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Innovation strategy design of public sports service governance based on cloud computing

Yangyang Hao^{1,2}, Zhaoyi Qiu^{3*}, Qiner Xu¹, QiuHong He¹, Xuemo Fang⁴ and Chuyun Wang¹

Abstract

Public sports service is an important component of the modern government construction service system. They play an important role in strengthening the national physique, improving people's satisfaction with public services, and improving people's welfare. With the implementation of the national sports strategy, the quality of sports has continuously improved, and significant progress has been made in the construction of sports facilities, sports service mechanisms, sports service projects, and sports service personnel. Due to the inclination of national development centers and differences in regional economic levels, the effectiveness and implementation of public sports service governance may be affected. In order to solve the current problems of unbalanced development of public SS and insufficient social security, this article used cloud computing to conduct an innovative design for public SS governance and surveyed the satisfaction of residents in the community with public SS governance under the innovative design. Through comparative experiments, it studied the service quality and implementation effect of cloud computing on public SS governance. Through experimental analysis, it was found that the service quality and implementation effect of the public SS governance innovation strategy were higher than the original public SS service system. The service quality of the edge computing public SS innovation system was about 10.6% higher than the original public SS system, and the implementation effect was about 8.1% higher than the original public SS system. Experiments have verified the feasibility of sports service innovation strategies under cloud computing.

Keywords Public sports service, Governance innovation strategy, Cloud computing, Intelligent service

Introduction

Research background

Public sports services supervision is an important prerequisite for the sustainable development of public sports. After years of development, the quality of public sports services has not reached the real standard level. If the standardization construction is not continued in

practice, it would have an impact on the healthy development of the whole people. Because of the construction of sports, standardization is closely related to the quality of life of the masses. Therefore, it is necessary to reform the national sports service management system, strengthen the overall planning and construction standards, promote the fair development of national sports services, establish a sports sharing social network, and constantly improve the quality and development level of national sports services. Therefore, by analyzing the goal of public sports service standardization, this paper specified the basic principles and strategies of public sports service standardization, which provided a theoretical basis for public sports service construction.

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Literature review

Sports services has brought many benefits to the society. Leisink Peter LM discussed the public service motivation. The commitment of the public service motivation dimension to the public interest is related to voluntary service. Employees who are committed to public welfare look for volunteer service opportunities that match their motivation [1]. Byers Terri believed that sports governance helps to explain the response and value system of sports managers and hoped that this new perspective on sports governance can encourage readers to think about new ways of organization and governance, which is more inclusive of diversity in sports [2]. Davies Larissa E addressed the knowledge gap related to the social impact of local sports and leisure facilities, continuing to enhance cultural citizenship by providing a series of live sports programs. Because public service broadcasters need more political support [3]. Ives Ben A discussed the life experiences of two community sports coaches in the era of neo-liberal capitalism, consumerism, and insecure employment, and considered their attempts to develop their ideal professional identity in temporary and audit-driven industries [4]. Chai Weiqi tested the structural equation model of service quality, relationship, quality, satisfaction, and loyalty of sports public service center. He believed that if the use of public sports centers was to be promoted, marketing strategies should be implemented to improve the relationship between quality and satisfaction of citizens with the sports center [5]. Gerke Anna believed that the sports value framework explained the value creation of the localized sports industry and explained the value creation of the localized sports industry through the perspective of service leading logic. This would help sports management practitioners better understand the creation of the localized sports industry [6]. In order to understand the factors that affect the development of urban and rural public sports use compensation services, Liu Hong Cun analyzed the situation of public sports use compensation. The results showed that there was still obvious inequality in the public sports services field, which was mainly reflected in cultural, urban, and rural differences. They were affected by macroeconomic factors such as income gap [7]. These studies have all described the benefits of sports services, but not the governance and innovation of services.

Sports services (SS) governance innovation needs a lot of policy support. Chappelet Jean-Loup discussed the necessity of a new sports governance method that combined all aspects of corporate governance and democratic governance. He believed that only international supervision can ensure that sports obtain the required improved governance to maintain its integrity and value in the eyes of the public [8]. Lindsey Iain reviewed the applicability

of SWApS to sports for development and raised important issues that need further consideration, and indicated that sports for development must learn from the long-term established international development field more generally [9]. Using the methods of literature review and logical analysis, XIA Manhui explained the dimensions of public sports services policy embedded in sports governance, which were mainly embodied in action embeddedness, tool embeddedness, subjective embeddedness and organizational embeddedness [10]. WANG Zhankun used the method of literature review to reveal the governance experience of Japanese teenagers' public sports services and formulated and improved the governance policies and regulations of teenagers' public sports services, because the construction of a coordinated youth public sports service governance model between the government and the society can effectively improve the quality of service [11]. These studies all describe sports governance, but there are still some deficiencies in the technical innovation methods.

Research significance

To sum up, there are a lot of problems in the current public SS, and the public SS also affects people's health. In addition, the innovation of public SS also needs a lot of policy support and technical support. In order to solve the related problems in public SS, this paper studied the update weight and bias vector of public SS through cloud computing and then compared and analyzed the service quality and implementation effect of public SS under cloud computing through experiments. Through experimental analysis, it was found that cloud computing can effectively improve the quality of public SS services and improve people's health.

Organizational structure of the article

In the second part of this article, the status quo of the public SS system was studied. In this part, the importance of the development of public SS, the characteristics of public SS needs, and the status quo and causes of the public SS system were elaborated. In the third part, the objectives and principles of optimizing public SS governance innovation strategies were analyzed. In the fourth part, the innovation of public SS governance using cloud computing is analyzed, and the corresponding innovation strategies in the fifth part were proposed. At the end of the article, an experimental analysis of public SS system innovation was conducted.

Main contributions

- This article has studied the current situation of public SS, optimized its governance strategy and service

methods, and verified the implementation feasibility of this optimization strategy through experimental analysis.

- This paper investigated the satisfaction of residents with the optimization strategy and found that residents have a high degree of satisfaction with public SS optimization.
- This article compared and analyzed the infrastructure perfection and sports market supervision of the public SS system under cloud computing and found that both have significantly improved compared to the original.
- This article used cloud computing to study the update weight and bias vector of the public SS system after optimization and compared and analyzed the service quality and implementation effect. The results showed that these indicators have significantly improved after optimization. The above data analysis confirmed the feasibility of a public SS system.

Public SS system demand and status

(1) Importance of public sports services development

In the current sports development process, the importance of public sports services development is reflected in the following aspects, as shown in Fig. 1. The first is to promote social construction. Strengthening the public sports services system is a prerequisite for developing the advanced socialist culture and building a harmonious

society, and establishing the public sports services system is an important means to realize the basic rights and interests of the whole people. Because the public sports service system can improve the physical quality of the masses, the development of public sports services is of great significance to the overall development of the population, the improvement of the physical condition of the population, and the construction of a modern socialist country. The second is to promote the development of sports. Citizens’ demands on the public sports system are growing. In the past, the state’s attention to sports has quickly become the main source of sports medals [12]. To become a sports power, everyone must participate in sports events. Therefore, the development of social sports is one of the most important tasks in the development of sports industry, and even the most important indicator of social sports development [13]. The third is to strengthen urban governance. Enhancing the cultural power of a city is an important way for urban development, but urban governments often neglect the role of public sports service power in urban development. Continuously improving the public sports services system is an important means to strengthen the weak links of cities. In addition, public sports services can provide good education and communication opportunities for citizens. The fourth is to strengthen urban construction. Public sports service is not only an important part of urban public service, but also an important part of the national sports system. Therefore, it is of great significance for public sports services to establish harmony, sense of belonging, and

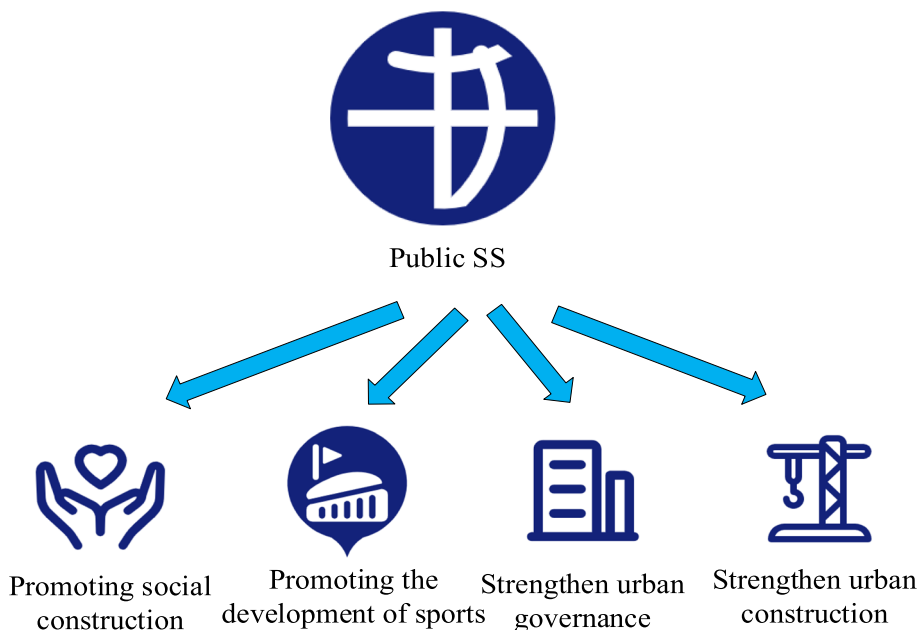


Fig. 1 Importance of public sports services development

happiness among communities. At the same time, public sports services can provide people with more perfect infrastructure and improve their physical conditions.

(2) Characteristics of public sports services requirements

There are four main characteristics of current sports service requirements. The first is the centralization of demand objects. With the transfer of surplus rural labor to cities, the elderly, children, and women remain in the countryside. At present, school sports and fitness equipment are the most important means to protect children's health. However, many children rely on the Internet because they have no extracurricular fitness and entertainment facilities. On the one hand, it affects their learning, but on the other hand, it also brings many hidden dangers to the society. The aging phenomenon occurs not only in cities, but also in remote areas. Aging has seriously affected the use frequency of sports infrastructure. Therefore, fitness facilities and projects for children and middle-aged and elderly people are one of the urgent problems to be solved by rural public sports services. The second is the need for health guidance. The elderly in small towns and rural areas lack systematic physical education, sports skills, and scientific fitness knowledge, which puts forward high requirements for fitness guidance. The third is to improve sports facilities. Public sports facilities are material conditions, necessary sports facilities are the basic guarantee to meet the fitness needs of rural residents, and they are also important material indicators to measure the government's ability to provide public sports services [14]. At present, the scope of sports facilities is relatively small. In addition, it is mainly aimed

at healthy and disabled young and middle-aged people. For people who mainly need the elderly and children, the target group of equipment is relatively low, and the equipment needs to be improved and repositioned. The fourth is the demand for traditional sports. Most people like traditional sports events. They don't need too much equipment. They just need to provide venues and activity funds to improve everyone's enthusiasm for participation.

(3) Current status of public sports services system

The current status of the public sports services system can be analyzed from the following aspects, as shown in Fig. 2. The first is the backward consciousness of the sports management department. Due to the lack of publicity of the concept of sports, it is difficult to achieve real demand and balance in mass sports activities. Serious defects in social management, insufficient guidance and supervision of service managers, and abnormal development and publicity of public sports have all had a negative impact on the sports services model. This is mainly reflected in the serious defects in the protection of civil rights and the slow process of institutionalization of community sports management and services. Second, the quality of sports equipment is not high. The public sports services system is a production and supply system of sports public goods, which fully reflects the actual accessibility and production conditions of public sports services. The most important material supply in sports services is to equip sports facilities. Equipping sports facilities is an important sports equipment for fitness. The economic situation of most communities has improved. To improve the level of urbanization, public sports facilities and public services need to be built in time, but there

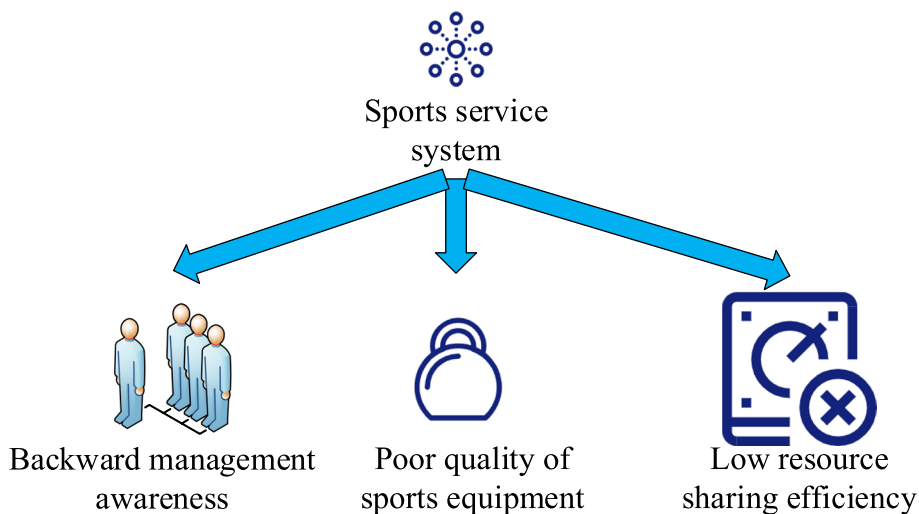


Fig. 2 Current status of public sports services system

are still some practical problems. Third, the efficiency of sports resource sharing is low. As an important part of social development and physical education curriculum reform, community sports should focus on better management of standards, funds, and facilities, otherwise the project would be shelved [15]. However, the current public sports services system only depends on the working methods of sports management institutions and does not take into account the changes in sports management and citizen relations. This leads to the low efficiency of the regulatory agencies in dealing with the allocation of sports social resources, and the process of sports services is still unclear.

(4) The cause of the current situation of the public sports services system

In the public sports services system, the main factors causing the imperfect service system are as follows, as shown in Fig. 3. The first is that sports institutions have insufficient awareness of their own responsibilities, focusing only on control and ignoring services. They only used cultural and sports organizations to develop community sports services. In addition, the society did not pay enough attention to sports training and publicity, nor did it reflect the core functions of sports. This led to a great demand for sports and obvious contradictions. Second, the governance mechanism is insufficient. The development of sports advertising and mass sports activities was affected by many defects in the network management and sharing of sports resources. In particular, the lack of community sports resources and the inability to provide public services in community sports services

have led to a significant decrease in community sports activities [16]. Therefore, the development of public sports services has not had a satisfactory impact on community sports. The third is the lack of social resources. Due to limited national resources and insufficient social resources, there was a lack of financial support for the construction of public sports services facilities. In addition, the optimization design of urban sports facilities can achieve the optimization goal, but relevant designers need to accumulate advanced experience, constantly improve the structure, and actively carry out urban transformation exchanges, because relevant designers lack an understanding of the needs of the masses. The fourth is the poor connection between systems. In terms of community sports construction, the government shifted from power to service, resulting in great differences in sports views. It even completely divorced from the concept of community sports development and did not meet the regulatory standards.

Objectives and principles of public SS governance

(1) Objectives of public sports services governance

Public sports service is the basic premise of human’s all-round development and the objective indicator of modern sports development. With the release of public sports development indicators, many provinces and cities have reached a consensus on the development of public sports standardization. This has promoted the healthy and orderly development of the sports market, especially in regulating the development of the sports

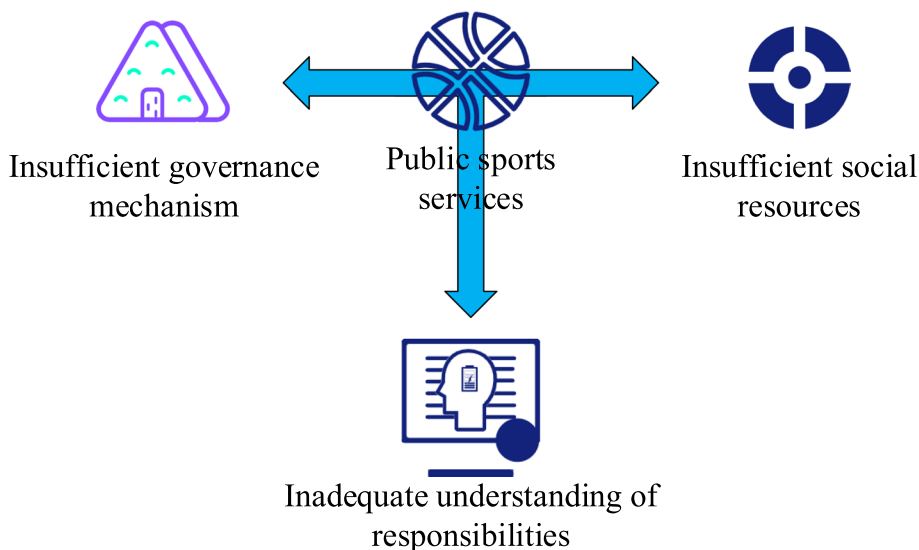


Fig. 3 Imperfect factors of public sports services system service system

market. The standardization of public sports is the macro goal of the construction of public sports services norms. The first is to strengthen the supervision of the sports consumption market to meet the diversified needs of the sports consumption market. Second, standardized indicators and conditions for access to social security must be formulated to ensure that social security is healthier and consumers' property is safer. The third is to standardize the service quality of sports facilities construction. The fourth is to strengthen the standardization of professional qualifications of sports workers, build a sound talent infrastructure, and lay a foundation for the development of sports services. It should strengthen the regulatory framework for public sports services governance, supervise the public sports services market, and build a more orderly sports services market. It should also improve the core quality and professional skills of public sports service staff and become an important direction of public sports service standard construction.

(2) Principles of public sports services governance

According to the goals of sports services, the principles of service governance are constructed, which mainly include two kinds. The first is macro and comprehensive. Public sports services needs normative construction, because people need large-scale sports events. With the development of the market, the demand for diversified sports is growing. However, there are still many shortcomings in public health. For example, if the health status of public sports services cannot be sustained for a long time, the service quality provided by public sports facilities cannot be improved, and the community public sports services cannot operate normally. Therefore, it is hoped that the social security system can be standardized and expanded at the macro level, which makes it truly beneficial to all social groups. The second is micro indicators and implementation indicators. In terms of efficiency, the public sports services system needs to be improved. Compared with the national standards, the requirements for service quality are not the lowest, but the upper limit of fitness standards based on mental health. Public satisfaction with service quality cannot be improved unless due consideration is given to public requirements for ICP standardization. Therefore, it is necessary to study the construction of public sports services, standardize the public sports services, and pay special attention to the implementation speed at the implementation level to meet the needs of people's daily physical exercise and fitness.

Application of cloud computing in public sports services governance innovation

In order to study the implementation effect of public sports services governance and innovation strategies, this paper analyzed the loss function and convolution operation results of the predictive governance effect in sports services through cloud computing algorithm, and finally got the service weight and paranoia amount. First, the loss function of the predicted cross entropy of the public sports services was studied as follows:

$$A'_i = -\left(x'_i \lg(y_i) + (1 - x'_i)(1 - \lg(y_i))\right) \tag{1}$$

x'_i is the innovation strategy of service, and y_i is the loss variable of cross entropy. Next, it would analyze the loss function of key strategies as follows:

$$A'_i = \left\| \hat{x}'_i - x'_i \right\|_2^2 \tag{2}$$

\hat{x}'_i is the regression variable of the strategy. This variable is used to measure the feasibility of a sports service innovation strategy. Then the normalization model GY is used to process the data in the innovation strategy, and the output normalization model can be obtained as follows:

$$B_{GY} = g\left(R - s\sqrt{t}\right) + c \tag{3}$$

In the formula, g is the normalization factor and R is the input data. S is the acceleration data of the convolution layer, t is the data data, and c is the constant. Next, it would analyze the operation functions under the convolutional network as follows:

$$B_m = OR + v \tag{4}$$

O is the operation weight of the convolution layer, and v is the offset. Then the implementation effect of sports service innovation strategy can be obtained through convolution pooling operation:

$$B = \frac{O \cdot g}{\sqrt{t}} \cdot R + \frac{(v - s) \cdot g}{\sqrt{t}} + c \tag{5}$$

Finally, according to the implementation effect, the update operation weight and bias vector under the final innovation strategy can be obtained as follows:

$$O' = \frac{O \cdot g}{\sqrt{t}} \tag{6}$$

$$v' = \frac{(v - s) \cdot g}{\sqrt{t}} + c \tag{7}$$

Innovation of public sports service governance under cloud computing

(1) Application of cloud computing in sports service

The application process of cloud computing in sports services can be divided into three basic processes, as shown in Fig. 4. The first is the joint planning process. The strategic planning process is the process of determining the strategic vision and goals of sports service information exchange. The exchange of sports service information resources is an important practical activity. Sports service information resources are part of the management of different regions, industries, and institutions. These sharing activities must be independently and comprehensively planned and managed between professional organizations and system organizations. The second is the process of platform construction. The exchange of sports service information resources needs a sharing platform. Sports information resource exchange based on cloud computing technology must select appropriate cloud service providers, manage the

implementation process of cloud services, and build a platform for the exchange of sports information resources according to the vision and goals of the strategic plan for service information resource exchange. The inefficiency of activities such as formulating cloud service provider selection criteria, selecting and managing cloud service providers, and defining service contract content would directly lead to the failure of sports service information resource construction. The third is the process of platform information sharing. The information sharing process is the process of effectively exchanging sports archives information resources through the sports service information resource exchange platform. The establishment of the sharing platform has reduced the one-time investment cost of the exchange of sports service information resources, but its effectiveness should be based on the responsibility and obligation of the users and providers of sports service information resources to correctly use sports service information, through the development of other parts of users and themes, and the definition of a group of activities to be implemented during use.

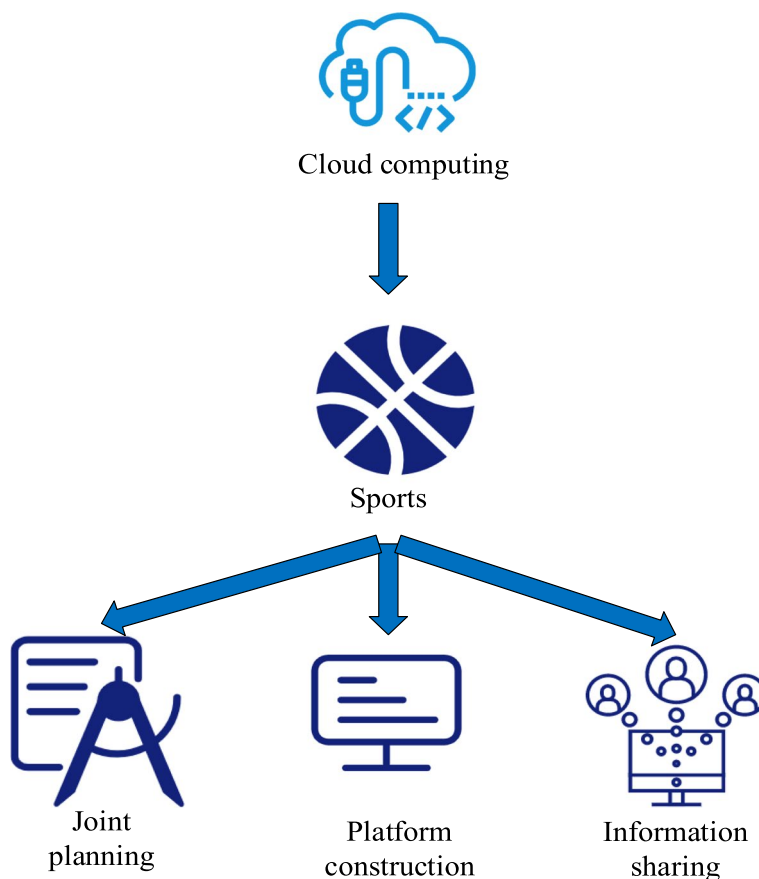


Fig. 4 Application process of cloud computing in sports services

(2) Innovation strategy of sports service governance under cloud computing

With the help of cloud computing, people can effectively promote the reform of public sports services, reorganize service processes, and ensure the participation of market organizations and citizens. This can increase the effective supply of sports equipment, thereby improving service levels and efficiency. Therefore, the platform can be designed from the following aspects to perfectly integrate cloud computing with public sports services, as shown in Fig. 5.

1) Government participation

Sports products of public sports services are public products that are invested by the public and pursue social interests. Therefore, the government directly decides to provide public sports services. However, this model has contributed to the phenomenon of government corruption and low efficiency of public sports services. The government can not only be the provider and manager of the public sports services system, but also compete with private and social actors by providing the same public sports services services, because indirect decision-making allows decision-makers to have more time to think in combination with the actual needs of the masses. The government must shift from direct decision-making to indirect decision-making, listen to public opinion and conduct public bidding, and vigorously develop public

sports services with social forces. These methods can not only diversify the public sports services and health decision-making methods, but also help the government develop the public sports services industry.

2) Establishing the assessment system

Performance evaluation is the analysis and evaluation of the performance, service quality, social responsibility, and public satisfaction of different departments, as well as the grading of the input and output of performance evaluation and management processes. However, in the current political environment, the public sports services are led by the government. To enable local governments to carry out sports construction in the region, it is urgent to incorporate public satisfaction into the performance indicator system and monitor and evaluate from the perspective of users to control the quality of government public sports services.

3) Optimizing service functions

According to the functional requirements of micro-public sports services, at least an appropriate public sports service space is required to ensure appropriate sports and fitness equipment, and a higher level of application and safety is required. This innovation requires expanding the basic functions of urban public sports services services. In the process of developing relevant functions, it can start from a comprehensive community

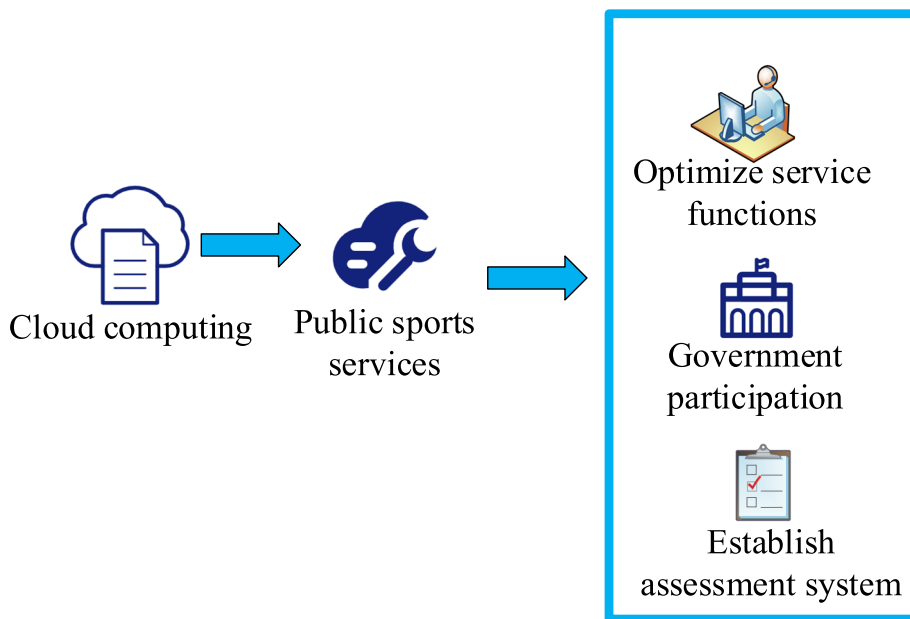


Fig. 5 Innovation strategy of public sports services governance under cloud computing

survey to understand the needs of the community for sports, and then constantly adjust the configuration of sports services and functional equipment to meet the basic fitness needs. At the same time, it is necessary to regularly visit and collect data on the use frequency of public sports equipment and relevant feedback to strengthen the standardization of public sports services.

Experimental analysis of public sports service innovation strategy under cloud computing

In order to study the specific implementation effect of the innovation strategy of public sports services, this paper analyzed the implementation effect and service quality of the innovation strategy of public sports services through cloud computing. According to the implementation effect and service quality, the service function of public sports service was optimized, and its assessment system was improved to promote the development and construction of the public sports services system. First of all, this paper investigated the residents’ satisfaction with the innovation of the public sports services system in three communities, including 100 people in each community. This paper specifically investigated their satisfaction with the improvement of infrastructure under the innovation of the public sports services system and the regulatory effect of the sports market, as shown in Table 1.

According to the data described in Table 1, residents in the three communities were relatively satisfied with the innovation of the public sports services system. Among the satisfied residents, Community 2 had the most satisfied residents, accounting for 34.4% of the total, and Community 3 had the least satisfied residents, accounting for 32.4% of the total. Among the general residents, Community 1 had the largest number of residents, accounting for 42.9% of the total general population and Community 2 had the smallest number, accounting for 23.8% of the total general population. Among the unsatisfied residents, the residents in Community 3 were the most, accounting for 43.5% of the total number of unsatisfied residents and the residents in Community 1 were the least, accounting for 26.1% of the total number of unsatisfied residents. On the whole, 85.3% of the residents in the three communities were satisfied; 7%

of people were generally satisfied; 7.7% of people were dissatisfied. Satisfied residents believe that the public sports services system under the innovative strategy can improve sports equipment and facilities, and can also pay attention to every resident who needs help, so that they can have their own sports equipment, thus improving their physical fitness. The dissatisfied residents believe that the public sports services system under the innovation strategy still cannot meet their needs, and the service quality was not as good as before. Then, it would analyze the infrastructure perfection and sports market supervision under the public sports services system and study the application effect of the public sports services system according to their changes, as shown in Fig. 6.

It can be seen from the data described in Fig. 6 that under the public sports services system, the degree of infrastructure perfection and the degree of sports market supervision were gradually increasing over time. The average of infrastructure perfection under the public sports services system was about 0.65, and the average of sports market supervision was about 0.48. On the whole, the initial value of infrastructure perfection under the public sports services system was 0.37, which increased to 0.89 on the seventh day, and 0.52 in the whole process. The initial value of sports market supervision degree was 0.21, which increased to 0.75 on the seventh day, and increased by 0.54 in the whole process. The improvement of infrastructure and the increase of sports market supervision indicated that the public sports services system can meet the basic needs of the masses. It would also rectify the imperfect system according to the feedback of the masses. It also increased the frequency of communication between the masses and the government, which made the communication between the masses and the government more convenient, thus promoting the implementation and development of public services. Then, this paper analyzed the change of update weight and offset vector under the public sports services innovation strategy under cloud computing and investigated the change of both within a week, as shown in Fig. 7.

According to the curve described in Fig. 7, the update weight and offset vector under the public sports services

Table 1 The residents of the three communities are satisfied with the innovation of the public sports services system

	Satisfied		Commonly		Dissatisfied	
	Number of people	Proportion	Number of people	Proportion	Number of people	Proportion
Community 1	85	33.2%	9	42.9%	6	26.1%
Community 2	88	34.4%	5	23.8%	7	30.4%
Community 3	83	32.4%	7	33.3%	10	43.5%
Total	256	85.3%	21	7%	23	7.7%

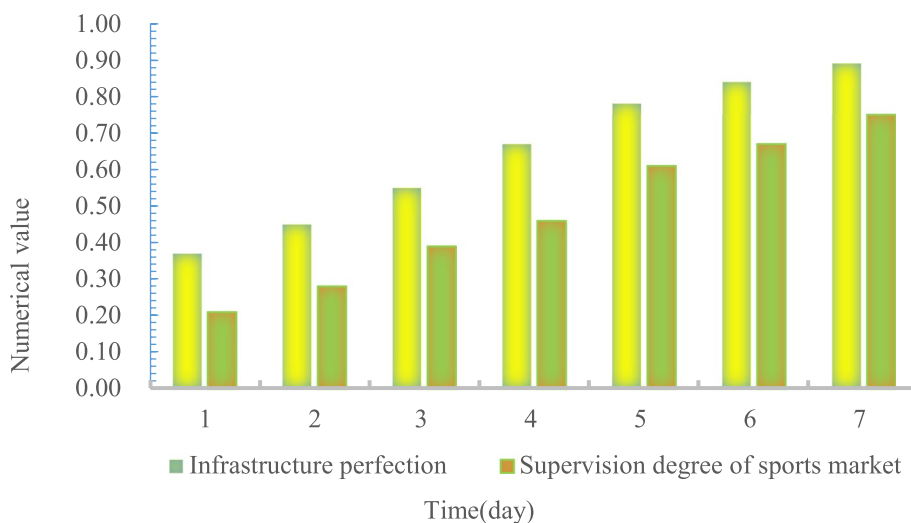


Fig. 6 Infrastructure perfection and sports market supervision under the public sports services system

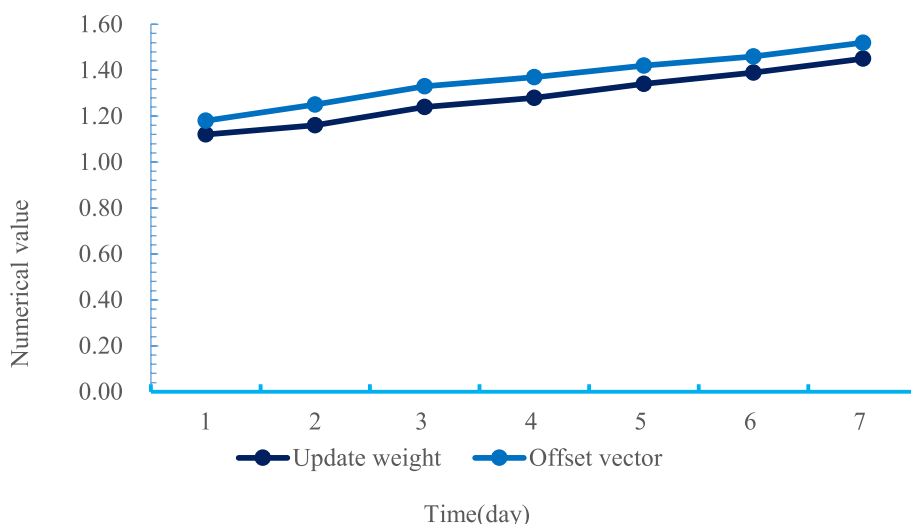


Fig. 7 Change of update weight and offset vector under the public sports services innovation strategy under cloud computing

innovation strategy were growing gradually over time. The average value of the update weight under the public sports services innovation strategy was about 1.28, and the average value of the offset vector was about 1.36. On the whole, the initial value of the update weight under the public sports services innovation strategy was 1.12, which increased to 1.45 on the seventh day, an increase of 0.33 in the whole process. The initial value of the offset vector was 1.18, which increased to 1.52 on the seventh day, and increased by 0.34 in the whole process. The improvement of update weight and offset vector showed that cloud computing can optimize the service quality of the public sports services innovation system, and it can

also score the sports services through the performance accounting mechanism, which to a certain extent has urged the development of public sports services. Finally, this paper would analyze the service quality and implementation effect of the cloud computing public sports service innovation system and compare it with the original public sports service system, as shown in Fig. 8.

According to the comparison chart in Fig. 8, the service quality and implementation effect of the cloud computing public sports service innovation system were better than the original public sports service system. The service quality of the cloud computing public sports service innovation system was about 10.6% higher than

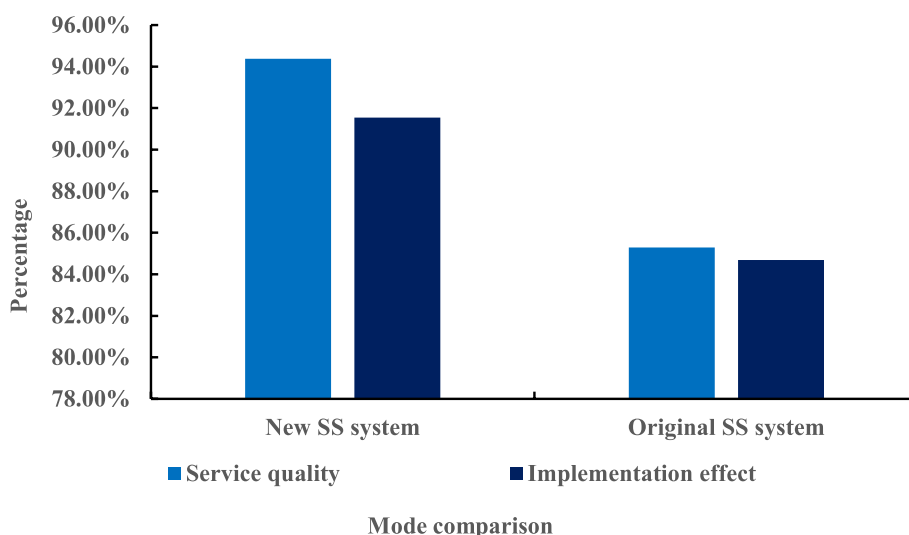


Fig. 8 Service quality and implementation effect of cloud computing public sports service innovation system

the original public sports service system, and the implementation effect was about 8.1% higher than the original public sports service system. Cloud computing can optimize the design of public SS by monitoring the infrastructure usage and maintenance of public SS, and help the community to timely count the specific preferences of sports groups to improve their participation. The public sports service innovation system under cloud computing mostly investigates the frequency and use effect of sports equipment and infrastructure through field visits, to better provide targeted services, understand the public sentiment, and make public sports services more in line with the needs of the masses. The innovation strategy of public sports services not only realized the innovation of rules and regulations, but also promoted the development of personalized sports services and improved the participation of the masses to a certain extent. It made communication between the masses and the government more convenient, thus promoting the implementation and development of public public services.

Finally, a total of three regions were investigated to compare the functional integrity and performance evaluation of the public SS service system before and after innovation, and the specific results are shown in Fig. 9.

Figure 9a shows the public SS system before optimization, and Fig. 9b shows the public SS system after optimization. It can be seen from Fig. 9a that before the public SS optimization, the functional integrity of Region 1 was 76.8%, and the performance evaluation was 72.6%; the functional integrity of Region 2 was 75.1%, and the performance evaluation was 74.9%; the functional integrity of Region 3 was 75.7%, and the performance evaluation was 72.9%. It can be seen from Fig. 9b that

after the optimization of public SS, the functional perfection of Region 1 was 82.3%, and the performance evaluation was 80.5%; the functional integrity of Region 2 was 80.9%, and the performance evaluation was 82.6%; the functional integrity of Region 3 was 83.1%, and the performance evaluation was 81.7%. It can be seen from the comparison that the function perfection of the public SS after optimization was 6.2% higher than that before optimization, and the performance evaluation was 8.1% higher than that before optimization. The sports service innovation related to cloud computing has eliminated the barriers of market organizations and citizens' participation in public sports services, ensured the effectiveness and efficiency of services, and effectively solved the problems of insufficient supply and low service level. At the same time, the construction of a cloud computing platform can cover all communities, grass-roots, rural, and border areas, effectively reducing the difficulties and obstacles for citizens to access public sports services. Thus, it promoted the fairness of public sports service acquisition and provided a practical means for sports service innovation.

Conclusions

In the phased construction of public sports services, it is necessary to gradually improve the service quality of national sports institutions, improve the working conditions of sports services, and optimize public sports services. Efforts should be made to establish a communication channel between the socio-economic development system and the non-profit sports public service system, gradually improving the public sports service system, maximizing the needs of the people,

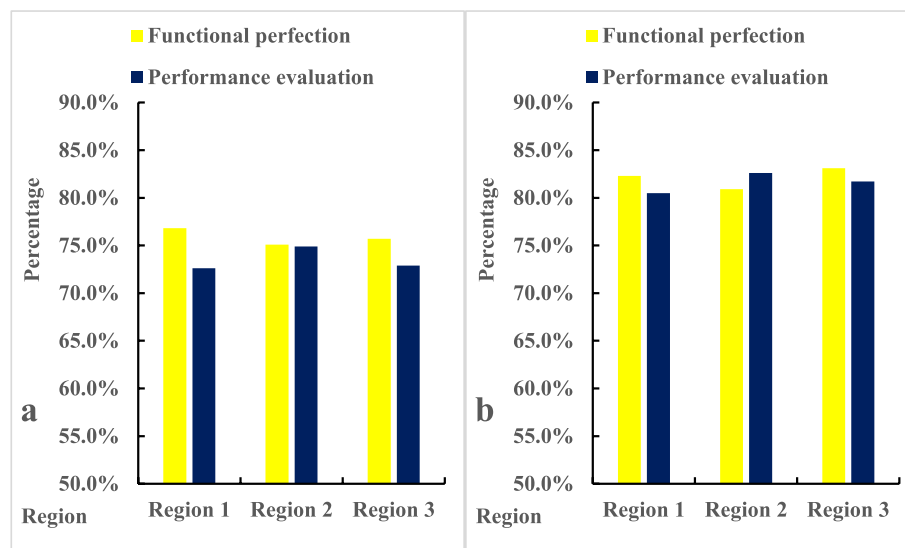


Fig. 9 Functional perfection and performance evaluation of public SS service system before and after innovation. **a** Before optimization of public SS service system. **b** after optimization of public SS service system

and promoting the healthy development of the people and society. This article confirms the effectiveness of cloud computing application in public SS innovation through experimental comparative analysis. In the experimental analysis, it was found that cloud computing can improve the service quality and implementation effect of public SS system innovation and make good progress in functional integrity and performance evaluation. However, due to limited survey samples during the experimental process, the data reflects trends consistent with other studies, but there are still some shortcomings in data analysis. In addition, the experimental results are also worth promoting in the subsequent process of public SS innovation, which can promote the innovation and optimization of public SS by increasing government participation and financial support, thereby improving service quality. In future development, public SS system optimization strategies can also promote the improvement of service quality.

Authors' contributions

Yangyang Hao designed the experiments, collected data for the number of trajectory points, trained, performed the characterization modeling, and wrote the first draft of the paper. Zhaoyi Qiu critically reviewed the method used and contributed to structuring the paper. Qiner Xu implemented the proposed prototype, ran the experiments for the performance study. Qihong He and Xuemo Fang collected data for experimental comparison usage and drew the curve. Chuyun Wang critically reviewed the paper and contributed to the improvement of paper writing. The authors read and approved the final manuscript.

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Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Competing interests

The authors declare no competing interests.

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