. A malicious user may attack other computers from anywhere on the Internet through anonymous communication systems [1] (such as Mixminion [2], Tor [3], Crowds [4, 5] and Anonymizer) or a sequence of stepping stones [6]. As a result, it is challenging to hold attackers accountable for their malicious activities.

Active watermarking is one of the promising approaches aimed at tracing back to the attacker's source through connection chains or an anonymizing network [7]. These approaches embed a watermark into a network flow by delaying selected packets or marginally varying traffic rate. Trace-back is achieved by embedding/decoding watermarks in network flows and correlating the flows with similar watermarks. Compared with passive approaches [8-11], which correlate network flows simply using packet timing (without alteration), packet count and packet sizes, the active watermarking schemes in general require fewer packets and thus can identify the origins of attacks more efficiently.

Pyun et al. developed a new class of Interval-Based Watermarking (IBW) technique for the traceback of stepping stones [12]. Packet timing is adjusted to

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manipulate the packet count in specific intervals, for purposes of embedding the watermark. A statistical analysis of the method, with no assumptions or limitations concerning the distribution of packet times, proves its effectiveness given a sufficient number of packets, despite natural and/or deliberate repacketization and perturbation of the traffic timing by an adversary.

However, this interval-based watermarking technique is vulnerable to mutli-flow attack. Kiyavash et al. [13] analyzed several recent schemes, including IBW, which mark network flows based on splitting the flow into intervals. Multi-flow attack uses the dependent correlations among the flows marked with the same watermark to effectively recover the secret parameters, and remove the watermark from a flow, even if different flows are marked with different values of a watermark.

Houmansadr et al. [14] proposed a Multi-flow Attack Resistant Interval Centroid Based Watermarking (MAR-ICBW) scheme for network flows. This scheme can withstand the newly introduced multi-flow watermarking attack, however, it modifies the Interval Centroid Based Watermarking (ICBW) scheme [15].

Wang et al. [16] proposed an Interval Centroid Based Spread Spectrum Watermark (ICBSSW) for tracing multiple network flows. Although ICBSSW provides robustness against flow watermarking attacks and timing perturbation, however, it hasn't addressed challenges introduced by repacketization, which occurs as per the standard network protocols (TCP and SSH), and maliciously splitting or merging flows, which active adversaries often utilize.

In this paper, a Multi-flow Attack Resistant Interval-Based Watermarking (MAR-IBW) scheme for network attack attribution is proposed, which embeds watermarks in the randomly choosed interval positions using different seeds across multiple flows by manipulating the arrival times of the packets. Theoretical analysis and empirical evaluation demonstrate that this proposed scheme, robust against multi-flow attack, traffic timing perturbation and repacketization, is effective and efficient in tracing multiple interactive traffic flows.

The rest of the paper is organized as follows. Section 2 introduces our proposed multi-flow attack resistant interval-based flow watermarking scheme for tracing multiple network flows in details. In Section 3 and 4, we analyze the effectiveness of this proposed scheme, and evaluate it through experiments, respectively. This paper is concluded in Section 5 along with some future research directions.

2 Multi-flow Attack Resistant Interval-Based Watermarking Scheme

The main vulnerability of interval-based watermarking scheme is that it embeds the watermark in the same intervals in the flows. Therefore, an attacker that observes multiple watermarked flows can align them to render the watermarks visible. However, if the watermark was embedded using different intervals, the alignment approach [13] of multi-flow attack would fail.

A. Packet Arriving Time based Signal Embedding

Given a packet flow F, starting form an offset $o > 0$, this flow is divided into intervals I_i ($i > 0$) of time length $T > 0$. An interval I_i contains N_i contiguous

packets, which are identically distributed, and we denote the mean of N_i as μ_x and the variance as σ_x^2, whose values are both proportional to the interval length T.

Then, r pairs of 2 consecutive intervals are randomly selected. $I_{1,j}$ and $I_{2,j}$ $(j=1,2,\cdots,r)$ denote the first and second interval of each pair. Assuming a flow lasts long enough, $N_{1,j}$ and $N_{2,j}$ $(j=1,2,\cdots,r)$ are random samples from a sufficiently large population ($N_i, i>0$) of a common distribution.

Let the sample mean of the packet count difference of the above selected interval pair be $\overline{D_r}=\frac{1}{r}\sum_{j=1}^{r}(N_{1,j}-N_{2,j})/2$. It can be easily shown that $E(\overline{D_r})=\mu_x$, $V(\overline{D_r})=\sigma_x^2/2r$. Hence, the distribution of $\overline{D_r}$ is also symmetric about the mean with its variance decreasing as we increase r.

Specifically, MAR-IBW encodes a watermark bit by either increasing or decreasing $\overline{D_r}$ by an amount of μ_x, depending on the given value of the watermark bit.

Increasing $\overline{D_r}$ by μ_x can be achieved by increasing $\frac{1}{r}\sum_{j=1}^{r}N_{1,j}$ by μ_x and simultaneously decreasing $\frac{1}{r}\sum_{j=1}^{r}N_{2,j}$ by μ_x. The former is accomplished by loading each of the corresponding intervals $N_{1,j}$ $(j=1,2,\cdots,r)$; all the packets in the preceding interval are shifted into this interval by adding a maximum delay $d=T$ (called timing adjustment) to each of the packets. The latter is accomplished by simply clearing each of the corresponding intervals $N_{2,j}$ $(j=1,2,\cdots,r)$; all the packets are delayed to the following interval in the same manner. Note that, since clearing one interval implicitly loads the next, it takes three intervals to send a bit. Decreasing $\overline{D_r}$ by μ_x can be done in the opposite way.

B. Watermark Embedding

As in the conventional watermarking and cryptography, the watermarking method relies on a shared secret (key) between the encoder and the decoder. This new method assumes that the following parameters are pre-distributed: a random offset $o>0$, an interval length $T>0$, multiple seed values $s=\{s_1,\cdots,s_n\}$, a list of positions $S=\{S_1,\cdots,S_k\}$, and a binary watermark w of l bits. We pick one of seed values at random to randomly select intervals to different signal bit for each flow in order to synchronize the encoder and decoder and defeat multi-flow attack. Once the watermark embedding interval pairs are selected, the encoder encodes the intended watermark w onto a given unwatermarked flow F^u. Similarly, given a watermarked flow F^w, the decoder decodes a watermark w^r and then compares it against w for a correlation result.

To encode a watermark bit '0', $\overline{D_r}$ is increased so that the result, denoted as $\overline{D_r^w}$, is positive. On the other hand, to encode a watermark bit '1', $\overline{D_r}$ is decreased so that the result is negative. It not guaranteed that $\overline{D_r^w}$ can be increased; the preceding

interval may happen not to contain any packets. The use of redundant coding reduces the likelihood that a particular value cannot be coded because of an absence of packets. In addition, the watermark itself is l bits in length, and is tolerant to small errors in coding.

C. Watermark Detection

To decode watermark bit from received watermarked flow F^w, the detector would need to try to recover the watermark with each possible s_i and pick the best match.

Given a seed s_i, we let $\overline{D_r^{w'}}$ be a random variable comparable to $\overline{D_r^w}$ at an encoder. To decode a watermark w' of a watermarked flow, $\overline{D_r^{w'}}$ is computed over the embedding intervals computed by seed s_i and then compared against 0, a positive result implies a watermark bit of '0', whereas a negative result implies a watermark bit of '1'. After decoded every bit, we then can get a w', and we denote this watermark computed under seed s_i as w_i'.

After $w_1', w_2', \cdots, w_n'$ are computed under every possible seed, then each decoded watermark's Hamming distance with the original watermark $hd_i = H(w_i', w)$ will be computed. The detector reports a positive detection of the watermark w if $\min(hd_1, hd_2, \cdots, hd_n) \le h$ $(0 \le h < l)$, where h is a decoding threshold.

3 Analysis

A. Efficiency of Multi-flow Traceback

Tracing multiple flows in parallel is important to achieve efficient traceback, however, the different flows may go through the same stepping stone (or mix node) and interfere with each other. To address this problem, MAR-IBW uses different interval positions to different target traffic flows of interest. Since the positions are choosed by different seeds, this makes the flows cause little interference to each other. As a result, MAR-IBW can effectively identify the watermark of interest from an aggregated watermarked flow, supporting multi-flow traceback.

B. Robustness against Mutli-flow Attack

When flows are watermarked using multiple seed values, the attacker can still commit multi-flow attack [13], however, the attack complexity grows quickly. The probability of a given set of k flows using the same seed is $(1/n)^{k-1}$, which falls quite quickly when $k = 10$ (the number of flows recommended in [13]). According to the pigeon hole principle, a subset of k flows with the same seed within $n(k-1)+1$ flows can always be found, however, the search space of all $\binom{n(k-1)+1}{k}$ subsets grows superexponentially in n. For example, with $n = 5$ and $k = 10$, $\binom{46}{10} > 10^9$, resulting in an infeasible number of subsets to list.

4 Empirical Evaluation

To evaluate the effectiveness of MAR-IBW, we implemented a MAR-IBW watermarking system shown in Fig. 1. A series of synthetic SSH interactive flows were generated at Client. A 25-bit watermark w was first embedded at Watermarker. The watermarked flow was then perturbed with random delays at Perturber to simulate the timing perturbation, and repacketized at Perturber. Finally, the Detector detected a watermark w' from the received flow, which was compared against the original watermark w for a match. We used 80 random flows, each with at least 2000 packets and an average packet rate of 2.36 packets/second. These interactive traffic flows exhibited the ON-OFF periods.

A. Efficiency of Multi-flow Traceback

To demonstrate the effectiveness of MAR-IBW when tracing multiple flows simultaneously, another watermarked flow generated at Perturber was added to the target flow generated at Client. These two flows were interfered at Perturber. The parameters are T = 900 ms, with a fixed timing perturbation of 1200 ms (9.8% repacketization). Fig. 2 shows the detection rate comparison between IBW and MAR-IBW under the cross-flow interference. The result demonstrates that IBW requires the redundancy 28, requiring 1800 packets to achieve a 84% detection rate. Compared with IBW, MAR-IBW only requires the redundancy 18 to achieve a 100% detection rate, requiring only 1400 packets. We conclude that MAR-IBW can effectively and efficiently trace multiple flows simultaneously. The reason is that the watermarked flows embed watermarks using different interval positions which are minimally cross-correlated. This feature is important for MAR-IBW scheme to withstand multi-flow attack.

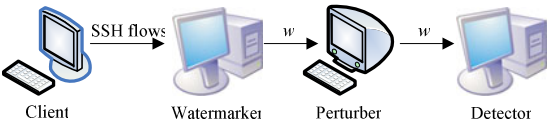
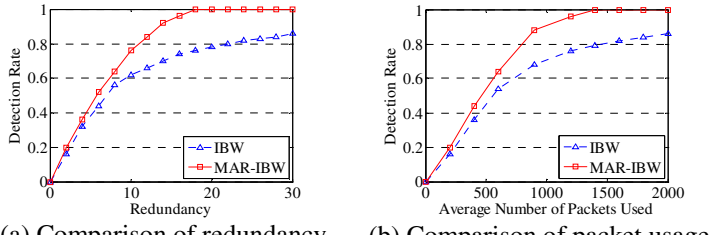


Fig. 1. Experiment setup



(a) Comparison of redundancy (b) Comparison of packet usage

Fig. 2. Detection rate comparison faced with cross-flow interference.

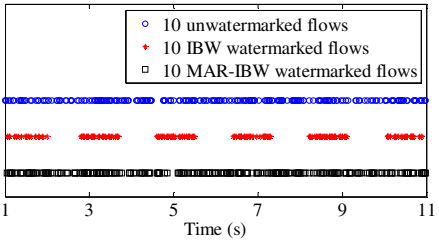
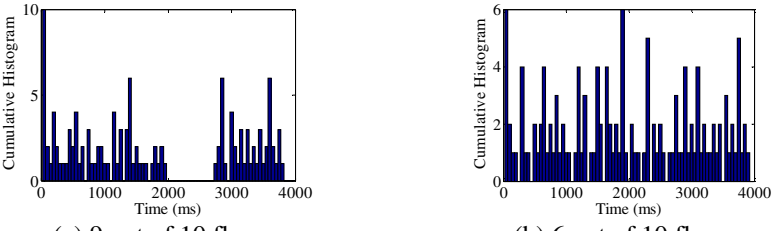


Fig. 3. 10 flows before and after watermarked by IBW and MAR-IBW.



(a) 9 out of 10 flows (b) 6 out of 10 flows

Fig. 4. Multi-flow attack against MAR-IBW with 5 seeds

B. Resistance of Mutli-flow Attack

As multi-flow attack relies on collecting a series of flows that are watermarked with the same interval position. These flows are combined into a single flow and examined for large gaps between packets. Fig. 3 shows the packet arrivals for 10 combined flows before and after an IBW and MAR-IBW watermark has been applied. The IBW watermark pattern is clearly visible in the combined flows, revealing the presence of a watermark, while the MAR-IBW watermark pattern is hardly to reveal.

When not all the flows are marked using the same seed, multi-flow attackers can still notice certain intervals, which have fewer than usual packets. Fig. 4 shows the results of multi-flow attack for our proposed MAR-IBW scheme. We choose $n = 5$ seeds for interval locations of watermark, and other parameters are $T = 900$ ms, $r = 20$, respectively.

Fig. 4(a) shows that when 9 out of 10 flows are watermarked using the same seed, the multi-flow attack can still reveal the cleared interval. As depicted in Fig. 4(b), when 6 out of 10 flows are marked with the same seed, the clear watermark is no more detectable. Finding a 6 flow match still requires $\binom{26}{6} = 230230$ subsets.

Note that this increased multi-flow attack resistance comes at the cost of higher computation overhead at the detector. However, this increased cost is only linear, whereas the increased cost for the multi-flow attacker is superexponential. Therefore with slight increase of computation cost at the detector, we provide an effective defense of multi-flow attack.

5 Conclusion and Future Direction

In this work, we proposed a Multi-flow Attack Resistant Interval-Based Watermarking (MAR-IBW) scheme for tracing multiple network flows. Our proposed scheme can withstand the newly introduced multi-flow watermarking attack, by virtue of randomizing the location of the embedded watermark across multiple flows and therefore, effectively removing the correlations between the flows.

Although this propsed technique provides robustness against multi-flow attack and packet count transformation, there are other challenges that have not been addressed in this paper. Our future work will address other transformations, such as adding chaff packets into a flow. We will also investigate the robustness and stealthiness of our method against other potential timing analysis.

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An Improved Diploid Genetic Algorithm for Head-Independency Hydro Plant Scheduling*

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Abstract. This paper analyzed the influence of mutation operator of diploid genetic algorithm (DGA) on population diversity. It shows that DGA has a better performance than HGA in terms of preserving the diversity. An improved method of mutation operator for DGA was developed to deal with the nonlinear optimization problem for hydro scheduling in power market. The results interpreted using a realistic example.

Keywords: Diploid genetic algorithm, mutation operatorm hydro scheduling.

1 Introduction

In this paper, the influence of mutation operator of diploid genetic algorithm (DGA) on population diversity was considered. Haploid GA involves the use of a single stranded chromosome to represent the solution to a problem. Haploid GA has been shown to be useful for a variety of difficult optimization problems. Diploid individuals in nature occur to inherit genes from parents to preserve traits from generation to generation. Natural phenomena inspires to the proposal of a diploid chromosome structure.

Some researchers have studied diploid chromosomes, [1] takes a step toward solving dynamic fitness problems by using diploidy to create individuals in changing, often oscillating, fitness environments. GAs accomplish search in the feasible space by exchanging and recombining of the schema. Many scholars concentrate on coding, control parameters and operators strategies to improve its performance. [2-3] proposes an effective diploid genotypes representation, a Boolean dominance mechanism and the crossover operator. The crossover operator is carried out through a series of exchanging and recombining procession, which has the same effect as uniform crossover operator. S. Yang investigates the cardinality of genotypic representation and the existence of uncertainty in the genotype-to-phenotype mapping and proposes a generalized dominance mechanism for DGAs in dynamic environments [4].

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The Optimal scheduling of hydropower is a nonlinear programming problem. Linear programming, nonlinear programming, dynamic programming and heuristic algorithm et al. are used to solve the hydro scheduling problem [5-6]. Genetic algorithm (GA) adapts to solve the optimization problem with irregular search space without requiring continuous and derivative information. They also exhibit a more subtle implicit parallelism [7-8].

With the criterion measuring the amount of schema, this paper analysis the influence of mutation operator on population diversity and propose the dynamic adaptation strategy for mutation operator for DGA to solve the short-term hydro scheduling problem.

The remainder of this paper will proceed as follows. In section 2, the influence of mutation operator on population diversity was investigated by introducing the measure criterion. Therefore section 3 proposed a dynamic strategy on the mutation operator. Section 4 provides the modeling framework to solve scheduling problem for hydropower. In section 5, a realistic case study is presented. Finally, Section 6 concluded the paper.

2 Infuluence of Mutation Operator of DGA

In realistic problem, all variables are separately encoded into a fixed number of binary bits and are concatenated to a binary string as an individual, while DGA is represented as two strings and then could map into a function string by dominance mechanism. To investigate the influence of the mutation operator on population diversity for DGA, schema, schema order and schema of DGA are defined similarly referred to HGA and ASSR criterion to measure the amount of schema is given by [2].

ASSR is defined for population n as follows:

$$P_{same} = \frac{1}{L} \cdot \sum_{k=0}^{L-1} [\frac{\mathrm{m}^2(H_0^k) + \mathrm{m}^2(H_1^k)}{n^2}] \tag{1}$$

Where $\mathrm{m}(H_i^k)$ is the number of individuals of which the bit at position k is i, L is schema defining length.

It is proved that the smaller p_{same} is, the better diversity the population has.

Mutation operators of DGA have influence on the two strings. The mapping course is:

$$\left.\begin{matrix} S1(k) \\ S2(k) \end{matrix}\right\} \xrightarrow{ds(k)} f(k)$$

Here the mapping mechanism is given by:

$$f(k) = S1(k) \cdot ds(k) + S2(k) \cdot ds(k) + S1(k) \cdot S2(k) \tag{2}$$

Where $f(k)$ and $ds(k)$ are assumed to be the bit at position k of the function string and the dominance string respectively. $S1(k)$ and $S2(k)$ are assumed to be the bit at position k respectively.

Mutation of a bit involves change from 0 to 1 or 1 to 0. After mutation operation, the total number of 0 or 1 in each bit of individuals is possibly changed. For a population of n, there is:

$$\mathrm{m}(H_0^k,t)+\mathrm{m}(H_1^k,t)=n \tag{3}$$

Where $\mathrm{m}(H_i^k,t)$ is the number of individuals of which bit at position k is i for generation t.

Assuming that $\alpha(k)$ is the expectation incremental of individuals of which the bit at position k turns to 0 after mutating, we can obtain as follows for generation $t+1$:

$$\alpha(k)=m(H_1^k,t)\cdot P_{10}(k)-m(H_0^k,t)\cdot P_{01}(k) \tag{4}$$

Where $P_{10}(k)$ is the conversion probability of $f(k)$ from 1 to 0 after mutation, for $P_{01}(k)$ is 0 to 1.

To calculate $P_{10}(k)$, it is divided into two conditions for $ds(k)$ and $f(k)$ respectively. And it is assumed that the individual is represented as strings $\{ch1,ch2\}$ before mutation and $\{ch1',ch2'\}$ after mutation.

Firstly, we calculate $P_{10}(k)$. Since $ds(k)$ can be either 1 or 0, the problem is analyzed separately:

- $ds(k)=1$

1) Before mutating: $ds(k)=f(k)=1$. According to (2), we can conclude that $ch1(k)\bigcup ch2(k)=1$, that is: i.e. $(ch1(k),ch2(k))\in\{(0,1);(1,0);(1,1)\}$.

2) After mutating, $ch1(k)$ and $ch2(k)$ are converted into $ch1'(k)$ and $ch2'(k)$ respectively, and $f(k)$ is affirmably converted into 0. That is $ds(k)=1,\ f(k)=0$. According to (2), both $ch1'(k)$ and $ch2'(k)$ are equal to 0 whatever $ch1(k)$ and $ch2(k)$ are before mutation.

- $ds(k)=0$

1) Before mutating: $ds(k)=0$, $f(k)=1$. According to (2), therefore $ch1(k)=ch2(k)=1$.

2) After mutating: $f(k)$ is newly converted into 0. We can analyze similarly according to (2). $ch1'(k)\bigcup ch2'(k)=1$, i.e. $(ch1'(k),ch2'(k))\in\{(0,1);(1,0);(1,1)\}$.

Then we have:

$$P_{10}(k)=\frac{(C_2^1\cdot Pm(1-Pm)+Pm^2)/C_3^1+1-(1-Pm)^2}{C_2^1} \tag{5}$$

The ASSR for $t+1$ generations after mutation is:

$$P_{same}(t+1)=\frac{1}{L}\cdot\sum_{k=0}^{L-1}\left[\frac{m^2(H_0^k,t+1)+m^2(H_1^k,t+1)}{n^2}\right]$$

$$=P_{same}(t)-\frac{1}{L}\cdot\sum_{k=0}^{L-1}\left[2P_{10}(1-P_{10})\cdot\left(\frac{m(H_1^k,t)-m(H_0^k,t)}{n}\right)^2\right] \tag{6}$$

Assuming $P_{same}^{HGA}(i+1)$ and $P_{same}^{DGA}(i+1)$ are ASSR of HGA in [2] and DGA from (6), we get the difference:

the difference between them is:

$$Dif(i+1)=P_{same}^{DGA}(i+1)-P_{same}^{HGA}(i+1)$$

$$=\left[Pm(1-Pm)-P_{10}(1-P_{10})\right]\cdot$$

$$\frac{2}{L}\cdot\sum_{k=0}^{L-1}\left[\left(\frac{m(H_1^k,t)-m(H_0^k,t)}{n}\right)^2\right]$$

$$=\frac{4}{9}[\frac{1}{16}-(Pm-\frac{1}{4})^2]\cdot[\frac{25}{16}-(Pm-\frac{7}{4})^2]\cdot$$

$$\left[\frac{2}{L}\cdot\sum_{k=0}^{L-1}\left(\frac{m(H_1^k,t)-m(H_0^k,t)}{n}\right)^2\right] \tag{7}$$

The second item of the right of (7) is positive; the first item is shown in Fig. 1.

It shows that DGA has a better performance in preserving the diversity than HGA. $Pm=0.5$ is a threshold. If $Pm\in[0,0.5]$, the differencevaries from small to large and go back to 0. $Pm\in[0.5,1]$, the difference goes to greater.

3 Improved Strategy of Mutation Operator

It shows mutation operator could improve the population diversity. Normally the probability of mutation operator is fixed in the whole evolution process. The dynamic mutation operator adaptation strategy is proposed to make the initial random population search to the suboptimal region roughly in the early period and in the region cautiously in the later period. The overall mechanism is that the diversity of the

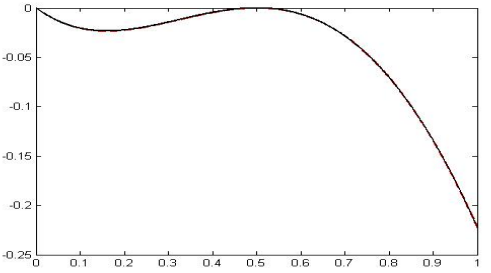

Fig. 1. Difference of ASSA between HGA and DGA

population is reduced greatly early and then kept to the extent lately. The indexes are the current ASSR and iteration times.

The method is simple to implement.

$$Pm(i) = Pm_{fixed} \times AF(i) \tag{8}$$

Where Pm_{fixed} is the fixed probability of mutation operator, $AF(i)$ is adaption function related to the iteration time i. $Pm(i)$ is the probability of adaption mutation.

We adopted the Mexican hat wavelet, which is available in Matlab as following:

$$[PSI, X] = mexihat(LB, UB, N) \tag{9}$$

This function is proportional to the second derivative function of the Gaussian probability density function. It returns values of the Mexican hat wavelet on the N point regular grid in the interval $[LB, UB]$. To adapt to be practical, set $LB = 0$ and $AF(i) \subseteq \left[0, 1/Pm_{fixed}\right]$.

The whole flow of DGA is as follows:

- Generate $2n$ binary strings with length of L at random to compose an original population of n individuals, and generate a binary string with length of L at random as the initial dominance string. The rule of encoding and decoding rules is that: We took the power generation of each plant at each hour as the variable to be encoded. Each variable is lineally mapped to an integer defined in its limited range, and the integer is encoded using a fixed number of binary bits. The binary codes of all the variables are then concatenated to obtain a binary string of length. By the same token, any binary string of length can be decoded as a solution.
- Calculate the fitness of each individual in the current generation. One individual can be mapped into a single string, which can be decoded to a feasible or infeasible solution, with the function string. The profit and can be calculated. In order to obtain a feasible solution, the value of is decreased if

constraint is violated. An individual, which sell more profit and has less amount of violation of constraints, should have a larger fitness.

- Create the new generation of individuals by means of the select and crossover operators described in [9] and mutation operator described in (8), the form of embodied function $AF(i)$ is related to the fixed number of generations and the fixed probability of mutation operator without complex operation, which is quite simple to implement.
- The best solution of the current generation is copied into the next generation so that the possibility of its destruction through a genetic operator is eliminated.
- If the fitness has never changed continuously for evolution generations or the number of iterative times is over threshold value, stop algorithm and the best solution is considered as the solution. Otherwise, go to the step 2.

4 Optimal Hydro Scheduling Modeling

In this paper, the short-term bidding strategy problem of a hydropower plant in a pool-based spot electricity market is considered. It is assumed that the next-day hourly prices are with high uncertainty and however forecasted by an appropriate tool. Their probability density function can also be estimated.

Substantial studies work on the optimal scheduling problem for hydropower in vertical monopoly market with the aim to minimize water consumption or electricity generation and maximize efficiency, etc. The profit maximization problem of a hydropower generator under price uncertainty is maximizing the surplus profit of the total incoming from selling energy minus the generation cost. The hydropower cost is approximates to zero and ignored. It can be formulated as follows:

$$F(P_t) = Max\sum_{t=1}^{T} \lambda_t P_t \tag{10}$$

Where λ_t is the forecasted price at hour t, P_t is the power output at hour t.

The function of discharge-generation is given by:

$$aP_t^2 + bP_t + c = Q_t \tag{11}$$

Where a, b, c are the coefficients of the quadratic function. Q_t is the discharge at hour t.

Constraint of reservoir's water consumption is given by:

$$\sum_{t=1}^{T} Q_t \cdot \Delta t = W \tag{12}$$

Where W is the water consumption. Δt is scheduling interval.

And some constraints are given by:

$$\underline{P_t} \le P_t \le \overline{P_t} \tag{13}$$

$$\underline{Q_t} \le Q_t \le \overline{Q_t} \tag{14}$$

Where $\underline{P_t}$ and $\overline{P_t}$ are the lower and up bound of electricity quantity at hour t, $\underline{Q_t}$ and $\overline{Q_t}$ are the lower and up bound of discharge at hour t, $\underline{V_t}$ and $\overline{V_t}$ are the lower and up bound of volume at hour t.

The Optimal scheduling of hydropower is a nonlinear programming problem. Linear programming, nonlinear programming, dynamic programming and heuristic algorithm et al. are used to solve the hydro scheduling problem. GAs have good performance in solving the optimization problem with irregular search space without requiring continuous and derivative information. This paper applied the improved DGA into the nonlinear program.

5 Case Study

The following is an example of a realistic hydropower plant. And power generation equation of hydropower plant is as following.

$$Q(P) = 0.019 \cdot P^2 + 2.962 \cdot P + 135.0 \tag{15}$$

And $W = 0.4 \times 10^9\ m^3$, $\overline{P_t} = 125\ MW$. Forecasted price is given as follows (price (RMB/MWh)):

The result data are in the Tab. 2 (power (MW)). Fig.2 is the scheduling course of price and power output of whole scheduling period. It shows hydro plant will generate more power and submit bids to the power market to obtain higher profit.

Table 1. Caculation information

T	price	T	price	T	price
1	31.06	9	33.26	17	33.20
2	31.28	10	33.12	18	33.23
3	32.50	11	33.11	19	33.19
4	31.67	12	33.09	20	33.20
5	31.89	13	33.10	21	33.18
6	32.33	14	33.16	22	33.01
7	33.01	15	33.18	23	32.72
8	33.33	16	33.21	24	32.48

Table 2. Caculation results

T	power	T	power	T	power	T	power
1	67	7	76	13	76	19	77
2	68	8	77	14	77	20	77
3	74	9	77	15	77	21	77
4	70	10	76	16	77	22	76
5	71	11	76	17	77	23	75
6	73	12	76	18	77	24	73

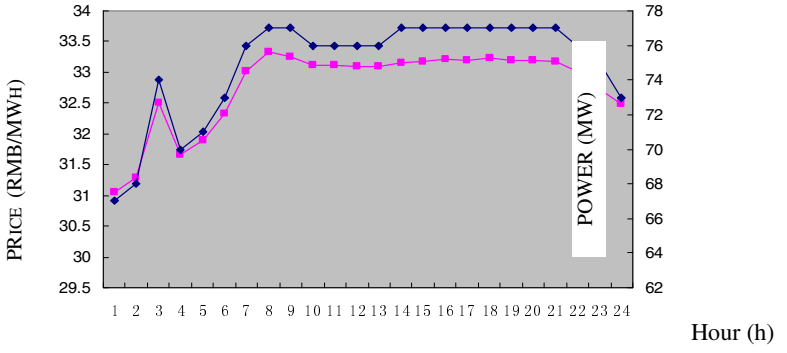

Fig. 2. The results of price and power output

6 Conclusion

DGA is an effective search algorithm for solving optimization problems. Genetic operator is important to the whole optimization process. The influence of mutation operator is deduced, and comparison between HGA and DGA is drawn. Further more, a feasible method of dynamically regulating the mutation operator along with iterative generations is proposed in the paper. The improved DGA is applied to the realistic hydropower scheduling problem and the results are satisfying.

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Stratagem Research for China Foreign Trade-Based Logistics Companies in the Global Financial Crisis Time

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Abstract. This paper views the literature of financial crisis and China foreign trade-based logistics companies' (CFTLCs) stratagem. By the method of Likert Scale and interview, the CFTLCs of city Shanghai, Shenzhen, Nanjing, Hangzhou and Tianjin in China are surveyed. The results show that CFTLCs suffer great impact. In view of the different areas, the impact on shanghai is greater than Nanjing and Hangzhou, while Shenzhen is deeper than Shanghai and Tianjin. Logistics resource integration, service innovation, cost control and informatization are the top four most important strategies. Tax concession, encouraging service innovation, favor financing and encouragement policy of manufacturing logistics demand release are most four expected policies among CFTLCs. Based on this, six advices are put forward to promote the development of CFTLCs.

Keywords: Financial crisis, impact, stratagem.

1 Introduction

The global financial crisis leads directly to a reduction of quantum of China international import and export trade. The slumping trend of trade has impacted a lot on Chinese logistics industry, and the first to be affected are trade-based logistics companies including international freight forwarding enterprise, customs clearing company and international shipping logistics company. Under this circumstance, most China foreign trade-based logistics companies (CFTLCs) are facing problems like decline in business, financial strain, increased risk, profit decline, and even a loss or business failure. The business income and profit of such international shipping logistics companies as COSCO and China Shipping decline sharply and these companies even present a loss; in freight forwarding, many forwarding companies also suffer from the impact: export order falls dramatically, low-price competition bring about the disorder market, corporate layoffs is serious; in customs clearing companies, the volume of customs declaration, as well as the whole profits of most companies drop substantially. China Federation of Logistics and Purchasing has predicted that most logistics companies would appear a noticeable decline in business volume, business growth rate would slump by 20%-30% over the same period; besides, more than 60% companies' business volume would have a negative growth [1].

In China's government work report on March 5th, 2010, Premier Wen Jiabao pointed out that 2010 was the critical year in which China should continue to cope with the international financial crisis, maintain the stable and relatively fast economic

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growth, and accelerate transformation of the mode of economic development [2]. Therefore, it is predicted that the trade conditions would not be optimistic; the gross of import and export goods would appear a slow and restorative growth trend. In this case, how the trade-based logistics companies survive and develop becomes the current issues need to be settled urgently.

2 Literature Review

A. The Impact of Financial Crisis on Chinese Logistics Companies

The financial storm triggered by American subprime leading crisis finally led into a global financial crisis, which is penetrating the real economy. Chinese logistics industry are severely affected by the global financial crisis, and faced with difficult positions for its development. Therefore, the impact of financial crisis on logistics companies has been paid much attention by many scholars in China. Song Xuelian and Hou Xie (2009) expound that at present Chinese logistics companies; especially CFTLCs are extremely vulnerable in front of the financial crisis [3]. Feng Jianben (2009) indicate that this financial crisis results in the sluggish economy, which has a reality and potential effect on the logistics industry under development in China [4]. He analyses the challenges of the slowdown Chinese logistics companies below the setting of financial crisis, meanwhile summarizes the logistics industry upgrading and service level promotion opportunities behind the marketplace. Yang Zihui (2009) points out that American subprime crisis's unceasing spread and the overall slowdown global economy developments has significantly affect the international import and export trade, and directly affect Chinese trade-based logistics companies [5]. From the three aspects of international logistics, domestic logistics and business logistics, he analyses the impact financial crisis have on Chinese logistics companies.

B. The Coping Strategy of Logistics Companies, Especilly CFTLCs

Aiming at the impact of financial crisis on CFTLCs, a lot of scholars proposed many coping strategies. Yang zihui (2009) proposes to intensify the effort to guide governmental investment, promote the joint development of logistics companies and manufacturing industry, and logistics companies to exert oneself to enhance service ability[5]. Tao Chun (2009) introduces the general state of China's logistics economical operation, and analyse the SWOT of the influence of financial crisis on Chinese logistics industry; based on this, discuss the strategy to deal with financial crisis and bring up supply chain service pattern network based on network information technology [6]. Li Wei (2009) helds that it is necessary to increase support by policy, optimize enterprise resource, accelerate the training of qualified personnel, undertake informatization and strive to develop third-party logistics [7]. The financial crisis from 2008 to now have great impact on Guangdong's logistics companies with high foreign trade dependency, based on which, Lv Yingjun (2009) have a specialized investment and discuss the development of Guangdong international logistics industry under financial crisis background from both the macro and micro perspective [8].

Literature research reveals that monographic study on CFTLCs coping with financial crisis is absent. For insight into the impact of international financial crisis, our research group conducted the field survey and interview in Shanghai, Shenzhen, Nanjing,

Hangzhou and Tianjin of China, and analysed the impact on CFTLCs in financial crisis; on that basis, the coping strategies for logistics companies are discussed.

3 Research Method

A. Measuring Instrument Selection

The measuring instrument of this paper research is questionnaire. The questionnaire is designed based on consulting related domestic and foreign literatures, with consideration of CFTLCs' current conditions and characters and combining interviews with some individual business. The questionnaire mainly includes basic status of enterprise, the impact of financial crisis on CFTLCs, coping strategy of CFTLCs, policy requirement of CFTLCs. This questionnaire employs a 7-point Likert Scale method to measure every question. According to the survey results from all questionnaires, mean value and variance of every question are calculated. When asked to fill in the questionnaire, respondents choose the corresponding answers under the actual situation; a small number of questions require respondents' written answers.

Table 1. Sample Information of Questionnaire in Different Regions

Types		Shanghai	Nanjing	Hangzhou	Tianjin	Shenzhen
Survey time		January, 2009	March, 2009	May, 2009	July, 2009	August, 2009
Survey format		Questionnaire distribution	Questionnaire distribution, on-site colloquia	Questionnaire distribution, on-site colloquia	Questionnaire distribution	Questionnaire distribution
Participants		26 CFTLCs like Shanghai Xinhai Declaration Company, Shanghai Hanglian Declaration Company, Baosteel International Transportation	28 companies like Jiangsu Huilong Asset Management Limited, Suzhou Logistics Center Limited	29 companies like Zhangjiang Material Logistics Limited, Ningbo Hailian Logistics Limited	24 companies like Tianjin Port Group, Tianjin Oushen Freight Forwarding Company	30 companies like Shenzhen Feima International Supply Chain Company, Shenzhen Baodingwei Logistics company
Questionnaire retrieved		55 questionnaires distributed and 38 retrieved, with a respondent rate of 69.1%	56 questionnaires distributed and 42 retrieved, with a respondent rate of 75%	58 questionnaires distributed and 46 retrieved, with a respondent rate of 79.3%	96 questionnaires distributed and 60 retrieved, with a respondent rate of 62.5%	98 questionnaires distributed and 62 retrieved, with a respondent rate of 63.2%
Nature of enterprise	State-owned enterprise	10(26.3%)	12（28.57%）	6(13.04%)	9（15%）	8（12.9%）
	Private enterprise	9(23.7%)	15（35.70%）	26(56.52%)	30（50.00%）	36（58.1%）
	Sino-foreign joint venture	3(7.9%)	7（16.67%）	7(15.27%)	7（11.67%）	6（9.7%）
	Organization	12(31.6%)	4（9.52%）	5(10.86%)	10（16.67%）	10（16.1%）
	Others	4(10.5%)	4（9.52%）	2(4.35%)	4（6.67%）	2（3.2%）
Enterprise assets	1.5－5 m	8(21.1%)	8（19.05%）	4（8.70%）	22（36.67%）	21（33.87%）
	5－10 m	10(26.3%)	21（50%）	25（54.34%）	26（43.33%）	23（37.09%）
	≥ 10 m	20(52.6%)	14(30.95%)	17（36.95%）	12（20.00%）	18（29.0%）
Number of emplorees	20－50	3(7.9%)	0(0%)	0（0%）	6（10.00%）	8（12.9%）
	50－100	5(13.2%)	4（9.52%）	7（15.27%）	10（16.67%）	11（17.74%）
	100－300	7(18.4%)	16（38.10%）	19（41.3%）	16（26.67%）	15（21.19%）
	300-500	6(15.8%)	14（33.33%）	12（26.09%）	15（25%）	18（29.0%）
	≥500	17(44.7%)	8（19.05%）	8（17.39%）	13（21.67%）	12（19.4%）
Working experience	3-5 years	3(8.1%)	7（16.67%）	10（21.74%）	18（30.00%）	17（27.42%）
	5-7 years	2(5.4%)	21（50%）	22（47.83%）	24（40.00%）	21（33.87%）
	≥ 8 years	33(86.5%)	14（33.33%）	14（30.43%）	18（30.00%）	24（32.3%）
Position	Staff	1(2.7%)	2（4.76%）	4（8.70%）	11（18.33%）	8（12.9%）
	Supervisor	1(2.7%)	10（23.81%）	13（28.26%）	18（30.00%）	16（25.8%）
	Manager	25(64.9%)	18（42.86%）	15（32.6%）	25（41.67%）	26（41.9%）
	Top management	11(29.7%)	12（28.57%）	14（30.43%）	6（10.00%）	12（19.4%）
Age distribution	≤25	1(2.7%)	2（4.76%）	2（4.35%）	8（13.33%）	9（14.51%）
	25－35	10(27.0%)	17（40.47%）	21（45.65%）	30（50.00%）	29（46.77%）
	36－55	14(37.8%)	24（54.76%）	23（50%）	22（36.67%）	24（38.7%）

B. General Information of Samples

In order to get a comprehensive view of CFTLCs affected by the financial crisis, Eastern Coastal Region of China whose volume of foreign trade export covers more than 80% of China's total foreign trade value is selected to be investigated. Pearl River Delta region, Yangtze River Delta region and Circum-Bohai region are the focus of the investigation. Due to the survey time divided into four phases with the different locations, sample size of each phase varies from each other. The sample information of questionnaire is as Table 1. From Table 1, we delivered 363 questionnaires altogether in 5 regions and retrieved 248 ones, with a response rate of 68.32%.

4 The Influence of Financial Crisis on CHINA's Foreign Trade Logistics Company

Based on the questionnaire above, we conducted a survey of CFTLCs in each region. The influence of financial crisis on CFTLCs of different regions is as Table 2.

Table 2. The Influence of Financial Crisis on CFTLCs of Different Regions

Survey area	Index	Import business volume variation	Export business volume variation	Impact on whole company	Consumer portfolio decline	Client requirement of price reduction	Client requirement of deferring payment	Problem of capital flow	Serious employee leaving	Bankrupt
Shanghai	Mean value	5.18	5.55	5.88	4.03	4.13	3.43	3.18	3.56	2.71
	Standard deviation	2.4	2.82	3.67	4.79	3.91	3.81	3.12	3.56	3.26
Nanjing	Mean value	4.05	3.97	5.32	5.11	3.76	3.84	3.21	2.92	2.18
	Standard deviation	1.72	1.79	1.93	1.93	2.03	1.78	1.6	1.65	1.52
Shenzhen	Mean value	5.33	5.75	6.22	5.23	5.56	4.83	5.22	4.26	4.11
	Standard deviation	1.2	1.52	1.83	3.59	4.21	2.94	2.72	2.45	4.26
Hangzhou	Mean value	4.28	5.13	5.22	3.21	4.23	3.04	3.27	3.06	2.61
	Standard deviation	2.54	2.89	3.21	4.23	3.34	3.12	4.02	3.06	1.18
Tianjin	Mean value	4.83	5.43	4.98	3.1	3.8	3.37	3.94	2.76	2.81
	Standard deviation	2.12	2.45	3.88	2.34	1.89	2.94	3.72	4.26	2.32

From Table 2, the survey data of Shanghai is obviously greater than other areas like Nanjing and Hangzhou, which indicates that CFTLCs in Shanghai suffers greater impact. By a comparison with the data of Hangzhou and Nanjing, it reveals that though the beginning time of survey in Hangzhou is 2 months later than in Nanjing, Zhejiang's companies receives a more serious influence. It is possibly because that the proportion of Zhejiang's international trade in GDP is greater than that in Jiangsu, and thus CFTLCs receive a more serious impact. From the time point of view, logistics business of many areas has risen gradually since the trough period of the end of 2008, which is reflected on the survey data. Meanwhile, the result data items of Hangzhou and Tianjin are obviously inferior to that of Shanghai. We also state this point during the interview taken in Zhejiang. A lot of company delegates express in succession that since May 2009 business portfolio has started to rebound.

5 Stratagem Research of Enhancing the Capacity of Foreign Trade Logistics Companies to Deal with Financial Crisis

A. Strategy Segmentation

In order to have a profound knowledge of the strategy for CFTLCs to deal with financial crisis, this paper conducts a survey on strategy segmentation supporting CFTLCs to deal with financial crisis. We select Shanghai, Shenzhen, Tianjin, and make a comparison between the three representative areas. The survey result is as Table 3.

Table 3. Strategy Segmentation Category Supporting CFTLCS to Deal with Financial Crisis

Types	Shanghai		Shenzhen		Tianjin	
Stratagem Category	Mean value	Standard deviation	Mean value	Standard deviation	Mean value	Standard deviation
Logistics Resource Integration Strategy	6.34	1.23	6.22	1.02	6.03	1.43
Supply Chain Cost Control Strategy	6.12	1.98	5.96	1.13	5.68	1.34
Emergency Management Strategy	4.34	1.34	4.12	1.23	4.05	1.29
Logistic Service innovation Strategy	5.78	1.02	5.48	1.33	5.9	1.18
Scale Business Strategy	4.92	1.56	4.58	1.25	4.65	1.78
Informatization Strategy	4.95	1.45	5.09	1.35	5.04	1.69
Scale Operating Strategy	4.67	1.18	4.29	1.27	4.28	1.24
Supply Chain Risk Management Strategy	5.12	1.29	4.7	1.07	5.06	1.97
Human Resource Strategy	4.3	1.43	4.51	1.23	4.51	1.78
Brand Operation Strategy	4.04	1.17	4.54	1.47	4.35	1.86
Marketing Strategy	4.27	1.24	4.87	1.52	4.37	1.43
Leadership Team Strategy	4.34	1.07	4.83	1.31	4.22	1.89
Financial Management Strategy	4.98	1.63	4.61	1.17	4.23	1.65
Capital Operation Strategy	4.57	1.34	4.38	1.38	4.12	1.79

From Table 3, although the companies of different region think that strategy segmentation supporting logistics companies to deal with financial crisis are different, in general, logistics resource integration, cost control, service innovation and informatization are among the top five strategy segmentations accepted by all three areas and are the main strategies to deal with the financial crisis for CFTLCs.

B. Specific Coping Strategy Selection

We also conduct a corresponding survey on specific coping strategy of logistics companies. The results are as Table 4.

From the overall data of Table 4 average score of each item of Shanghai's CFTLCs is apparently higher than that of Shenzhen and Tianjin. From the area perspective, the top 4 coping strategies proposed by Shanghai's companies are "Improve attitude of service personnel", "Improve enterprise service speed & quality", "Increase service

types & introduce new business", "Extend service area division". While, in Shenzhen, the top 4 are "Improve enterprise service speed & quality", "Extend service area division", "Increase service types & introduce new business", "Improve attitude of service personnel". In Tianjin, companies take "Improve enterprise service speed & quality", "Increase service types & introduce new business" as the top 2 strategies.

Table 4. Specific Coping Strategy Selection of Different Areas' CFTLCS

Types	Shanghai		Shenzhen		Tianjin	
Coping strategy	Mean value	Standard deviation	Mean value	Standard deviation	Mean value	Standard deviation
Improve enterprise service speed & quality	6.55	0.89	5.8	1.37	5.86	1.55
Reduce service price	3.53	2.06	3.46	1.68	3.8	1.82
Increase service types & introduce new business	6	1.62	5.26	1.79	5.73	1.486
Strengthen reorganization and merger activity	4.78	1.24	4.61	1.34	4.13	1.68
Improve attitude of service personnel	6.58	0.79	5.53	1.84	5.2	1.78
Extend service area division	5.87	1.96	5.73	1.27	5.3	1.37
Ally with peer enterprises	4.24	1.38	3.93	1.57	4.66	1.83
Improve ability of emergency treatment	5.84	1.82	5	1.6	5.53	1.59

6 Advices on Promoting the Development of Foreign Trade Logistics Companies under Financial Crisis

A. Policy Requirements Survey

We analyze the retrieved 143 questionnaires of policy requirements survey, and the specific outcomes are as Table 5.

Table 5. Rank Of Policy Requirements Coping With Financial Crisis

Policy category	Selection	Rank
Tax concession	96	1
Encouraging service innovation	88	2
Favor financing	78	3
Encouragement policy of manufacturing logistics demand release	74	4
Convenient transportation	70	5
Special fund support of infrastructure construction	64	6
Safety supervision of logistics industry	57	7
Land policy	48	8
Logistics technology application support policy	39	9

B. Advice on Promoting the Development of CFTLCs

According to the questionnaire survey and enterprise interview above, this paper puts forward some advice on promoting the development of CFTLCs as follows:

1) Special tax financial policy support for CFTLCs in future three years

Firstly, speed up efforts to research the problems of logistics companies and CFTLCs, like taxation financing. Make a prompt settlement with innovative ideas. On the issue of taxation, various sales tax, income tax, land tax, etc. should be given appropriate tax concessions. Soften the terms of financing loans in order to cushion the impact of financial crisis on logistics companies. For the private logistics companies with weak financial strength, intensify the efforts of financing and loan and help them out of the rough time of financial crisis. The second is to give aid to CFTLCs appropriately through tax policy. List the whole financing costs into the financial costs. Lower the cost of financing, allow logistics enterprises to repay loans before paying taxes, and sequentially improve the ability of financing.

2) Speed up efforts to solve the critical problem affecting CFTLCs development

First is to put development policy into practice and focus on solving the problems of logistics companies especially CFTLCs on land use costs, tax rebates and invoice amount constraints, heavy tax burden, informatization and logistics infrastructure construction fund, professional vehicle and vessel survey, vehicle and vessel overlapping insurance, city distribution wayleave, regional logistics coordination and convenience. By that means, provide better conditions for logistics companies development. Second, in the settlement of critical problems affecting CFTLCs, all local government should take positive measures to conduct market research with innovative ideas, policy segmentation and coordinating settlement; make a slack development environment for logistics companies.

3) Multiple practices to incite linkage development between manufacturing and logistics industry

One is to vigorously promote the logistics outsourcing of manufacturing and marketing enterprises. The authorities of all provinces, cities and autonomous regions in China should make incentive and reward policy according to local conditions. Also, in terms of finance, revenue and land, introduce measures to promote the linkage development substantially and facilitate the release of logistics demand. The second is to suggest NDRC (National Development and Reform Committee) and other governmental departments actively introduce demonstration project of linkage between manufacturing and logistics industry and carry out linkage demonstration project including linkage demonstration enterprises and technology. By means of setting an example and policy guidance, promote work in the entire area by drawing on experience gained in pilot project.

4) Encourage domestic CFTLCs to implement integration and reform and the strategy of "going global"

In financial crisis, CFTLCs are faced with the opportunities of adjustment and upgrade. Policy levers of finance and revenue are proposed to encourage domestic foreign trade companies to implement integration & reform and the strategy of "going global". Domestic logistics companies should be encouraged merger and integration

with international logistics resources through various methods and thus establish worldwide logistics network. Simplify project approval procedures, complete policy measures like credit, foreign exchange, tax, personnel exit and entry. Give support to the qualified large-scale enterprise on capital injection and the use of foreign exchange. Learn and introduce foreign investment environment and thus provide information and legal aid for companies "going global".

5) Encourage CFTLCs to make service innovation through various means and strengthen the ability to deal with financial crisis
In current financial crisis, CFTLCs should be encouraged and guided to make service innovation. One is to encourage logistics companies to reduce logistics service costs and strengthen the ability to deal with financial crisis through innovative method of resource integration of client, ability and information. The second is to encourage logistics companies to transform service pattern from single element and single field to multiple elements and multiple fields, and also to extend service area and service chain. The third is to encourage logistics companies to develop various innovative patterns in order to enhance enterprise service level: integrated logistics service innovation, finance-oriented logistics innovation, trade-oriented logistics innovation, and upstream & downstream of supply chain oriented service innovation. The fourth is to actively guide and encourage qualifies and capable logistics companies to transform into supply chain companies.

6) Policy refinement with innovated ideas for create a healthy external logistics service innovation environment
One is to develop market research and to look into current situation, problems and trend of logistics companies with innovative ideas. Introduce relevant innovative policies for local foreign trade logistics service. The second is to select part of the logistics service innovation program possessing scientific logistics planning and sophisticated organizational planning as demonstration project. The third is to undermine the administrative monopoly like regional protectionism which goes against logistics service innovation.

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IWVL: A Web-Based Virtual Lab for Physics Teaching in Junior High Schools

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Abstract. This paper discusses the theoretical basis for the design of virtual laboratories for experimental teaching, presents a framework report on the focuses web-based virtual lab (IWVL), and explores the characteristics of IWVL, including media-richness, interactivity, utility, and authenticity.

Keywords: Web-based Virtual Laboratory, IWVL, Physics Teaching.

1 Introduction

Computer-based network, especially the Internet, is promising to provide learners with an open, shared, personalized, multi-dimensional interactive learning space. In recent years, with the rapid development of computer networks and its wider application in the field of education, the term e-learning is being used with increased frequency in both academic and corporate circles.

The introduction of web-based virtual laboratories promises to transform the traditional experimental teaching model by breaking space and time separation to provide students with opportunities to carry out physical experiments when they need to do so. Through virtual experiments, students can analyze the process of experiment, sum up the feelings of their own experiments, and to conduct self-assessment on the level of the grasp of theory and analytical problem-solving capabilities. Students can also collaboratively promote virtual experiments. In this context, it is meaningful to adopt virtual laboratories to cultivate students' collaboration attitudes and abilities, and to reduce pressure on teachers.

This study focuses on the discussions of a web-based virtual lab (IWVL) for physics teaching in middle schools. The remainder of this paper is organized as follows. Section 2 discusses the theoretical basis for the design of virtual laboratories for teaching. Section 3 presents a framework report on the focuses web-based virtual lab (IWVL). Section 4 explores the characteristics of IWVL. The last section summarizes this paper.

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2 Theoretical Foundations for Virtual Laboratories Design

A virtual laboratory is a virtual environment designed for experiments. To improve the functionality and efficiency of virtual laboratories in the educational context, it is necessary to recognition its theoretic basis involved in the design processes. This study discusses the inspirations from behaviorism, cognitivism, and constructivism theories for the design of virtual laboratories.

A. Behaviorism

Behaviorists developed theories about learning by conditioning, rewarding behavior conducive to learning and using negative reinforcement to discourage behaviors not conducive to learning. Behaviorism frames learning as a pervasive biological function, universally realized through mechanisms of stimulus and response association, which concentrates on the study of overt behaviors that can be observed and measured [6]. Behaviorism learning theory views the mind as a "black box" in the sense that response to stimulus can be observed quantitatively, totally ignoring the possibility of thought processes occurring in the mind, and stating that learning objectives can be specified, quantifiable, terminal, and learning is promoted due to operant conditioning (drill and practice) [7]. Fixed learning objectives, observed behaviors, accountable movements, and reinforcements are often used to describe learning process by behaviorism theorists.

B. Cognitivism

Cognitive theories focus on analyzing how an individual processes mental representations, and study how individuals gain information from the world, how that information is represented, how it is stored, and how it directs one's attention and behavior. "Cognitive theorists recognize that much learning involves associations established through contiguity and repetition. They also acknowledge the importance of reinforcement, although they stress its role in providing feedback about the correctness of responses over its role as a motivator. However, even while accepting such behavioristic concepts, cognitive theorists view learning as involving the acquisition or reorganization of the cognitive structures through which humans process and store information."[8].

For example, Rumelhart & Norman [9] argued that the fundamental units of knowledge are schemata, and learning was to build schemata. Accordingly, they described three fundamental modes of learning, including structuring, accretion and tuning. Structuring is the formation of new schemata. A new schema is formed when existing knowledge will no longer be sufficient for full understanding. Structuring occurs relatively rarely and often involves considerable cognitive efforts, such as questioning, hypothesis testing, problem formulation, etc. Once a structure is in place then incoming information can be transformed into meaningful patterns. Accretion is the adding of new knowledge to existing schemata. Tuning is the fine adjustment of the schema to adapt practical demands.

C. Constructivism

The third typical learning theory is constructivism-based. Moshman [10] has identified three types of constructivism: (a) endogenous constructivism, which emphasizes the individual nature of each learner's knowledge construction process; (b) exogenous

constructivism, which recognizes the role of direct and formal instruction in helping learners actively construct their own knowledge representations; and (c) dialectical constructivism, which emphasizes the role of interaction among learners, their peers, and instructors, during which learners require scaffolding provided by teachers or experts as well as collaboration with peers. Constructivism postulates that knowledge is constructed by the learner through his/her interactions in learning environments. People build meaning and make sense of their world through interacting with their surroundings.

Savery & Duffy [11] characterized three primary propositions of constructivism. First, understanding exists in the interactions with the environment. In this context, what is learned cannot be separated from how it is learned, and cognition is not just within the individual but rather it is a part of the entire context, i.e., cognition is distributed. Second, cognitive conflicts or puzzlements are the stimulus for learning and determines the organization and nature of what is learned. The goal why the learner selects the learning environment might be a primary factor in determining what the learner attends to, what prior experience the learner brings to bear in constructing an understanding, and what understanding is eventually constructed. Third, knowledge evolution is based on social negotiation and cannot be detached from the evaluation of the viability of individual understandings. Social environment is critical to "the development of individual understanding as well as to the development of the body of propositions we call knowledge".

Learning theories are widely applied in instruction design. Ertmer & Newby [12] compared behaviorism, cognitivism and constructivism, and did not advocate one single learning theory, but stressed that the application of learning theories should be matched with the contents to be learned/taught. For example, Ertmer & Newby [12]suggested that a behavioral approach could effectively facilitate mastery of the content of a profession (knowing what); cognitive strategies were useful in teaching problem -solving tactics where defined facts and rules were applied in unfamiliar situations (knowing how); and constructivist strategies were especially suited to dealing with ill-defined problems through reflection-in-action. They also suggested that the strategies promoted by different learning theories overlaped (the same strategy for a different reason) and that learning theory strategies were concentrated along different points of a continuum depending of the focus of the learning theory - the level of cognitive processing required. In this context, on the one hand, each learning theory has its potential to support effective learning/instructional strategies. On the other hand, the practical application of learning theories and corresponding instructional strategies should be related to actual learning/instructional situations.

3 IWVL: A Web-Based Virtual Laboratory for Physics Teaching in Junior High Schools

IWVL (a Web-based Virtual Laboratory developed by Ideal institute of information and technology) is a web-based virtual lab for physics teaching of middle schools.

Experiments in IWVL are organized according to grade levels in junior high school, and are classified into two types: one is for virtual demonstration and group-based experiment, and the other is for inquiry-based experiments. The former type includes 72 experiments, and the latter comprises 34 experiments. IWVL consists of five

components, including virtual demonstration and group-based experiment module, Inquiry-based virtual experiment module, experimental tool module, experimental platform module ,virtual instrument module, and extension resource module.

- Virtual demonstration and group-based experiment module.
- Inquiry-based virtual experiment module.
- Experimental platform module of IWVL.
- Experimental instrument module of IWVL.
- Extension resource module of IWVL.

There are three experimental platforms in IWVL. These platforms can not only provide students with open opportunities to explore physical phenomena inherent in physical laws, but also support teachers to create personalized courseware based on teaching demands. In this context, this platform promises to enrich the teaching methods and approaches by providing an information-rich teaching environment, thus to finally reduce the burden on teachers and helps to improve teaching efficiency and quality.

D. Physical electricity experiment platform

The physical electricity experiment platform in IWVL is an open virtual laboratory for students and physics teachers of middle schools, and provides a variety of electronic components for virtual electrical experiments. In this experimental platform, users can utilize various electronic components to rapidly design and build different circuits based on their own needs, to set the parameters of electronic components, and to explore the physical phenomena and laws of electricity. In addition, the platform can also automatically generate independently running teaching animations according to users' operations and inherent electrical principles.

Functionality of the Physical Electricity Experiment Platform includes:

- The assembly of symbol based simple circuit
- The assembly of virtual object based circuit
- The automatic connection of circuit
- The automatic solving of circuit
- The management of resource pages
- The export of circuit-related pictures
- The export of personalized courseware

E. Physical optics experiment platform

The physical optics experiment platform in IWVL is a flexible and interactive experiment environment that supports students and teacher to carry out various optical experiments by providing a wide range of optical components and the chance for optical experiment simulation. Users can easily operate involved optical components according to their own learning and working needs to quickly build optical paths and optical maps. Users are also able to set the properties of optical components, and the experimental platform will automatically calculate the corresponding physical quantities based on the set parameter of components, then produce a simulation experiment environment and run the real-time generated animations according to the laws of physics. Finally, this platform can generate a teaching animation that can

demonstrate experiment procedures step by step, and can independently function out of this platform.

F. Physical pulley block experimental platform

The physical pulley block experimental platform in IWVL provides teachers with a visual and intuitive teaching environment. Based on this teaching platform, teachers can operated virtual experiments by changing the form and mode of experiment models and instruments in virtual environments, and simultaneously explain experimental phenomena and principles for students. In this way, the physical pulley block experimental platform can not only solve the problems faced by teachers in terms of the shortage of exercise pulley means, but also help students to grasp the knowledge on the pulley group, and to facilitate better understanding of relative principles and skills.

4 Characteristics of Web-Based Laboratories

There has been much literature on the ontological characteristics of virtual laboratories by comparing them with real laboratories. On the one hand, same as real laboratories, virtual laboratories promise to support users' experiences and experimental operations. On the other hand, in contrast real laboratories, virtual laboratories have their own unique characteristics because of the introduction of technical support. For example, according to [12], a well-designed laboratory should possess the following characteristics: reconfigurable, heterogeneous, scalable, cost effective, robust, maintainable, realistic, insulated, accessible, observable, able to simulate realistic scenarios, realistic, separability of virtual networks, remote configurability, and the ability to share resources efficiently. However, there is no much discussion on the characteristics of virtual laboratories in the educational context. The study highlights several advantages of web-based virtual laboratories as follows in support learning and teaching, including media-richness, interactivity, utility, and authenticity.

G. Media-richness: constructing a rich educational environment

A web-based virtual laboratory is a technically-enhanced educational environment for experiment teaching. Various technical media are jointly utilized to provide students and teachers with a rich experimental setting. According to [13], "Media richness represents the extent to which media are able to bridge different frames of reference, make issues less ambiguous, or provide opportunities for learning in a given time interval, based on the medium's capacity for immediate feedback, the number of cues and senses involved, personalization, and language variety". Technical media are not only used for the representation, visualization, and delivery of experimental information, but also applied to build integrated, interactive, and open educational situations for students and teachers.

H. Interactivity: supporting unique user experience

Effective interactions promise to improve learners' academic achievement and performances, and contribute to the development of learners' higher-order thinking skills and social skills. According to [14], interactions "occur when objects and events mutually influence one another", and interactivity "appears to emerge from

descriptions of technology for establishing connections from point to point". Interaction is ensured by system interactivity. A web-based virtual laboratory not only provides users with user-friendly interfaces and suitable help information for effective human-computer interaction and user-content interaction, but also support social interaction by providing collaboration chances. At the same time, a web-based virtual laboratory will provide different users with different support according to users' individual differences. For example, Kolb has distinguished four types of learners according to different learning styles [15]: a) Converger who wants to solve a problem and who relies heavily upon hypothetical-deductive reasoning to focus on specific problems; b) Diverger who solves problems by viewing situations from many perspectives and who relies heavily upon brainstorming and generation of ideas; c) Assimilator who solves problems by inductive reasoning and the ability to create theoretical models; and d) Accommodator who can be classified as someone who solves problems by carrying out plans and experiments. A web-based virtual laboratory promises to support different types of students' experimental learning by providing demonstration experiments, structured inquiry based experiments, self-regulated inquiry based experiments, and collaborative inquiry based experiments.

I. Utility: providing cognitive and teaching tools

According to [16], cognitive tools are often defined as computer-based tools and learning environments that have been adapted or developed to function as intellectual partners with the learner in order to engage and facilitate critical thinking and higher-order learning. Based on distributed cognition theory, a web-based virtual laboratory is not limited to a virtual environment but does involve rich cognitive resources that can act as an effective cognitive tool for students. As a cognitive tool, a web-based virtual laboratory allows learners to engage in cognitive activities based on experiments, and allows learners to generate and test hypotheses in the context of problem solving. At the same time, a web-based virtual laboratory is also a creative teaching tool for teachers. Teachers can use a web-based virtual laboratory as a lesson preparation assistant, or as a teaching partner. With a web-based virtual laboratory, teachers can effectively show the microscopic world, demonstrate the process of physical change, enable students to better understand the physical principles, and avoid dangers that might be faced with in real experimental environments.

J. Authenticity: building authentic learning environments for authentic learning activities

A web-based virtual laboratory should be an authentic learning environment support for authentic learning activities. Authentic learning allows students to explore, discover, discuss, and meaningfully construct concepts and relationships in contexts that involve real-world problems and projects that are relevant and interesting to the learner (Donovan, Bransford & Pellegrino, 2001). Cronin (1993) discussed four misconceptions about authentic learning, and points out that: first, authentic learning context should be real world related as possible, but that does not mean it must be real. Second, authentic learning does not mean the learner must have complete prior experiences about current learning goals. Third, authentic learning context also might be not fun enough. Finally, not all the authentic learning tasks are elaborate and complex. Newmann & Wehlage (1993) proposed five standards of authentic instruction that would contribute to authentic learning: 1) promote students to perform

higher-order thinking; 2) ensure the depth of learners' knowledge and understanding; 3) ensure the learning context has connectedness to the real world; 4) ensure the learning involves high-level substantive conversations; and 5) ensure there is enough social support for student achievement.

Herrington & Oliver (2000) proposed several approaches to support authentic and situated learning by: 1) providing authentic contexts that reflect the way the knowledge will be used in real life; 2) designing authentic activities; 3) providing access to expert performances and the modeling of processes; 4) providing multiple roles and perspectives; 5) supporting collaborative construction of knowledge; 6) promoting reflection to enable abstractions to be formed; 7) promoting articulation to enable tacit knowledge to be made explicit; 8) providing coaching and scaffolding by the teacher at critical times; and 9) providing for authentic assessment of learning within the tasks.

Reeves et al. have conclude ten design elements for authentic learning activities [7], including the relevance with real-world, the ill-defined problem field, the requirement of sustained investigation, the support from multiple sources and perspectives, initiating collaboration, involving reflection (metacognition), exposing to interdisciplinary perspectives, encompassing integrated assessment, the output of polished products, and the result of multiple interpretations and outcomes.

5 Conclusion

Physics teaching is important to cultivate students' scientific inquiry ability and innovation ability. Based on the recognition of context for physics teaching and the discussion on the theoretical foundations for the design of virtual laboratories for teaching, this paper reported the construction, characteristics, and application scenarios of a web-based virtual laboratory for physics teaching in middle schools (IWVL). More efforts will be promoted for the actual application efficiency of IWVL in future study.

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Constructivism Computer-Assisted Instruction Model for College English Study

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Abstract. Computer-assisted instruction (CAI) has such advantages as multimedia, instantaneousness, interaction, flexibility, privacy, and low marginal costs. Constructivism CAI model integrates CAI with constructivism learning theory and greatly enhances results in the teaching of college English.

Keywords: Constructivism learning theory, computer-assisted instruction, college English teaching.

1 Introduction

The wide use of modern digital technology and wide spread of personal computers make it necessary and feasible to introduce computers into English study. The success of constructivism learning theory in interpreting the learning process and in improving teaching results has recently brought many reforms in the teaching of various disciplines of study in China and other countries. College English teachers need to seriously consider the pros and cons of computer-assisted instruction (CAI) and integrate constructivism learning theory with CAI to develop a new constructivism CAI teaching model to make best use of computers and internet for the improvement of college English teaching.

2 Advantages of CAI

Compared with the traditional blackboard-and-chalk teaching model, CAI has at least the following advantages:

A. Multi-media

Computers have audio and visual functions. They can display still and motion pictures and play music. They can simulate scenarios in real life. These functions are valuable to improve teaching. Teachers can use computers to present the text with programs such as PowerPoint. This feature of multi-media is the most basic feature of CAI. However, CAI has more features.

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B. Instantaneousness

Computers are fast in speed and vast in information storage. They can make response instantaneously. This saves the time of teachers and students and makes the learning and teaching more efficient. An example is many computer-run offline and online dictionaries.

C. Interaction

Interaction here includes two aspects. First, human beings can interact with computers running various programs. Second, human beings can interact with each other with the help of computers and internet, with much higher efficiency.

This feature enables students to learn English and test their English language abilities by themselves with the aid of computer programs. It also enables students to easily communicate with instructors, peer students, and other people.

D. Flexibility

The pace of teaching at the classroom is for ordinary students. For those exceptional good or bad in foreign language learning, the pace may be too slow or too fast. With the aid of computers, students can study more or spend more time in their spare time to make up the course. Students can have more control of they study compared with the traditional blackboard-and-chalk classroom teaching. With the aid of internet, CAI also makes distant learning much easier. In one word, CAI provides both temporal and spatial flexibility.

E. Privacy

The interaction between a human being and a computer may happen in seclusion and the online interaction between human beings also greatly reduces the interference of other people. Therefore, CAI may take place without the presence of other human beings or at least the physical presence of other human beings. This privacy helps students to overcome shyness. Some students are especially shy and feel timid to interact with their teachers and classmates. They are not confident enough about their English abilities. However, they will feel much at ease to speak with a computer or chat online.

F. Low Marginal Costs

The biggest investment in CAI lies in hardware, such as computers and internet communication network. Once the infrastructure of computers and internet are established, the courseware and teaching materials will be at a cost much lower than that of traditional teaching materials. That is to say, the marginal costs of additional teaching materials or the teaching of additional students is very low.

The above features are applicable not only to the classroom presentation, but also applicable to such steps of teaching as preview, review, test, and free communication.

3 Constructivism and the Change of Teaching Models

The above features of CAI fully accommodate the modern theory of constructivism learning. This theory gained rapid influence since 1990s and is an underlying theme of many English teaching reforms in China.

According to constructivism learning theory, humans generate knowledge and meaning from their experiences. Individuals construct new knowledge from their experiences through processes of accommodation and assimilation. When they do not notice a contradiction between a new experience and their internal framework, individuals assimilate, i.e., incorporate, the new experience into an already existing framework without changing that framework. In contrast, when individuals' experiences contradict their internal representations, they may accommodate the new experience by changing their perceptions of the experiences to fit their internal representations. According to the theory, accommodation is the process of reframing one's mental representation of the external world to fit new experiences. Accommodation can be understood as the mechanism by which failure leads to learning. We learn from the experience of failure of ours and others. According to this theory, learners are at the center of cognitive and learning processes.

Under the constructivism learning theory, teachers are merely facilitators and should be more appropriately called instructors. In contrast with giving a didactic lecturer who covers the subject matter, a facilitator helps the learner to actively get to his or her own understanding of the content.

The integration of constructivism learning theory and CAI technology leads to a new constructivism CAI teaching model. An important role of instructors in this model is to provide learning environment. CAI provides an ideal tool for instructors to provide an environment for students to actively learn the English language. When designing and creating learning environment, instructors should be fully aware of the whole learning process of students, within and without the classroom, offline and online.

An important part of constructivism CAI teaching model is the design of courseware. When designing courseware, instructors should follow principles below:

A. Learners as the Center

Learners are at the center of their cognitive processes and learn the English language by assimilation and accommodation. The courseware should first consider the current internal framework of students, including their current level of English proficiency and the language structure of their mother tongue (for most Chinese students, Chinese). From that point, and from the students' perspective, instructors consider what students need to assimilate and accommodate. Generally speaking, the enlargement of vocabulary follows into the category of assimilation while the understanding and use of grammatical rules fall into the category of accommodation. However, that is not necessarily so. The enlargement of vocabulary also involves new rules on the formation of words, which more likely needs students to accommodate such new rules. The understanding of grammatical rules also involves the study of new rules which are not radically different from English grammatical rules they already studied or Chinese grammatical rules. The courseware should balance the content of assimilation and accommodation, and meaningfully and actively inspire students' aspiration for knowledge. Students should have adequate opportunities to test and challenge themselves, and make responses according to the feedback. As CAI has much advantage of low marginal costs when increasing study materials, instructors should provide students with adequate teaching materials.

B. Creation of Scenarios

According to constructivism learning theory, the social and cultural background and the mother tongue of a learner is quite important for his learning of a foreign language. It is important to take into account the current social and cultural background and the mother tongue of the students throughout the learning process, as they help to shape the knowledge and understanding that the learner creates, discovers and attains in the learning process of the English language. As the English language is deeply embedded in the culture of Anglo-American countries, the knowledge of that culture is also important to the learning of English language. As CAI has the advantage of presenting and simulating scenarios, instructors need to use this function to increase students' knowledge of the culture of Anglo-American culture to help students to understand the cultural background of the English language, so that students can have the necessary internal cultural framework to arrive at their own correct understanding of the English language itself.

C. Interaction

The importance of internal framework for new knowledge necessarily leads to the importance of interaction between social members for the development of internal framework necessary for the acquiring of new language abilities. Instructors should stress their students' interaction with other social members with higher English proficiency. Without the social interaction with other people better in English, it is impossible to acquire new skills in the English language. In the traditional blackboard-and-chalk teaching, students could only interact with their teachers. CAI, especially CAI with the aid of internet, provide students with vast opportunities to interact with other people, many of them have a higher proficiency in the English language, and many of them are even native English speakers. Instructors should grasp this opportunity and design courseware encouraging students to interact with other people. For those students with less confidence to interact with strangers, the courseware should give them adequate opportunities to have simulated interactions with the computer. Besides the interaction with people out of the classroom or roles in computer programs, instructors should also encourage students to interact with each other and interact with instruct in English. Blogs and Blackboard are typical platforms for this purpose.

D. Inspiration

When designing CAI courseware, instructors should make the learning environment support and challenge the learner's thinking. When the materials are critical and challenge the learner's thinking, and when such materials are presented in English, learners will be more likely to and will gradually think in English. Whether students can think in English is a critical threshold for learners to enjoy English study and acquire new knowledge of other disciplines in English. Therefore, instructors should avoid dull and childish teaching materials for college students and should try to incorporate materials on hot social topics and materials related to students' major field of study into the teaching materials for English study.

E. Integration

Instructors should adequately consider the classroom teaching and the study at students' spare time. Courseware should integrate classroom teaching with extra-curriculum activities and integrate offline resources with online resources.

With the development of internet technology, students have access to a vast amount of information, including online database of books, journals, and newspapers. The courseware should guide students to read more online and make reports to the class as to what they read and exchange their knowledge with other students. Although there are many things to integrate, the ultimate purpose is that same, that is, the study of English within and without the classroom.

4 Comparison with the Traditional Blackboard-and-Chalk Teaching Model

The application of constructivism with the help of CAI in college English teaching represents a major change from the traditional blackboard-and-chalk teaching model in China. This paper here compares two aspects of change in the following paragraphs. The first aspect is the workload of instructors and the second aspect is the teaching results as demonstrated by students' English proficiency in listening, speaking, reading, and writing.

A. Workload of Instructors

If we regard the work on preparation, classroom teaching, marking papers, and testing as direct workload of English teaching and the study of the English language and related knowledge as indirect workload, the workload of instructors in fact increases significantly in the constructivism CAI model.

The shift of center of teaching activities from the teacher to learners does not ease the workload of instructors. Instead, when learners become the center, instructors need to better prepare themselves for unexpected questions from learners. This significantly increases indirect workload of instructors, as they can no longer feel contented with their knowledge.

Neither does the presentation of study materials in electronic forms ease the workload of instructors. Indeed instructors are freed from tedious work of typing and printing, but they need to read more and choose from a vast amount of information to provide appropriate materials for students.

This increase of workload is unavoidable because the application of constructivism CAI still requires instructors to be able to adapt the learning experience 'in mid-air' by using his or her own initiative in order to steer the learning experience to where the learners want to create value, and requires instructors to a be a critical goal to support the learner in becoming an effective thinker. Instructors should not abandon their duties, stick to their old teaching model, and just use computers and PowerPoint slides as a simple replacement of blackboard and chalk.

B. Teaching Results

To test the results of the application of constructivism CAI model in college English teaching, we collected data of two similar classes taught by two instructors. One class is the experimental group while the other class is the control group. Both classes are of the same grade, the same department, and the same university. They are admitted with similar proficiency in English. They are tested with the same test comprehensively evaluating their overall proficiency in listening, speaking, reading, and writing. The instructors of the two classes are not changed in the two years of experimental period. The data can be presented in the follow figure.

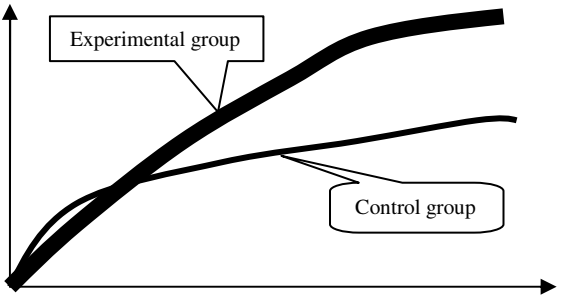

Fig. 1. Teaching Results of Two Classes

(1) The control group learns faster in the frist semester becaue they are used to this way of learning in high school.

(2)The English proficiency of the control group continue to improve but the speed gradually slows as students at tired and marginal efficacy of the traditional teaching model reduces.

(3)The experiental group learns slower in the first semester as they are not used to the constructivism CAI model and fails to fully cooperate with instructors, though they have great interest in this teaching model.

(4)The experimental group learns much faster in the second semester and later on as they get used to and can fully cooperate with their instructor.

(5)The experimental group also witnesses a redution of marginal efficacy but this marginal decrease of efficacy is unavoidable for any single teaching model.

Thus it can be seen that constructivism CAI model is much better in the long run.

5 Conclusion

Constructivism CAI teaching model for college English teaching is promising for the improvement of college students' English proficiency although it increases the workload of instructors. However, this increased workload is worthwhile. College English teachers in China should face the challenge and try to follow the constructivism CAI model and make best use of it.

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Reform and Practice on the Basic Computer Education Associated with Specialty

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Abstract. The basic computer education associated with specialty not only can meet the different needs of professionals, and to a large extent, it determines students' ability and level on applying computer technology to solve practical problems on their fields. This paper introduces the reform on basic computer education which is combined with specialty, taking our University's practice as an example, for the purpose to arouse the concern of peer.

Keywords: Reform, practice, basic education, innovation.

1 Introduction

In the "Basic computer education courses system of China's institutions of higher learning 2006 (CFC2006)", it points out that basic computer education in colleges and universities is an important component of higher education, which is used by non-computer students which account for more than 95% of all university students. The goal of basic computer education is to disseminate the computer knowledge and application skills in various fields, and let all students become the compound experts who not only master the expertise, but also use computer skills adroitly. As mathematics and physics knowledge, the basis computer education in college should become a necessary foundation for the professional knowledge.

At present, the basic computer teaching for non-computer students contains two arrangements in most Chinese colleges and universities. One is taking the computer basis as a common basic course, the other is the course imparting computer skills with combination of professional lessons. According to the partition of liberal art and science, the course system in these two arrangements is divided into program designing and database category. There are many kinds of non-computer specialties in university, which cover a large of fields. For example, our university has more than 70 specialties such as science course, engineering course, literature, history, and economics. As information technology education begins in elementary school and secondary school, and university entrants are "non-beginners" on basic computer knowledge, we always hear some puzzles from students such as "What is the role of learning computer knowledge?" in the two arrangements of computer teaching process.

According to the guiding ideology of basic computer education in University and student's confusion, the reform idea of basic computer teaching, namely combining of themselves specialty, is proposed on the basis of further study, and initial results is achieved.

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2 Teaching Objectives and Positioning

In University, the essence objective of basic computer education is to train students with some basic computer knowledge and basic skills, and the ability to use computer to resolve professional problems. According to the professional needs of the computer knowledge of the extent and the characteristics of students, we have identified the basic goal of computer education on the two arrangements in different levels.

For most liberal arts, students learn computer to a great extent for the purpose of using a computer. So, for liberal arts students, we just request them to master how to use computer software related to their specialty, as well as to learn some applications of computer technology, such as searching from information database, making images by multimedia software, using network access to get knowledge, using defending software to protect the security of computer.

For non-computer professional science and engineering students, even though they study and work without a computer center, in many cases they are inseparable from the computer. They always need to carry out the work not only combing their own expertise, but also using computer as a tool. Therefore, the non-computer professional Polytechnic students, in addition to fill the requirements of liberal arts students, will also have to learn some basic computer application skills, such as program design, and so on, in order to use computer in a deeper level of their own expertise.

3 Set Up the System of Courses

Science 2000, our school has started to delaminate computer-based teaching courses in accordance with the difference of liberal arts and science, and designed relevant curriculum system. That is, non-computer professionals Polytechnic opened C programming, arts professionals with VFP database creation. This classification by different subjects made it with no advantage in some professional knowledge, projected itself in linking incompactly with specialty, such as advertising students were very difficult in database and they felt it no help for them after learning.

Therefore, we re-examined the past basic computer teaching, from the teaching requirements and objectives, in accordance with the thinking that attaching importance to basis, and strengthening practice, and highlight the integrated application skills. From 2005 onwards, in the original basic computer teaching, according to specialties in our school, we have been exploring new course system, and making application-oriented and capacity-building as the main line. Now our school has constructed a new curriculum framework which is called "1 + 1 + X" in different levels, sub-category, multi-module (ie: Basic Computer course, one compulsory course and an elective), and has already begun to implement.

Non-computer science professionals are required courses for program design, C, C + +, JAVA, bilingual C, VB, while the Arts students has compulsory courses containing database, VB, multimedia technologies and applications, web site design and construction, information security knowledge. Students under its own professional characteristics receive a required course in the above correspondence courses. For example, materials and automation students have C program design course, industrial design students learn VB, accounting and business administration

students learn database, advertising and art students need to study multimedia application technology.

In addition, the computer capacity requirements from employing units on the community increase day by day, it has become essential for careers for graduates to operate computer better. We focus on application capabilities of professional, and try to help students to study knowledge which will be used in professional field. Therefore, besides compulsory, we also intercalated optional courses, including a senior database program design, Delphi, SQL Server, Web design, VB.net, interface technology, and so on. So far, our school has 15 basic computer courses. In those courses, students can choose their own favorite or that they would like to expand. For example, art and advertising students can learn database and web production courses after they have learned Multimedia Application Technology, while engineering students can learn database and web page design courses after they have learned program design. In this way, students can keep their four year lines in computer knowledge, and at the same time have more space expanded of computer knowledge.

4 Teaching Combined with Specialty

In teaching, we not only adopted diverse teaching methods, but also organized our basic computer teaching by distinguishing between different specialties.

For non- computer professional science and engineering students, we carried the basic computer teaching mainly from process design and the use of software. On the program design courses, we need to teach at different levels, and must highlight programming method. Investigation shows that about half of the research work of the non-computer professionals carried out in the programming or the application procedure, therefore, our school takes program design as a required course for non-computer professionals. However, the different professional courses vary in their requirements. For example, computational mathematics stresses on programming, so we must strengthen design in the teaching aspects, while industrial engineering specialty pays much attention to process-oriented applications, so we need to reduce programming aspects in teaching. Regardless of what the situation is, we should be prominent on program design, the correct choice of algorithms and data structures, formal procedures design training. As programming languages upgrade constantly, it's out of the question that we teach students to design all the procedures. So we may choose a teaching programming language according to the pertinence with the specialty and the specific conditions of students, so that students can master the method of program design, and comprehend by analogy in future study and work.

The software used in teaching should be practical and professional. Therefore, we added some useful content of data processing and scientific graphics software, such as WinRAR or WinZap used in compression and decompression documents, burning CDs with Nero, cut graphs with Hyper Sna-DX software. On explaining how to use the software, the foremost focus is to train students the ability to use new software. Teachers can introduce at a higher altitude, for example, we can compare the database VFP with Access and detect the different and same using methods of them; we also can encourage students to try their own hands to use more software, such as antivirus software, data recovery software, and so on. This method can help students to easily

understand how to use the software, and it will be easier for students to master new software in the future work.

Arts students have a high requirement content at the practicability and interest on teaching, and the teaching content doesn't need to be too difficult. So we can add some content about animation and video clips, and at the same time teach the students to learn how to use the software and solute professional practical problems at a high-level application. Besides the existing courses taught common software, we can also choose one or two software according to the specialty. For example, advertising and the art students need to master professional animation and film production, so we have chosen the Flash, video, audio editing software to explain to students, such as how to edit a small film by using the software Windows Movie Mager. On the course, we emphasize the functions of the software, allowing the students to understand what problems the software can solve, and then demonstrate the steps using the software by examples, after that we choose some suitable exercises for students, at last explain exercises further more.

Elective courses are different from compulsory courses, and should take expanding knowledge and enhancing their knowledge level as purpose. Elective hours are less, in the limited teaching time, "Case-driven" approach is more appropriate. After several years of innovative teaching, we have collected many outstanding works by students, and when we demonstrate these works in teaching, students feel that computer courses are not illusory, but a knowledge system which is real and could be grasp through their own efforts, they also feel that learning computer knowledge combined with the professional courses is a demand to improve their own quality to meet its own work and various social needs. In addition, we dispose some homework of integrated design to let students themselves to develop small applications or programming under the guidance of teachers, and to train students the capacity of practical application.

Computer classes are practical courses, the training of students' computer knowledge and ability depends great on the study and practice when they use computer. Therefore, we conducted experiments in interactive teaching method and tried to train students the ability of learning independently and awareness of innovation. For that purpose, we divided the experiments of the course into two parts, the basic requirement and the independent development of students. Experiments of basic requirement include completing the main examples and the experiments in the textbooks, so that students can acquire basic knowledge and the basic experimental skills and methods. The independent development of students primarily solves the problems raised by themselves and the experiments that they are interested in. For the students who are interested in the course and good at developing knowledge, we encouraged them to do experiments with their own ideas. Through experiments designed by students independently, they learned knowledge and exercised the sense and capability of innovation.

Teachers singled out some outstanding and creative works from students' experimental operations to demonstrate in the large screen for everyone, and then evaluated them. Through interactive experiments, combing with their own operations, students became more active in learning mutually, it has also inspired students a positive and uplifting learning enthusiasm, and has advanced teaching.

5 Reform the Evaluation Form of Grade, Give Prominence to Ability

In order to foster students' capacity on operating in practice, on application and integrating knowledge, on analysis and solving problems independently, we have increased the time for experiments and made experiment and theory at a ratio of 1.5:1; we also have adjusted final examination methods to a compounding of three parts — peacetime results (20%) , Integrated Design (30%) and theory examination (50%). Elective final is evaluated by the actual design performance of students, mainly from analysis ability, the ability on solving practical problems and operating experiments, and also other aspects of comprehensive assessment. Although this approach has increased the workload of teachers, we feel happy in heart to see the achievements of students.

6 Conclusion

The rapid development of information technology and the combination of professional disciplines and information technology have improved the teaching and scientific researching level of each professional course. The diversified and professional development trend of basic computer teaching indicates that China's basic computer education is moving toward a new phase. After combining the basic computer teaching with professional courses, students feel that computer is useful in their own battlefield, and "What is the help of learning computers" are no doubt less.

Practice shows that the combination of basic computer teaching and professional courses is correct and feasible, and exploring further about the combination method of basic computer teaching and professional courses is our long-term goal, we will continue the reform programs in teaching, and form new ideas and new methods on computer teaching to fit the development trend in the future.

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A Data Sorted Method for the Rough Relational Databases

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Abstract. According to the characteristics of the data of rough relational databases, it was put forward a sorted method for uncertainty data. It was by means of the data of the equivalence class, and according to the property such as size、depth、good or bad etc in the database to sort. In sorted time, data of ordered sequence and disordered sequence matching with the data of equivalence class and determined the position of data of the disordered sequence in the ordered sequence, then implement the sort of the rough relational databases. Searched speed can be improved greatly after sort. At the same time, sorted algorithm was given and an example to illustrate the feasibility and effectiveness of the sorted method.

Keywords: The rough relational databases, functional dependency, sorted, queried.

1 Introduction

Theresa and others were put forward the rough relational database model by combined the rough set theory with the traditional relational database model in 1993, it is mainly deal with the data of uncertainty. Query is one of the most important operations in traditional relational databases; it is can speed up query after data sorted. Data of traditional relational database is meet requirements of the first paradigm, and it has broken restricting of the first paradigm in the relational database which attribute value is non-atomic value that make up of multi-atomic value, and its attribute value can be partitioned into some equivalence classes. If used traditional sorted method in the rough relational, it is maybe inefficient or can not sort, then this essay is put forward a data sorted method for rough relational databases based on the characteristics of the data of rough relational databases.

2 Basic Conception of the Rough Relational Databases

The rough relational database model is an extension of the relational database model, it has broken restricting of the first paradigm in the relational database which attribute value is non-atomic value that make up of multi-atomic value, and its attribute value can be

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partitioned into some equivalence classes. At the same time, it also inherited the basic characteristics of rough sets, such as the upper and lower approximation equivalence classes etc [1][2][3]. Attribute range Dj (1 <= i <= n) of rough relational database which were consisted of equivalence classes, a tuple of data items (dij) $d_{ij} \subseteq D_j (d_{ij} \neq \varnothing)$,the rough relational database model for data storage as rough relational database (for short RRDB).

For example: It is assumed that the soil analyst usually measure and analysis soil from soil color 、 partition size and quality of soil. The range of three attributes is partitioned into below equivalence classes in measure:

COLOR = {[black, ebony], [brown, tan, sienna], [white], [gray], [orange]}

SIZE={[big, large], [huge, enormous], [medium], [small, little, tiny]}

QUALITY =([good], [fertile, productive], [normal], [poor, bad]}.

Which color has eight values, it is partitioned five equivalence classes; size has eight values, it is partitioned into four equivalence classes; quality has six values, it is partitioned into four equivalence classes. Below table 1 is soil analyst measured data.

Table 1. Soil information of rough relational table [4]

COLOR	SIZE	QUALITY
Brown	Medium	Normal
Black, tan	Large	Normal, fertile
Gray	Medium, small	Poor
Gray, black	Tiny	Poor
Gray, brown	Large	Normal, productive
Gray, white	Medium	Normal
Gray, black	Big	Normal, fertile
White, gray, tan	Enormous, big	Good, productive, normal

3 Functional Dependency

Firstly it is make certain the key of rough relational databases when data sort of database, it is introduced that the size of soil affect the quality of soil which the size of soil is larger and the quality of soil is better, otherwise the size of soil is smaller and the quality of soil is worse [4].

4 The Adjacency List for Equivalence Classes to Store

Equivalence classes are made up of similar and inclusive elements. It is partitioned equivalence classes according to attributes which partitioned into one or some equivalence classes in RRDB. It is considered the storage of equivalence classes in data storage because data manipulation of the basic table is involved in equivalence classes, then it is in virtue of the adjacency list to store the equivalence classes. [5, 6].

The adjacency list is a chain storage structure for graph. The structure of the adjacency list has consisted of head node which is made of three domains that adjacency node domain chain domain and data domain and list node which is made of two domains that chain domain and information domain. In this essay, the adjacency list is used for the equivalence classes to store, and the structure of it has two parts that head node and list node. The head node is consisted of information domain which stored the number of element of the same equivalence classes and chain domain which be stored the address of element of equivalence class; the list node also has consisted of two domains, one is adjacency domain which be stored the element of equivalence classes, another is chain domain which stored the address of next element in the same equivalence classes. Remark that number of elements in the light of the order of 26 letters to store in the same equivalence classes. (Figure 1 is the storage structure of equivalence classes of SIZE attribute of table 1).

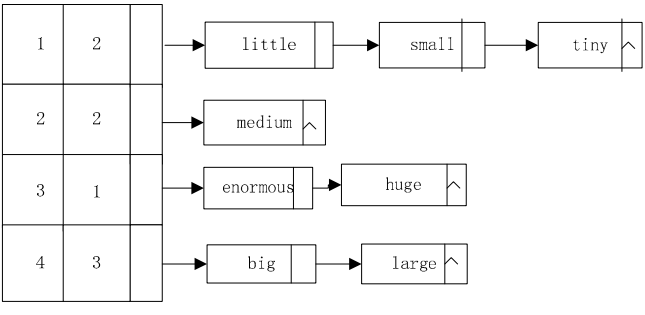

Fig. 1. Adjacency list of attribute SIZE

In table 1, the domain of the attribute SIZE has eight elements which be partitioned into four equivalence classes that {[big, large], [huge, enormous],[medium], [small,little,tiny]}. According to the adjacency list and the equivalence classes of the attribute SIZE, the head node has four nodes which the information domain in turn is 2,2,1,3, and the chain domain is stored the address of big、enormous、 medium and little; The table node has eight nodes which the adjacency domain is the equivalence class element and the chain domain is the address of the next element in the same equivalent classes, for example big and the chain domain of big is the address of large.

5 Sorted Method for the Rough Relational Databases

Sort is a regular operation of computer, its purpose that a disorder sequence is adjusted to ordered sequence. Followed is the basic idea of the sorted method in this essay:

Firstly, it is fetched out two group's data from the disordered sequence and taken the first group data as the ordered sequence.

Secondly, it is found the first values above the fetched data in equivalence classes, if them are found at the same time that noted the two values is same, and then take the next two values of two groups data to compare; if first found the ordered sequence value that noted the group data of the disordered sequence comes after the group data of the ordered sequence , and then fetched out the next data from the ordered sequence; if first found the value of the disordered sequence, it is indicated the group data placed in front of the group data of the ordered sequence number; and then inserted it into the ordered sequence and take the next group data from the disordered sequence.

Repeat the second step continue until all the disorder data are inserted into the ordered sequence.

A. Algorithm description

Input: the basic table and equivalence classes of the RRDB

Output: sorted table of the RRDB

Variable Description: count (R (i)) is used to denote the number of the attribute values of the disordered sequence, count2 (R (j)) is used to denote the number of the attribute values of the ordered sequence.

```
// sorted for the basic table of the RRDB
    for (i=0; i<n; i++)
    {
     for (j=0; j<i; j++)
     {
            for (k=0; k< count(R (i)) ||k<count2(R (j))); k++)
            {
              If the attribute value of the disordered sequence□ □ the attribute value of the ordered attribute value
                Then continue;
                Else if the attribute value of the ordered sequence□ □ the equivalence class value
                 Then break;
                Else if the attribute value of the disordered sequence□ □ the equivalence class value
                 Then inserted the data of the disorder sequence into the ordered sequence
            }
        }
    }
```

The algorithm is provided a sorted method for the basic data of the RRDB, although its has spent some time in sorted, it's retrieved faster after sorted, and then improved the query efficiency.

B. For example

According to the functional dependency above and the sorted method, the sorted for the attribute SIZE of Table 1 in the following.

First of all, it is fetched out the two groups data {Medium} and {Large} in the front, and denoted the {Medium} as a ordered sequence;

Next, it is found 'Medium' and 'Large' in the equivalence classes, the 'Medium' is inserted before of the 'Large' because it is first find the Medium from figure 1, and the ordered sequence is {{Medium}, {Large}} after inserted into 'Large'.

Then taken the new value of the disordered sequence {Small, medium}, followed the same way, and the ordered sequence is {{Small, medium}, {Medium}, {Large}}. Turn down until all records of the disordered sequence are inserted into the ordered sequence, and the sorted of the table 1 is shown in Table 2.

Table 2. Soil information basic table after sorted

COLOR	SIZE	QUALITY
Gray, black	Tiny	Poor
Gray	Small medium	Poor
Brown	Medium	Normal
Gray, white	Medium	Normal
White, gray, tan	Enormous, big	Good, productive, normal
Black, tan	Large	Normal, fertile
Gray, brown	Large	Normal, productive
Gray, black	Big	Normal, fertile

6 Conclusions

It is put forward a sorted method for rough relational databases based on the data characteristics of the rough relational databases, and designed the algorithm, then applied its to example, it is improved the speed of retrieve data from the example to prove its feasibility and effectiveness.

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Analysis and Optimizing for Large Management of Information System

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Abstract. The quality of MIS has direct effect on enterprises' competitiveness and development. As one of the most important way to improve software and application, performance optimization is getting more and more attention. In this article, we take c/s application as example; focus on finding out the best ways of optimization.

Keywords: C/S.MIS.Optimization.

1 Introduction

Optimization means making comparisons among several different programs and finding out the best one which contains the fewest code lines, uses the least memory, runs fastest and makes the best use of all devices. However, the first thought of optimization is improvement of algorithm. Although algorithm optimization of course has effect on performance of application, it is not the most direct way in MIS. The most direct optimizing way is making reasonable allocation of available resources. One of the most typical example is that there are 1000 times speed gap between two program of the same algorithm which is realized by different I/O allocation.

2 Design Bottleneck and Solutions

Whenever applications meet bottlenecks, getting more and more slowly or even break down are the most typical manifestations. The causes of most bottlenecks can be included in two aspects.

1) Frequently database operations are not legitimately tackled with.
2) Complex operations are not legitimately

tackled with.

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A. Solutions for Frequently database operations

There are four ways can be taken to improve the performance of database.

1) Close the connection after using.
2) Never create/close database connection in “while” or “for”
3) Procedure can be used to realize difficult query.
4) Use web service to manipulate database.

B. Solutions For Complex Operations

1. Tack Blocks as Solutions

In the field of computer program, one of the most important jobs is controlling several operations in the same time. However, most programs need other processes release occupied resources. There are several ways can meet this aim. The simplest method is coding several blocks to momentarily halt itself by cease the hardware resources. Although it is an effective method the program is difficult to be transformed. The cost of the program designed by the simplest way will cause one major problem. All running processes start waiting from the very beginning. The application is easily halted, or even broken down.

2. Take Single-threading as Solutions

When the program adopt single-threading as it algorithm, all processes run under a certain way. The following process will not start until the front process dispose. Server side fetches the query of client side from http, sockets, files and etc. Then, send a response signal after processing. The following diagram take “hardware shop” as example, unfolds the words above.

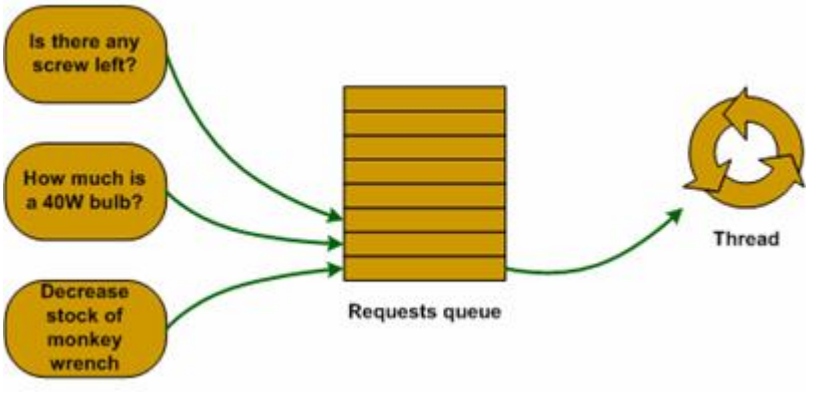

Fig. 1. Single-threading Model

In single-threading model, there is only one thread in one process, the rest processes have to wait until the current thread disposed. The disability of this model is that a small task always takes a long time.

3. Take Multi-threading as Solutions

One optimizing strategy is using muli-threading model (MTA). In MTA, there is only one module which control several threads in process. Message queue is not needed, since every thread is one part of the same module. Moreover, each thread can share resources with each other. Since the load of system is reduced, this strategy will largely speed up the program. Therefore, idle time can also be reduced by other optimizing strategy. However, this kind o f applications are always very complex, because coder have to guarantee that one thread will visit the resources which is being occupied by another resource.

Another optimizing strategy creates different thread for every query. When a new query arrives, server side creates a new thread for it, and disposes it after the query complete. Multi-threading is aiming at complete several tasks during the same period. The usage of resources can be improved by this model, so that the speed of application can also be improved. The following picture shows the procedure mentioned above

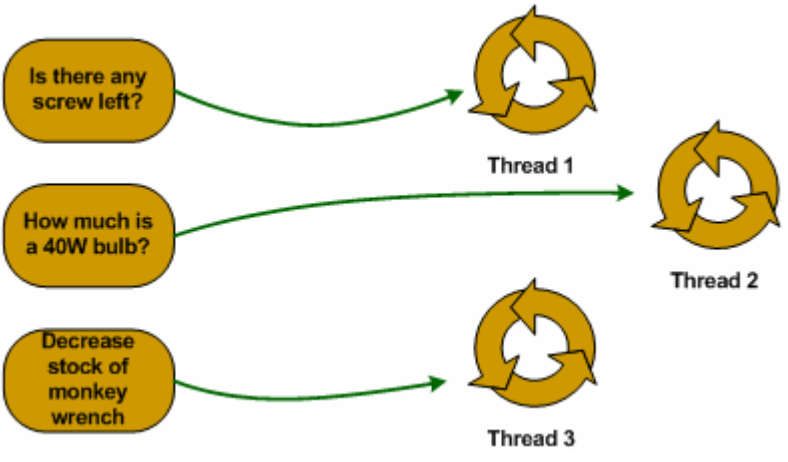

Fig. 2. Multi-threading Model

4. Take Threading Pool as Solutions

The most effective and efficient strategy is synthetically using single-threading model and multi-threading model, that is thread pool model. When a new query arrives, the application put into a received queue. Then, a group of thread will be fetched and allocated to tackle with the query. The following picture takes “hardware shop” as example to elaborate.

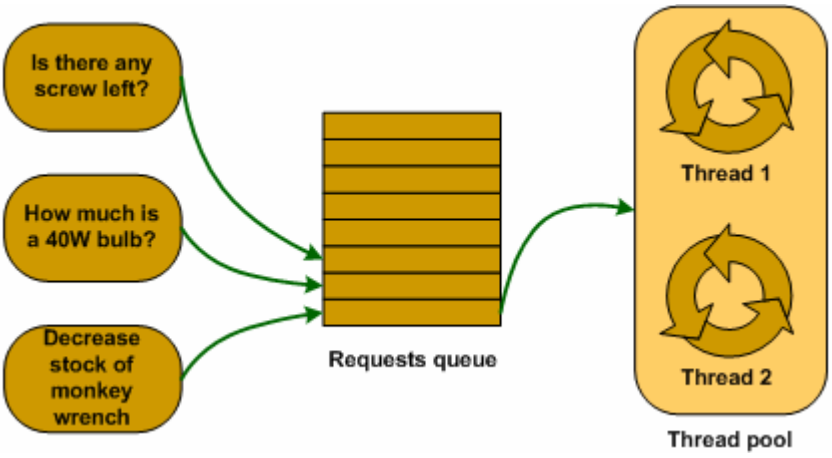

Fig. 3. Thread Pool Model

Optimizing purpose:

1) Provide a flexible thread pool component which can be automatically dispose thread when they are enough, and create thread when not enough.
2) Provide a task interface and task queue, every task must realize the task interface, and then be put into task queue.
3) Every thread in thread pool can fetch task which will be deal with automatically.

The main control classes and their functions

1) Design the functions of ThreadPoolManager in interface.
2) Manage all parameters of thread pool. For example, the max thread number, the min thread number, the idle thread number and the busy thread number.
3) Destroy needless sleeping thread when busy thread number is less than the min thread number.
4) Create thread when the total number of task queue is more than the max thread number.

5. Performance after optimizing

1) Blocks Solutions:

Testing examples	CPU usage	Memory usage (KB)	Cost Time (ms)
Read 1file	3%	4,198	1000
Read 10 files	22%	6,320	120,783
Read 100 files	35%	9,920	Block
Read 1000 files	65%	21,930	Break

2) Single-threading Solutions:

Testing examples	CPU usage	Memory usage (KB)	Cost Time (ms)
Read 1file	ignore	2,144	ignore
Read 10 files	ignore	3,329	ignore
Read 100 files	2%	5,832	21,326
Read 1000 files	5%	8,846	99,231

3) Mingle-threading Solutions:

Testing examples	CPU usage	Memory usage (KB)	Cost Time (ms)
Read 1file	ignore	1,122	ignore
Read 10 files	ignore	2,342	ignore
Read 100 files	1%	4,232	ignore
Read 1000 files	3%	6,322	17,332

4) Thread Pool Solutions:

Testing examples	CPU usage	Memory usage (KB)	Cost Time (ms)
Read 1file	ignore	1,002	ignore
Read 10 files	ignore	2,242	ignore
Read 100 files	1%	3,232	ignore
Read 1000 files	2%	6,122	11,377

3 Summary

From above analysis, there are at least 4 advantages by using threads for optimizing.

1) The task which is highly cost can be sent to back ground.
2) User interface can be more attractive. For example, processing bar will pop up after a button is clicked.

3) Speed up the application.
4) Some cherish resources, such as memory, can be released. Especially in the following situations.

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How to Stick to Online Consumers: CRM Perspective

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Abstract. How to attract and retain online consumers, that is, stick to them is one of the most important objectives faced by website managers in the fierce competition. This paper tried to solve it from a perspective of Customer Relationship Management (CRM). We developed a model to explain online consumers' repurchase loyalty. The SEM (Structure Equation Modeling) is used to test relationships between variables in the model by the tools of Lisrel8.70 and SPSS15.0. The empirical findings show that website information quality, system quality and service quality are all important factors influencing online consumer repurchase loyalty. The customer-oriented view is still a key for e-commerce to success. Based on this, we suggested some measurements to stick to online consumers and make them loyalty to the special websites. We expected to offer some references to websites' operators.

Keywords: Customer Relationship Management (CRM), online consumers, repurchase loyalty.

1 Introduction

The website as a new business distribution channel is constantly playing a role in making online sellers to offer products and services in many ways superior to the traditional channels, and it is also more efficient than other channels. What it provides to consumers is not only the flexibility and convenience, but also it gives them many choices and lower costs. It is often true that only one click can make consumers transform from one website to another. With the quick development of e-commerce, the competition in the network market space becomes gradually fierce. Therefore, how to attract and retain consumers online is one of the most important objectives faced by website managers. It is very important to understand consumers' think and behavior for e-tailors to stick to consumers online.

Compared to traditional retailers who owe physical and online stores, it will take more 20% to 40% of the cost to attract new customers for an e-tailor [1], we can see that in the Internet, to capture customers is extremely expensive, unless customers stick to the enterprises around within a few years to make a lot of repeat purchase, or the profit is still uncertain.

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CRM is a kind of management and marketing philosophy. Its goal is to develop, maintain and enhance customer satisfaction and loyalty, and create and enhance customer value. It helps to develop and maintain customers' long-term, stable and mutually beneficial relationship. Customer loyalty and customer value are its core elements. Customer relationship management (CRM) is a good way to understand online consumers' performance.

It must be one of the business goals for any Internet stores to found the reasons why customers choose their own stores but not a competitor's store. As in traditional marketing environment, just as in a network environment, customer-oriented e-commerce is still the key to succeed. Because in the Internet environment, there are various options available and the convenient conversion between retailers, if there is no customer-oriented philosophy, it is difficult for an online retailer to continue to encourage its customers to return purchases.

Based on this, considering online consumer's perception, this study regards repurchase loyalty as a core element and discusses its influencing factors.

2 Literature Reviews

A. Online Repurchase Loyalty

Loyalty has been defined and measured in many different ways. Dick and Basu defined customer loyalty as the relationship between relative attitude and repeat patronage [2]. In comparison with the amount of research that has been devoted to online shopping, relatively little empirical research has been conducted to date into the issue of online loyalty. An early investigation carried out by Johnson et al. into online search behavior suggested that customer loyalty could be linked to experience with internet shopping [3].

Some recent work has discussed loyalty within this cognition-affect-action perspective [4], but few empirical studies have tested the entire relationship between quality, satisfaction, and loyalty [5]. Some studies have tested the relationship between quality, satisfaction, and intention-based loyalty (e.g. [6]) and assume these relationships to be positive but to vary between products, industries, and situations (e.g. [7]). Whether this relationship can be used in the e-commerce context has not been discussed.

B. Perceived Website Quality

Because website not only represents a kind of information system but also is a marketing channel, website quality can be analyzed from technology perspective and service perspective. From the technology perspective, website quality is made of information quality and system quality; from service perspective, website can be regarded as service provider including service quality.

We consider online consumer's experience process as mainly three phases, before-sale, inter-sale and after-sale. "Software" aspect, the service, is specially looked as a variable of service quality after the sale. So website quality is identified as information quality, system quality and service quality. Information quality consists of design and operation characters such as data format, completeness and timeliness

etc; system quality is about the performance characters of design-directed such as interface design and function etc; service quality means the acceptance of consumer's complain, the availability of timely solving communication mechanism as that service level can satisfy better customer's expectation.

So perceived website quality is classified by perceived information quality, perceived system quality and perceived service quality. Hsiu-Fen Lin's findings showed that perceived information quality, perceived system quality and perceived service quality are important prerequisite for consumer satisfaction [8]. In e-commerce environment, consumers experiencing through the three-stage process would conduct a comprehensive assessment to the performance of the website. If the website's quality can meet all kinds of consumers' needs and expectations, they will make a positive evaluation, and thus feel satisfied. So we can speculate in the e-commerce environment, the positive or negative experience consumers perceived from the website's quality would affect their evaluation of satisfaction. The website quality also has a direct impact on consumers' trading decisions.

C. Online Consumer Satisfaction

Based on Oliver [9], we define online consumer satisfaction as an affective state representing an emotional reaction to the entire website purchase experience. This definition focuses on the process evaluation associated with the purchase behavior as opposed to the outcome-oriented approach, which emphasizes the buyer's cognitive state resulting from the consumption experience.

Szymanski and Hise have conducted an exploratory study into e-satisfaction, which is widely regarded as an essential pre-requisite for loyalty [10]. Their results showed that greater product choice did not influence e-satisfaction levels, although greater product information did have a significant effect on these levels. According to the findings of this study, good web site design also had a positive effect on e-satisfaction.

For online shopping, the experience of using a website during the information-search phase could be affected by information quality factors (e.g., a richer product description) and system quality factors (e.g., other links).Similarly, during after-sale phase, consumers' behavior could be affected by service quality level (e.g., delivery and payment).

D. Online Ongoing Trust

Online ongoing trust refers to the stable high level of trust formed after the online consumer or the repeat consumer has the purchase experience with a website. According to McKnight, Choudhury and Kacmar's point of view, in the context t of B2C e-commerce, there are two phases of trust development-an exploratory stage and a commitment stage [11]. Trust in the exploratory stage is known as initial trust; and trust in the commitment stage is called ongoing trust.

In a study of online purchasing of books and flights, Harris and Goode demonstrate that loyalty is both directly and indirectly influenced by service quality, perceived value, satisfaction and trust [12]. It can be expected that online ongoing trust will influence online consumer loyalty.

3 Model Development and Hypotheses Proposed

A. Model Development

According to the discussed in the literature review, we can develop a model, as shown in Fig. 1.Placing these factors in the three stages of online experience process; we can find that perceived information quality and systems quality relating to the website run through the whole pre-purchase and the shopping process. Post-purchase stage is service delivery perception stage. It is also a factor which will affect online consumer's follow-up behaviors.

B. Hypotheses Proposed

Based on the above discussion, we can hypothesize:

H1a-H1b: perceived information quality has a positive relationship with online ongoing trust and consumer satisfaction respectively.

H2a-H2b: perceived system quality has a positive relationship with online ongoing trust and consumer satisfaction respectively.

H3a-H3b: perceived service quality has a positive relationship with online ongoing trust and consumer satisfaction respectively.

H4: online consumer satisfaction has a positive relationship with online ongoing trust.

H5a-H5b: online consumer satisfaction and online ongoing trust have positive relationships with online repurchase loyalty.

The relationships between variables are shown in Fig.1.

4 Empirical Test

Lisrel8.70 is used as a tool and structural equation modeling (SEM) as a method to verify the relationship between variables in the model. SPSS15.0 is used as a statistical tool to analyze and verify the reliability and validity of the scale and the survey data.

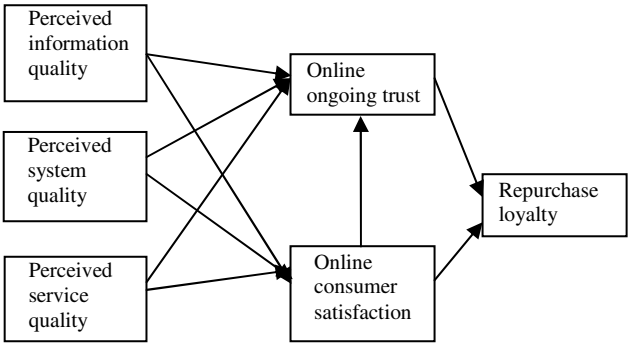

Fig. 1. Online consumer repurchase loyalty model

A. Scale Development

In the Internet environment, "system quality" measures the expected characteristics of e-commerce, such as usability, reliability, adaptability, practicability etc.; response time such as download speed is one of the quality characteristics evaluated by e-commerce system users. Perceived system quality is measured by four items including perception to website design and interaction [13, 14].

"Information quality" focuses on the content of e-commerce. Web content should be personalized, complete, related, easy to understand and safe. Perceived information system is measured by four items including perception to information provided and safety [15, 16].

"Service quality" is the overall support delivered by the service providers, regardless of whether such support is provided by the information systems department, or by a new organization, or outsourced to other service providers, this factor can be used to indicate the level of serving users. Because if the support can not make customers feel satisfied, it will lead to the loss of customers. So the importance of service quality is even greater than before. According to Kimery & McCard [17] and DeLone & McLean [18], the measurements items of perceived service quality include responsiveness, trust, and empathy ([17, 18]).

"Consumer satisfaction" is an important means measuring customers' evaluation of e-commerce systems. It refers to the evaluation which consumers make about whether to repurchase or revisit in their mind based on perception to the performance of the website. According to Devaraj, Ming, and Kohli [18], measurement consists of three items: (1) The information that the website provides satisfies my needs; (2) I am satisfied with the product provided by the website; (3) I am satisfied with the experience process in the website.

"Ongoing trust" measures online consumers' belief on the website's reliability and integrity and benevolence. We use "(1) I think the e-tailor is worth to trust; (2) I think the e-tailor offer the reliable information; (3) I think the e-tailor concerns consumer's very much."[11].

"Repurchase loyalty" refers to the behavior consumers want to continue to purchase online shopping. The most common assessments of loyalty are behavioral frequency or repurchase patterns [19]. We use "How many times—on average—during the last year have you purchased books from the website?" to measure it.

All other measurement items use seven-point Likert scale (from 1 for strongly disagree to 7 very much agree).

After determining the content validity of the questionnaire, a pre-test is made to refine them. Pre-test focuses on the clarity, the question wording and accuracy of the measurement. In the pre-test, 12 online shoppers are selected as respondents to evaluate the problems and wording of the questionnaire. This is used as a basis for the questionnaire to be modified.

B. Survey Process

Using the revised questionnaire, a total of 500 copies is sent to university students. Because university students are the most potential consumer groups; compared with

the traditional customers, online customers are usually younger, well-educated, which means that student groups are very similar to the online customer communities.

This study selects an online clothes store; the respondents are asked to choose one clothes they want to buy from the website. After experiencing purchase process, they must fill out the questionnaire. The effective response rate is 91%.

C. Data Analysis

Data analysis is to prove reliability and validity of measurement by SPSS15.0.

Through the calculation of Cronbach alpha coefficient shown in Table 1, the internal consistency reliability can be assessed. The coefficients of the measurements are all above 0.75 and beyond a standard 0.70 proposed by Hair, Anderson, Tatham & Black [20].

The measurement model is tested by confirmatory factor analysis. The χ^2/df of this study is 1.90 after calculation, less than 3(a standard Bagozzi & Yi recommended [21]); goodness of fit index (GFI) is 0.97; adjusted goodness of fit index (AGFI) is 0.87; compared goodness of fit index (CFI) is 0.98 and root mean square error of approximation (RMSEA) is 0.080. The measurement model shows that a considerable goodness of fit with the collection data.

Consistent validity measures the consistent level reached when many attempts measure the same concept. The factor loads of all items exceed the recommended factor load of 0.6 [22]. Discriminant validity can be tested by comparing the square of correlation between variables and average variance extracted [23]. The results show that the square of correlation coefficient of each variable is lower than the average variance extracted measuring the variable. It indicates that the measurements have full discriminant validity. In short, the measurement model demonstrates adequate reliability, validity and discriminant validity.

D. Hypotheses Test

The use of Structural Equation Modeling (SEM) tests the relationship between each variable in the model by Lisrel 8.70 because this method can test causal relationships between constructions with multiple measurements items. The confirmatory factor analysis is used to test the validity of the model. The structural model is analyzed to test hypotheses in the model.

The analysis of structural equation model shows that the goodness of fit is better: χ^2/df = 2.2; GFI = 0.92; AGFI = 0.87; CFI = 0.91; RMSEA = 0.071. Standardized correlation coefficient, T value, and the test results of hypotheses are shown in Table 2. All the hypotheses are supported.

Table 1. Cronbach Alpha Coefficients

Variables(number of items)	Cronbach α coefficient
Perceived information quality(4)	0.81
Perceived system quality(4)	0.80
Perceived service quality(3)	0.82
Online ongoing trust(3)	0.84
Online consumer satisfaction(3)	0.81
Online repurchase loyalty (3)	0.79

Table 2. The Test Results of Hypotheses

Hypotheses	Corresponding path	Standardized correlation coefficient	T	Test results
H1a	Perceived information quality→ ongoing trust	0.42	4.23***	support
H1b	perceived information quality→ online consumer satisfaction	0.44	4.31***	support
H2a	perceived system quality→ ongoing trust	0.58	5.02***	support
H2b	perceived system quality→ online consumer satisfaction	0.19	1.85*	support
H3a	perceived service quality→ ongoing trust	0.25	2.79*	support
H3b	perceived service quality→ online consumer satisfaction	0.31	3.98**	support
H4	online consumer satisfaction→ ongoing trust	0.67	5.45***	support
H5a	online consumer satisfaction→ repurchase loyalty	0.35	3.71*	support
H5b	Online ongoing trust → online repurchase loyalty	0.37	3.89***	support

Note: * On behalf of the 0.05 significance level, *** on behalf of 0.001 level of significance.

5 Conclusion

This paper discusses how to stick to online consumers from CRM perspective. According to the empirical outcomes, the website managers should improve the website quality including information quality, system quality and service quality. If they can't let consumers feel satisfied, they would lose consumers and competition advantage. E-tailers should reduce transaction and system-specific uncertainty and use privacy protection policy, and a variety of online security measurements to ensure the security of accounts and transactions, and ultimately improve consumer's trust in the transactions and encourage them to continue to buy. Just like in the traditional environment, websites should also make any improvements based on consumer's perception. Researchers may understand further the nature and importance of B2C e-commerce. Customer-oriented objective is the key.

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The Analysis of the Policy of Chinese Development of Low-Carbon Economy

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Abstract. The climate change and the related question it brings receive too much international attention. The developed countries are vigorously advancing the strategic plan which is turning into the low-carbon economy. China has released a series of policies which are advancing low-carbon development in recent years. This article unifies the background of Chinese development of low-carbon economy and the related policy which is already issued, analyzing the existing problems of Chinese development of low-carbon economy, pointing out the Chinese development of low-carbon economy, not only adjust the industrial structure, conserve energy and enhance the potency, optimize energy structure and increase sink through the effective action, making the realm of production vigorously developed through the low-carbon policy, more importantly, we must extend the low-carbon policy to the life domain, promoting Chinese low-carbon development.

Keywords: China, Low-carbon economy, Policy, Analysis.

1 The Background of Chinese Development of Low-Carbon Economy

Firstly, the development of low-carbon economy in China is the intrinsic need for realizing sustainable development. The Chinese population is large, the climatic condition is complex, the ecological environment is frail, and easily affected by climatic change. The climate change will bring significant threat to China's economic development, ecological protection and so on, the development of low-carbon economy is advantageous in breaking through the resources and environment restraint in Chinese economic development process, realizing the sustainable development.

Next, the development of low-carbon economy is the efficient path for China to transform the way of economic growth. The carbon emissions space will become the scarcer element of production than labor force, the capital, the land and other natural resource. Therefore, we must reduce energy intensity and carbon intensity of GDP. However, Chinese traditional high-carbon industry which depends on energy causes the high price of economic growth, so the development of low-carbon economy is advantageous to transform the way of economic growth.

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Thirdly, it is the international responsibility to slow down global warming through the development of low-carbon economy. China decided that the unit GDP carbon dioxide emission could drop 40%-45% in 2020 comparing 2005, which will be integrated as the bounded target added in the medium and long-term plan of the national economy and the social development.

2 The Analysis of Problems in Chinese Development of Low-Carbon Economic

At present, China is being in the development time of industrialization and urbanization, coal is the primary energy, the economic growth way is extensive, the efficiency of using energy resources is low, and the demand will continue to grow, the development of low-carbon economy and dealing with the climatic change are faced with huge pressure and special difficulty.

Firstly, the task of energy conservation and emission reduction is arduous. The material of the State Statistical Bureau in 2007 indicated that only Beijing has achieved the year unit GDP energy consumption goal in 31 provinces and cities as well as autonomous regions in China in 2006, which explained that China's energy conservation and emission reduction faced with serious challenge. It is difficult to change energy structure which is primarily used coal in short-term, to rapidly enhance enterprise's scale effect, to minimize the disparity between the level of the product energy consumption as well as the level of system energy efficiency and the world advanced level, all the above factors could decide the long-term characteristic and the difficulty of energy conservation and emission reduction in China.

Next, grasping the low-carbon technology exist barrier. At present, Chinese economic development and the infrastructural facilities have the high emissions characteristic, China urgently need low-carbon technology independent innovation and technical transfer from developed country. China pay more attention on bringing in, but less attention on digesting and absorbing, which causes the technical dependence and the technology brought in hasn’t been applied well.

3 The Related Policy of Chinese Development of Low-Carbon Economy

China has proposed a lot of measures to protect resources and the environment one after another since 1970s. Since from 2002, China has proposed the scientific outlook on development, the construction of resource conservation and environmentally friendly society and the socialism ecology civilization. The present low-carbon policy mainly concentrates on high energy consumption domains, architecture industry, family electrical industry and renewable energy industry and so on. From the policy content; firstly, adopt the policy that the government invest or subsidy, adjust industrial structure, optimize energy structure, such as enlarging the new energy investment and so on; Secondly, adopt the tax policy to compel enterprise to do clean production, conserve energy and fall consumption, enhance the potency; Thirdly, adopt the policy that the low-carbon economical experiment site demonstration, from point to area, promote Chinese low-carbon reform; Fourthly, enhance the ability of carbon sink. (details in the following table).

Table 1. China's Low Carbon Policy

TIME		MAJOR POLICIES	ISSUING UNIT
Year 1997		*China' no-pollution coal technology in the ninth five-year plan and the 2010 development planning*	The State Council
Year 1998		Implementation of *energy conservation of the People's Republic of China*	
Year 2003	Jan.	*The Law of the People's Republic of China on Promoting the no-pollution Production*	The NPC Standing Committee
	Sep.	The first phase of wind power concession bidding.	The State Development and Reform Commission
Year 2004	Jun.	*The CDM project management provisional regulations*	the State Development and Reform Commission ,Department of Science and the Technology, Ministry of Foreign Affairs
	Sep.	The second phase of wind power concession bidding.	the State Development and Reform Commission
Year 2005	Feb.	*Laws of renewable energy*	NPC standing committee
	May	China's national energy leading group was established.	
	Jun.	*Several opinions on promoting the healthy development of the coal industry*	The State Council
	Oct.	*The CDM project operational Guidance*	the State Development and Reform Commission, Department of Science and Technology, Ministry of Foreign Affairs,Ministry of Finance
	Dec.	The notification of *the implementation of GDP energy consumption index*	the State Development and Reform Commission the State Energy Resources Commission and the State Statistics Bureau
Year 2006	Jan.	*Laws of renewable energy*	the NPC Standing Committee
	Jan.	*The renewable power generation management-related regulations*	the State Development and Reform Commission
	Jan.	*Renewable energy generation price and cost allocation management provisional measures*	the State Development and Reform Commission

Table 1. *(continued)*

		The efficient utilization of coal clean energy technologies as advanced technology enters C*hina should grasp the key technologies of independent intellectual property and products catalogue*	
	May	*The tentative method of administrating the special fund of the renewable energy development*	Ministry of Finance
	Aug.	*The notice of related request about the management of wind electricity construction*	The State Development and Reform Commission
	Dec.	*The instructional opinion of the State Forestry Bureau carbon sink management office on the development of afforesting and afforesting again carbon sink project under the no-pollution development mechanism*	The State Forestry Bureau
	Dec.	*Climatic change country assessment report*	Department of Science and the Technology、China Meteorological Bureau、Chinese Academy of Sciences
	Dec.	*The notice of energy auditing reports and conservation energy verification guide*	The State Development and Reform Commission Office
Year 2007	Mar.	The seventeenth National Congress of the CPC proposed the building of socialism ecology civilization in 2007	
	Apr.	*The "Eleventh Five-Year" Plan of energy development*	The State Development and Reform Commission
	Jun.	*The program of China to deal with the climatic change*	The State Council
	Jun.	*The comprehensive work program of energy conservation and emission reduction*	The State Council
	Jun.	*The foundation of leading group office which deals with the climatic change taking the national premier as group leader*	
	Jun.	*The science and technology special action of China to deal with the climatic change*	Department of Science and the Technology
	Jul.	*The opinion about carrying out the environmental protection policies and regulating credit risk*	Environmental Protection Agency、People's Bank of China、China's Securities Regulatory Commission
	Jul.	*To invite bids of the concession of the fourth issue of wind electricity*	The State Development and Reform Commission
	Aug.	*The long-term development project of renewable energy source*	The State Development and Reform Commission
	Aug.	*The tentative method of administrating the finance reward of the fund from energy conservation technological transformation*	Ministry of Finance、The State Development and Reform Commission

Table 1. *(continued)*

	Sep.	*The notice of electricity price subsidy of the renewable energy and quota transaction plan in the year of 2006*	The State Development and Reform Commission、China's Securities Electronic Commission
	Sep.	*Hu Jintao made the main speech in the 15th leaders informal meeting in APEC*	
	Oct.	*The medium and long-term development project of nuclear power* (2005-2020)	The State Council
	Nov.	*The notice of the State Council promises the statistics and inspection of energy conservation and emission reduction as well as the check implementation plan and methods*	The State Council
	Dec.	*The instructional opinion of the credit work of energy conservation and emission reduction*	China's Securities Regulatory Commission
Year 2008	Jan.	*Significant technical equip development and significant industry technology development special plan in the "eleventh five plan*	The State Development and Reform Commission
	Jan.	Global Protective organization WWF (World nature foundation) officially starts "the development project of Chinese low-carbon city" in Beijing, Shanghai, Baoding are selected as the first batch of the experiment site city.	The State Development and Reform Commission and WWF
	Jan.	*The tentative method of adjusting the addtional revenue of renewable energy electricity price*	The State Development and Reform Commission
	Mar.	*The "eleventh five plan"* of *renewable energy development*	The State Development and Reform Commission
	Apr.	*Execute " the Law of Saving Energy " which is revised*	The NPC Standing Committee
	Apr.	*The implementation plan of the activity of conserving energy from thousand enterprises*	The State Development and Reform Commission、the State Energy Resources Commission、the State Statistics Bureau、the General Administration of Quality Supervision、The State Council and the Stated-owned Assets Supervision and Administration Commission of the State Council jointly issued
	Apr.	*The notice of the adjustment of high efficiency wind electrical machinery and the key spare part and the import tax policy of raw material*	Ministry of Finance
	Aug.	*The tentative method of Wind power generation equipment industrial production special fund management*	Ministry of Finance

Table 1. *(continued)*

	Aug.	*The administration rules of recycling and dealing with the abandoned electric appliance electronic products*	
	Oct.	*The policy and the motion of China to deal with the climatic change*	The State Council
	Oct.	Apply *civil construction Energy conservation Rule*	The State Council
	Dec.	Start the demonstration work called "ten city ten thousand lights"	Department of Science and the Technology
Year 2009	Jan.	*The preferential table of contents of resources comprehensively utilize enterprise income tax*	Ministry of Finance the State Taxation Administration and The State Development and Reform Commission jointly issued
	Jan.	*The law of promoting recycling economy*	The NPC Standing Committee
	Jan.	*The arrangement of the work of energy conservation and emission reduction in 2009*	The State Council
	Mar.	*The tentative method of administrating the application of finance subsidy of the fund on solar energy electro-optic construction*	Ministry of Finance
	Mar.	*To advance the industrial production of non-pollution coal technology with the development of the nuclear power, the wind electricity, the solar electrical energy generation and other non-pollution energy, which together lists as the key work in Government work report.*	The State Council
	Mar.	*The plan of the adjustment and promotion of automobile industry*	The State Council
	Jun.	*The route map of China in the progress of energy technological to 2050*	Chinese Academy of Sciences
	Aug.	*The resolution about positively dealing with the climatic change*	The NPC Standing Committee
	Aug.	Pass the *Plan Environmental effect Appraisal Rule* (implement in October)	The State Council
	Sep.	Hu Jintao explicitly proposed that climatic change must be integrated in the national economy and the social development plan at the United Nations climatic change summit, vigorously developing the green economy, positively developing the low-carbon economy and the circulation economy.	
	Sep.	Hu Jintao pledged at New York's United Nations summit: the emission of the unit GDP carbon dioxide will remarkable drop in 2020, the non-fossil energy accounts for about 15% of consumption proportion of the primary energy, the forest area increases 40,000,000 hectares, the storing quantity of forest increases 1,300,000,000 cubic meters.	
	Nov.	The Chinese government announced that the emission of the unit GDP carbon dioxide will remarkable drop 40% to 45% in 2020 comparing 2005.	
	Dec.	*The opinion of the State Council about speeding up the development of tourism*	The State Council
	Dec.	*the total plan of the recycling economy in Gansu Province*	The State Council

Table 1. *(continued)*

	Dec.	The notice of the preferential table of contents of the enterprise income tax on the project of environmental protection, energy conservation and water conservation (pilot edition)	Ministry of Finance, the State Taxation Administration The State Development and Reform Commission
Year 2010	Feb.	*The notice of the State Council further strengthens the work of eliminating the backward production*	The State Council
	Apr.	Implement the new revision *Renewable energy Law*	
Soon issued policy		*The administration method of the electricity generation quota target of the renewable energy*	
		The administration method of the renewable energy developing funds	
		The series necessary regulation of the *renewable energy Law*	
The formulating policy		*The development project of energy conservation environmental industry*	
		The opinion about developing the semiconductor illumination energy conservation industry	
		The instructional opinion about developing low-carbon economy	
		The development project of the new energy industry	
		The medium and long-term development project of the nuclear power and so on	

4 The Trend of Development of Chinese Low-Carbon Economy

A. New energy industry will rapidly expand

Firstly, the progress of energy technology not only unceasingly enhances the efficiency of source use and transfer, but also reverses the tendency of GDP energy intensity rise. For example, the efficiency of coal consumption for power supply enhances 14.2% in 10 years, the energy unit consumption of the main high energy consumption product almost drops at the speed of 1.5%-2.5% every year; Chinese energy intensity of GDP drops 14.38% in 2009 comparing 2005.

Secondly, the new and renewable energy rapidly developed, of which the growth is nearly 60% between the year 2005 and 2008, the proportion in the primary energy grows from 7.1% to 8.9%. The proportion of non-fossil energy will reach 15% in 2020. New Energy industry Promotion Plan which will be soon released has made a large scale adjustment on the goal of windward electricity, solar electrical energy generation and nuclear power, the goal of 2020 was largely adjusted from original 30,000,000 kilowatt, 1,800,000 kilowatt, 40,000,000 kilowatts separately to the installed capacities 100,000,000 kilowatts, 20 GW, 70,000,000 kilowatt.

B. The measure of energy conservation and emission reduction extends from the realm of production to the life domain development

First of all, the most effective measure in the realm of production is to enlarge the fund of reducing emission and the proportion of technical investment. According to the reckoning, the appended investment of energy conservation and emission reduction was about 150 billion Yuan during the “Eleventh Five-Year Plan”, which

will be increased to 190 -340 billion Yuan during the "Twelfth Five-Year Plan", of which the investment that depends upon the profit of the project itself but can't recall the funding will increase from 20% of the "Eleventh Five-Year Plan" to 40% of the "Twelfth Five-Year Plan". The advancement of structural adjustment and the industrial upgrading, as well as the intense dynamics of eliminating the backward production are able to promote China to transform the way of economic growth, realizing the development of low-carbon.

Next, research the technology of Carbon Capture and Storage and enhance the ability of carbon sink. From the year 1980 to 2005, China has absorbed 4.68 billion tons of carbon dioxide through afforestation and forest regulation and reduced 0.43 billion tons of carbon dioxide emission through the control of destroying forest, which amounts to 5.11 billion tons. Along with the growth of forest resource in China and the enhancement of forest quality, the ability of absorbing CO2 yearly will be increased year by year.

Thirdly, gradually transit from the low-carbon experiment site to comprehensive reform. China has already selected the key area, profession and cities to carry on the experiment site demonstration, gradually promoting according to the actual situation. Like low-carbon urban construction, carbon tax, carbon transaction and so on.

Fourthly, encourage and initiate low-carbon life style and the low-carbon culture in life domain. Enlarge the propaganda dynamics of low-carbon economy in the whole society, making the concept of low-carbon go deep into the hearts of the people.

What is worth emphasizing, China must absorb the experience of the developed country, strengthening the building of transportation infrastructural facilities. Such as enlarging the investment of railway transportation and the urban public transportation, transform from high energy consumption to the low one.

C. Construct the industry system of low-carbon and enhance the ability of international competition

In the background of reducing emission in the whole world, if the circulated, ecology and green product does not have the low-carbon label, it possibly loses the international competitiveness and receives the restriction of trade protectionism. The establishment of industrial system which takes the low-carbon emissions as the characteristic, is advantageous to promote the coordination and the sustainable development between economic society and resources environment.

In brief, China will comprehensively utilize each kind of policy such as law, economy and financial, continuously optimize the energy structure, adjust industrial structure, realize the economic growth, by the science development model, and promote the healthy development of Chinese low-carbon economy.

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Research on Pharmaceutical E-Commerce Enterprises: A Case Study of Jxdyf.com

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Abstract. Jxdyf.com, a Chinese pharmaceutical e-commerce company to offer all kinds of medicines, medicine-related information and services, including medicines and chemical reagents, medicine-related services, health information, the pharmaceutical company supply and demand, industry forums, FQA(frequently question answer), and so on, was built in early 2007. Now, Jxdyf.com has above 60 million registered users and offers more than 10,000 kinds of medicine-related merchandise every day. This paper analyzes the running model of Jxdyf.com comprehensively from the perspective of technology, management, capital, operation and cooperation. Based on the analysis and current development trend of e-commerce enterprises, this paper puts forward with some suggestions for Jxdyf.com.

Keywords: Jxdyf.com, e-commerce (EC), running model, pharmaceutical enterprises, application analysis.

1 Introduction

Jxdyf.com, founded in early 2007 by Beijing Jinxiang pharmaceutical Co., Ltd, is a Chinese pharmaceutical e-commerce company to offer all kinds of medicines, medicine-related information and services, including medicines and chemical reagents, medicine-related services, health information, the pharmaceutical company supply and demand, industry forums, FQA(frequently question answer), and so on. It focuses on items that have comprehensive and timely medicine-related information, convenient and efficient web-based shopping tools, multi-functional, simple and quick cyberspace, medicine industry and the industry's close advisers. Now, Jxdyf.com offers more than 10,000 kinds of medicine-related merchandise every day, and has more than 60 million registered users and above 300 chain drugstores offline.

Jxdyf.com promotes itself as an online pharmaceutical enterprise on authoritative, timeliness, correctness, and completeness with all medicine-related information, merchandise and services, which covers a broad range of consumer, such as baby and mother, male and female, young and old people, healthy person and patients, and so on. In addition, all of medicines on Jxdyf.com can be online ordering, online payment or cash on delivery easily. So, Jxdyf.com is one of the largest pharmaceutical e-commerce websites in China today. By now, Jxdyf.com has been the famous brand of pharmaceutical e-commerce enterprises in China.

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2 Case Study of JXDYF.COM

What promoted the success of Jxdyf.com? Will Jxdyf.com continue to succeed? To answer these questions, this paper analyzes the running model of Jxdyf.com comprehensively from the perspective of technology, management, capital, operation and cooperation.

A. Operation model of Jxdyf.com

Jxdyf.com provides the payment option of bank transfer, online payment, virtual account, post office remittance and cash on delivery currently. As soon as the development of IT technology, Jxdyf.com will provide customers with more choice for payment in the future.

Jxdyf.com has two main functions. As the window of online publicity and promotion of Beijing Jinxiang pharmaceutical Co., Ltd, Jxdyf.com has these columns, such as company introduction, company news, special reports, medicine-related information, show information, shopping guides, fair market, etc. As an online trading platform to the online consumers, Jxdyf.com has some columns of daily drugs, health products, skin care products, medical apparatus and instruments, new drugs, special drugs, and so on.

By now, Jxdyf.com offers more than 10,000 kinds of medicine-related merchandise such as medicines for colds, antipyretic, medical apparatus and instruments, mask for beauty, cosmetic, diet pills, and so on. By utilizing customer management system with advanced IT technology, Jxdyf.com could manage about 60 million registered customer services effectively.

Jxdyf.com has launched the famous instant communication and online call center service, which means medicine-related information about medicine-related problems, company information, shopping questions and professional advice in the website, will be offered to consumers easily day and night. Instant communication and online call center service brought much convenience to the consumers, since then, Jxdyf.com had about 60 million registered users and page impressions topped 20 thousand per day.

Shopping model of Jxdyf.com is convenient and easy. First, customers should login and register by their self in Jxdyf.com website; then, customers can browse and select medicine-related merchandise freely; if there are satisfied, customers can submit an application online or by telephone, and determine merchandise about the needs of customers; if not, customers can confer with Jxdyf.com to next turn; next, customers must confirm the order with Jxdyf.com for both price and delivery mode clearly; finally, customers should pay by bank transfer, online payment, virtual account, post office remittance and cash on delivery currently; then, shopping is completed. Shopping model of Jxdya.com is shown as figure 1.

In addition, as online medicine-related information, merchandise and service platform, Jxdyf.com not only provides medicine-related information, merchandise and service to customers, but also offers maximal convenience and best services to customers by cooperating with the traditional producers and using advanced IT technology; customers also can select other service, such as booking drugs, professional advice, arranging logistics, and so on. Jxdyf.com deals with customer service in the way of call center, MSN, E-mail, QQ, BBS and telephone.

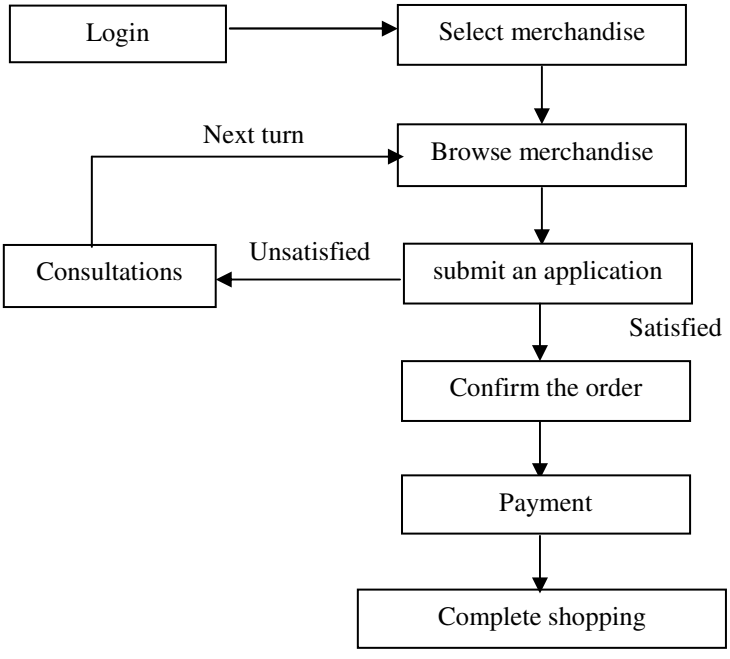

Fig. 1. Shopping model of Jxdyf.com

B. Technology, management and capital model of Jxdyf.com

Beijing Jinxiang pharmaceutical Co., Ltd has above 300 chain drugstores offline, covering Beijing, Tianjin, Sichuan, Shandong, Hebei, Shanxi, Inner Mongolia and other provinces, municipalities and autonomous regions. So, the management model of Jxdyf.com is the B2C (business to consumer) E-commerce enterprises and entities of the corresponding shops; that is, online drugstore is supported by its corporate entities, which selling the merchandise and publishing medicine-related information to online customers same as its corporate entities to offline customers. So, online customers can get their merchandise by post or self pick in its corporate entities. So, this management model is different from other B2C (business to consumer) e-commerce platforms, such as www.dangdang.com, www.amazon.com, etc.

Now, Jxdyf.com has above 100 formal staffs including IT professionals, art designers, marketing staffs, medical expert, customer service, etc. its cooperation with universities brought many talents, and it provided powerful R&D support for its development. In addition, Jxdyf.com continues to attract highly qualified employees. There are over 90% formal staffs, which have university degrees or college degrees.

There are over 2 servers, 100 PC with 200 square meters office area in the headquarters of Jxdyf.com. With the support of CRM (customer relationship management) system, outsourcing logistics service, paying management system and its corporate entities, Jxdyf.com is entering into a stage of fast development.

There are 9 departments in Jxdyf.com, including Website Department, Sales Department, Marketing Department, Technology Department, Development Department,

Business Department, Cooperation Department, and Customer Service Department. Each department has itself executive duty individually and in cooperation with each other.

Functions of each department are as follows:

1) General Manager: Draw the development strategy and annual plan, etc.

2) Website Department: Development and maintenance of Jxdyf.com's website.

3) Sales Department: Sell exhibition-related information**,** merchandise and services, develop market, VIP management.

*4) Marketing Department:*Onling marketing, online advertising, network alliance and website promotion.

5) Technology Department: Construct the network, maintain the server.

6) Development Department: Recruitment, training, and development strategic planning.

7) Business Department: Contract, stock, and finance management.

8) Cooperation Department: Supplier management, coordination and management of various departments.

9) Customer Service Department: Pre-sale service, after-sales service, and customer relationship management.

With the support of ASP+SQL system, web2.0 system, talented professionals, and fair and open trading, Jxdyf.com provides the simple version of the system to its customers for free. With the use of the Management System, its managers could management their merchandise and services exactly, and its customers could get more choices and the lowest price.

In practice, different applications of management mode has its self-owned characteristics, therefore different business operation strategy have be taken in Jxdyf.com accordingly.

Timely handling customer complaints and saving customers have led to its success on maintaining its clientele base. From the first distrust to the final interest, Jxdyf.com carried out its promise all the way, and won the trust and respect of its customers. With the fast growing customers, Jxdyf.com expands fast. The revenue of Jxdyf.com mainly came from the earnings of sales, ads and posting fee. Since the foundation of Jxdyf.com, the sales earnings were in the majority.

C. Innovative cooperation strategies of Jxdyf.com

Perhaps, the success of Jxdyf.com is due to its cooperation with traditional pharmaceutical enterprises and internet companies.

Now, above 300 traditional companies choose Jxdyf.com as one of its e-commerce partners, and consumers could buy medicine-related merchandise from the website of Jxdyf.com directly. There are many successful advantages form Jxdyf.com on the cooperation with traditional pharmaceutical enterprises, including low-cost, not subject to restrictions on space and time, simple and fast to publishing medicine-related information, details and rapid development by internet.

So, it is an important strategy for traditional pharmaceutical enterprises to start online selling medicine in order to exploit the Chinese market. Thus, the number of traditional pharmaceutical enterprises cooperated with Jxdyf.com is increasing continually, and a range of industries is involved with diversified cooperation way.

In addition to the cooperation with traditional pharmaceutical enterprises, Jxdyf.com cooperated with leading websites and companies in worldwide also, such as SINA, SOHU, TAOBAO, JOYO, DANGDANG, BUIDU, GOOGLE, IKANG, 39NET, etc.

At the same time, Jxdyf.com launched their own coalition platform, all joined the coalition platform can be obtained the net profit rebate through the sale from online advertising. So, Jxdyf.com has entered a long term strategic alliance for common development with partners.

As an innovation park of medicine-related companies especially online customers, Jxdyf.com offers a free B2C (business to consumer) platform, virtual drugstore without space and time limit, while the medicine-related advisers offer ideas, and the profits will be increased by Jxdyf.com and partners.

3 Conclusions

D. The reason of Jxdyf.com's success

Based on the above analysis, the reason of its success can be summarized as the following three points:

First, unlike any other of e-commerce websites, Jxdyf.com is the largest and the most well-known B2C (business to consumer) e-commerce websites of medicine-related information, merchandise and service platform in China. It relied on above 300 corporate entities and expanded it most service scope covering Beijing, Tianjin, Sichuan, Shandong, Hebei, Shanxi, Inner Mongolia and other provinces, municipalities and autonomous regions. Through many kinds of payment options and logistics model, a fair market environment and more medicine-related information, merchandise and service, Jxdyf.com can provide high-quality services with low cost to customers.

Second, with the innovative cooperation way, Jxdyf.com heightened its brand awareness and attracted many traditional pharmaceutical enterprises and general customers. By the cooperation with traditional pharmaceutical enterprises and the third-party logistics companies, Jxdyf.com offers a growing wide variety of all medicine-related information and merchandise, maximal convenience and best services to customers. With the cooperation with leading websites and companies, Jxdyf.com reinforced its brand popularity during a wide variety of industries and attracted many high quality partners.

Third, with application of the advanced IT technology, Jxdyf.com could offer convenient and efficient web-based shopping tools. The online trading platform breaks up the restrictions of district, time, and consumers could experiment with the advantages of e-commerce. For example, instant communication and online call center service brought much convenience to the consumers, and then consumers can undertake complaints by online or telephone freely. All of the above, Jxdyf.com can manage information properly and streamline the business process. By this way, Jxdyf.com plays a more effective role to implement online drugstore mode in internet.

E. Suggestions

But will it succeed in the future with the expanding of partners? Is it restricted the development by limiting profit?

For the security issue and quality problems of medicine-related merchandise, Jxdyf.com offers many quality services and guarantee, but most of general customers are unwilling to pay more for medicine-related merchandise in online drugstore. So, Jxdyf.com must obtain the trust of consumers to satisfactory each other. In addition, Jxdyf.com could use emerging online marketing way to attract the eyes and customers.

For the ads, most ads of Jxdyf.com are put on the medicine-related websites, while little on the traditional industry. In order to attract more partners and customers, Jxdyf.com should spread propaganda to improve brand awareness. Detailed speaking, Jxdyf.com should reinforce the customer relationship management, do market research on customer satisfaction, analyze the question feed-backed in the BBS and B-log, deal with the customer complaints effectively, and improve the communication with customers.

All in above, we can believe under further research and practice about e-commerce, Jxdyf.com will have more achievements and contributions to the applications of pharmaceutical enterprises in internet.

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Research on E-Learning System Prototype Based on Semantic Web Service Technology

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Abstract. E-Learning refers to learning that is delivered or enabled via electronic technology. The major problem existed in current E-Learning is the difficulty of resources sharing and searching, which is mostly caused by the weak-semantic learning resources and the poor sharing mechanism. Meanwhile, selecting appropriate learning services for a learner from a large number of heterogeneous knowledge sources is a complex and challenging task. By applying ontology and Web services technology to E-Learning, this paper presents a service-oriented intelligent E-Learning architecture prototype, where the learning resources with well-defined is presented by ontology and information exchanging is supported by Web services.

Keywords: E-learning, Web service, Semantic, ontology.

1 Introduction

With the rapid development of Internet and the demand for lifelong education, asynchronous education as the main features of the E-learning is becoming an important application on the Internet. E-learning (electronic learning), as a new way of online education, based on the traditional school, demonstrates the advantages of Network learning by means of internet technology. The problem in the existing system is the lack of personalization due to weak-semantic learning resources. The management of knowledge organization and teaching resources are confused, the logical arrangement is lack, and the learners can't make their individualized learning projects according to their own learning habits and characters. This is due to lack of semantic parts in web service technologies and also data on the network increase in geometric progression makes it too difficult for finding suitable learning objects according to the user's request. Most of current e-learning systems at present with heterogeneous internal structures are physically distributed, which causes the difficulty of data sharing and interoperability. It is the so-called "information island". For this reason, many international organizations have developed a series of standards including LMS (Learning Management System) by AICC (The Aviation Industry CBT Committee), IMS (Instructional Management Systems) by IMS, Global Learning Consortium and the Learning Object by IEEE/LTSC (IEEE's Learning Technology Standards Committee), etc.[1]However, these learning objects absolutely

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independent to system. So the reusing degree is low and they can do little to the real time objects or interaction objects. In order to enhance the personalization and sharablity, based on semantic web service and ontology technology, we illustrate e-learning system in the form of services which consolidates large amounts of network resources, and translates into machine-readable data. According to learner's knowledge base and cognitive style, select learning strategies dynamically according to reasoning technology, and get the proper learning materials from the knowledge base to generate the learning content which met the individual needs of learners more closely. The paper is organized as follow. The second chapter describes the summary information and the framework of this system. The third chapter introduces the core techniques from three aspects respectively, which are the SOA, the ontology technique and Algorithm of concept matching. The fourth chapter sums up the whole.

2 E-Learning System Based on Semantic Web Service Technology

1. System overview

For the previously mentioned e-learning application problems, this paper presents a semantic Web services based solution that does not require centralized control in the case of integrated distributed learning resources and personalized learning services. E-learning system based on semantic web services includes two functional features : Firstly, e-learning system should have a certain "intelligence", which can use ontology-based knowledge representation to represent domain knowledge, and can achieve semantic understanding, so that to reason out appropriate learning materials for each user. Let the computer understand the user's intent can better meet the requests of users. Sometimes the information entered by the user may not be accurate or complete, reasoning technology that can find the adaptive information is needed. Secondly, with the semantic Web service description, service-oriented architecture builds e-learning the system that can achieve system interoperability between systems [2]; a variety of learning resources form Internet are registered in the system as a service with a corresponding description. If the learning resources on the Internet have become to web services, these service providers register their services into our system, then we can overcome the physical boundaries to call these web services.

When using the e-learning system, the user propose study requests at first, then the system find the ontology concept corresponding based on user input and web service description, and after some reasoning, find all the relevant concepts, finally calculate the Similarity between user generated concepts and service description generated concepts and get the service with the largest Similarity value.

2. System framework description

Semantic web service technology based on e-learning system framework can be divided into five levels, namely: data layer; service layer, ontology layer, inference layer and user layer. The service layer which provides the teaching applications is similar to the application layer in traditional system. It encapsulates the applications in one service, and can distribute in different physical locations. Layers are shown in Fig1.

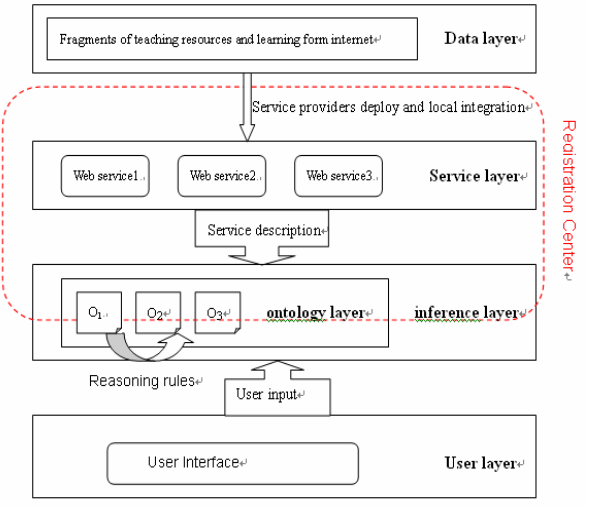

Fig. 1. System Architecture

The specific function and role of each layer described as follows:

(1)Data layer: a variety of learning materials with expressions of discrete, distributed, non-semantic forms exist in every corner of the network.

(2)Service layer: Some services integrated by providers from internet and others locally developed, can be texts, multimedia and real-time interactive teaching resources available. Register these extractions of functional descriptions of each service to the service registry for the system call.

(3) Ontology layer: The key layer of the system, it organizes study materials which related to metadata, knowledge points, the concept of knowledge unit, into a network structure of ontology form by concept including, attribute correlation, mutual restraint, justice and other methods. It reveals the essential relationship between concepts. Ontology here includes descriptions of the learning resources and service description messages.

(4) Inference layer: Include semantic analysis, semantic reasoning and other functions. By calculating the correlation and similarity of ontology concepts it can work out the degree of correlation between the knowledge concepts and description of services and user input.

(5) User layer: User interface, receiving user input information, and pass it to the ontology layer for processing. [3]

This system can provide some teaching web services, and register them to the service registry centre. Meanwhile, the remote service providers can offer their web services which including learning objects to our registration centre. In the ontology built up, concepts corresponding with each service description can be found.

Adding description information to web services can make them semantic web services. This information is saved in a register centre, a Service Profile in our system. Both the description information and user input messages are nature language

sentences. The method of making annotations for web service and user input is mapping these sentences to the logical concept tree in Ontology. These sentences can be break into words and map to concepts in Ontology. With the relationships and reasoning strategy in Ontology all related concepts should be added into the "Concept Set" of each service and each piece of user information. Meanwhile, the strategies used are recorded for each web service. Then we should use a matching algorithm to compute the similarity between "Concept Set" of user input and "Concept Set" of each service description. Finally the service with "Concept Set" of the largest similarity value is picked up and return to user as the most appropriate service. The whole progress is showed in Fig.2:

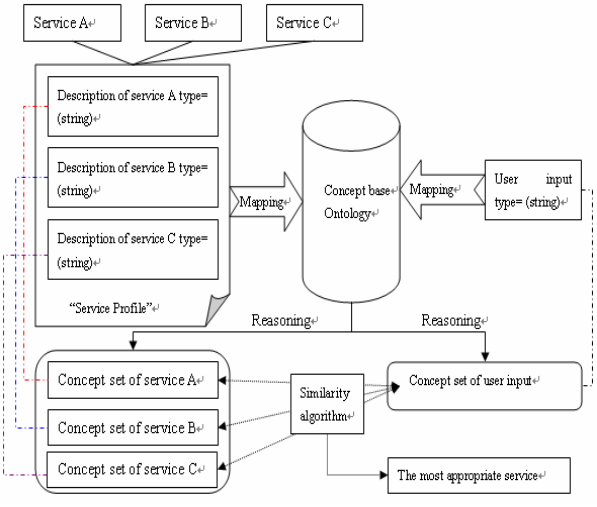

Fig. 2. Information stream

3 Related Technology and the Core Algorithm

1. Implementation based on Web service

Service-oriented architecture (SOA) which can better reusing existing modules is designed based on services. From the perspective of SOA, software resources distributed on the network can be seen as web services. Web service can encapsulate system function modules at a higher level than components.[4] Web service which provides services by published API not only can assemble new web services but also can build systems.

Web service technologies in the narrow sense build up on four main components:

(1)An agreed transport protocol.

(2)A platform-independent message description format.

(3)A language for Web service interface description that describes which operations and with which messages a service can offer. XML-based interface description using the Web Service Description Language (WSDL). On the one hand

WSDL describes the operation, input and output parameters of services; on the other hand, it describes the service terminal address, and supported protocol.

(4)A registry for publication and discovery of available services [5]

This system registers all the web services into a Service Profile which is a simple UDDI and makes it as a register centre of the system. After the semantic matching, it can find the corresponding web service, and return to the application to fulfil the user's response. Users only need to find a remote web service to use these methods of this service and do online learning.

2. Ontology

Ontology is a philosophical category at first, and later with the development of artificial intelligence, was given a new definition. The goal of ontology is to capture the knowledge in related fields, provide a common understanding of this knowledge in this area, determine the areas of common recognition of words, and give the clear definition of relationship definition between words from different levels of formal models.

Ontology language allows the user to write a clear and formal concept description for the domain model, so it should meet the following requirements:

（1）a well-defined syntax
（2）a well-defined semantics
（3）efficient reasoning support
（4）sufficient expressive power
（5）convenience of expression

Common ontology languages include the following: RDF (S), OIL, DAML and OWL, etc. This e-learning system use OWL language to describe ontology. OWL (the Web Ontology Language), is ontology language standard in the Semantic Web recommended by W3C. It comes from a combinative description language DAML + OIL developed by a number of research institutions from Europe and the United States. For different demand OWL has three sub-languages, from small to large order according to the function is OWL Lite, OWL DL and OWL Full. With expression and reasoning abilities as its core characters, each sub-language is the expansion of the previous one. These three sub-language have the following relationship:

- Every legal OWL Lite ontology is a legal OWL DL ontology;
- Every legal OWL DL ontology is a legal OWL Full ontology;
- Every valid OWL Lite conclusion is a valid OWL DL conclusions;

Every valid OWL Lite conclusion is a valid OWL DL conclusion;

Semantic mark-up establishes a mapping between network data and the specific domain ontology. In this e-learning system, the ontology layer must contact with data layer, in order to make data understandable by both people and computers. Semantic tags which provide a mapping between data and ontology make data point to the corresponding concept, and concepts are interrelated with each other at the same time, so that to form a semantic knowledge network.[6]

With protégé as a tool and OWL as a description language ontology with concepts and relationships in it is built and saved in an OWL file. In OWL files, you can create a variety of concepts, and relations between them. To classify how to create an ontology a simple example in data structure domain is showed in Fig.2.

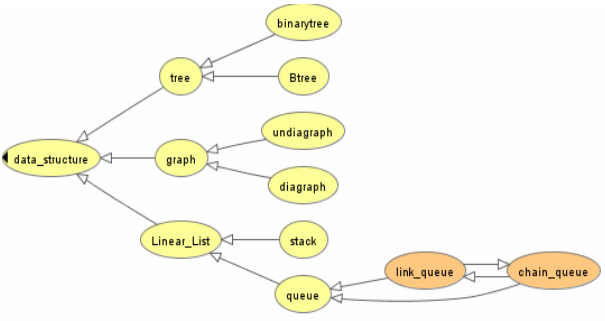

Fig. 3. Example of data structure

In Fig.2 “queue”is a sub-class (subClassOf) of “Linear_list” and “link_queue” is equivalence class (equivalentClass) of “chain_queue”. More concepts and relationships can be added on this basis ontology.

Advertising information such as service operation, information (messages), pre-condition (precondition), post-effect (effect) should be added to services. Mappings between service advertisement information and service URIs can be saved in a “Service Profile” which can be expressed using the OWL file. There is a "description" property through which the descriptions of the service semantic annotation is made and its value is the corresponding to the concepts of ontology. Make “queue_ins” service as an example showed in Fig.3:

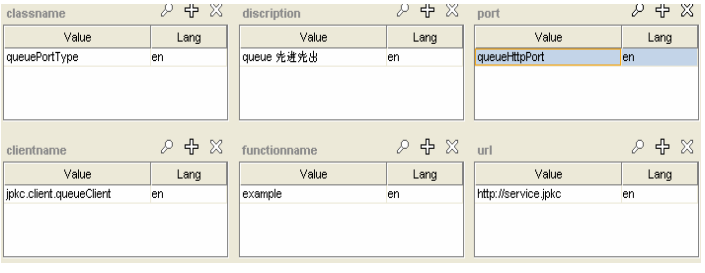

Fig. 4. Example of web service registry

3. Ontology matching algorithm

Mark up advertising messages and user requests concept with ontology making them the data that with semantic. In order to find suitable services for the users, a corresponding match algorithm is needed.

Definition 1. There are two concepts C1 and C2 in ontology, if C1 is the same concept with C2 or C1 is defined as the equivalence class of C2, claimed that the concept of the concept of C1 and C2 semantic equivalent, denoted as C1 = C2.

Ontology is represented as a tree structure by means of the ontology description language (such as OWL, etc.).There is a root node, and every concept is a node, their various relationships are the connections in this tree. Each node at different levels with their own depth, the depth of the root definition of ontology is 0, plus 1 for each additional layer of depth. Similarity between two concepts determines whether they match, we use the concept of semantic distance to measure the similarity.

Definition 2. Semantic distance is a measure refers to the shortest length of chain between two different concepts of the inheritance relationship or a binary relation in a same ontology.

Two concepts in the ontology of the shorter connection path, the more similar they are. This paper introduces Generalized Cosine-Similarity Measure (GCSM) function.

Definition 3. Lowest Common Ancestor (LCA) refers to a concept node which is a common ancestor of other two notes with the deepest depth.

GCSM function is defined as follows (Fig.5):

$$DS(C_i, C_j) = \frac{depth(C_i) + depth(C_j)}{depth(LCA(C_i, C_j))}$$

Fig. 5.

Here depth (Ci) Represents that the depth to the node, and LCA (Ci, Cj) is the lowest common ancestor of two nodes.

Similarity between two concepts which are defined as follows (Fig.6):

$$SM(C_i, C_j) = \frac{\alpha}{DS(C_i, C_j) + 1}$$

Fig. 6.

Here α is the traditional matching algorithm matching coefficient, for the correlation of different, the value of α is different. [7] The table below shows different values in different conditions which have a good performance in my testing.

Table 1. Matching Coefficirnt (reference)

Relevance	Matching coefficient
Equivalent class	0.8
user-defined relationship (feature in our system)	0.7
inheritance relationship	0.5

While doing the reasoning among concepts in ontology we record the relationships used, according to the relationships, the proper value of "Matching coefficient" is chosen. If the "Equivalent class" relationship is used, the value is 0.8; if the "feature" relationship is used, the value is 0.7 and if the "inheritance" relationship is used, the value is 0.5.We also add the longest match strategy to the algorithm, which means select the longest concepts are both in ontology and contained keywords of user input for reasoning. For example, a user input a string contains "linkqueue",so "linkqueue" and"queue" can be found in ontology as concepts, but "linkqueue" is chosen finally because it is a longer one.

4 Summary

Personalized support for learners becomes more important, when e-Learning takes place in open and dynamic learning environment. This paper presents an approach to E-Learning personalization based on an ontology and web service. It also describes the development of e-learning System prototype based on semantic web service technology in detail. Semantic web offers a theory frame for the e-Learning resources sharing, alternation and intelligence. Domain ontology plays a very import role in it.

The whole process contains building web services locally, integrating web services from internet, adding descriptions to web services, establishing the ontology of concept, mapping user input and description of services to ontology, using the matching algorithm to find the most similar "Concept Set" of web service in ontology, and getting the most appropriate web service.

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Synthetic Evaluation Model of Corporate Governance in E-Business Environment

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Abstract. This paper compares indicators of existing corporate governance index evaluation system, and then establishes a more comprehensive evaluation model of corporate governance composed of two subsystems—internal corporate governance evaluation subsystem and external corporate governance evaluation subsystem, including the seven elements and fifteen evaluation indicators. Finally, we selected three companies to do a case application and then made some recommendations on their company governance after a comprehensive analysis.

Keywords: E-business environment, corporate governance evaluation, corporate index, AHP Method.

1 Introduction

The rapid development of e-business fundamentally changed the company's business environment. With rapidly developing of information technology and widely application of e-business, business environment are changing more and more rapidly, therefore its complexity is increasing sharply. This makes a higher demand on the formulation, implementation and adjustments of company's competitive strategy. Practices of corporate governance are undergoing profound changes in turn. Although reasons of corporate governance reform are different, many people in the field generally recognized that good corporate governance is an important condition to maintain the growth of company performance, and then ensure the efficient operation of modern market system. In July 2002, the U.S. Securities and Exchange Commission (SEC) began implementing the "Sarbanes-Oxley Act". So good corporate governance is increasingly being seen by investors as an important indicator of business performance, investment return and investment risk. A survey of McKinsey & Company in 2002 showed that, with the similar financial situation, investors are willing to pay 20-27% of the premium for "well-governed" Asian companies[1].

In conclusion, as an institutional arrangement concerning shareholders, management staff and other stakeholders, corporate governance is seen as an institutional guarantee to ensure good company performance. With the development of global reform movement on corporate governance, more people have come to realize that, through a

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series of arrangements on measures, regulation and incentives, corporate governance can effectively promote the company's management level to achieve maximized corporate value, and then protect the interests of investors. So researches on the evaluation system of corporate governance are of great practical significance.

2 An Overview of Company Governance Index

A. Research Abroad

Since the 90s of the 20th century, researches on the theory and method of corporate governance rating are increasing deeply with their contents ranges changing from special aptitude to comprehensive direction. There are three representative index systems outside China[2].

1) Standard & Poor's Corporate Governance Service System. In 1997, the U.S. Standard & Poor's constructed a set of indicators of corporate governance, mainly related to corporate ownership structure and influence, financial stakeholder relations, financial transparency and information disclosure, board structure and operation.

2) Deminor Corporate Governance Evaluation System. In 1999, Deminor Corporation evaluated the corporate governance of listed European companies. It includes the following four dimensions: shareholder rights and obligations, the scope of defence and taking over, disclosure of corporate governance and structure and function of board.

3) Lyon Securities' (Asia) Corporate Governance Evaluation System. It focuses on corporate transparency, board independence and the protection of minority shareholders, emphasizing corporate social responsibility. Lyon Securities (Asia) system includes 57 indicators,.

B. Review in Chinese

Research on corporate governance index in China is relatively late. Currently, high-profile corporate governance rating system has the following four.

1) Listed company board governance assessment index system of Beijing Liancheng International financial consultancy. Introduced in 2002, the index system related to five dimensions: business performance, the independence of director system, information disclosure, integrity and fault, result of decision-making.

2) Evaluation System of Dapeng Securities Institute. It involves four dimensions: structure and influence of ownership, shareholders' rights, financial transparency and information disclosure, structure and operation of board, including 18 indicators such as the largest shareholder equity ratio, the percentage of independent directors and so on.

3) Nankai Governance Index. In 2003, Research Centre for Corporate Governance of Chinese Listed Companies in Nankai University established a Governance Index (CCGINK), also known as the Nankai Governance Index. It involves six first-level indicators such as shareholders' right, controlling shareholders, directors and board of directors, managers, supervisors and board of supervisors, information disclosure and stakeholders in the six-level indicators.

4) G— index. Monetary Research Centre of Hong Kong University outlined the standard of internal and external mechanisms a good corporate governance in China must have.

With booming development of e-commerce in China, market environment is maturing. Therefore, building China's corporate governance evaluation index system in line with the actual situation should use foreign experience as reference. On the one hand this system should take internal corporate governance indicators such as behaviour of shareholders, mechanism of directorate, managers' incentive and restraint mechanisms into account; on the other hand, it should also attach importance to external governance evaluation.

3 Construction of Synthetic Corporate Governance Evaluation System

A sound corporate governance evaluation system should meet two basic requirements: a comprehensive evaluation index system and a scientific evaluation method, and neither is dispensable. From the company perspective, the value of corporate governance is reflected in the improvement of company value, but also in the reducing of financial distress possibility[3]. If we can define the effectiveness of corporate governance and select indicators of evaluation index system from value-oriented perspective to design evaluation model, then we can solve some shortcoming of the existing evaluation system such as focused too much on expert's subjective scoring method (such as Standard & Poor's rating system and the CLSA rating system) or just focus on internal corporate governance (such as the Nankai corporate governance index).

A. Market Environment Analysis in E-Commerce Context

Essential difference of these corporate governance evaluation systems is that most of them are based on different corporate environment. For Chinese companies compared with foreign counterparts, their internal environment, external environment and development are a lot of difference. Therefore, in order to construct an accurate, objective assessment of corporate governance, we should consider those different in legal and institutional environment, market conditions and company's own development [4].

Corporate governance environment, such as institutional, legal, policy and market environment, the company's development stage and other factors directly affect the effectiveness of evaluation index system of corporate governance. And the booming of e-commerce is probably the biggest changes in company’s external environment. So it is necessary to learn from foreign corporate governance system and construct an evaluation system particularly for Chinese companies based on the consideration of e-business environment, market characteristics.

B. Design of a Synthetic Corporate Governance Evaluation System

1) Design Principles

In order to reflect and measure the overall effectiveness of corporate governance and make it ease of operation, the establishment of corporate governance evaluation index system should meet the following principles.

- *Scientific and practical principles.* The index system should be designed to effectively reflect the characteristics of corporate governance.
- *Principle of comprehensive and systematic.* Reasonable index hierarchy structure should fully reflect the basic state of evaluated corporate governance and can provide the necessary data for the evaluation.
- *Principle of qualitative analysis and quantitative analysis combination.* In order to evaluate the corporate governance status, we must adopt quantitative, standardized indicators, and then can be evaluated and analyzed by quantitative methods.
- *Feasibility principle.* Indicators should be quantifiable and can be collected for effective measure or statistic analysis.

2) Design of Synthetic Evaluation System

Corporate governance system is a complex system consisting of multiple subsystems. It has distinct characteristics on integrity, relevance and environmental adaptability. Through the foregoing analysis, we can know that a reasonable evaluation index system of corporate governance should include two sub-systems: internal governance evaluation sub-system and external governance evaluation subsystem.

According to the actual changes in business environment and the design principles of evaluation index system, this article combine the existing evaluation index systems, and then proposed a more comprehensive evaluation index system of corporate governance. The goal layer of the evaluation index system is the effectiveness of corporate governance. It is divided into two interrelated parts: internal governance assessment subsystem and external governance assessment subsystem. Each sub-system is consisted of a main criteria layer and sub-criteria layer. Sub-criteria layer includes several indicators which are fine divided into specific and quantifiable evaluation indicators from main criteria layer.

Here, we divided the main criteria layer of internal governance subsystem into four elements: financing structure, ownership structure, incentive mechanism, and restraint mechanism. Furthermore, we divided sub- criteria into 8 specific indicators (see Table 1). The particular evaluation content is shown as following:

- *Financing Structure:* refers to the types of investors' financing. It determines the investor's degree of control and intervention type to the company, and the choice of bankruptcy liquidation mode.
- *Ownership Structure:* refers to the shares proportion of shareholder in company, reflecting the interests of different relations between stakeholders and determine the distribution of company control rights and the over nature of entrust relationship.
- *Incentive mechanism:* means the use of incentive compensation, control right incentives and other means to stimulate business operators. Effective incentive mechanism can adapt to business conditions, using a variety of incentives complement each other and mutually reinforcing incentives.
- *Restraint mechanism:* means how the owners and their agents resist violations through mutual restraint, supervision, control and self-discipline.

Table 1. Indicators of internal governance assessment subsystem

Main criteria layer	Sub-criteria layer
Financing structure (U1)	Equity financing (U11)
	Bond financing (U12)
Ownership Structure (U2)	Institutional ownership ratio (U21)
	Personal ownership ratio (U22)
Incentives mechanism (U3)	Operator's salary (U31)
	Stock Option ratio (U32)
Constraint mechanism (U4)	Constraint degree of directors board (U41)
	Constraint degree of supervisors board (U42)

The main criteria layer of external governance assessment subsystem includes three elements: alliance system mechanism, information mechanism and legal mechanism, which can be further divided into seven specific indicators (see Table 2). Specific evaluation items are shown as follows.

- *Union mechanism: e*valuating the importance of enterprise in its value chain. This mechanism determines how enterprise access external resources.
- *Information mechanism.* Evaluate the enterprise's information collection, processing and distribution capacity. Enterprise information system can be used to influence the external environment stakeholders to gain a better competitive edge.
- *Legal mechanism.* Evaluating enterprise's external legal environment, including whether a company set up anti-takeover law provisions, whether checks use management is under strict supervision.

Table 2. Indicators of EXternal governance assessment subsystem

Main criteria layer	Sub-criteria layer
Union mechanism (U5)	Providers' satisfaction (U51)
	Partners' satisfaction (U51)
Information mechanism (U6)	Information dissemination (U61)
	Information collection (U62)
Legal mechanism (U7)	Anti-takeover provisions (U71)
	Financial regulatory system (U72)
	Financial control systems (U73)

C. AHP-Based Synthetic Evaluation Model of Enterprise Corporate Governance

The effectiveness of corporate governance (U) is the function of seven elements, namely financing structure (U1), ownership structure (U2), incentives mechanism (U3), constraint mechanism (U4), union mechanism (U5), information mechanism (U6) and legal mechanism (U7).

$$U = f(U1, U2, U3, U4, U5, U6, U7)$$

The weight of each indicator can be determined through the model of AHP. The basic steps are as follows.

- *To establish a hierarchical model.* According to the analysis of earlier analysis, we select the level of corporate governance as target layer, and divide the various evaluation indicators of corporate governance into two levels in accordance with different properties of these factors: main criteria layer and sub-criteria layer. Factors of the same level are subordinate to the factors of upper level, and affect the factors of lower layer. Main criteria layer contains seven elements, and sub-criteria layer contains 15 indicators.
- *Construct pairwise comparison matrix.* From layer 2 of the hierarchy model, indicators on the same level which are subordinated to (or influenced by) elements of upper layer, are used to construct a pairwise comparison matrix and comparative measure from 1 to 5.
- *To calculate the weight vector and make a consistency test.* We calculate the maximum eigenvalue and corresponding eigenvector for each pairwise comparison matrix, and then use consistency index, random consistency ratio to do the consistency test. If the test passed, feature vector (normalized) is the weight vector: if not passed, we need to re-construct pairwise comparison matrix.
- *To calculate combination weight vector and make a mix consistency test.* To calculate the combination weight vector of the lowest level to the target layer, and do a consistency test according to the former formula. If the test is passed, the combination weight vector can be used to support decision-making. Otherwise, we need to reconsider the model or re-construct a pairwise comparison matrix of higher consistent percentage.

According to the above steps, through the method of expert scoring, standardized weights are calculated as follows.

Table 3. Standardized weight of indicators of Synthetic coperate governance

Criteria layer A	Weight of layer A	Criteria layer B	Weight of layer B	Criteria layer C	Weight of layer C	Synthetic weight
INTERNAL SUBSYSTEM	0.7	U1	0.225	U11	0.572	0.09
			0.225	U12	0.428	0.07
		U2	0.272	U21	0.629	0.12
			0.272	U22	0.371	0.07
		U3	0.285	U31	0.631	0.13
			0.285	U32	0.369	0.07
		U4	0.218	U41	0.502	0.08
			0.218	U42	0.498	0.08
EXTERNAL SUBSYSTEM	0.3	U5	0.386	U51	0.583	0.07
			0.386	U51	0.417	0.05
		U6	0.237	U61	0.497	0.04
			0.237	U62	0.503	0.04
		U7	0.377	U71	0.25	0.03
			0.377	U72	0.362	0.04
			0.377	U73	0.388	0.04

We then ask experts to score each indicators of lowest sub-criteria layer by 1-5 and get a evaluation matrix R. By multiply evaluation matrix R and the weight vector A, we can calculate a company's corporate governance index.

4 Case Study on Corporate Governance

A. Corporate Governance Index

We select three companies to analysis according to the preceding model designed, and then calculate original value and standard value of those indicators in sub-criteria layer. By processing this evaluation matrix according to the above synthetic model, corporate governance index of these three companies can be gotten. The process is shown as follows.

$$U = A \bullet R = \begin{bmatrix} 0.09 \\ 0.07 \\ 0.12 \\ 0.07 \\ 0.13 \\ 0.07 \\ 0.08 \\ 0.08 \\ 0.07 \\ 0.05 \\ 0.04 \\ 0.04 \\ 0.03 \\ 0.04 \\ 0.04 \end{bmatrix}^{T} \bullet \begin{bmatrix} 0.36 & 0.27 & 0.36 \\ 0.27 & 0.14 & 0.20 \\ 0.48 & 0.36 & 0.36 \\ 0.21 & 0.28 & 0.21 \\ 0.63 & 0.50 & 0.38 \\ 0.29 & 0.29 & 0.29 \\ 0.23 & 0.31 & 0.31 \\ 0.30 & 0.38 & 0.30 \\ 0.27 & 0.20 & 0.20 \\ 0.19 & 0.19 & 0.14 \\ 0.11 & 0.14 & 0.11 \\ 0.14 & 0.14 & 0.11 \\ 0.11 & 0.08 & 0.08 \\ 0.20 & 0.16 & 0.16 \\ 0.18 & 0.18 & 0.18 \end{bmatrix} = [3.98 \quad 3.64 \quad 3.36]$$

Corporate governance indices of these three companies are [3.98, 3.64, 3.36]. As can be seen, corporate governance index of the first company is the highest, and its corporate governance effectiveness is the best.

B. Data Analysis of Corporate Governance Index

By compared those indicators of layer B, we can have more detailed information on companies' governance situation.

Scoring for sub-criteria layer B is shown as follows.

Table 4. Scores of indicators of sub-criteria layer B

CRITERIA LAYER B	COMPANY 1	COMPANY 2	COMPANY 3
U1	4.00	2.57	3.57
U2	3.60	3.37	3.00
U3	4.60	4.00	3.37
U4	3.50	4.50	4.00
U5	4.00	3.42	3.00
U6	3.50	4.00	3.00
U7	4.40	3.75	3.36

For Company1, the score of ownership structure indicator (U2) is 3.60, constraint mechanism (U4) is 3.50 and information mechanism (U6) is 3.98, all are lower than the corporate governance index. We can estimate that company1 has the following questions: a) ownership structure is irrational, institutional investors have less equity, is not conducive to the improvement of corporate management; b) the function of enterprise supervisors board is weak, and there is a tendency to weaken the Board of Supervisors; c) information gathering and dissemination mechanisms are inadequate.

For Company2, the score of financing structure (U1) is 2.57, incentive mechanism (U3) is 3.37, and legal mechanism (U7) is 3.50, all are lower than the corporate governance index 3.64. We can estimate that company2 has the following questions: a) financing way is single. In addition to shareholders, the corporate sources of funding investments are mostly bank loans, and the means of financing by bonds issued to the society is less used; b) the extent of the operator's incentive is not enough, salary is low and lack of adequate equity incentives, etc.; c) legal system of corporate governance is lack. So the company can not effectively prevent the occurrence of a hostile takeover bid and so on.

For Company3, the score of ownership structure indicator (U2) is 3.00, union mechanism (U5) is 3.00 and information mechanism (U6) is 3.00, all are lower than the corporate governance index 3.36. We can estimate that company3 has the following questions: a) the equity structure is unreasonable, institutional investors have less equity, is not conducive to raising the effectiveness of corporate governance; b) do not have close coordination with suppliers and partners, further more external stakeholders are less satisfied; c) information gathering and dissemination mechanisms are inadequate.

In short, through the evaluation model of corporate governance, we can make a comprehensive analysis on company’s corporate governance problems, therefore adopt targeted measures to improve company's profitability.

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Impact of IT Industry on Chinese Technology Advancement Based on Panel Data Approach*

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Abstract. This paper estimates how degree IT industry effect on growth rate of technological progress. The model is estimated using the method of multiple panel data approach. The results are the export trade promoted the IT industrial technology advancement, when increase dollar of export amounts, the growth rate of Chinese technological progress can increase 41.4%. But, the import trade is opposite result. We draw the conclusion that independent innovation can raise IT industrial technology advancement of china.

Keywords: IT industry, technology advancement, panel data.

1 Introduction

World exports of ITA products have more than doubled in dollar terms between 1996 and 2005, the annual average growth rate was 8.5 per cent over this nine year period and the value reach$1450 billion in 2005. In that year, IT products accounted for 14 per cent of world merchandise export thereby exceeding the combined global exports of agricultural products, and textiles and clothing. Since 90‘, exports of Chinese IT products have rapid growed. China has been by far the most dynamic exporter of IT products over the last decade. During the 1996-2000 period China’s exports rose by 29 per cent annually, nearly three times faster than those of all other traders[1]. Moreover, while global IT export growth slowed in the 2000-2006 period, China’s export of the products in question accelerated to nearly 33 percent annually, approximately composes 22% of the world electronic information product exports. China ranked as the seventh largest exporter in 1996 and became the largest in 2005, if EU (25) intra-trade is not taken into account. Commodity of the most export amount mainly includes the computer, the communication, and the home electric appliances and so on. In them, the export amounts of the notebook computer, the mobile phone, the integrated circuit, the monitor and the liquid crystal display panel surpass 13,000,000,000 US dollars in 2006(show table 1) [2].

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Table 1. Export amount biggest first 5 kind of electronic information productin which made in china in 2006

Product range (Ten thousand)	Volume of exports	Export amount （100 million US dollars）	The rate of growth (%)
notebook computer	5198.7	385	28.6
Mobile Phone	38542.6	312	51.0
integrated circuit	3197770.7	203	47.5
monitor	10703.2	168	4.2
liquid crystal display panel	168721.0	130	19.4

The outstanding growth of China's exports of ITA products is closely linked to FDI inflows into China. Many globally operating firms, encouraged by low operating costs and attractive investment conditions, have increasingly added new production capacity in China. Monitor, Mobile Phone, Color Television, Laser Video Disc Machine and Notebook Computer which made in China account for the global total output separately 50%, 31%, 43%, 80% and 40%, production of Program Controlled Switch, Telephone, Compact Disc Driver And Printer also are the world vanguard [2].

The Chinese IT industry ability growth benefits the shift IT industry not only from developed countries such as the United States and Japan, but prominently also from rapidly growing economies in East Asia such as Singapore, Chinese Taipei and the Republic of Korea. This shift in the location of the global information and communication industry in Asia contributed to the deceleration of export growth of some of the major developing exporters in Asia after 2000, and the rise of China is an outstanding.

Import developments by country between 1996 and 2005 show many similarities with those of exports. Among the major developed countries the United States, Japan, the EU (15) and Canada recorded an import increase below the global average over this nine-year period. China's imports expanded at an annual rate of nearly 30 per cent and became the third largest importer of the world behind the EU (15) and the United States [1].

IT products belong to the High-tech industry in china. In the economic and technical development of China, IT industry has played a very important role. On one hand, it has improved the employment rate for China. On the other hand, it imports advanced technology, apparatus and experience of management from foreign countries, and makes direct contribution for the technological progress of China. Then, China's IT industry development is mainly by processing trade way, what is the influence degree to technology advancement?

The purpose of this paper is to analyze impact of IT industry development on Chinese technology advancement in the periods of 2001- 2008. The paper investigates empirically to what extend IT industry impact on growth rate of technological progress, and compare with exportation and importation impaction on pace of technological progress.

The paper is organized as follows: Section 2 calculates annual the growth rate of technological progress of each kind of IT product from 2001 to 2008. Section 3 describes the empirical work and discusses its main results, and Section 4 concludes the paper.

2 Growth Rate of Technological Progress

The growth rate of technological progress means the increasing intensity of the technological progress. Because of different base period, the growth pace can divide into a chain and the base rate definitely. The former describe fluctuation degree by time, the latter accumulate total fluctuation degree in observation period. The paper use way of the latter. We establish a formula:

$$JJ = GDP - \partial K - \beta L \tag{1}$$

Among them, ∂ and β respectively mean output elasticity of fund and labor, generally the fetching value is ∂=0.2～0.3, β=0.7～0.8. IT products belong to the High-tech industry in china, so we fetch value. I.e. ∂=0.3, β=0.7. According to the data procurability, we divide the IT industry into two kinds, they are: Computers and Communications Equipment, Electronic Installation. We use the increasing rate of Annual Average Balance of Net Value of Fixed Assets shows Fund K , the increasing rate of Annual Average Employed Persons shows labor L.The data stem from the Chinese statistical yearbook (2001-2009 year), which calculate annual the growth rate of technological progress from 2001 to 2008.

Table 2. Table Type Styles

year	2001	2002	2003	2004
Computers and communications Equipment	-4.034	57.121	20.211	37.532
Electronic installation	-50.146	42.881	12.026	18.464
year	2005	2006	2007	2008
Computers and communications Equipment	14.025	-12.096	4.291	-30.237
Electronic installation	30.041	-4.511	0.996	-18.496

3 Impact of IT Industry on Chinese Technology Advancement

A. Methodology and data

A plural fixed effect regression model of the panel data is employed to investigate the impact of FDI and Export on the productivity of the Chinese high-tech industry. The growth rate of technological progress (jp) is the dependent variables. Generally speaking, import and export trades have different influence on technological progress in the IT industry, so we will regard import amounts (im) and export amounts (ex) as independent variable. Because the human resources and the R&D investment are very important influence to the technology advancement, we will regard every year rate of Scientist (ps) and R&D investment (rd) as independent variable. Our model takes 2 IT industries as the panel, and uses the annual data in the period 2001 to 2008. The model is as follows:

$$jp = \partial + \beta_{1it} ex_{it} + \beta_{2it} im_{it} + \beta_{3it} ps_{it} + \beta_{4it} rd_{it} + \mu_{it} \tag{2}$$

Data of dependent variable come from results that calculated the second part of this text. Import amounts (im) and export amounts (ex) are current data. Data of independent variables are calculated from Chinese Science and Technology Statistical and the Chinese statistical yearbook.

B. Results

Using the EVIEWS5.1 to estimate the model, and obtaining the conclusion:

$$jp = -33.75 + 0.414ex_{it} - 1.167im_{it} + 0.787ps_{it} + 1.028rd_{it} + \mu_{it} \quad (3)$$

（0.992）（-2.415）(7.716）（2.519）

$\mathbf{R^2}$=0.869　　F=13.306（0.000）

Regression results show: T-test value of variable through 10% level. Value of R^2 is 0.869, which means the great relevance between the variables. F value is passed, the equation is tenable.

The export trade promoted the IT industrial technology advancement, when increase dollar of export amounts, the growth rate of Chinese technological progress can increase 41.4%. But, the import trade was are opposite result, when increase dollar of import amounts, Chinese technological progress pace can depression 116.7%.In addition, when increase a scientist, IT industrial technology advancement will grow 78.7%，and increase a R&D investment，technology advancement will rise 102.8% .

Human resources and R&D funds investment are mainly two factors of independent innovation. According to the results, independent innovation can raise IT industrial technology advancement of china. Because the international market competition pressure increases, which promote the manufacturer to improve the equipment unceasingly and sharpen the technical ability, export trade is positive influence.

4 Conclusion

The IT product applies in many domains. For instance, an advanced and secure IT infrastructure—typified by, among other features, high levels of broadband access and hardware and software adoption by organizations and consumers—enables technology firms to do business effectively with customers, suppliers and partners, whether through online marketing, web-based collaboration or multi-channel customer relationship management (CRM). High-quality infrastructure is also a precondition for vigorous innovation by IT firms. In addition, IT technology enable people to freely access information and communicate with peers online, and to analyze, manipulate and create data using sophisticated computer devices and applications.

It is extremely wonderful that the Chinese IT industry develop increasingly well at present. Under the international industrial shift impetus, Chinese electronic information industry maintains the fast growth continuously and the industrial scale is the lead situation in various professions. Technological innovation ability of IT industry strengthens gradually and emerges some technology and the products of the own proprietary intellectual property rights, reduces gradually disparity with the international advanced level. The TD-SCDMA technology research and development and the industrial production make the important progress. The competitive power of

the information industries which dependent intellectual property rights, as well as the independent formulation standard forms is forming gradually. Region characteristic industry colony accelerant form. Exportation of the high-tech content product is expanding.

But it also has many insufficient. At first, Chinese IT industry is low end in the global industry value chain and gain lower added value. Take the computer industry chain as the example, Chinese IT industry is in the assembly processing manufacture link. The global computer industry chain takes the technical research and development as the core, various links cooperation at present. But Chinese computer and the external instrumentation industry is in the middle production and manufacture link. The upstream research and development design have the extremely big disparity with US. In the downstream brand channel, Chinese Electronic information Enterprise mostly process for some international giant, i.e. Dell. And lack the controlling force and the words power.

So, the country should actively encourage innovating independently and developing the independent brand. And enlarge public investment in the basic research and technical research and development. Second, China should cultivate some the transnational groups which own the international competitive power and the outstanding talented person.

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Research on Problems and Countermeasures of City Marketing

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Abstract. After illustrating some concepts related to city marketing, and clarifying distinctly the relationship between these concepts, the paper discusses about the subjects of city marketing and puts forward strategies of city marketing, including product strategy, pricing strategy, promotion strategy, competition strategy of city marketing.

Keywords: Concepts, City marketing, Strategies.

1 Introduction

With the fast pace of urbanization in China, "city marketing" was first put forward as a brand new idea to city development [1]. Though appeared only several years ago, city marketing has attracted much attention and been actively put into practice. Although some cities have acquired a lot of achievement, there are still many problems: policy makers can not exactly understand the connotation of city marketing; they can't clearly recognize the object of city marketing; theoretic research about city marketing is not all-sided. All of these problems lead to the result that the strategies of city marketing can't be implemented perfectly. The paper tries to explain the basic problems about city marketing and puts forward some advices in order to promote the research about city marketing [2].

2 Correlative Concepts

A. Concepts of city marketing

As a whole process, city marketing consists of all kinds of social activities that city managers provide valuable "city products" to satisfy the needs of "city consumers". City consumers are different from daily consumers [3]. The former refers to national person, artificial person, or organizations for example inhabitants, tourists, investors, and companies who take part in city activities through consuming city products, and the later the people who purchase commodity to meet demand of living consumer. City products include not only tangible products but also intangible products, like city policy products, city legal products, and city environment products, including life environment, investment environment, public security environment, city civilized products, city

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technological products, city road and traffic products, and city basic establishment products [4].

To sum up, city marketing is marketing "the whole of city". City consumers are its center, competition its base, sales promotion its means, exchange its essence, and win-win strategy its effect [5].

B. City marketing and marketing

The concept of city marketing derives from the concept of marketing, which means a whole process how producers sell the goods and service to consumers (as shown in Figure 1). City marketing means creating city products to satisfy the needs of city consumers, that is to say, it makes inhabitants peaceful and content, gives investors attractive and feasible investment environment, and lets travelers have a worthy trip. Marketing may make the enterprise develop rapidly, but city marketing may inspire city energy and promote city to develop (as shown in Figure 2).

Theory of city marketing is based on the theory of marketing, so both of them have similar system info. There are market strategy, product strategy, pricing strategy, promotion strategy, and service strategy in both theories. Compared with theory of marketing, theory of city marketing is more macroscopic, more complicated, and more inenarrable.

C. City marketing and city management

A new concept appeared in recent years, city management means managing all kinds of city resources including natural resource (as land), manpower capital (as bridge, road) and outspread capital (as anonymous right for bridge, road) in order to realize the optimum collocation of city resource.

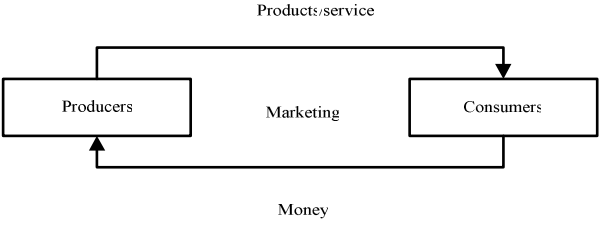

Fig. 1. The Process of Marketing

Fig. 2. The Process of City Marketing

The relationship between city marketing and city management is similar to the relationship between enterprise marketing and enterprise management. Marketing means the whole process done by enterprise in order to transfer the goods and services from producer to consumer. Enterprise management includes six kinds of activities, technical activity; business activity, financial activity, safety activity, accounting activity and management activity. Though marketing and management are different concepts, both of them have a common object, to grasp the opportunity of market and produce suitable goods to satisfy the needs of consumer and finally make enterprise more competitive and stronger. The difference between them is that marketing emphasizes particularly how to sell products to buyer successfully, while management emphasizes particularly how to produce goods efficiently.

The relationship of city marketing and city management is similar to the above description. City management pays more attention to how to manage city tangible assets (as land, public service) and intangible assets (as city policy, historical culture, city scene) in order to keep their value and further increase their value. City marketing pays more attention to how to respond well to the changes of city consumers in order to sell city products successfully.

3 Subjects of City Marketing

City marketing, a grand system, demands government, all kinds of enterprises and townsmen to make an effort.

A. Government as dominator of city marketing

As a leader of the city, government is taking on the loads of city programming, constructing, management, and marketing. Undoubtedly, the government is top dog in the process of city marketing. In practice, we often excessively depend on the market power and ignore the dominant action of the government. Relevant government organizations should be come into existence to deal with the daily affairs in the process of city marketing. In order to operate efficiently, these organizations must be made up of many city departments including city programming department, city constructing department, city management department, city tour department, city culture department, city propaganda department, etc.

B. Enterprise group as principal part of city marketing

As the material undertaker of city economy, which creates all sorts of city products, and makes city prosperous, enterprise group is the principal part of city marketing. Meanwhile, enterprise group is the concrete executor for city marketing strategies and policies. For example, if the government wants to develop city tourism, at first they must design a series of strategic plans for successfully selling the city tour products to city consumers—the tourists. Then, enterprise group will produce these tour products and sell them. They are travel agency, travel industry sites, or any company that maybe contact tourists. All of them have accountability to provide all wool and a yard wide goods and service to tourists. Therefore, without the effort of enterprise group, the city marketing strategy can't be put into effect at all.

Townsman is determinant power of city marketing. Diathesis, psychosis, ideology of townsman is the dominant factor for smoothly carrying the city marketing strategy into

execution. As employee is the source of an enterprise's energy, townsman is determinant power of city marketing. Without townsman's understanding, participation and sustention, city products can't be produced, city environment can't be improved and the image of city can't be built well. Thereby the government should build townsman's consciousness of mastership and strengthen their pride because I am a membership of this beautiful city, by which makes them consciously take on the idiographic task of city marketing.

4 Strategies of City Marketing

The study of city marketing focuses on how to market city products. The answer to it is comprehensive and complicated. For the limitation of its length, the paper only discusses about the basic thought about the choice of city marketing strategies.

First of all, we should take a city as a whole product. It is necessary to establish city image and plan a series of city products as a whole so as to enhance the competition power of the city. At the same time, it should be done to provide the efficient information about the city to potential city consumers across the whole bag of tricks. All of above things are beneficial to introduce economic activities, industries and residents into city, also beneficial to leave on existent company and inspire them to expand. All of above things may help potential city consumers acquaint themselves with the city and make a decision to do something beneficial to city development.

Basic idea of city marketing is to adjust city resources, improve city environment, build city image, set up city brand, strengthen city attraction and finally promote city development by planning and carrying out the strategies of city marketing.

A. Product strategies

As it communicates substance, energy and information with outside at any moment, modern city is an on-limits system, which provides all kinds of products to social system.

Traditional design of city products only paid attention to physical layer in order to acquire loaves and fishes, which was the manner of Supply-Oriented and Product Delivery system, tending to solve functional problems existing in city system. The old strategies usually ignored the genuine demand of city consumers, which made city development direction become fuzzy, even fuzzy entirely. Furthermore, city programming will be discontinuous, various departments can't cooperate in phase and the city development isn't ideal as a whole.

However, new product strategies of city marketing should pay much attention to the manner of Demand-Oriented. Different from Product Delivery system, it is Value Delivery system, which means to think over the demand of existent and potential consumers, plan the city on the basis of certain city value judgment, study out city future targets to according with benefits of all of city consumers.

In the final analysis, the correct product strategy of city marketing is to design excellent city products for city consumers. Here, city products have broad sense. They are coverall including financial products (services), tour products, industrial products, trade products but also culture products, education products, technology products, etc.

B. Pricing strategies

City products have their own particularities. Some are tangible, and others intangible; some have price, and others are invaluable; some are measurable, and others immeasurable. As a result, pricing strategies of city marketing are very complicated.

City products can be classified into tangible ones and intangible ones according to shapes. Tangible products consist of two types: one is natural resources, as lands, grassland, and the other all kinds of merchandises, like building, road, and commodities provided for inhabitants, tourists and investors. Intangible products refer to all kinds of services including two types: one type of service is provided combining with tangible products and establishments like education, financial services, providing of electricity, water, gas, transportation, etc. the other type of service is provided across people's endeavor but itself is intangible, like city competitive power, city image-building, city political environment, city policy environment, city economic environment, city market environment, city humanistic environment.

We should take city products separately while pricing the city products. They can be divided into three types, some of which can be priced easily like all kinks of merchandises and some intangible city products like education, financial services, providing of electricity, water, gas, transportation, etc, whose prices are mainly decided by market, some of which can't be priced easily like natural resources, whose prices are decided subjectively and their prices are optional, and some of which are both intangible and invaluable and can't be priced directly like city competitive power, city image-building, city political environment, city policy environment, city economic environment, city market environment, city humanistic environment.

The last type of city products has indirect price instead of direct price. Their prices are embodied by the prices of other city products, namely, their prices adhere to the prices of other city products. For example, if the policy, market, economy, law, humanistic environment in a city are excellent, the government is clean-fingered and efficient, the risk of investment will be little and return of investment will be high for investors, so they would like to cost more money to purchase the correlative city products, which may lead to the prices of land, workshop, house and the wage level in this city higher than the prices in other cities.

In a word, it is hard to find reasonable price for city products accepted by both buyers and sellers of city products. None but people take all kinds of factors as a whole into account, the competitive and acceptable prices of city products can be found.

C. Promotion strategies

Sale promotion of city products aims at advertising the city as special merchandise to outside and leaving no stone unturned to sell all kinds of city products to city consumers. Through sale promotion, the city itself and city products will be known, be liked, and be trusted by the outside. Finally, city products are successfully sold and the city develops rapidly.

Sale promotion plays an important role in city marketing strategies. City products of high quality can't always attract a great deal of city consumers because they never hear these products before, and more important, city marketing activities cover a large geographical range and have a complicated social background. It is urgent for city government to impress city products on city consumers (existent and potential) by some

efficient methods in order to arose their attention and inspire their consumer desire, finally attract them take part in city economic activities. There are three measures as follows.

The first measure is news propaganda.

City managers may release city information to city consumers via news reportage, on-the-spot record, personality visiting on all kinds of mediums including TV, newspaper, net of domestic or foreign, etc. By comparison, news reportage is more efficient than advertisement because the former is timely, popular and affecting. In addition, city manager may publicize new products, new measures, new policies and new trends of city by news promulgation meeting for attracting city consumers.

The second measure is advertisement propaganda.

City managers also depend on network to advertise their city products, besides four traditional mediums namely newspaper, magazine, radio and TV. Network advertisement has many merits such as living, low cost and flexible. In addition, network advertisement has a unique feature: comparing with other mediums, its incidence is widest and its influence speed is fastest. These are the reasons why many countries and cities advertise on network one after another. Network promotion may help city managers realize global management strategy of city.

The third measure is public relation.

As another important promotion means of city products, public relation means city managers should often communicate thoughts and emotion with outside by all kinds of methods, by which they can build well image and marketing environment of city. Public relation is not an ordinary promotion means. Its aims are not only marketing city products but also building well image of city to improve city marketing environment. Therefore public relation must design a series of public activities as international conference, meeting of investment introducing, meeting of inviting public bidding, etc, by which city manager can strengthen the friendship between the city and outside.

D. Competition strategies

First of all, we should clarify the concept of market competition in city marketing strategies. Here, market competition means competition among cities to scrabble for city consumers. The key that a city wins the rivals is if its competition strategy is perfect. Excellent competition strategy must content two conditions: the first one is competition strategy must be more suitable for the demand of city consumers than the competitors' strategy. The second one is city competition strategy must let city comparative advantage bring into play farthest.

The market structure of city marketing is imperfect competitive market, since city products provided by a city are always different from those by its rivals. That is to say, the winner city will make monopolistic profits. There will be a cruel competition over who gets these profits. In this case, it is possible in principle for city government to alter the rules of the game to shift these excess returns from other cities to own city.

For example, there are only two cities competing for an investment item. Suppose each city can make only a yes/no decision: either to attract investment or not. Table 1 illustrates how the profits earned by the two cities might depend on their decisions. Each row corresponds to a particular decision by city A, and each column the decision by city B. There are two entries in each box: the entry on the lower left represents the profits of city A, while on the upper right the profits of city B.

Table 1 reflects the assumption that either city alone can get profits through attracting investment, but if both cities try to attract investment, both will suffer losses. Which city will actually get the profits? It depends on who gets there first. Suppose city A is able to get a small head start. City B will find that it has no incentive to enter. The outcome will be in the upper right of the table, with city A earning profits.

Now the governors of city B can reverse the situation. Suppose governors of city B promises investor to decrease the tax partially. The result will change. The city B will get a small head start. It is now profitable for city B to attracting investment.

Table 1. Competition between Two Cities

City B / City A	Attract investment	Don't attract investment
Attract investment	-10 / -10	0 / 100
Don't attract investment	100 / 0	0 / 0

From the above example, we can draw the conclusion that competition strategies of city marketing will be difficult to achieve success without government support. Each city adopts different competition strategies of city marketing, because the internal conditions and external environment are different from each other, and the best competition strategy should be suitable for city features.

5 Conclusions

Through the analysis, we can draw the conclusion as follows.

1） As a whole process, city marketing concludes various social activities that city managers provide valuable "city products" to meet the needs of "city consumers". Although developed from the concept of marketing, the concept of city marketing is different from it. Marketing mainly studies on enterprise's behavior, while city marketing mainly studies on city manager's behavior. The concept of city marketing is also different from that of city management. City management pays more attention to how to manage city assets for keeping and increasing their value. City marketing pays more attention to how to grasp the needs of city consumers for selling the city products successfully.

2） Government, enterprise group, and townsman are the subjects of city marketing, who construct a pyramidal structure together and play different roles in city marketing, in which government is the dominator of city marketing, enterprise group the principal part of city marketing and townsman the determinant power of city marketing.

3）Strategies of city marketing is a system made up of various concrete strategies including product strategy, pricing strategy, promotion strategy, competition strategy, and so on. The product strategies of city marketing should be the manner of Demand-Oriented and Value Delivery system, and the keystone of pricing strategy of city products divides city products into three types and prices them separately after

taking all kinds of factors as a whole into account. There are three main measures of promotion strategies of city marketing, news propaganda, advertisement propaganda and public relation. The best competition strategy of city marketing is the one most suitable for city features. From what has been discussed above, we can know that the support of the government is the precondition for a city to win the game with another city.

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Design and Implementation of a Professional Electronic Dictionary for the *Multimedia Technology* Bilingual Curriculum

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Abstract. Multimedia Technology is one of bilingual curriculums in our department and it is based on English original edition teaching materials. In order to help our students to read the materials more smoothly and understand the knowledge in them better, we designed and implemented a professional electronic dictionary. In this dictionary, students could not only query the Chinese meaning of a vocabulary, but also view the professional meaning explanation and related professional knowledge instruction about this vocabulary. What's more, we adopted online audio capture and playback technology as well as phonetic symbols input and display technology. So that students could also view the phonetic symbols and listen to the pronunciation of the vocabulary. And this will greatly help them to improve their spoken professional English. Fantastically, teachers could conveniently manage and update vocabulary information through the friendly user interfaces in the dictionary. If a teacher input another bilingual curriculum's vocabulary information into the dictionary, it will soon be change into another bilingual curriculum's dictionary. The architecture and function models of the dictionary were introduced in this paper. On this basis, the realization of online audio capture and playback as well as phonetic symbols input and display was described in detail.

Keywords: Bilingual instruction, electronic dictionary, online audio capture, phonetic symbols input.

1 Introduction

Currently, one of the common ways to carry out bilingual instruction in our country is to adopt English original edition textbooks, English edition professional literatures or other English edition teaching materials to help students to learn professional knowledge. We have provided our undergraduate students a bilingual curriculum which is named *Multimedia Technology* in this way since 2003. And during the past years, we have made a lot of experiences and harvests, but we also have found a lot of problems. Some of the problems were encountered by students. For example, because of the limitation of professional vocabularies and without knowing the professional

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meanings of the vocabularies, they are not able to smoothly read and understand the English original edition textbooks, English edition professional literatures or other English edition teaching materials, which will not benefit to their meaning construction of professional knowledge. Worse still, because of unfamiliar with the pronunciations, they are never self-confident when doing professional conversation in English and dare not to speak, which will seriously prevent them from improving their own spoken professional English.

A lot of electronic dictionaries have been brought out to the market nowadays, some of which are very famous, such as the *Kin*gsoft, *Google Translation*, and so on. But almost all of these dictionaries are only able to explain the common meaning of the vocabularies instead of detailed professional meaning explanations and related professional knowledge instructions about the vocabularies. Furthermore, some of the electronic dictionaries including *Google Translation* have not provided the functions of English phonetic symbols input and display as well as pronunciation record and play, which will be helpless for improving users' spoken professional English.

For the above reason, we designed and developed a professional electronic dictionary for the *Multimedia Technology* bilingual curriculum, with the integrated use of online audio capture and playback technology, English phonetic symbols input and display technology, and dynamic Web page programming technology, so that students could get a useful learning tool to learn professional knowledge and improve their spoken professional English more effectively.

2 Design of the Electronic Dictionary

A. Architecture Design

Browser/Server architecture was adopted in this electronic dictionary, as shown in Figure 1. Users do not need to install any client applications. They can visit and use the electronic dictionary only through a Web browser, which is really very simple and convenient. What' more, it will lighten the system administrator's maintenance burden. All the data of the dictionary were stored on the Server, so that the development environment and application environment were separated, which will improve the security of the system.

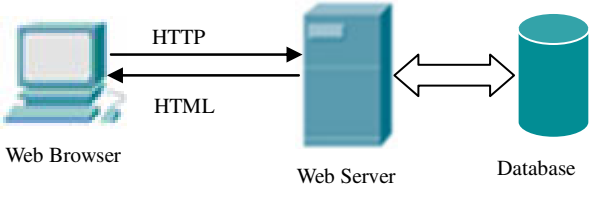

Fig. 1. Architecture of the electronic dictionary

B. Function design

Different function models were designed for different users, so the electronic dictionary was divided into two sub-systems which are the teacher sub-system and the student sub-system. Different users log on the dictionary through the same login interface and the dictionary will identify the user's role automatically according to the user name and password, and then switch into the corresponding sub-system. Vocabulary management, vocabulary checking and user management models were designed in the teacher sub-system, while in the student sub-system vocabulary query, vocabulary uploading and personal information modifying models were designed.

1) Vocabulary Management Model in the Teacher Sub-system

Vocabulary management is the main function of the teacher sub-system, through which teacher could not only add new vocabulary to the database but also modify, delete or search vocabulary in the database. The information of a vocabulary includes spelling, phonetic symbol, Chinese meaning, professional meaning explanation and some of the related professional knowledge instruction. Teacher could input phonetic symbol by the use of the soft keyboard provided in this function model. What's more, teacher could record pronunciation conveniently with the help of online audio capture and playback function. When the recorded sound data is saved, the dictionary could intelligently build the relationship between the word and the sound data file. Additionally, teacher could upload image to illustrate the professional knowledge. When a student searches a vocabulary, he/she could not only get the Chinese meaning and the phonetic symbol of the vocabulary, but also could listen to the pronunciation, view the professional meaning explanation and read the related professional knowledge instruction with illustrations. And this will greatly benefit to the student's meaning construction of professional knowledge and help them to improve their spoken professional English.

2) Vocabulary Query Model in the Student Sub-system

Two kinds of query methods were designed in the student sub-system, which are exact query and fuzzy query. Student could exactly query a word's detailed information by inputting the full spelling of the word. While, if a student only inputs some of the beginning letters, fuzzy query will be executed and all the words which begin with these letters will be listed in a table where hyperlinks were followed behind each word. If the student clicks one of the hyperlinks, the detailed information about the word will be shown. The detailed information of a word is composed of spelling, phonetic symbol, pronunciation, Chinese meaning, professional meaning explanation and some of the related professional knowledge instruction. For example, if a student inputs the full spelling of the word "sample", the exact query will be executed. Soon, the phonetic symbol which is [□□□□□□□] and the Chinese meaning of the world will be shown. And if the student further to click the "  " icon button, the pronunciation will be played. What's more, the professional meaning explanation will be shown, which might like that sample is one of the key steps for the digitalization of analog signal and it means that the analog signal's value will be measured at regular time intervals to produce a series of numbers, thus the analog signal is discrete in time dimension. In addition, some of the sample-related professional knowledge will also be introduced to the student with illustration, which

might include the conception of audio sampling, the conception of sampling rate, the Nyquist sampling theorem and its application, etc.

3) Vocabulary Uploading Model and Vocabulary Checking Model

In order to make good use of the power of team to enrich the vocabulary database, vocabulary uploading model was designed for students, which means that students could upload self-determinedly some new words and their detailed information, such as phonetic symbol, Chinese meaning and professional meaning explanation and so on, into the temporary database. Correspondingly, vocabulary checking model was designed for teacher to view, check or complete the vocabularies' information in the temporary database and then move them into the formal database. After that, these new words formal could be queried and used by all students.

3 Implementation of the Electronic Dictionary

A. Implementation of the Online Audio Capture and Playback

Online audio capture and playback is one of the main functions of the vocabulary management model, through which user could conveniently record the pronunciation and listen on line. If the effect of sound is satisfactory, user could save it as a WAV file. And during the process of sound saving, a relationship between the WAV file and the vocabulary will be builded intelligently by the electronic dictionary. Of course, user could re-record the pronunciation if he/she is not satisfied with it. Because all the operations including recording, listening, saving and building relationship have been integrated into one model, user could complete all these operations faster than before without the need of third-party software (eg. CoolEdit, Adobe Auditon, etc).

1) Realization of Online Audio Capture

The online audio capture function was realized by the use of *Microsoft.DirectX. DirecSound* technology and its technical line was shown in Figure 2. Previously, a *Microsoft.DirectX.DirectSound.Capture* object should be created for the sound card and a corresponding *Microsoft.DirectX.DirectSound.CaptureBuffer* object should also be created for the capture object. Thus, when a user begins to record, the analog audio signal will be inputted into the computer's sound card through the microphone. And then the analog signal will be converted into digital signal by the Analog-to-Digital Converter in the sound card. After that, the digital sound data will be captured into the capture buffer by the use of the *start( )* method of the capture buffer object.

Particularly, in order to prevent the audio recording process from being broken off, the capture buffer is divided into several sub buffers and at the end of each sub buffer, a notification point and a notification event are set. What's more, a special thread is created to manage these notification points and notification events. When the writing pointer of the capture buffer arrives at one of the notification points, the notification event at this point will be triggered. And then the special thread will be started to move the audio data in this sub buffer into the WAV file. Meanwhile, the main thread of the recording application program keeps on capturing audio data from the sound card and saving the new data into the follow-up sub buffer without any interruption. By this way, the audio recording process is continuous without any interruption.

When the last sub buffer is full of audio data, the writing pointer will move automatically back to the beginning point of the whole capture buffer and the newly captured data will be saved into the sub buffers from the first to the last, one after another, by overwriting the old data in them. By this way, the capture buffer is reused and data overflow is avoided.

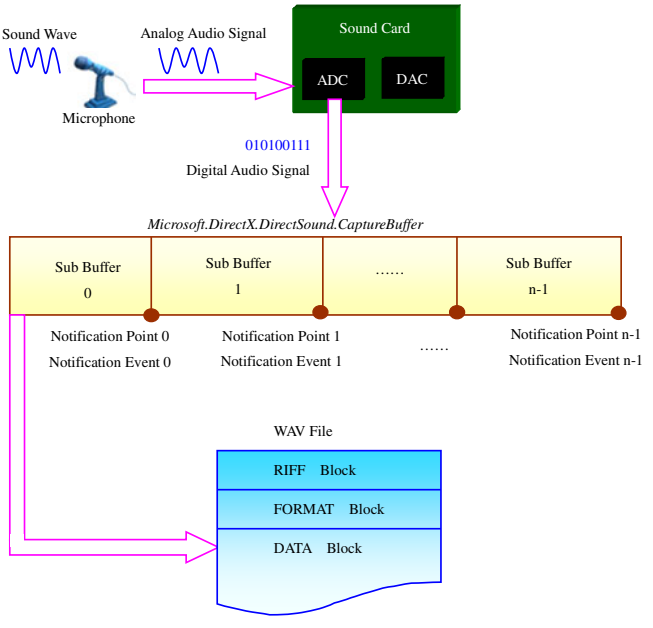

Fig. 2. Technical line of the online audio capture

2) Realization of Online Audio Playback

Online audio playback was realized by the use of *Windows Media Player* control. As we know, the program could automatically build the relationship between the vocabulary and its pronunciation WAV file. So, when a user click the "🔊" icon button on the Web page, the program will automatically make a *Windows Media Player* control object to get the path and file name of the WAV file, and then play the WAV file with its *controls.play()* method. Thus, the pronunciation is played and the user could listen to it.

B. Implementation of the English Phonetic Symbols Input and Display

English phonetic symbols input and display is another main function of the vocabulary management model, through which user could conveniently input the phonetic symbols of vocabularies. So that, student could view the phonetic symbols when they are listening to the pronunciations, which would help them to better grasp the pronunciations and improve their spoken professional English more effectively.

In order to input and display phonetic symbols, a kind of phonetic font should be installed in the Server firstly. In this dictionary, we adopted the *Kingsoft Phonetic*

Plain which can be downloaded for free from Internet. Just copy the downloaded font file which is named *King Font Plain.ttf* to the *C:\WINDOWS\Fonts* folder on the service, then we can program to realize this function. The implementation principle of this function was shown in Figure 3.

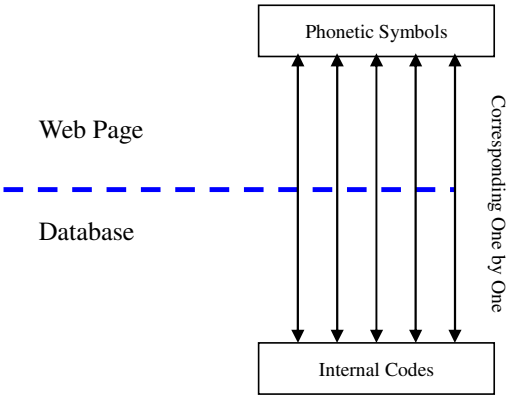

Fig. 3. Implementation principle of phonetic symbols input and display

1) Realization of English Phonetic Symbols Input

On the vocabulary management user interface, there is a soft keyboard which is composed of 48 buttons and each button represents an English phonetic symbol. The text fonts of these buttons were all set as *Kingsoft Phonetic Plain*. In the *Kingsoft Phonetic Plain* font, each English phonetic symbol has a special corresponding letter which is called *internal code*. For example, the internal code for English phonetic symbol "□"is a letter "A", and the internal code for "□" is "Z",…. So, when one of the buttons on the soft keyboard is clicked by a user, the corresponding internal code of the phonetic symbol on this button will be stored into a variable by the program. And when the inputting of the phonetic symbols of a vocabulary is completed, the sequence of internal codes for these phonetic symbols will be stored into the database. For example, if a use input the phonetic symbols "□□□□" for the word "Apple", the corresponding sequence of internal codes "`Apl" will be stored into the database. Thus, by the use of *Kingsoft Phonetic Plain* font and its internal code, the English phonetic symbols inputting function was realized.

2) Realization of English Phonetic Symbols Display

The phonetic symbols are displayed in a Label, the font of which is also set as *Kingsoft Phonetic Plain*. When a user queries a vocabulary, the corresponding sequence of internal codes will be searched out from the database and then assigned to the Label. Because the Label's font has been previously set as *Kingsoft Phonetic Plain*, the internal codes will be transformed into phonetic symbols automatically. Thus, the user could view the phonetic symbols of the vocabulary. For example, if a user input the full spelling of vocabulary "Apple", the corresponding sequence of internal codes "`Apl" will be searched out from the database and then assigned to the

Label. The Label will automatically transform the internal codes into phonetic symbols "ㄖㄐㄇㄛ" and the user could view them.

4 Conclusion

It has been one of the common ways to carry out bilingual instruction by the use of English original edition textbooks, English edition professional literatures or other English edition teaching materials. The professional electronic dictionary for the *Multimedia Technology* bilingual curriculum, which has been designed and implemented in this paper, has effectively solved some of the problems encountered by students during this curriculum's instruction which have been carried out in the above way. In this dictionary, students could not only query the Chinese meaning of a professional vocabulary, but also view the professional meaning explanation and related professional knowledge instruction, which has help them to learn professional knowledge in English more effectively. In addition, students could also view the phonetic symbols of the vocabulary and listen to the pronunciation, which has help them to improve their spoken professional English much better. This electronic dictionary has been widely used by our students and has been an effective learning tool of them. What's more, all the vocabularies and their information are stored in database and could be managed dynamically through the friendly use interfaces of vocabulary management model. If another curriculum's vocabularies and their information are added to the database through these user interfaces, this electronic dictionary could soon become another curriculum's learning tool.

Acknowledgment. We would like to acknowledge the contribution of many people to this article. Chengyao WANG has offered much helpful suggestion. Jianchun QI has helped in developing the electronic dictionary. The department of electronic information has provided us an excellent environment to develop, debug and apply the electronic dictionary. And we also would like to thank our families for their love and support.

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Policy-Based Market-Oriented Cloud Service Management Architecture

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Abstract. Policy-based management technologies represent an important tool for managing the user services that cloud-application frameworks provide. However, current policy-management system is a poor fit for the domain because they don't support market-oriented management in cloud environments. The Policy-Based Market-Oriented Cloud Service Management Architecture (PBMOCSMA) can manage services in domains where users' requirement is dynamic and flexible, policy specification is distributed and management decision-making is shared between users and service providers. This article describes the PBMOCSMA schema and architecture, showing how it provides flexible, dynamic, and extensible policy-based management capabilities to those who provide user services on the cloud.

Keywords: Cloud Computing, Resources Management, SLA, Policy.

1 Introduction

Cloud computing is the latest technology evolution and potential silver bullet. With the cloud, enterprises can leverage centralized and virtualized IT systems, services, and a variety of service providers to access high-quality and high-value IT services, while lowering their own overall costs and increasing productivity to enable them to focus on core business competencies. The implementation of virtual machines within the IT infrastructure allows for more efficient use of physical servers, which reduces capital expenses along with power and cooling requirements. However, the use of virtual servers also increases the management challenges associated with maintaining infrastructure reliability and ensuring service-level agreements. For peak efficiency, the new environment requires the use of integrated tools that can proactively manage infrastructure fault, performance and capacity issues within hybrid environments combining both physical and virtual environments [1] [4].

But when consumers rely on Cloud providers to supply more of their computing needs, they are inevitably confronted by a variety of new management challenges:

1) Lack of end-to-end cloud service performance visibility: cloud platforms provide little information about the performance of the applications running with the environment.

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2) Lack of visibility into customer experience: cloud-based applications provide tremendous cost savings by moving critical business functions to the cloud, but they "automate" customer relationships. The result is that the application provider and relationship owner lose the critical visibility they once had into the level of customer satisfaction, and IT has no way of knowing how many customer transactions succeeded or failed.

3) Dynamic cloud service automation: Automate control, update, and movement within the heterogeneous, multi-location IT infrastructure supporting your applications and data. This results in a more flexible environment which can support variable, up-to-the-minute business requirements, with an eye toward maintaining SLAs.

4) Cloud service quality and scalability: Manage a composite transaction end-to-end, from the end-user's perspective through to the visible infrastructure. This assures that cloud service performance and availability meet expectations.

From a management viewpoint, Cloud-application frameworks largely remain isolated islands. They lack the facilities to apply management rules, such as pricing models and access control, and so on. This is because these frameworks can't apply the rules to the cloud-based services. Thus, services providers can't solve these new challenges. Policy-based management (PBM) is a popular method for combining flexibility and efficiency in systems administration. PBM systems specify decisions about system behavior as rules, often in a high-level language, which the policy system then maps to concrete behaviors. [7][8][9] The Policy-Based Market-Oriented Cloud Services Management Architecture (PBMOCSMA) is a policy framework uniquely designed to manage policies for cloud-based services owned by different cloud service providers (CSP).

To achieve even high levels of savings and greater efficiencies three additional service management steps or should be implemented. The first step would map the cloud computing environment so that the relationship of the physical and virtual assets is understood so that reported problems and potential problems can be quickly isolated and remediated. The second step addresses the performance monitoring and management of the virtual servers so that trends can be established and watched so actions can be taken proactively. The third step is to manage the cloud at the services layer and ensure that the services are meeting their service level objectives. This paper will explain each step in more detail.

The rest of this paper is organized as follows. Section 2 presents existing solutions and useful standards for implementing a certain level of cloud services management. This section also enumerates the goals to be addressed to enable the automatic scaling of services. Section 3 describes the components and capabilities of PBMOCSMA and how it fulfills the challenges above. Finally, Section 4 emphasized the final conclusion of the present work.

2 Related Works

In the cloud management field, there are four of the most advanced platforms (Eucalyptus, IBM Tivoli, OpenNebula, and CA:

1) Eucalyptus, by replicating the functionalities and API of EC2 [26] and S3, is a good candidate to provide resource leasing as well as testing facilities for EC2-compatible applications [24].

2) IBM Tivoli software offers a range of service management solutions designed to help organizations better understand their virtualized environment — how to map virtual resources to physical resources, automate the various operations, calculate usage, and manage performance and availability.[1][15]

3) The OpenNebula Virtual Infrastructure Manager provides the functionality needed to deploy, monitor and control VMs on a pool of distributed physical resources, usually organized in a cluster-like architecture, but can additionally incorporate remote cloud providers. [25]

4) CA Spectrum Infrastructure Manager and CA eHealth Performance Manager have established a successful track record of effectively handling infrastructure and performance issues within large, complex IT environments. These two products simplify the IT management task and lower costs while helping to ensure reliability and quality of service (QoS). In combination with CA Virtual Performance Management (CA VPM), these two products extend their proven capabilities to handle the increased complexity of virtualized server environments. Their ability to provide a unified management platform for the entire systems environment simplifies the management chore [20].

But yesterday's management tools are not enough. All the solutions above still lack the ability to handle the lifecycle of cloud services, also lack the ability to handle the co-ordination of supply and demand in the cloud services context.

Hence, in this paper, we define provide the architecture for creating Clouds with policy-based market-oriented resource allocation by leveraging technologies such as Virtual Machines (VMs). We also provide insights on market-based resource management strategies that encompass customer-driven service management to sustain Service Level Agreement (SLA)-oriented resource allocation.

3 Policy-Based Market-Oriented Cloud Service Management Architecture

A. Policy-Based Management

There are many ways to declare precise and expressive rules about the sharing of resource — researchers have proposed numerous policy-specification languages. Some of these languages, such as the Extensible Access Control Markup Language (XACML) can express sophisticated rules in a wide range of application domains. Policy enforcement technology for clouds can create secure, managed communications between legacy applications in the enterprise and new applications residing in the cloud [2][3][4][5][6].

Figure 1 illustrate the Policy-based Cloud Services Management Framework, the framework consists of Policy Enforcement Point (PEP), Virtual PEP, Policy Decision Points (PDP), Management Console, Policy Repository, VM Monitoring Server, Accounting Server [8] [9].

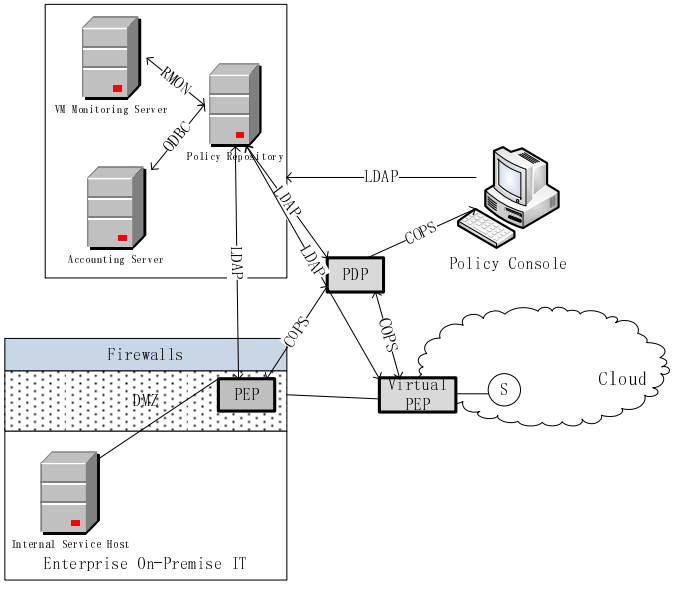

Fig. 1. Policy-Based Cloud Services Management Framework

1) Policy Enforcement Point (PEP): The PEP is responsible for enforcement and execution of policy actions. It is an operational component that can take actions such as filtering, packet marking, rate enforcement, shaping, resource management, etc.

2) Virtual Policy Enforcement Point (VPEP). Deploying virtualized, distributed PEPs in front of cloud Services (S) allows owners to protect and manage their services. Application-level policy enforcement gives fine-grained access control and in-depth understanding of use patterns of actual services, instead of virtual machines. Not only does this protect the data and applications from unauthorized use, it may manage the distribution of requests to virtualized application instances, providing balancing or failover within or between different vendors. This provides the necessary abstraction layer that discourages single-vendor lock-in. Finally, the fusion of all three of these components enables the hybrid on-premises, in-cloud deployment model, which is the likely future for most organizations [12] [16].

3) Policy Decision Point (PDP). The PDP is typically referred to as the Policy Server, which is responsible for determining which actions are applicable to which packets. The PDP retrieves policies; perform complex policy translation and interpretation based on information contained in data or signaling packets, current network condition, as well as dynamic information.

4) Policy Repository: The policy repository stores policies defined for the domain.

5) Policy Console: Policy Console acts as a user interface to allow constructing policies, deploying policies, and monitoring the status of the policy-management environment.

In IETF (Internet Engineering Task Force), protocols for the standard reference model have been standardized: LDAP (Light-weight Directory Access Protocol) for the

communication between the policy-repository (LDAP server) and PDP, and COPS (Common Open Policy Services) for the communication between PDP and PEP [18].

The high-level policies themselves are described using an if-then approach: if certain conditions are present, then specific actions are taken.

Once policies are defined and deployed at the policy server (PDP), they are further translated and download to corresponding network devices (PEP, VPEP) to put the policies in effect. This interaction between PDP and PEP works in the opposite direction also.

PBM systems also tend to be tightly coupled to policy languages, with architectures that depend on the language's semantics. Given the heterogeneity of cloud service and their policy requirements, as well as the wide variety of policy languages available, a management system that imposes a single, system-wide policy-specification language might not be the best option. Also, in practice, service-management systems tend to be components of proprietary management systems.

B. Policy-Based Market-Oriented Cloud Service Management Architecture

In the context of a Cloud as a commercial offering to enable crucial business operations of companies, there are critical QoS parameters to consider in a service request, such as time, cost, reliability and trust/security. In particular, QoS requirements cannot be static and may change over time due to continuing changes in business operations and operating environments. In short, there should be greater requirement on customers since they pay for accessing services in Clouds. In addition, the state-of-the art in Cloud computing has no or limited support for dynamic negotiation of SLAs between participants and mechanisms for automatic allocation of resources to multiple competing requests [13] [14].

To achieve market equilibrium, providing feedback in terms of economic incentives for both Cloud consumers and providers, and promoting QoS-based resource allocation mechanisms that differentiate service requests based on their utility. In addition, clients can benefit from the "potential" cost reduction of providers, which could lead to a more competitive market and thus lower prices. Fig. 2 shows the high-level architecture for supporting market-oriented resource allocation in Data Centers and Clouds.

1) Cloud consumer: these who acting on their behalf submit service requests from anywhere in the world to the Cloud.

2) Authentication and Access controller: When a service request is first submitted, the Authentication and access controller Control mechanism interprets the submitted request for QoS requirements before determining whether to accept or reject the request.

3) Service Request Examiner: When a service request is first submitted, the Service Request Examiner and Admission Control mechanism interprets the submitted request for QoS requirements before determining whether to accept or reject the request. Thus, it ensures that there is no overloading of resources whereby many service requests cannot be fulfilled successfully due to limited resources available. It also needs the latest status information regarding resource availability (from the VM Monitor mechanism) and workload processing (from the Service Request Monitor mechanism) in order to make resource allocation decisions effectively. Then, it assigns requests to VMs and determines resource entitlements for allocated VMs [12] [13].

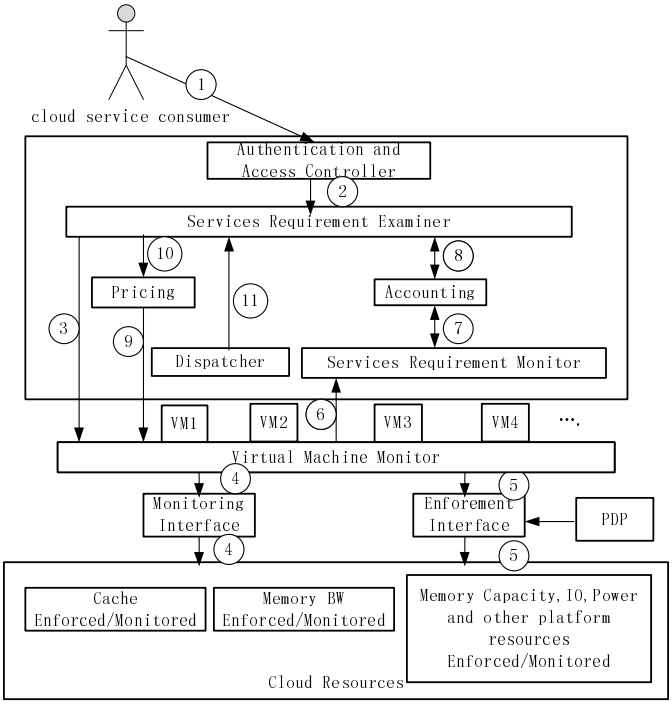

Fig. 2. Policy-based Market-oriented Cloud Management Architecture. Arrows 1 through 11 show the sequence of cloud consumer use the cloud resource.

4) Pricing: The Pricing mechanism decides how service requests are charged. For instance, requests can be charged based on submission time (peak/off-peak), pricing rates (fixed/changing) or availability of resources (supply/demand). Pricing serves as a basis for managing the supply and demand of computing resources within the Data Center and facilitates in prioritizing resource allocations effectively [22] [23].

5) Accounting: The Accounting mechanism maintains the actual usage of resources by requests so that the final cost can be computed and charged to the users. In addition, the maintained historical usage information can be utilized by the Service Request Examiner and Admission Control mechanism to improve resource allocation decisions.

6) VM Monitor: The VM Monitor mechanism keeps track of the availability of VMs and their resource entitlements [11].

Dispatcher: The Dispatcher mechanism starts the execution of accepted service requests on allocated VMs.

7) Service Request Monitor: The Service Request Monitor mechanism keeps track of the execution progress of service requests.

8) VMs: Multiple VMs can be started and stopped on-demand on a single physical machine to meet accepted service requests, hence providing maximum flexibility to configure various partitions of resources on the same physical machine to different specific requirements of service requests. In addition, multiple VMs can concurrently

run applications based on different operating system environments on a single physical machine since every VM is completely isolated from one another on the same physical machine [20].

9) Cloud Resources: The Data Center comprises multiple cloud resources (including cache, IO, Power, Storage, and so on) that provide resources to meet service demands.

4 Conclusion

In this paper, the authors have provided an overview of Policy-Based Market-Oriented Cloud Service Management Architecture. This architecture is based on requirements that underline the need for policy and process management, services life-cycle management, visibility and contextualization. In this domain, such a framework is a prerequisite for successfully implement cloud computing.

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Discussion on Production Skills of Multimedia Courseware for Building Material Course

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Abstract. Multimedia courseware has been widely used in teaching building material course. There are a lot of courseware software, but Flash has its own unique advantages which are smaller, more interactive and more animate than others. This paper mainly describes the skills of multimedia courseware facture: process of developing the Flash courseware, skills of reducing the courseware volume, treatment of connecting text and animation, skills of application deformation and scene. It can greatly enhance the production efficiency and quality of courseware.

Keywords: Building materials, flash multimedia courseware, production skills.

1 Introduction

At present, education continues to improve with the help of the high technology, teaching methods, teaching models have undergone a qualitative change from writing on the blackboard to the present multi-media technology. The multimedia courseware has been widely applied, because it owns visual image, rich content, large amounts of information and it is free from time and space constraints. Building material course uses the multi-media to teach, so teaching becomes vivid and efficient. Those abstractive, micro and difficult to capture knowledge in daily teaching can be showed in the form of animation by the multi-media.

Construction Materials" is a basic and professional compulsory course in agricultural water conservancy professional, water conservancy and hydropower engineering professional, civil engineering professional, project management professional, hydrology and water resources professional of my college. It's very helpful to learn other professional courses well. It's good for the students to build a theoretical knowledge framework of engaging in the actual work, such as engineering design, site construction, construction supervision and so on in the future. It is also helpful for the students to achieve work capability. Therefore, we should pay attention to improve the quality of teaching building material course. Traditional courseware software are simple to learn, easy to use and support medias of multiple formats, but the interaction is not strong, for example the PPT. Although the interaction of the authorware is good, its heads of the courseware are generally relatively large, uneasy to

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download and share. Flash provides an easily useful and extremely important process of courseware production and teaching platform for school education in various courses of teaching, courseware are small, strongly interactive and good teaching, so this paper recommends using Flash to make multimedia courseware.

2 Advantages of Using Flash to Make Amultimedia Courseware of Building Marerial Couese

A. Traditional production of multimedia courseware

Traditional multimedia courseware ppt, its images can not be arbitrarily scaled, change size and become blurred as enlarge. Animation is not good, it needs to introduce other software. The ppt courseware mostly relies on the research of the teachers, production method is simple, courseware slides over one of the lists up, templates and backgrounds of the courseware are powerpoint mostly native, the picture is downloaded directly and put together, it can not be directly reflect the characteristics of the building material course, courseware types are single and overall lack of coordination.

B. Advantages of Using Flash to Make Multimedia Courseware of Building Material Course

Flash is one great two-dimensional animation software, which was introduced by Macromedia company. It has a smaller size, higher quality and it can be introduced fonts, sounds, video and other files, it plays simply, owns powerful interactive features and produces high-quality animation. Flash should be adopted to make the multimedia courseware for the characteristics of the building material course, the advantages that the specific description of Flash courseware is better than others are as follows.

- The size of the file is small.

The courseware (swf files) which is produced by Flash has a very small size, a complete courseware is usually only about several hundred KB. However, the courseware made by PowerPoint includes images, animation, video and sound, after packing, the data is not compressed, so the size of the file is very large. To Authorware and Director: Authorware needs to rely on a number of plugs to make some excellent dynamic effects, the number of the outside multimedia elements introduced by Director is very large, the file is quite large, because the overall resources arrange together when packaged, the size of a class courseware files reach more than 10 trillion, and then adding some videos and sounds even to reach hundreds of megabytes. Therefore, flash courseware has an obvious advantage in size relative to other software.

- Strong interactive and easy to use

Flash has rich and flexible buttons, owns the script control language and animation editing, can exchange with "man-machine" dialogue, mutual coordination and control to help students in learning watch back and forth according to their own needs, images and animations can zoom to full screen, which is more easy to look at every detail. It sets up to help interface, describes how to operate, helps students make better use of multimedia courseware.

Courseware files are small, can realize the sharing of resources, and the play is also extremely convenient, as long as the installation of a simple player, you can play, even

if there is no player, with the ordinary IE browser can play courseware (SWF) file, even downloading while translating, convenient and quick.

- A variety of file formats are Supported and easy to modify

Flash Courseware can add sound files (WAV, MP3, etc.) can also compress the sounds. For the imported video objects（AVI, RM etc.）can not only zoom, rotate, twist handle, you can also write a script to create the video object animation. In addition, flash can also import professional-grade graphics tools, such as M icromedia FreeHand, Adobe Illustrator and other drawing graphics, and beautiful interface.

Flash courseware has become more convenient in revising than other multimedia courseware making software. Courseware in the ppt, if an image is needed to modified , the image must be modified to re-insert everywhere in the courseware. In the Flash courseware, as long as modify the corresponding components of the image, this image will change in the entire courseware, very convenient to modify.

3 Specific Production Skills of Multimedia Courseware for the Building Mateial Course

C. The production process of multimedia courseware

- Determine the content of the multimedia courseware and clear teaching goals

The teaching objectives of this course is to enable students to grasp the types , technology, features, notes, application scope of building materials, for example, in this chapter of the concrete , it is necessary to master all types of concretes and its technology, features and application scope, the properties of concrete are difficulties , resistance to stress is good, but heavy weight and crisp, should be reinforced to work together, can reduce weight, enhance tensile properties, also can protect steel from corrosion. Admixtures can also be join in the concrete to improve the work performance, expand the scope of application and concrete construction conditions.

Following is the production process of multimedia courseware.

- Establish owned building materials database, classify the data

Comprehensive information of building materials should be collected, the collected information is classified by chapters, when you can accelerate the speed of production courseware, so that we can greatly enhance the efficiency of courseware. For example, what kind of pictures and what logical relationship between the picture are needed in this reinforcement chapter, some difficult to understand test should be to animation, it need not be finalized and ready for the required information.

- Design the script

Script design can be prepared into the teaching process with clear ideas and refining process of "script." The detailed description of the process of teaching and learning activities, it include which and when the media shows to the teaching information, how to arrange the interaction. Every detail is designed to be as specific as possible.

- Begin to make courseware

The production of courseware is to edit, modify, synthesis the ready materials. Production should pay attention to the harmony and beauty of all the courseware

interface, text, pictures and background colors should be reasonable, human-computer interaction should be easy to practice, strong interesting. The characteristics of this course are highlighted, a building or a structure is proposed to be the background of courseware.

- Commissioning and operation of the courseware

After the courseware completed, a number of commission, operation and testing should be conducted in order to identify problems, make changes in time, until the smooth operation of courseware. Because the building materials industry develops fast, courseware must constantly add new content, modify, improve, and associated with the actual engineering, the production of multimedia courseware materials is a dynamic process.

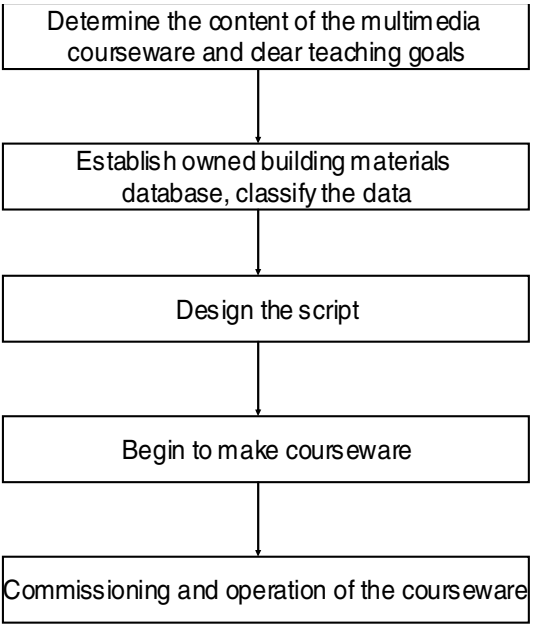

Fig. 1. Production process of multimedia courseware

D. Apply a small trick to reduce the volume of courseware

Although the Flash courseware size compared to other courseware is already small ,and it can also adopt the following ways to reduce the size further.

- Reduce the file size by processing the image

If the Flash courseware needs to join the vector graphics, vector images can be arbitrarily scaled and not affect the quality. If there is a place that has to use a bitmap image, uses JPEG compression method to reduce the volume.

- By handling animation to reduce the size of the file

This courseware requires Flash animations, the mobile gradient-generated animationin is made in order to reduce the volume, the gradient-generated method is used to produce animation, because there are many key frames in the "Motion Tween" , the more use , larger the file will be.

- Through the handling of sound and font to reduce the size of the file

For the voice added in the courseware, the best way to compression with MP3, because MP3 is the smallest sound format. For the font used in Flash, the more texts, bigger the file will be , so use Flash predetermined font as possible , not to introduce an external text.

E. Skill and Connection Merhods of Text and Animation Processing

Text in multimedia courseware is not only the needs of teaching content to express, but also the important elements of the overall interface design artistry. In order to increase the courseware color design, shadows, glossy, shiny, deformation, etc. can be used. The cover production of building materials as example in order to address the skills of word processing specifically, the WordArt provided by the Word software edits the text of "construction materials", the edited text will appear as images in the form of pictures automatically, and then copy paste the image into the Flash courseware, namely the completion of a simple word processing. However, if when required a strong artistic effect, we need to use specialized processing software, such as Photoshop, Fireworks image-processing software, COOL3D character animation production software and save the text with picture format, then add an image in the Flash courseware.

The dazzling animation of Flash Courseware is the most attractive and a variety of visual animation can be made by Flash. The commonly used methods are the frame animation and tweening animation. Each frame of the frame animation is the key frame to achieve more complex animations. The tweening animation only need to determine the picture of start and end, the middle part of the animations are generated by Flash automatically to considerably reduce the workload of graphics producers, and can greatly enhance the production efficiency. Therefore, the tweening animation is the most widely used.

F. Precise deformation of the object and scene application skill

There are some experiment in material course, such as concrete beams damaged , it need to demonstrate the change process from the beginning of the force to the final destruction of concrete specimens, which requires precise effect of distortion. Deformation effect is a more useful technology in Flash. Destruction of concrete of bending is the example that can specify the exact object deformation. Specific steps are as follows:

Firstly. Open the Flash, draw a prism-type concrete specimen in 1 frame with a rectangle tool, then insert a blank key frame in the 40 frame, and at the same time draw a broken concrete specimen.

Second. Open Frame window, Change Tweening option to Shape, set the other parameters remain unchanged. Now in 1 and 40 Frame where will appear between the lines with the arrow, indicating the basic deformation features achieved.

Finally. The above two basically achieve deformation effect, now begin accurate deformation. Click the 1 frame to add a number of key points, and then click the 40 frame, In this frame the graphics of the prism concrete specimens broken are respectively

dragged to the corresponding location of key points, after drag is completed, in the 40 frame the Concrete breaks become green and in1 frame the concrete breaks will become yellow, indicating deformation succeed. Then press the Enter key to watch movement effect.

Course materials have many content, if only an animation, time may be too long, according to level of knowledge or teaching process ,the whole animation are divided into paragraphs, each section were completed in a scene, so it can reduce the number of layers and each scene frames. In the last frame of every scene add action code (start, end, return, pause, etc.) or the action button can jump to other scenes. When courseware come into use, teachers according to the teaching progress and acceptance of student to choose is to return to the previous scene or connected to the next scene, improving the interaction between teachers and students.

For example, in the experiment of the concrete mixtures' workability, the experiment can be divided into three stages - measure sand, water, coarse and fine aggregates, etc; mix the material with water; measure the slump value. the process of the three trials completed in the same scene need a few hundred frames, but if each stage of the process were completed in a scene, then the number of frames each scene needs only about 100 frames, reducing the trouble of dragging the scroll bar back and forth in order to find a key frame .And in teaching, the first phase - measure sand, water, aggregate presentation end, teachers can explain and conclude, and then click the Go button to the next stage - mix materials, the teaching in this way can meet the teaching requirements and situation of the students in acquiring knowledge.

4 Conclusion

In a word, the multimedia building materials courseware which are made by Flash merge of text, graphics, animation and video, it is learned and understanded easily, and saving the time of teaching courseware, not only is animation rich and the size of the file small, but also is easy to network traffic as well as the exchange and sharing of resources. In addition, there is a strong interactivity, students can learn any point of knowledge according to their own needs. The production and usage of Flash multimedia courseware will improve teaching effectiveness and learning passion of the students significantly, provide students with a vivid learning environment in order to open up a new way to improve teaching efficiency and the effectiveness.

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Study and Practice on Training Scheme of University Students' Entrepreneurship Ability

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Abstract. University's executing the student business education is an important task of implementing the scientific development concept, changing the education idea, deepening the educational reform, promoting the educational innovation. According the orientation, the talent cultivation mode, the development demand and the practical situation of our university, the paper puts forward the training scheme of university students' entrepreneurial competence and ability, constructs the entrepreneurship and innovation training platforms, adopts the staging training mode to train students for the basic skills, the knowledge application ability, the engineering design capacity, the scientific research and development capability and the integrated innovation capability. By combining a modern multi-level integrated manufacturing system with a multi-stage practical teaching mode, the students' entrepreneurship ability is enhanced.

Keywords: Business education, training scheme, innovation capability, experiment platform.

1 Introduction

In recent years, with the rapid development of the Chinese higher education, improving the employment rate of university graduates becomes a top issue of concern to all levels of government and university. And employment opportunities are closely related with the regional economy and social development needs. In addition to the efforts of government, industry and social undertakings, the university should take responsibility and make a difference for expanding employment opportunities. She must adjust the structure of academic disciplines and enhance the cultivation to the students' qualities, skills and innovative ability for the graduates to raise the social adaptability, technical skills and employ ability. That is only one aspect of these efforts. Universities should strive to promote the contribution to the regional economy and social development, and to train the entrepreneurial ability of students. It can have more as. Livening up the university's creative design, cultivating the cultural background of innovation, and correctly guiding entrepreneurship training and design training for college students, can more pool their creative juices and trigger the "explosive" innovative thinking. Innovation is essentially a challenge to the powerful

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and beyond the self. The university's goal to success is to be become the cradle of innovative culture.

2 Definition and Connotation of Entrepreneurship Education

Entrepreneurship education also stresses the students' competitive ability and career ability. However, it further demands that the higher education takes innovation and creativity as the basic connotation to train students for the self-employment ability and quality of predicting consciously changes and replying actively changes in the face of the rapid development and abrupt change of the information society and knowledge economy era. Therefore, that is a kind of active entrepreneurial education.

Entrepreneurship education is rich in content. Designing, setting up, operating and managing an enterprise or company is undoubtedly the important form and content of business and entrepreneurship education, but far short of covering the full content of entrepreneurship education and profound connotation. The career education in colleges and universities should be a deeply fundamental education system, not the minor and surface aspects of education. Entrepreneurship education includes not only improving the students' competitiveness in the job market and developing the students' entrepreneurial capacity through the skills training, but also generally upgrading the students' personality, talents, comprehensive cultural quality and creativity to enhance the students' capacity and power of the pioneering autonomy entrepreneurship.

Innovation and creativity is the inherent nature of entrepreneurship. And entrepreneurship is the concrete embodiment and practice of innovation and creativity. The real sense of quality education is that "Creativity, innovation and entrepreneurship" education is organically integrated. From this perspective, the current entrepreneurship education in colleges and universities also has the minor and surface characteristics of entrepreneurship education. There are some limitations, or even some kind of misunderstanding.

3 Training Scheme

The cultivation of entrepreneurial ability depends on the cultivation of innovation and creativity, while the source and foundation of innovation and the creation is the individuality of talents. The free personal character first needs to establish the diversity of quality philosophy. There are considerable differences in inherent potentiality, disposition, personality, hobby, ambition, talent, adaptability and so on for each individual. The multiple quality philosophy in the modern market economy needs to protect and develop the students' difference and personality with an open and flexible teaching system. The various abilities of students should be given the same emphasis, such as theoretical research ability, scientific reasoning ability, expression skills, writing ability, social organization, practical competence, etc. Students are allowed to develop the some special ability. Only then the various kinds of students are able to fully play their nature and can become the creational talents of characteristic and specialty, such as the theoretic type, the speculative type, the

academic type, the design type, the application type, the management type and the business type. The individualized education needs the credit management system to form the students' positive, self-learning modes.

Our school is a researching university which is prominently characteristic in electronic information, obviously dominant in economics and management, mutually penetrating in multi-discipline. According to the school's orientation, training model and development needs, the students' entrepreneurship development program is presented by considering the main majors of engineering and economic management. Its architecture is shown in Figure 1. The whole system is divided into three levels. The underlying layer is the foundation layer composed of the mechanical and electronic, economic management, and computer disciplines. In the layer the 8 modules are set, such as mechanical design innovation, control system innovation, electronic system innovation, creativity and industrial design, modern management innovation, management information system innovation, manufacturing information system innovation, digital design innovation. The teaching modules are implemented in disciplines, and they are crossed among modules. The teaching links in the middle layer are implemented in main categories. For the engineering students, the teaching on the product's business plans is made. For the economic and management students, the teaching on the project's business plans is made. The top level is the competition for the entrepreneurial design which is operated at the school level for high school students.

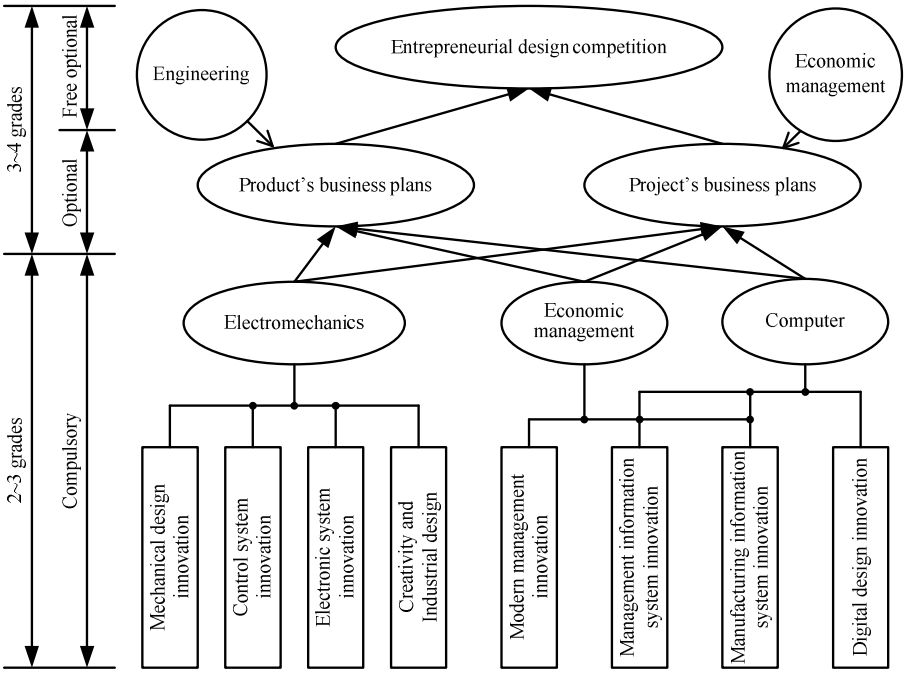

Fig. 1. Architecture of the students' entrepreneurship development program

According to the training program for entrepreneurship, the innovative training and experimental platforms are established for cooperating the teaching of each module, as shown in Figure 2. Each platform consists of several projects. Numerous projects form the basis-level curriculums on entrepreneurial ability. From the systemic point of view, the innovative training and experimental platforms lie respectively in the management decision-making layer, the design and control layer, and the executing layer, which basically reflect the complete view of the modern manufacturing enterprises and the workflow. The teaching in the middle layer is actualized through the engineering training, research project, curriculum design and graduate design links. And, the entrepreneurial design competition in the top layer is held in the school 1-2 times per year.

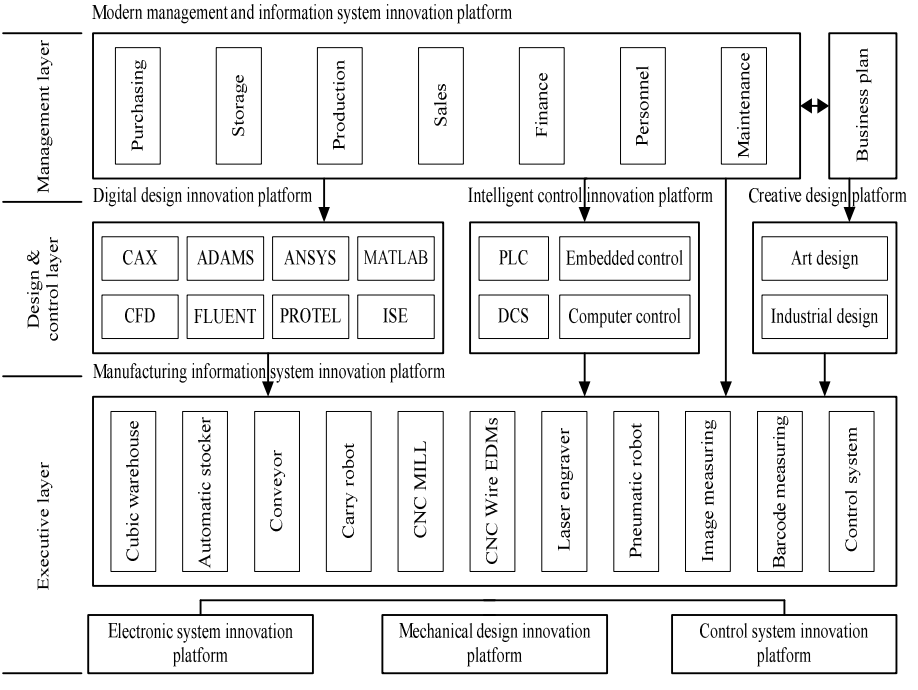

Fig. 2. Innovative training and experimental platform

4 Characteristics of Training Program

(1) Our school is a researching university which is prominently characteristic in electronic information, obviously dominant in economics and management, mutually penetrating in multi-discipline. The training program of entrepreneurship, whether in the organization of the teaching contents, or in the building of the practical platforms, fully embodies the characteristics of information and economic management for running the university.

(2) The modern enterprise can not break away from the advanced production equipments and the production model of integrated automation, but also is inseparable from the superior level of management information and the innovative design capabilities. The entrepreneurship training programs reflect the actual situation of the modern enterprise and the objective requirements. Meanwhile, according to the objective laws of university education, the phased training teaching is adopted to develop the students' basic skills, knowledge application ability, engineering design ability, research and development capacity, and integrated innovation capability. Thus the students' entrepreneurial capacity is enhanced. That can make the multi-level integrated structural system of modern manufacturing enterprises be combined with the multi-phase practical teaching models.

(3) The principle of progressive type and continuous line is used for the students' entrepreneurship and innovation ability in the university. The training programs set the junior and senior training phases to achieve the training span from a low starting point (engineering cognition, basic training) to a high end (integrated innovative training, business design training), throughout the four-year undergraduate course of study.

5 Conclusion

Employment is inferior to entrepreneurship. In the face of the severe employment situation, many students give up fighting for jobs, but chose their own business. In this context, the entrepreneurship education has become increasingly a popular vocabulary of higher education field. Quality education is specialized into training the innovation, creativity and entrepreneurial abilities. That is not by accident, but an inevitable requirement for progress and development of a modern society. Innovation and creativity is the inherent nature and support for entrepreneurship ability, while entrepreneurship ability is the concrete embodiment and practice of innovation and creativity. That innovation, creativity and entrepreneurship education is organically integrated is the quality education in the real sense. Entrepreneurial ability depends on the cultivation of innovation and creativity, while the source and foundation of innovation and the creation is individual talents. The free personal character first needs to establish multiple quality philosophy. The multiple quality philosophy in modern market economy requires an open, integrated and flexible system of education and teaching. Focusing on training entrepreneurial ability, this paper presents the multi-level, comprehensive, open training programs reflecting the characteristics of information and economic management for running the university, establishes the innovative training and experimental platforms, and forms the practical teaching modules of various combinations. At the same time, the heuristic, individualized, mentoring, innovative learning methods and the "Students in the main, teachers guide" model are taken to actively promote the cultivation of the students' individual ability in the entrepreneurship education. Through these series of teaching reform measures, the innovation and entrepreneurship abilities of our students are greatly improved. Especially the students have made unprecedented good results in the various competitions of science and technology. The employment rate over the years is at the forefront of the provincial universities. The number of the students' self-generating enterprises increases year by year.

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Study on the Education Plan of the Creativity, Innovation and Entrepreneurship Ability in University Students

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Abstract. For the engineering institutions and universities, the implementation of the students' creativity, innovation and entrepreneurial abilities, has become imperative. According to our orientation, training model and development needs, combined with the our condition mainly administered by the students of engineering classes and economy & management classes, the education programs of creativity, innovation and entrepreneurial capacity are put forward. The matched experimental platforms are established. According to the educational reform idea of a phased, modular, integrated and open style, the new practical system of a progressive and constant style for the engineering undergraduates is built with the "big engineering education" thought as a guide. Through the years of the "creativity, innovation and entrepreneurship" teaching practice, the student's initiative was developed, the innovative ability and overall quality of our students were greatly enhanced, and the outstanding achievements in the innovative awareness and practical ability won the praise of the employing units.

Keywords: Creativity and innovation and entrepreneurship ability, education for all-round development, education plan, experimental platform.

1 Introduction

In recent years, the Ministry of Education has published the two documents of "the comments on the implementation of the higher education quality and reform project for universities' undergraduate" and "some opinions of the Ministry of Education on further deepening the reform of undergraduate education to improve teaching quality". Improving the quality of higher education has become the major national policies to guide the development of higher education in the new historical conditions and at the new historical starting point. The institutions of higher education shoulder the heavy responsibility of nurturing their new century talents useful in society. Therefore, they must permeate the quality education into all aspects of teaching, throughout the entire training process. Specializing the quality education into the cultivation of the innovation, creativity and entrepreneurial abilities is not by accident, but is an inevitable requirement for progress and development of a modern society. First of all, the vitality and internal energy of a modern market economy comes from the self-awareness and increase of subjectivity and creativity for most members of society. Therefore, higher education is no longer a privilege for the few, but is the

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only way leading to society for more and more people. It is a public or widespread education. As a result, a general increase of the community's creativity and entrepreneurial capacity becomes the fundamental duties of modern higher education. Second, the coming of the knowledge economy and information era, and the strengthening of internationalization and globalization leads to the constant changes in the social industrial structure, the social division of labor, the social level, the social status, the occupation and the job under the market economy conditions. In this case, not only the counterpart elite education has failed, the quality education characterized by the self-career and keeping business in the general sense also has some limitations. In the face of the times' demand, the active entrepreneurship education of knowledge background has become a necessity.

We should implement the development strategies of expanding employment and take entrepreneurship to drive employment, also should speed up the establishment of the technical innovation system that enterprises are the main body of innovation, markets are a guiding, while production, learning and research is combined to lead and support the aggregation of innovative elements to enterprises in order to promote the transformation of the scientific and technological achievements into the practical productive forces. These two aspects give new demands to the functional construction and exertion of our universities. They are the important tasks for colleges and universities to implement the scientific concept of development, change the education sense, deepen the education reform, and promote the educational innovation. For engineering colleges, the implementation of the students' creativity, innovation and entrepreneurial ability, has become a top priority.

2 Training Program Design

The connotation and extension of the three conceptions "creation, innovation and entrepreneurship" are respectively different, but related. "Creative education, innovative education and enterprise education" are the specific applications of the conceptions "creation, innovation and entrepreneurship" in education. They are both related and different, also are the embodiment of quality education. "Innovation" and "creation" are interchangeable to a certain extent, and there is no essential difference between two. The "entrepreneurship" gives "innovation" and "creation" the more specific contents.

For the traditional exam-oriented education in China there are many problems. But the quality education takes improving the national quality as the fundamental purpose, training the students' innovative spirit and practical ability as the key points to stimulate students the sense of independent thinking and innovation, and to cultivate the students' scientific spirit and innovative thinking. Quality education requires that the higher education should pay attention to training students the innovative ability, practical ability and entrepreneurial spirit to raise the students' humanistic and scientific quality. The innovation and creativity is the inherent nature and support of entrepreneurship, while entrepreneurship is the concrete embodiment and practice of the innovation and creativity. In this way, quality education can be concretized into the cultivation of innovative, creative and entrepreneurial abilities.

Creative design is a form of creativity. Cultivation of innovation and creativity has become the fashion of the times. The university's higher education is based on the knowledge innovation and technological innovation system. Its role is to bring up the

high-level professional personnel with innovation and creativity. That the creative consciousness and creative ability is integrated into the whole process of school education is the requirement of the era and social development.

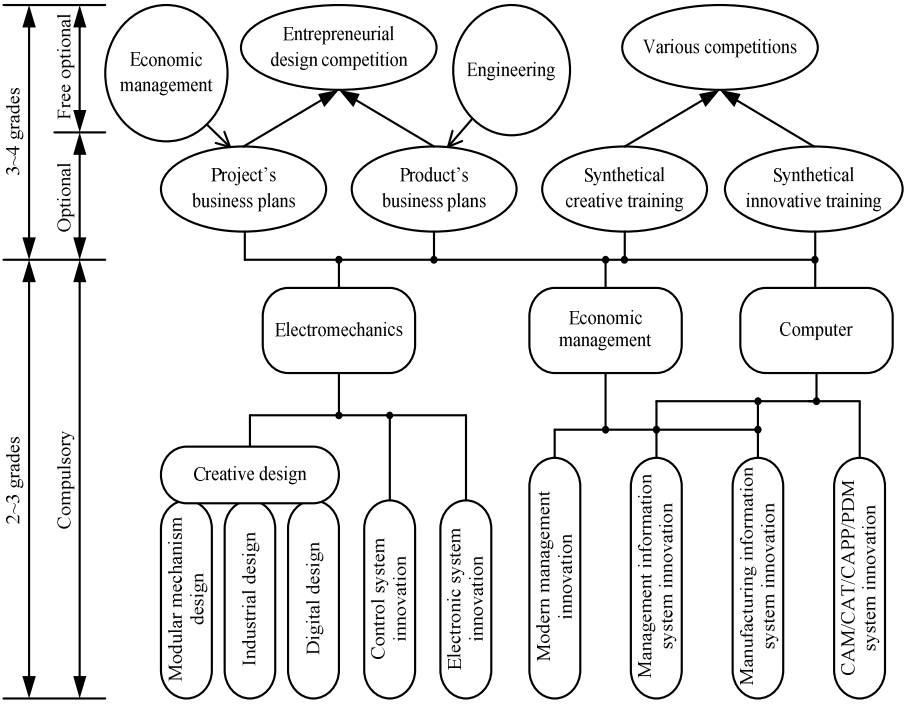

Fig. 1. Architecture of development program

Our school is a researching university which is prominently characteristic in electronic information, obviously dominant in economics and management, mutually penetrating in multi-discipline. According to the school's orientation, training model and development needs, the students' creation, innovation and entrepreneurship development program is presented by considering the main majors of engineering and economic management. Its architecture is shown in Figure 1. The whole system is divided into three levels. The underlying layer is the foundation layer composed of the mechanical and electronic, economic management, and computer disciplines. In the layer the 7 modules are set, such as creative design, control system innovation, electronic system innovation, modern management innovation, management information system innovation, manufacturing information system innovation, CAM/CAT/CAPP/PDM innovation. Among them, the creative design module is composed of modular mechanism design, industrial design and digital design. The teaching modules are implemented in disciplines, and they are crossed among modules. The teaching links in the middle layer are implemented by category. For the engineering students, the three teaching links on the product's business plan, the

synthetical creative training and the synthetical innovative training are made. For the economic and management students, the teaching on the project's business plan is made. The top level is the competition for the entrepreneurial design which is operated at the school level for high school students.

3 Experimental Platform

According to the training program for creation, innovation and entrepreneurship, the experimental platforms are established for cooperating the teaching of each module, as shown in Figure 2. Each platform consists of several projects. Numerous projects form the basis-level curriculums on the student's ability. From the systemic point of view, the experimental platforms lie respectively in the management decision-making layer, the design and control layer, and the executing layer, which basically reflect the complete view of the modern manufacturing enterprises and the workflow. The teaching in the middle layer is actualized through the engineering training, research project, curriculum design and graduate design links. The entrepreneurial design and other competitions in the top layer are held in the school 1-2 times per year.

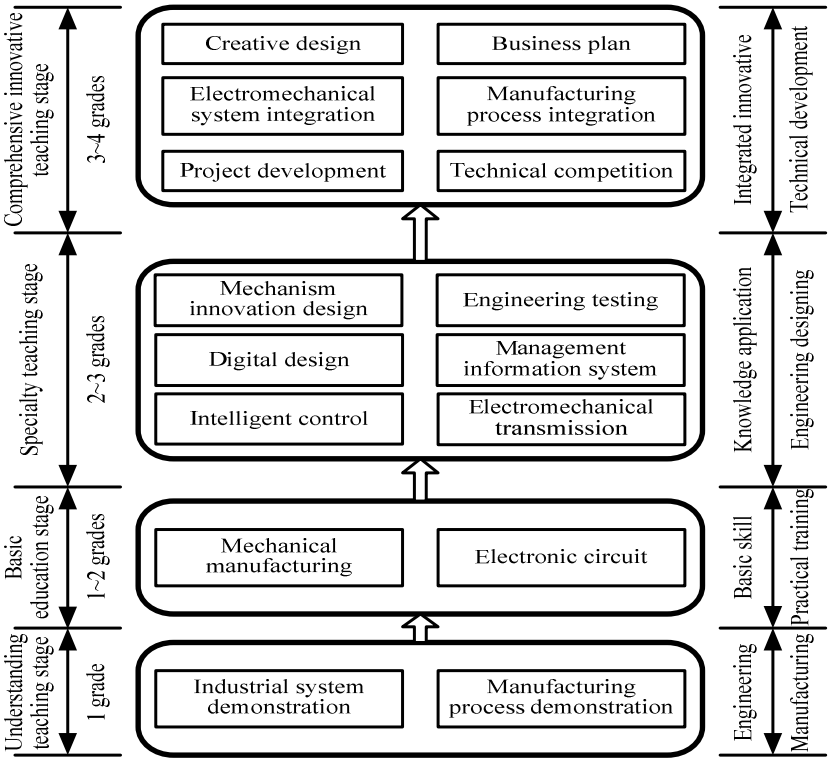

Fig. 2. Experimental platform

4 Setting of Training Module

According to the overall idea of the phased, modular, comprehensive, open teaching reform, the "progressive style, keeping line" innovative teaching and practical program for the engineering students is built taking the thinking of "great engineering education" as a guide. Its architecture is shown in Figure 3. The teaching system is in accordance with the overall requirements of quality and capacity cultivation, and its scientific setting is reasonably connected with teaching at various faculties. Each level contains the plentiful innovative teaching modules. Its teaching contents cover the mechanical, electrical, control, management engineering professional categories. For the school students of various faculties they achieve the training span from a low starting point (engineering cognition, basic training) to a high end (integrated innovative training, business design training), go through from the establishment of engineering concepts, the understanding of industrial systems and manufacturing processes, the basic skill training, the practical ability, the knowledge application ability, the engineering design capacity to the integrated innovation ability and the technology development ability. They have become an important culturing part of the basic quality education and innovation ability for all students in the school.

The understanding stage of the teaching enables students to understand the mechanical and electrical integration of industrial systems, the management and control integration of manufacturing processes, to establish the engineering concepts, and to master the workflow and work model of modern manufacturing processes by mainly visiting, demonstrating, etc. The main contents are understanding and operating of the industrial systems, including the exercising demonstrations for various types of static/dynamic models, the on-site multimedia showing, the virtual simulating demonstration and explanation, the on-site operation and explanation, the hands-on disassembling and assembling of all kinds of tools and gear-reducers. These works are for the economics, management and engineering majors.

The basic education stage enables students to strengthen the basic knowledge of engineering through the practical platforms of the mechanical manufacture, electronic circuits and systems, and teaching the basic skill and engineering operation concepts, and to gradually establish the concepts of the working processes and information processing technology and control systems. That is focusing on the student's basic operational skills and practical training ability. The main contents are the basic engineering training and experiments, including the basic manufacturing technology training, the electronic circuit technology training, the basic training in the financial management information system and the experimental courses corresponding to the "basic courses", "basic courses". These works are for the economics and management and engineering majors.

In the specialty teaching stage the innovative teaching modules of the mechanism innovation design, the engineering testing, the mechanical and electrical transmission, the intelligent control, the digital design, the management information systems, the computer applications are set up to enhance the students' knowledge application ability, the engineering designing capacity in order to enable students to master the key technologies and the modular designing methods for the mechanical and electrical integration of industrial systems and the management and control integration of manufacturing processes. In the teaching modules, the self-design and innovation

projects are set to develop the students' awareness of innovation. That lays the solid foundation for the innovation in the systemic integration and integrated design. The stage includes the comprehensive experiments, modern engineering trainings and curriculum designs. These works are for the engineering majors.

The comprehensive innovative teaching stage trains the students' systemic integration and integrated design abilities in the industrial systems of the electromechanical integration and the manufacturing processes of the management and control integration through the links of the creative design, the business plan, the project development, the technical competition and the curriculum design. The comprehensive engineering training and the cultivation of the innovative ability enables students to have the basic working ability towards a society. These teaching links include the extracurricular activities of science and technology, all kinds of competitions, the enterprise's projects, the innovative funds, the open laboratory projects, and the teacher's research projects. The laboratories open all day. The innovative teaching teams provide directions. Students are encouraged to independently choose the interdisciplinary topics. These works are for the students of spare capacity in the school.

5 Conclusion

The innovative and creative ability is the core of quality education. Innovation and creativity is the external performance of the people's overall quality and comprehensive capabilities. It is based on the deep cultural foundation, the high integration of knowledge, the personal thoughts and the lofty spiritual insight. The latest psychological research shows that innovation and creativity is the syntheses of knowing, personality, social dimensions, involving the psychological, physical, intellectual, ideology, personality and other aspects, and complementing each other. Innovation and creativity can strengthen and enrich the overall quality. In this sense, innovation and creativity is the core of the students' quality, and is the external performance of overall quality. Bringing up the innovative and creative ability is the basis and deepening of quality education.

Innovation and creativity is the inherent nature and support of entrepreneurship. Entrepreneurship is the concrete embodiment and practice of innovation and creativity. That innovation, creativity and entrepreneurship education is organically integrated is the quality education in the real sense. Entrepreneurial ability depends on the cultivation of innovation and creativity, while the source and foundation of innovation and the creation is individual talents. The free personal character first needs to establish multiple quality philosophy. The multiple quality philosophy in modern market economy requires an open, integrated and flexible system of education and teaching. Focusing on training innovative, creative and entrepreneurial abilities, this paper presents the multi-level, comprehensive, open training programs reflecting the characteristics of information and economic management for running the university, establishes the experimental platforms, and forms the practical teaching modules of various combinations. Through several years of the teaching practice of innovation, creativity and entrepreneurship, the students' subjective initiative is brought into play, the innovative ability and comprehensive quality of our

school's students has greatly enhanced, and the students have gotten the outstanding achievements in various competitions of science and technology. Especially in recent years, the employment rate of our school's graduates has been among the best in the universities of our province, and their prominent creative and practical ability wins the employers.

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The Study on Trust Management Model Based on Probability in Distributed E-Commerce System

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Abstract. This paper proposes PTME, which is a probability-based trust management model for distributed e-commerce. PTME can establish trust relations between buyers and sellers in a distributed e-commerce application. By employing a recommendation framework which forms objectively reputation based on both direct observation and indirect recommendation, PTME inhibits the false accusation attack and collusion attack. Also, PTME uses a forgetting factor to expire old observations, which is of great help to defeat on-off attacks.

Keywords: Probability, Trust Management Model, Distributed E-commerce.

1 Introduction

Due to the growth of online transactions and electronic business activities, the design of trust management framework for electronic commerce has attracted much research attention in recent years.

A distributed e-commerce application consists of a collection of users who communicate with each other by exchanging messages. These users might have never met and know nothing about each other's trustworthiness. The lack of information about users' trustworthiness causes mistrust and influences the e-commerce's efficiency.

Traditional security services, such as encryption and authentication, can only identify whether an entity is what it claims to be, and partly qualify whether the entity is capable of performing some specific services. However, it is not enough to simply trust that a legal user will act consistently in all transactions [1]. Researchers have recognized that new tools, beyond traditional security services, need to be developed in order to defend these distributed networks from misbehaviors and attacks that may be launched by selfish and malicious entities [2, 3].

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2 Probability-Based Trust Management Model for Distributed E-Commerce

To solve the above problems with existing frameworks, we propose a probability-based trust management model for distributed e-commerce.

A. Trust Definitions and Metrics

Reputation formation has been extensively studied by economists using the tools of game theory [9]. Reputation encompasses any perfect or imperfect information about participants' history of actions. Trust can simply be defined as the expectation that one participant can put on another participant for a specific action according to previous reputation.

In PTME, a user maintains reputation for other users. We define R_{st} as the transaction reputationof a target user t maintained by a subject user s. It is a random variable which is the probability that t will perform a specific action in s's viewpoint. R_{st} is represented by P {subject: target, action}.

R_{st} is comprised by two parts: $(R_{st})_D$ and $(R_{st})_R$.(R_{st}) $_D$ is established through user s 's direct observations, while $(R_{st})_R$ is established through the recommendations of other users.

We define $RRep_{sm}$ as the recommender reputation of user m from user s 's viewpoint. $RRep_{sm}$ represents the believe level of user s about user m's recommendations. Recommender trust value is determined by both the mean value and variance value of $RRep_{sm}$.

E_{st} denotes the mathematical expectation of R_{st} with respect to its probability measure.

$$E_{st} = E[E_{st}] = E[P\{subject : t \arg et, action\}] \tag{1}$$

V_{st} denotes the statistical variance of R_{st} . V_{st} can capture reputation's scale or degree of being spread out. It can be used by a subject user to differentiate the action stability of different target users who might have a same mean value.

$$V_{st} = Var[R_{st}] = Var[P\{subject : t \arg et, action\}] \tag{2}$$

T_{st} denotes the transaction trust value, which represents the subjective expectation that s has about t 's future actions. To build a more reliable trust value, in our model T_{st} is determined by both the mean value and variance value of R_{st} .

$$T_{st} = E_{st} - w_V V_{st} \tag{3}$$

Where w_V is the weight of V_{st} determined by s 's desire.

B. Probability-based Trust Management

1) Direct Observation and Trust Setup

After an e-commerce transaction, user s evaluates user t's behavior and gives a rating which can be a continuous value. The rating can be normalized as a degree of satisfaction between -1 and 1, S_{st} .General speaking, S_{st} is positive when user s is more likely to be satisfied in the transaction, and is negative when user s is more likely to be dissatisfied. The positive and negative rating can be expressed as a pair

($satisfaction_{st}$, $dissatisfication_{st}$) .Based on direct observation, we utilize Bayesian theorem to estimate the trustworthy of a target user, as shown in Figure 1.

In probability theory, Bayesian theorem can be seen as an extension of logic that enables reasoning with uncertain statements. To evaluate the posterior probability P(H | E) of a hypothesis H given observed evidence E , the Bayesian formula is shown as:

$$P(H \mid E) = \frac{P(E \mid H)}{P(E)} P(H) \tag{4}$$

Where P(H) and P(E) are the prior probabilities of H and E , respectively. P (E |H) is the likelihood of E given H.

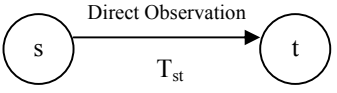

Fig. 1. Direct Observation and Trust Setup

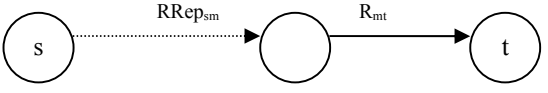

Fig. 2. Distributed Transaction Reputation Propagation

In our model, each observation is given a different weight according to its transaction size. For example, a 1,000 dollars transaction should contribute more transaction reputation than a one dollar transaction. This is an efficient way to defeat on-off attack. We define the unit transaction, which can be seen a probability event with two possible outcomes, $satisfaction_{st}$ and $dissatisfication_{st}$. Each transaction is a combination of n unit transactions, n=1, 2…n.

Let u_{st} be the total number of unit transactions contributing $satisfaction_{st}$, v_{st} be the total number of unit transactions contributing $dissatisfication_{st}$ .Each unit transaction yields $satisfaction_{st}$ with an uncertain probability p_{st} . u_{st} is a random variable which follows a binomial distribution with (u_{st}, v_{st}) and p_{st}.

Since user s does not know the true probability of user t to perform a specific action, it makes an estimation of p_{st} by inference from the previous observations. Clearly, without any prior information, p_{st} is a random variable following continuous uniform distribution on the interval [0, 1]:

$$f(p_{st}) = U(0,1) = \begin{cases} 0 & p_{st} < 0, p_{st} > 1 \\ 1 & 0 \le p_{st} \le 1 \end{cases} \tag{5}$$

From (4), the posterior probability of p_{st}, which is the probability density function of observing outcome satisfaction , can be expressed as:

$$
\begin{aligned}
&f(p_{st} \mid Observed \quad number \quad of \quad satisfication_{st} = u_{st}) \\
&= \frac{f(Observed \quad number \quad of \quad satisfication_{st} = u_{st} \mid p_{st})}{f(Observed \quad number \quad of \quad satisfication_{st} = u_{st})} f(p_{st}) \\
&= \frac{\binom{u_{st}+v_{st}}{u_{st}} (p_{st})^{u_{st}} (1-p_{st})^{v_{st}}}{\int_0^1 \binom{u_{st}+v_{st}}{u_{st}} (p_{st})^{u_{st}} (1-p_{st})^{v_{st}} dp_{st}} \\
&= beta(p_{st} : u_{st}+1, v_{st}+1) \qquad 0 \le p_{st} \le 1
\end{aligned} \tag{6}
$$

From the definition of transaction reputation, we can know that:

$$(Rst)D = P\{subject : t \arg et, action\} = P_{st} \tag{7}$$

2) Distributed Reputation Propagation

In a large distributed system, it is impossible for every user to obtain first-hand information about all other users. As an option, users can rely on recommendations to build reputation of other users. We develop a distributed transaction reputation propagation model shown in Figure 2.

$RRep_{sm}$ is an uncertain random variable which represents the probability of user m to provide an honest recommendation. Since a subject user s does not know the true probability of user m to give an honest recommendation, it makes an estimation of the probability of RRepsm by inference from the previous recommendation observations. For example, if user s adopts user m's recommendation and carries out a transaction with user t. After the transaction, user s will rate user m's recommender reputation based on user t's real behavior. This procedure is similar with that how we get R_{st} . Similarly, we give the density function of RRepsm as follows:

$$
\begin{aligned}
&f(R\mathrm{Re}p_{sm} \mid Observed \quad number \quad of \quad honest \quad recommendation_{sm} = i_{sm}) \\
&= \frac{\binom{i_{sm}+j_{sm}}{u_{sm}} (R\mathrm{Re}p_{sm})^{i_{sm}} (1-R\mathrm{Re}p_{st})^{j_{sm}}}{\int_0^1 \binom{i_{sm}+j_{sm}}{i_{sm}} (R\mathrm{Re}p_{sm})^{i_{sm}} (1-R\mathrm{Re}p_{st})^{j_{sm}} dp_{st}} \\
&= beta(R\mathrm{Re}p_{sm} : i_{sm}+1, j_{sm}+1) \qquad 0 \le R\mathrm{Re}p_{sm} \le 1
\end{aligned} \tag{8}
$$

Where i_{sm} and j_{sm} are the number of user m giving honest and dishonest recommendations, respectively. We can derive that the transaction reputation of user t from user s's point of view:

$$((R_{st})_R) = beta\left(\begin{array}{c}(R_{st})_R;\\ \dfrac{2i_{sm}u_{mt}}{(j_{sm}+2)(u_{mt}+v_{mt}+2i_{sm})};\\ \dfrac{2i_{sm}v_{mt}}{(j_{sm}+2)(u_{mt}+v_{mt}+2i_{sm})}\end{array}\right) \tag{9}$$

Where u_{mt} and v_{mt} are the observed number of satisfaction and dissatisfaction of user t in user m 's point of view, respectively.

3) Combination of Direct Reputation and Indirect Reputation

R_{st} is comprised by $(R_{st})_D$ and $(R_{st})_R$, as shown in Figure 3.

According to user s 's character, different weights, w_D and w_R , are given to $(R_{st})_D$ and $(R_{st})_R$ respectively. For example, a very confident user will give heavy weight to $(R_{st})D$, whereas a user without confidence will give heavy weight to (R_{st}) R .

$$\begin{aligned} &R_{st} = (w_D)_D + (w_R)_R \\ &where\, w_D + w_R = 1, w_D \in [0,1], w_R \in [0,1] \end{aligned} \tag{10}$$

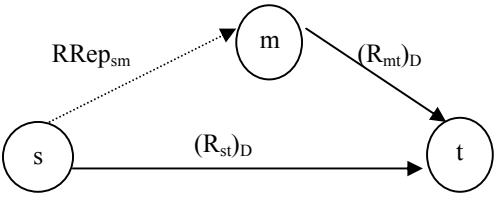

Fig. 3. Combination of Direct Reputation and Indirect Reputation

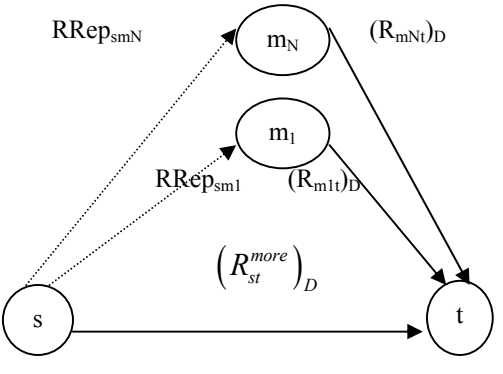

Fig. 4. Reputation updating and forgetting

To normalize Rst, we restrict that $w_D + w_R = 1$, and $w_D \in [0,1], w_R \in [0,1]$.

4) Reputation Updating and Forgetting

Assume that user s has build some transaction reputation, R_{st}^{old} , for user t , through direct observation or indirect reputation propagation.

User s may again directly transact with user t for $\left(u_{st}^{more} + v_{st}^{more}\right)$ more times, including u_{st}^{more} times of satisfaction$_{st}$ and v_{st}^{more} times of dissatisfactionst .Then we can update R_{st}^{old} and get the new direct reputation $\left(R_{st}^{new}\right)_D$ based on Bayesian formula:

$$\begin{aligned} &P\left(\left(R_{st}^{new}\right)_D \mid New\ \ Observed\ \ number\ \ of\ \ satisfication_{st} = u_{st}^{more}\right) \\ &= \frac{P(u_{st}^{more} \mid \left(R_{st}^{new}\right)_D)}{P(u_{st}^{more})} beta\left(\left(R_{st}^{old}\right)_D; f_{st}u_{st}^{old}+1, f_{st}v_{st}^{old}+1\right) \\ &= beta\left(\left(R_{st}^{new}\right)_D; f_{st}u_{st}^{old}+u_{st}^{more}+1, f_{st}v_{st}^{old}+v_{st}^{more}+1\right) \end{aligned} \tag{11}$$

Where fst is a forgetting factor? f_{st} is an important factor because the recent action of a user is more close to its future actions. Here, f_{st}=0 means user s only uses the most recent observation to predict the future behavior of user t , while f_{st} = 1 means user s forgets nothing.

User s may also again obtain some new recommendations from user $m_i, i \in (1,2,...)$, and updates $\left(R_{st}^{new}\right)_R$ based on Bayesian formula.

5) Trust Value Computation

To build a more reliable trust value, T_{st} is determined by both the mean and variance value of R_{st}. From (3) and (10) we can derive that:

$$\begin{aligned} &T_{st} = E_{st} - w_V V_{st} = E[R_{st}] - w_V Var[R_{st}] \\ &= w_D E[(R_{st})_D] + w_R E[(R_{st})_R] \\ &- w_V (w_D^2 Var[(R_{st})_D] + w_R^2 Var[(R_{st})_R] + 2w_D w_R Cov[(R_{st})_D, (R_{st})_R]) \end{aligned}$$

Where w_V is the weight of V_{st} determined by s 's desire.

3 Performance Evaluation

C. Rationality of Importing Variance Value

To build a more reliable trust value, we determine trust value both by the mean value and variance value of reputation. In this section we analyses the necessity of importing the variance value of reputation.

From Figure5 we can see that the variance value is bigger when total observation number is smaller. This is because the variance value of reputation reflects the reputation's scale or degree of being spread out. Thus, when two e-commerce users

have a same mean value, the variance value will be an important factor to differentiate their actions in the future.

D. Effectiveness against False accusation and Collusion Attacks

For that recommender reputation is independent of transaction reputation, PTME can efficiently defeat false accusation attack and collusion attack?

From Figure 6 we can observe that the recommender trust value of a user will become very small when it cheats a subject user continuously. The result is that the subject user will never adopt the recommendation of the malicious user. Thus, the false accusation attack and collusion attack can be avoided.

E. Effectiveness against On-off Attack

One kind of on-off attacks is that a malicious seller obtains a good transaction reputation by selling low-cost products, and then deceives buyers by selling expensive products. To defeat this attack, we introduce the concept of unit transaction. In PTME, big size transactions contribute more transaction reputation than small size transactions.

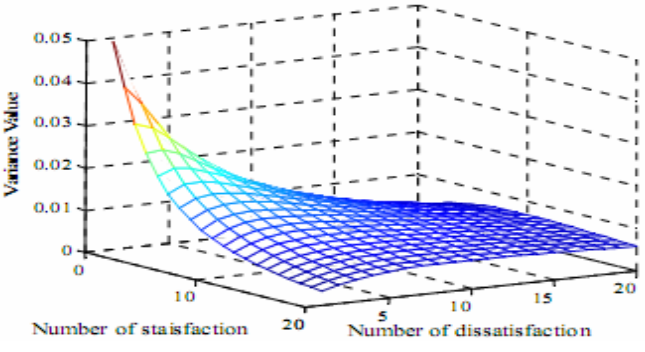

Fig. 5. Rationality of importing variance value

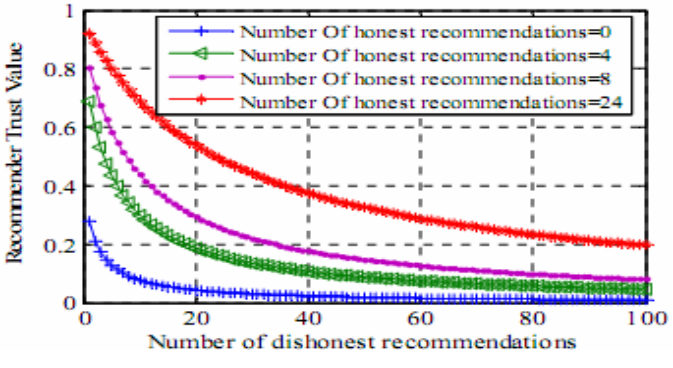

Fig. 6. Effectiveness against false accusation and collusion attacks

Figure 7 shows two curves, one for our model, and the other for the models not considering a transaction size. When the transaction size is not considered, a deceive on a 500 dollars' transaction decreases little reputation that are established by good behaviors on 25 times one dollar's transactions. Whereas, when the transaction size is considered, the transaction reputation of this malicious user will decrease very sharply.

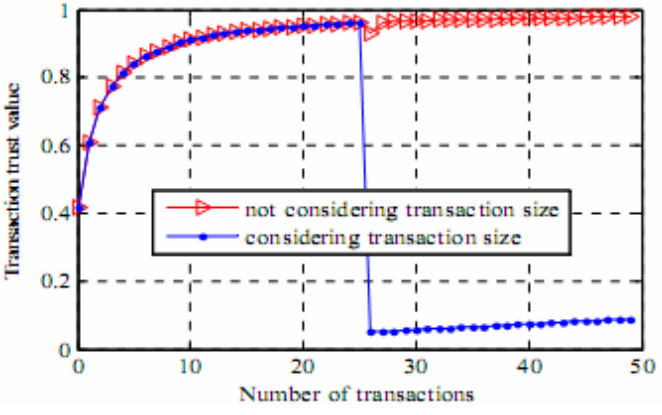

Fig. 7. Effectiveness against On-off Attack

4 Conclusions

In order to fight against conflicting behavior attack, PTME utilizes two independent metric to describe users' transaction reputation and recommender reputation. Furthermore, benefit from the probability approach, both the mean value and variance value of reputation are included in our model to build a more reliable trust value for e-commerce users.

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Modified Iterative Decoding Algorithm for BICM-ID

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Abstract. Bit-interleaved coded modulation with iterative decoding (BICM-ID), which possesses low complexity, strong agility, high spectrum efficiency and excellent BER performance, has been a key technique for next generation of wireless communication. The critical technology of BICM-ID is the feedback between the demodulator and the decoder, and also lies in the decoding between adjacent iterative. In the process of iterative decoding, the extrinsic information and the received systematic observations exert different influence on decision-making as the channel SNR changes. By multiplying a weighted coefficient for the priori information, this paper proposed a novel iterative decoding algorithm for BICM-ID. The improved scheme alters the proportion of the extrinsic information and the received systematic observations in the soft outputs of decoding. In this way, turbo decoding can trace the changes of channel and obtain improved performance. Simulation results show that the proposed scheme can lower the error floor of BICM-ID.

Keywords: Bit-interleaved coded modulation with iterative decoding, extrinsic information, priori information, weighted coefficient.

1 Introduction

Bit-interleaved coded modulation (BICM), first introduced by Zehavi [1] and further studied by Caire [2], is a technique to achieve larger coding gain for bandwidth efficient transmission. The performance of BICM can be greatly improved through iterative information exchange between the demapper and the channel decoder. This system, introduced in [3] [4], is usually referred to as BICM with iterative decoding (BICM-ID).

BICM-ID technique is a bandwidth efficient transmission scheme which can increase the free Euclidean distance by the knowledge of other bit values. In recent literatures [5]-[9], two class methods have been presented to improve performance of BICM-ID. One class is based on searching for optimal constellation [5]-[7]. The other class is based on constructing modified iterative receiver [8] [9]. In [10], many factors that effect performance of BICM-ID were analyzed.

In Li's iterative decoding scheme, the bit-metric generation at the demodulator is improved with the soft information feedback from the convolution decoder. This improves the performance of BICM with higher coding gain. However, the proportion between the extrinsic information and the systematic information is always 1:1. Moreover, the proportion is invariable when the channel SNR changes.

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In this paper, we proposed a modified iterative decoding scheme based on the channel SNR, which has different proportion between received observation and complementary estimate in soft outputs of decoder as SNR changes. The improved scheme is to extract the extrinsic information and speed up the convergence of iterative computation.

The remainder of this paper is organized as follows. The next section describes BICM-ID system, including symbol mappings and characteristic parameters; in Section 3, an iterative decoding algorithm is given. Simulation results are presented in Section 4. Finally, Section 5 concludes this paper.

2 Background of System Model

A. The BICM-ID System

BICM-ID model is represented by the block diagram of Fig.1. The transmitter is made up of a binary encoder followed by a bit-by-bit interleaver and a modulator modeled by a signal set S composed of $M = 2^m$ complex signals. The interleaved sequence of coded bits is broken into subsequences of m bits. Subsequently, each subsequence is mapped to a complex signal in S according to a certain constellation. To achieve a better performance, iterative decoder with soft output is employed.

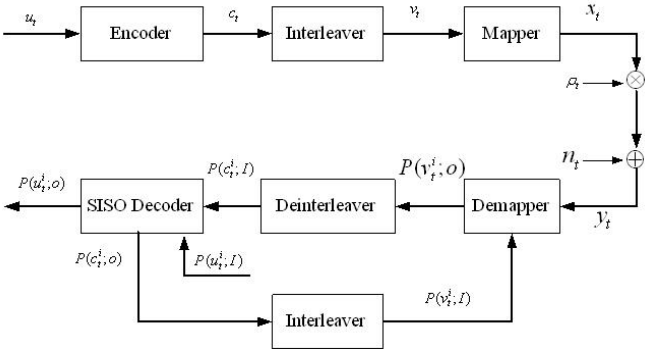

Fig. 1. BICM-ID system

Denoting an interleaver output by $v_t = [v_t^1, v_t^2, v_t^3]$, a signal labeling map by μ, and the corresponding 8PSK signal at time t by x_t,

$$x_t = \mu(v_t), x_t \in \chi . \tag{1}$$

where the 8PSK signal set is $\chi = \left\{\sqrt{E_s}e^{j2n\pi/8}, n = 0,\ldots,7\right\}$, and E_s is the energy per channel symbol. For an ordinary channel with coherent detection, the received discrete-time signal is

$$y_t = \rho_t x_t + n_t . \tag{2}$$

where ρ_t is the Rayleigh-distributed fading amplitude with $E(\rho_t^2)=1$. When ρ_t is a constant ρ, this channel is called as a flat fading channel. For AWGN channels, $\rho_t=1$. And n_t is complex white Gaussian noise with variance y_t.

In the receiver the demodulator processes the received complex symbols y_t and the corresponding priori loglikelihood ratios (LLR) of the coded bits

$$L_a(c_t(i))=\log\left[\frac{P(c_t(i)=0)}{P(c_t(i)=1)}\right]. \tag{3}$$

and outputs the extrinsic LLRs

$$L_e(c_t(i))=\log\left[\frac{P(c_t(i)=0|r_t,L_a(c_t))}{P(c_t(i)=1|r_t,L_a(c_t)))}\right]-L_a(c_t(i)). \tag{4}$$

B. Conventional Iterative Decoding for BICM-ID Using Soft Feedback

BICM-ID adopts revised BCJR algorithm, the Log-likelihood ratio (LLR) of decoder in relation can be induced as follows:

$$L(v_t)=\log\frac{p(y_t^c/v_t^s=1)}{p(y_t^c/v_t^s=0)}+\log\frac{\sum_m\sum_{m'}\sum_{j=0}^{1}\gamma_1(y_t^s,m',m)\alpha_{t-1}^j(m')\beta_t(m)}{\sum_m\sum_{m'}\sum_{j=0}^{1}\gamma_0(y_t^s,m',m)\alpha_{t-1}^j(m')\beta_t(m)}. \tag{5}$$

where y_t^c and y_t^s are the data information and checking information in the receiver respectively.

As the channel is a flat fading one and by using 8PSK modulation, the observation of received signals is as follows:

$$y_t=\rho\sqrt{E_s}(e^{j2n\pi/8})+n_t \quad n=0,...7. \tag{6}$$

Thus the first item in right side of (5) is equal to:

$$\log\frac{p(y_t/v_t=1)}{p(y_t/v_t=0)}=\frac{\rho E_S}{N_0}y_t. \tag{7}$$

This expression above is mainly depended on the observation y_t of received systematic information, where the coefficient $L_c=\rho E_S/N_0$ is called as reliable value of channel. The second item in right side of (5) is complementary estimate in relation to received observation y_t from other symbols by iterative decoding, which is called as the extrinsic information.

As is shown in Fig.2, the relationship between extrinsic information and channel observations, priori information, and soft output of iterative decoding is supposed to satisfy the following relation [11]:

$$L_e(v_t) = L(v_t) - [L_c y_t + L_a(v_t)]. \tag{8}$$

On the *l*th iteration, the iterative MAP decoder calculates the a posteriori probability (APP) for input systematic bit v_t using the following equations [12]:

$$L_l(v_t) = L_c y_t^s + L_{a,l}(v_t) + L_{e,l}(v_t)\ . \tag{9}$$

$$L_{a,l}(v_t) = L_{e,l-1}(v_t) \tag{10}$$

where $L_l(v_t)$, $L_{e,l}(v_t)$ and $L_{a,l}(v_t)$ are respectively the APP, the extrinsic information and priori information of v_t calculated at the *l*th iteration by decoder.

In the iterative decoding process, the extrinsic information derived from the last iterative in the decoder is used as the next iterative priori information. Likewise, the relationship between adjacent iterative go on until iterative being stopped. In our simulation in Section 4, iterative will be stopped when the iterative number is 10.

3 The Improved Iterative Decoding Algorithm for BICM-ID

We have known that the output of BICM-ID decoder is composed of three parts: systematic observation, priori information and extrinsic information. The priori information derives from the extrinsic information of the decoder in the last iterative decoding computation. So the extrinsic information can be seen as a complement estimate to the corresponding received systematic information from other symbols by iterative decoding.

Let the priori information multiples a weighted coefficient w, we can adjust the proportion of the extrinsic information and the systematic information in order to adapt the channel changes. In this way, (9) and (10) should be rewritten as follows:

$$L_l(v_t) = L_c y_t^s + w \cdot L_{e,l-1}(v_t) + L_{e,l}(v_t)\ . \tag{11}$$

When $w = 1$, it is the conventional decoding scheme for BICM-ID.

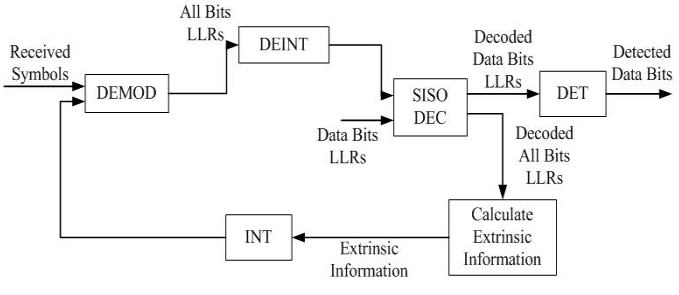

Fig. 2. Iterative decoding process of BICM

4 Simulation Results and Analysis

In this section, the effects of BICM-ID on the performance in various weighted coefficient are provided. Simulations are performed by using Monte-Carlo method and linear-log-MAP iterative decoding algorithm, where a random interleaver was adopted with an interleaving size 5114bits. The generator polynomial of eight-state convolutional encoder is (133,171) with the rate-1/2, and the constraint lengths of convolutional codes is 7. The iteration number is set to be 10 and SP labeling is considered in all the simulations. We focus on the bit error rate (BER) performance over Rayleigh fading channels.

Fig.3 and Fig.4 denoted the comparisons of BICM-ID decoding results under the conditions of different weighted coefficients. From (11), we have known that as weighted coefficient rises, the systematic bit observation included in extrinsic information for the next iterative decoding stage is smaller. Thus, within the likely soft outputs of iterative decoding, the complementary estimate extracted from other symbols relatively increases. This applies to the channel circumstance with high noise interference. Its results are shown in Fig.3 where per-bit SNR is -0.6 dB, low SNR but high noise interference.

From Fig.3 we know, when calculating the likely soft values and extrinsic information, by setting the weighted coefficient of priori information as 0.8, we can achieve the lowest BER; While, if the weighted coefficient is set as 1.5, the performance of error-correction is the worst. In Fig.4, per-bit SNR is 6.0dB, high SNR but low noise interference. When making decisions, observation information plays a more important role. The performance of error-correction is better when weighted coefficient is 1.5 than 0.8, and the error floor of BER is lower.

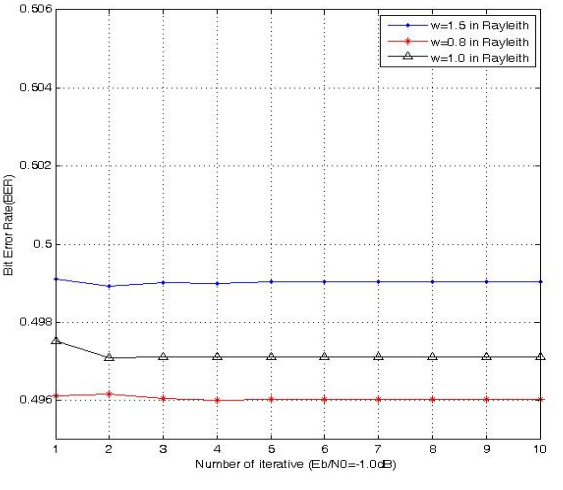

Fig. 3. Comparison of decoding results for variable weighted coefficients (Eb/N0=-1.0dB)

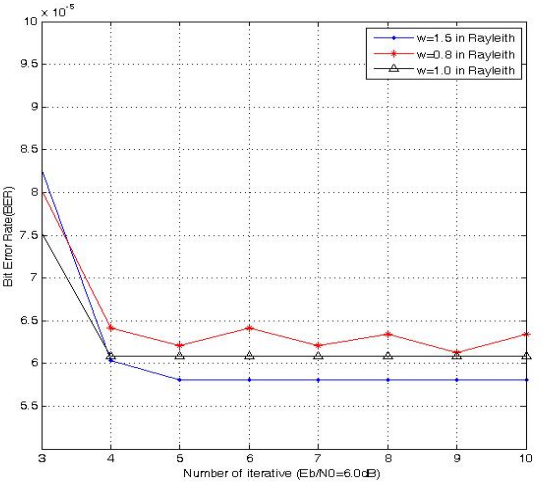

Fig. 4. Comparison of decoding results for variable weighted coefficients (Eb/N0=6.0dB)

The comparison results between weighted coefficient scheme and conventional scheme are shown in Table 1. After regulating the weighted coefficient in terms of different channel conditions, the error-correcting performance of BICM-ID decoder at variable SNR could be further improved.

Table 1. Comparisons between Weighted Coefficient Scheme and Conventional Scheme over Rayleigh Channels

SNR(E_b / N_0)	-1.0dB	-0.6dB	0.5dB	6.0dB
Value of weighted coefficient (w)	0.8	0.8	1.5	1.5
BER of conventional scheme	0.497117	0.497399	0.490843	0.000061
BER of improved scheme	0.496033	0.497089	0.489223	0.000058

5 Conclusions

In this paper, a modified iterative decoding algorithm for BICM-ID is proposed, which adjusts the proportion between the extrinsic information and the systematic information as SNR changes. Simulation results show that the proposed scheme can improve the decoding performance of BICM-ID. In this way, iterative decoding of BICM can trace the changes of channel and proceed in the optimal state.

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Multi-mobile Agent Architecture for On-Line Mutual Funds Trading in India-A Hybrid Approach

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Abstract. In this paper, we propose Multi Mobile Agent Architecture for On-Line Mutual Funds Trading. This is an E-commerce application, which helps individual investor to plan and invest his money in an efficient and secured manner. Investors can collect, filter, combine and integrate financial portfolio related information which are provided through various Internet services like web databases, WWW etc using intelligent and multiple agents. This can provide complete Internet based and inexpensive solution for buying and selling of the mutual funds on-line to the investors. The Indian Mutual funds Industry has been chosen as the case study for the design and implementation of the proposed system. This architecture is being developed using Java based Mobile Agent platform called "Aglets Software Development Kit 2.0.2", mysql has been used as backend for data storage requirements.

Keywords: Multi Mobile Agents, Mutual Funds, Aglets, Pull model, Mutual Funds Company Super Market, Push Model, Hybrid.

1 Introduction

With every passing day, e-commerce is becoming very popular in the business world due to its potential of lower costs, lower business cycle time, faster customer response and improved service quality. As more and more products are traded on the Internet, the need for better and customized online system is ever increasing. The introduction of personal finance software agent is helping individual investors a lot in diversification and management of their financial assets. The mutual funds industry has exploded to more than 20,000 in number, holding a total asset of US$ 10 trillion [3]. Several mutual fund companies have reacted to the challenges from e-commerce. They have set up websites, have put account services on-line, and have allowed online transactions.

Fidelity [7], an individual investor mutual fund family, has built a mutual fund called "Super Market" that consists of over 6000 mutual funds from different companies. Investors can access their accounts and search for information about stocks,

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funds and policies. Fidelity facilitates transactions such as investing on funds, dividend and capital gains distributions, automatic investment on a monthly or quarterly and buyback etc, through Electronic Fund Transfer. Nevertheless, we feel there is a need to go beyond information retrieval and carryout more active investor counselling which will aid in their personal financial portfolio planning. Also physical transaction process can be substituted with an Internet based, streamlined, secure and cheaper online transaction.

We have proposed, designed and realised an on-line mutual funds trading system in an Internet banking and payment environment. The new system can offer much more benefits to the online investors than ever before.

This paper presents a new mutual funds market system that assists in doing it yourself (DIY) investors to select and manage their portfolio with Multi Intelligent Mobile Agents. We have also designed an online transaction protocol that imports an online banking agent (e-banking), Internet banking and payment to co-ordinate with mutual fund companies and banks for providing a complete Internet based solution.

2 System Design

This section introduces the various functions of the system .In this section, we also describe the system architecture and new techniques used. Following are the building blocks of the architecture. It consists of four main modules [1] namely user module, Mutual Funds Company Super Market module, Internet Banking and Payment module and Share and Stock Market module.

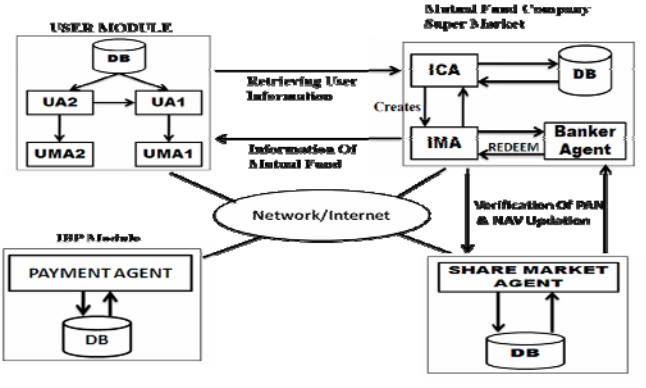

Fig. 1. Architecture

A. User Module

The user (investor) is a person who invests money on one or more mutual funds provided by Mutual Funds Company. The process flow and module architecture is shown in the Fig. 2 below. This module also maintains a database for the purpose of tracking user investments.

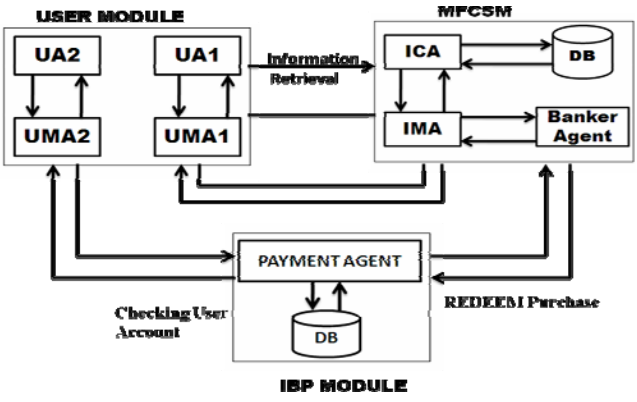

Fig. 2. User Module

Following tasks have to be performed in order to complete her/his investment plan.

- She/he should have registered account in Internet banking and Payment module with sufficient balance.
- Module should help the user to register with the Mutual Funds Company Super Market.
- Should enable logging through the MFC Super Market Web site for browsing, consulting, managing or negotiation using mobile agents.
- Should facilitate task of buying, redemption (buyback) and transfer of funds to other mutual funds using mobile agents.
- Checking account status, transaction history and portfolio if necessary

In order to carry out the above tasks, this module takes the help of the following two pairs of agents,

a. User Agent 1(UA1)
b. User Mobile Agent(UMA1)
c. User Agent2(UA2)
d. User Mobile Agent2(UMA2)

1) User Agent1 (UA1): This agent is created by user in the user module. It acts as an interface to create User Mobile Agent [UMA1]. These agents are used mainly for the purpose of information retrieval. They enable the user to obtain information such as Arrival of new Mutual funds, new companies registered with Mutual funds Company super Market, or updation of NAV's of the existing mutual funds, etc.

2) *User Mobile Agent1 (UMA1):* This agent is created by UA1 to perform the retrieval of information. This agent acts as a helping agent for UA1 in getting necessary information from mutual funds company super market as and when required by the user.

3) *User Agent2(UA2):* This agent is a stationary agent completely responsible for giving orders for investment, redemption\(buyback) and transfer of funds to other mutual funds. This takes the help of User Mobile Agent2 for accomplishing this task.

4) User Mobile Agent2 (UMA2): This agent is created by UA2 for performing the above mentioned functions.

B. Mutual Funds Company Super Market.

It is a company which creates and manages the Mutual Funds. Its website acts as the interface and front-end to streamline the investors and give them online investing experience. We have designed its business service architecture at the backend for providing secure on-line transactions as well as assistance for better decision and management of their mutual fund assets. MFC supermarket module provides the following services,

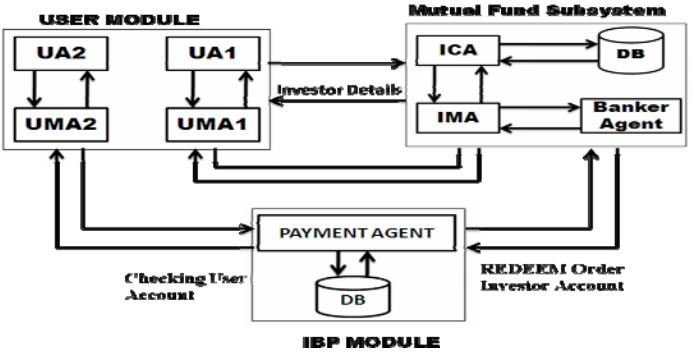

Fig. 3. Mutual Funds Company Super Market

- It allows the admin of the module to validate and register Mutual Funds Company with the Super Market.
- Assists investors in selecting mutual funds best suited to them by looking at their preferences, constraints and the economic climate etc. Online chat is also provided to make it more interactive.
- New investors can register themselves with the MFC Super Market and check for the availability of mutual funds which suit their profile. They can then invest on the funds
- The investor can also redeem her/his fund totally or partially at the prevailing price. The money is then transferred to her/his account on Internet Banking and Payment module.
- The company distributes the dividend and capital gains the way the investor wants such as transferring to her/his account or re-investing.
- Allows investors for systematic investment plan. For example, a fixed amount say Rs.2000.00 will be deducted automatically every month and transferred to the mutual funds account Investors can retrieve all required information such as portfolio, performance, Policies etc.
- The Investor agent is responsible for pushing the IMA's to share market sites to get the updated NAV's of all mutual funds registered with supermarket. Here it follows the Push model of e-commerce.

In order to provide the above services to investors, the Mutual Funds Super Market module should consists of the following Agents.

1. Investor Controller Agent or Investor Agent
2. Investor Mobile Agent (IMA)
3. Banker Agent. (BA)

1) Investor Controller Agent (ICA): This is a stationary agent. It is used for several purposes like, creating an investor mobile agent and filling that agent with the itinerary details of share and stock market server. It also prepares necessary questionnaire for investors with the purpose of creating the investor profiles at MFC Super Market. It processes the requests from User Mobile Agent and provides the services to it. It helps to retrieve the information required by the user for investing her money in a proper manner. It has an interface with the banker agent for the purpose of money transactions.

*2) Investor Mobile Agent [IMA]***:** This agent is created by investor agent to send the questionnaire to the user creating the user profile at super market and to get the NAV'S from the share market.

3) Banker Agent [BA]: This is another stationary agent of Mutual Funds Company Super Market. It deals with payment issues such as checking balances and making payments on purchase of mutual funds.

C. The Internet Banking and Payment Module.

This is an open Electronic Payment system which settles mutual funds transactions via fund transfer between the investors account and the MFC Super Market. It can act as a virtual bank or be associated with real banks on the basis of the set of open data transmission standards and security protocols. Following are the services that are provided by the system.

- The investor and the MFC Super market open accounts on-line with IBP
- The financial transaction between the investor and MFC takes place through IBP.
- IBP provides a number of services for on-line transactions including transaction authorisation and payment capture. All the transactions between Super Market and the investor such as buy back, dividend and capital gains distributions, automatic investments etc.., can be accomplished through IBP. It is ensured that this transaction is transparent to both MFC and investor.

The above functionalities can be achieved by having one Stationary agent called payment Agent.

1) Payment Agent (PA): This agent is used to process the payment request in a transaction. IBP is a distributed system which may be distributed across the world. Each IBP is localized and customized to local customers and local banks. One IBP is associated with one or more banks, so is the bank. Every IBP has complete information about any other IBP so that a global communication and transaction system can be set up. Thus, the scenario of "Anywhere, Anytime" which any mutual fund investor expects can be realized.

The agents and their functionalities of this module are represented pictorially in the Fig. 4.

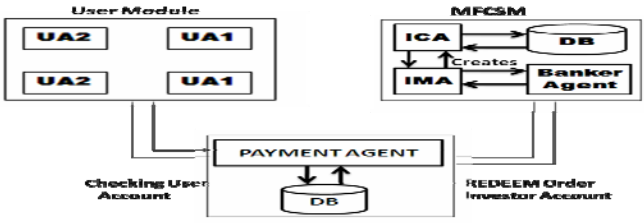

Fig. 4. Internet Banking and Payment Module

D. Share and Stock Market Module

This module consists of one static agent called share market agent [2]. This agent is responsible for updating the NAV for each mutual fund from various companies when IMA Submits the Query. This is also responsible for verification of the PAN number during the purchasing of the mutual funds.

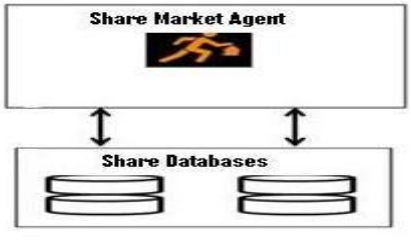

Fig. 5. Share and Stock Market Module

3 Working Procedure

This section deals with the procedures necessary for completing a single transaction. The procedures are as follows.

- Registration
- Selection
- Placing an Order
- Purchasing

A. Registration

The sequence of events is as follows

1) *Investor Account Registration:* The investor should obtain an account from IBP by registering himself with the IBP. Front–end (Interface) will be provided to the investor to fill in his details. After he submits the relevant data, the verification for identity is done and if found correct, his registration is confirmed and an account number is allocated to him.

Investor should also get registered with MFC Super Market Sub System through the User Interface. When the registration is successful, he is assigned login name and password.

2) Mutual Fund Company Account Registration: MFC Super Market has to register with IBP. Once this is done, it is assigned an account number.

B. Mutual Funds Selection Process.
The goal of the Mutual fund selection process is to select a feasible mutual fund from a large pool of mutual funds. The investor specifies his own preferences and or constraints based on which the Investor agent determines suitable funds by executing the queries given by the User Mobile Agent1. The selection process can be virtualized as an autonomous procedure described as a sequence of steps given below,

Step1: Identification and Analysis of the Users goals, needs and constraints.
The first step is to build the investor's profile and try to determine the investor's investment objectives. In order to accomplish this task, the Investor agent creates an Investor mobile agent and stuffs that agent with a questionnaire which contains various questions such as age, experience, forecasting ability, risk tolerance etc. After these questions are answered either by stationary User Agent1 or directly by the user, the Investor mobile agent is retracted by the Investor Agent. The information is stored at the backend maintained at the MFC Super Market module.

Step 2: Analysis of All the Available Mutual Funds.
The banker agent analyses all the funds based on their underlying investment objectives, risk profiles, fund Manager's reputations, experience rates and so on. Based on these, the profile of each fund is created and is maintained at the super market's backend.

Step 3. Selection of Appropriate Mutual Fund.
The objective of this step is to find a match between the investor's profile and that of the fund. The match actually decides the appropriate funds for the particular investor. This functionality can be accomplished as follows.

First, User Agent1 creates User Mobile Agent1 and dispatches it to the super market by specifying its IP-Address or URL in its itinerary. After reaching the super market, it contacts Investor agent to retrieve the details of Mutual funds available in the funds profile at the back end. Now the Investor Profile is matched with the funds Profile. Once a match is found, investor agent fills-in this result in User Mobile Agent1 and looks for more matches. Once all the matches have been found, the agent returns to the source and displays selected funds at the investor or user system. The investor then determines whether to invest in all or some of the funds. This can be manually done also. This negotiation procedure may loop for several rounds. At last, the investor selects funds in which she/he wants to invest. She/he then follows the purchase and payment procedure.

C. Purchase and Payment Procedure.
The transaction procedure is based on the inbuilt java security mechanism incorporated in Aglets framework. It provides the important properties like authentication of participants which is a very preliminary stage in providing the security for transaction.

The IBP acts as a financial institution with which the super market and investor establish their accounts for processing payment on-line. Investor and MFC are authenticated, only if they provide the PAN number.. The purchase and payment execute in the following sequence.

- User Agent2 submits its funds selection form to the created User Mobile Agent2, in which selected mutual funds are described in detail. This form will later be used as Mutual fund order information (OI). UMA2 reaches MFC Super Market and resides there for performing the payment task. During this time, it is not necessary for User Agent2 to be online because once it dispatches its user mobile agent 2, the further task will be carried out by the mobile agent itself.
- UMA2 agent gives Order information (OI) to Stationary Investor Agent (IA). IA transfers this OI to banker Agent. Banker Agent checks the user account for accomplishing the task. If sufficient fund is available, then it is not necessary to transfer money from IBP. The confirmation message will be sent back to the Mobile agent to inform the investor. The investor's portfolio management is processed based on the request.
- User Mobile Agent2 creates the message agent and conveys this message to the investor by dispatching the message agent to the user**.** Otherwise, the banker agent will assign a unique transaction identifier to the message and then pass its own signature certificate cert (IBP) along with the Transaction ID to mobile agent.
- Now UA2 takes Order Information (OI) of selected mutual funds. The message is stuffed in UMA2 along with itinerary and dispatched to MFC Super market. Finally, the Investor agent and Banking Agent complete the transaction ad enters the transaction in the transaction log.
- Banker agent verifies the investors PAN number and forwards it to IBP for authorization. If the authorization response form of IBP indicates that the transaction is approved, then BA pursues the service stated in the request form and at the same time generates and sends the purchase complete message back to UMA2.
- User Agent2 retracts the mobile agent and receives message from Super Market. If everything is correct, it takes on those actions indicated in the response message.

4 Conclusion

Multi-Mobile Agent Architecture for On-Line Mutual Funds Trading is a very good solution to handle day to day investment needs of Do It Yourself kind of investors in the Mutual Funds Industry. This work proves to be a very efficient way of handling investments without wasting much time in searching, collecting and filtering mutual funds as most of the works in transaction processing are automated. The use of mobile agent is very useful in working using connections which are unreliable. Also the short falls of traditional client server architecture can be overcome. Our future work is concerned with providing the security for transaction process of the system by modifying the Secure Electronic Transaction Protocol.

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Research on Product Family Modeling Method for Design Resource Reuse

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Abstract. In order to solve the problem that design resources can not be effectively managed in the process of product rapid response design, a product family modeling method of design resource reuse-oriented is proposed, and design resources reusable model based on the level of feature base is established. Based on Generic Bill of Materials (GBOM) structure tree of product family and master model technology, product family variant parameters transmission structure model is constructed, and product family design resource is established through instantiation to master model so as to realize product configuration and variant design in the construction of resource base. In the developing process of the rapid response design system of machine tool component, the Linear Motion (LM) rolling guide variant design subsystem is developed by the application of the above methods to realize the variant design and configuration management of LM rolling guide. The result shows that the method can provide a reliable guarantee for establishment and effective management of corporate design resource base.

Keywords: Rapid response design, Design resource reuse, Product family modeling, Variant design, Master model.

1 Introduction

Design resources reuse is a key technology of rapid response design, collaborative design and virtual design. In the current modeling methods that support product design reuse modeling, reuse of design resources is achieved primarily by the method of configuration management and variant design. The researchers mainly adopt the method of combination of three-dimensional model and process controlling, according to the design requirements of parts or components, a set of design parameters which can control the shape of three-dimensional model and topological relations is established. And relations and constraints among parameters are also established. Finally, certain parameters or partial structure of product is modified through the application of the idea of size variant design; the value of certain

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parameters and relations is updated so as to drive the model to generate new similar products, which can achieve the purpose of resource reuse [1-3].

However, product information model established by the above method does not cover the whole process of design reuse, moreover, product information, such as variant information, production processing information etc, is not taken into consideration except geometry structure information of products. Thus, it brought a lot of trouble to effective management of design resources.

In this paper, a multi-level, multi-view product design resources reusable model based on the characteristic level is proposed for effectively supporting the design reuse, and variant design modeling method of product family based on the GBOM structure tree and master model technology is discussed and constructed. On this basis, the machine tool parts rapid response design system was developed; it shows the method can meet the requirements of design resources reuse.

2 Construction of Reusable Design Resource Base

A. Reusable Model of Design Resource

Qi Feng, Tan Jian-rong, etc. proposed a multi-level, multi-view reusable model of product design resources to meet the requirements of design resource reuse [4]. But it did not consider how to build the design resources reusable model based on 3D design software.

In this paper, the model is expanded to establish the design resource reusable model based on the level of the feature base. Reusable model structure of design resources is shown in Fig. 1.

In the above model, assembly modeling method of top-down is adopted to make an overall analysis and decomposition to the product model, customer needs information should be made a function mapping on each level and translated into specific product structure information and behaviour information. Firstly, according to enterprise product series, product configuration structure tree is established based on feature base. Then make a parametric modeling of components and the product assembly by means of CAD software. In this way, in the process of product reuse design or variant design, examples of model reference can be generated easily by parameter driven technology of master model, which can improve the response speed greatly.

B. Construction of Design Resource Library

Design resource library is established on the basis of reusable model of design resource, building process of design resource library is shown in Fig. 2. Design resources make a correlation between product structure feature information and high-level feature information by means of packaging the reusable model, store the standardized information unit in the design resource library by means of defining model, extracting unit, standardizing unit, the preparation of specifications, classifying and establishing index etc, query, browse, and update the design resource by taking advantage of effective management mechanism in design resource library to provide effective support to reusable design and configuration. Meanwhile, new features, component instances and product examples which are established in each design process can be added to design resource library automatically to meet the needs of design reuse on different level.

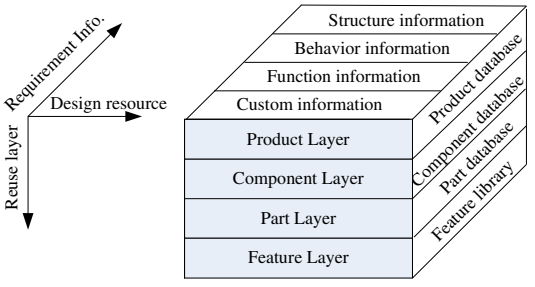

Fig. 1. The reusable model of design resource

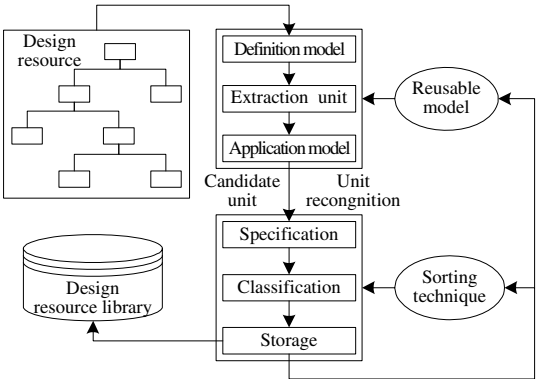

Fig. 2. Process of constructing design resource base

3 Modeling Method of Reusable Product Family

In the process of rapid response design to complex product, configuration management and variant design of product family components is the core of design resources reuse. Configuration management and variant design of product family can be achieved by master model technology provided by three-dimensional CAD platform. In this paper, complex product variant master model is divided into four parts: product family GBOM (Generic Bill of Materials) structure [5], product 3D master model, product variant parameters transferring structure and product information master model [6].

A. GBOM Model of Product Family Based on Polychromatic Sets

GBOM structure of product family is a tree hierarchy structure which is similar to the product BOM structure, it can express the composition of all components included in the product family of the various types of products.

Generic product family GBOM structure is shown in Fig. 3. Class components in Fig. 3 mean the collection of all components which are in the identical node location in product structure. Class parts mean the collection of all parts which are in the identical node location in product structure. In the process of product variant design, any one class components or parts has corresponding variable table which is stored in

the SML to represent the changes of node components in order to achieve product configuration design.

In this paper, modeling method based on polychromatic sets theory is adopted to describe tree structure of product family GBOM.

Components and parts of product are expressed by the nodes of polychromatic graph; their different attributes are expressed by different colors of nodes. The configuration relations of parts can be expressed by different colors painted in edge. Configuration model of product family structure based on polychromatic sets theory can be expressed as follows [7]:

$$PG = (F(G), P, C, F(P), F(C), R) \tag{1}$$

In (1), $F(G)$ represents the overall attribute of product family, $F(G) = (F_1, F_2, F_3, \ldots, F_n)$. $P = (P_0, P_1, P_2, \ldots, P_m)$, P0 represents product, P_i represents components or parts. F (P) represents different attributes of components or parts, $F(P) = (F_1, F_2, \ldots, F_l)$, it can represent different meanings according to practical application. $C = (C_{0(1)}, C_{0(2)}, \ldots, C_{j(k)} \mid 0 \le j \le m, 0 \le k \le m)$, $C_{j(k)}$ represents the vector edge that connects P_j and P_k. $F(C) = (F_{c1}, F_{c2}, \ldots, F_{ck})$, it represents different attributes of edge, Fck can denotes different meanings according to practical application.

$R = (R_1, R_2, \ldots, R_c)$, it represents the constraint relations between part nodes. $R_c = (P_{ij}^{kl}, rel)$, it indicates there is a constraints *rel* between the end node (P_j) of edge P_iP_j and the end node (P_l) of edge P_kP_l. General type of relationship *rel* can include such as dependency, conflicts, exchange, replacement, etc.

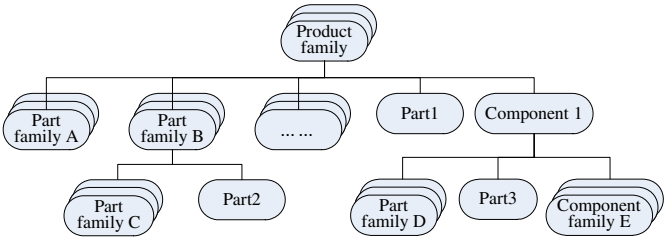

Fig. 3. GBOM structure of product family

Matrix is used to record various attributes set in Polychromatic sets theory. There is a unique matrix to correspond to each constraint in product. All structure of product family can be converted to matrix representation by filling the information matrix, and the matrixes can be expanded to meet the more complex product modeling. This is propitious to the computer programming.

B. *Expression of Product Three-dimensional Master Model*

Product 3D master model indicates abstract of components and parts in order to satisfy the functional or assembling requirements of the upper parent-part on all layered structure in enterprise product family model. Product 3D master model has the same characteristics degree of abstraction and follows the rules of similar configuration restraint; it can represent product class, part class, component class on random abstract rank. Product 3D master model can be expressed as follows [8].

$$CM = (ID, SML, CP, Op, Cons) \tag{2}$$

In (2), *CM* represents the product 3D master model, *ID* is the identification of *CM*, *SML* includes main parameters of *CM*; $CP = (cp_1, cp_2 \ldots cp_i)$ $(i \geq 1)$ is the configuration parameters of *CM*, CP is obtained by mapping of SML's feature set $C = (c_1, c_2 \ldots c_n)$ $(n \geq 1)$. More common situation is to extract features directly from the C as a configuration parameter. $Op = (op_1, op_2 \ldots op_m)$ $(m \geq 1)$ is a group of operations to *CM*. $Cons = (cons_1, cons_2 \ldots cons_i)$ $(i \geq 1)$ is a group of constraints set of *CM*.

Product information master model preserves variant information and production processing information which are outside the geometric information. Different types of documents, such as engineering drawing, NC program, processing technique etc, can be derived by taking advantage of different information master model. Files, databases and PDM systems are frequently adopted to preserve product information, and unified coding system is used to facilitate the database operation.

C. Structure Model of Variant Parameter Transmission

Product variant parameter transmission structure is established on the basis of product variant parameters constraint relations, it combined with product family GBOM structure, CAD software features and tabular techniques.

In product variant parameter transmission structure, parameters which are passed between upper layer and lower layer include component part geometric variant parameters and product family configuration parameters. Product master models on each levels package their own SML, on different levels of product structure, information stored in tabular is different. In this paper, function characteristic parameter is added to SML through self-definition, and pointer that points to lower component parts or SML is preserved. Based on the pointer, *SML_R* among component parts master model can be established. The value of feature's global parameter is transited from upper master model to lower master model.

$$SML\_R = (ID, SML_P, SML_C, Pr) \tag{3}$$

In (3), *ID* is the identification number of associated object, SML_P is identification number of SML of upper master model, *SMLc* is identification number of lower master model, and *Pr* is the transmission relation among parameters of upper master model and lower master model. Through *Pr*, changes of parameters of any upper master model will lead to changes of corresponding parameters of node in lower master model from up to down.

According to transmission theory of parameters in upper layer and lower layer through product variant parameter, product variant parameter transmission model established is shown in Fig.4. In the model, data file in master model of components is divided into four basic levels: parameter input layer, data processing layer, model-driven layer, parameters output layer. Parameter input layer receives parameters that upper level assembly passed down and parameters in its *SML*; then after data processing (specific data processing is completed through variant rules), part of the parameter drives components or changes of assembly model, other parameters are separated and transmitted to various subordinates child assemblage and components as configuration parameters.

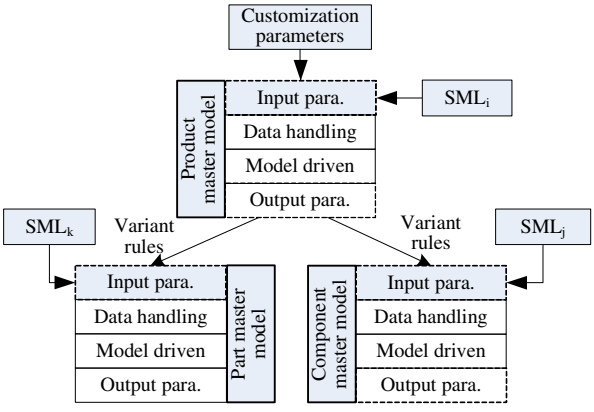

Fig. 4. Parameters transfer model of variant design

D. Instantiation of Product Master Model

Instantiation process of product master model is shown in Fig. 6. Based on the product information master model and product parameter transmission structure, part of Customization parameters are used to control the configuration of product 3D master model, the other parameters will be passed and acted as the optional parameters of product variant design. during the running process of system, three-dimensional model of customized products can be obtained to meet customers' need through SML of components, variant rules etc which are called by the ID code of products or components; In addition, Customization parameters control structure variant of product family GBOM to generate BOM structure of customized products through variant parameter transmission structure, SML and variant rules; while product information master model gets corresponding data information from customization parameters, 3D model of customized products and BOM structure to form customized product information instance through variant.

4 Application

In the rapid response design system of machine tools for mass customization, rolling guide design subsystem was developed to achieve its configuration management and variant design based on UG NX and Teamcenter Engineering developing platform.

Fig.5 shows the tree model of product family structure of LM rolling guide.

The master model of guide was established mainly based on UG NX modeling and assembly modeling environment. During the modeling process, UG NX feature modeling, product family modeling technology, electronic forms technology, and UG WAVE technology were used.

Fig.6 shows the several 3D models of rolling guide which were generated based on different configuration parameters.

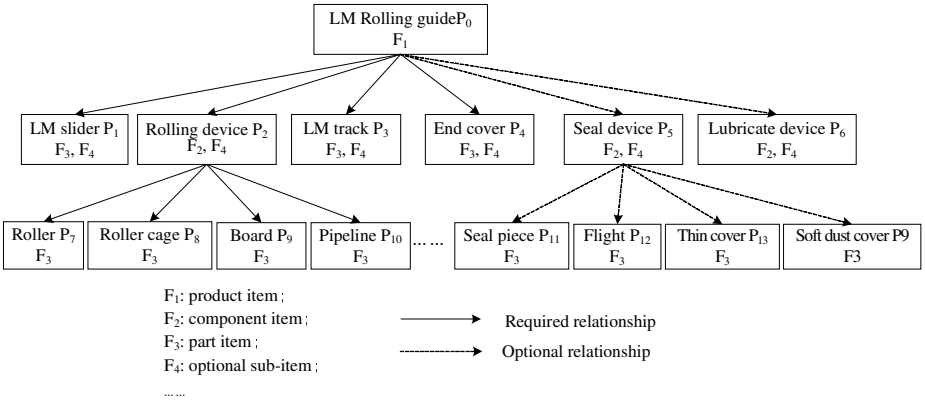

Fig. 5. Product family model of LM rolling guide

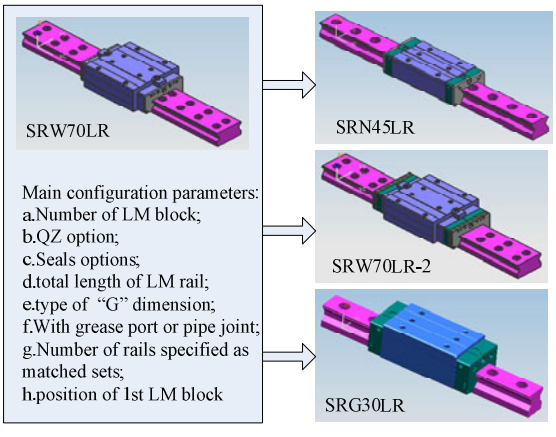

Fig. 6. Configuration management of LM rolling guide based on master model of product family

5 Conclusions

In this paper, a multi-level, multi-view design model is constructed for reusable resources based on Feature database to meet the design requirements of different levels of reuse, which greatly improve the response speed of product design. In addition, the assembly components product family modeling for design resource reuse is achieved based on the complex products GBOM structure, product 3D master model, product variant parameters transmission structure and product information main model. Lastly, we lay out the variant design and configuration management of LM rolling guide product family by developing a prototype system to prove the feasibility of the proposed method.

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The Study on Active Input and Active Output Learning Method Based on Feedback Theory*

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Abstract. Based on cybernetics, feedback and other theories, the paper first introduces something about the learning system and then puts forward a new learning method-active input and active output method. The main characteristic of it is that: Successful language acquisition requires the learners' taking active part in the learning process, because English is not taught, but learned, acquired. Only through constant input and output, especially, practice, can the students overcome the present 'deaf and dumb' English phenomenon. And finally, the paper puts forward a new teaching design based on the learning method.

Keywords: Active input, active output, learning method, cybernetics, feedback theory.

1 Cybernetics, Feedback and English Learning System

In the light of the characteristic of foreign language learning, the paper studies the process of English language learning from the point of view of feedback theory, and advocates active input and active output learning method. First, some relative concepts related with it.

A. The Concept of Cybernetics

Cybernetics was defined by Norbert Wiener as the study of control and communication in the animal and the machine. Louis Couffignal [1], one of the pioneers of cybernetics, characterizes cybernetics as "the art of ensuring the efficacy of action" [2]. .Here, in this paper, Cybernetics refers to the general cybernetics which can be applied to any system, it studies the control method of various process (system), its main characteristics is to observe and study the system in the changing process. It mainly studies the law of the control and the regulation of the system, the object of control is the various able- to-be-controlled system, and the means of control is mainly the transference of information and feedback which is the core of the realization of control. The essence of feedback is to counteract the output signal of the system to the input end, and exerts an influence to the output signal. It is demonstrated as figure 1.

If we make a study on the English learning process with the English learners as the principal part, we can find it is a process beginning from the inputting of knowledge to the

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laying up, understanding, internalization, and application (output) of knowledge. The learning efficiency of the students is also connected with their knowledge structure and intelligence.

B. The Theory of Feedback

1) The System of Open-circle

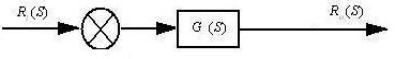

Fig. 1. The system of open-circle

$\frac{R_O(S)}{R_I(S)} = G(S)$, it is called the transition function of the system of open-circle.

As far as the students are concerned, the traditional teaching method is a learning process mainly composed of the system of open-circle. Its advantage is that in the per unit, a large quantity of information is inputted, as a result, the students can be offered more knowledge. But because of the fact that only after a lot of active practice after class can the students grasp this kind of language learning completely, it requires highly on the language environment and the consciousness of the students after class.

2) The System of Closed-circle

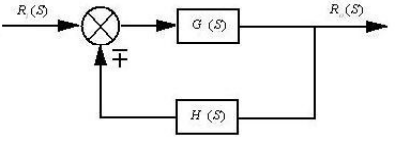

Fig. 2. The system of closed-circle

$\frac{R_O(S)}{R_I(S)} = \frac{G(S)}{1 \pm G(S)H(S)}$, it is called the transition function of the system of closed-circle. G (S) is the transition function of the system of open-circle, H(S) is the feedback function of the closed-circle. $\pm$ represent respectively the feedback system is the positive or the negative feedback, and the arrow signifies the flowing direction of the signal.

3) The Supposed English Learning System.

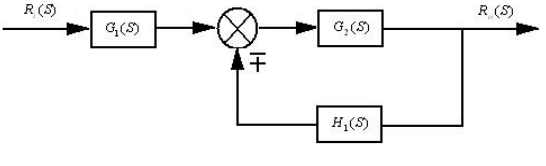

Fig. 3. The supposed English learning system

Some hypotheses:

Suppose G1 (S), G2 (S), H1 (S) in the English learning system are the enlarging link, that is to say, G1 (S), G2(S), H1 (S) are all constants, but in the process of learning, they can change.

Led by the teacher, the learners have definite learning motivation, high learning enthusiasm, from the supposed English learning system, we can get the transition function between the input and output, $\frac{R_o(S)}{R_i(S)} = \frac{G_1(S)G_2(S)}{1+G_1(S)G_2(S)}$, simplified: $\frac{R_o}{R_i} = \frac{G_1G_2}{1+G_1G_2}$.

In this formula:

Ro(S): simplified R0, means the linguistic amount of output.

Ri(S), simplified R1, means the linguistic amount of input.

G1(S) simplified G1, it is a variable which is about the degree of difficulty of the input to the learner and the affective factors of the learner（$0 \leq G_1 \leq 1$）, if the learner's learning spirit is very high, and the input is completely apprehensible, then G1 is near to 1, if the input is completely not apprehensible or if the learner is not willing to learn at all, then G1 is near to 0; in other circumstance it lies between 0 and 1, if the learner always studies very enthusiastically, this variable will tend to a be 1 with the learner gradually digesting and absorbing the learning content.

G2(S) simplified G2, it is a variable which has something to do with the language learners' intelligence quotient, in the learning process, G2 of different learners are different , for making a distinction between the language learners' language learning intelligence quotient, I'd like to give a definition of G2 as follows: Through a period of time of Language study, (a) If G2 is always smaller than 0.1, namely $G_2 < 0.1$, this means the learners have language barrier, and this theory is not suitable to them;(b) If $1 \leq G_2 < 0.3$, this means the learners' language intelligence quotient is a little bit lower, if they want to learn English well, they have to exert themselves compared with the normal people, otherwise they can' t learn well; (c) If $0.3 \leq G_2 < 0.8$, this means the learners have normal language intelligence quotient, as long as they study properly, and through effort, their English level will increase gradually; (d) If$0.8 \leq G_2 < 8$, this means the learners' language intelligence quotient is higher, they can make rapid progress, and belong to the giant among dwarfs in the class when talking about the English study;(e) If $G_2 = 1$, this means the language intelligence quotient of the learner is very high, he is a language genius and has a photographic memory.

H1(S) simplified H1, it is a variable, the positive and minus sign inside the transition square frame diagram means respectively the positive feedback or the negative feedback. H1 is an index reflecting the learners' degree in storing, comprehending, internalization of knowledge and also their degree of diligence.

Concerning the problem of whether the learning system after all is a positive or negative feedback, we need to talk it over before we can make sure.

According to the general theory of the control theory, there is no harm in supposing that the learning system is a negative feedback, from the formula $\frac{R_o(S)}{R_i(S)} = \frac{G_1(S)G_2(S)}{1+G_2(S)H_1(S)}$. we can analyze, when H1 is 0, $\frac{R_o(S)}{R_i(S)} = G_1(S)G_2(S)$, it is about equal to the open circle system: Let $\frac{R_o(S)}{R_i(S)} = \frac{G_1(S)G_2(S)}{1+G_2(S)H_1(S)} = 0$, we can get $H_1 = -\frac{1-G_1G_2}{G_2} = -\frac{1}{G_2}+G_1 < 0$(because of G_1、$G_2 < 1$) , so the value of H1 should be a negative

number, from the supposing system as the negative feedback, and the negative number of H1 which we get, the practical learning system should be positive feedback.

4) The Actual English Learning System

From the above analysis, we come to the conclusion that the actual English learning system is a positive feedback, therefore, the mathematical model of the English learning system is as follows:

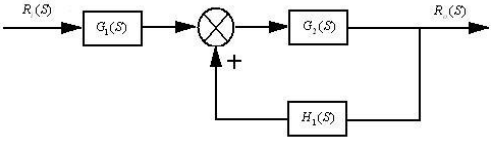

Fig. 4. The actual English learning system

Then the system transition function is as follows: $\frac{R_o(S)}{R_i(S)} = \frac{G_1(S)G_2(S)}{1+G_2(S)H_1(S)}$

In view of the fact that it is a positive feedback system, the meaning of the parameter of the system $R_o(S), R_i(S), G_1(S), G_2(S)$ is similar to the supposed negative feedback system of the above part, only the meaning of $H_1(S)$ wants to be defined afresh.

In view of the fact that it is a positive feedback, then the scope of H_1 should be: $0 \leq H_1 \leq \frac{1-G_1G_2}{G_2}$, (1) when $H_1 \to 0$, the transition function of the system is: $\frac{R_o(S)}{R_i(S)} = G_1(S)G_2(S)$, which means the learner does not work hard the least bit, the learner's output completely depends on his language natural endowments, and the system is equal to the open- circle without feedback; (2) When $H_1 \to \frac{1-G_1G_2}{G_2}$, namely, $\frac{R_o(S)}{R_i(S)} = 1$, this means the contents of the learning material are completely digested and absorbed by the learner who can put out drawing inferences about other cases from one instance of the contents of the input; (3) when $0< H_1 < \frac{1-G_1G_2}{G_2}$, it means that the learner has already digested and absorbed part of the content, the bigger the value of H1 is, the smaller the value of $1 - G_1G_2$ is, which means the learner's degree of diligence is higher.

It is obvious that to a particular learner in a particular time, G2 is a relative fixed amount, but through the learner's effort with the right learning method, G2 is also a deal that can change, and the student's learning capacity can also be raised in the process of actual use the language, but the changing of the deal of G1 is lower; G1 embodies the following several meanings (a) The degree of difficulty of the input to the learner, (b) The affective factors of the learner to input, but H1 is a deal of feedback that has something to do with the diligent factor, learning efficiency (study method) of the learner. Obviously, with the learner striving hard with positive attitude and full enthusiasm constantly, when he gradually grasps the knowledge that is being studied, the information of the input has become comprehended by him. At this time, G1 tends to go toward 1, this represents that the contents of learning are already

digested by the learner who has formed short-term memory. At this time, the incomprehensible input has become comprehensible, the learner can get into the next learning process, that is, through further efforts and constant practice, he can complete the transition from short-term memory to long-term memory of the inputted content, and thus thoroughly grasp it, finish the whole learning process.

C. Summary

In this part, first, the paper introduces the concept of cybernetics, the theory of feedback, and then studies the process of English learning from the point of view of feedback, which suggests that a lot of teaching tasks carried on in the traditional formal instruction can be completed out of class, and if the learners are active in their study and try to use every possible opportunity to practice, they are sure to succeed. Together with other theories, for example, constructivism [3], interlanguage[4] and learner autonomy [2] that highlight learners' active role in the learning process, the information-processing theories and output theory [5] that emphasize the importance of output in the learning process, and the input theory [6] that lays stress on the importance of input, especially, comprehensible input, the paper puts forward the new learning method- the method of active input and active output.

2 The Active Input and Active Output Learning Method

For the sake of better illustration of the active input and active output learning method, the paper introduces some of the concepts that are related with it.

A. Related Concepts.

1) The Learner

Learner: students whose foreign language learning methods are based on active input and active output are called learners. They are also the main part of the method of active input and active output, their main task is to review, digest and absorb what the teacher has taught in class, remember again and again part of the content that needs to be grasped, make preparation for the content of next class for the purpose of communicating with their study pair.

2) Study Pair

Study pair: Regard each learner as the unit, the combination of two or three of good classmates who usually study and live together (the best situation is that of the two roommates), is called a study pair. To the language learners, the main mission of forming a study pair is to communicate in English as much as possible at ordinary times, exchange opinions after class about the contents of the teacher's talk, create opportunities as many as possible to use the foreign language, make preparation for the content of next class that needs to be communicated in order that it becomes comprehensible.

3) Study Group

Regard each study pair as the unit, a certain number of students (six to eight) consisted of three or four study pair forms a study group, each study group contains a "leader", the "leader" is chosen by turn from the classmates in the group. The main

mission of the study group is to discuss after class the contents of the lesson every day, make a deep study of the contents that will be made a statement the next class and reach to a conclusion. Discuss and sum up within the group the contents of the last class before they can reach into the mid- term or long-term memory, discuss thoroughly the contents of the next class so that the students can take the floor actively in the study of the natural teaching class based on the unit of the study group. Every leader within the study group is responsible for the making speech every time, and he also needs to bring every possible factor into play, so that every study pair can pour out all that one wishes to say in the group discussion.

4) Natural Teaching Class.

We call the actual class that college English teacher teaches during one class as a natural teaching class. Because the universities increase enrollment, generally, the number of the students in the college English natural teaching class is about seventy, under such circumstance, the common communicative language teaching method is very difficult to deal with such a big class. When we teach the natural teaching class, we adopt the communicative language teaching method that is based on the study group, that is to say, in every class time, the "leader" in each group representing the whole group makes a concluding speech about the learning content that is assigned by the teacher, through the communication with the teacher, he can have a better understanding of the learning content, and after further practice, it is very likely for him to form a long-term memory. This kind of teaching method can solve the contradiction of giving a big class and communicative language teaching, in such a class, the students have something to say, and the example communication with the teacher enables them to bring into play to the full their learning potential in their study pair and study group learning, take part in the communicative learning activities outside class, learn in the process of practice, practice in the process of learning, and through a large amount of practice to grasp the contents before they reach into the long-term memory.

5)Rereading Machine.

Its characteristics is that not only the information imported can be replayed again and again, but also the output of learners can be recorded and replayed, so that the students can compare their output with the original recording, and with the passing of time, they are able to improve their learning efficiency.

In today's information society, the communication of language can be obtained through not only the direct communication between people, but also the internet-having dialogues with the other people, but the cost of doing so is high, and at present it is not the main input style.

It is known to us all that English is a subject that can only be grasped through a large amount of language practice, but since class time is limited, it remains impossible for every student to conduct ample oral practice in class, so if we want our students to have a good command of oral English, it is necessary for us to let them practice as much as possible after school, that is to say, the main battlefield of college English oral learning is the outside class study, formal instruction serves only the extracurricular study. The purpose of the formal teaching is to provide the students with "fishing" but not the fish. Just as Professor Wen Qiufang said: "Give a man a fish and he eats for a day. Teach him how to fish and he eats for a lifetime."[7]

Since a lot of work should be done out of class, so how can the students make preparation for the class when the task assigned is comprehensible or incomprehensible input?

B. The Task Assigned Is Comprehensible Input

If the task assigned is comprehensible input, or in other words, the difficulty degree of the mission is slightly higher than the level of the learner, then the learner need not make preparation before he can conduct language practice with his classmates or the study pair outside class and form short-term memory, and also through further language practice and language communication both in and outside class, he can have a good command of the learning content.

C. The Mission Assigned Is Incomprehensible Input

If the mission assigned is incomprehensible input, it needs the learner to self-digest the learning content according to the learning system theories of the positive feedback, that is, first, change the incomprehensible content to the comprehensible content, and then study the learning content in order according to the teaching model of the active input and active output theory.

The active input and active output learning method is the abbreviated form of the active input and active output foreign language learning method based on cybernetics, feedback, constructivism, interlanguage, information-processing, input theory, output theory, etc. It is a foreign language learner theory, it specially emphasizes: when the input is incomprehensible input, the learners need to study according to the teaching model of the learning system, and through the ample quantity of active and positive feedback (the process of working hard), they can promote the output, which is an important link for foreign language learners in the digesting, storing and accumulating of knowledge and only when they have stored and accumulated enough knowledge (form short-term memory or middle-term memory), can they put out freely the imported information, and only after enough output and repeated practice, can they strengthen the knowledge learned, and change the short-term memory of the new knowledge to the long-term memory. Here, we once again stress that the mastery of a foreign language depends on the learners' a great deal of use (practice) instead of the teacher's instruction in class, because, a flood of language practice is very much important, it includes three meanings: firstly, it refers to a lot of input, secondly, it refers to a lot of output, and lastly, it refers to a lot of storing of knowledge (that is, the positive feedback of the learning system), in the process of constant input, feedback (the storing of knowledge), output (the communication of language), the learners can have a good command of the language.

In sum, active input embodies the following several meanings. (1) The students are active in learning both in and out of class, they try to make use of any opportunity to absorb knowledge, to listen more and to read more. (2) Both teachers and students make joint efforts to enhance the students' English capabilities, especially, their listening and oral abilities. As for the teachers, they try to encourage the students to be actively involved in learning, and at the same time, the students actively input 'big materials at similar levels from different resources of language input'. The meaning of active output is quite simple, it means that the students actively make use of any opportunity to put out as much as possible.

Since the active input and active output method involves both students and teachers, what teachers should do in the new situation?

D. The New Teaching Design.

1) The constitution of the natural teaching class

It is known to us all that teaching serves for learning, since the students adopt the new learning method, so, the teaching method should also change. Considering this, the paper designs the natural teaching class, it is composed of several study groups, while each study group is composed of several study pairs. The relationship between the natural teaching class, study group, and study pair is as the following chart shows. It is clear that the new teaching design lays stress on the study group and study pairs who are actively involved in the learning process.

In view of the phenomenon that Chinese English learners are often too shy to express their immature opinions in front of people who are superior to them, we design specially the English study pair outside class. It is known to us all that a great majority of the students, no matter how introverted by nature they are, dare to make a speech boldly or dispute in front of their good friends, so we make use of the learning psychology of the students and design the following requirement of them outside class: after they have mastered preliminarily the learning contents, they can carry on language communication through the study pair, and in the process of communication, they can gradually understand the learning contents, and in the meantime, their short-term memory develop into the long-term memory.

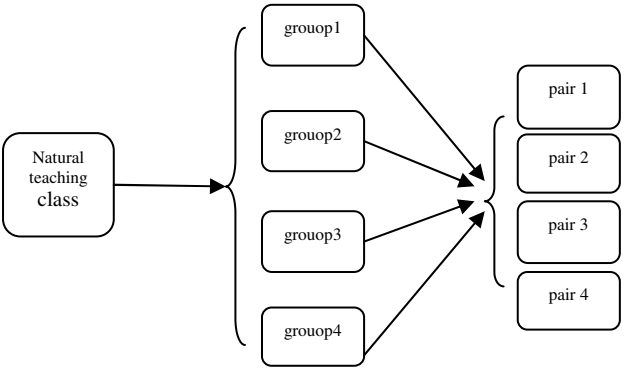

Fig. 5. Classroom teaching design

2) Classroom Teaching Design

(a) Answer the questions that the students meet in their studies within five minutes.
(b) In class, discuss the learning contents that are assigned by the teacher in the study group within thirty minutes.
(c) Make a speech and discuss the learning contents that are assigned by the teacher in the last lesson between the groups within forty minutes.
(d) Summarize the learning contents that are discussed by the students within five minutes (mainly praise them so as to improve their learning enthusiasm).
(e) Give explanation to the relevant important language points within ten minutes.
(f) Make arrangements for the learning contents, the main points and the difficulty points that will be conducted in the next class within ten minutes.

In the process of teaching, there are still some matters needing attention.

E. Matters Needing Attention.

1) The Purpose of Formal Instruction

We should pay special attention to the fact that the purpose of formal instruction is to serve for learners' active learning, and it is also specially designed for the learning system of the active input and active output, it's main function is to help learners to gradually master oral English through their host of practice so as to overcome the phenomenon of "dumb and deaf" English that is quite common among Chinese college students.

2) The Premise of Formal Instruction

In the classroom teaching environment that we design, the premise of the classroom teaching is that: the students need to digest the learning content that will be communicated before class, and reach to the level of comprehension so that they can communicate freely with the other students or the teacher in class.

3) We Should Pay Attention to the Problem of the Variety of Answers in the Process of Discussion

Generally, the teacher does not give the conclusion that one answer is superior to the other in the process of discussion in class, which answer is better is for the students themselves to discover in the process of use. We should also let them understand that it is much more important for them to use skillfully the interlanguage with deviation than not being able to use language or not being able to use proficiently even the correct target language, that is to say, language learning has its own characteristics, language is gradually mastered by the learner in the process of large quantity of use, without which the students can't learn a foreign language well. During such process, the students should not be afraid of the appearance of the deviation of language. The correction of it requires the learner's large quantity of language practice before he can gradually realize it. Here, we don't say that there appears language mistakes, it is because the purpose for us to study the foreign language is to have language exchanges with the foreigners, as long as we can put it out courageously, even if it is not up to standard, in general the foreigners can understand it, so, we can reach to the purpose of communication. If we say it is a mistake, then the students need to rectify it immediately while practicing, thus it is unfavorable for them to communicate with others using the language. At the same time, in the process of using the language for exchanging information, the students are permitted to have different ways of expression to the same affairs, under the condition that they can make it clearly.

4 Conclusion

In this paper, first, the author introduces to you something about cybernetics, then puts forward a new learning theory-active input and active output theory. The main characteristic of it is that: Successful language acquisition requires the learners' taking active part in the learning process, because English is not taught, but learned, acquired. Only through constant input and output, especially, practice, can the students overcome the present 'deaf and dumb' English phenomenon. And finally, I put forward a new teaching design based on the new theory.

It is true that theoretically the new learning approach is supported by many other theories as the paper has mentioned above, but is it practicable in the real world? And since students are the principle part in the learning process, how can they apply for it? So in another paper, the author will conduct a current study to prove the feasibility of the new active input and active output learning model.

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The Experimental Study on the Effects of Active Input and Active Output Learning Method Based on Feedback Theory*

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Abstract. In connection with the current problem of college students' not very high learning efficiency, this research, based on feedback theory, aims to investigate the effects of Active Input and Active Output Learning Model on them. The author of the research has once done a four-month experiment on 36 first-year students of a certain university, the result shows that compared with the control class, the experimental class has a remarkable learning result. The research indicates that in the current non-immersion leaning environment, the active input and active output leaning method will not only help learners to form new acquisition of language, improve comprehensively their discourse behavior, but also to spur on learners to make use of all their resources to solve communicative problems. College students, who adopt such learning methods, show a higher enthusiasm and stronger confidence.

Keywords: Active input, active output, control feedback theory, study pair, contrast experiment.

1 Introduction

A. Cybernetics and Feedback theory

Cybernetics is the study of systems and processes that interact with themselves and produce themselves from themselves[1].Here, in this paper, Cybernetics refers to the general cybernetics which can be applied to any system, it studies the control method of various process (system). It mainly studies the law of the control and the regulation of the system, feedback, which is the core of the realization of control, is a mechanism, process or signal that is looped back to control a system within itself. Such a loop is called a feedback loop. In systems containing an input and output, feeding back part of the output so as to increase the input is positive feedback; feeding back part of the output in such a way as to partially oppose the input is negative feedback. The essence of feedback is to counteract the output signal of the system to the input end, and exerts an influence to the output signal. If we make a study on the English learning process with the English learners as the principal part,

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we can find it is a process beginning from the inputting of knowledge to the laying up, understanding, internalization, and application (output) of knowledge.

As we know the actual English learning system is a positive feedback, therefore, the mathematical model of the English learning system is as follows:

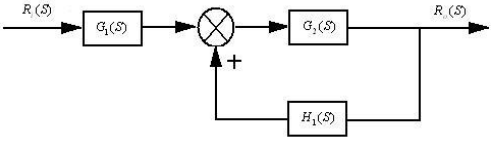

Fig. 1. The actual English learning system

$R_o(S)$ means the linguistic amount of output, $R_i(S)$ means the linguistic amount of input, $G_1(S)$ is about the degree of difficulty of the input to the learner and the affective factors of the learner, $G_2(S)$ is a variable which has something to do with the language learners' intelligence quotient, $H_1(S)$ is an index reflecting the learners' degree in storing, comprehending, internalization of knowledge and also their degree of diligence.

In this part, first, the paper introduces the concept of cybernetics, the theory of feedback, and then studies the process of English learning from the point of view of feedback, which suggests that a lot of teaching tasks carried on in the traditional formal instruction can be completed out of class, and if the learners are active in their study and try to use every possible opportunity to practice, they are sure to succeed. Together with other theories, for example, the input theory [2],learner autonomy [3], constructivism [4], interlanguage [5], and output theory [6], the paper puts forward the new learning method- the method of active input and active output.

B. The active input and active output learning method

The main idea of this learning method is: Successful language acquisition requires the learners' taking active part in the learning process, because English is not taught, but learned, acquired. Only through constant input and output, especially, practice, can the students overcome the present 'deaf and dumb' English phenomenon.

2 Subjects

Four hundred and forty-eight freshmen in Grade 2009 from Anhui XX University were chosen as subjects, including two classes, one is the experimental group - mechanical designing class 2009-6, which consists of 36 students, and the other is the control group- mechanical designing class 2009-7, which also consists of 36 people. The students in each of the groups respectively show the following common properties: (1)They had similar educational background. (2) The age levels were identical. (3) The educational facilities at the school were at the service of every student. (4) They were all native speakers of Chinese. We took back the questionnaire three hundred seventy-eight pieces, among them were the total number of the questionnaire carried by the experimental group and the control group. After four-month experiment made on the experimental group, we conducted the second questionnaire. The very closeness of the mean and Std. Deviation of the questionnaire

taken back illustrates the closeness of the English language level between the experimental group and the control group before the experiment. For saving space, the study mainly analyzes the situation of their answering questions in the pre and post-experiment of the experimental group.

3 Instruments

The questionnaire is chosen as the measurement of the students' listening and oral problems, including five parts concerning their level of listening, speaking, the situation of interactive study, the setting up of their program for study, learning goals and methods. The questionnaire adopts five scale, representing respectively very good, better, good, bad and worse, or similarly strongly agree, agree, uncertain, disagree, strongly disagree, the corresponding values are: 5,4,3,2 and 1. After the questionnaire data was collected, they were typed into computer, the Statistical Package for Social Sciences (SPSS) is used for the analysis of the data obtained during the research. The software is one of the best software and is very popular, it is widely used in education statistic analysis now. There is no doubt about its reliability.

4 Results and Discussion

A. Questionnaire about the students' listening level

A1 You are very good at listening
A2 You often practice listening.
A3 You can often make use of listening skills in the listening process.
A4 You can catch the ordinary indication language.
A5 You can understand the low-rate English programs in the native country.

Table 1. The pre-test (questionnaire data) statistics of the subjects

	A1	A2	A3	A4	A5	T1
Mean	3.06	3.61	3.58	3.92	2.67	16.83
Std.	0.86	0.49	0.73	0.77	0.68	3.07
Minimum	2	3	2	3	2	12
Maximum	5	4	5	5	4	22

After the data analysis using SPSS to the questionnaire done before the experiment on the experimental group, we can see from table 1: in the five groups of questionnaire related with the student's listening ability, those who can understand the low-rate English programs in the native country score the lowest, the score is 2.6667, while those who can catch the ordinary indication language score the highest, the score is 3.9167, the average score is 3.3667, from this, we can see that the freshmen basically reach the requirement of them. In the table, "mean" denotes the average score of each question, Std. Deviation reflects the situation of deviation of the data. Maximum, minimum are the highest and lowest scores in the test.

After four month of experiment, we conducted the second questionnaire, once again, the analysis work is done through SPSS, the results are shown in table 2.

Table 2. The post-test (questionnaire data) statistics of the subjects

	A6	A7	A8	A9	A10	TB1
Mean	3.83	4.72	4.14	4.67	4.167	21.53
Std.	0.70	0.45	0.64	0.48	0.56	2.26
Minimum	3	4	3	4	3	17
Maximum	5	5	5	5	5	25

A6, A7, A8, A9, A10 respectively corresponds to the question A1, A2, A3, A4, A5. We can see from table 2: in the five groups of questionnaire related with the student's listening ability, after four month of experiment, the highest score appears in the item "You often practice listening", the score is 4.72 , the lowest score appears in the item "You think that you are very good at listening", it is 3.83 , it is quite obvious that the total score is higher than that before the experiment, and the Std. Deviation is all lower than that before the test.

Table 3 is an analysis chart of the result of paired sample test.

Here, let's first investigate the value of "t", we can see from table 3 that the value of "t" in this table is all negative, this shows that the achievement in the second test is obviously better that that in the first test, because $|t| \geq 2.031$, so the achievement in every item of the two tests has evidently improved, among them the rapid progress appears in the item "You can understand the low-rate English programs in the native country", the value of "t" is 16.05, while the slow achievement appears in the item "You can often make use of listening skills in the listening process", the value of "t" is 4.57, this is because, after four months of interactive training on listening and speaking based on the active input and active output theory, the listening level of the subjects in the experimental group has been greatly improved, who can basically catch the words and expressions for daily use in English. As far as the slow improvement in the item "You often make use of the listening skills", it is because the traditional teaching method pays much attention to the teaching in this aspect, and the students have basically grasped the listening skills, but in practice they are poor at it.

Table 3. Paired sample test

		Paired Differences				t	df	Sig. (2-tailed)
		Mean	Std.	95% Confidence				
				Lower	Upper			
Pair 1	A1 - A6	-0.78	0.64	-0.99	-0.56	-7.32	35	0.00
Pair 2	A2 - A7	-1.11	0.57	-1.31	-0.92	-11.60	35	0.00
Pair 3	A3 - A8	-0.56	0.73	-0.80	-0.31	-4.54	35	0.00
Pair 4	A4 - A9	-0.75	0.77	-1.01	-0.49	-5.84	35	0.00
Pair 5	A5 - A10	-1.50	0.56	-1.69	-1.30	-16.05	35	0.00
Pair 6	T1 - TB1	-4.69	2.28	-5.47	-3.90	-12.36	35	0.00

B. The proficiency oral test.

B1 You can show people the way, make a purchase, leave a message and make an application using simple language and with the help of gesture.
B2 You can often practice speaking English outside class.
B3 You often actively make a speech in the English class.

B4 Your level of oral English can satisfy the needs of society.
B5 You enjoy making a one-minute free speech on some question in class.

Table 4. Pre-test statistics

	B1	B2	B3	B4	B5	T2
Mean	3.83	3.34	3.31	2.97	3.37	16.83
Std.	0.71	0.73	0.87	0.79	1.03	3.76
Min	3	2	1	2	2	10
Max	5	5	5	5	5	25

Judging from table 4, we can see that in the first pre-oral questionnaire, the highest score appears in the item "You can show people the way, make a purchase, leave a message and make an application using simple language and with the help of gesture", the lowest score appears in the item "Your level of oral English can satisfy the needs of society", the largest Std. Deviation appears in the item "You enjoy making a one-minute free speech on some question in class", for example, say something about your family, your hobbies, interest, etc, which suggests that the degree of deviation is the largest, and there appears the phenomenon of polarity.

Table 5. Post-test statistics

	B6	B7	B8	B9	B10	TB2
Mean	4.46	4.74	4.80	4.09	4.40	22.49
Std.	0.56	0.44	0.41	0.70	0.60	2.25
Min	3	4	4	3	3	18
Max	5	5	5	5	5	25

Judging from table 5, we can see that in the second post-oral questionnaire, the highest score appears in the item "You often actively make a speech in the English class", the score is 4.8, the lowest score appears in the item "Your level of oral English can satisfy the needs of society", the score is 4.09, the average score in every item is evidently improved, and the Std. Deviation is reduced, that is to say, there appears the phenomenon of common progress.

We can see from table 6 that the value of "t" in this table is all negative, this shows that the achievement in the second test is obviously better that that in the first test, because $|t| \geq 2.031$, so if we compare these two tests, we can find that the result in every item has evidently changed, the general score is all larger than 10, this is because: the weak point in the traditional teaching method is that the students are not willing to open their mouth, while the interactive training on listening and speaking based on the active input and active output theory has remarkable role in the elevation of the students' oral level, as to this point, we can testify it from the oral test achievement of the students after the experiment.

C. Questionnaire on the students' interactive study.

C1 You can take active part in the English classroom activities.
C2 You can often communicate in English.

C3 You can understand the lessons which are conducted in English, and carry on the discussion according to the requirement.
C4 You can communicate with the natives in simple English about some daily activities.
C5 You can often communicate and discuss with your classmates in English outside class.

Table 6. The second Paired Samples Test

.		Paired Differences				t	df	Sig. (2-tailed)
		Mean	Std.	95% Confidence				
				Lower	Upper			
Pair1	B1 - B6	-0.63	0.49	-0.80	-0.46	-7.59	34	0.00
Pair2	B2 - B7	-1.40	0.65	-1.62	-1.18	-12.72	34	0.00
Pair3	B3 - B8	-1.49	0.78	-1.75	-1.22	-11.25	34	0.00
Pair4	B4 - B9	-1.11	0.47	-1.28	-0.95	-14.00	34	0.00
Pair5	B5 - B10	-1.03	0.71	-1.27	-0.79	-8.61	34	0.00
Pair6	T2 - TB2	-5.66	2.15	-6.40	-4.92	-15.53	34	0.00

Table 7. Pre-test statistics.

	C1	C2	C3	C4	C5	T3
Mean	2.86	2.39	3.00	2.61	2.56	13.42
Std. Deviation	1.05	0.69	0.68	0.90	1.13	4.02
Minimum	1	1	2	1	1	8
Maximum	5	4	4	5	5	23

Judging from table 7, we can see that in the first questionnaire on the students' interactive study, the score is low, the total score is only 13.42, the highest score appears in the single item "You can understand the lessons which are conducted in English, and carry on the discussion according to the requirement", the score is 3, there are three items whose Std. Deviation is large, they are respectively: "You can take active part in the English classroom activities", "You can communicate with the natives in the simple English about some daily activities", "You can often communicate and discuss with your classmates in English outside class", that is to say, the degrees of deviation of these items are large, and there appears the phenomenon of polarity.

Table 8. Post-test statistics

	C6	C7	C8	C9	C10	TB3
Mean	3.81	3.75	4.39	3.81	4.78	20.53
Std. Deviation	0.67	0.69	0.55	0.67	0.42	2.31
Minimum	3	3	3	3	4	17
Maximum	5	5	5	5	5	25

Judging from table 8, we can see that in the second questionnaire on the students' interactive study, the highest score appears in the item "You can often communicate and discuss with your classmates in English outside class", the score is 4.78, there are three items whose score is very close, the Std. Deviation is not large, and the total score has been greatly improved, there appears the phenomenon of common progress.

The value of "t" in this table is all negative, this shows that the achievement in the second test is obviously better that that in the first test, because $|t| \geq 2.031$, so if we compare the two tests, we can find that the result in every item has evidently changed, and the general score is all larger than 10, this is because: the weak point in the traditional teaching method is that the students are not willing to open their mouth, while the interactive training on listening and speaking based on the active input and active output leaning method plays remarkable role in the elevation of the students' listening and oral level, as to this point, we can testify it from the listening and oral test achievement of the students after the experiment in next paper.

5 Conclusion

From the above analysis, we can reach the following conclusions:

(1) The listening and speaking abilities of the experimental group has evidently improved compared with that of the pre-test.

(2) Compared with the control group, the every item (except the dictation) in the aspect of listening and speaking of the experimental group after the test has evidently improved.

Table 9. Paired samples test

		Paired Differences				t	df	Sig. (2-tailed)
		Mean	Std.	95% Confidence				
				Lower	Upper			
Pair1	C1 - C6	-0.94	0.67	-1.17	-0.72	-8.41	35	0.00
Pair2	C2 - C7	-1.36	0.49	-1.53	-1.20	-16.77	35	0.00
Pair3	C3 - C8	-1.39	0.64	-1.61	-1.17	-12.92	35	0.00
Pair4	C4 - C9	-1.19	0.82	-1.47	-0.92	-8.72	35	0.00
Pair5	C5 - C10	-2.22	1.07	-2.58	-1.86	-12.44	35	0.00
Pair6	T3 - TB3	-7.11	2.29	-7.89	-6.34	-18.63	35	0.00

The experiment has reached the expected result, which illustrates that in the Chinese College English listening and oral teaching, the active input and active output learning method has achieved some results. It will not only help learners to form new acquisition of language, improve comprehensively their discourse behavior, but also to encourage learners to make use of all their resources to solve communicative problems. College students, who adopt such learning methods, show a higher enthusiasm and stronger confidence in studying English. We can enlarge the range, and conduct further experiment to testify it.

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The Model of Active Input and Active Output*

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Abstract. In connection with the current problem of college students 'deaf and dumb' English phenomenon, this paper, based on cybernetics, feedback theory, and other theories, put forward a new learning model-active input and active output method, analyzed the practicability of it theoretically, offered the way to apply it and then conducted an experiment to investigate its effect . The main characteristic of it is that: Successful language acquisition requires the learners' taking active part in the learning process, because English is not taught, but learned, acquired. Only through constant input and output, especially, practice, can the students overcome the present 'deaf and dumb' English phenomenon. College students, who adopt such learning methods, show a higher enthusiasm and stronger confidence in studying English.

Keywords: Active input, active output, control feedback theory, cybernetics, study pair.

1 Introduction

It is known to us all that, in his own country, even if one is illiterate, generally he can exchange information fluently in his mother tongue. But in our country, even after years of study, many college students still can't communicate in the foreign language, this phenomenon is called "deaf and dumb" English and is quite abnormal. We say that "deaf and dumb" English, which is criticized as "time-consuming, low efficiency". is the main deficiency in our foreign language teaching and is really worth our attention. In order to remedy this phenomenon, we should give priority to students' listening and speaking abilities. Many scholars have shared the same opinions. Professor Xu Guozhango nce said: "The real command of English is proved by free speech communication". And Professor Li Yanfu pointed out in "linguistics: A course book" that speech is considered as the primary medium of language". The reason is quite simple. Because language is a system of arbitrary vocal systems used for human communication.

How to improve College students' listening and speaking ability? The biggest characteristics of oral speech is to let both parties involved obtain the information they need though communication. In order to obtain smoothly the information, firstly the learners need to make the knowledge for communication comprehensible to himself (which can be realized through non-interaction input and output out of class),

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when the content of communication has become apprehensible, the learners can further consolidate the knowledge through a great deal of initial language practice which is characterized by interactive input and output after class, and lastly, in order to reach the aim of being in command of the information to be exchanged, and keep the leaning content from the short term memory to the long term memory, the learners are required to make further practice through the interactive input and output in the classroom.

To make it more clearly, I'd like to offer you a diagram of the active input learning model.

2 The Model of Active Input

The following diagram shows the model of active input.

Input can be divided into two kinds, interactive input and non-interactive input. In class, interactive input includes teacher's talk and interlanguage talk, while non-interactive input includes listening to the radio and watching video. Outside the classroom, interactive input includes pair work, interlanguage talk, and internat talk, etc, while non –interactive input includes radio and television, recorder and radio, rereading machine, etc. On the bottom, the arrow signifies the learners' learning process. So here, in this diagram, I combine the categories of input with learners' learning process, the outer factor (input) together with the inner factor of the learner (memory), it shows a complicated yet clear process of active input, and it highlights the learners' active role and the importance of practice in the learning process.

Why can this new active input model play a role in both theory and practice?

Theoretically, first, it is supported by some theories, such as, constructivism[1],, interlanguage[2], input theory [3] that lays stress on the importance of input, especially, comprehensible input[4], learner autonomy[5]that highlight learners' active role in the learning process, and the information-processing theories[6],etc. With the students' taking active part in the learning process, they have low affective filter. Second, it is in accordance with students' cognitive rules, that is, keep language materials from short-term memory to long-term memory. Third, it is in agreement with the principle of cybernetics[7] which emphasizes the importance of practice in the learning practice. Fourth, it accords with the principle of philosophy, that is, internal force is the basis for change, while external force is the condition for change. Here, active plus input and output is to some extent similar to the internal force plus the external force, with students' taking active part in the learning process, they have strong internal force, together with external force, they are likely to succeed. And last, it is also in accordance with Professor Sun Changshun's "3B" Constructivist ELT Approach[8], which can be generalized as 'big students', 'big socialized class' and 'big materials at similar levels from different resources of language input'.

In practice, the new learning approach solved the problem of College students' deaf and dumb' English, esp, deaf English, we can prove this from the achievement of the experimental group done in my university. We can easily explain this. In this approach, many of the traditional teaching contents are laid out of class, in class, the students mainly practice listening and speaking English. Through the 'big materials at similar levels from different resources of language input', the students have many opportunities to practice. "Practice makes perfect", that's quite true.

Then, how to implement active input?

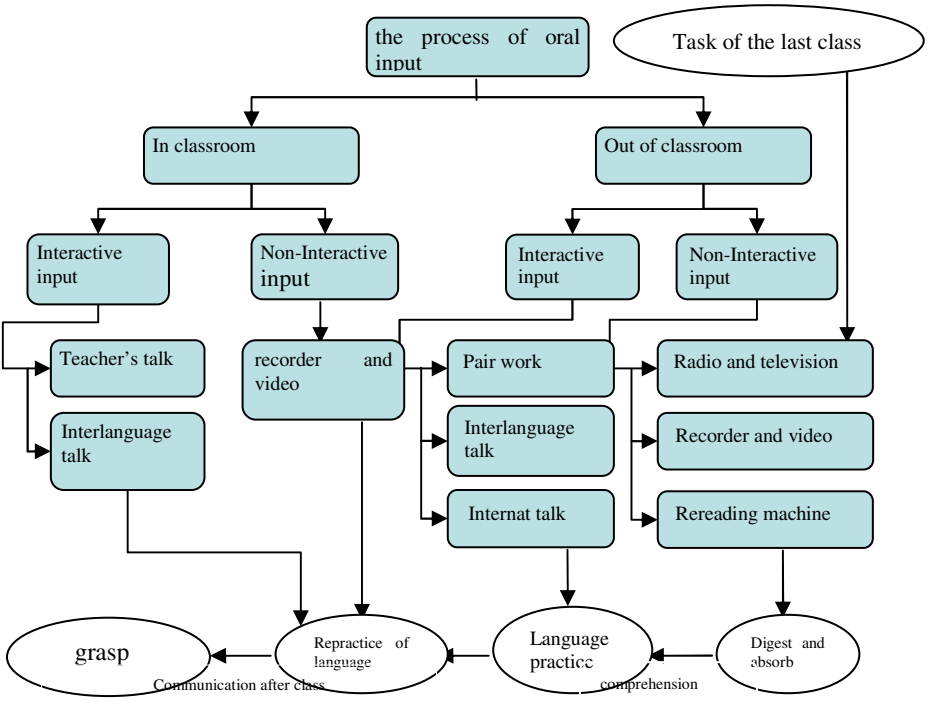

Fig. 1. Model of the process of vernacular speech input

Through the experiment that the author has done, the paper puts forward the new learning model and the new teaching design, and sums up some useful ways to implement them. Active input involves two kinds of combination. One is the combination of the students' activities both in and out of class, the other involves the combination of the teachers' guiding and the students' learning. Good language learners make their own opportunities for practice in using the language inside and outside the classroom [9](Rubin and Thompson, 1982). It is known to us all that classroom teaching is not an adequate way of acquiring a foreign language. With the limited time and resources it is simply impossible for learners to learn to be able to use the language for communication purposes. In the past, many students who were taught in this way turned out to be "deaf and dumb" in the target language.

As for the teachers, they are now busy in new ways, give this shift to the role of supporting the learner in more effective learning from the role of "fountain of knowledge" [10](Andrew D. Cohen, 2000). The teacher should encourage the students to learn useful English, observe them and do some research work. Whenever the teacher finds out that the students have some difficulty, he may have a talk with them and try to find solutions to the problems. Teachers can assume the role of diagnotician, coach, coordinator, language learner, researchers, ladder, motivator, advisor, scafforder, and helper. The teacher should try every means to arouse students' interest in learning English, and guide them to be actively involved in learning both in and out of class.

In establishing the new learning method, the author draws a lot of hint from the memorial articles written by many famous scholars, such as Xu Guozhang, Huang Yuanshen, Hu Zhanglin, Liu Zunqing, etc, and also Professor Sun Changshun's proposition of 'big socialized classes' which aims at integrating classroom teaching with extracurricular activities such as English corners, drama clubs, inter-school speaking contests, or language camps. Students may listen to VOA or BBC English programs or to watch English films in the original so as to be familiar with the English accents and the correct way of expressing things, through the big materials at similar levels from different resources of language input, the students can have a better understanding of the English language and the English world, and they can also learn to appreciate the beauty of the English language, enjoy speaking English, fall in love with it, and finally reach to the ultimate goal. In the process, students should not be afraid of making mistakes, because "To err is human".

Since input, together with intake and output form a whole learning process, and they can't be taken apart, so, now, I'd like to say something about the active output learning model, which is supported by output theory [11],that emphasize the importance of output in the learning process and other theories that the paper has already listed above..

3 The Model of Active Output

The following diagram shows the process of oral speech output.

Since the source, explanation, the theoretical and practical foundation of this model are to some extent similar to that of the learning approach of the active input, the paper will not explain them in detail for the limited space. What deserves our more attention is how to apply this learning approach of active output.

A. Students should make use of every time to practice, when he is alone, he may talk to himself, reflect, retell stories and texts, think in English, try to cultivate Shakespear's "theme eye", and depict the things in English in his mind, etc. For example, when he is taking a walk, he may depict the beautiful scenery around him in English.

B. When the student meets with his classmates, they may form a study pair, discuss the text that they have learned or speak out his own opinions about the latest news, such as the World Cup, the American NBA, the pop singer or the famous film stars, etc. The study pair may be his roommate, so that they have every opportunity to practice, thus in a small environment, a semi-natural language environment has been established.

C. Take active part in the English corner, and learn to ask questions which may begin from simple sentence, to simple general questions, etc. Communication begins from asking questions. When the student attends a meeting, he may ask the president some questions that he has prepared before.

D. Be ready to open one's mouth, whenever it is possible, the student should be actively involved in the discussion, debating, presentation, interpretation, etc. He may act as interpretator, or even simultaneous interpretator. At ordinary time, he may pay attention to the preparation of fifty to seventy humorous stories, sing English songs, recite some good English poems, such as 'Ode to the west wind', 'A red, red rose', 'A psalm of life', 'Old captain', etc. At the same time, he may also recite some humorous stories, anecdotes, and good biography, such as 'The tower of Babylon', etc.

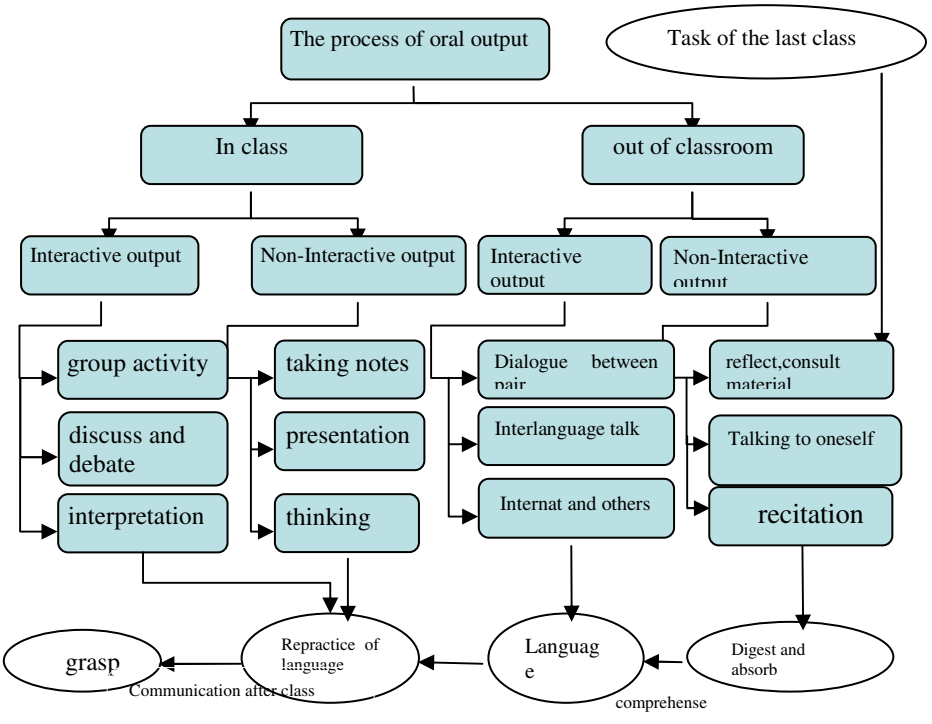

Fig. 2. Model of the process of oral speech output

Make sentences orally, and try to generalize the idea of some sentences.

So it is clear that in order to put out fluently, the students have to learn many things, the active input and active output learning model serves the purpose of elevating the students' overall English capabilities, esp, their listening and speaking abilities, and eliminating the phenomenon of "deaf and dumb" English in China.

The author of the research, using the active input and active output model, has once done a four-month experiment on 140 first-year students of a certain university, the result shows that compared with the control class, the experimental class has a remarkable learning result. (The empirical study is reported in another article).

4 Conclusion

From the above analysis, we can reach the following conclusions:

A. The active input and active output learning model opened a path to the 'blackbox', activated the processing of information in the 'blackbox'.

B. In the process of creating, imitating, testing hypothesis, and foreign language learning process, active input, processing and active output form a whole circulation, the students' listening and speaking abilities were improved. It is well known that

students can't do without input, but it should be active input. Only when the students are actively involved in the learning process can they have abundant power to overcome whatever difficulties. With high emotion, they may try to find every time to input and output.

C. We found in the experiment guided by the new learning model , the students combined their short-term target together with the long-term target. Their short-term target was to find their dream jobs in the job hunting market, while their long-term target was to serve the motherland and have a better life in the future. This new theory and model enabled the students to combine their short-term target together with the long-term target, their interest with their lifelong career, so they had limitless power in learning. They found it very useful and very stimulating to learn English well.

D. This model is very stimulating and interesting, it combines active input together with active output. We know that input cannot do without output, only through active output can the student open the other's mouth, and at the same time, obtain the necessary information, and avoid the phenomenon of "deaf and dumb" English, besides, it arouses the students' interest in learning, introduces to us the concept of study pair, especially it emphasizes practice, and it is in accordance with the proverb "Practice makes perfect".

E. It is in agreement with suggestopedia, which emphasizes relaxed states of mind for maximum atmosphere of the learning and teaching environment created by cheerful decoration, comfortable settings, etc. Its core is active output, having confidence in one's own potential, through the relaxed states of mind, the students can relieve their pressure, and arrive at the expected result.

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Research on the Cost Control Method of the Green Agricultural Product Sealed Supply Chain Based on the Total Process Analysis

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Abstract. The cost control on the green agricultural products sealed supply chain (GAPSSC) should be combined with the process analysis. For the finiteness of member quantity, the consistence of run standards, multi-participants, multi-hierarchy detecting, traceability of the information and higher cost in GAPSSC, the cost control method is different from the normal supply chain. This paper introduces the cost control methods of GAPSSC based on the process analysis which could be divided into push GAPSSC and pull GAPSSC. An example of Jiangsu Suguo supermarket is presented to prove the effectiveness of the cost control methods of push GAPSSC.

Keywords: Cost control, agricultural products, process.

1 Introduction

GAPSSC system nowadays in China, is a relatively loose and open chain, which has not formed a product circulation pattern with effective supervision and bounding the government credit, enterprise operation and product base of green agricultural production together. Therefore, based on the specific conditions of China, it is an urgent and important task to build the green agricultural product sealed supply chain, which is combined with market access system, strict membership qualification audit, governmental effective supervision, effective information distribution ,finally can form a supply chain system with standard operation, effective safeguard of consumption safety and high trust level. Sealed supply chain lay stress on consistency of operation standards, undisturbed and the traceability of products quality of forward logistics. Therefore, sealed supply chain management has become an important idea and method to reduce agricultural product quality risks and ensure agricultural consumption safety in China.

With the limitation of traditional concept and circulation patterns, the development of GAPSSC is relatively slow; the main restriction is the cost control problem. For this reason, further study of the problem of cost control on GAPSSC, cost control of

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whole process, will contribute to sealed reform of Chinese existing green agricultural product supply chain, which provides powerful decision-making references for controlling cost and improving the market responsiveness on green agricultural product supply chain.

2 Literature Review

Researches mainly focus on two sides for cost controlling of supply chain: some scholars do cost control research from the perspective of supply chain cost type (such as direct costs, activity-based costs, transaction costs or logistics costs, capital costs, information stream costs), others do from the perspective of distributions of supply chain cost (such as supplier cost, manufacturer cost, vendor cost, customer cost). When it comes to specific cost control methods, recent researches mainly concentrate on Target Costing[1][2], activity-based costing[3][4], life cycle costing[5], kaizen costing[4], integrated method[6]and some other aspects. Therefore, researches from the process perspective are still less common. Recent cost research mostly has not linked to the supply chain process especially on agricultural product supply chain. They just study on methods, or distributions, lacking a whole process view of supply chain of control cost.

Many researches have not considered the effects of sealed characteristic on existent methods for cost management on supply chain [7][8]. In practice, sealed supply chain has the business characteristics of members' finiteness and stability, operation standards consistency, multi-agent participation, multiple-level detection, information traceability. These characteristics are essential constraint conditions, and should be considered.

3 The Characteristic and Effects of GAPSSC

A. The characteristics of GAPSSC

GAPSSC has the following characteristics: (1) Finiteness of member quantity. In order to meet the requirement of 'sealed', GAPSSC require node enterprises in supply chain have to meet certain market access characteristics, such as nuisance-less admittance, forensic admittance, QS certification admittance, etc. (2) Consistency of operation standards. Sealed supply chain requires every node enterprise satisfy specified standards set by core enterprise and each batch of agricultural products have to satisfy the requirements of stability, when designing the production standards. (3) The organization is multi-subject participated. (4) Multiple-level detection and information traceability. (5) Relatively high cost. In order to meet the requirements of 'sealed', the cost of green agricultural products is higher than that of common agricultural products. In green products, market access cost, information tracing cost and detection cost occupy a large proportion in the whole cost, which is the key point of cost controlling.

B. Operational process of GAPSSC

According to the different way to satisfy agricultural product demands, GAPSSC can be divided into push GAPSSC and pull GAPSSC. Push GAPSSC process is shown in Figure 1, and pull GAPSSC process is shown in Figure 2.

In push GAPSSC, production and sales decisions of agricultural products are made based on long-term predictions. Generally speaking, every production base, cooperation organization, scattered farmers undertake agricultural cultivation based on its natural characteristics, then sell ripe agricultural products through local distribution channel to enterprises engaged in processing agricultural products. After appropriately processing and packaging, products are distributed to wholesalers and retailers, finally sold to customers. In pull GAPSSC, usually oriented by consumer demands, a customer or a certain enterprise client raise purchasing demand to core enterprise (such as enterprises engaged in processing agricultural products and enterprises engaged in sales agricultural products) in agricultural product supply chain. Then, core enterprise organizes farmers, rural cooperative economic organization, or production bases to product according to the standards set by customer. Finally agricultural products are delivered to customers when completed.

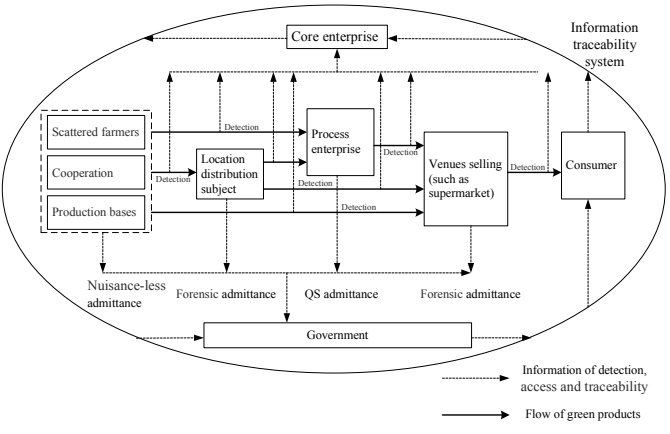

Fig. 1. Process flow of push GAPSSC

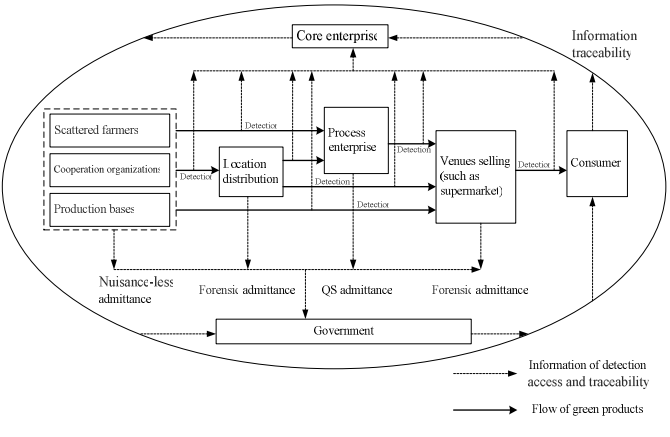

Fig. 2. Process flow of pull GAPSSC

C. The effects of characteristic of GAPSSC on cost control

The effects of characteristics of GAPSSC on cost control reflect in the following respects:

1) Market access in sealed supply chain determines the finiteness of member' option, which causes the threshold cost on enterprise selection. Namely, total target cost of the sealed supply chain should not be reduced infinitely, it has lower limits.

2) The methods of standard cost management is difficult to apply. Because there is a need of multiple-level detection and information traceability in the sealed supply chain and the quality variations in individual agricultural products, it causes the ultimate detection cost difficult to be accurately predicted, standard detection cost hard to devise, traditional standard cost method improper to copy.

3) Cost management must design for the whole life cycle of product. The characteristic of 'Sealed' requires the total cost of green agricultural products must cover all of the four processes of production, circulation, consumption and feedback. Therefore, cost management must design for the whole.

4) Transaction cost becomes a managerial focus. In order to guarantee the needs of sealed operation, each enterprise in sealed supply chain have to concentrate efforts on the feedback control methods of multiple-level detection and information traceability.

4 Cost Control Model of GAPSSC Based on the Total Process Analysis

A. The conception of cost control based on proces

Cost control model of GAPSSC based on the total process analysis is a method which makes green agriculture products as the cardinal line on GAPSSC. It applies the thinking of supply chain to achieve the time and space expanding of cost control. By controlling cost framework at the beginning point and controlling cost target at the occurring point, this method can control and reduce costs from the roots and overall, also avoid the part of the business risks effectively, the realization of supply chain profits is thereby guaranteed.

B. Cost controlling models of push and pull GAPSSC

Here introduce different cost controlling models of push and pull GAPSSC, which are shown in Figure 3 and Figure 4.

Characteristics of Push GAPSSC cost controlling model are displayed as follows:

1) Cost control based on product process. We should advance cost control according to the progress of product process over time.

2) The integrality of control objects. The control object of traditional target costing is always the resources of core enterprise itself, but cost controlling based on process expand the object to many sections and stages.

*3) Feedback of cost control model. I*n various stages of the product process, we set control quota according to total target costs, and then feedback the situation of every stage. If something deviates, total target cost should be modified in time.

4) The scope and keystone of cost control. Product life cycle should be the scope of cost control, including design cost, plant cost, purchase cost, processing cost, deliver cost,

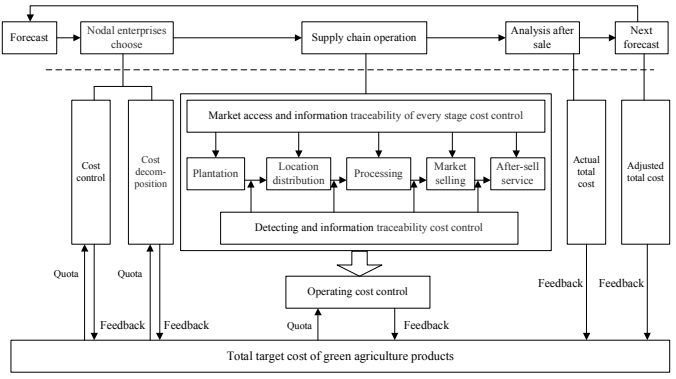

Fig. 3. Push GAPSSC based on processing

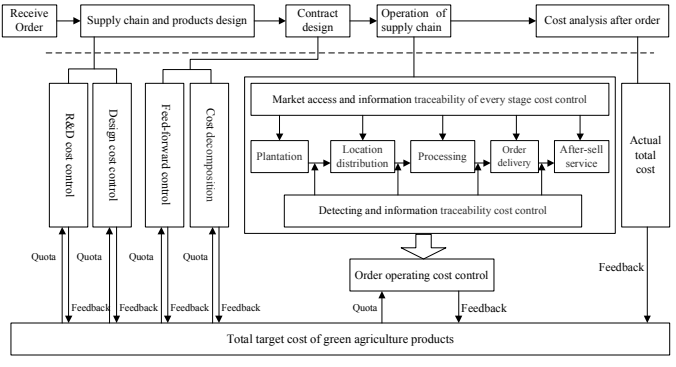

Fig. 4. Pull GAPSSC based on processing

after-sale service cost and so on. The keystone of cost control not only includes the enterprise itself, but also includes the cost of multi-hierarchy detection and information tracing.

5) Methods of cost control. Cost control based on product process infiltrates the entire process of product and at the same time emphasizes feed-forward control.

6) Multi-participants of cost control. The subject of cost controlling is not the Finance Department but the Cost Management Committee which commit the control into each functional department within an enterprise. While outside the enterprise, each functional department ensures multi-participants of cost control by core enterprise coordination, users involving in the design, multi-hierarchy detection, information retroaction and dynamic management of supply chain.

7) Continuous improvement. In push supply chain, without the knowledge of the demands of customers, or the purchase agreement with clients in advance. Therefore, after selling a batch of green agriculture products, enterprise makes cost control decision of the next batch as mentioned above; that is, this control method is necessarily a continuous improvement.

Different from push GAPSSC, besides the characteristic No.1 to No.6 of push GAPSSC, pull GAPSSC also has the following three:

1) Market or consumer oriented and predictability. Cost control runs at the quotation and design stage before signing order contract in the model of pull supply chain which is consumer oriented.

2) Cost controlling acts as a project. Pull supply chain is consumer oriented, each order should conduct according to customer demand (what, how much, how about, when to cultivate). Pull supply chain must meet the customer's demands for visualization of the information about the process of the order fulfillment and the quality standard.

(3) More restrictive constraint of market access cost. For the customer demands of pull GAPSSC, the products not only have to meet national accreditation standards, but also have to satisfy their customers' specific standards. So, the constraint of market access cost of pull GAPSSC is more restrictive.

5 One Case about Push GAPSSC

Jiangsu Suguo Group is the largest agricultural supermarket in Jiangsu, which has 1800 branch stores coving Jiangsu, Anhui, Shandong, Henan, Hubei, Hebei province. The agricultural supply chain of Suguo is the a typical push GAPSSC, which deserves to draw lessons from.

A. Setting total target cost of product

Suguo supermarket, as the core of the GAPSSC, sets total cost target according to the market situation, quality of past agricultural products, ability of the enterprises themselves before green agriculture product planted. At the initial stage, total target cost model can be rough, and then refined and worked out into detailed target cost deepening of the supply chain operating. Furthermore, according to the actual cost situation of each stage, enterprise modifies the target cost to make sure the target cost is closer to the actual cost, so that target costing can be more guidable and constrainable.

B. Control the design cost

At the stage of design, Suguo supermarket considers the life cycle cost of green agricultural products. In terms of the supply chain design, Suguo supermarket should consider the influence of cost control caused by different supply chain design proposals, screen corresponding suppliers according to the optimal cost control mode. At present, the suppliers can be divided into two kinds: rural cooperation and corporation. The enterprise has strict constraint to allied bases on cost standard and quality standard; only the ones who meet the required standards are qualified. The enterprise has a hundred of green agricultural products bases now all over the country, besides Jiangsu, there are also Suguo bases in Shandong, Inner Mongolia, Xinjiang.

C. Decomposition of target cost

Target costing is a method of making products profit plans and cost management according to market situation, whose core process is confirmation and decomposition of target cost. Suguo supermarket makes a target sale price and a target cost generally

according to market demand of products, then breaks down the target cost, and commits it to the specific enterprise in agricultural products supply chain.

D. Cost control during operation period

Operation period consists of the five stages of plantation, location distribution, processing, sales venues selling and after-sale service. According to the characteristics of sealed supply chain, cost control during operation period of Suguo can be shown as follows:

1) Cost control of market admittance

Suguo supermarket stipulates that allied agricultural products supplier must get QC certification, HACCP certification, ISO quality standard certification and food hygiene license certification, in order to control the cost of market admittance. This makes Suguo improves the stability of products delivery qualit, reduces the nonessential extra cost in future and ensures the normal operation of agricultural products supply chain.

2) Detection cost control

Detection cost comes from three factors: the detection links of agricultural products, the number of detection facilities in every link, the frequency of actual detection in every link. In terms of detecting, each batch of fresh products needs inspection, if incompatible with relevant standard, the supplier will be disqualified. Before cooperating, supplier and Suguo come to the agreement of food special security check in advance, which prescribes the food sending to Suguo Distribution Center, must be qualified. If disqualification, Suguo will punish or even remove the supplier. Meanwhile, Suguo improves the ability of quality detection and information tracing ability positively.

3) Cost control of information retroaction

Suguo supermarket invests in information retroaction system in line with local conditions according to the principles of practicality and convenience, on the one hand, in order to enhance cost control of information retroaction. For example, Jiangsu Nanjing Suguo Horse Distribution Center, widely use many advanced, mature technique and equipment. The world-leading professional storage management software (SSA Exceed 4000) serves as its logistics information system. Meanwhile, the system applies the equipment of the wireless network and RF, supporting logistics working paperless and shipping information traceable. On the other hand, Suguo establishes standardization management procedure to ensure that the information of GAPSSC can be input and searched instantly.

E. Actual total cost analysis of supply chain

Suguo supermarket analyses the cost of supply chain at regular intervals(such as a monthly basis and quarterly basis), to find the composition of the total cost in different links and distributing trend charts in different stages over time about purchasing cost, inventory cost, transportation cost and transaction cost of products. Suguo also analyses the reasons for the variable differences of purchasing cost, labor cost, and infrastructure cost and so on, and then finds out the reasons and countermeasures of cost variance.

6 Conclusions and Future Works

Controlling cost availably and guaranteeing the fulfillment of target profit is a key problem needed to be solved urgently in Chinese green agricultural product sealed supply chain. The conclusion drawn by this paper is that cost control of GAPSSC should combine with the process of agriculture products closely, cost control target should focus on transaction cost, the controlling period should be the product life cycle, the controlled object should be the every joint enterprise on supply chain, feed-forward control and then safeguarding through concurrent control is the first choice for the method of the control. This paper divides the cost control of GAPSSC into push GAPSSC and pull GAPSSC based on process then analyses the characteristics of each cost mode. I hope the cost control model presented in this paper will bring helpful enlightens and thoughts for researching the management problem of sealed supply chain cost in future.

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Research on Chinese Word Segmentation Algorithm Based on Special Identifiers

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Abstract. Chinese information processing is a tedious and massive information processing engineering, Chinese word processing is that the whole project-based and one among the important aspects. This paper provides a word segmentation method based on special identifiers, and realizes a word segmentation system by combining the special identifier set with the modified two-character dictionary structure, before it carries out the comparison test for that system and other word segmentation systems by SOUGOU training corpus's test text.

Keywords: Chinese word segmentation, special identifie, vocabulary.

1 Introduction

Chinese word segmentation is to segment the orderly sequence of Chinese to meaningful words, so as to be convenient for the computer's understanding and processing. As Chinese characters don't have natural advantage in the computer processing, and are different from the English words which have clear blank space as the space mark, they are saved in the form of the arrayed Chinese character string sequences with equal distance but without any segmental mark in the computer [1]. Therefore, in the relevant technical fields of Chinese character processing, Chinese word segmentation is a key and critical technique.

2 Presentation of Special Identifier

A. Definition for the Special Identifier

In Chinese texts, there are many identifying marks for special usage and with special meanings, such as, punctuation marks, unit symbols, mathematical signs, digit symbols, letters of the alphabet and other non-Chinese character signs and symbols. Besides, Chinese language has extensive and profound meanings, large quantity of vocabulary, and some characters with special meanings, so the special identifier can be defined as: the words or the symbols have special meanings and functions in the text or the sentences, and consist of the special Chinese identifying words and the non-Chinese character signs, including punctuation marks, unit symbols, mathematical signs, digit symbols and letters of the alphabet.

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The definition of the special identifier can be used for selecting the special identifiers. The special non-Chinese identifiers can be extracted independently and conveniently. For selection of the special Chinese identifiers, through analysis of the Chinese words' parts of speech, some words used as independent sentences, such as interjection and onomatopoeic words, can be clearly defined into an independent special string set; and adverbs, prepositions, auxiliary words and conjunctions are also have clear segmentation capabilities. After repeatedly looking up the Chinese dictionary, we have the special Chinese identifiers listed in Table 1.

Table 1. Special Chinese Identifier Set

啊	吖	嗄	锕	阿	錒	哎	唉	嗳	乂	嘢	鄢	既	即	比	被	把	倍	已	乙
罢	叭	呸	吓	哔	佰	啵	百	北	卟	又	嚘	唷	由	越	咋	喂	壹	哟	哟
嘎	咘	叉	此	吡	嚓	采	喋	毗	叭	吁	右	呦	则	吭	咱	尚	别	凭	啧
咂	嗒	呬	嗝	当	咚	噔	嗲	嚜	唸	止	至	吱	在	极	总	刚	不	唷	与
喋	叮	啶	嘎	咧	嘚	但	吋	唗	哦	过	何	莫	反	敢	或	跟	果	内	还
嗯	呃	哑	欸	而	尔	尔	唄	噶	咯	况	没	该	嘧	去	固	与	进	几	后
汩	啒	嘓	哈	嗨	嘿	呵	吽	咳	和	倘	非	噔	咔	第	予	及	啲	再	正
啊	嗳	哼	啐	叮	哗	嚯	啪	何	咭	很	于	以	吾	咦	兮	嘘	只	始	连
吆	呴	吭	叩	吭	咔	鲃	喀	咧	咯	铛	仍	嗷	哪	任	喳	俩	囌	吧	里
喟	啰	喇	来	唠	叻	嚼	呖	唰	喨	咂	哒	嘣	呸	那	都	喽	喀	潺	咩
吗	嘛	唛	么	乜	咪	眸	牟	哂	嘍	呃	嗝	嘬	去	经	嘀	喱	着	的	傣
每	们	嘧	乜	吁	厶	呐	噙	乃	哔	咣	咂	滴	壬	前	咬	喵	啅	啲	噢
喃	呢	廿	哳	您	你	廿	哦	喔	那	啊	呷	嘟	哂	斯	咣	佴	共	吠	嗪
嘭	磞	呔	呯	岂	亓	呛	其	丿	且	忒	嘴	呱	俟	最	囃	啪	倘	咕	嗞
亻	迈	如	入	哎	若	汝	然	啥	咲	吨	叽	嗐	唄	上	哜	入	都	咍	什
煞	嘎	吵	唆	啶	喢	噻	叁	嗓	佘	咯	啦	唧	无	总	哏	顶	嚯	昀	哟
是	似	厮	使	古	已	嘶	咭	厶	国	吪	了	哩	嘶	往	嚒	未	吼	叻	咍
啫	哧	辻	唰	罒	三	嗾	虽	哑	嚃	喂	往	往	呜	嘘	呐	喳	勿	往	往
哇	呔	嗒	岂	嗖	谁	嗢	外	汪	嗡	唇	嘘	嘘	这	吙	内	趁	出	嘘	嘘
丗	晲	呀	呀	吖	焉	闫	也	耶	嘻	为	甚	嗝	亦	唏	常	怎	地		

For the segmentation operation of the abovementioned special identifier set, it shall forward scan the full text starting from the head word, identify and segment the identified special identifiers from the text, so as to divide the text into small parts with certain lengths.

B. The steps of text segmentation by the special identifier

1) *Forward verbatim scan the Chinese text;*
2) *Detach the special non-Chinese identifiers from the text before and behind them;*
3) *Scan the text again, and find matches to the list of special Chinese identifiers;*
4) *Carry out selection according to the two-character root external word list consisting of three-character words, 4-character words and multi-character words;*
5) *Verify the collocation of the character at right of the matched special identifying word; if it can form a word in the two-character dictionary, segmentation is determined;*
6) *Otherwise, they are naturally isolated.*

The matching segmentation of special identifier set can divide the text into several short-length paragraphs. And in the following word segmentation algorithm, it just requires the matching operation for those detailed paragraphs, so it can more rapidly segment the potential words in the text.

3 Dictionary Mechanism of Structure of Two-Character Root Word List

The successful Chinese word segmentation system is asked to have higher segmentation accuracy and rapid segmentation capacity. At present, the word segmentation system mainly accelerates the segment speed by the design of high-efficient word segmentation dictionary. In the rapid dictionary query method, the word segment dictionary mechanism with high segmentation speed often consumes more internal memory resources, and large occupation of the memory will also affect the algorithm's practical application and executive capability.

This paper brings forward the idea that, use two-character words as the roots to replace the traditional method using the single-character words as the head word roots for the word list structure. After the priority processing of two-character words, the words longer than 2 characters are put into the two-character root suffix set.

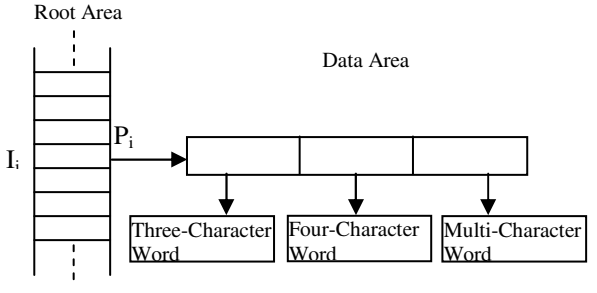

Fig. 1. Structure of New Word List

The word segmentation dictionary is produced through processing the ordinary Chinese dictionary. Each step of the word segmentation algorithm's matching operation is defined in the limited Chinese character range of space, and the whole structure of the word segmentation dictionary includes 2 parts, namely, two-character root area and data area. The data area[2] is the suffix area of two-character words and is for the words with different lengths during the word segmentation; it put the words with same root but different lengths into different sections, so as to form three-character word list, four-character word list and multi-character list (whose number of character is more than 4) and save them in the form of chain tables. The dictionary structure is shown in Figure 1.

Ii: index entry of two-character root; C_iC_{i+1}, occupies 9 bytes in data storage, and the storage structure is shown in Figure 2 below:

C_iC_{i+1}	n	Flag

Fig. 2. Root Storage Structure

In the above table, C_iC_{i+1} is the part of header two-character root; n represents the number of the suffix entries in that two-character root; flag shows availability for word segmentation.

The search procedure of the two-character root list: identify the Chinese string for segmentation by the letter as the string $S=C_0C_1C_2\ldots\ldots C_n$ (in which, n represents the number of all entries). According to the two-character root and the index entry I_i, calculate the two-character root's corresponding storage address in the dictionary. Therefore, we can get the number n of the entries in the two-character root, and all entries that the indicator P_i points at.

On the basis of that new dictionary structure and combining with the actual word segmentation process, in the matching process of the word segmentation, firstly, it shall looked up the substring (collective suffix entries) of C_iC_{i+1} in the dictionary, and find out the index entry P_i (if C_iC_{i+1} is not in the word segmentation dictionary, it shall use and put the index number closest to C_iC_{i+1} at the front position).

Secondly, it shall search the longest and completely matched entry after the index entry. The search operation can be terminated when either of these two demands is met: the current string's matching length is larger than the maximum matching length, or the string for matching is longer than the entries in the word segmentation dictionary.

At last, it shall use the same method to segment the next Chinese string.

According to the organization structure of the word segmentation dictionary, the expression for the chain table storage structure of two-character root suffix is as follows:

$$t+ N + Length + postfix\ 1 + postfix2 + \ldots\ldots + postfix\ N$$

In the expression, t represents the two-character word, N represents the entry of the two-character root suffix set with t root, and Length represents the length of the longest entry of the two-character root suffix set.

In the whole structure of the new dictionary, the two-character word is used as the header index and the root, which is different from the common dictionary structure using the single-character word as the header index.

According to the access process of Chinese electronic dictionary and the coding features of Chinese characters, given the querying entry is presented in the form of

Chinese internal code, the root is C_iC_{i+1} in the dictionary structure. That method is for the one-to-one corresponding relationship with different header roots and different corresponding addresses. The matching operation is not required during the processing of calculating the root index entry by the root. After the index entry is found out, if the searching string is a single-character word or independent word, it shall consider if C_iC_{i+1} can independently form a word or not even a word; otherwise, it shall search according to the third character of the searching item, and then return result.

The dictionary mechanism using the two-character words as roots doesn't unrestrictedly occupy the memory resources, and it mainly reduces the average matching times in word segmentation to improve the segmentation efficiency.

4 Method Based on Special Identifiers

This paper's word segmentation design is a mechanical word segmentation based on the string matching, which is improved on the basis of the forward maximum matching method[3].

The forward maximum matching method has simple principle, is easy to be realized on the computer, and has lower time complexity; but its disadvantage is also obvious, due to the restriction of length, the longer the words are, the lower its efficiency will be; on the contrary, if the words are too short, it can't guarantee the word segmentation accuracy; when most of words have 2 characters, even when the words' lengths are defined in the relatively short range (for instance, set up the word's length as 5), at least 3 times of matching algorithms are redundant and waste; it can't correctly segment the combined and ambiguous fields and the overlapping ambiguous fields, as it's hard to determine their Max Lens.

A. The steps of word segmentation algorithm

The improved word segmentation algorithm in this paper is to carry out the word segmentation for the forward scanning string for segmentation by combining the new dictionary structure of two-character roots. In the word segmentation, it firstly forward scans the input string S, reads the string in the set range of the maximum matching length; it reads the head word in the forward scan for matching in the new word list with the new word list's dictionary structure; according to the two-character roots, it progressively increase the string to match downwards until it meets the character or special identifiers that can't form words. That improved forward scan is used for improving the word segmentation algorithm's efficiency and breaking through the restriction of the segmentation length.

It scans the root node's chain table and matches the root nodes to the first two-character of Chinese string; if they match successfully, it reads MaxLen-2 characters in the order of the root node's information sequence, and match them in the corresponding root node suffix set.

For example, Chinese string $S=C_0C_1C_2\ldots\ldots C_n$, the root indicator P_i points at C_iC_{i+1}.

1) Firstly, after processing the special identifiers, the address of the corresponding index entry Ii shall be calculated according to the root C_iC_{i+1}. And for Chinese string, we scan and read its header two-character word C_0C_1 ;

2) The two-character word read in scan is to be looked up as the root in this table; when word is found, it shall turn to Step 3); otherwise, the read two-character word is actually a single-character word, and it shall turn to Step 5). After the root is found, the corresponding index address I0 can be calculated according to the root.
3) If the read word's length is 2 and it is successfully found in the root area of the word list, $C_0C_1$is a two-character phase, and it shall turn to Step 5);
4) After scanning the roots, when S string's length is longer than 2, these operations shall be carried out: search and match the rest strings, if the string $C_iC_{i+1}……C_{i+k-1}$is in the root node suffix set, the string is a multi-character word, and it shall turn to Step 5), when the string's length shall subtract 1.
5) The segmented string "W" shall be added with the segmentation identifier and stored in the cache.
6) It shall define the length of P_i=P_i+ "W", turn to Step 2), continue to read the segmented string's following string part, and terminate the search until it meets the special identifier.

This improved word segmentation algorithm is to be implemented after the Chinese string for segmentation has been through the segmentation of special identifiers, so before the segmentation in this method, it's necessary to scan and compare with the special identifiers in the special identifier set first; and before the matching search in the two-character root dictionary, the text shall be preliminarily segmented, so the originally long text is divided into several continuous phases of Chinese test.

B. Source code

According to the description of the algorithm, a part of core program segments are listed below:

Dictionary Structure:

```
public class str_dicsort{
    HashMap dic[]=new HashMap[8192];
    FileInputStream myfis=null;
    File myFile_distrc;
    long lenth;
    myFile_from=new File("d:/distrc.txt");//Dictionary file
    lenth=myFile_distrc.length();
    byte b[]=new byte[lenth];
    myfis=new FileInputStream(myFile_distrc);
    while(i!=-1)i=myfile.read(b);} ;
```

Interruption according to the special identifiers:

public class sentens{public String sentens(String myfile) throws ExceptionFile{according to the special identifier participle, "/" is used as the mark at interruption point}}

Word Segmentation Matching:

```
public class SegmentationMatching{
int totalOffset=0;
int strLen=strlen(S);
while(totalOffset<strLen)
{int result=0;  //calculate the index entry's address
 unsigned char q=*S,w=*(S+1);
 int n;  //n is the number of entries;
 int index=FindWord(4  (char*)C0C1  &result);
 if(index==-1)
 {start=result+1;  //not find C0C1
  matchMax=0;}
  else{start=index+1;matchMax=1;}
  int bContinued=1; //search the mark
  while(start<n&&bContinued>0)
  {bContinued=1;
   char*wordPtr=Pi[start];int wordLen=strlen(wordPtr)-2;
   if(*(S+offset)!=*wordPtr||*(S+offset+1)!=*(wordPtr+1))
        break;
   i=2;
   while(i<wordLen)
   {if(*(S+offset+i)==*(wordPtr+i)) i++;
    else{bContinued=*(textPtr+offset+i)-*(wordPtr+i);
         //if the string is larger than entry, it aborts
         break;}
   if(i==wordLen)
   {i>>=1; if(i<MaxLenth) break; else MaxLenth=i;}
   start++; //prepare for the next entry
  }
  offset+=MaxLenth<<1;S+=offset;TotalOffset+=offset;
 }
}
```

Due to the limited space, this paper mainly describes the overall structure of the word segmentation program in details, and doesn't list all core algorithms and source codes.

5 Comparison and Analysis of Test Results

The evaluation indicators for the Chinese word segmentation system include: accuracy, efficiency, applicability, rate of accuracy, recall rate and segmentation speed [4].

Evaluation and test of the word segmentation system in this paper by the above evaluation indicators for word segmentation system are completed in the machine with Intel Core2, 1G memory, and WindowsXP operating system. The text data to process in the test are from SOUGOU laboratory corpus, and the result of word segmentation is manually evaluated.

Table 2. Manual Evaluation and Comparison of Rates of Accuracy of Word Segmentation

Names of Systems	Test Text 1	Test Text 2	Test Text 3
Word Segmentation System Based on Special Identifiers	0.966	0.972	0.963
ICTCLAS	0.968	0.97	0.952

Table 3. Manual Evaluation and Comparison of Efficiencies of Word Segmentation

Names of Systems	Methods of Word Segmentation	Time
Word Segmentation System Based on Special Identifiers	Improved FMM Based on Special Identifiers	68ms
Lucene	FMM Algorithm	80ms

Comparison and analysis of the test results show that, the word segmentation method in this paper reaches certain levels of word segmentation accuracy and speed, so it's feasible.

Acknowledgment. Thanks for my parents take good care of me, and thanks for my friends care for me.

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Research on IPv6 Transition Strategy of Campus Network

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Abstract. In order to realize campus network transition from IPv4 to IPv6, one IPv6 scheme based on soft route is introduced, and has carried network experiment on Linux systematic platform , has disposed some application services which support IPv6 protocol: such as WWW, FTP, DNS, etc.

Keywords: IPv6, Ipsec, protocol, network.

1 Introduction

Any technology for the transition from IPv4 to IPv6 is for specific problem, so it's not commonly applicable. However, in the specified network environment, it often needs to be combined with other technologies, and the actual application often asks for integrally considering the actual situation in order to draft appropriate transition plans, and continuously update and optimize those plans in line with the improvement of network software and hardware technologies.

During the transition from IPv4 to IPv6, the update of the campus network generally follows these principles:

1) Progressively Update: guarantee the existing IPv4 nodes in the network can communicate regularly and be upgraded to IPv6.

2) Progressively Disposition: new IPv6 nodes can be added in the network at any time.

3) Convenient for Network Addressing: in the environment of coexistence of IPv6 host or router, IPv4 equipment can continue to use the original addressing methods.

4) When IPv6 link is unable to be used, the tunneling technique shall be used among IPv6 nodes.

5) Communication of dual-stack IPv6/IPv4 host and pure IPv6 or pure IPv4 hosts doesn't use the protocol conversion, and directly "and automatically" chooses the relevant communications protocol (IPv4 or IPv6).

6) For the communication between pure IPv6 and pure IPv4 hosts, protocol conversion or application-level gateways (ALG) techniques shall be adopted; the protocol converter or ALG shall be designed to guarantee that, they can be possibly used without changes of original applications.

7) Update shall guarantee the minimum consumption costs and the minimum preparation.

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2 IPv6 Transition Plan of Campus Network

At present, most of the devices in the network only support IPv4, and replacement of all those devices with IPv6 devices will need a large expense, which is not able to be realized in the current conditions in short period; besides, upgrade of network cannot discontinue the current network, and more importantly, IPv4 network applications are relatively more stable and reliable, when current IPv6 applications are still in the stage of research and experiments. In consideration of all those factors, transition from IPv4 to IPv6 is destined to be a progressive process which lasts for a long time. IPv6 disposition process can be divided into 3 stages shown in Figure 1.

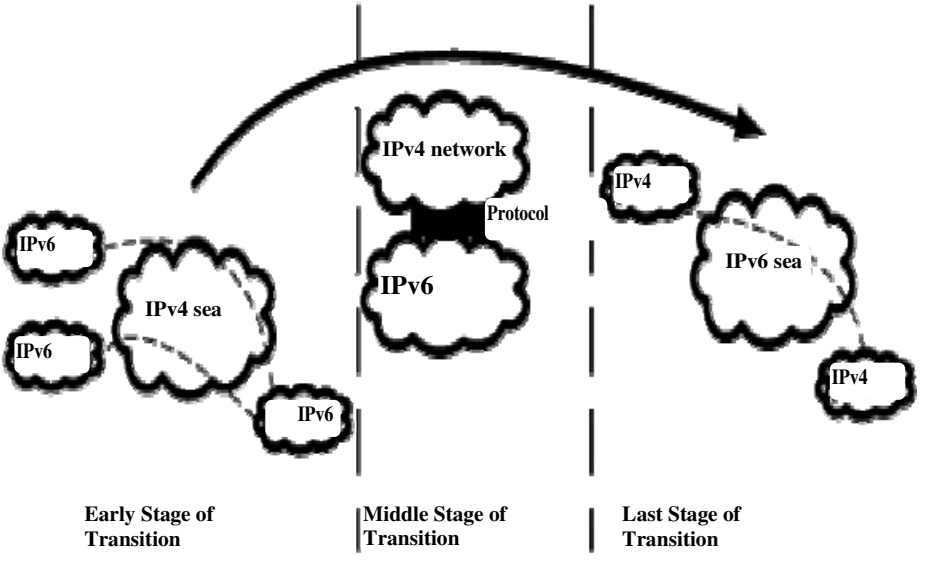

Fig. 1. IPv4/IPv6 Transition Disposition Process

A. First Stage: the early stage of IPv6 development

In this stage, IPv4 network is in the dominant position, and IPv6 network consists of some islands, which are fundamentally in the early stage; and the solution is to use types of tunneling techniques to interconnect IPv6 networks.

B. Second Stage: the stage of coexistence of IPv6 and IPv4

IPv6 is widely applied, and the backbone is IPv6 Internet network; so a lot of business is introduced on IPv6 platform, and many advantages of IPv6 can be fully brought into play. However, IPv6 networks are impossible to be intercommunicated already, tunneling interconnection is still necessary; at the same time, although IPv6 platform realizes more business and accelerates implementation of IPv6, due to a long amount of traditional IPv4 business, many nodes are still dual-stack nodes; at this moment, not only the tunneling technique shall be used, but also the protocol conversion technique for network communication between IPv4 and IPv6 shall be adopted.

C. Third Stage: the stage of IPv6's dominance

When IPv6 is well developed, the backbone networks are IPv6 networks, when IPv4 networks become islands; that stage was similar to the early stage of IPv6 development, which is also disposed through the tunneling technique but for IPv4 network.

Realization of IPv6 campus work shall include access realization and internal realization, in which, the access realization is to connect the campus network's existing IPv6 network to IPv6 network on the education network through the current IPv4 network, so as to access to IPv6 network resources in the world; and the internal realization is to realize the access of the campus network's internal IPv6 applications through certain mechanism. On the basis of current situations (most of network devices don't support IPv6, there's limited fund) of the campus network, this primary design plan for the campus network's transition from IPv4 to IPv6 is drafted, and the network's topological structure is shown in Figure 2.

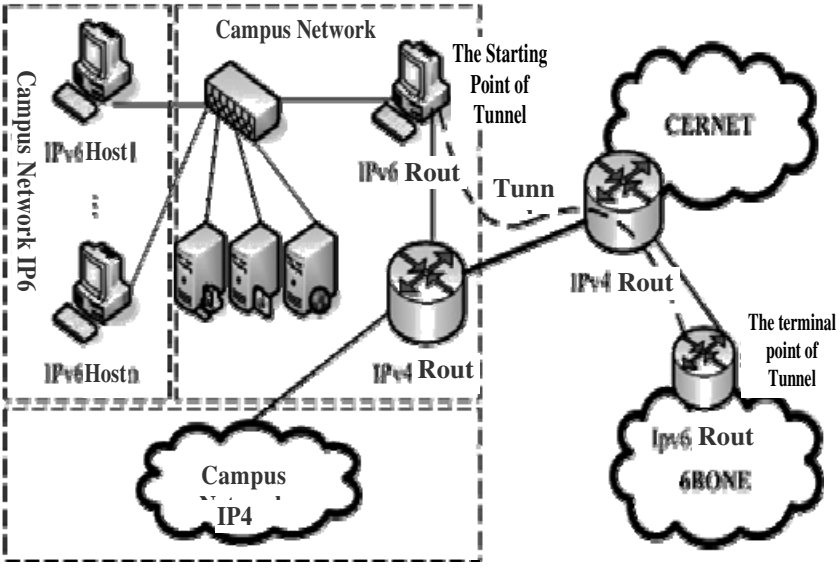

Fig. 2. Topology Diagram of Campus Network's IPv6 Access

The dashed box at bottom of the figure above represents the topologic structure of the current campus network's IPv4 parts, and the upper left dashed box represents that of the campus network's IPv6 parts; the upper right dashed box represents the network center, where IPv6/v4 router is set up as the starting point of IPv6 tunnel; the router of tunnel is connected with IPv6 testbed of CERNET by the tunnel, interconnected with 6bone by the testbed; other hosts connected with the router can be the dual-stack host or the pure IPv6 host, which can carry out automatic address configuration and visit external IPv6 though the router.

This is the diagram of the transition network's logical topological structure:

Fig. 3. Logical Diagram of Tunnel Configuration

3 Configuration Method for Tunnel's Access to IPv6 Testbed

A. Tunnel Applications

To realize the campus network's access to IPv6, IPv6 address and Tunnel must be applied from network center CERNET; and given these are provided:

Information of IPv6 router in CERNET:
IPv4 address: 202.38.99.4
IPv6 address: 3ffe:3240::ffff:0:1e:1/112
BGP AS Number: 65001
Information of IPv6 router in campus network:
IPv4 address: 202.114.88.12
IPv6 address: 3ffe:3240::ffff:0:1e:2/112
BGP AS Number: 65031

B. Establish tunnel by soft route

At present, all routing products companies have promoted their own routers support to IPv6, but the access routers for upgrading the campus network are v4/v6 dual-stack routers which will be a large amount of expense; therefore, in consideration of the cost, the route operation system can be used.

IPv6 access router can be established by a dual-homed host RedHat9 installing with Zebra software; Zebra software, as the assembly of several routing protocol platforms, can support RIP, OSPF, BGP, and other routing protocols; Zebra uses the Neighbor Discovery Protocols (ND) to urge IPv6 host, on the same link with the router, to automatically gain IPv6 address; and the latest Zebra source program can be downloaded from Zebra.org, and Zebra can be installed in line with default settings.

1) In /etc/rc.local, use the relevant instructions to establish the tunnel, and the specific instructions are as follows:

```
Modprobe IPv6
IP tunnel add sitl mode sit remote 202.38.99.4 local 202.114.88.12 ttl 255
IP link set sitl up              //Start Tunnel
Service zebra start              //Start zebra
Service bgpd start               // Start Router bgpd
```

2) Permit the core to forward the pockets, and these instructions permit the core to forward the pockets:

```
#echo"1">/proc/sys/net/lPv6/conf/all/forwarding
```

3) Configurate routing, and relevant IPv6 configuration is:

Zebra's key configuration information:

IPv6 address of configuration interface eth0 makes the interface issue the route announcement, so as to realize the address's automatic configuration.

```
interface eth0
    IPv6 address 2001:250:209:1::1/64
    no IPv6 nd suppress-ra
    IPv6 nd prefix-advertisement 2001:250:209:1::/64 2592000 604800 onlink
autoconfig
 !
interface eth1
    IPv6 address 2001:250:209:2::1/64
    IPv6 nd suppress-ra
 ! // Set up sitl's IPv6 address as the one distributed by the opponent
interface sitl
    IPv6 address 3ffe:3240::ffff:0:1e:2/112
    IPv6 nd suppress-ra
    !
bgp4+route's key configuration information:
router bgp 65031 // Announce its own bgp (Border Gateway Protocol) AS
Number
    bgp router-id 1.1.1.1 // Set up route-id
    no bgp default IPv4-unicast // Make bgp as the default of IPv6 route
    neighbor 3ffe:3240::ffff:0:1e:1 remote-as 65001     //Set up the connected
route's IPv6 address and its AS Number
    !
    address-family IPv6
    neighbor 3ffe:3240::ffff:0:1e:1 activate
    exit-address-family
    !
```

In that way, the access router's configuration is completed, and the software route platform can be IPv6 gateway edge route of the campus network, so the campus network's IPv6 users can access to the external IPv6 sites.

4 IPv6 Application Disposition

In the present stage, there are not many IPv6 applications, which are still in the stage of transplanting IPv4 applications to IPv6, and many applications have certain dependency relationships with the service platforms and the customer platforms.

A. DNS Service

Configuration of IPv6 DNS service can choose bind-9.2.2-21 DNS on linux, which supports IPv4 and IPv6 addresses at the same time, but in default condition, it just supports IPv4; to make it also support IPv6, it's necessary to add listen-on-v6{any;} ; and allow-v6-synthesis{any;} ; in the configuration file /etc/named.conf, in order to listen to IPv6.

Configuration is as follows:

1) configuration of /etc/named.conf:

```
options{directory "/var/named";
        listen-on-v6 {any;};
        allow-v6-synthesis {any;};};
controls{
        inet 127.0.0.1 allow{localhost;} keys{mdckey;};};
zone"·"IN{type hint; file "named.ca";};
zone "localhost" IN{type master;
file "localhost.zone";
        allow-update{none;};};
zone "0.0.127.in-addr.arpa" IN{type master;
        file "named.local";
        allow-update{none;};};
zone "whut6.edu.cn" IN{type master;
         file "db.whut6.edu.cn";
         allow-update{none;};};
zone "1.0.0.0.9zone"1.0.0.0.9.0.2.0.0.5.2.0.1.0.0.2.ip6.int"{
          type master;
          file "db.1.209.250.2001";};
include "/etc/mdc.key";
```

Few primary domains are defined in the configuration file, in which, configuration of whut6.edu.cn domain is saved in /var/named/db.whut6.edu.cn; that domain uses the prefix address 2001:250:209:1::/64, so its AAAA reverse domain "1.0.0.0.9.0.2.0.0.5.2.0.1.0.0.2.ip6.int" (reverse writing of 2001:0250:0209:0001 as prescribed) is also defined and saved in /var/named/db.1.209.250.2001.

2) Domain Name Resolution

The forward resolution of the domain name db.whut6.edu.cn is in this format:

```
www IN AAAA 2001:250:209:1::1
www IN A 202.114.88.12
```

The reverse resolution AAAA of the domain name db.1.209.250.2001is in this format:

```
1.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0 IN PTR www.whut6.edu.en.
```

3) Network Test

After run the command #service named start to start the domain name, carry out test; when the domain name system can resolute www.whut6.edu.cn to PIv4 address 202.114.88.12 and IPv6 address 2001:250:209:1::l, it means IPv6 domain name server is successfully set up.

B. WWW Service

Choose apache2 on linux as the configuration software of WWW server. That software can support IPv4 and IPv6 at the same time, but in default situation, it only supports IPv4; and to make it also supports IPv6, statement shall be added in its configuration file httpd.conf in order to make it listen to IPv6.

The key configuration about IPv6 in httpd.conf is as follows:

```
Listen [2001:250:209:1::1]:80
<VirtualHost *:80>
    ServerAdmin admin@cau.edu.cn
    DocumentRoot /usr/local/apache2/htdocs
    ServerName [2001:250:209:1::1]
    ErrorLog logs/error_log
    CustomLog logs/access_log common
</VirtualHost>
```

After the service is started, type in http://[2001:250:209:1::1] in the browser for test, and WWW service has started.

Analysis:

i. In configuration of apache, apache is also configurated to listen to 80 port of httpd of 2001:250:209:1::1, and the name of the virtual host's configurated server is 2001:250:209:1::1; if it's combined with IPv6 domain name server, this IP's corresponding IPv6 domain name can also be used.

ii. IPv6 address in the configuration file must be enclosed by the bracket [].

iii. In current stage, not all browsers can support the direct access to IPv6 address.

C. FTP Service

VSFTPD and SmartFTP in linux 9 are used for realization.

Fig. 4. IPv6 FTP Service Test

After installation of VSFTPD, start vsftpd in the mode of xinetd.

1) cp /etc/vsftpd/vsftpd.conf /etc/vsftpd/vsftpd.conf.bak

// reserved original configure files

2) vi /etc/vsftpd/vsftpd.conf

Add listen=YES

tcp_wrappers=YES with # in the front, that's:

#listen=YES

#tcp_wrappers=YES

3) cp /usr/share/doc/vsftpd-x.x.x/vsftpd.xinetd /etc/xinetd.d/vsftpd

Copy vsftpd's configuration file xinetd

4) vi /etc/exinetd.d/vsftpd

Change disable=yes to disable=no, and flags=IPv4 to flags=IPv6

Stop vsftpd

service vsftpd stop
chkconfig vsftpd off //Prohibit boot
Restart xinetd service
service xinetd restart
netstat –nat, you can see the system has already listened to 21 port in IPv6 address.

Use SmartFTP for connection, the result is shown in Figure 4. IPv6's FTP service has been started.

Acknowledgment. Thanks for my parents take good care of me, and thanks for my friends care for me.

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A Conceptual Model of Online Community of Teaching Practice for Preservice Teachers

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Abstract. This paper discusses the theoretical basis for the design of an online community of teaching practice for pre-service teachers, and presents a conceptual community model under a perspective from SECI model. Social members, knowledge, teaching practice, and technology are recognized as the key components of the online community of teaching practice, and the SECI model is utilized to explain the knowledge transformation within the community. The identification of a relatively stable knowledge domain, the recognition of appropriate context, and the promotion of the distribution and integration of community resources are proposed as the indispensable issues for nurturing an online community of teaching practice.

Keywords: Online Community of Teaching Practice, Pre-service Teachers, SECI Model

1 Introduction

Communities of practice (CoP) promise to foster creative interactions and to promote knowledge use/reuse and sharing, which are playing an increasingly important role in knowledge-intensive and technology-enhanced society. Online communities of practice (CoPs) are promising to integrate formal and informal learning by provide systematic online resources and open communication chances among physically distributed participants.

Since 2009, the authors have been engaging in a national research project on the construction and application of online community of teaching practice for the improvement of student-teachers' teaching skills. The development of teaching skills does not rely on the mastery of theoretic knowledge of pedagogy, educational psychology, but also depend on the practice and reflection of teaching processes. The development process of teaching skills is a complicated knowledge process that requires

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student teachers to synthetically utilize various knowledge resources. There are many basic teaching skills, such as introduction skill, organization skill, demonstration skill, explaining skills, assessment skill etc. In each skill system, there are further different types of skills. The introduction of online community of teaching practice promises to effectively integrate various resources to provide pre-service teachers with opportunities to accomplish knowledge construction and skills development.

SECI model is a famous knowledge management model which is often used to explain the transformation of explicit knowledge and tacit knowledge. This study focuses on the discussions of the design of an online community of teaching practice for pre-service teachers under the perspective from SECI model. Section 2 discusses the theoretical basis for the design of online community of teaching practice. Section 3 presents a conceptual model of online community of teaching practice based on the recognition of SECI model. Section 4 summarizes this paper.

2 Theoretical Foundations for the Design of Community of Teaching Practice for Preservice Teachers

A. Social Constructivism Theory

Researches on social constructivism theory are often relied on the recognition of two directly relative theories: the socio-cognitive conflict theory of Piaget and the socio-cultural theory proposed by Vygotsky. The socio-cognitive conflict theory insists that "cognitive conflict created by social interaction is the locus at which the power driving intellectual development is generated." [1]. The socio-cultural theory suggests that "the social dimension of consciousness is primary in time and in fact. The individual dimension of consciousness is derivative and secondary" ,and asserts that knowledge constructions have social origins and are promoted through interaction with other people, and that learning is a process of social negotiation or collaborative sense making, mentoring, and joint knowledge construction[2].

Vygotsky's social constructivism learning theory particularly stresses the social-interactional origins of individual mental functioning. The Zone of Proximal Development (ZPD) proposed by Vygotsky has proven to be most useful both theoretically and practically in explaining and designing peer interaction. ZPD is defined as "the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" [2]. The metaphor of the scaffold is widely used to support the ZPD. Scaffolding is described as a "process that enables a child or novice to solve a problem, carry out a task, or achieve a goal that would be beyond his unassisted efforts" [3]. Joint activity with a more competent adult or peer is promising to create a ZPD for problem-solving and higher performance.

A community is a formal or informal social structure in which all the members share the same beliefs, resources or practices etc. Social interaction among members is the basis of the development of a community. From the perspective of social constructivism theory, several issues about the building of a community of practice can be reasoned. First, social interaction, especially peer interaction is an important approach for knowledge construction. Learning process is a socially interactive process in substance. Second, social interaction is an effective approach to promote

high-level learning and to improve learning performance. Learners are more likely to discuss with peers openly rather with than adults. Third, appropriate cognitive conflict is necessary for effective and promotive social interaction. In other words, disagreement and argument is indispensable for high-quality peer interaction. Fourth, social interaction can be mediated by various physical or virtual tools and other type of social mediators.

B. Knowledge Creation Theory: SECI model

According to Fischer, lifelong learning is more than training by supporting learning in the context of realistic, open-ended, ill-defined problems. Life learning is "a mindset and a habit for people to acquire. Lifelong learning creates the challenge to understand, explore, and support new essential dimensions of learning such as self-directed learning, learning on demand, collaborative learning, and organizational learning. These approaches need new media and innovative technologies to be adequately supported" [4].

In this context, professional activity is knowledge-intensive, and learning should be integrated into work activities. The creation of knowledge and the application of such knowledge in work practices has become a key point in professional development. The combination with work experiences, constant interaction with others, and forming a learning community, might contribute to teacher education.

Nonaka & Takeuchi's knowledge-creation model is often used to explore the knowledge building process directly related to products, performance and work practices [5]. This study acknowledges Nonaka & Takeuchi's knowledge-creation model to analyze how to support knowledge building in the development process of pre-service teachers' teaching skills.

Human knowledge is created and expanded through social interaction between tacit and explicit knowledge, and knowledge creation is not confined to an individual, rather it is a social process between individuals, groups and organizations [6]. Polanyi introduced two types of knowledge in his famous literature 'Personal Knowledge : explicit and tacit knowledge. Explicit knowledge, also referred to as articulate knowledge, can be expressed in words, diagrams, or formulas. In other words, explicit knowledge is easily codified, represented and shared asynchronously, which maybe clearly narrated in a document, or explicitly interpreted by communicators. Contrarily, tacit knowledge, is also called inarticulate knowledge, which is ineffable, contextual, and based on personal experiences. Tacit knowledge can't be explicitly described, and just resides in people's heads, which directly relates with personal cognitive skills, embodies personal beliefs and values, and is best communicated through face-to-face encounters. Broadly, based on Knowledge Creation theory [7], the knowledge building process can be regarded as a spiral knowledge transfer process, which involves four sub-processes: Socialization (tacit-to-tacit), Externalization (tacit-to-explicit), Combination (explicit-to-explicit), and Internalization (explicit-to-tacit).

Under the perspective of the SECI model, individuals, groups, organizations are recognized as the subjects of knowledge transformation, while originating ba, dialoguing ba, systemizing ba, and exercising ba are taken as the working contexts for knowledge conversation. A practice process is in substance a knowledge transformation process. From the SECI model, knowledge is not static information, but related with real practice.

3 A Conceptual Model of Online Community of Teaching Practice for Preservice Teachers

Lave and Wenger first introduced the term of community of practice (CoP) [7], which was described as "…a set of relations among persons, activity, and world, over time and in relation with other tangential and overlapping communities of practice ".

A "community of teaching practice" is the substantiation of a community of practice in the specific context of teaching practice. Such a community of practice at least involves three issues: (1) a common vision for the optimization of the effects of teaching practice, (2) a relatively stabile membership of community with common concern on teaching practice, and (3) actions of sharing vision, resources, friendship etc. among community members.

As illustrated in Figure 1, this paper proposes a conceptual model of an online community of teaching practice for pre-service teachers.

C. Key components of the proposed community model

There are four key components in the proposed community model, including *members*, *knowledge*, *teaching practice,* and *technology*.

1) Members

A community is a social concept with social members and social structure. Broadly speaking, a community of teaching practice may involved all the persons who pay attention to teaching practice, such as in-service teachers, pre-service teachers, teachers of normal universities, students etc. In a narrow sense, the members of a community of teaching practice may be only related with pre-service teachers.

The members of a community of practice may play different roles in different participation stage. The social roles to a great extent impact the results of social interaction. For example, Wenger proposed three types of community roles based on the recognition of different participation extent of different members, including core members, active participants, and peripheral members [8].

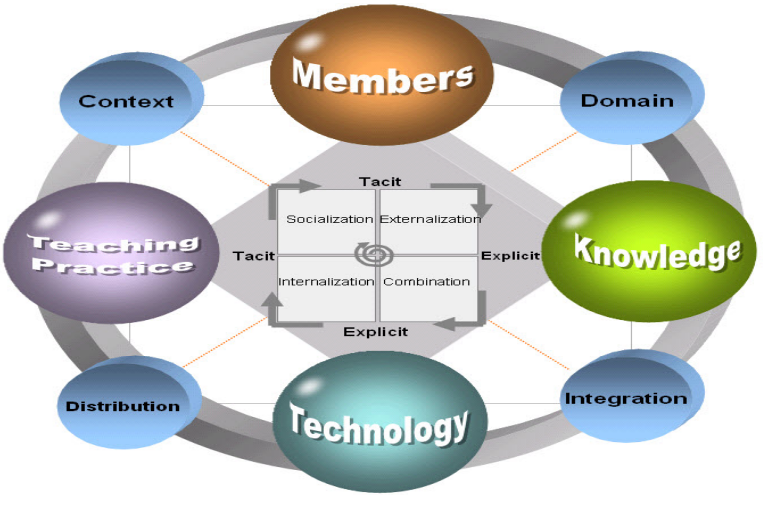

Fig. 1. A conceptual model of an online community of teaching practice

2) Knowledge

Knowledge is not only the resource for the initiation and development of a community of practice, but also the results of the running of a community of practice. Knowledge also relates to the practice domain of communities of practice. In this context, the identification, representation, delivery, sharing and transformation of knowledge is one of the key steps during the running of a community of practice.

3) Teaching Practice

Wenger has identified three dimensions of practice as the property of a community [8], including mutual engagement-people engaging in actions and negotiating the meanings of these actions with each other; joint enterprise-creating mutual accountability and shared vision; and shared repertoire-producing and maintaining shared resources, such as procedures, routines, tools, stories, concepts, and artifacts.

In the light of knowledge management, especial under the SECI model, teaching practice implies that pre-service teachers transform their theoretic knowledge to teaching ability and wisdom with various supports, including human support, such as instructor's help, and related technical tools, resources etc. Pre-service teachers' theoretic knowledge includes subject knowledge, pedagogical and psychological knowledge which are often explicit knowledge and lack of context, while the knowledge ability and wisdom often results from real practice with rich context. In this context, teaching practice is of contextualization, process, and focuses on the practice, innovation and implicit of knowledge.

4) Technology

The reliable technical promise is the necessary mediator for effective communications and collaborations in online communities of practice. Technology serves providing a kind of communication framework and multiple means for community members for conversations, communications and collaborations, overcoming the timely and spatial limit, and despite all differences in perspectives and lifestyles of the participants.

D. Knowledge transformation in the proposed community model

The central part of the model implies the knowledge transformation process in an online community of practice. Based on the SECI model [5][6], there are four processes in terms of knowledge transformation in an online community of teaching practice.

Socialization (tacit to tacit) involves the sharing of tacit knowledge between individuals with direct and synchronous interactions. In an online community of practice, for example, community members can promote the socialization of knowledge through viewing, reflecting and emulating of video cases of teaching. Real-time chatting also helps the sharing and transformation of tacit knowledge.

Externalization (tacit to explicit): through conceptualization, elicitation, and articulation, some proportion of a person's tacit knowledge may be captured in explicit form. For instance, in responding to questions, or through the elicitation of stories, learners' tacit ideas might be expressed as words, concepts, metaphors, and so forth. Externalization benefits future knowledge use/reuse and knowledge sharing in a more clear way and in a wider scope. Knowledge externalization often depends on personal reflections and collaborative discussions. Recently, weblog has turned to be a very popular and practical oasis for personal reflections, even for personal knowledge management.

Community members can promote the externalization of knowledge through personal reflections and collaborative discussions.

Combination (explicit to explicit): involves the conversion of explicit knowledge into more complex sets of explicit knowledge. A typical example of knowledge combination is to dynamically extract explicit knowledge from dynamic conversations among participants and integrate the extracted knowledge into a knowledge repository for easier search and access.

Internalization (explicit to tacit) aims at understanding, absorbing and transforming explicit knowledge into tacit knowledge. In other words, internalization means explicit community knowledge must be internalized into individuals' tacit knowledge and into action. Individual learners contribute their own tacit or explicit knowledge for community progress, and also assimilate community knowledge in their personalized ways.

E. Nurturing a community of teaching practice for pre-service teachers

Wenger and Lave [1] suggests several key points in terms of the nurturing of a community of practice, including legitimizing participation, negotiating a strategic context, being attuned to real practices, fine-tuning the community, and providing appropriate support, such as the provision of guidance and resources when needed, helping the communities create links to other communities, making sure the communities include all the right people etc. This paper highlights the following issues in the nurturing of a community of teaching practice.

1) Context

Any one teaching practice is always implanted in a specialized context. It is important to provide community members with appropriate support for the building of personalized practice environments.

2) Domain

A commonly interested and relatively stable domain is the basis for the initiation, maintain, and development of a community of practice. In a broad sense, a community of teaching practice may be defined according to community members' interests in "teaching skills". However, each subject may have different teaching skills. If a community of teaching practice has a relatively refined domain, the community members may have more enthusiasm and potential in knowledge sharing and practice promotion. For example, a community may focus on the development of mathematics teaching skills, or aim at the acquisition of the application skills of educational technology.

3) Distribution

Distribution is indispensable for a technology-enhanced community. As an online community of teaching practice, members, tools, and resources are often distributed.

4) Integration

Effective integration of community resources is helpful for the development of a community of teaching practice. It is challengeable for a community to provide pre-service teachers with personalized, functional resources for effective teaching practice. To promote the development of a community of practice, it is necessary to highlight resource integration by the building of knowledge repositories, the mining of social networks in a community of practice.

4 Conclusion

Community building and utilization is important to improve learners' knowledge construction and skill development. Based on the recognition of community of practice and the discussion on the theoretical foundations for design, this paper reported a conceptual model of online community of teaching practice for the improvement of teaching skills of pre-service teachers. SECI model was imposed in the community model design process. More efforts will be promoted for the actual application efficiency of the proposed community model in future study.

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Study on Model-Based Security Assessment of Information Systems*

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Abstract. Security problems of an information system are mainly due to its internal vulnerabilities, by exploiting which external threats do harm to the system. Security Assessment of Vulnerabilities (SAV) is, with appropriate methods, to assess an information system by investigating vulnerabilities in its architecture, hardware, software, networks, and protocols. These methods can be divided into two categories: rule-based and model-based, and the later draws more research focuses at present. In this paper we make an extensive survey on existing model-based approaches to security assessment of vulnerabilities in information systems, analysing their working mechanics, advantages and disadvantages. Finally, conclusions are made on open problems in model-based security assessment, and on the possible future directions of the research.

Keywords: Security assessment, vulnerability, attack tree, attack graph.

1 Introduction

With the development of information technology, information systems and applications in all walks of life are continuing to expand in breadth and depth. Information security issues become increasingly important and draw more attentions. Information security problems arise for many reasons. Security risks can be generally attributed to inherent vulnerabilities and threats from outside the system. In order to improve system security, we must know what risks the information system faces, their distribution, the possibility of the risks' happening, and how much of loss they will lead to. Vulnerability assessment is to assess the vulnerabilities of a system based on the system's architecture, hardware, software, networks and existing protocols. Methods of vulnerability assessment can be divided into rule-based and model-based. Rule-based method works as follows. Extract features from the openly known vulnerabilities, summarize them into rule expressions, and then apply the rules to the target evaluation system, examining whether each of the rules matches with the system. By doing with this method we hunt for vulnerabilities in the target system. For example, the host-based vulnerability scanning tool Nikto [1], many CVE-based vulnerability scanners [2], network security assessment software Nessus Vulnerability Scanner [3], and others like Nmap [4], PVS [5] are all rule-base methods.

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The limitation of rule-based methods is that they only works with local vulnerability assessment. Model-based methods, on the other hand, aim to establish the system model as a whole, which possibly models all system behaviours and dynamic states, and then use model-based analysis tools to evaluate the safety of the whole system. Currently, model-based vulnerability assessment has become a focus of research in this field. Corresponding assessment methods can be divided into tree-based model, graph-based model, mesh-based model, and the like. We will study in more details on these methods in the following sections.

2 Tree-Based Security Assessment Model

A. Fault Tree Model

Fault tree model and its corresponding analysis is a formal method originally used to evaluate system reliability [6]. Fault tree analysis is particularly effective for complex security analysis of systems including hardware and software. Analysts can use it to analyse various reasons for security incidents programs generate, find out failures of any part of the system, hardware, search for software and operator errors, and identify potential, complex failure modes. Fault-tree-model based security assessment can find possible attack paths in the information system, and by evaluating the failure probability and other indicators conduct quantitative security analysis of the system. However, traditional fault tree analysis is only effective for the objects within the system because the root of that model stands for a failure within the system. Expansion of the model is needed for the analysis of external threats to the system.

B. Attack Tree Model

Attack tree model [7] is a method that can model external security threats to a system. Attack tree model can be seen as an extension of the fault tree, which root node is the ultimate target that the attacker wants to achieve, and nodes of the lower layer stand for possible means and methods used to achieve the objective.

Moore et al [8] discussed an offensive attack tree in detail by means of recursive or incremental changes in the expression of the tree. This attack tree can more directly reflect the attack steps undertaken by attackers. Dawkins and others [9] parameterize the attack plan and definite a classification of attack levels in accordance with network-levels. The attack tree resulted from hierarchical attack method can reflect all the possible information leakage channels, thus provide users with a manageable way. Clark et al[10] model multi-step attacks with the attack tree method, and conduct qualitative and quantitative analysis by calculating cut sets of the attack tree, and the probability of the weaknesses and vulnerabilities being exploited. Ray and Poolsapassit [11] present an attack tree expansion structure (Augmented Attack Tree) and a minimal-attack-tree generation algorithm to overcome the deficiencies in traditional attack trees after the attack scenes are modelled. Dalton et al [12] propose an attack tree analysis using generalized stochastic Petri nets providing a standard method of attack tree generation and analysis.

The attack tree model has several advantages besides being well-structured. The model can be used for quantitative analysis, such as computing the probability of reachability to the target, return-compliant analysis of secure investment. It also allows integrating experts' opinions from brain storms into attack trees, and describing complex

attack scenes with attack trees. But the attack tree can not model cycle events, and the size of its trees causes it unsuitable for application in large-scale network environment.

3 Graph-Based Security Assessment Model

A. Privilege Graph Model

Dacier et al [13] use privilege graph model for the first time to describe security features of a single computer. In a privilege graph, a node represents a set of privileges owned by one or a group of users, and a connection arc between two nodes means a vulnerability that can happen to change the system set permissions.

The full path to a particular privilege obtained an attacker can be found by analysing the graph. Dacier et al also assign a value on the cost needed to successfully exploit a vulnerability. Basis on this, the average cost of system failure can be calculated, which then be used to evaluate the securty of the system. Ortalo et al [14] use a random variable to describe necessary cost an attacker has to spend to exploit the vulnerability, and assume that the random variable is exponentially distributed, so as to establish Markov model for assessing the security of a system.

B. Attack Graph Model

Real network attacks often need to use multiple vulnerabilities across multiple host borders to complete its mission. In order to objectively describe these attacks, it is necessary that analysis tools can establish a systematic attack scene according to existing vulnerabilities, services, physical links, access privileges and other information in the target network. For this reason, researchers proposed attack graph model by formalizing the prerequisites, processes and results for an attack. Currently, research on attack graph model can be divided into three categories: generation of attack graphs, analysis of attack graphs and optimization of attack graphs.

1) Generation of attack graphs

Methods of attack graph generation can be divided into three categories: model-checking based, graph based, and logic- programming based.

Model checking works automatically on a given machine model testing whether the model meets a certain character. If the character is satisfied it answers "Yes", if not it answers "no" and gives a counterexample. Attack graphs are generated by all these counterexamples [15,16,17]. Time complexity and space complexity of generating attack graphs with model-checking are both high making the method less practical.

With graph-based attack graph generation method [18,19,20], we first need to define security attributes and attack templates, and then use the templates to relate possible atomic attacks applying depth-first or breadth-first approach to generate attack graphs. Compared with model-checking, this method has low time complexity and space complexity, but still has state explosion problem.

The third type of generation methods [21,22,23] use logic programming language to describe network security properties and attack templates, and then find dependence of various attacks in the logic programming system, and finally construct attack graphs on the basis of these dependencies.

Compared with the previous two, the time complexity of this method is the minimum, but dependencies between nodes of the attack graph are very complex and not conducive to visual analysis.

2) Analysis of attack graphs
According to different purposes, attack graph analysis can be divided into two categories. The one is to identify and analyse existing vulnerabilities in the network; the other is correlation analysis of the network intrusion alarms [24].

Attack-graph based vulnerability analysis can be Quantitative and qualitative. Qualitative analysis is to use the logical operator, cut sets and the greedy algorithms [25,26] to obtain the critical weakness sets that affect network security. Quantitative analysis includes use of Markov chain model [27], use of Bayesian networks [28], comprehensive quantitative method [29].

3) Optimization of attack graphs
The state explosion problem can happen in the process of attack graph generation leading to a too large scale graph to analyse. To solve this problem, the researchers present a number of optimization methods. The typical methods include: the hierarchical display method proposed by Noel et al [30], the pruning techniques proposed by Limmpman and others [31], restricted attack steps by Dawkins and others [32]. These methods have certain advantages, but they can not resolve the state explosion problem.

4 Petri Net Based Security Assessment Model

Petri net is a mathematical modelling language for the description of distributed, asynchronous, concurrent computer systems. McDermott [33] uses Petri nets to model the network attacks in the penetration testing process, and names the proposed model as attack net. Helmer et al [34] use colored Petri net to model attack behaviour. In their model, tokens are marked as different colours, indicating different data types, such as attack targets, addresses of source hosts. Laborde et al [35] use colored Petri nets to describe network topologies, security mechanisms and security objectives, and then to evaluate confidentiality, integrity and other security properties.

Petri nets can not only describe system states, also can be used for behavioural analysis. In addition, flexible structure enhances its reusability. However, Petri net, the same as the other methods, is also limited to the size of the target system, making it difficult to analyse the overall vulnerabilities of large-scale networks.

5 Conclusions

In this paper, we have reviewed most of the important research on methods of vulnerability assessment. The achievements in this field are significant, but there still exit some unsolved problems.

1) Rule-based assessment focuses only on the vulnerabilities in local hosts or networks, and ignores the overall security. It analyses and assesses isolated host systems, software vulnerabilities, does not take into account the connections between various hosts and weaknesses within the network, leading to inaccurate assessment results.

2) With the model-based assessment, methods of security assessment model, description, validation and measurement all need to be explored in depth. Subjective factors and the model being lack of completion are likely to result in uncertain outcomes.

3) Most existing model-based methods have not solved the state explosion problem. For a large-scale network that contains hundreds of hosts and network devices, there are quite a lot factors affecting security. If we describe the system by modelling all those network security states in detail, it is likely to have the state explosion problem, causing the model scale too large, and increasing the difficulty of vulnerability assessment.

4) Quantification of vulnerabilities is a key issue for accuracy of the assessment results. In quantitative assessment, there are many attributes to be quantified, including the degree of difficulty of exploiting vulnerability, the degree vulnerabilities may affect on system confidentiality, integrity and availability properties. It is still a task and also a need for in-depth research to establish an objective and accurate quantitative criteria for these security attributes.

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Design of Location-Aware Sales Promotion Information Delivery Service System

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Abstract. Sales promotion planning is an indispensable and integral part of business activities. Product development, preparation of sales strategies, and sales promotions all require advertisements via different media channels. RFID is a non-contact awareness technology and is widely used in various contexts. This study combines RFID awareness with wireless network environments and proposes a location-aware sales promotion-information delivery service system, which can provide customers with real-time sales promotion information. The system provides users with individualized services aims to provide sales promotion information of preferred stores, and avoids providing excessive information. The purpose of the system is to provide all-around marketing channels; increase purchasing, profitability, and competitiveness for enterprises by offering real-time and convenient shopping environments for customers; and to improve the development of mobile commerce.

Keywords: Mobile Commerce, Location Aware, RFID technology.

1 Introduction

Traditional retail stores, mail order, telephone shopping, on-line shopping and auction websites are all examples of how shopping channels for customers are continuously increasing and changing. The emergence of auction websites enabled online shopping to become a popular shopping channel for rapid developments in the integration of wireless communications and the Internet [1]. The market is becoming dominated by mobile commerce, which provides wireless Internet access and other mobile services for customers. The wireless network environment exists in many public spaces and presently several metropolitan cities have created their own urban wireless network plans [2,3]. As hand-held GPS devices gain maturity, mobile positioning, value-added services have drawn market attention, which has quickened the development of positioning services. Therefore, consumer awareness of mobile positioning services has gradually enhanced. In addition to information related to the accurate location of people, companies, or sites of interest, mobile positioning services can provide relevant information and guidance through individualized information services according to the individual needs of users [4].

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Many past studies integrated RFID positioning functions with XML Topic Maps (XTM) of regional guide systems, which provide effective real-time positioning information services for users [5]. For mobile learning, the learners can identify the location tag by using a PDA and RFID reader, and a remote server provides English dialogue discourses related to the place to achieve situated learning effects [6]. Roussos [7] suggested that intelligent shopping carts could help customers obtain commodity information in supermarkets and support shopping decisions of customers while in the store. Retail suppliers who apply RFID include Wal-Market and the METRO Group [8]. Wal-Market mainly applies it to logistics, and all products are installed with tags to reduce stock and labor force errors and to improve the speed of restocking. The METRO Group uses individual shopping assistance, intelligent shopping carts, and self-help checkouts to improve customers' shopping experiences and internal inventory management processes.

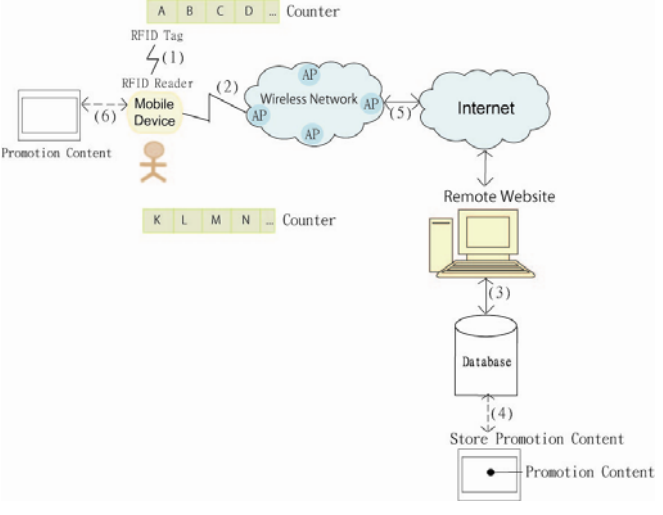

Fig. 1. The framework of a location-aware promotion information delivery service system

Chiang and Liao [9] indicated that people tend to display purchasing behaviors when they obtain their favorite commodity or special commodity information, such as advertisements, sales promotions, and discounts. Asthana [10] suggested that customers like to browse, search, touch commodities, and talk with other consumers. Andrew [11] argued that consumers cannot clearly describe their commodity needs when purchasing commodities and would only produce their commodity preferences after attending the physical store and browsing commodity information. Thus, this study utilizes a wireless network environment and interactive mechanisms through RFID to display real-time sales promotion information provided by stores in order to allow consumers to obtain their required information during shopping. Thus, consumers no longer need to hold a thick stack of advertising DM during sales promotions and mark their choices of preferred commodities. To enhance customers' purchasing power, stores will often increase customer purchase intentions and sales volume through short-time sales promotion

activities. At the same time, stores will ignore price fairness perceptions and subsequent negative intentions after the restoration of the original price or missing a free-gift after a sale promotion [12]. Therefore, this study uses RFID to display real-time sales promotion information to avoid the negative emotions of price fairness perceptions after missing sales promotions.

2 Design of Location Aware Promotion Information Delivery Service System

The location-aware system for sales promotion information delivery services consists of two parts: a mobile device and a maintenance management system, which must be installed in stores with a wireless network. The counter sales promotion information in the background database could be displayed in real-time on the PDA of users via the wireless network. Fig. 1 shows the system architecture:

(1) Each counter of the shopping center is marked with a unique RFID tag, and the hand-held mobile devices of customers must have an RFID reader. The sensor of the mobile device will read out RFID tag information contained in the counter when customers pass by the counter.
(2) The mobile device of the user can identify the tag information of the counter and the information will be sent to the Internet via the wireless network card and wireless network environment.
(3) The background information system is formed by a webpage host and a database. The webpage program receives the counter tag information sent by the customer's mobile device and uses the tag information to open a database for filtration and analysis.
(4) The database contains member management, supplier management, and advertisement information. The management personnel of the supplier stores sales promotion contents and activities' dates in the database via webpage input. The webpage program searches the satisfied information (to check whether the date is effective and whether it is individualized) and reads out the corresponding counter sales promotion information to display on the webpage. If a customer chooses to receive the counter's sales promotion information, the system will judge it and filter the lists not checked on the counter where the customer is located. If an individual's settings are checked in advance for the counter where the customer is located, the sales promotion information will be sent to the mobile device of the user.
(5) The sales promotion web page filtered by the database will display the data on the mobile device of the user via the wireless Internet.
(6) Customers can browse real-time sales promotion information of the counter with an Internet browser.

Implementation of this system entails three steps: information browsing, log-in management of the supplier of the counter, and log-in management of member as shown in Fig. 2. The detailed system functions are listed below:

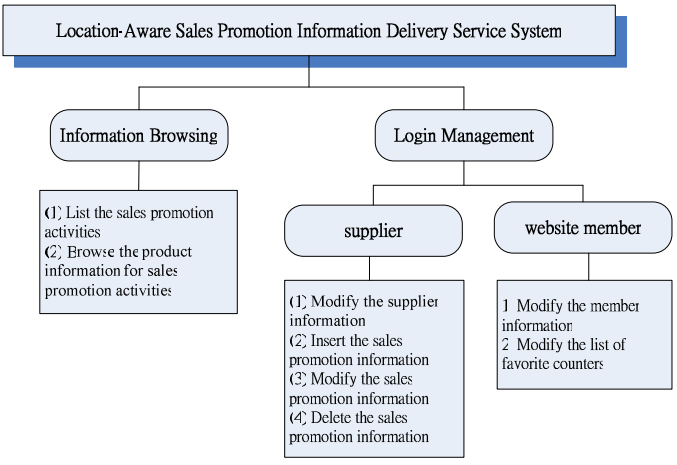

Fig. 2. The functions of location-aware sales promotion delivery service system

1. Login management of member:
Members can log into the system to modify their basic personal information and tick the counters in which they are interested. The counter will allow promotion information to be provided while shopping. For future shopping, the mobile device will not display the sales promotion information of counters not checked. In addition, members can set their current budget as a filter. In case of promotions priced higher than their budget allows, the sales promotion information will not be displayed.

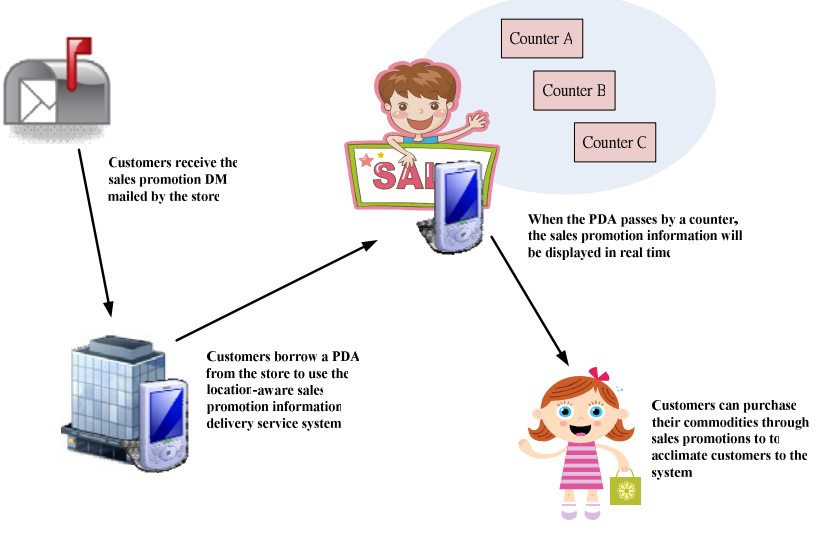

Fig. 3. Demonstration of shopping situation

2. The supplier of the counter's login management:
The suppliers of the counters can log into the system to modify their basic information and issue sales promotion information as the company develops promotional activities such as themes, contents, starting dates, and expiration dates. Furthermore, they can modify the sales promotion information and delete expired sales promotion information.

3. Information browsing:
This step displays the sales promotion information issued by the suppliers of counters, and the website can be accessed by home desk computers via the Internet. Ordinary people can browse the sales promotion information list and details. Thus, the system can be integrated with store websites and make sales promotion information delivery systems for location-aware mobile shopping an important part of shopping.

3 System Evaluation

Fig. 3 shows a simulation of shopping situations. In the beginning, customers receive the sales promotion DM mailed by the store. However, these are heavy and not convenient. Then customers borrow a PDA from the store to use the location-aware sales promotion information delivery service system. When the PDA passes by a counter, the sales promotion information will be displayed in real time. Thus, customers can purchase their commodities through sales promotions and gain appreciation for the system design.

The implemented functions of the system have an interface for users, which is designed from the consumer's viewpoint, is easy to operate, and has four features: (1) Interaction: Past studies on mobile shopping stressed the discussions of real-time displays of commodity data, setting shopping lists, and settlement. However, they neglected responses of customers, which resulted in an increase of sales promotion activities (coupon, lottery, reduced price, free–gifts, etc.). This system can display real-time sales promotion information and inform customers via RFID and a wireless network connection to the background database. (2) Real-time: During sales promotion periods, many customers would buy products, but some miss the promotion, which would produce negative emotions and subsequent negative intentions. This is often neglected by marketing personnel and suppliers. Thus, this study suggests the sales promotion information service system for location-aware mobile shopping in order to avoid price fairness perceptions of customers that miss sales promotions. (3) Convenience: In comparison to the paper DM provided by stores and supermarkets for sales promotions, this system can display real-time sales promotion information. For customers in complicated shopping environments full of diversified goods, when PDA users change their location, the sales promotion information service system for location-aware mobile shopping will provide sales promotion advertisements of interest to the customer, as well as a more convenient and burdenless shopping environment. (4) Individualization: This system can provide individualized service and allow customers to check their preferred counters. When customers pass by counters, the system only displays the sales promotion information of the preferred counters. The customization can avoid excessive sales promotion information interference to users.

4 Conclusion

The study implements a location-aware sales promotion information delivery service platform to display real-time sales promotion information to customers via location-aware technology in a wireless network environment based on the shopping decisions of the customers to provide convenient environments for mobile shopping and allow users to enjoy convenient and pleasurable shopping. Moreover, it presents a new concept and advertising method for sales promotions, which can provide all-round marketing channels for enterprises and diversified consumption patterns for customers.

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Study on Students' Comprehensive Evaluation Model

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Abstract. University is the importance place to train high-quality person, reinforcing comprehensive education is need with the development of the times, and is also the need of higher education reforms in our country. Designing and working out a science, practical, feasible comprehensive evaluation model, is related to student oneself develops, university educational reform, to whether can gain height talented person for the enterprise, the all-round quality evaluation not only be navigation effect for the university student cultivates up, also makes university education development is targeted, initiative and more efficient. According to the characteristics of university students, carefully analyze their daily lives , extract the main aspects of their daily 1ires, scientifically classify them, and according to design principle of index system and basic steps of mathematical modeling, builds up students' comprehensive evaluation index system, and gives its computational model, and checks computational model.

Keywords: Comprehensive evaluation, deign principle, index system, multi-attribute, computational model.

1 Introduction

University is the main base to cultivate the high quality talents, and continuously supply all kinds of professionals for the society. High quality talents play an important role in enhancing overall national strength and our national competitive power. The higher demand has been placed on talents along with the rapid development of modern social economy, science and technology. In order to conform it, the reform of high education pays more attention to cultivate university students' comprehensive quality in our country, comprehensive evaluation for university students is the important part of students' comprehensive quality cultivation. Evaluation not only checks out comprehensive education level but also promotes the implementation and improvement of it. The result of evaluation can direct the personalization education; students can make personal development planning according to evaluation results; teacher can teach students according to their aptitude on the basis of evaluation results. Currently, how do we complete the comprehensive evaluation scientifically accurately and efficiently, which plays an important part in the work of managing university students. So on the basis of referencing comprehensive evaluation of many universities, carefully analyze their daily lives extract the main aspects of their daily 1ires, scientifically classify them, and according to design principle of index system, the text shows a integrate students' comprehensive evaluation index system and computational model.

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2 Index System of Students' Comprehensive Evaluation

Students' comprehensive evaluation system is a kind of value judgment targeted at students' conduct in every aspect on campus. The key of accurate judgment is to design a scientific and reasonable comprehensive evaluation index system.

A. Deign Principle of Index System

Students' comprehensive evaluation index system must be able to play the role of guidance, examination, control and stimulating. It must be brief and to the point and convenient for operation. So design of comprehensive evaluation index system must adhere to the following principles:

- Principle of scientificity. As a practice of evaluating students' quality, comprehensive evaluation must be guided and regulated by scientific theories of education. Comprehensive evaluation index system is the embodiment of this guidance and regulation. The establishment of evaluation index system should not only embody the objective laws governing education but also conform to the laws of talents requirement to reflect the essential factors of comprehensive evaluation and their inner relationship.
- Principle of independence. It is the basic requirement of establishing index system. Students' integrated quality consists of many factors. Each factor is relatively independent and separately reflects certain aspect of students. By observing change of every index in different periods, changing situation of students' mental attitude and learning attitude can be found.
- Principle of guidance. Comprehensive evaluation system can play a guiding role for students if it can reflect the basic requirements for students in promoting quality education by university and guide many students to participate in the survey on activities. It can solve the essential problems of "do what" and "how to do" for students and define the goal and point of strength for students in quality education, which is to the advantage of students in making independent choice of development direction and growth approach under the restriction and guidance of relative rules of conduct to achieve ego development and self-management.
- Principle of operability. Comprehensive evaluation index system, as a tool to judge students' quality, should not only make actual measurement of every aspect of students on campus but also be convenient for evaluator to operate in actual evaluation. This requires the index designed should: firstly, the index entries are concise and to the point, secondly, the information need to be collected for index is easy to observe and understand.
- Principle of systematicity. Design of index should fully reflect the general condition of students' quality. Find index of main aspects from them which can reflect both direct effect and indirect effect to ensure integrality and credibility of comprehensive evaluation.
- Principle of measurability. The index should have defined meaning and stratification, which is benefit for confirming index weighting and calculating data necessary for collection. The calculating method is easy.

- Principle of combining qualitative index and quantitative index. Calculation by quantitative index can makes evaluation objective which is convenient for process by mathematical technique. Combination with qualitative index can make up for the lack of quantitative index to avoid partialness.

B. Establishment of Index System

Using scientific measurement and evaluation method according to evaluation model is the basis to ensure accuracy of quantitative evaluation results. Combining students' comprehensive evaluation practice of many universities, through analysis and discussion, the evaluation index system is defined and shown in Table 1.

The main quantitative indexes of students' comprehensive evaluation index system include: moral education, intellectual education, capability, personality development.

- The lower level indexes of moral education include: political record, social responsibility, honest and trustworthy, civilization and orderliness, diligence, frugality and self-improvement. The characteristics of moral education include: advanced collectives and individuals, participation and engagement in group activity, class attendance and social practice condition, commendation by notice, illegalities, breaching the principle, etc.
- The lower level indexes of intellectual education include: Literacy programs, Physical education and physical ability. The characteristics of intellectual education include: general subject, special series of lecture, practical course, PE class, physical ability test, etc.
- The lower level indexes of capability include: autonomic learning, practice and innovation, organizational communication, social work. The characteristics of capability include: career planning, curricula, social practice, academic contests, scientific research, be in position in league and students' organization and participation in society, etc.
- The lower level indexes of personality development include: innovation, talent and skill, others. The characteristics of personality development include: innovation and innovative undertaking competitions, sports competitions, entertainment items, speaking and debating, painting, calligraphy and photography, results of other kinds of activities and recognition, etc.

3 Computational Model of Students' Comprehensive Evaluation

C. Multi-attribute Model of Comprehensive Evaluation

Students' comprehensive evaluation index could be made up of many "classification" of index, and these "classification" can be decomposed into a number of "items", each "item" can be segmented in accordance with the requirement, this can be segmented at each level, so quantitative evaluation system has the general characteristics of uncertain multi-attribute. In order to better analyzing and describing, in the text, the evaluation framework with multi-level hierarchical structure is abstracted into a general multi-attribute quantitative evaluation, as shown in figure 1. Theoretically, each attribute can be decomposed into infinite level, numbers of levels for continuing to decompose can not shows the further accuracy, but too little to easily lead to the subjectivity and inaccuracy become the identification principles. For the quantitative evaluation, attribute in the same level could have different significance.

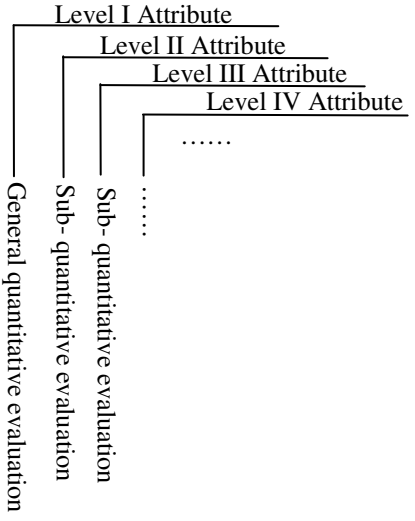

Fig. 1. Multi-attribute evaluation model

Table 1. Students' comprehensive evaluation index system

First-level index	Second-level index	Main characteristics
Moral education	Political record	Advanced collectives and individuals, participation and engagement in group activity, class attendance and social practice condition, commendation by notice, illegalities, breaching the principle, etc
	Social responsibility	
	Honest and trustworthy	
	Civilization and orderliness	
	Diligence, frugality and self-improvement	
Intellectual education	Literacy programs	General subject, special series of lecture, practical course, PE class, physical ability test
	Physical education and physical ability	
Capability	Autonomic learning	Career planning, curricula, social practice, academic contests, scientific research, position in league and students' organization and participation in society
	Practice and innovation	
	Organizational communication	
	Social work	
Personality development	Innovation	Innovation and innovative undertaking competitions, sports competitions, entertainment items, speaking and debating, painting, calligraphy and photography, results of other kinds of activities and recognition
	Talent and skill	
	others	

D. Basic Steps of Mathematical Modeling

a) Modeling preparation: Mathematical modeling is an innovation, it faces the issue is that people in the production and scientific research in order to further develop understanding and practice of the problem must be solved.

b) Modeling assumptions: As a prototype of the subject is complex and specific, is the quality and quantity, phenomenon and essence, the unity of chance and necessity, such a prototype, if not through the abstract and simplified, awareness about the difficult and can not accurately grasp the essential attributes.

c) Model establishmeng: In the modeling assumptions, based on further analysis of modeling assumptions first distinguish between the various conditions of a constant, which is variable, which is a known quantity, which is the unknown quantity; and then identify the amount the status, role and the relationship between them, the establishment of various equality or inequality between the amount of relations, listing forms, draw graphics or other mathematical structure to determine and select the appropriate mathematical tools and construction methods on the model to characterize and construct a practical characterization a mathematical model.

d) Model solving: Mathematical model structure and then after a known condition and data analysis features and structural features of the model, design or select a mathematical method to solve the model and algorithms, which include solutions of equations, draw graphs, theorem proving, logic operation and stability of the discussion in particular the preparation of a computer program or application package compatible with the algorithm, and using the computer to complete the solution of the model.

e) Model analysis: The purpose of modeling requirements based on the model solution of the numerical results, or analysis of dependencies between variables, or stability analysis or sensitivity analysis of system parameters, or the error analysis. Through analysis, if you do not meet the requirements, to modify or change on modeling assumptions, re-modeling, until the meet the requirements; by analyzing the requirements are fulfilled, but also to evaluate the model, forecasting, optimization.

f) Model Checking: After the model meets the requirements, it must return to objective reality models were tested, with the actual phenomenon, and data testing the rationality and applicability of the model to see whether it conforms to objective reality, if not, on its modification or change assumptions, re-modeling, the cycle, continuous improvement, until you are satisfied Jie Guo current computer technology has been Womenjinhang model analysis, model Jianyan provide the advanced means fully leveraging this vehicle, save a lot of time, manpower and material resources.

g) Model application: Model application is the purpose of mathematical modeling, the model is the most objective, most fair test, therefore, a successful model, must be based on the purpose of modeling, be used in analysis, research and solve practical problems, give full play to Mathematics model in the production and the special role of scientific research.

E. Mathematical Description and Establishing of Computational Model

Students' comprehensive evaluation index is qualitative description, in order to better describing the qualitative characteristics of comprehensive quality, it shows a set for quantitative index in accordance with the characteristics of quantitative evaluation:

$$W = \{W_1, W_2, W_3, ..., W_n\} \tag{1}$$

The quantitative score of students' comprehensive evaluation should be sum of its value of lower index times the corresponding quantitative index value W_i :

$$C = \sum_{i=1}^{n} C_i W_i \tag{2}$$

In order to quantitative evaluation of all the index attributes, the quantitative index set of one attribute C_i is W_i :

$$W_i = \{W_{i1}, W_{i2}, W_{i3}, ..., W_{im}\} \tag{3}$$

Then C_i of （2） should be the sum of its lower index value C_{ij} times its corresponding quantitative value W_{ij} :

$$C_i = \sum_{j=1}^{m} C_{ij} W_{ij} \tag{4}$$

Composition of two above levels, the quantitative score K of students' comprehensive evaluation is:

$$C = \sum_{i=1}^{n} \sum_{j=1}^{m} C_{ij} W_{ij} \tag{5}$$

The rest can be done in the same manner, the quantitative score C of students' comprehensive evaluation is:

$$C = \sum_{i=1}^{n} \sum_{j=1}^{m} \cdots \sum_{x=1}^{v} C_{ij\cdots x} W_{ij\cdots x} \tag{6}$$

F. Checking of Computational Model

In the index system, distribute different weighting according to the different contents of each index; confirm mark range of each index according to the mark, method and particular condition when evaluating; make certain the progression of index and specific weighting of each index according to the complexity of each index. Taking the level I index, according to the methods of expert approximation of value assignment and AHP, the index value is: $W = \{0.4, 0.4, 0.2, 1\}$.

For example, for student A, score of moral education is 20, intellectual education is 65, capability is 40 and personality development is 5; for student B, score of moral education is 15, intellectual education is 65, capability is 35 and personality development is 10.

Before being processed by computational model, the total score of student A is: $C_A = 20 + 65 + 40 + 5 = 130$, the total score of student B is: $C_B = 15 + 65 + 35 + 10 = 125$,

so, student A>student B , but after being processed by computational model, the total score of student A is: $C_A = 0.4\times 20 + 0.4\times 65 + 0.2\times 40 + 5 = 47$, the total score of student B is: $C_B = 0.4\times 15 + 0.4\times 65 + 0.2\times 35 + 10 = 49$, so , student A<student B .

It can be seen that the computational model fully consider each index, rather than considering from raw score, so the computational model would be more reasonable, fair and scientific.

4 Conclusion

Combines with the actual situation of students' comprehensive evaluation, according to design principle of index system and basic steps of mathematical modeling, builds up students' comprehensive evaluation index system, and gives its computational model, and checks computational model. Evaluation index system is flexibility, generality, scientificity. According to the actual situation, university can be adjust the value of index system and weights, so students' comprehensive evaluation can be reasonable, fair and scientific. At the same time, it can supply a basis of self-development for students, as well as promote the reform of university.

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Study on the Evaluation System of E-Learning Based on E-Learning Portfolio

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Abstract. E-learning is act for a new learning way, in the evaluation development function, the evaluation main body interaction and the participation, the evaluation content is comprehensive aspect and so on, the evaluation way diversification as well as evaluation process dynamic development all needs further to obtain the strengthening, thus forms the new study evaluation idea. E-learning Portfolio is a kind of strong tool of realizing learning evaluation which makes students complete self-evaluation, self-reflective thinking and self-management in the E-learning. This paper analyzes design concept of E-learning portfolio, expounds content planning of E-learning portfolio, and analysis and designs the evaluation module of E-learning portfolio.

Keywords: E-learning portfolio, E-learning, evaluation system, design concept, content planning, evaluation module.

1 Introduction

E-learning portfolio is a collection through which the learner, under the information technology environment, applies information means to represent and show learning goals, learning activities, learning achievements, learning performance, efforts for learning, studies' progress and introspection of learning process and outcome, which mainly includes works of learning, learning participation, learning selection, learning strategy and learning introspection, etc. It is mainly applied in the management, evaluation, discussion and design of learning and knowledge in modern learning activities and completed mainly by the learner himself/herself supported by other people (teacher, learning companion, facilitator, etc). The content selection and standard selection of the portfolio must embody the participation of learner. E-learning portfolio records learning portfolio of students in digital form. The internet-based E-learning environment provides strong technical support for the establishment and use of E-learning portfolio for it is very interactive, widely disseminated, instant and convenient to collect and dispose data and it has the function of fast data statistics and analysis, which is mainly embodied in the following aspects: automatic data collection and disposal and portfolio management can be achieved by use of computer data base technique; trace and record of students' learning behavior can be achieved by use of

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computer network technique; the self-adaptive feedback of learning can be achieved by use of intelligence of computer which can provide personal learning guidance for students.

2 Design Concept of E-Learning Portfolio

E-learning portfolio is not designed and developed to assist teaching activities of teachers. It is designed and established to express the creative mind of teachers or students, solution of problems or certain idea. Viewed from this angle, E-learning portfolio is the result of learning-centered teaching activities and the embodiment of innovative education thought in teaching. The following concepts should be embodied:

A. Embody Subject Status of Students in E-Learning and Evaluation

E-learning provides enough learner autonomy for students to make them real masters of learning, which is the greatest difference compared with traditional teaching in time and space. But traditional web-based learning evaluation is just simple network test which is the duplicate of paper test in the class, so students are still in the positive position and this test method cannot faithfully reflect students' progressive ideas. In order to overcome this disadvantage of web-based evaluation, E-learning portfolio makes students evaluate themselves in a gradually developing process through collection and submission of works by themselves, browsing evaluation information of their own by classmates, teachers and experts. Meanwhile, students have rights to manage the works in their own E-learning portfolio. Through management of functions of add, delete, amend and share (different people with different browse ranges), students become manager of evaluation materials, at the same time, management process is the process of introspection for students.

B. Achieve that Evaluation Integrates with Learning Process

The current educative reform expressly points out that we should attach importance to process-based evaluation, promote learning through evaluation and integrate evaluation into learning process. Evaluation should not be the conclusive judgment after finishing the study, but it should run through the whole learning process and can be carried out at all times and places. The evaluation process is the process to learn and grow. Evaluation and learning are inseparable and integrated with each other, which put emphasis on learning condition that develops and changes gradually.

C. Emphasize Qualitative Evaluation, no Weighting for Index, no Quantification for Results

Currently, most studies on E-learning portfolio still remain at the level of utilization survey and quantitative analysis, which doesn't focus on the evidence of qualitative learning in learning process. So this evaluation system mainly evaluates the development of capability, emotion and attitude of students, i.e. development of high level thinking ability. Therefore, it is of little practical significance to set weighing and give evaluation result in the form of total points, but it is significant to provide learners meaningful inspiring information through evaluation.

D. Evaluation Standard lays Stress on Autonomous Negotiation

Learning goals and evaluation standard are results of autonomous negotiation. We should not only give prominence to subject status of students in learning and

evaluation, but also make the evaluation standard embody characteristics of individualized teaching to develop various intelligences of students and make them try all their innate skills. We should help students to choose evaluation criterion and goals to be achieved which are suitable for them, then confirm them in the form of learning contract to urge students to accomplish their goals.

E. Achieve the Whole Process, all Sidedness and Trueness of Data Collection

Data to be collected must reflect relatively wide range of cognitive process and capability, rather than focus on the level of verbal information and regulation practice and memory. The data of certain task and skill gained from the meaningful practical situation can better reflect students' development, so we introduce the tool of web log to achieve the trace of all-round real performance of students in the whole process.

F. All Sidedness and Trueness of Peer-evaluation

Pluralism of evaluation subject is advocated by the new evaluation reform, of which peer-evaluation is an important part. Classmates know each other comprehensively, for they stay together for a long time, learn, live and discuss together, thus range of evaluation can be increased to make the evaluation information truer and more effective. So peer-evaluation information is valuable.

G. Improve the Introspection and Autonomic Learning Capability of Students

The fundamental difference of "portfolios" and "data book" lies in "introspection", so portfolio without introspection is another kind of binder. The true purpose of introspection type E-learning portfolio designed through meta-evaluation is to provide favorable learning environment, assist students to become automatic introspective learner who can check and correct his/her own imperfect in life process and develop with practice. If E-learning portfolio is endowed with the purpose of cultivating automatic introspective learner, then it is unique and irreplaceable.

3 Content Planning of E-Learning Portfolio

Development of E-learning portfolio consists of two aspects-multimedia development and learning portfolio development, that is to say a complete E-learning portfolio is a system with the integration of multimedia learning software and evaluation and management of file folder. Meanwhile, it is found in the study that learning evaluation integrates intimately with teaching implementation of teachers and learning process of students, so the design of web-based learning evaluation based on E-learning portfolio should relay on certain web-based learning system and performance of its function must combine concrete learning process of E-learners. The content of E-learning portfolio is shown in figure 1.

A. Students' Information

Personal information includes name, telephone number, postal address, extended information (other information related to student mainly includes date of registration, self-introduction, specialty, hobbies, learning style, etc). Personal information has no direct connection with measurement and record of students' performance, but it mainly related to management.

B. Studies' Information

Studies' information is related to students' learning. Such as learning task is related to courses which stipulates learning contents for students to complete and reflects the teaching plan. Learning plan is made on the basis of requirements of teaching plan and the actual learning capability and organization of the work of oneself, which is embodied in the form of learning contract. Progression of learning refers to that the system judge the completion status of current learning task by tracing learning activities of students. Learning performance records information of schoolwork and test score, encouragement, punishment, etc.

C. Learning Activities Record

Learning activities record means that, by use of computer technology and network technique, it traces and records learning activities to collect information related to learning behavior of students. According to requirements of learning evaluation, content can be recorded from three aspects-learner and learner, learner and teacher, learner and learning materials, such as numbers (times) of articles (speeches) published in discussion area and total data volume, times of speeches and the data volume in chat room; numbers of questions asked by learner, times of solving questions when browsing them and the times of offering solution to questions; learning of web-based course including learning date, sojourn time on the web page, learning path; utilization condition of resources (question resources, electronic library , search engine) provided by teachers or internet and uploaded data by students in learning process.

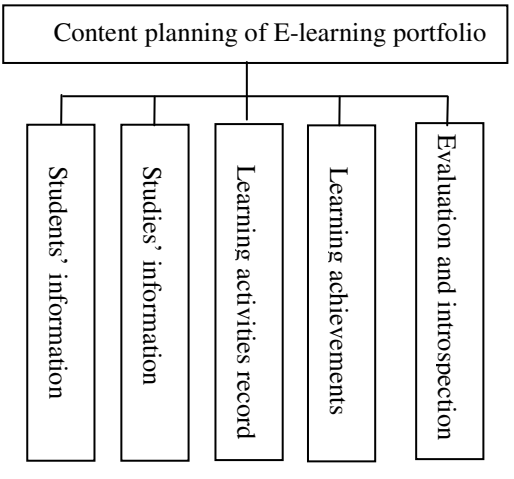

Fig. 1. Content planning of E-learning portfolio

D. Learning Achievements

Works information is the collection of representative works of students and relevant evidential documents which describes students' capability and achievements. It mainly includes finished schoolwork assigned by teacher, electronic works, learning notes wrote by oneself, submitted course paper. Something else, which is related to learning

evaluation and closely connected with course, is excellent works and "questions and answers".

E. Evaluation and Introspection Information

Evaluation information is the summary of learning evaluation of students including three aspects introspection of own learning portfolio, self-evaluation, evaluation carried out by learning companion and evaluation carried out by teacher. Through self-evaluation, students make self-rating from the aspects of learning attitude, learning effect, cooperativeness and interactive level. By comparing this information with evaluation information by learning companion and teachers, students can easily understand their learning conditions, difference between self-understanding and appraisal of other people from different aspects and know where to go and what need to be improved; learning companion's evaluation is their opinion of the behavior, method and effect of the student in learning activities; teachers' evaluation is the comprehensive evaluation got by referring to learning evaluation index system in accordance with students' learning behavior and learning effect on the basis of self-evaluation and learning companion's evaluation, which is the most convincing evaluation with the greatest guiding significance.

4 Design and Development of E-Learning Portfolio

Under the direction of design concept of E-learning portfolio, combining content planning of it, we design and develop E-learning portfolio applicable to E-learning evaluation. Its evaluation module is shown in figure 2.

A. Evaluation of Learners by Teachers and Experts

Teachers or experts evaluate learners to a certain degree according to progression of learning, quality of schoolwork or results of test and exercise, etc to point out deficiency or weakness of learning content, thus learner can improve himself/herself and cover the shortage on the basis of evaluation information.

B. Learning Contract

Learning contract is essentially an agreement (contract) which can be corrected continuously in learning process. It endows students with right of self-determination in learning which specifies obligations to be performed by learner and provides a standard to develop self-directed learning.

C. Works Submission

Works describe and prove the capability and achievements of learner, which mainly consist of schoolwork assigned by teachers, electronic works, submitted course paper, etc. Moreover, it is an effective way to gain peer-evaluation information through other learners' evaluation of works. For example, 5-mark system is adopted, i.e. 5 marks means very good, 4 marks good and 3 marks barely good. Calculate mean value of all the marks, and then give corresponding remarks.

D. Self-evaluation Information, Peer-evaluation Information and Introspection Information

Peer-evaluation information mainly refers to the evaluation information of submitted works of learner given by group members, that is to say, each member marks works

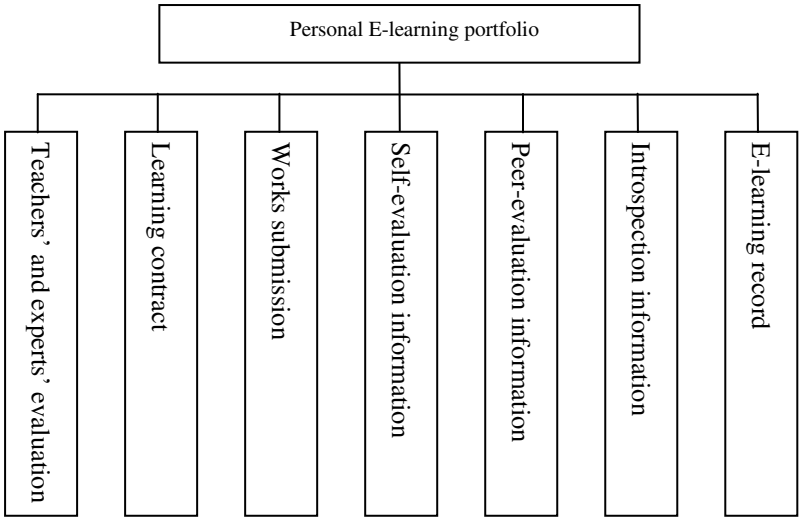

Fig. 2. Evaluation module of E-learning portfolio

according to the quality of it, then calculates mean value, finally gives corresponding remarks.

E. E-learning Activities Record

Learning activities record mainly traces and records learning activities of students, collects relating information of learning behavior by use of computer technology and network technique. Its content can be recorded from three aspects-learner and learner, learner and teacher, learner and learning materials to meet the need of learning evaluation.

5 Conclusion

Establish E-learning portfolio applicable to E-learning evaluation. By use of rational utilization of heuristic path information of learning process, individual knowledge forming and cognition improvement, it provides the most important intelligent reference for individualized learning and automatic learning which greatly improves the enthusiasm of students to participate in learning activities, so there is no room for doubt that it improves E-learning of students.

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The Analysis of College Student's Cyber-Consumption and Related Marketing Strategy

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Abstract. This essay focuses on the cyber-consumption of college students. Analysis with the authorized data that open to the Internet, find out the current situation about cyber-consumption of college students in China and the importance of the position of college students cyber-consumer. Got the characteristic of college students cyber-consumption by analysis associated with the fact. Finally, give some strategies for the cyber marketing according to those characters.

Keywords: college student cyber-consumption, cyber-marketing, marketing strategy.

1 Introduction

With the popularization of the use of computer and Internet, cyber-consumption comes to our life gradually as a new type of consumption. For there are some uncertainty factors of this new kinds of consumption type, it is hard for the comparative conservative consumer to accept. College students, as a group with open minds, are more willing to accept new things and try new ways. However, the merit of cyber-consumption that convenient, cheap and with a plenty of goods just meets the consumption demand of them, the associate of all the factors above make cyber-consumption part of college students' daily life. They will also be the potential client base in the future. So plan the marketing strategy directed towards the group of college students become crucial.

2 The General Situation of Cyber-Consumption of College Students

According to the research report of China Internet Network Information Center (CNNIC) about online shopping in 2008, the average educational background of the netizen who usually shopping online are much higher than that of other netizen, almost 60% of them with a education higher than junior college as shown in the Fig 1.

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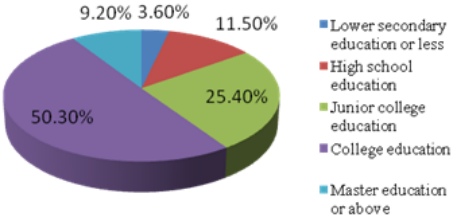

Fig. 1. Proportion of buyer's education level on the Internet

From this, we may draw the conclusion that cyber-consumption group usually with a high education level. At the same time, the customer occupation statistical data in the report also reflects that within the cyber-consumption group, the proportion of students and other occupation are as high as 1:2. All of the shown data provide sufficient evidence that college students have play a main role in cyber-consumption group.

3 The Characteristic of College Student Cyber-Consumption

A. Care more about price

Generally, the college students are not economic independent, the source of income usually from their parents. Excluding the expenses of life's necessities, the amount of funds available always limited. Therefore the consuming capacity may not that strong. So the lower price becomes one of the key issues when college students make shopping decision. Also, quality of good is also another point when they shopping. E-marketing can provide low cost goods by reduce the spending of real stores and storage expenses. So the high quality and low price goods are available to consumers. Meanwhile, the goods price of shopping website base on C2C type can also be reduced because the competition between the sellers.

B. Seek novelty

Seek novelty, also can be called curiosity, widely lie in human's daily behaviors. College students mind active, have exploratory spirit, want to change and keen on creating. For them, psychology of seek novelty are more obvious or even can affect their daily active, consumption active also includes, especially the cyber-consumption. The Internet reduces the goods limit of geography and space, allow a plenty of goods available to customers. This just attracts the people who have a strong seek novelty such as college students. When shopping online, they can find more products that may not ever see in real store. It exactly meet the seek novelty demand of those people. Although different people have different favor, the E-marketing can also meet different demands by immerse goods. Thus it can also bring people gratification of shopping.

C. Contagion effect

For most of college students, they live together in a dormitory four or more students share one room. It will be unavoidable that they may imitate each other in daily

behaviors. This is also can be found when they are shopping. Here we call this phenomenon contagion effect. The effect is common in college life, for example, one student buys something good from a website, he or she will then tell others initiative or passive about the information of the website, the listener may then pass the information to some people else. Finally, more customers will try to shopping through that website. The whole process is just like the "spread of virus". Once start, it will go though the whole campus with a unbelievable speeds. There are two reasons for this phenomenon:

1) College students live together almost every day, thus communication is quite frequent. This could be a media for the information to spread.

2) Another reason is that college students still suspicious when consumption on the internet. The cyber-consumption decrease the transparence of the transaction, also, the low price may cause the doubt about the quality of the goods. Based on those two assumptions, the purchase confidence will increase greatly if there are real products as reference, especially for the students who own few funds that are available. The real product can reduce their misgivings. So the recommend with real experience are more persuasive. This helps strengthen the contagiousness.

Above all, the contagion effect is stronger in the group of college students.

D. Pursuit individual and independent consumption

The industry revolution makes it possible for goods to mass produce. For a long period, manufacture just treat consumers' need equality and produce no different product. The individual needs submerged in the flood of mass low cost and mass produced product which as a result of industrialization the industry standard. About recent years, People's mind is become more open and began to pursuit individuality. This is especially true for the college students. Also, as the development of manufactory technology, it is possible for manufacture to produce product that meet individual needs.

Cyber-consumption, as a new business model, can meet those demands better and has already been a notability characteristic of college students' shopping active. The using of Internet in the business active enhances the interactive between cyber-sellers and consumers. College students then can communicate directly with the seller and order the product that belongs only to them. Even though they can just buy goods through Internet, abundant kinds of goods also can meet the "seeking for different" consumption need.

Under the current trend of specialization and detailing, the products become more professional. This makes it more difficult to select goods. The asymmetric information between seller and consumer is kind of unfair and cause consumer misgiving when shopping. This feeling can be enlarged in college students for they have few funds for shopping thus have to prudent. However, Internet market provides plenty of goods and lots of useful information at the same time. It alleviates the misgiving feeling and rebalances the information. Consumers can consumption more independently. It also becomes one feature of college students' cyber-consumption.

E. Pursuit convenience and swift

For college students, it is more important to be convenient and swift when purchase goods. It is impossible for them to spend vast of time for shopping, especially for

demand relatively stable goods. Traditional purchasing process needs at least half an hour or more. Account the time spend on the road, it cost really a lot of time. Cyber-consumption is a better way to remedy this defect. Shopping online allow consumer finish selecting and pay process within several minutes. This is also one reason why more and more students interested in cyber consumption.

F. Impulsive consumption

Another notability feature of college student shopping is impulsive consumption. College students are under the age that easy to impulsive when doing things. They may also lack of calm when shopping. The result could be that when they find cheap or interesting commodity, they will just buy it without thinking whether they really need the goods or not. This can be common when they shopping online, numerous cheap commodities can cause their irrational thinking and wildcat consumption. Another reason why college students are likely to impulsive consumption is that they are lack of consumption experience. They can't measure the cost and the consumption value rationally when shopping. The reason for purchase could then be a small idea.

4 E-Market Strategy for College Student

College student take a relative large proportion of the whole cyber-consumption group, they are also the potential key client in the future. Based on the characters above, author proposes 5 pieces of advice about the E-Marketing strategy.

A. Price strategy

E-Marketing saves lots of real store cost such as the expense of room tenancy and wages of employee. So the operating expenses are much lower than traditional store. In a related survey shows that although the goods price on the Internet are much lower than that of real store, sometimes can be lower as much as 20%, the profit margin of cyber shop may not lower or even higher than real store. It is obvious that the price of online goods can be quite flexibility. For college student's care more about price, cyber sellers can take full advantage of price flexibility and attract them by the cheap price and to expand the market share. This is also the precondition of prosperous the market of cyber-market.

B. Target consumer selling strategy

Seeking for individual and being out of common is a trait of college student, the strategy should also meet their demand about this. Different consumers have different demands. Cyber seller must make specific sell strategy for distinct consumer. However, though there are plenty of goods sailing on the Internet, it is impossible for a single to seller sale all of the commodities. The result is a single seller can't meet all of the customer demand. At this degree, find the target consumer group becomes crucial. After this, seller can try their best focus on the service of a particular realm.

C. Word of mouth marketing strategy

Word of mouth marketing focus on the product promotion, as the analysis above, college student consumption has contagion effect. Combining the two points, it will

be an effective way for cyber marketer to make a better performance with exploit word of mouth marketing strategy.

First, what the cyber-seller should do is to advertise. For the business of cyber-seller is base on the Internet, it will be a better way to advertise there. University students' online community such as BBS and RenRen.com provides a good platform at this stage. The goal for this step is to plant "seed" for the spread of word of mouth.

Next step is to create enough valuable word of mouth information for spread. The information includes reasonable price, good quality or a fast dispatching speed. That information can be spread quickly with the university campus with the help of contagion effect.

The last thing to do is to maintain the positive WOM. Positive WOM helps a lot for the operation of E-Marketing, meanwhile, negative WOM could cause terrible result or even bankrupt. The speed of this process depends on the spread speed of the words. It could be much faster than anywhere else in the college.

Above all, word of mouth marketing strategy is a kind of rapid feedback method. If it is used correctly, it could be a highly active marketing method.

D. Product differentiation strategy

As the rapid growth of Chinese economy, the wealth gap between people increases, this is also reflected by the consumption capability of modern college students. It is find from the Fig 2 below. Some students own few funds, what they care more is the price of the goods. But for the other side of students, they have adequate funds and willing to spend more money for better quality or famous brand products. Under this society background, cyber-marketer should provide differentiate product. In another word, they'd better include some high quality goods which may cost a little bit more money when sale plenty of cheap commodities. Regularly, high price product can help seller earn more profit. Return of cheap goods is relatively low, but the huge market of those products can also help make considerable profits. To sum up, differentiate product strategy can both meet the demand of different consumption capacity group and help earn more profits.

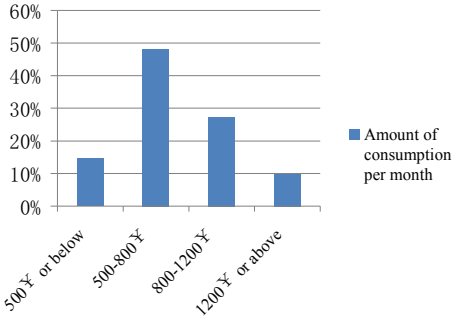

Fig. 2. College students amount of consumption per month

E. Cultivate potential customer

College students, as the new blood of the market, have their limitations. For instance, they have no constant income limit their purchasing power, their demand is also limited by their current student status. However, as they leave school, go to work and form family, their purchase power must have a considerable increase. Exploit of this potential power can be an important strategy for the seller's future competition. Cultivate the brand loyalty of college student is a long head strategy. For the seller, meet the need of customer and cultivate the brand loyalty is key for competition.

5 Conclusion

Cyber-consumption has been a direction of the development in the future. The college students play a important role during the consumption mode convert. In order to keep a long time development, the cyber-marketer should care more about the group of college students. According to their consumption features (such as care more about price, seek novelty and contagious effect) to make related market strategy. With the help of those strategies, strive for a further development of E-commerce. This should be down as early as possible. College students would be a suitable target group for this. The seller can use discount, member system or any other kinds of promotion to cultivate the college students' loyalty to their brand. Finally, they will be more competitive in the future competition.

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Characteristics of Corn Flour Fermented by Some Lactobacillus Species

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Abstract. Corn flours with different particle sizes were prepared and fermented by some Lactobacillus species isolated from the traditional process of corn fermentation. The main components, physicochemical, apparent viscosity and pasting properties of the fermented corn flours were studied. The results showed that there were little difference of fermentation kinetics of the flours with different particle sizes. After fermentation, the total acid and reducing sugar contents of the flours increased but pH value decreased. The great differences in the swelling power, solubility, water binding capacity and pasting properties of the fermented flours were observed. After fermentation for 24 h, the apparent viscosity of the flour slurries was significantly increased. The obtained result of our study could be used to improve the cold viscosity of corn flour and the quality of cereal food by using lactobacillus fermentation.

Keywords: Apparent viscosity, Corn flour, Fermentation, Lactobacillus, Physicochemical.

1 Introduction

Corn was one of the most important cereals in the world. And corn flour is widely used to prepare different foods with different quality requirements. By using post-harvest processing technology such as milling or modifying, the properties of cereal flours could be changed to meet the special requirements.

The viscosity parameters during pasting are controlled by the properties of both the swollen granules and the soluble materials leaking from the granules [1-4]. Singh et al [5] found the physicochemical, rheological and cookie-making properties of corn and potato flours were significantly influenced by the properties of their starches and the viscosity of potato flour.

In developing countries, lactobacillus is widely used in food processing to improve the natural fermentation, but the theoretical research of this application was poor. To the best of our knowledge, there was no report investigating the effects of fermentation by lactobacillus on the physicochemical, apparent viscosity and pasting

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properties of corn flours with different particle sizes, which was just the purpose of this study.

2 Experimental

A. Materials and Chemicals

Corn was purchased from a local market in Xinxiang, China. Corn was dehulled, milled and sieved (L510578 mill, Westingarea M&E system Co., Limited, Shanghai,China) with 50 μm, 100 μm and 150 μm pore mesh, respectively. The obtained flours with different particle sizes were stored at 4 °C. The Lactobacillus spp. was obtained from our lab and had identified according to phenotypic characterization. Other chemical were of analytical grade.

B. Microorganisms and Cultivation Methods

The strains were maintained in the stock culture and kept in 40 % glycerol at -80 °C. The growth of lactobacillus is measured on MRS plates and expressed with colony forming unit (cfu). The cells are routinely propagated with 10 % (v/v) inoculation in sterilized MRS broth and incubated at 30 °C overnight. The corn slurry was made for inoculation. And the absorbance at the wavelength of 600 nm (A600) of the overnight culture was measured.

Calibration curves (A600 vs. cfu/mL) could be used to measure the cell concentration of the inoculums from the absorbance values. Initial concentrations were presented in Fig. 1. After determining A600 of the inoculums, the cells were collected by centrifugation at 14,000G for 10 min. Cell pellets were washed in physiological sterile solution (0.9 %, w/v saline), centrifuged and suspended in the physiological sterile solution inoculation.

A600 was measured with a Spectronic 7202 spectrophotometer (Unico, Shanghai, China). In order to make the results in the linear range of the regression equation (A600 vs. cell concentration), cell cultures were appropriately diluted in sterile medium in order to make the A600 of less than 0.4.

Microbial growth during fermentation was measured by the method of plate-count on MRS agar after diluted with an initial suspension containing 10 g of sample homogenized in 90 mL of physiological sterile solution. Incubation was carried out at 30 °C for 24 h.

C. Fermentation Conditions

Fermentation of the slurry (30 %, w/w) was performed in a batch by using 200 mL fermentor (Minifors, ShineTek Instruments Research Institute,Beijing,China) filled to 170 mL. Temperature was set at 30 °C. pH was recorded every 3 hours by using a acidometer. Total acid (mainly lactic acid) was determined by alkaline titrimetric method. The rate of pH decrease was calculated as the first derivative of pH=f (time), which made the maximum rate (-dpH/dt) to be determined graphically.

Inoculation was performed by washing cells. And the initial cell concentration was determined by the method described in the above step. The corn flour slurry was regularly removed from the fermentor for analysis. All experiments were performed in triplicate.

Total amylase (a-amylase EC 3.2.1.1 and/3-amylase EC 3.2.1:2) activity was determined by the method according to Steinmann et al [6].

D. Proximal Analysis of Raw Materials and Fermented Slurries

Crude protein content was determined according to the Kjeldahl method with a conversion factor of 6.25. Crude lipid content was measured by the Soxhlet extraction method. Ash content was obtained by a muffle furnace at (550 ±15) °C. Acid detergent fibre content (ADF) was determined according to the gravimetric method. Total starch content was analyzed by the enzymatic colorimetric method and with a conversion factor of 0.9, included mono- and disaccharides which were disregarded since they were only present in small quantities in raw cereal grains. Damaged starch was determined by a method based on the evaluation of susceptibility to amyloglucosidase hydrolysis. The damage starch content is the ratio of the maltose content to total starch content. The measurement of the maltose was determined according to a standard curve developed using maltose. Analyses of crude protein, crude lipid and ADF fiber were made in triplicate. Analyses of total starch and damaged starch were made in duplicate.

E. Amylose Content

Flour (20 mg) and 0.5 N KOH (10 mL) were mixed. The dispersed sample was diluted to 100 mL with distilled water. An aliquot of test sample solution (10 mL), 5 mL of 0.1 N HCl and 0.5 mL of iodine reagent were mixed and diluted to 50 mL. Then the absorbance of the mixture was measured at 625 nm. The content of the amylose was determined from a standard curve with amylose and amylopectin blends as standard.

F. Swelling Power and Solubility

Swelling power (SP) of corn flours (ratio of the weight of swollen flour to the initial weight of the dry flour) was measured according to the method of Chung et al. [7]. The solubility of corn flour was determined in triplicate by using the method of Leach et al.[8].

G. Water Binding Capacity

A suspension of 5 g sample (dry weight) in 75 mL distilled water was agitated for 1 h and centrifuged under 3000 g for 10 min. The free water was removed from the wet flour. Then, the wet flour was drained for 10 min and weighed.

H. Pasting Properties

Pasting properties of the corn flour or fermented flour were evaluated with the Rapid Visco Analyzer (RAV-4, Newport Scientific, Warriewood, Australia). Viscosity profiles of flours were recorded using flour suspensions (10.6 %, w/w; total weight of 28 g). A programmed heating and cooling cycle was carried out, where the samples were held at 50 °C for 1 min, heated to 95 °C at 6 °C /min, held at 95 °C for 2.7 min, and held at 50 °C for 2 min before cooled from 95 to 50 °C at 6 °C /min. The recorded parameters included pasting temperature, peak viscosity, trough viscosity (minimum viscosity at 95 °C), final viscosity (viscosity at 50 °C), breakdown viscosity (peak-trough viscosity) and setback viscosity (final-trough viscosity). All measurements were carried out in triplicate.

I. Apparent viscosity

The measurements of apparent viscosity of the corn flour or fermented flour slurries were evaluated with the Rapid Visco Analyzer (RAV-4, Newport Scientific, Warriewood, Australia). Measurements were made at 30 °C for 3 min. The recorded parameters included initial viscosity and final viscosity. The result was expressed with the mean value of the two measured values.

3 Results and Discussion

A. Growth of the Lactobacillus in Corn Slurries

The growth of the Lactobacillus spp. in the slurries made from the corn flours with different particle sizes was shown in Figure 1.

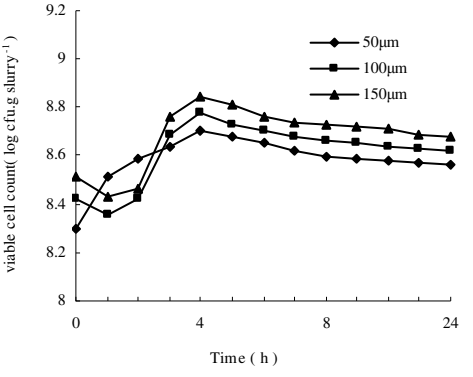

Fig. 1. Growth of strains lactobacillus in corn slurries

Lactobacillus spp. grew best in the fine flour through the sieve with pore mesh of 150 μm and worst in coarse flour through the sieve with pore mesh of 50 μm. The slurries could support a limited growth of the Lactobacillus spp. which could reach a maximum population concentration of 8.7-8.9 log cfu/g in less than 4 h. Because it was difficult to distinguish a clear single logarithmic phase during growth, the specific growth rate was not calculated. Since the fact that it was not possible to clearly identify a single logarithmic growth phase could attribute to the corn flours with different particle sizes. As a result, in such conditions, such a growth pattern is more realistic than a classical smooth "S-shape" logarithmic growth curve.

B. Changes of pH decrease and sugar content during fermentation.

pH decrease in the process of the fermentation and the kinetics of organic acid formation were shown in Figure 2. In all assays, pH decreased without any lag from the beginning of the fermentation. For the flours with particle sizes of 50 μm, 100 μm and 150 μm, pH reduced from an initial value of 6.42 to final values of 3.68, 3.55 and 3.48, respectively (Figure 2). For the rate of pH decrease (-dpH/dt), the major difference was observed at the first 6 hours. After 12-15 h, pH could be reduced to

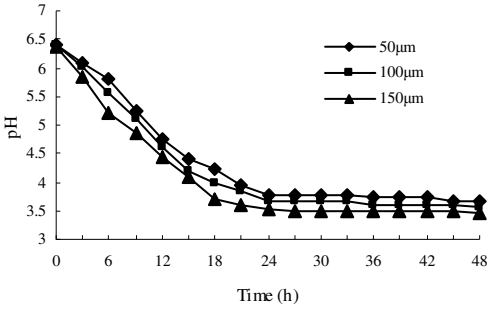

Fig. 2. Kinetics of pH decrease in the slurries during fermentation

4.5, below which food borne pathogens could be inhibited. pH decrease mainly attributed to the formation of total acid.

In view of the change of reducing sugars during fermentation (Figure 3), the formation of acid couldn't be explained by the consumption of mono- and disaccharides since reducing sugar concentration increased.

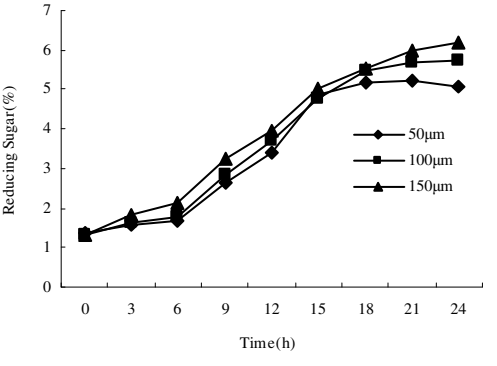

Fig. 3. Changes of reducing sugar content changes in slurries during fermentation.

Table 1. Chemical analysis of the slurries made from the corn flours and the fermented flours

Particle size	*Corn flour*			*Fermented flour*		
	50 μm	100 μm	150 μm	50 μm	100 μm	150 μm
Crude proteins (%,w/w)	11.39	11.2	11.28	10.98	11.06	10.64
Crude lipids (%,w/w)	2.01	2.12	2.16	1.94	2.06	2
Ash (%,w/w)	5.46	5.28	5.2	5.15	4.99	5.02
Fiber (%,w/w)	5.24	4.98	5.16	4.96	4.92	5.04
Damaged starch (%,w/w)	2.13	2.36	2.84	5.46	6.82	8.65

And as shown in Table 1, the change of the global composition of the fermented slurry wasn't significant, which showed that the fermentation didn't influence the nutritional value of corn flour. The initial content of damaged starch in the flour was 2-3 %.The contents in corn slurries made from the flours with particle size of 50 μm, 100 μm and 150 μm were 5.46 %, 6.82 % and 8.65 %, respectively.

C. Physicochemical Properties

The amylose contents of the flours with particle size of 50 μm, 100 μm and 150 μm were 15.53 %, 16.80 % and 17.04 %, respectively. The amylose content of corn flours increased significantly after fermentation (Table 2), which suggested that starch was degraded to some extent during fermentation.

The swelling power and the solubility of the flours also changed significantly (Table 2). Swelling power (SP) and solubility can be used to evaluate the interaction between starch chains of the flours in the amorphous and crystalline regions of the starch granule. SP of the flour with particle size of 150 μm (14.65 g/g) was highest while SP of the flour with particle size of 50 μm flour (12.54 g/g) was lowest.

Starch swelling occurs with loss of birefringence and increase of solubilization. Solubility of the flours with different particle sizes ranged from 8.42 % to 10.68 % (Table 2). And water binding capacity (WBC) of the flours ranged from 45.21% to 58.93%.

The swelling power, solubility and WBC of corn flours also increased after fermentation, which attributed to the changes of reducing sugars and starches.

Table 2. Physicochemical properties of the flours with different particle sizes

	size	Amylose content (%,w/w)	Swelling power (g/g,w/w)	Solubility (%,w/w)	WBC (%,w/w)
Corn flour	50 μm	15.53	12.54	8.42	45.21
	100 μm	16.80	13.88	9.64	54.82
	150 μm	17.04	14.65	10.68	58.93
fermented flour	50 μm	19.64	16.26	16.26	66.50
	100 μm	19.28	16.84	18.24	74.68
	150 μm	21.65	17.34	19.88	79.42

D. Pasting Properties

The pasting properties of the flours with different particle size were shown in Fig. 4. The viscosities of the flours gradually increased with temperature. Peak viscosity (PV) for the slurries made from the flours of 50 μm, 100 μm and 150 μm were 105, 1074 and 1945 cP, respectively. Although the trough viscosity (TV) of the flour with particle size of 50 μm (191 cP) was the lowest which the viscosity of the flour with particle size of 150 μm (704 cP) was highest. Breakdown viscosity (BV) was found to be the lowest for the flour of 50 μm and the highest for the flour of 150 μm. Final

viscosity (FV) was found to be the lowest for the flour of 50 μm and the highest for the flour of 150 μm. Setback viscosity (SV) was also found to be the lowest for the flour of 50 μm and the highest for the flour of 150 μm. Pasting temperatures (PT) (temperature at the onset of rise in viscosity) for different flours were close. The higher pasting temperature indicated the higher resistance towards swelling.

Pasting properties were significantly changed after fermentation by some lactobacillus species (Fig. 4). All pasting parameters for the flour of 50 μm increased, while the PV, BV, FV and SV for the flours of 100 μm and 150 μm significantly decreased. The viscosities of the flours of 100 μm and 150 μm decreased, which attributed to enzyme hydrolysis during fermentation and pasting. Pasting temperatures (PT) for all the samples increased.

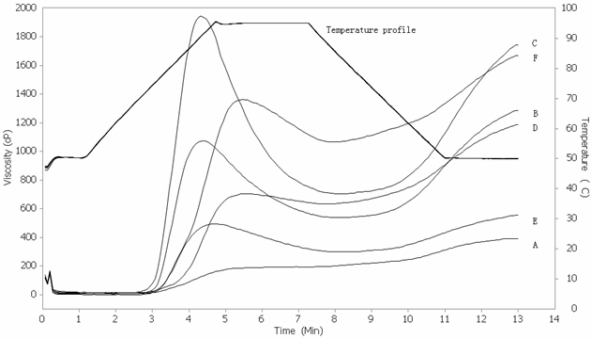

Fig. 4. Pasting profiles of the flours with different particle sizes. The experimental error of the triplicate determinations is less than 4%.(A) Flour 50 μm; (B) Flour 100 μm; (C) Flour 150 μm; (D) Fermented flour 50 μm; (E) Fermented flour 100 μm; (F) Fermented flour 150 μm.

E. Apparent viscosity of Corn Flour

The apparent viscosities of the slurries before inoculation and after fermenting 24 hours were determined. Before inoculation, the viscosities of the slurries made from the different flours were different. After 24h of inoculation and fermentation, the viscosities of the slurries gradually increased (Fig. 5). The viscosities were 111, 491 and 597 cP for the flours of 50, 100 and 150 μm, respectively.

The replacement of gluten by starch results in a major challenge to the cereal technologist mainly from the structural point of view. Gluten-free starches (corn, rice) have been utilized to formulate breads. However, they failed to form a continuous phase and thus lack the necessary dough structure for the production of the dough with good quality. Therefore, gluten-free bakery products require polymeric substances that mimic the viscoelastic properties of gluten in dough. Undoubtedly, the method enhancing cold viscosity of corn flour slurries by lactic acid bacteria fermentation could be used to improve dough handling. In northeast of China most of people made the sour noodles with corn flour after natural fermenting 12 hours or more.

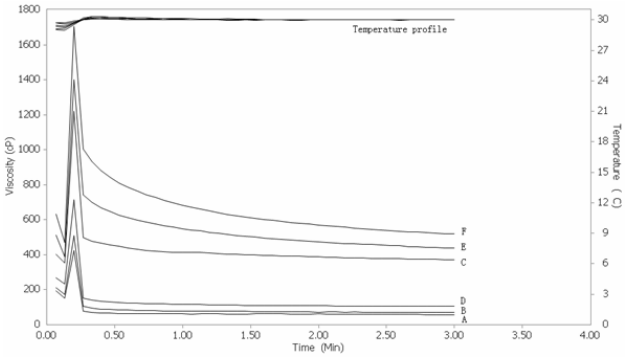

Fig. 5. Effect of fermentation by *lactobacillus* on the apparent viscosity. The experimental error of the triplicate determinations is less than 4%. (A) Flour 50 μm; (B) Flour 100 μm; (C) Flour 150 μm; (D) Fermented flour 50 μm; (E) Fermented flour 100 μm;(F) Fermented flour 150 μm.

4 Conclusion

The growth pattern of Lactobacillus was more realistic than a classical smooth "S-shape" logarithmic growth curve. It took 12-15 h for l Lactobacillus to make pH decrease to 4.5. During fermentation, the contents of total acid and reducing sugar increased. And the effect of the flour with small particle size was more significant. The effects of particle size on the physicochemical properties of the products were different. The swelling power, solubility and WBC of maize flours increased with the decrease of the particle size. After fermentation, these properties also improved greatly. The pasting properties of the flours with different particle size were different. With the decrease of the particle size, the PV, TV, BV, FV and SV values increased. After fermentation, the changes of pasting parameters and apparent viscosity of slurries were also significant.

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A Study on Game Theory in Decision Interaction for Multi Intelligent Agents Based on Information Fusion*

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Abstract. Variation tendency of situation of an interaction system combined by multi intelligent agent is pushed forward by their respective decision process, pure probability and evidence theory are not satisfying available tools for this type of prediction. For these predictions, game theory can provide preferable decision and recognition, and is a tool of Process Planning. By combining influence diagrams with game theory, we proposed a new architecture—Bayesian Game Model for decision support to enhance capability of the awareness and prediction for a complex situation caused by multi interactive intelligent agents. In this paper, we discuss Bayesian game architecture and the related algorithm for a situation evolution under the circumstance of multi-source information fusion containing multi intelligent agents. Compared with other high level information fusion models containing decision makers and environmental status, this method can provide better decision effect. By combining with game theory, the proposed method provide a Joint probability distribution for whole situation in the form of Bayesian game and make the decision maker's game strategies to be reflected in situation evolution.

Keywords: Multisource Information Fusion, Game theory, Strategy profile, Mixed Strategy Equilibrium, Bayesian.

1 Introduction

In a system which is composed of multiple intelligent agents, the evolution of its situation usually caused by the result of game playing between related parties, and its most typical expression is in military area. In Network-Centric Warfare, commander can use information fusion technology to get help about decision support by using information from sensors and history database of themselves or opponents.

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In recent years, the decision support tools which deal with Command and Control (named C2), seldom include the meaning of game. However, the game is outstanding characteristic in military, but for the application of game, there is still big gap between theory and practice. The related research shows that in most situations which have the game activities, the evaluation to situation mainly depend on the decision maker's subjective judgement, not the rational analysis, which is because people often make the supposition, not concern on the cause when they face the uncertain situation. Nowadays, the application of game in decision support has been attracted more and more attention, and may be regarded to improve the level for decision-making.

Information fusion trends to provide decision makers the various perception levels for situation. The multi-source information fusion is developing quickly in recent years, and in a sense, the relation between multiple information sources which are completing is considered to be a game. At present, in many models for information fusion, the JDL model [1] from United States Department of Defense is a most typical representative. JDL model divide the whole fusion process into 5 levels and the prediction to situation is included in level 3, but there is no any factors about game which is included in. we think, for a prediction to a complex situation, that two important problems need to be resolved. One is how to get all information about a complex situation, and the other is the strategic interaction between multiple intelligent agents. For the first problem, association diagram is a good solution such as dynamic Bayesian networks [2], but for the later problem, we can solve it by considering a decision-making as a game process.

In this paper, we propose a basic framework, which can give Joint probability distribution in the form of Bayesian game by using association diagram for describing a situation. Each game side can be included into an association to form a Bayesian network (BN), which describes the current situation. The results of game can be represented by using mixed-strategy Equilibrium.

2 Association Diagram

Recently, it is becoming possible to set up Bayesian networks to discern the opponent's course of action(COA)[3]. The conditions of the recognition to COA are that we clearly know opponent's aims and regulations and there is a limit COA set to select for us and we can infer the opponent's COA by using the limit COA set. When we know nothing about the opponent's aims and strategies, we can evaluate a probability by considering the COA as statistical variables in a BN. Certainly, this is a dependable method, because in a game sense, the decision-making to opponent's COA, mainly depends on opponent's strategies, COA and aims to us. So recognition to opponent's COA is typically a game process and we need to use game algorithm to resolve it.

In the past several years, the viewpoint of the intelligent agents has been appeared. In a circumstance which has several competing information sources, each information source can be represented by an intelligent agent and be embedded into a practical application. In latter discussion, we will replace the real information source with intelligent agent.

Based on the perceptive information, intelligent agents can make decision to uncertain situation to get prospective result. If there is too much uncertain information,

the Joint probability distribution which describes these uncertain can not be resolved effectively, and then Bayesian net may become an effect tool.

Association diagram is a natural expansion to BN. In association diagram, besides the choice nodes, decision nodes and profit nodes are added. An association diagram can describe a decision-making problem for a single intelligent agent. On decision nodes, decision maker must select an action to execute, and profit nodes, which are terminal nodes, need to calculate the decision profit on it. Association diagram usually is used to evaluate the situation from bottom to top and to get the serials of decisions for us through inference.

It is reasonable to use association diagram to describe the relationship between multiple intelligent agents, and a simple model is shown in Fig. 1. In Fig. 1, C is a discrete random variable, which represents a decision sequence named D1,D2,…,Dn. D1 represents ourselves decision, and D2—Dn represents other intelligent agent's decision. G1 is a discrete random variable, which represents our aim. U1 is our income after executing D1. D1 depends on sequence D and our aim G1. The meanings of Gi and Ui are similar to other agents.

In Fig. 1, sub-graph 1 and 2 denote the special models for special domains which are independent of interactive intelligent agents. These models provide some external conditions to the evaluation of situation such as terrain, weather and so on. These models usually are existing models and can be denoted with BN, which can bring some influence to decision-making of intelligent agents.

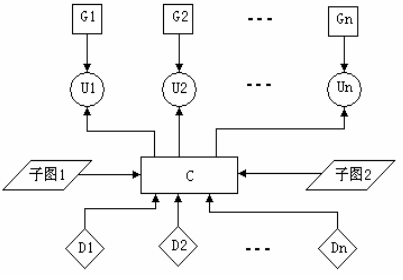

Fig. 1. The Decision process emulated with association diagram

A problem in Fig. 1 is that the game situation is not captured. For example, a problem one side wants to know the reason that the other side takes some actions. What action of one side is taken depends on the prediction and analysis to the other side's action. If there is no additional expression, the relationship can not be denoted in association diagram or BN diagram. Therefore, Fig. 1 is not good enough in expressing the relationship, and in fact, it reflects a problem we need to resolve exactly.

3 The Decision Interaction between Multiple Agents

In association diagram shown in Fig. 1, the decisions made by decision nodes are independent from each other. In a complex situation which agents have the intimate

connection between their decisions, the artificial intelligence tools, such as dynamic decision support network or association diagram, which is to resolve decision support problem, are not suitable for the kinds of situations. Game theory provides a mathematical tool to analyse agent's interaction under the condition of rational supposition. In game theory, different from traditional profit maximization principle, the decisions and aims of each side in the game always try to reach a game equilibrium.

In traditional game theory, a strategic equilibrium which provided by each side in the game can always be supposed to be implemented, and this supposition is correct doubtlessly under a regulation planed in advance, for example, the management of own mobile sensors, or the construction of share algorithm to network capacity. But unfortunately that's not the case. The real game situation usually includes mach uncertain information between agents, or uncertain information of whole situation evolution.

In this paper, in order to emulate decision interaction between agents in a complex situation, a Bayesian game concept is proposed. A Bayesian game is a game with uncertain or incomplete information, that is to say, in the begin of game, some agents may have some private information that other agents don't know, and each agent estimates other agent's private information in the form of probability according known information to others.

4 The Structure, Representation and Model of Bayesian Game

The game structure should be a tree structure. In this structure, non-terminal nodes denote a random possibility. Leaf nodes denote the end of game or final income, the sub-nodes of non-leaf nodes (not terminal nodes) denote an optional result of a possible action, and each optional result has a probability distribution. For a game with complete information, the game can be resolved due to its game tree can be traversed through dynamic inference from bottom to up.

In a game with uncertain or incomplete information, the location of agent's action in game tree is not known, and the estimation to game tree through traverse will has no effect. To this game situation, besides numerical method, linear programming method and so on [4], Nash equilibrium is a acceptable method. In this paper, Nash equilibrium is adopted. In general, Nash equilibrium is always exist, but probably have many, namely, we can have multiple acceptable strategies.

Using the symbols of paper [5], a Bayesian game Γ^b can be defined as follow:

$$\Gamma^b = (N, (C_i)_{i\in N}, (T_i)_{i\in N}, (p_i)_{i\in N}, (u_i)_{i\in N}) \tag{1}$$

Where N is a set of players, C_i is the set of possible actions for player $i \in N$, T_i is the set of player i 's possible types, p_i is a probability distribution representing what player i believes about the other players' types, and u_i is a utility function mapping each possible combination of actions and types into the payoff for player i.

An important class of Bayesian games is games with consistent beliefs. In this case the player's belief, conditional on his type, about other players' types are all derivable

from a global distribution over all players' types by conditioning, i.e., $p_i(t_{-i} \mid t_i) = p(t_{-i} \mid t_i)$. Hence, this class is a subclass of imperfect information games.

We define the proposed information fusion game model using the symbols from paper [5]. Fig. 2 gives a concept sketch which depicts the architecture of model we proposed. In this model, we use the algorithm shown in Fig. 3 to evaluate a situation. There are two most important rules in this architecture: one is the supposition that the agents make decisions according to their beliefs to other agent's private information, the other is that this architecture can be denote as an association diagram.

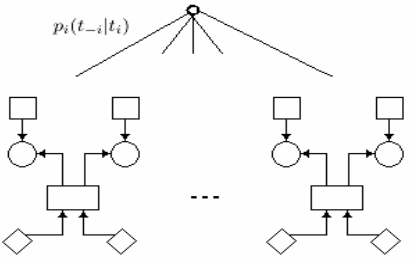

Fig. 2. The Architecture of Bayesian game model

The algorithm to evaluate a situation which denoted as Fig. 2 is as follow:

Inputs: 1. A list of influence diagrams; one influence diagram for each possible agent model that needs to be considered. Decision nodes $D_1,\ldots,D_n$, and utility nodes U1,…,Un, belonging to agents 1,….n respectively, need to exist in all diagrams. 2. A common prior probability distribution P over the possible agent models.

Outputs: Solution proposals for the influence diagram decision variables $D_1,\ldots,Dn$ in the form of mixed strategy Nash equilibrium.

Let each influence diagram correspond to a Bayesian game type profile named $t \in T$, representing that each influence diagram corresponds to different beliefs regarding the participating agents' private information.

Formulate the Bayesian game

$$T^b = \left(N, (C_i)_{i\in N}, (T_i)_{i\in N}, (P_i)_{i\in N}, (U_i)_{i\in N}\right) \tag{2}$$

So that,

(a) N, the set of players, corresponds directly to the set of participating agents,

(b) Ci corresponds to the set of actions available to agent i in decision node Di in the influence diagrams.

(c) Ti contains the possible type for player i; induced by T according to item 1 above,

(d) $P_i(t_{-i} \mid t_i) = \dfrac{P(t)}{\sum_{S_{-i}\in T_{-i}} p(S_{-i}, t_i)}$ (consistent beliefs)

Calculate one or more solutions to the Bayesian game in the form of mixed strategy Nash Equilibrium.

Equilibrium in the game corresponds directly to solution probability distributions over the decision variables $D_1,...,D_n$ in the original influence diagrams. These distributions are returned as solution concepts – not necessarily to be executed, but to further enhance a commander's predictive situation awareness.

5 The Equilibrium of Bayesian Game

In game theory, Nash Equilibrium define the resolution of a game situation as a kind of strategy profiles. Defining equilibrium is the final target of game theory. For a Bayesian Equilibrium, Harsanyi[6] define the Bayesian Equilibrium as a mixed strategy for each players in each type of situation. In mathematics, a Nash Equilibrium of Bayesian game Γ^b, as defined as formula 1, for each player in each type of situation, is a mixed strategy as follow:

$$\sigma(\cdot \mid t_i) \in \underset{T_i \in \Delta(C_i)}{\arg\max} \sum_{t_{-i} \in T_i} p_i(t_{-i} \mid t_i) \times \sum_{c \in C} \left(\prod_{j \in N-i} \sigma_j(c_j \mid t_j) \right) T_i(c_j) u_i(c,t) \tag{3}$$

Where $\Delta(C_i)$ denotes the set of probability distributions in set C_i, that is to say, C_i is a mixed strategy that player i can choose from it, and $\sigma_i(\cdot \mid t_i)$ is the possible mixed strategy for player i in type ti.

In general, it is difficult to resolve a game problem. The famouse method, Lemke Howson algorithm [7], only solved a Linear complementary problem. The computational complexity of finding a equilibrium is still not known. According to Nash, there is one equilibrium at least in mixed strategies, but constructing it is a problem. Lemke Howson's algorithm has the exponential computing time to some game, even zero-sum game. It is proved that finding a Equilibrium that each player has maximum profit is a NP-Hard problem.

With regard to game model of information fusion, it is a complex problem due to the strategy game caused by the method in Fig. 2. However, through using additional chance nodes to denote prior general model, and transforming the whole game model to a big association diagram, we can probably avoid the combination explosion in game, and an association diagram can be transformed to a game tree directly through using multi-agent association diagram transform algorithm.

Although in most case, there are no feasible resolutions for a game in game theory, but for a decision-making problem with suitable scale, the optimal resolution is still to be found [8]. In addition, although finding out all the optimal resolutions are still difficult, the fast algorithms of finding similar resolutions are still exist.

6 An Example: The Game Analysis of Vehicle Identification in Electronic Toll Collection (ETC)

Now, we take an example in ETC to demonstrate a game situation and study its resolution of Bayesian game.

At present, vehicle tolls is till collected according to vehicle type on toll station. Supposing that ETC system recognize vehicle through images including licence plate and vehicle type, ETC system get vehicle type directly from vehicle's documents on network according to the results of recognition of licence plate, and if the results of licence plate recognition is not correct, ETC system may recognize vehicle type directly according to image of vehicle type taken on the spot.

We denote licence plate recognition and vehicle type recognition as agent 1 and agent 2 respectively, and keep "toll basic decision right"as the object of bilateral game. If agent 1 is superior to identification system and agent 2 is inferior to it, then agent 1 will win agent 2 and take the toll basic decision right, and the same applies in reverse. When both are superior or inferior (note difference of degree), they will get toll basic decision right in the form of Nash equilibrium of Bayesian game.

In a process of toll collection, suppose agent 1 take the toll basic decision right. On the one hand, agent 2 doesn't know the agent 1's capacity of identification (named a probability). The agent 1 has the right to take toll basic decision right, and at the same time, also can give up the right. If agent 1 give up, agent 2 will detect the identification probability of agent 1 by a intermediary structure, and if the identification probability of agent1 is lower than that of agent 2, agent 2 takes decision right. On the other hand, if agent 1 tries to take decision right, agent 2 will face fighting to agent 1 or give up. If agent 1 is superior, and agent 2 will fight to it, agent 1 will win and take the decision right, and if agent 1 is inferior and agent 2 will fight to it, and then agent 1 will loss decision right, and if agent 2 choose to give up, then agent 2 will keep the decision right.

The corresponding association diagram is shown in Fig. 3. Random variable A1S (means agent 1 is superior) includes agent 1's decision evidences, not agent 2's evidences, and denote as an arrow from A1S to DA1. A1S is also a father node of a situation result node because it decides the result of game. Node RS effects the utility node of each decision-makers. In this game, because of zero-sum game, Ublue=-Ured. For agent 1, variable A1S is a proof and it produce a optimal game model on agent1 and a non-optimal model on agent1, and for agent 2, A1S is just a common random variable, and has a condition probability table associated with itself. In addition, the chance node RS will be not a evidence variable for ever due to relating to a future status.

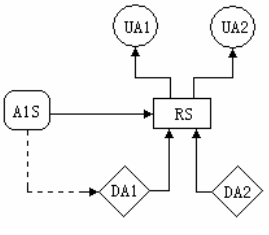

Fig. 3. The Association diagram in ETC

Supposing $q \in (0,1)$ denote the beliefs of agent 2 to agent 1. In this example, agent 2 also knows the q value. That is to say, the beliefs of the two agents are consistent. This situation can be described as follow:

N={1,2} C1={R,F},C2={M,I}
T1={1.s,1.i} T2={2}
P1(2|1.s)=P1(2|1.i)=1 P2(1.s|2)= q, P2(1.i|2)=1-q
U1(C1,C2,t1),u2(C1,C2,t1) as shown in table 1.

Using Harsanyi's method, we introduce a history chance node to decide the type of agent 1 such as superior or inferior at the start. Thus, this Bayesian game can be transformed to the expansion form shown in Fig. 4 according to utility matrix shown in table 1. Note that the two nodes denoted as 2.0 represents the uncertain of agent 1's type to agent 2, and synchronously note that the label denoted as 1.s is different from the label denoted as 1.i, which denote that agent 1 can distinguish the two nodes named 1.s and 1.i.The common mode to solve the game problem is strategy table shown in table 2.

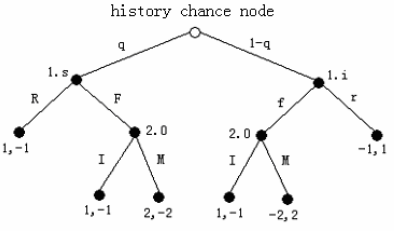

Fig. 4. The Harsanyi transform of game in table 1

Table 1. The utility matrix of the example

Agent1 \ Agent2	M	I
F	2,-2	1,-1
R	1,-1	1,-1

t1=1.s(优)

Agent1 \ Agent2	M	I
F	-2,2	1,-1
R	-1,1	-1,1

t1=1.i(次)

Table 2. The strategy table of game in Figure 4

Agent1 \ Agent2	M	I
Ff	4q-2, 2-4q	1, -1
Fr	3q-1, 1-3q	2q-1, 1-2q
Rf	3q-2, 2-3q	1, -1
Rr	2q-1, 1-2q	2q-1, 1-2q

No matter what value q is, agent 1 always fights for the decision right if it is superior. If $4/5 \le q \le 1$, agent 2 always choose to ignore the decision right. So, ([Ff],[I]) is only one strategy equilibrium under the condition of $4/5 \le q \le 1$, which demonstrate that under the superior of licence plate recognition , the basic of toll collection always depend on the result of Licence plate recognition, and the vehicle recognition system always choose to give up. Therefore, the both sides reach a strategy Equilibrium in the game. For $0 < q < 4/5$, there is no pure strategy Equilibrium, and we have to find an Equilibrium in mixed strategies. Supposing that x[Ff]+(1-x)[Fr] and y[M]+(1-y)[I] denote respective Equilibrium strategies of agent 1 and agent 2. X denotes the probability that agent 1 fight for, and Y denote the probability that agent 2 answer. For agent 1, the need to Equilibrium is that the expected income is same for Ff and Fr, namely,

$$y(4q-2)+(1-y)1 = y(3q-1)+(1-y)(2q-1) \Rightarrow y = 2/3 \tag{4}$$

Similarly, in order to enable agent 2 to make a random choice between M and I, M and I must give agent 2 the same expected income to x[Ff]+(1-x)[Fr]. So,

$$x(4q-2)+(1-x)(3q-1) = x1+(1-x)(2q-1) \Rightarrow x = -q/(3(q-1)) \tag{5}$$

An equilibrium of game with incomplete information is a Bayesian Equilibrium which is a random strategy profile, including a strategy profile $\sigma(\cdot \mid t_i)$ of all agents and their types. In this example, an exclusive Bayesian Equilibrium is as follow:

For $0 < q < 4/5$

$\sigma_1(\cdot \mid 1.s) = [F]$

$\sigma_1(\cdot \mid 1.i) = x[F] + (1-x)[R]$

$\sigma_2(\cdot \mid 2) = 2/3[M] + 1/3[I]$

For $4/5 \le q \le 1$

$\sigma_1(\cdot \mid 1.s) = [F]$

$\sigma_1(\cdot \mid 1.i) = [R]$

$\sigma_2(\cdot \mid 2) = [I]$

In the above example, we give a Nash equilibrium for a simple decision in the form of mixed strategy. Now let we think it again deeply. On the one hand, strategy Equilibrium theory is reasonable. After all, the concept of Nash Equilibrium is constructed on the basic of rational analysis and can be defined clearly. Through Bayesian game, we can construct the optional agent model to resolve the problem whether the resolution of a game situation is exist. On the other hand, although Nash Equilibrium is constructed on the basic of rational activities, but there are still several problems that need to discuss. As far as the prior example be concerned, how the variable x and y change with q is shown in Fig. 5. That is to say, Fig. 5 demonstrates that how the agent's decision change depend on the other's decision. Not knowing the background of situation, we can not understand why the probability x(q) still take the active action under knowing that it itself is inferior in Fig. 5. Look further the agent's answer, the probability of agent 2 remains constant 2.3, but when q=4/5, it suddenly

reduce to 0, which demonstrate that when q changes, there is a interrupt in optimal strategies, but the optimal income is till continuous in interrupt point.

This example also explains that considering the risk assessment to the private information of opponent as a basis of decision-making is valuable. We can choose a Nash Equilibrium strategy when the risk is higher and choose a pure strategy with maximum income when the risk is lower.

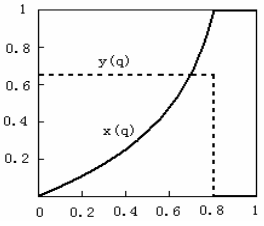

Fig. 5. The Change of resolution of Bayesian game with the evaluation to opponent's type

7 Conclusion

In this paper, we discuss a architecture as a information fusion model and point out the evolvement of game situation is closely related with the interaction between fusion processes. Game theory can not be only considered a tool of decision maker's toolkit, on the contrary, it a science that agents interact themselves. That is to say, we can regard the game theory as a whole toolkit to resolve the situation assessment or other prediction problems.

The game tools have the capacity of situation prediction, and consider the uncertain or fraudulent information into an evaluation to opponent. For a decision maker who faced a simple real decision-making problem, the idea of Bayesian game is necessary, which can give a resolution of a game situation in the form of mixed strategy Nash Equilibrium by combining several situation models. But in a real complex situation, Bayesian game still has some limit. In spite of that, Bayesian game model is still an important and necessary tool for the prediction of future events on higher level data fusion.

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A Study of the Demonstration on KPI performance Examination for Aviation SP Enterprise of XAC

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Abstract. An often real problem encountered in performance evaluations for aviation subcontract production (SP) enterprise of XAC was difficult to establish the quantificational targets and quantifiable performance indicators. Key performance indicators (KPI) is a target-type quantitative management indicators that measuring the process performance. The practical manufacturing enterprise in aviation subcontract production is expatiated, and the overall KPI analysis and design process from planning to final implementation and proceedings is put forward by using the KPI performance assessment. It is important to improve human resources management and to enhance the economic benefits for aviation SP enterprise of XAC.

Keywords: Subcontract production (SP), Key performance indicators (KPI), SMART principals, Quantity management, Check factors, Xi'an Aeronautical Cooperation (XAC).

1 Introduction

A set of perfect performance assessment system may stimulate the staff's work enthusiasm, encourage the staff's innovation spirit, forms the positive competition atmosphere, and promote enterprises to develop fast. However, a common question in performance assessment for enterprise is difficult to confirm the quantificational targets impersonally. In fact, it is unrealistic to quantify all performance assessment, and it is unnecessary to do so. Enterprise's performance can be weighed by the indicators system of the behaviours too.

Key performance indicators (KPI) is a target quantitative management indicators that measuring the process performance by setting, sampling, calculation and analysing the key input and output parameters of some process in the cooperation. It can break down the company's strategic target as an operational perspective objective tool and the basis for enterprise performance management system [1]. It is a quantificational management indicator to weigh procedure performance. It divides strategic objective of enterprise into some operational goals. This is a foundation of performance management system in enterprise. KPI is a performance assessment method that is popular widely with enterprise. KPI can make the executive of department define the ultimate liability of the department, make the personnel of

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department define performance assessment indicators, and make performance assessment quantized. It is important to set up the clear, feasible KPI index system to manage performance well.

Compared with traditional performance assessment system , it has some characteristics as follow [2].

a) Can maximum reduce influence of the subjective factors in course of assessment, thus assessment is fair comparatively.

b) Once KPI assessment system is determined, then the calculation procedure of the performance and performance indicators of each employee's can be disclosed in public.

c) The implementation of KPI system is one course from top to bottom, while it is the course from bottom to top. It can combine each employee and company together closely.

In this paper, an aviation subcontract production enterprise in Xi'an aircraft manufacturing Co., Ltd. (XAC) was as the example. The KPI design principle follows two eight principle. This paper explains the whole design process of KPI performance assessment system to final implementation.

2 KPI Design Principle

A. KPI design principle

The KPI design follows an important management principle two eight principles. In value creation process of enterprise, there is a law of "20/80", i.e. the key personnel of 20% create the value of 80% enterprises. Two eight principles is applicable on each employee, the task of 80% is finished by the key behavior of 20%. So, we must catch the key behavior of 20%, analyze and weigh them.

B. The procedure of designing KPI

The key of designing the KPI system lies in procedure, planning and systematicness.

KPI indicator of each employee should be established firstly. The establishing of these indicators is the most important to the KPI design system. This can be divided into three steps. Fistly, KPI indicators of the enterprise should be determined on the basis of business strategy, KPI indicators of the enterprise is decomposed to KPI indicators of the department, KPI indicators of the department is decomposed to KPI indicators of the staff. Thus, the big indicators are decomposed to small indicators, these small indicators are concrete and feasible and can be confirmed and controlled objectively.

And then, the method of KPI quantization will be determined. There are some methods which can mostly reflect the disparity of the staff assessed. Futhermore these methods are easily understood.

Finally, how to combine the inspection result with the rewards and punishments system will be considered. In fact, it is the course of establishing a simple rule, this work can be finished with the help of the Human Resource Department [4].

C. The difficulty of designing KPI

Performance assessment is important in performance management. Performance assessment mainly realizes two goals: One is performance improvement, the other

one is value appraisal. The assessment facing performance improvement mainly concerns the settlement of the problem and the improvement of the performance. It does not often link with the salary directly, but can offer the reference for the value appraisal. This assessment not only reflects the staff's work performance, but can fully reflect the executive's management level. Because the manager's goal is consistent with the staff's goal and the staff's achievement is the executive's achievement too. Thus the executive will get along with the staff very well. They may work together more harmoniously [5].

There is a new method combining the assessment facing performance improvement with the performance assessment facing value appraisal. This method emphasizes the continue improvement in the daily assessment. When carrying on value appraise, Human Resource Department will make uniform criterion. In this way, the appraise result will be fairer, and performance of the staff will be improved greatly. The staff can obtain higher remuneration and approval depending on their outstanding work performance. KPI can offer the basic reference of the staff assessment [6-8].

3 Process of KPI Design (An Example of XAC)

A. The establishment of the KPI system

a) The KPI indicators Determination. The determination of the KPI indicators follows the SMART principle. SMART is abbreviation of 5 English words. First letter S represents the word "specific", it means that the work indicators should be confirmed specifically. M represents the word "measurable", it means that indicators should be quantified, and the data or information validating indicators can be obtained feasibly. A represents the "attainable", it means that indicators should be attainable with efforts, and the indicators can't set up unrealistically. *R* represents the "realistic", it means that the indicators are actual. *T* represents the "timetable", it means that indicators should be finished in limited time. The flow chart of KPI indicators determination is shown as Fig.1.

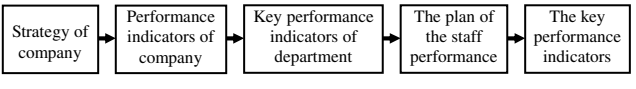

Fig. 1. The flow chart of determining KPI indicators

b) The KPI indicators Quantization. The three input and output variable was determined. One is the burden proportion of each employee, other is the difficulty degree of KPI, and another is the completion degree of KPI. The output variable is the performance score of each employee. And the burden proportion of each employee means that the task and corresponding proportion is distributed by the executive every year. The difficulty degree of KPI means that the numerical value is determined by the executive according to the difficulty of task. The standard of determination is shown in Table I. The completion degree of KPI is the numerical value that is determined according to the finish of the last month task.

Table 1. The standard of determining the difficulty of KPI/PI

The determination standard		
Commonly 60-79%	Difficulty is common	Work is done in Corporation
Difficultly 80-89%	Innovative work	It never happen in same trade
Challenging 90-99%	More time and energy	It will bring great benefit

c) **Combination of the KPI assessment result and the system of rewards and punishments.** The KPI performance place is taken as the main reference of assessing the staff performance. The place of KPI performance should have the close relation with staff's salary welfare. So, the proportion of assessment, performance bonus and the specialized allowance can be assessed based on the place of KPI performance.

d) **Flow and content of the KPI assessment system.** The content of KPI assessment system and the flow chart is shown as Fig.2.

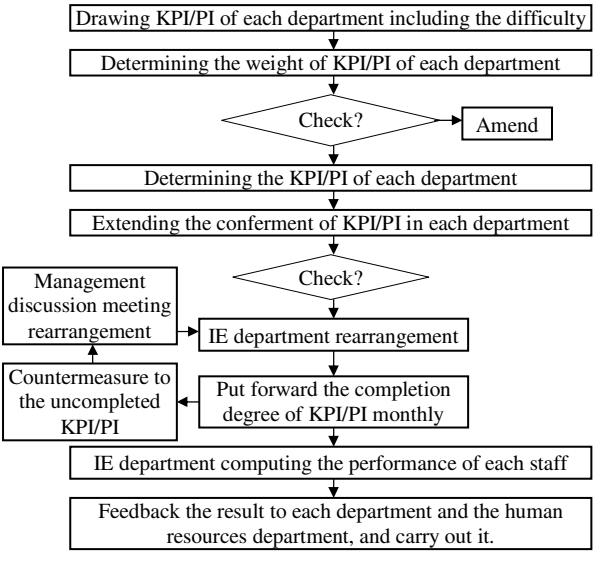

Fig. 2. The flow chart of KPI system

B. The preliminary implementation of the KPI system

a) Determination the cycle of KPI assessment. The goal of KPI assessment is the executive's better communication with the employee. The implementation of the KPI system is to improve the performance of the whole enterprise. The result is combined with the bonus and allowance of the staff at the same time. Moreover, the KPI

assessment indicators are task performance entirely. Therefore, the cycle of KPI assessment may be defined 1 month.

b) The daily management of KPI assessment. The KPI assessment system is used to assess the daily management in the beginning of the year, at the beginning of or at the end of each management period (such as each month, season) and the year's end.

Table 2. XAC KPI/PI of IE in 2009

	No	Project specification	The way of measurement Measurable	Accountable department	The feasible target value Realistic	Time	Difficulty degree
KPI	1	The assessment and implement of cost plan	By the effectiveness, the number of completion/ the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	80
	2	The implement of 6σplan	Number	management	Complete with cooperation	2009-12-13	75
	3	The completion of the prepositive work on COG product	The completion date	IE	Complete before 2009-12-13	2009-12-13	80
	4	LCM□factory one pass	The completion date	IE	Complete before 2009-12-13	2009-12-13	90
	5	The completion of KPI	• Number of implement dept • Rate of improving the problem		• the number of implement department or company=14/18 • the rate of improving=100%	2009-12-13	80
	6	The establishing and implement of the case system	The consilient degree of implement effect	Knowledge system	100%	2009-12-13	75
	7	The change of project	The completion date of the new system day long	Knowledge system	Complete before 2009-12-13	2009-12-13	70
	8	The optimization of ISO	The lost rate of ISO	Knowledge system	the lost rate=100%	2009-12-13	75
	9	Setting up the standard of checking and accepting the project	The completion date	construction	Complete before 2009-05-01	2009-12-13	80
	10	The reduce of accident in work	The number of accident	IE	0/month	2009-12-13	70
PI	1	The analysis of monthly management	• The accuracy rate of analysis • The completion date	management	• the error date=0; • the analysis report is put forward before 6th each month	2009-12-13	85
	2	Checking business indicators of each department	The completion date	management	Complete before 6th each month	2009-12-13	70
	3	The completion of work goal in 2005	The completion date	management	Complete before 6th each month	2009-12-13	65

Table 2. *(continued)*

4	Compute the charge	By the effectiveness, number of completion or the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	75
5	The analysis of the propositional plan	By the effectiveness, number of completion or the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	75
6	The analysis of the difference between the costs of machines	By the effectiveness, number of completion or the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	75
7	The assessment of new machine cost	By the effectiveness, number of completion or the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	75
8	The work procedure of management plan in 2005	The completion date	management	Complete before 2009-12-13	2009-12-13	75
9	The analysis of benefit	• The accuracy rate of analysis • By the effectiveness, the number of completion or the number of receive order	management	• the accuracy rate is 100% • receive the order and complete the order this month	2009-12-13	75
10	Establishing of information on the benchmarking	The completion of information collection	IE	100%	2009-12-13	70
11	The application and completion of the budget on developing new machine	The completion rate	IE	Put forward the report about new machine	2009-12-13	75
12	Collection of product information	The completion rate	IE	complete this month	2009-12-13	70
13	Collection of APQP information	The completion rate	IE	The completion of new machine	2009-12-13	70
14	Making an inventory of production and marketing	The completion date	IE	Complete before 2009-12	2009-12-13	70
15	Certification of ISO 14001 and the OHSAS 18001	The completion rate	IE	Complete before 10th each month	2009-12-13	70
16	Checking the completion degree of KPI/PI and the measure of KPI/PI	• the accuracy rate of measure • the completion rate	Knowledge system	• the accuracy rate is 100% • Complete before 6th each month	2009-12-13	70

Table 2. *(continued)*

17	Evaluation of duty and the optimization of human resource	The completion time	Knowledge system	Confirm the necessary and the disposing way after receive the order in three days, and hand it to the manger for signature	2009-12-13	75
18	Check 5S	The status of checking	Knowledge system	The implement of 5S benchmarking book	2009-12-13	75
19	The training of IE department	Number/month	Knowledge system	• the course about 6σand cost ≥2/month • have the other courses according to the plan of company	2009-12-13	70
20	Assist Audit to complete each work	The lost rate	Knowledge system	the lost rate=100%	2009-12-13	75
21	Routine work	The completion rate	Knowledge system	100%	2009-12-13	75
22	Collection/propaganda of Lesson Learn	The completion date	Knowledge system	Statistic every month	2009-12-13	72
23	Processing of project	The completion rate	construction	Complete according to the amount of user	2009-12-13	75
24	Processing of miscellaneous project	The completion rate	construction	Complete according to the amount of user	2009-12-13	75
25	File the files of IE department	• the accuracy rate of filing • the completion rate	IE ALL	• File the present files • File the new files in time	2009-12-13	65
26	The increase of KMS date	The number of date	IE ALL	1/month	2009-12-13	70
27	The processing of stock order which must be applied	The money/ The completion time	IE ALL	Confirm the necessary and the disposing way after receive the order in three days, and hand it to the manger for signature	2009-12-13	70
28	The processing of stock order which can be determined themselves	The money/ The completion time	IE ALL	Confirm the necessary and the disposing way after receive the order in three days, and hand it to the manger for signature	2009-12-13	80

Table 2. *(continued)*

29	Case study	The completion time	IE ALL	Confirm the necessary and the disposing way after receive the order in three days, and hand it to the manger for signature	2009-12-13	75
30	Deal with the communication order of departments	The completion time	IE ALL	Confirm the necessary and the disposing way after receive the order in three days, and hand it to the manger for signature	2009-12-13	70

Table 3. KPI in XAC

KPI		The table of computing KPI performance									
		ENG1	ENG2	ENG3	ENG4	ENG5	ENG1	ENG2	ENG3	ENG4	ENG5
Establish the PANEL feeding management system	55%				100%					100%	
The accuracy rate of estimating PANELL material price	70%				100%					100%	
The management balance each month	55%				100%					100%	
The accuracy rate of cost simulation	80%				100%					100%	
The completion of the cost improvement system	70%				100%					100%	
The completion of performance assessment about project	55%			100%					80%		
The recognition of performance assessment	75%			100%					0%		

Table 3. (*continued*)

The completion of dormitories in the second period	60%			65%		35%			100%		0%
The completion of LCM I factory in the second period	50%	100%					100%				
The completion of LCM II factory in the first period	70%		100%					100%			
The raise of company's honor and improve of life environment	70%					100%					20%
The complementary money of special plan	50%	25%	40%	15%		10%	100%	100%	100%		100%
The complementary rate of special project	70%	25%	40%	15%		10%	0%	0%	0%		0%
The amount of KM system date	60%	10%	10%	60%	10%	10%		0%	100%	0%	0%
The plan of basic training and KM system	50%			100%							
The standardization of file about establishing the factory	60%	20%	30%	40%		10%	0%	0%	0%		0%
The satisfaction of IE department	60%			100%					50%		
The standardization of IE file	50%	20%	20%	20%	20%	20%	0%	0%	0%	0%	0%
The priority weight score within the department (											
The relative priority weight ratio within the department (											
KPI performance		KPI performance of each person in one month $\delta_j=\gamma_j*\kappa_j$					**8.7%**	**13.8%**	**41.4%**	**70.7%**	**5.2%**

Table 4. KPI/PI assessment of the staff in XAC

Department	Name	No.	Date
IE	xxx	xxx	xxx

KPI/PI Self-assessment and Assessment:

	The content of KPI/PI	Difficulty degree (%)	The target	The border proportion	Self assessment	Assess by the executive
KPI	The reduce of accident in work	70	0	100%	100	100
	LCM III factory one pass	90	Check design	20%	100	90
	Implement of cost CD plan	70	Check the schedule CD plan	22.5%	95	100
PI	Case study	85	Development of the signal producing machine	20%	90	90
	Implement of plan on generate electricity house	70	The data about prevent fire	100%	100	90
	File the IE files	65	File the file about LCM III factory	23%	95	100
	Analysis of monthly management	85	The analysis of CPTW	30%	100	100
	Analysis of the difference between the costs of machines	75	The analysis of the costs difference between 15XG and NB	33%	100	100
	Analysis of benefit	75	Cost assessment	29%	100	100
	Compute all kinds of charge	75	Finish 10	11%	100	100

c) The establishment of the assessment table. The table is made by IE department, and the each department fills in these tables. The formulation table fills in for various departments. The principle of making table is overall, simple, clear and convenient. The table of XAC includes the department yearly KPI/PI table, the distribution table of KPI/PI, the spreading table of KPI/PI personally and the table of KPI/PI assessment (As shown in Table 2, Table 3 and Table 4).

C. The check of the KPI system implementation

The check of the KPI system implementation will spend much time. During the period of the check, IE department should receive, collect the suggestion of every department, and improve the KPI system constantly according to the suggestion.

At the beginning of determining the KPI system, a lot of staff don't understand the KPI system. So, performance can't be calculated effectively. To make every staff familiar with this `system as soon as possible, the executive should explain the KPI system to the every department in detail. In addition, the staff gets in touch with the help of the NOTES software.

The staff can suggest to the executive the suggestion about the KPI system. If the suggestion follows the overall thought, it can be accepted. If the suggestion damages another department, it can't be accepted.

D. Implement the final plan

If the satisfaction degree reaches above 95%, the system can be determined basically. Then implement the system, and the question in the course of implementation will be reduced greatly.

4 Conclusions

It will spend a lot of time from drawing up the system initially to improve the system. Finally, the satisfaction degree should reach above 95%. It is difficult to change the opinion of the staff, so IE personnel should communicate with the staff more frequently, and help the staff to solve the problem that can be met in the course of assessment. It makes them know that the KPI system has interest with themselves. Thus the staff is easy to change the opinion, and they will understand the KPI system and accept the KPI system.

The executive of the department should pay more attention to the KPI indicators, and keep the idea of optimization management constantly. The assessment should be done by the specialist. The management mode of KPI indicators application should be established. Definition of the KPI indicators, multidimensional data statistics, objective analysis and the idea of continuous improve are the foundation of implementing the KPI system successfully. At the same time, all kinds of training and propaganda will facilitate the implementation of the KPI system. In a word, the KPI system can help to optimize the management and improve the system of assessment.

In the course of implementing the KPI system, the management level of enterprise will affect the implementation of the KPI system directly. Therefore, if the good management system has been set up, the KPI performance assessment will go on smoothly.

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A Study of the Buyer-Oriented Collaboration and Stimulation Approach of E-Supply Chain Management

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Abstract. A buyer-oriented electronic supply chain management (e-SCM) to the core issue of supply chain management (SCM) with coordination and stimulation approach by adopting the return contract was studied, and a practical explanation and operable plan with coordination and stimulation in e-SCM on the basis of return contract was propose. When the supplier in such supply chain gives the buyer a certain rebate rate to unsold products, the SCM can be coordinated. The buyer always has the motivation to join the e-SCM, but the supplier's motivation depends on the rate of commission and coordination mechanism. When the rate of commission is lowered to a certain level, the supplier will join the e-SCM even without any extra incentive. However, when the rate of commission is increased to a certain higher level, the supplier will not join the e-SCM even if the buyer offers the highest subsidy. When the situation is between the above two cases, i.e., if the buyer gives a certain amount of subsidy to the supplier, the whole supply chain still can be coordinated.

Keywords: Electronic supply chain management (e-SCM), Coordination and stimulation Approach, Electronic commerce (E-commerce), Buyer-oriented.

1 Introduction

The kernel issue of supply chain management (SCM) is collaboration and stimulation [1-2]. Contract (i.e. Return Contract, revenue sharing contract, backups contract, option contract, etc) is the most prevalent coordination and stimulation mechanism in traditional SCM. The collaboration and stimulation have been well studied in SCM. However, its researching object is based on traditional SCM. With the development and popularization of Internet, and the application of E-Commerce in SCM, the electronic supply chain management (e-SCM) is formed [3-5]. According to the different structure of E-Commerce, e-SCM could be divided into three kinds: buyer-biased e-SCM, neutral e-SCM and seller-biased e-SCM, as table 1.

E-SCM is differ from the traditional SCM in that it has self characteristic in coordination and stimulation with depressing consumedly the transaction cost of buyer and seller, and paying the definite commission and leaguer fee for e-commence serve provider. This paper studies the coordination and stimulation in buyer-oriented

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E-supply chain management under the return contract. When the supplier in such supply chain gives the buyer a certain rebate rate to unsold products, the supply chain management can be coordinated.

Table 1. The classification and its characteristics of e-SCM

Classes	Excellency	Shortcoming	Samples
Buyer-biased e-SCM	Buyer win the lowest price through collecting seller info and inviting public bidding.	Seller faced with vehement market price; and paying for commission; and not enough supplier.	FreeMarkets FOB Covisint
Neutral e-SCM	Win benefits of seller and buyer through collecting info and inviting public bidding of seller and buyer each other.	The seller and buyer will unwillingness joining if there is not enough actors; and all paying for commission each other.	E-steel Chemdee FastParts
Seller-biased e-SCM	seller win the maximal price through collecting buyer info and inviting public bidding.	Buyer faced with vehement market price; and paying for commission; and not enough buyers.	E-Chemicals Telekom Deutsche

2 Model Explanation

Set $\boldsymbol{c}$ as the unit production costs of the supplier, set $\boldsymbol{w_1}$ and $\boldsymbol{w_2}$ respectively as the unit selling prices of traditional supply chain and e-supply chain. As the researching object is the buyer-oriented e-supply chain, and the buyer needn't to pay commission but the supplier needs to pay certain and invariable fee of membership (S) and a certain amount of commission that calculated according to the amount of money of the trade, and set $\boldsymbol{\rho}$ as the rate of commission. Set $\boldsymbol{Q_1}$ and $\boldsymbol{Q_2}$ respectively as the order quantity of the buyer in the traditional supply chain and in the e-supply chain. Set $\boldsymbol{b_1}$ and $\boldsymbol{b_2}$ respectively as the returning refund proportions that the supplier pays for the goods that the buyer couldn't sell out in traditional supply chain and in the e-supply chain. Set $\boldsymbol{r}$ as the retailing unit price of the distributor. Set $\boldsymbol{A_s}$ and $\boldsymbol{A_b}$ respectively as unit trading fee of the supplier and the buyer in the traditional supply chain. In e-supply chain, as the trading fee is reduced enormously with e-commerce and derived simply, set the trading cost of the supplier and the buyer as ***zero***. Set $\boldsymbol{x}$ as the amount of customer's requirement (CR). x is a continuous and random variable that is not negative, the density function is $\boldsymbol{f(x)}$ and it's distributing function is $\boldsymbol{F(x)}$.

In this model, the order of incident is as follows:

a) The supplier participates the purchasing competitive bidding, and the buyer chooses the person who win the bidding form it, and get order from him;
b) The supplier organizes the production and sends the goods to the buyer;
c) The demand happens and the unmet demand is backlogged. The unsold goods are returned the supplier at a discount.

And the hypothesis is as follows:

a) Neglecting the lose of reputation by short supply;
b) The supplier's production capacity is unrestricted, and the relationship is positive proportion within the cost and the quantity of production.

c) F(x) is successive and differentiable, and it has a contradictorily function. By way of seeking the obvious result, and supposing x accords with the equably distributing in block [0, D], so $f(x)=\frac{1}{D}$,
d) For ensuring the profit of the supplier and the buyer in the traditional supply chain, that r-Ab>w1>As+c;
e) In e-commerce, the supplier is produced by competition. So the price is lower than that in the traditional supply chain, that w1>w2>c;
f) The retailing price is invariable, no matter where the buyer gets the goods, from traditional supply chain or e-commerce network-station.
g) The Common Knowledge is the price, cost and demand of goods, and there is not anisomerous information problem between the supplier and the buyer.

3 Collaboration of Traditional SCM

The manufacturer and the buyer join the e-supply chain by comparing with the e-SCM and researching the stimulation. At firstly, studying the stimulation of traditional supply chain. In traditional supply chain, supplier must afford as production cost c and exchange fee A_s, and the distributor must afford the purchasing cost w_1 and exchange fee A_b.

A. Integrated Supply Chain
In the integrated supply chain, supplier and distributor allocate products by ierarchy mechanism, so there is no exchange fee, that also means As=Ab=0. The whole supply chain's expected profit is as:

$$\prod(Q)=-cQ+\int_0^Q rxf(x)dx+\int_Q^x rQf(x)dx \tag{1}$$

According to literature [8], the production quantity optimistically of supply chain can be expressed as follows:

$$Q_T^*=F^{-1}(\frac{r-c}{r}) \tag{2}$$

B. Distributive Supply Chain
In distributing SCM, the supplier and distributor are independent main-body, and their trading by market mechanism should afford the homologous fee, hat also means $A_s=A_b\neq 0$. Considering the trading fee, the distributor's profit ($\prod_T^B$) is as:

$$\prod_T^B=-w_1Q_1-A_bQ_1+\int_0^{Q_1} rxf(x)dx+\int_{Q_1}^{\infty} rQ_1f(x)dx \tag{3}$$

So, according to literature [9], the economic order quantity of buyer is as:

$$Q_1^*=F^{-1}(\frac{r-w_1-A_b}{r}) \tag{4}$$

Accordingly, if the order quantity is Q1*, the supplier's profit is as:

$$\prod_T^S (Q_1^*) = -cQ_1^* - A_s Q_1^* + w_1 Q_1^* \tag{5}$$

To comparing (2) with (4), as w_1>c, so $\frac{r - w_1 - A_b}{r} < \frac{r - c}{r}$, and according to assumption 4, so:

$$Q_1^* = F^{-1}(\frac{r - w_1 - A_b}{r}) < Q_T^* = F^{-1}(\frac{r - c}{r}).$$

There out acquirability to:

***Deduction* 1:** In traditional supply chain, the economic order quantify of buyer is less than the production quantity optimistically of supply chain, that also means $Q_1^* < Q_T^*$.

The above-mentioned phenomenon is named as Double Marginalization [10]. That is means, when the trade price of supplier is higher than its marginal cost, the buyer's economic order quantity will be less than the optimum production quantity of whole supply chain. In order to controlling this phenomenon, the supply chain management must afford a collaborative mechanism, which is used by the buyer so that their economic order quantity can be equal to the whole supply chain's production. This paper studies the collaboration under the return contract.

According to [9], in the whole given back items and the rate of drawback of each unit of product is b1, the buyer's economic order quantity q* is as:

$$q^* = F^{-1}(\frac{r - w_1 - A_b}{r - b_1})$$

Assuming $q^* = Q_T^*$, that is $F^{-1}(\frac{r - w_1 - A_b}{r - b_1}) = F^{-1}(\frac{r - c}{r})$

According to the assumption 4, gained $\frac{r - w_1 - A_b}{r - b_1} = \frac{r - c}{r}$, the consequence is $b_1 = \frac{(w_1 + A_b - c)r}{r - c}$. And the second deduction is as follows:

***Deduction* 2:** The refund rate $\{ b_1 = \frac{(w_1 + A_b - c)r}{r - c} \}$ that the supplier provided can be coordinated to the traditional SCM under the strategy of surplus product return.

4 Collaboration and Stimulation of E-SCM

In the e-SCM, suppliers have to pay the trade commission (ρw_2) to the website for each unit of agreement, in addition the firm use cost charged generally by the year. Because the e-business greatly reduced the trade cost. So, the assumption of its trade cost is zero.

A. The collaboration of the e-SCM

The e-SCM is the same as the traditional SCM, and the optimum production quantity of integrated supply chain is expressed as follows:

$$Q_E^* = F^{-1}(\frac{r-c}{r}) \tag{6}$$

In distributive SCM, the supplier and the distributor respectively maximize their own profits. The distributor's profit ($\prod_E^B$) is expressed as follows:

$$\prod_E^B = -w_2 Q_2 + \int_0^{Q_2} rxf(x)dx + \int_{Q_2}^{\infty} rQ_2 f(x)dx \tag{7}$$

And also according to [8], the optimum order quantity of the distributor (Q_2^*) can be expressed as follows:

$$Q_2^* = F^{-1}(\frac{r-w_2}{r}) \tag{8}$$

Correspondingly, when the order quantity equals Q_2^*, the supplier's profit ($\prod_E^S$) is as:

$$\prod_E^S(Q_2^*) = (w_2 - c - \rho w_2)Q_2^* - s \tag{9}$$

To comparing (6) with (8), we can find the third deduction:

***Deduction* 3:** In e-SCM, the optimum order quantity of the distributor is less than the optimum production quantity in the supply chain, that is $Q_2^* < Q_E^*$.

This means that there is a "Double Marginalization" phenomenon in the e-SCM as well. So it is possible to coordination under the return contract. The reasoning process is similar to that of the second deduction. So we come to:

***Deduction* 4:** In e-SCM, the refund rate { $b_2 = \frac{(w_2 - c)r}{r-c}$ } that the supplier provided for the surplus product can be coordinated to the e-SCM.

B. The stimulation of the e-SCM

Although the whole e-SCM can be more excellent through adopting the coordinating mechanism, but according to the stimulation compatibility, manufacturer and the distributor have motivation to engage in the e-SCM unless the profits of both them are respectively more than that in the traditional SCM.

- The stimulation to the distributor(or buyer)

In the traditional SCM,

$$\prod_T^B(Q^*) = -(w_1 + A_b)Q^* + \int_0^{Q^*} [rx + b_1(Q^* - x)]f(x)dx + \int_{Q_1^*}^{\infty} rQ^* f(x)dx$$

And also, in the e-SCM,

$$\prod_E^B(Q^*) = -w_2 Q^* + \int_0^{Q^*} [rx + b_2(Q^* - x)] f(x)dx + \int_{Q_1^*}^{\infty} rQ^* f(x)dx$$

Assuming $\Delta\prod^B = \Delta\prod_E^B(Q^*) - \prod_T^B(Q^*)$, introduce Q^*, b_1 and b_2. The consequence is as:

$$\Delta\prod^B = \frac{1}{2}(w_1 + A_b - w_2)Q^* > 0$$

Hence, the fifth deduction can be expressed as:

$$\prod_T^B(Q^*) = -(w_1 + A_b)Q^* + \int_0^{Q^*} [rx + b_1(Q^* - x)] f(x)dx + \int_{Q_1^*}^{\infty} rQ^* f(x)dx$$

***Deduction* 5:** In e-SCM, the profit of the distributor is always more than that in traditional SCM after coordinating. So the rational distributor should engage in the e-supply chain spontaneously without additional encouragement.

- The stimulation to the supplier

In traditional SCM, the profit of the supplier is expressed as follows:

$$\prod_T^S(Q^*) = (w_1 - c - A_s)Q^* - \int_0^{Q^*} b_1(Q^* - x) f(x)dx$$

In e-SCM, the profit of the supplier is expressed as follows:

$$\prod_E^S(Q^*) = (w_2 - c - \rho w_2)Q^* - S - \int_0^{Q^*} b_2(Q^* - x) f(x)dx$$

Assume $\Delta\prod^S = \Delta\prod_E^S(Q^*) - \prod_T^S(Q^*)$, Introducing Q^*, b_1 and b_2, the consequence is as:

$$\Delta\prod^S = \frac{1}{2}(w_2 - w_1 + 2A_s - 2\rho w_2 + A_b)Q^* - S$$

Introducing Q^*, and assuming the equation above equals zero, the consequence can be expressed:

$$\rho^* = \frac{2A_s + A_b + w_2 - w_1}{2w_2} - \frac{rS}{(r-c)Dw_2}$$

If $\rho \geq \rho^*$, $\Delta\prod^S \leq 0$, that is, the profit that the supplier gained in e-SCM is less than that in the traditional SCM. So, the rational supplier refuses to engage in e-SCM. And if $\rho < \rho^*$, $\Delta\prod^S > 0$, the supplier will engage in it spontaneously.

So, the deduction can be expressed as follows:

***Deduction* 6:** Under the coordinating mechanism of the surplus return, if the commission $\rho \geq \rho^*$, the supplier will not engage in e-SCM. And if the commission $\rho < \rho^*$, the supplier will engage in it spontaneously.

According to Deduction 5, if $\rho \geq \rho^*$, the supplier refuses to engage in e-SCM, but if the distributor will give the supplier some bonus from his own profit, the supplier has possibly motivation to engage in it. So it is helpful to make the coordination of the supply chain continuous. In underside, the maximum unit bonus that the distributor is able to provide will be deduced.

In e-SCM, the good quantity which the distributor able to sell is:

$$Q_E^E = Q^* - \int_0^{Q^*} (Q^* - x) f(x) dx = Q^* - \frac{Q^{*2}}{2D}$$

Assuming the commission rate under this condition is ρMax, the incremental profit per unit that the distributor gained is $\frac{\Delta \prod^B}{Q_E^E} = \frac{r(w_1 + A_b - w_2)}{r + c}$, and the maximum unit bonus that the distributor is able to pay is $(\rho_{Max} - \rho^*) w_2 = \frac{\Delta \prod^B}{Q_E^E}$, so we can come to $\rho_{Max} = \rho^* + \frac{r(w_1 + A_b - w_2)}{(r + c) w_2}$. If $\rho > \rho Max$, the maximum bonus paid by the supplier is not enough to profit the supplier from engaging in the e-SC, so the latter refuses to engage in it. Therefore the seventh deduction is as follows:

***Deduction* 7:** if the commission rate $\rho^* \leq \rho \leq \rho Max$, the buyer gives a certain amount of unit bonus $(\rho - \rho^*)$ to the supplier, the supplier will be stimulated to engage the e-SC and the whole supply chain will be improved, also the maximum unit bonus that the buyer gives is $\frac{r(w_1 + A_b - w_2)}{r + c}$; If the $\rho > \rho Max$, the supplier will not engage the e-SC spontaneously, even if the buyer offers the maximum unit bonus.

5 Conclusions and Further Research

This paper studies the coordination and stimulation in buyer-oriented E-supply chain under the return contract and gets following conclusions: when the supplier in such supply chain gives the buyer a certain rebate rate to unsold products, the supply chain can be coordinated. The buyer always has the motivation to join the E-supply chain, but the supplier's motivation depends on the rate of commission and coordination mechanism. When the rate of commission is lowered to a certain level ($\rho < \rho^*$), the supplier will join the E-supply chain even without any extra incentive. However, when the rate of commission is increased to a certain higher level ($\rho > \rho Max$), the supplier will not join the E-supply chain even if the buyer offers the highest subsidy.

Then the E-supply chain is dismissed because of being short of participants, when the situation is between the above two cases ($\rho^* \leq \rho \leq \rho Max$), as the buyer gives a certain amount of subsidy to the supplier, the whole supply chain can still be coordinated. The paper gives explanation to the failure of E-supply chain, and proposes a practical and operable mechanism of coordination in E-supply chain on the basis of return contract. According to the mechanism, we can learn how to define the rational rate of commission of E-commerce. We will do further research on how to make use of other contract to carry on the coordination and stimulation in e-supply chain management.

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Error Analysis of Phasor Calculation Based on Stochastic

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Abstract. The result of existing FFT algorithm of phasor calculation has serious error. In this paper, we firstly propose a reasonable model to actual AC signal. Then, in the base of stochastic process, we deeply analysis and compare these errors in the condition that the AC signals contains frequency offset, harmonics and noise. Simulation results show that the error mainly depends on the frequency offset.

Keywords: Data Acquisition, Power System, Non-synchronous Sampling, Error Analysis, Period Signals.

1 Introduction

In the process of power system operation, the positive sequence fundamental phase of exchange capacity is the important parameter of characterizing power system operating state. Therefore, the real-time measurement of the amount of power exchange has played an important role in power system state estimation, stability controlling, and fault diagnosis and relay protection and so on. At present, the discrete Fourier transform (DFT) and its fast algorithm is one of the basic methods of obtaining fundamental positive sequence phase of power exchange. When the sampling frequency is a strictly integer multiple of signal frequency, and greater than the Nyquist frequency, either time-domain analysis or Fourier transform can access to high accuracy. However, the actual grid frequency signals often fluctuate. The testing signal contains not only the fundamental and integer harmonics but also includes non-integer harmonics (between harmonics). Thus it is difficult to maintain tight synchronization sampling, and leads to non-synchronization error in time domain analysis and results in the spectrum leakage error in the traditional DFT (Discrete Fourier Transform) analysis. And the measurement of amplitude, frequency and phase would deviate from actual values, especially the phase measurement would lead to greater error. This will result in that accuracy measurement of current and voltage can not meet the actual demand [1-3].

In order to solve the problems above, foreign literature propose many methods [2-9], including: quasi-synchronous DFT method [2], phase correction based on phase difference [3], improved FFT algorithm [4], adaptive sampling algorithm [5], interpolation after the windowed signal [6], means algorithm [7] and so on. To some extent, these algorithms reduce leakage errors caused by frequency offset. But from the perspective of simulation and practical results, it is difficult or only marginally meets the complexity requirements of accuracy, time and space of real-time phase measurement.

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The distortion of sampling signal and the fluctuation of signal amplitude will inevitably reduce the accuracy of the phasor estimation algorithm. This article first establishes a suitable model for electrical AC signal according to the national power quality standards and then defines a series of measure parameters on this basis. Then, based on random process thought, random signal model will be established for electric AC. On this basis, this article then analyzes the error changes of FFT algorithm when in the process of phasor calculation and when there exists frequency offset, noise, and etc. Finally, it lists the change law of actual error when using FFT algorithm to calculate the AC signal phase under the influence of various factors.

2 Modeling of Electric AC Signal

Changing ranges of various influencing factors of measurement errors are shown in Table 1.

Table 1. Range of Variation of Testing Signal

Impacting error factor	$\triangle f$/Hz	THD/%	Φ/rad	Amplitude of white noise /%
Range	±5	0～5	±π	±2

In order to make signals to be representative, the prototype of testing signal is:

$$x(t) = \sqrt{2}\cos(2\pi(f+\Delta f)t+\Phi) + \sqrt{2}a_{THD}\sum_{i=2}^{7} M_i \cos(2\pi i(f+\Delta f)t+\varphi_i) + \sqrt{2}a_{THD}M_8\,\mathrm{randn}(t) \quad (1)$$

Among them, the fundamental amplitude A has been normalized, and randn (t) is on behalf of white noise. a_{THD} is the clutter (harmonic and white noise) amplitude controlling variables. M_i is the fixed percentage of the coefficient of harmonic to the fundamental amplitude. Φ, φ_i (i = 2, ..., 7) are the initial phase of each harmonic, and the random variables uniformly distributed in (-π, π] interval simulation. The values of M_i as the following table shows:

Table 2. Percentage of Amplitude of Harmonic Wave vs. Fundamental Wave

i	1	2	3	4
M_i	1	$\sqrt{8}/5$	3/5	$\sqrt{2}/5$
i	5	6	7	8
M_i	2/5	$\sqrt{05}/5$	$\sqrt{05}/5$	1/5

Therefore,

$$\begin{aligned} THD_x &= \sqrt{\frac{P_x - A_x^2}{A_x^2}} \times 100\% \\ &= \sqrt{\frac{\sum_{i=1}^{8} (a_{THD} \square M_i)^2 - M_1^2}{M_1^2}} \times 100\% \\ &= a_{THD} \times 100\% \end{aligned} \tag{2}$$

Therefore the impact Factor THD can be controlled by a_{THD}.

3 Principle, Error Simulation and Comparison of Error Analysis Based on Statistics

Take all the instantaneous phasor sequence $\{X(\Phi,k)\}$ of the tested signals under a certain frequency offset and THD as a random process. Among which, Φ is the random variable, and k is the time variable. Treat the instantaneous phase sequence $X_{\Phi_i}(k)\}$ of each signal fixed by the initial phase Φ as a function of discrete time samples. For eachΦ_i, use DFT to calculate all the instantaneous phasors of signals within a power frequency cycle from the time initial synchrophasor corresponds to. Utilize these data to obtain the general average characteristics and the average characteristics of time in the first and second scale set of $\{X(\Phi,k)\}$. Among them, to make statistics on random variable $X_k(\Phi_i)$ at different time and different sample function is to verify the erogodicity of random process. Analyze the trend that statistical features change along with frequency offset and THD, and determine the relations of the statistical features between frequency offset and THD. Then, we can make use of this relationship to estimate the corresponding statistical features of $\{X(\Phi,k)\}$ in the actual use of the ergodicity of $\{X(\Phi,k)\}$, and furthermore estimate the frequency. This is the idea of the frequency estimation algorithm based on statistics.

Define the relative error of amplitude and phase:

$$\delta_A = \frac{A_{量} - A_{真}}{A_{真}} = \frac{A_{量}}{A_{真}} - 1 \tag{4}$$

$$\delta_\Phi = \Phi_{量} - \Phi_{真} \tag{5}$$

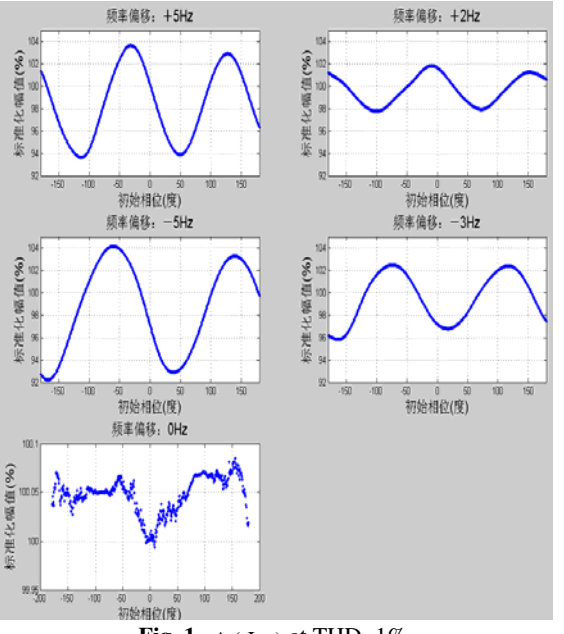

Fig. 1. $A(\Phi_0)$ at THD=1%

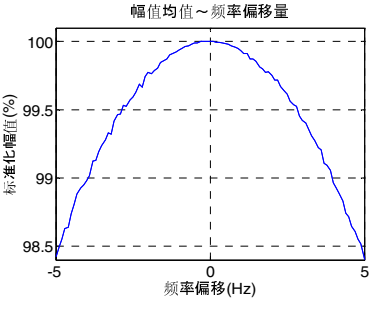

Fig. 2. Curve $E[A(\Delta f)]$

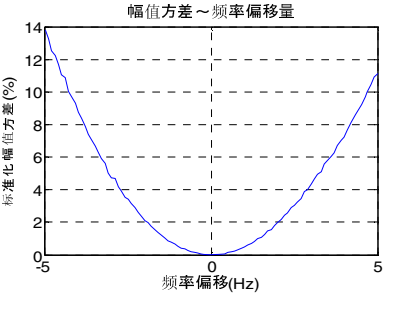

Fig. 3. Curve var $[A(\Delta f)]$

Simulation shows that under different THD, the change of phase measurement error is not great, that is, the filter effect of DFT on the signal (only for fundamental wave) is still relatively good. Consequently, fix THD now, but use phase difference interval to which the cycle corresponds when the initial phase is within the range of (-π,π], that is, change in equal interval of π/512, and then only do RDFT when the data is in the initial moment. This process is equivalent to the first step of error compensation algorithm based on interpolation—establish error compensation table. Finally when THD=1%, the situation that the amplitude of different frequency offset changes along with the initial phase is shown in figure 1.

Although the measured value of amplitude under different initial phases is highly volatile, the deviation between the vibration center of its amplitude and the standard deviation is not so great. Figure 2 shows the curve $E[A(\Delta f)]$ that the average value of amplitude of different initial phases changes along with frequency offset, and Figure 3 displays the curve $\mathrm{var}[A(\Delta f)]$ that variances of amplitude of different initial phases change along with frequency offset.

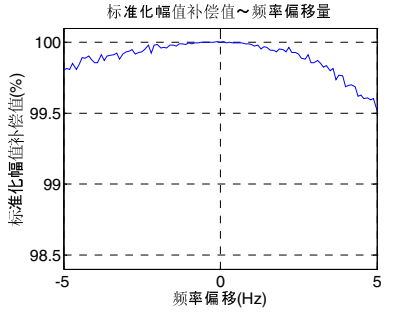

Fig. 4. Curve $A_{cmp}(\Delta f)$

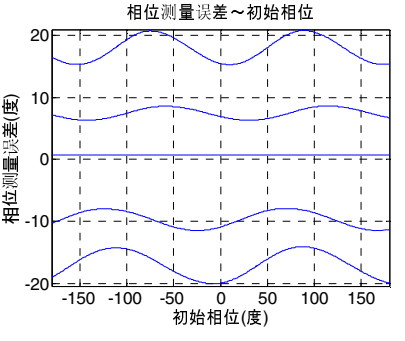

Fig. 5. Curve $\delta_{\Phi}(\Phi_0)$

By Figure 1, it is seen that although frequency offset is great, the variance of the average value of amplitude under different phases is not so great. Here, by watching Figure 2 and Figure 3, we can discover that. Order

$$A_{cmp} = E\left[A(\Delta f)\right] + \mathrm{var}\left[A(\Delta f)\right] / 10 \tag{6}$$

We can obtain curve $A_{cmp}(\Delta f)$ after being compensated, it is shown in Figure 4.

We can see that, after being compensated by formula (6), the error of amplitude that is obtained by compensation formula has been controlled within 0.5%.

Figure 5 illustrates the curve $\delta_{\Phi}(\Phi_0)$ that measuring error of phase changes along with different frequency offsets. These curves and curves in Figure 1 are almost identical.

Hence, no matter amplitude and phase error change along with time in the same sample or with initial phase in different samples, their change patterns are almost consistent. This explains that under the same THD, even the initial phase of harmonic wave changes, it has little impact on the test results.

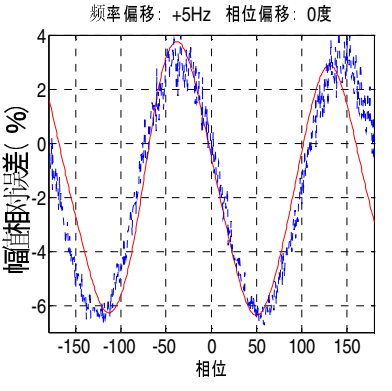

Fig. 6. The cureve of amplitude error when the frequency offset is +5Hz

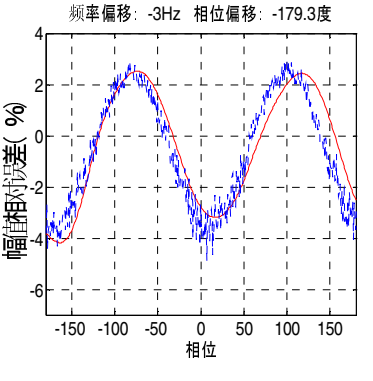

Fig. 7. The curve of amplitude error when frequency offset is-3Hz

Fix THD=5%, the change of Δf is the same with the former, use the interval of phase difference to which sampling cycle corresponds when the initial phase is within the range of $(-\pi,\pi]$, that is, change in the equal interval of $\pi/512$, and then use RDFT to solve the sequence of instantaneous phase which the sampling signals, defined by formula (2.3.32), correspond to. The curves of the same sample at different time and different samples at the same time are shown from Figure 6 to Figure 7. The corresponding curves of phase error are shown from Figure 8 to Figure 9. Among which, the thin lines explains the error curves of different samples when their initial phases change, while the thick lines illustrate the error curves which the same sample corresponds to over time.

It can be seen from Figure 8-9, even if the THD reaches maximum rate 5%, the error change curves of phase at different time are basically consistent with each other. Therefore, under certain circumstances we only need to analyze the error change situation of a certain THD and special signal under frequency deviation (that is harmonic amplitude and initial phase) in one or several cycles. Besides, it can be considered as the approximation of the change situation of this THD and special signal under frequency deviation. Only if this error is in the permitted range, this approximation is perfectly acceptable.

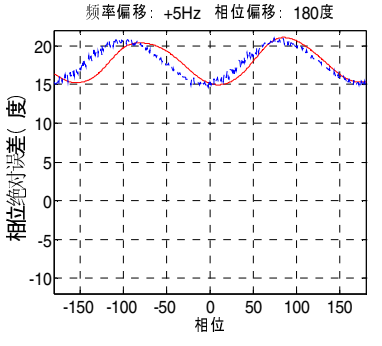

Fig. 8. Curve $\delta_{\varphi}(\Phi_0)$ when frequency offset is +5Hz

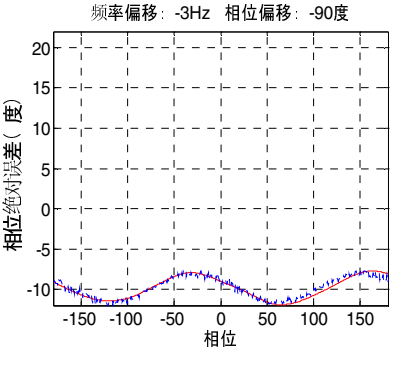

Fig. 9. Curve $\delta_{\varphi}(\Phi_0)$ when frequency offset is -3Hz By the formula

$$f = \frac{d\Phi}{2\pi dt} \tag{6}$$

The frequency estimation in actual measurement is proportional to the change rate of phase with time $d\Phi / dt$. As shown in Figure 8-9, when Δf is large, the oscillation of $\delta_{\Phi}(t)$ curve is also large, so when at different time, the value of $d\delta_{\Phi}(t)/dt$ is different. When the error reaches the centre point of the oscillation, the $d\delta_{\Phi}(t)/dt$ is the maximum, when the error reaches the amplitude point, the $d\delta_{\Phi}(t)/dt$ is the minimum. Because

$$\frac{d\delta_{\Phi}}{dt} = \frac{d(\Phi_{测} - \Phi_{真})}{dt} = \frac{d\Phi_{测}}{dt} - \frac{d\Phi_{真}}{dt} \tag{7}$$

Also because the algorithm in this article does not involve the adaptive adjustment sample rate, the phase between sampling points in actual situation is changing with the time interval. That is, $d\Phi_{真}$ is a constant, so there are:

$$\frac{d\delta_{\Phi}}{dt} = \frac{d\Phi_{测}}{dt} = \frac{d\Phi}{dt} \tag{8}$$

The above formula indicates that the change of $d\delta_{\Phi}(t)/dt$ has reflected the un-accuracy of frequency estimation when testing. If using formula (6) to estimate the frequency of oscillation, then the frequency estimation of $\delta_{\Phi}(t)$'s oscillation center and maximum point of amplitude is the most imprecise.

4 Conclusion

Based on random process thought, this article establishes random signal model for electric AC phasor. On this basis, it also analyzes the error changes when using FFT algorithm to calculate phasor and under the situation of frequency deviation, noise change. Besides it also points the error change law of FFT algorithm, which has provided a certain reference evidence for the improvement of electric AC vector real-time testing algorithm.

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A Repository-Based Enterprise Strategy Management Process Maturity Evaluation Model

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Abstract. Enterprise strategy management can be regarded essentially as a process of strategic planning, implementing, evaluating and controlling. Additionally, there are lots of detailed methods of operation in this process. How to evaluate the process of enterprise strategy management which applies various operating methods with one unified evaluating standard and measurement quantitatively and qualitatively is always the emphasis of the research of enterprise strategy management. Therefore, this paper uses the thought of Capability Maturity Model (CMM), which is applied in the process of software development for reference, and puts forward a Repository-Based Enterprise Strategy Management Process Maturity Evaluation Model. In this model, the enterprise strategy management process is evaluated comprehensively and classified as a whole, according to the knowledge maturity of the methods of strategic planning, implementation, evaluation and control used in the process (i.e. score based on the repository). This model contains a 4-level enterprise strategy management process maturity framework and a maturity evaluating repository. The Repository-Based Enterprise Strategy Management Process Maturity Evaluation Model measures the scientificity and quality of the process of enterprise strategy management. We hope, to the enterprise strategy management, the process maturity should be evaluated firstly, and then the scientific methods and operating techniques which can make enterprise strategy management process ascend in the maturity stairs can be introduced.

Keywords: Enterprise strategy management, repository, maturity, evaluation.

1 Introduction

Enterprise strategy management [1,2] is a subject about how to design, plan, implement, evaluate and control enterprise strategies, which in nature is to fully use enterprise resource such as human resource, financial resource and property, so as to optimize management and improve economic benefit. From 1990s, with the development of the theoretic research and practices of enterprise strategy management, how to evaluate the process of enterprise strategy management which applies various operating methods with one unified evaluating standard and measurement quantitatively and qualitatively is the emphasis of the research of enterprise strategy management [3,4].

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This paper uses the thought of Capability Maturity Model (CMM) [5] which is applied in the process of software development for reference, and puts forward a Repository-Based Enterprise Strategy Management Process Maturity Evaluation Model. In this model, the enterprise strategy management process is evaluated comprehensively and classified, according to the knowledge maturity of the planning and the skills of implementation and evaluation used in the process (i.e. score based on the repository). The second section of this paper starts from the definition of enterprise strategy management, then analyzes the process and stages of enterprise strategy management, and introduces the typical operation methods applied in the process and stages. The third section of this paper uses the CMM which is applied in the process of software development for reference, and puts forward the goal and thought of enterprise strategy management process maturity evaluation. On this basis, the fourth section established a 4-level Enterprise Strategy Management Process Maturity Framework. The fifth section gives a repository used in enterprise strategy management process maturity. The sixth section is the conclusion and points out the future work. Enterprise Strategy Management Process Maturity Model measures the scientificity and quality of the process. We hope, to enterprise strategy management, the process maturity should be evaluated firstly, and then the scientific methods and operation techniques which make the enterprise strategy management process ascend in maturity stairs, can be introduced into the process.

2 Analysis of Enterprise Strategy Management Process

Essentially, enterprise strategy management can be regarded as a whole process, in which the enterprise resource, such as human resource, financial resource and property can be fully used through the means of planning, implementing, evaluating, controlling and so on in macro-level, in order to realize the enterprise strategy total goal. This process includes 3 stages [1-4,6,7].

1) Strategic Planning Stage: This stage is a procedure, in which mainly through the analysis of enterprise outer environment and inner conditions, the enterprise strategy is comprehensively judged and formed with combination of the enterprise own development positioning. The typical operation methods and techniques of this stage include Porter's five forces model, SWOT, SPACE, Nine-cell matrix, and so on.

2) Strategic Implementing Stage: This stage mainly depends on the cooperation and hard work among the organizations of the enterprise's each level and all the staff members to implement the strategic goal in detail.

3) Strategic Evaluating and Controlling Stage: This stage mainly verifies and evaluates the degree of the implementation of enterprise strategic through all kinds of evaluation methods and index system, and adjusts and controls the design and implementation of next management strategies according to the evaluation of the result of implementation. The typical methods include the Balanced Score Card, Excellence Strategy Evaluation Standard, and so on [6].

The goal of enterprise strategy management is to realize the high-level aims and tasks of enterprise evolution in a period of strategic time [2]. The enterprise strategy management process can make the enterprise's resource get better use, then the efficiency can be higher and the result can be better. In order to make enterprise managers know, understand and use various operation techniques and methods better, it is very necessary to set up a method to evaluate the process of enterprise strategy

management which applies various implementing methods with unified evaluating standards and means quantitatively and qualitatively.

3 Goal and Thought of Enterprise Strategy Management Process Maturity Evaluation

The thought of Process Maturity was born in the Software Engineering Institute of the Department of Defense (DOD) of USA, in which the staffs invent a method of evaluating software development process, called Capability Maturity Model (CMM) [5] . The higher the grade of CMM is, the more mature the corresponding software development process is, and the better the developed software system is.

The emphasis of CMM is the development of software, which is not suitable for enterprise management process in general. This paper uses the same thought as reference, combining the tendency and features of enterprise strategy management development, and provides an enterprise strategy management oriented Process Maturity Evaluation Model. The Enterprise Strategy Management Process Maturity Evaluation Model can be used in measuring the scientificity of the enterprise strategy management process and the final management quality. Also, the Enterprise Strategy Management Process Maturity Evaluation Model shows the direction of enterprise strategy management development. We hope that, to the enterprise strategy management, its process maturity should be evaluated firstly, and then the scientific methods and operating techniques which can make enterprise strategy management process upgrade in the maturity stairs can be introduced. Thus, the enterprise strategy management can avoid most decision-making problems.

4 Framework of Enterprise Strategy Management Process Maturity Model

The framework of Enterprise Strategy Management Process Maturity Model which is shown in Fig. 1, is classified into 4 levels.

1) First Stair: Initial Level
The enterprise strategy management process has not been defined. In this level, the enterprise strategy management totally depends on enterprise manager own skills and experience. However, in an enterprise, especially a big enterprise, the strategy management and decision-making are so complex that none of these managers can be competent for the work only depending on one's personal skills and experience.

2) Second Stair: Basic Level
The enterprise strategy management process has been defined, but there are no repeatable operation methods and means adopted, and the standards of management process have not been defined. In this level, what kind of detailed operation methods should be adopted in each stage of enterprise strategy management process lies on the individual. This often results in unnecessary misunderstanding and risks. For instance, directors of the department of manufacture, marketing or financial management make and implement their own management methods separately. This may causes the resource confliction, goal collision or other problems among the departments.

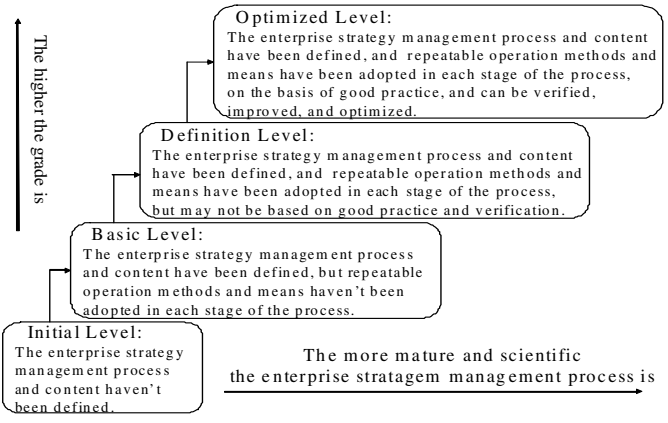

Fig. 1. The framework of enterprise strategy management process maturity evaluation model

3) Third Stair: Definition Level

The enterprise strategy management process has been defined, the repeatable operation methods and means are adopted, and the standards of management process have been defined, but which may not be based on good practices and can not be verified. Problems of this level include that the operation methods adopted and standards made in the enterprise strategy management process might not be the optimized and most suitable ones for the real situation in directing enterprise strategy management. For example, the Strategy Controlling Report (SCR) proposed by Andrew Flitman [6,7], is suitable for directing labor-intensive manufacturing industry. However, because it mainly reflects the past capability, can not deal with great changes and is not suitable for the over-diversified organizations as well as the enterprises which are lack of the support of techniques, the SCR is not suitable for directing the enterprise strategy management of technique-intensive manufacturing industry obviously.

4) Fourth Stair: Optimized Level

Enterprise strategy management process has been defined, repeatable scientific means and operation methods have been adopted. The standards of management process have been defined and are based on good practices, additionally can be verified, improved and optimized. This level can provide us practical methods and tools in enterprise strategy management process, and provide operable technique steps, standards, means and supporting platform for establishing the enterprise strategy management process which meets the requirements.

5 Repository of Enterprise Strategy Management Process Maturity Evaluation Model

Looking from the framework, the facts that affect enterprise strategy management process maturity are mainly the rationality of the process and the practicability of the

standards, methods, techniques and tools used in each stage of the process. Since the evaluation of the above facts can only be based on practice, a repository based on practice and used in enterprise strategy management process maturity evaluation can be set up.

The repository of enterprise strategy management process maturity evaluation includes: the score of enterprise strategy management process model and its practices; and the score of the practice of each kind of enterprise strategy management standards, methods, techniques and tools.

The maturity evaluation of enterprise strategy management is to give the relative score based on the repository and analyze comprehensively, and then provide the maturity grade of a given project process according to the maturity model framework.

We classify the rationality of enterprise strategy management process into the following 5-grade scores:

0 grade: the enterprise strategy management process is not defined;
1 grade: the enterprise strategy management process is irrational;
2 grade: the enterprise strategy management process is rational in logic, but hasn't been verified by practice;
3 grade: the enterprise strategy management process is rational according to the practical verification;
4 grade: the enterprise strategy management process is rational according to the practical verification, and has been optimized.

We classify the practicability of the standards, methods, techniques and tools used in enterprise strategy management process into 5-grade scores:

0 grade: no standard, method, technique or tool used in the enterprise strategy management process;
1 grade: can not be repeated;
2 grade: can be used basically, but imperfect;
3 grade: usable;
4 grade: optimized.

The corresponding relationship between enterprise strategy management process maturity levels and score grades has been shown as Table 1.

Table 1. The Corresponding Relationship between Process Maturity Levels and Score Grades

Maturity Levels	Score of Process	Score of Standards, Methods, Techniques and Tools used in the Process
Initial level	0 grade	
Basic level	1-2 grade	(or) existing at least one item of 0-1grade
Definition level	2-3 grade	(or) all the items are in 2-4 grade and existing at least one item of 2-3 grade
Optimized level	4 grade	(and) all the items are 4 grade

6 Conclusion

In nature, enterprise strategy management can be regarded as a process of strategic planning, implementing, evaluating and controlling. Also each of the stage in the process involves lots of detailed operation methods. This paper uses the thought of Capability Maturity Model (CMM)[5] in the process of software development as reference, providing a Repository-Based Enterprise Strategy Management Process Maturity Evaluation Model. This model includes an enterprise strategy management process maturity framework and a maturity evaluation repository, and comprehensively evaluates and grades the whole process according to the knowledge maturity of strategic planning, implementing, evaluating and controlling methods used in enterprise strategy management process (i.e. score based on the repository) in detail. Enterprise Strategy Management Process Maturity Evaluation Model firstly measures the scientificity and quality of the enterprise strategy management process. We hope, to the enterprise strategy management, its process maturity should be evaluated at first, and then the scientific means and operation methods which can make the enterprise strategy management process ascend in the maturity stairs should be introduced.

The future research work includes: the development of the Repository-Based Enterprise Strategy Management Process Maturity Evaluation System and its typical applications.

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Identify the Learning Style by Monitoring Learner's Behaviors

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Abstract. Most of current e-learning systems are not taking into account the learner's learning style. Although the Adaptive e-learning system pay attention to the learning style, the result is not better than expectation. The main reason is the Adaptive e-learning system force learners to fill in tedious questionnaires so that identify one's learning style. The method of identify the learners' learning style by monitoring the learners' browse behaviors has been discussed and the behaviors needed to monitor for each learning style have been found in this paper.

Keywords: E-learning system, Learning style, Browse Behavior.

1 Introduction

Nowadays, the e-learning system that is merely based on fixed material content and presentation is called the "one-for-all" teaching method because of not taking into account the learner's learning style. As a result, Adaptive e-learning system has gradually become the new hot problem.

In order to identify the learners' learning styles, current adaptive e-learning systems usually force learners to fill in tedious questionnaires. But the result is not better than expectation. The reasons are as following:

Firstly, because these questionnaires are usually time-consuming, the students tend to choose answers in a haphazard manner instead of thinking thoroughly about them and really choose the most descriptive answer. Accordingly, the results from the questionnaires are inaccurate measurements [1].

Secondly, learning style presses variant as well as developmental nature. Accordingly, in order to best adapt the e-learning system based on the learner's style, the learner has to be forced to fill in the same questionnaire more than once throughout the course. This method is not reasonable and would result in learner's discouragement and as well as wrong measurements [2].

The objective of this research is to develop an e-learning system that identifies the learners' learning styles by monitoring the learners' behaviors. Finding out the browse

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behaves which need to be monitored and the elements which need to be measured are out initial target.

2 Classification of the Learning Styles

In out research, reference to [3-4], we classify the learning style from four dimensions. They are as following:

A. Visual and Verbal

Considering the problem that which type of sensory information can be most effectively perceived, we classify the learners to the visual learners and verbal learners.

Visual learners remember best what they see; they remember things like photos, pictures, charts, timelines, videos, concept maps, diagrams, films and demonstrations.

Verbal learners most effectively perceive written and spoken words and formulas such as articles, textual content and audios.

B. Activist and Reflector

Considering the problem that the learner prefers to how to process information, we classify the learners to the actively learners and reflectively learners.

Activists prefer to perceive information using the concrete examples and dislike formal procedures and policies. They are very keen on try things out, get involved in new experiences and are very fond of the question "what would happen if I did this?"

Reflectors like to stand back, listen and observe carefully, capture data related to the topic from many sources and think thoroughly about the concepts from different perspectives. They learn best by watching and are very fond of the question:" why?"

C. Sequential and Global

Considering the problem that the learner how to progress in the course of understanding, we classify the learners to the sequential learners and global learners.

Sequential learners tend to follow logical stepwise paths in the course of finding solutions. They accumulate knowledge in linear steps. In other words, they are beginning from small details until drawing the overall picture out.

Global learners learn in large leaps or jumps, because of having a holistic perspective. Before starting the course, the learners are willing to know how the course material being presented, what are the major learning objectives, what are the main topics, etc. she first builds up the overall picture before jumping into details. Global learners tend to take large jumps between course's topics and absorb data randomly without seeing connections, neglecting details and suddenly they "get it".

D. Inductive and Deductive

Considering the problem that how to organize the information so that the learner feel more comfortable, we classify the learners to the **inductive** learners and **deductive** learners.

For the Inductive learners, facts and observations are provided and underlying principles are inferred". So learners proceed from particulars to generalities.

For the deductive learners, deducing consequences and results come from a set of principles and facts.

3 Learning Source Organization

In order to achieve the learning style using monitoring the learner's brose behaves, the learning content must be presented in different form and the necessary learning facilities must be provided. Only in this way, the learners are able to study using their own way.

The forms that presented the learning content have been shown as Fig.1. The necessary facilities have been shown as following Fig.2.

The learners are able to select the different facility and distinguished present ways according to their learning styles. For example, Activists may choose "Try it out" present form and using discussion forum or chartroom facility; Reflectors may choose the "Reflect" present form and using "Concept Map" or "Note-taking facility".

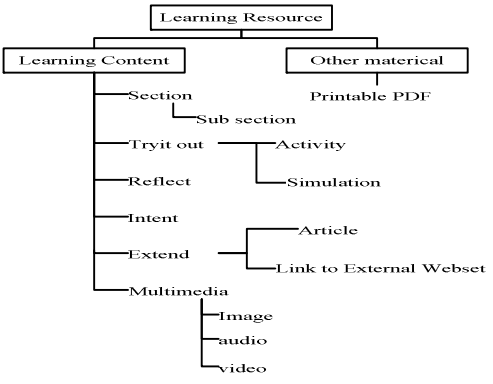

Fig. 1. Learning resource organization

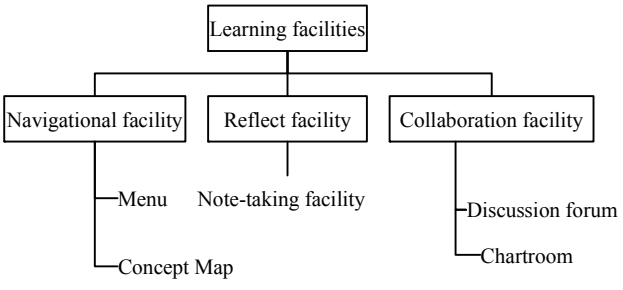

Fig. 2. Learning facility design

4 Monitoring and Deducing Strategy

According the classification of learning styles motioned above, the following monitoring and deducing strategy has been adopted in our research.

A. *Visual & Verbal*

In order to distinguish the visual and verbal learners, behaviours which need to be monitored and elements which need to be measured have been shown as Fig.3.

B. Activist & Reflector

For the partition of activist and reflector, behaviours which need to be monitored and elements which need to be measured have been shown as Fig.4.

C. Sequential & Global

In order to distinguish sequential and global learners, the monitored behaviours and measured elements have been shown as Fig.5.

D. Inductive & Deductive

For the partition of the inductive and deductive learners, behaviours which need to be monitored and elements which need to be measured have been shown as Fig.6.

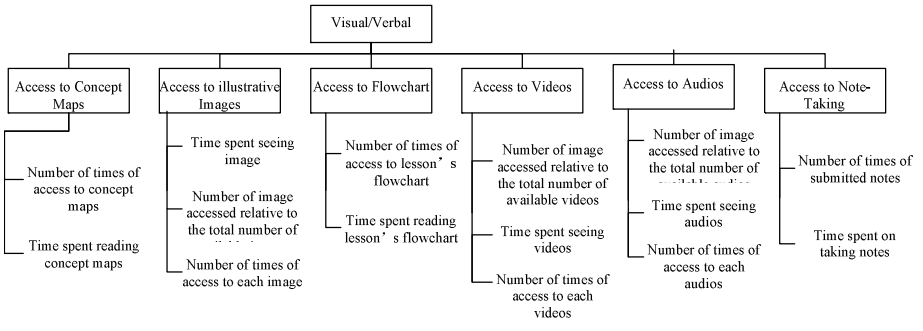

Fig. 3. Visual/Verbal monitoring and deducing

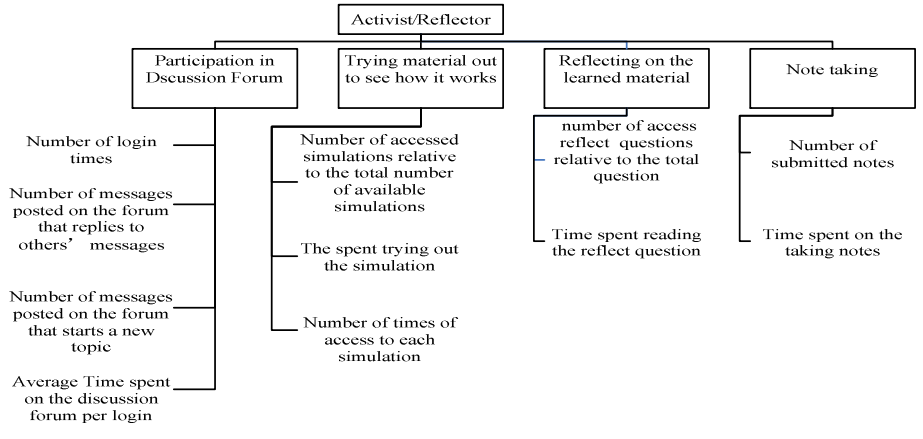

Fig. 4. Activist/Reflector monitoring and deducing

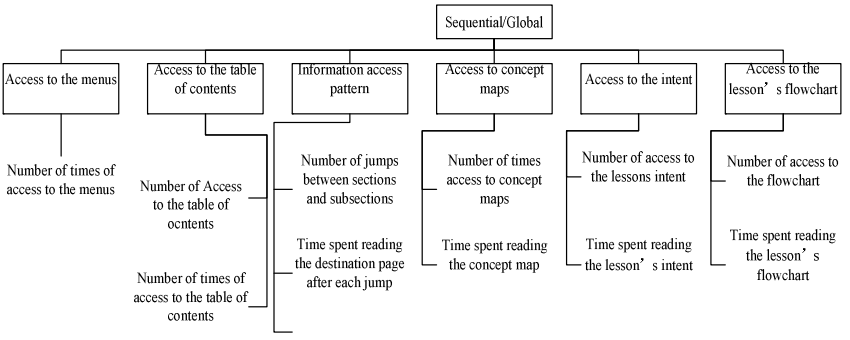

Fig. 5. Sequential/Global monitoring and deducing

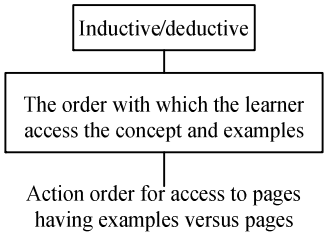

Fig. 6. Inductive/Deductive monitoring and deducing

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Strategies for Web-Based Teachers' Inter-institution Consultation and Collaboration in Basic Education*

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Abstract. This study aimed to explore the methods of improving teacher's competitiveness through web-based inter-school collaboration in basic education. We developed some special websites with special function to support collaboration, and designed related activities, tested and modified them. After a year and a half of exploration, we concluded the following typical models for Organizing related activities: the resource sharing, cases' peer assessment by asynchronous communication, classroom record commented by experts, topic-based asynchronous study and discussion, column discussion leading by experts and outstanding teachers, synchronous study and discussion based on instant communication tools, asynchronous communication based on educational narrative research etc.

Keywords: Web, Inter-Institution Consultation and Collaboration, Teacher Professional Development, Balanced Development of Education, CSCL.

1 The Third Way of Teacher Professional Development and Balanced Development of Education

Web-based teachers' inter-institution collaboration refers to the activities that: With the support of computer and Internet, through online synchronous or asynchronous ways, teachers in different schools communicate and discuss about education and teaching, learn and inspire from each other, expand their education and teaching perspectives, thinking ways and professional competence in order to achieve co-development.

Web-based teachers' inter-institution collaboration in basic education is a new research field of teacher professional development. Meanwhile, it developed a new way of teacher professional development in basic education.

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Traditionally, teacher professional development mainly relies on normal education, teacher in-service training and so on. But for the teachers' whole growth process, normal education is not nearly enough. Continuing education after post has won recognition from more and more people now, and school-based research is the main way of concern at present. School-based research broke the traditional mode that experts studying the theory as well as front-line teachers implementing, and made educational new theories and methods could be quickly tested, revised and promoted, so live educational experiences applying to a particular situation could also be produced faster. This form has already been applied well in the south-east China.

But our research found that, due to teachers working together in the same school for a long time, there will be a tendency towards homogeneity after a certain period of consultation. Teachers also feel that their ways of thinking, teaching experience and other aspects are more or less, so the significance of sustained interaction will decrease.

Therefore, by the help of Internet, we consider that we should give full play to the advantage of information environment to promote the teachers' consultation from the school-based communication to inter-school communication and collaboration. The support of web could make teachers in different schools and areas inspire and collaborate with each other in the aspects of knowledge, ideas, culture, etc. The way is further development of school-based training in basic education: from school-based research to web-based inter-institution collaboration training. Meanwhile, the requirements of the teacher level should be further considered as well after fully pay attention to the student level.

In addition, the development of education in various regions of China is great different. Solving the problem of balanced development of education has received adequate attention and become a new national education development program as well as the important issues which "two sessions" concern. Web-based teachers' inter-institution consultations and collaboration can transcend geographical restrictions with low investments, and promote experience-sharing and collaboration in different areas from school level to the individual teacher level, and then achieve co-development. So there is great realistic significance for balanced development of basic education.

The research of web-based teachers' inter-institution collaborative approach is also applied to the field which CSCL application research should be concerned. The study aboard about CSCL, which Koschmann and AmySollor represent for, has involved basic concepts, theoretical basis, effective evaluation, CSCL interactions and supportive technologies and tools, development methods of environment, etc[1][2][3].Besides that many specialized meetings accumulated lots of results. Domestic Professor Li Kedong, Professor Huang Ronghuai and Dr. Zhao Jianhua, who also systematically study for the basic principles of the CSCL, application mode, system model, evaluation methods and supportive platform[4][6]. On the other hand, Professor Xu Xiaodong has done some research on web-based students' inter-institution collaboration [6]. These studies in both aspects of CSCL theory

construction and application have made great contributions, but they have never systematically done some research on strategies for teachers' inter-institution collaboration in basic education. Accordingly the research of web-based teachers' inter-institution collaboration in basic education has significant value for enriching CSCL theory.

2 Initial Practice of Web-Based Teachers' Inter-institution Consultation and Collaboration

As I mentioned earlier about being a guide in a secondary school, the situation appeared which teachers want to communicate with others in different school. At that time, as a response to the problem, we established a network platform for schools which participate in the project and we set the basic goals and higher goals. Basic goals are that publishing project group's information and sending information as well as sharing resources of the project secondary school, these are given to that the school in project is relatively weak in the aspect of IT application. Higher goal is the formation of web-based teachers' daily consultation and collaboration. It is proposed based on the consideration that, as the project progressed, under the condition that the basic goal has been achieved, we expect to achieve the object that project school communicate and collaborate daily based on the web, further establishing web-based project school teachers development community in some degree.

The initial practice found that web-based teachers' consultation and collaboration has better effect on promoting the overall development of teachers, and this won the affirm of project school. Applying the system meet the basic goals designed. In the model of publishing news/notifications, showing style of project school, sending school-based activities information of project school and other aspects, we received a good effect so that the participated school learned together as a whole. Applying the system also meet a certain higher goal of supporting teachers in project school could consultation and receive co-development. Besides, we not only developed a specialized forum which could enable teachers to communicate at a convenient time, but also intended to organize several times synchronization-thematic educational consultations of teachers in the same subject but different schools, these all achieved the intended effect.

As a preliminary experiment, we found that web-based teachers' discussion is far form enough and the consultation between teachers is apparent. From the discussion text, the interaction and promotion, which collaborative learning theory expected in consultation, are not expressed clearly. And the links between the various statements is not very close.

In order to promote a more in-depth consultation and collaboration among teachers, we developed a system for commenting video classroom record and teacher professional development communities in other projects, so it deepened the depth of teachers' inter-institution collaboration from two aspects. On one hand, these systems promote many teachers to participate, especially in the north and south, east and west. From inter-institution to inter-region, this enlarges the scope of participating schools so that participating group identity becomes more diverse. On the other hand, the

form of consultation and collaboration also becomes more diverse. Through discussing topics, commenting video courses, communicating cases of instructional design, etc, the depth of teachers' consultation among different schools is deepened, and we obtained a preliminary effective.

Through these practices, we have explored a number of effective strategies for organizing elementary and secondary school teachers to consult and collaborate.

3 Typical Strategies for Web-Based Teachers' Inter-institution Consultation and Collaboration in Basic Education

Web-based teachers' inter-institution collaboration in basic education may adopt a variety of ways. For example, resources-shared teachers' free learning based on educational resources website, freestyle communication based on relevant educational forums, business communication based on network instant communication tools, etc. Through a summary of existing research, especially on our practice and experience, the following strategies are more typical, which are useful in application and should be promoted.

1. Strategy of shared resources

This is one of the most simple and more common online communication methods for teachers. Teachers from different schools put rewarding media courseware, teaching and research articles, ideas and experiences or other things on the Internet sharing areas, in order to learn from teachers in other schools. Most of teacher websites mainly use the way to communicate. Such as, China teacher training, Xicheng District teacher training, etc. But the strategy also has certain deficiencies, the mainly problem is that content and form are easily spread without topic so that consultation, especially collaboration, is inadequate on the dimension of depth. Frequently, we found some similar websites have rich resources but lower viewed and downloaded number. They should design and manage intensively in the aspects of resources' content and organization.

2. Strategy of cases' asynchronous consultation peer assessment

Through the web, the communication of inter-institution education and teaching cases can express education and teaching experiences in different schools and areas. The cases not only could be teachers' moral cases, but also instructional design cases, etc. The simplest way of communication is that sending cases to special areas in order that other teachers could watch and discuss. The benefits of asynchronous communication are that teachers may have more time to think, to improve statements' quality.

For better results and more in-depth consultations and discussions, it is necessary for someone to organize a course for a concert section. That is to say, the party involved should provide an instructional design program and comment on others' programs. Of course, in order to meet the requirement of respect and collaboration, it is also essential to initiative comments to follow the rules. Fig.1 is a screenshot when we using the strategy to organize teachers mutually commenting on an instructional design case. It can be seen that the form could create more in-depth collaboration.

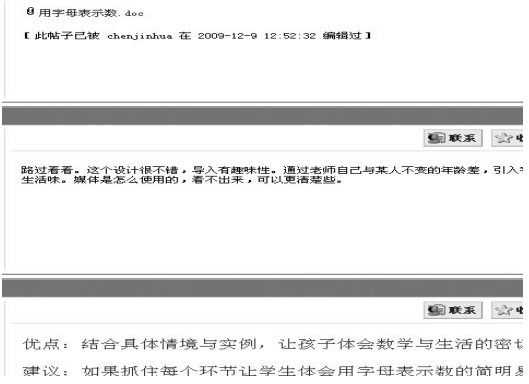

Fig. 1. Procedural fragment of commenting educational design cases

3. Strategy of experts' commenting on classroom record

The specific practice of the strategy is that publishing classroom record to a video comment platform which is developed specially, and then organizers invite subject experts to comment them. The method play a role on communication of classroom record teachers' learning and other teachers' watching. It has been found that the method is a high-efficient strategy for teachers absorbing excellent experiences and improving business level in a short time. Of course, the input of video recording, inviting experts and organizing activities is relatively high.

Fig. 2. Fragment of subject experts commenting classroom record

The video courses comment system which we developed allows inserting text or commenting record at any time, and the insertion point will set up an internal marker. In the process of teachers' watching videos, the comments which have been marked will automatically pop up to help teachers learn. In addition, teachers can also learn in the way that clicking comments in the list of experts' comments and then the corresponding content of comment will directly appear (See fig.2 for examples).

4. Strategy of topic-based asynchronous study and discussion

On account of identifying topics and implementing at different times, top-based study and discussion may have many ways to operate, and their classification and main form have been introduced in other articles[7]. Next, a convenient operation form which topic is raised on-line and discussion is asynchronous will be introduced. The form's operation method is that: firstly, organizers publish information to assemble suitable consultation topics through relevant website. Secondly, after choosing the topics assembled, free consultation based on different network tools can get under way. Our recent research mainly adopts the way that supporting teachers' on-line topic-based consultation on teachers training website established specially. After the website issued the bulletin on communication line, we received many topics from subject line or special mailbox. And then the relevant topics which have already been chosen would be sent to the discussion forum with common subject problem and the discussion forum by disciplines in order to raise teachers' inter-institution. Teachers can also discuss directly the problems which they interest in the area of assembling topics. Fig.3 is the process of teachers' discussion on a part of topics.

Fig. 3. Fragment of teachers' on-line discussion from different places in two topics

5. Strategy of leading by experts and outstanding teachers' columns

The concert measures for implementation of the strategy is that organizers invite subject experts or excellent teachers to open up special space for communicating with others in the network platform. The invented experts and excellent teachers can publish research achievement about subject education or relevant discussion in the platform. Other teachers can read content, ask questions and seek advices in order to get help directly. Under the condition, experts and excellent teachers in the columns play a role on leading. Fig.4 is the fragment that we use the strategy to organize teachers to learn and communicate. It can be seen that the posts of experts and excellent teachers have high viewed numbers, and some teachers get the answers to their questions. Meanwhile, when reading experts and excellent teachers' posts and the contents, other viewers will improve themselves.

Fig. 4. Expert columns and excellent teacher columns

6. Strategy of asynchronous communication based on educational narrative research
Guiding teachers writing down their daily thoughts and ideas is value for reflection and accumulating experiences. Accumulating teachers' self-expression is a way not only for researchers studying teacher but also for teachers using self-reflection and mutual communication to access to development. Presently, there are some good cases of using blog and other technology to promote communication, such as the "HaiYan Teacher Blog," and so on.

4 From General Consultation to Teacher Professional Community: Problems and Prospects

The value of web-based teachers' inter-institution consultation and collaboration in basic education may at least make teachers from different schools or different areas understand each other and get the effect of broadening horizons, widening thinking and sharing resources and reciprocity. However, through long-term communication, with the help of strategies mentioned above, if we could enable teachers who participate in the project collaborate daily on business and gradually form common object, resources, culture or even a common development community. These are more useful for teacher professional development and solving the problem that the imbalance of group of teachers under the background of educational imbalance.

However, we found that in practice, it is much harder to organize such consultation and collaboration at home. Mainly problems are as follows:

1) The problem of concept. Lots of teachers and school leaders did not realize the value of the activities, and they did not think others are worth studying. Furthermore, they think the activities will waste time and influence teaching.
2) Influence of heavy teaching task. Most elementary and secondary school teachers have heavy teaching tasks. After completing a large number of

teaching tasks, they often mark the homework at home. So they have no energy to participate in the activities.

3) The problem of job burnout. Heavy teaching tasks, the decreased awareness level for teachers in the society, lower income, and so on. These make teacher feel job burnout so that they lack momentum to study business and improve themselves. As a result, though some schools may be willing to participate in the activities, the teachers' initiative is not high.
4) Utilitarian thinking. Our survey discovered that some schools and teachers have utilitarian thinking. They will care about whether the relevant activities have enough bonuses or other compensation or not. Focusing more on the surfaces will neglect the underlying values of their own development.

Certainly, there are other reasons, such as inadequate investment and so on. But our research on organizing relevant activities is not enough and intensive. Lack of promotion of teachers' in-depth collaboration and even the effective way to form real development community is an important reason.

As a new way of teacher development, the value of web-based teachers' inter-institution consultation and collaboration in basic education will be recognized by more schools and teachers. We will continue to explore solutions to these problems mentioned above and promote further development of relevant activities.

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A Fast Web Service Selection Approach

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Abstract. Fast web service selection approach is crucial for seamless and dynamic integration of e-business applications. However, since existing service selection approaches take up a lot of time, this make service selection out of time control. In this paper, we propose a fast web service selection (FWSS) approach for service composition system in e-business. In FWSS, only those services that fit to the context of users are valid candidates for the composition, and then mixed integer programming is used to find the most suitable service from above services. Experimental results show that our approach can fast perform service selection for web service composition.

Keywords: Web service, Service selection, QoS; Hierarchical Fuzzy System, Mixed integer programming.

1 Introduction

Service-oriented computing (SOC) is designed to support the rapid creation of new, value-added applications and business processes [1]. SOC has emerged as an important technology that has received attention from both the research community and service industry. Concretely, eBay Developer Program and Amazon web services are illustrative examples of web service s being used in mission-critical and truly large-scale applications. Despite the widespread deployment of web services, significant research challenges still remain. This study is concerned with the service selection problem.

As it is well known that web services enable business applications running on distinct platforms and exchanging data over the Internet, to be applied in business. It has created unprecedented opportunities for organizations to shorten software development time by composing existing services across Internet. With the popularity of web service, the creation of valued-added services is gaining a significant momentum [2]. Web service selection technology creates new possibilities to assemble distributed web services for service composition. It is used to find the best set of services available to support users' end-to-end quality of service (QoS) requirements (e.g., availability, response time). Hence, the service selection approach performance plays an important role in the overall performance of composition system in e-business.

It is expected that the pay-per-use business model promoted by the Cloud Computing paradigm will enable service providers to offer their services to customers in different configurations with respect to QoS. From [3], there has been a more than

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130% growth in the number of published web services in the period from 2006 to 2007. Moreover, the dynamic changes of QoS can occur at run-time, which means that a quick response to adapt to requests is important in open and dynamic environment. Therefore, service requesters will be faced with a huge number of variation of the same services offered at different QoS, and the need for an effective and efficient service selection approach will increase. Therefore, reducing the search space by focusing only on "interesting" service offers is crucial for reducing the computation cost.

The problem of QoS-aware web service selection has received a lot of considerable attention during the last years in the service computing community. In [4], the authors proposed two heuristic algorithms based on linear programming to find near-optimal solutions, which are more efficiently than exact solutions suitable for making runtime decisions. The improvement of the two algorithms is significant compared with exact solutions, but both algorithms do not scale when web services increase, which remains out of real time requirements. The authors of [5] adopted the global optimization approach to find the best service components for the composition by linear programming. Soon afterwards the authors of [6] also used linear programming to optimize user's end-to-end QoS constraints, but differ in the solution of the optimization problem. Besides, the work of [7] extends the linear programming model to include local constraints. These linear programming approaches are effective when the size of the problem is not very large. However, their scalability is very poor due to the exponential time complexity of the applied search algorithms with the increasing size of the problem.

Although efforts and results above have been made and obtained in web service composition area, existing technologies on web service selection little considered the computation time or time complexity which are still not mature yet and require significant efforts. Already with few hundreds of candidate services the required time for finding the best combination will exceed the constraints for real-time execution which will not be adequate time to execute service re-plan leading to the failure of service composition. Therefore, considering few hundreds of candidate services and dynamic QoS in practical application, a high performance service selection approach is urgently desired for web service composition system.

In this paper we propose a fast web service selection (FWSS) approach to select web services for composition. In FWSS, we adopt hierarchical fuzzy system to prune those services that are not suitable to the context of users. Then mixed integer programming is used to find the most suitable services for users. We evaluate proposed FWSS experimentally on a publicly available collection of web services with real QoS. Experimental results show that FWSS is effectively and efficiently in service composition system for e-business application.

The remainder of this paper is organized as follows. FWSS is proposed in Section 2 including context inference with hierarchical fuzzy system, and selection algorithm with mixed integer programming. Comparison experiments on computation time and optimality are presented in Section 3. Finally, Section 4 is our conclusions.

2 FWSS

The proposed FWSS contains two phase. First phase is to prune the redundant web services by context inference with hierarchical fuzzy system. Second phase is to find the most suitable composition service for users with theirs QoS requirements by mixed integer programming.

A. Context Inference with Hierarchical Fuzzy System

In this section, we use hierarchical fuzzy system (HFS) to inference the context of users for reducing the redundancy of services. It mainly contains the following four steps:

1) Memberships: We set the context factors such as CPU, Power, Smooth and so on as input, with the context as output. In HFS, we adopt triangular membership function. To present context factors universally, we normalize them in the range of [0,1]. We classify all inputs into three fuzzy sets (i.e. "low (L)," "medium (M)," and "high (H)"), respectively. Each particular input belongs to 1-3 fuzzy sets with a corresponding degree of membership.

2)Fuzzification: By using the defined membership functions, we translate the input values into a set of linguistic values and assign a membership degree for each linguistic value such as the triangle function of the Fig. 1.

3)Inference: The inference engine makes decisions based on fuzzy rules. Each rule is an IF-THEN clause in nature, which determines the linguistic value of user context to the linguistic values of all context factors.

4)Defuzzification: We adopt the most common defuzzifcation method, called center of gravity, to get the crisp values of user context (uc). The center of gravity method is as follows:

$$uc = \frac{\sum_{i=1}^{n}(u_i \cdot y_i)}{\sum_{i=1}^{n} u_i} \tag{1}$$

Where u_i is the height of output area from the i-th rule, y_i is the gravity horizontal coordinate of output area from the i-th rule, and n is the total number of matching rules for given values of inputs.

Through above four steps, the user context can be obtained. Then we apply it to prune redundant services, reducing search space of service selection.

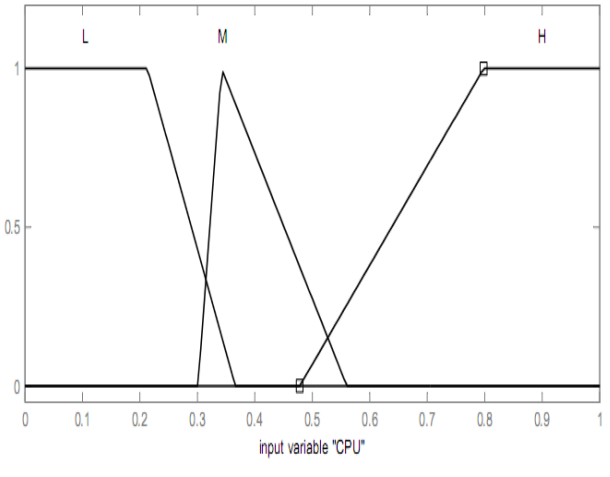

Fig. 1. The membership function of CPU

B. Service Selection with Mixed Integer Programming

In this study, we use mixed integer programming to find the best composition service with QoS constraints. The mixed integer programming has been recently used to solve the service composition problem by several researchers [7]. In our study, binary decision variables are used in the problem to represent the services. A service s_{ji} is selected in the optimal composition if its corresponding variable x_{ji} is set to 1 in the solution of the model and discarded otherwise. Then the problem of solving the model can be formulated as a maximization problem of the overall utility value given by

$$\sum_{k=1}^{r} \frac{Q_k^{\max} - \sum_{j=1}^{n}\sum_{i=1}^{l} x_{ji} \cdot q_k(s_{ji})}{Q_k^{\max} - Q_k^{\min}} . w_k \tag{2}$$

subject to the global QoS constraints and satisfying the allocation constraints on the decision as

$$\begin{cases} \sum_{j=1}^{n}\sum_{i=1}^{l} q_k(s_{ji}) \cdot x_{ji} \geq C_k, 1 \leq k \leq m \\ \sum_{j=1}^{l} x_{ji} = 1, 1 \leq j \leq n \end{cases} \tag{3}$$

Finally, by solving (2) and (3) using any mixed integer programming solver methods, a list of services are obtained and returned to service broker providing composition service for service customers. More information is in [7].

3 Performance Evaluation

We conduct an experimental evaluation of our approach, measuring computation time, in terms of the time cost to find a solution.

A. Experiment Setup

All the experiments are taken on the same software and hardware, which were Pentium 2.0GHz processor, 2.0GB of RAM, Windows XP SP3, development tool MATLAB R 7.6, Lp-Solve5.5. We have conducted our experiments using a real QoS data. The real data is the publicly available dataset QWS [8]. It includes measurements of 9 QoS attributes for 2500 real web services. Table 1 show the 4 QoS attributes of them . These services were collected from public sources on the Web. More details about this dataset can be found in [8].

In experiment, the number of service candidates per class from 100 to 1000. For the purpose of our evaluation, we considered a scenario, where a composite application comprises services from 10 different service classes. Thus, we randomly partitioned each of the aforementioned data into 10 service classes.

Table 1. QoS attributes in the QWS

QoS Attribute	QoS Description	Units
Response Time	Time taken to send a request and receive a response	millisecond
Availability	Number of successful invocations/total invocations	percent
Throughput	Total number of invocations for a given period of time	Invocations/second
Reliability	Ratio of the number of error messages to total messages	percent

B. Computation Time

Fig. 2 show experimental results on computation time with respect to the number of service candidates. The results are collected in average after each approach running 20 times.

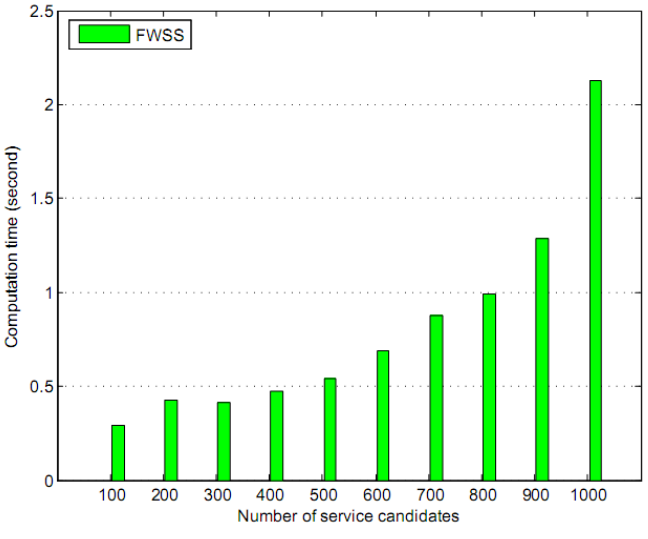

Fig. 2. Computation time comparison of FWSS and PMIP

From Fig. 2, the computation time of FWSS in average is only 0.812 second. The computation time is shorter than 2.5 seconds even if the number of service candidates is 1000. Clearly, the computation time of FWSS is obviously short for service selection in service composition system. Furthermore, with the increasing number of service candidates our approach has a significant advantage: the increase of computation time is very slow. Thus, FWSS is effective and is very suitable for web service selection supporting e-business with a great number of service candidates.

4 Conclusions

In this paper, we propose a fast web service selection approach. The approach utilizes hierarchical fuzzy system to infer the context of uses, aiming to prune the redundant

service candidates. Then, we adopt mixed integer programming to select web service with user's QoS requirements. The experimental results show that our proposed approach can perform service selection with low time cost. This significantly improve the service selection process for e-business application.

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Reform and Exploration on Experiment Teaching for Computer Specialty in Open University

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Abstract. In the Open University the experiment teaching for computer specialty is an important link for the practice teaching. Constructing the laboratory the massive funds need be invested. Because there was limited experimental condition in many branch schools, they can provide all kinds of expensive computer experiment installation independently with difficulty. Under this kind of condition, use of simulation software was practice teaching important means. Constructing the distance laboratories made up tradition laboratory for branch school. According to Shanghai Open University existing computer specialized experiment teaching situation, we has carried on the reform and the exploration on the experiment teaching. The union among the traditional experiment in laboratory, the hypothesized experiment, and the distance experiment help us not only completing the experiment teaching plan but also solving open question of experiment teaching resources. Certainly it provided the help for the open learning and independent E-learning for the entire society.

Keywords: Open University, experiment teaching, hypothesized experiment, long-distance experiment.

1 Introduction

For computer specialized student in Open University, society hope their ability in practice application better than in fundamental research level. At present, constructing the laboratory the massive funding need be invested. For Open University system, because there is limited experimental condition in many branch schools, they can provide all kinds of expensive computer test installation independently with difficulty. Under this kind of condition, use of simulation software is practice teaching important means. Constructing the distance laboratories makes up tradition laboratory for branch school. According to Shanghai Open University existing computer specialized experiment teaching's situation, we has carried on the reform and the exploration on the experiment teaching. The traditional experiment in laboratory, the hypothesized experiment, and the distance experiment can solve open question of experiment teaching resources, also provide the help for the open learning and independent E-learning for the entire society.

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On the one hand, because the open university system's characteristic, the branch school are distributed broadly, the corresponding computer hardware equipment is very difficult to follow the teaching need; on the other hand, because each branch school scale of study programs and the educational resources are limited. Stemming from the instruction cost and the use efficiency's consideration, putting in much funds in the computer teaching to purchase the comparison high-end the equipment is very difficultly, for instance routers and switch hubs test installations and so on. This has influenced seriously the important practice teaching link to a great extent.

2 The Reform and Exploration of Experiment Plan

In view of the above question, we carried on the reform and the exploration. This was a three-in-one combination. Namely the traditional experiment, the hypothesized experiment and the long-distance experiment was unified. First of all, we must understand the definitions about the traditional experiment, hypothesized experiment and long-distance experiment.

The traditional experiment: Experiment which carries on the traditional laboratory. The hypothesized experiment: Operating with the aid of the computer software simulator. The long-distance experiment: making the experiment with the aid of the computer through the Internet linking the equipment in the laboratory.

In strengthening in the traditional experiment's foundation, we unified hypothesized experiment with long-distance experiment.

The hypothesized software's application is an important mean to solve practice teaching. But they cannot substitute the real equipment. This kind of difference mainly manifests in two aspects. First, the most of hypothesized software artificially simulate the equipment environment through the software. There is no any bug in the disposition. There are problems in the real equipment during the operation. Student need learn to discover mistakes. Second, the hypothesized software can only simulate the corresponding equipment's function, but cannot achieve hardware's performance.

In view of the fact that the above situation, Shanghai Open University headquarter has purchased one batch of high-end test installation especially for the computer laboratory. To a great extent this solved the experiment teaching. But, many branch schools often only dispose the little real equipment for the student. This greatly has limited the branch school student's practice skill training. At the same time, in headquarter laboratory, because of the traditional experiment teaching method and the laboratory mode of administration, there are many limitation in space and time. The teaching resources cannot be used fully. Therefore, we have made the computer specialized experiment teaching development based on long-distance access's computer experiment with branch school. Its target was to raise the using ratio in headquarter laboratory. At the same time it also further opened the teaching resources.

3 Construction of Long-Distance Laboratory Platform

We used the network service technology and the related authentication technology to make long-distance access to equipment. This broke through the limit in space and

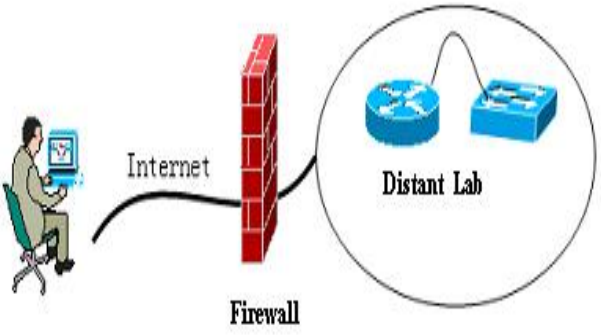

Fig. 1. The student was logging on long-distance laboratory

time for user and the laboratory manager [1]. The student was logging on long-distance laboratory in Fig.1.

In view of the Shanghai Open University computer network laboratories present situation, we have made a plan of software and hardware for the long-distance laboratory in the computer network curriculum teaching. This design can satisfy majority of CCNA and the CCNP network experiment.

A. Long-distance laboratory hardware environment

Network laboratories equipment: 5 routers (2600) (besides the console port and RJ45 connection port, there were not any other interface module) and 1 switch (3500) and so on.

In order to realize the build for the long-distance access network laboratories hardware, we purchased some equipment and the module, including:

- There was a Cisco 2500 router with asynchronous communication ports. It was made as a ACS (access control server). It controlled the visit and the configuration for router and switch.
- An eight fingernail fish line: An end of an eight fingernail fish line is an asynchronous connection. It can connect the access control server; other end is 8 RJ45 connections, separately with router switchboard's Console port connection;
- 4 back to back lines and 8 support serial WAN connection card with WIC-1T module. Through in 5 2600 router R1, R2, R3 built-in 2 WIC-1T module, R4 and R5 built-in together WIC-1T module, each router had the corresponding serial port, separately connects 5 routers again through 4 back to back lines.
- Finally by use of certain mesh wires, all of network equipment was connected through the switchboard.

The key was the access control server. The user can telnet to this access control server through computer terminal on the local area network or Internet, then again

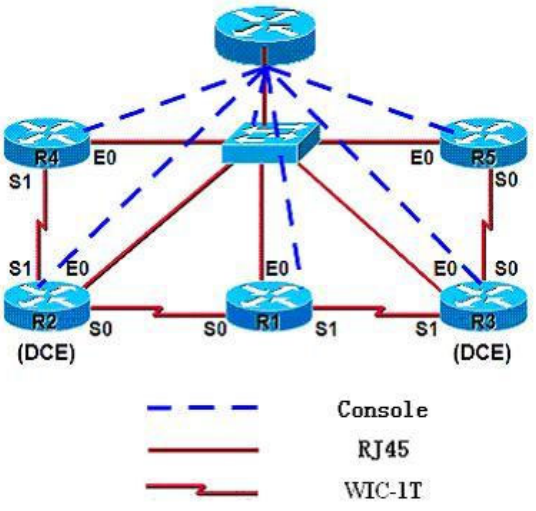

Fig. 2. Topology structure with device connection

through this access control server reversely telnet to the network equipment, carries on the related experiment.

B. Long-distance laboratory software environment

After having built the hardware equipment, we must consider that the long-distance access the control. There were mainly two long-distance access laboratory methods at present.

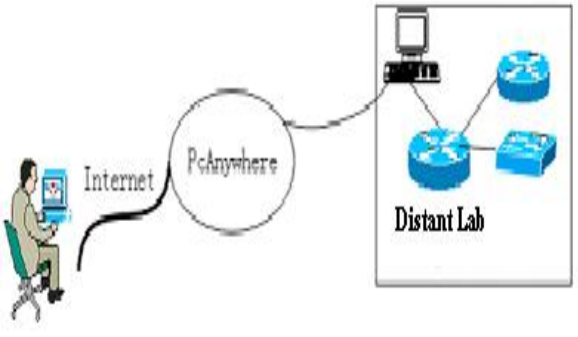

Fig. 3. Long-distance laboratory

The first method: we carried on the long-distance access by the simple remote control software, as shown in Figure 3. Through long-distance desktop in the Windows

network operating system we can login a computer and completely controlled the computer. At this time, the controlled computer in the laboratory was as same as the computer in front of the user. This kind of plan's merit was what had been implemented simply. But the deficiency was what user's login time. Moreover we controlled the network experiment's computer. It was easy to make problem of the network security [2].

The second method: According to different experiments, equipment quantity was different. Simultaneously the online configuration number of users was also different. It needs make a plan for the time and uses to access the lab. All of these need an advanced management, such as appointment system, authentication server, background DB server.

The appointment website platform's foreground was the long-distance experiment appointment system which had been developed with ASP.NET. The main database which was developed with SQL Server 2000 established a corresponding ODBC data pool. So the application system gained data. The client of authentication server RADIUS ran on the access control server. The client transmitted user's information pack to the assigned RADIUS server. According to server's response situation the related processes was made [3].

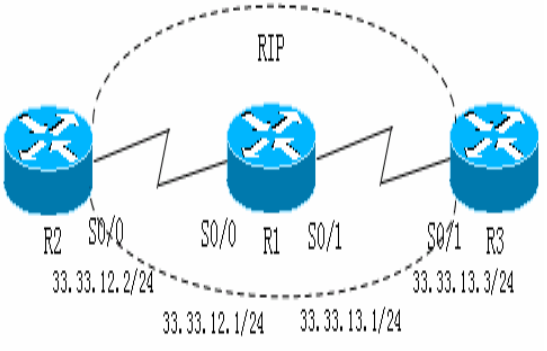

Fig. 4. Corresponding mutually in the multi-segment experiment topology

4 Case on Long-Distance Experiment

Below we explained the service condition by the case of the long-distance laboratory. This case was long-distance log on network laboratories. After using 3 router disposition essential port and the RIP protocol, we realized corresponding mutually in the multi-segments. Experiment topology was as shown in Fig.4.

Fig. 5 was the interface of long-distance login.

From the Fig.5 in this group of network equipment there were 5 routers and 1 switchboard. The switch between the different routers was made by pressing "Ctrl+Shift+6" then "x". In demonstration, we selected these three routers R1, R2, R3

to carry on the configuration, such as the port IP address. We can step by step according to the following Fig. 6.

After having configured computer RIP protocol for the 3 routers and succeeded in pinging, we finished a simple long-distance configuration experiment (shown in Fig. 7).

Fig. 5. The interface of finishing long-distance login

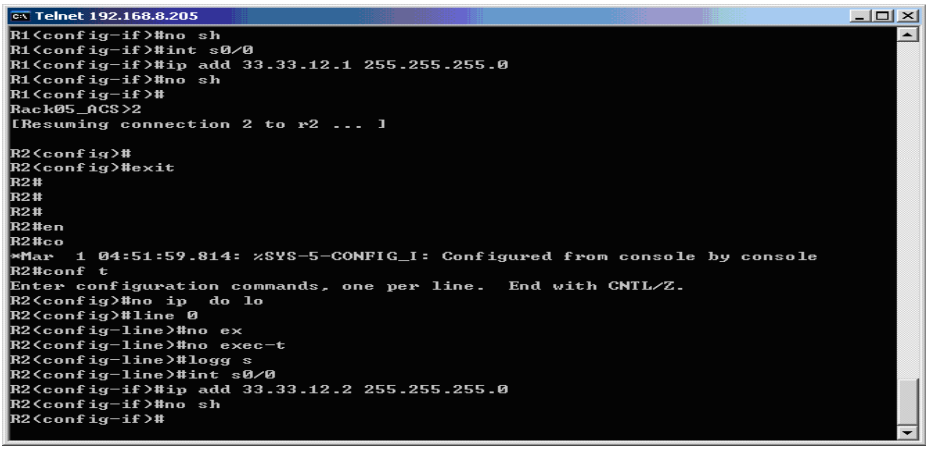

Fig. 6. Router configuration

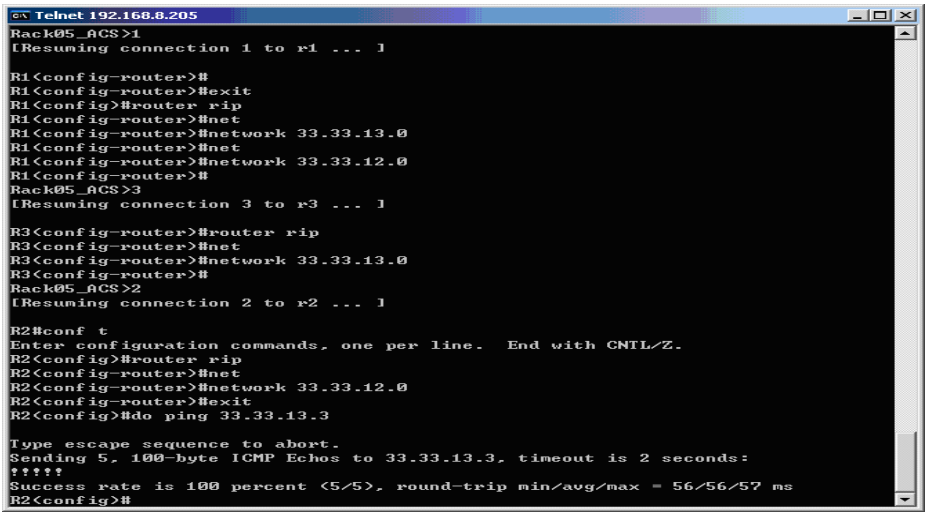

Fig. 7. The end of Router configuration

5 Conclusion

Along with information technology's popularization and the development, the society is rising unceasingly to the computer professional's demand. The request with the experiment teaching is also getting higher and higher to safeguard Open University's students level through the open and the electronic learning. We have carried on the reform and the exploration, this is a three-in-one combination, namely the traditional experiment, the hypothesized experiment and the long-distance experiment unifies. Constructs the long-distance laboratory is without doubt the atonement current branch school computer equipment limited, enhances one of field research quality effective measures, simultaneously also opened the teaching resources. Constructs the long-distance network laboratories the case, in reality had certain application, lets more students have the condition on the real network equipment's operation experiment, avoids the network laboratories resources effectively the waste. Next step we will improve the related link unceasingly. We will work hard to realize to open teaching resources completely and make long-distance learning valid with the electronic learning.

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Constructing Web-Based Learning Environment for College English Teaching

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Abstract. This study aims to investigate the application of Web-based learning mode to English teaching in China. Combining language learning and acquisition theories with computer technology, the paper explores theoretical foundation and guiding principles for constructing a Web-based learning environment for College English teaching. Probing the limitations existing in Web-based English learning environment in China, the author discusses the possible improvement in future.

Keywords: Computer technology, Web-based learning, learning environment.

1 Introduction

With the development of computer technology, the Internet has penetrated into every aspect of our life in all unprecedented speed and become a very important method to get information and communicate with other people. As the role of computer technology as both an instructional tool and a learning tool to stimulate and strengthen language learning is widely recognized in China, the Ministry of Education of China issued the *College English Curriculum Requirements* (2004), which dictates that the new teaching mode should be built on modern information technology, particularly network technology, so that English language teaching will be geared toward students' individualized autonomous learning. Since then, Web-based autonomous English learning mode has been on its way to gaining popularity on campus, many universities establish self-access centers to practice Web-based English learning.

Now, it almost has been six years since the issue of *College English Curriculum Requirements* (2004). In these six years, some Chinese scholars have reported positive effects on the integration of the use of computer technology into language learning curriculums (e.g. [1], [2], [3]). Some scholars have addressed the problems arising from the new learning mode and give some suggestions for the solutions (e.g. [4], [5], [6]). However, these researches only focus on empirical studies to examine the efficacy and problems brought by the Web-based English learning, and lack deep exploration for the theoretical foundation and guiding principles of an effective Web-based environment. This paper aims at exploring the theoretical foundation and guiding principles for building an effective Web-based English learning environment.

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2 The Emergence of Web-Based English Learning Environment

Learning environment refers to the situation and condition on which learning activity relies. The application of Internet and computer technology to education boosts the emergence of Web-based learning environment. Web-based learning environment is also called "online learning environment", "electronic learning environment", "network learning environment" or "virtual learning environment".

The use of computer technology in English learning makes the Web-based English learning mode popular. The College English Curriculum Requirements (2004) issued by Ministry of Education of China keeps up with the trend of Web-based education. It proposes suggestions on using the Web as a medium to improve English teaching and learning in higher education: "The extensive use of advanced information technology should be encouraged, computer-and Web-based English teaching should be promoted, and the learners should be provided with favorable environment and facilities for language learning."

As for this background, many colleges and universities in China try to create Web-based learning environment to improve the quality of English teaching and learning. Language labs are set for the learners to get access to the Internet for getting online English materials. Educational websites are built to provide the learners with the environment to learn English and discuss English-learning experiences. In fact, what boost the establishment of Web-based learning environment are the theoretical findings in language teaching and learning, as well as the rapid development of Internet and computer technology. To explore the supporting theories for Web-based language learning, we can build an effective learning environment and find proper solutions to the problems arising from it.

3 Theories for Building Web-Based Language Learning Environment

Using computer technology to improve English teaching and learning in higher education should be based on the theoretical foundation and practical guidelines of language teaching and learning.

A. Constructivism

Constructivism is one of the most influential learning theories and holds that learning is a process of meaning construction in which learners construct new meanings by using their inner cognitive principles. Constructivists view knowledge as cognitive structures and argue that individuals construct new information on the basis of his or her pre-existing experience in the process of interaction and in the environments surrounding him or her [7]. Constructivist learning environment is a place where learners may use a variety of information resources, pedagogical and assessment devices and interact with the tutor and peers through communication in their guided pursuit of learning objectives, according to constructivist principles.

By providing authentic learning materials, Web-based learning mode can fully meet the requirements of constructivist learning environment and provide the ideal conditions to support learning. The principles suggested by constructionist researchers

for constructivism learning environments design are still suitable for guiding the construction of Web-based language learning environment. Among the constructionist principles, the ones isolated by Jonassen [8] are most representative, which we still can use as practical guidelines for establishing Web-based language learning environment. The principles isolated by Jonassen are:

1) Relate real-world environments that employ the context in which learning is relevant.
2) Focus on realistic approaches to solving real-world problems.
3) The instructor is a coach and analyzer of the strategies used to solve these problems.
4) Stress conceptual interrelatedness, providing multiple representations or perspectives on the contents.
5) Instructional goals and objectives should be negotiated and not imposed.
6) Evaluation should serve as a self-analysis tool.
7) Provide tools and environments that help learners interpret the multiple perspectives of the world ·
8) Learning should be internally controlled and mediated by the learner.

B. Theories from second language acquisition

Another guideline for designing a Web-based English learning environment is from second language acquisition, which refers to the process of man's second language development. It is a complex and dynamic process which relates to both external factors such as social factor, linguistic factors and internal factors like affective conditions. In this field, one of the most influential theories is Krashen's second language theory [9], which contains five hypotheses. Of the five hypotheses, Input Hypothesis and Affective Filter Hypothesis contribute much to the establishment of learning environment. Explaining the Input Hypothesis, Krashen poses out a concept of "comprehensible input" which considers the difficulty level of language material. In his opinion, the learner needs language input a little above on his current level. The Affective Filter Hypothesis is all assumption on affective conditions of learners. The lower filter recalls a learner's strong learning motivation and interests in learning while the higher affective filter implies that a learner doesn't want to learn at all at the moment. Learners with lower affective filter tend to learn better than those with higher affective filter.

The importance of comprehensible input as a major factor in second language acquisition is further stressed by Long's interaction hypothesis [10], which claims what makes input to be comprehensible is modified interaction, or negotiation of meaning, and when meaning is negotiated, input comprehensibility is usually increased and learners tend to focus on salient linguistic features. Swain puts forward the Comprehensible Output Hypothesis and points out that the output "provides opportunities for contextualized, meaningful use, to test out hypotheses about the target language, and to move the learner from a purely semantic analysis of the language to a syntactic analysis of it" [11].

Following these second language acquisition theories, the design of Web-based language learning environment should focus on providing learners opportunities to hear or read comprehensible input, to negotiate meaning and produce comprehensible output, thus ensuring learners to receive input appropriate for their current stage of linguistic competence.

C. Socio-cognitive perspective and autonomous learning theory

Socio-cognitive perspective maintains language is a social and cognitive phenomenon understood through social interaction and assimilation of others' speech, rather than merely a private entity or series of operational sequences that occur solely in the head. Peer interaction, scaffolding, and modeling are important ways to facilitate individual cognitive growth and knowledge acquisition [12]. Holec defines learner autonomy as "the capability of taking charge of one's own learning" [13], which provides the theoretical framework for the research in the field.

From the socio-cognitive perspective, Web-based learning environment should provide authentic contexts for social interaction and facilitate access to existing discourse communities and the creation of new ones. Through the means of e-mail, chat rooms, BBS, ICQ, Newsgroup, etc., the Web-based learning mode should make learners access millions of files around the world, and make learners freely communicate with each other, encounter hundreds or thousands of people and all kinds of authentic social discourse situations and discourse communities, thus cultivating learners' communicative and collaborative competence. To promote learner autonomy, Web-based learning should present opportunities for learners to study on their own, direct their own learning and independent of a teacher.

4 Basic Requirements for Web-Based Learning Environment

According to the above theoretical discussion, we can conclude that an effective Web-based learning environment should basically fulfill the following functions:

1) Freedom to share learning materials.
The learning materials can be shared easily among the users.

2) Opportunities for communication synchronically or diachronically.
The tool for communication is regarded as a useful support to learners in difficulties. It should support the online as well as offline communications.

3) Chances to think reflectively.
A good learning environment should provide chances to promote and enhance thinking during learning.

4) Search engines.
According to the constructivist views, learners are required to explore on their own for knowledge and personal understanding through establishing connection between what he knows and what he is yet to know. Learners should be facilitated to develop their ability to search for information and decide how to use it.

5) Tool for self-assessment.
Learners need to know how much they have already achieved before deciding whether they should review what they have learned or go on learning anything new.

6) Stable system.
It should make sure that the website be in good condition as long as learners use it.

5 Enhancing Constuction of Web-Based English Learning Environment

Although many empirical studies prove that computer-based learning environment has great potential for college English teaching, there still exist some limitations in the application of the Web in educational field for those language teachers who want to create or promote a Web-based learning environment by themselves. From the aspect of technology, many language teachers lack programming knowledge, which hinders them from building educational websites by themselves. Those websites established by professional programmers may not fully satisfy the needs of the language teachers. From the aspect of the contents on the website, most learning materials and activities are selected and designed without following reasonable principles, and learners often get lost in the large amount of information on the Web. The learning tasks are designed without being distinguished in their difficulty levels and learners don't know how to select a task which is suitable to their knowledge level.

To promote Web-based learning environment, English teachers should strengthen their own computer knowledge on one hand. And on the other hand they ought to strictly follow the theoretical foundation and guiding principles for building an effective Web-based English learning environment, especially, through the design of English autonomous learning and the design of computer-mediated communication to improve the construction of Web-based learning environment in China.

A. The design of English autonomous learning

One of the attractive points of Web-based English learning environment in China is that it provides a new means for constructing the autonomous learning mode. Teachers should employ the appropriate software to create or promote Web-based English autonomous learning. For example, Moodle (short for Modular Object-Oriented Dynamic Learning Environment) is a software package for building Web-based educational course. It is very convenient for teachers to install Moodle by themselves for Moodle is installed on the Web server software such as Apache, the PHP scripting language and a working database sever such as MySQL.

The key point of the design lies in the improvement of the teaching resources (e.g. activities and materials) and increase of the learner autonomy. The topics in FORUM model should be open-ended and the teacher's comments to learners' work in due course contribute to maintaining a collaborative learning atmosphere. Moreover, learners' psychological condition in the Web-based learning environment should be considered. Several learning models can be employed in the environment as well: experiential learning model, collaborative learning model, project-based teaching model and problem-based teaching model. These considerations are very useful for designing the Web-base English learning environment.

B. The design of computer-mediated communication

The ultimate goal of language learning is to use it for communication. Computer-mediated communication (CMC) provides language learners a means to achieve such a goal. CMC is a real time communication where the communication is carried out within a user-created virtual world. Online chat is the main means of CMC, which makes use of online chat programs to facilitate communication between teachers and students, and among the students themselves. Poole et al. claim that "given the

right conditions, the synchronous environment of the chat room can be a successful medium for learning" [14]. Results from Mahfouz & Ihmeideh's research reveal that students' attitudes towards using video and text chat with English native speakers for improving their English language skills were higher concerning speaking skills, followed by listening skills, reading skills and finally writing skills [15]. The effectiveness of the chat room lies in the activities planed around it and how it is incorporated into the general design and delivery of online course. Organization is the key to a successful chat. Before designing online chat in the Web-based learning environment, the technical issues should be checked, which include Connection speed and Firewall, Audio/ Video setting and facilities, Client software installation, Virus warning.

6 Conclusion

Construction of Web-based English learning environment is a continuing challenge in China. We should realize that technology as such is not the answer to all our problems. What really matters is how we use it. Only we use the computer technology properly, can it offer us new opportunities for better language practice.

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