

Exploring the Imperative of Informatization in Sports Stadiums in China

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Abstract: As the importance of the sports industry in national health and economic development is increasing, the management problems of stadiums have gradually highlighted. This paper examines the current deficiencies in the use of stadiums in China and its causes, and proposes an informatization solution based on SaaS (Software as a Service) system. It is revealed that the current public facilities, such as sports stadiums, have inefficient management, difficulty in satisfying users' needs, and insufficient application of technology, which are not compatible with the development trend of informatization society. Through the introduction of SaaS system, the integrated management of stadiums and the optimization of resource allocation can be achieved, which contributes to the enhancement of user experience and there by promotes the information transformation of the sports industry. In addition, this paper argues the feasibility and necessity of SaaS system in the informatization management of sports venues from four aspects, political, economic, social, and technological, through PEST analysis, and offers actual cases to prove its effectiveness. Informatization is an inevitable choice for the sports industry to comply with the development of the times, which can effectively improve the operational efficiency and user participation of stadiums and promote the high-quality development of the sports industry.

Keywords: sport, large-scale sports stadium, software-as-a-service, high-quality development, information society

1. Introduction

To maintain and promote the health of the nation, the physical exercise is one of the most direct way. Routine physical activity can enhance body functions and strengthen the immune system for disease prevention, while promoting mental health through stress release and emotional control. As an essential way to improve citizen's health and the national economy, the development of the sports industry also plays a role in promoting economic development and enhancing social cohesion, which is of vital strategic significance to the development of the country. The importance of the sports industry is also gradually increasing with economic growth and social development. As attention to the sports industry continues to rise, the diversity of residents' demand for sports activities and the popularization of information based lifestyles, public facilities such as stadiums are gradually exposed in the actual use of their inability to meet the growing demand for public sports activities, as well as the problem of outdated technology. Therefore, this paper analyzes the current defects and problems faced by Chinese stadiums and the reasons for them and explores the

solutions that can be implemented. Meanwhile, by exploring the possibility of collaboration between the information society and the sports industry and the necessity for sports venues to solve the dilemma of realizing informatization, this paper seeks to find solutions to the problem of informatization of public facilities, so as to enable the construction of public facilities to meet the needs of the society and the residents.

2. Status and causes of stadiums

Since the 2020 survey data show that there are currently 3,713,400 usable venues in operation in China's stadiums, and the area of sports venues reaches 3,099 million square meters. However, the utilization efficiency of stadiums is undesirable, especially since the idle rate and loss rate are relatively high [1-2]. Relevant scholars have shown that using DEA research method to study the efficiency of free or low-fee opening of stadiums, the results show that the comprehensive efficiency of free or low-fee opening of stadiums in China is relatively low, at 29.6%, in addition to the pure technical efficiency (42.3%) and the efficiency of the scale (29.6%), which also have a large room for improvement [3].

2.1. Stadium management issues

Problems in stadium management include inefficient offline reservation services, a single channel for knowledge on the Internet, and a lack of system management and maintenance. The problem of offline inefficient reservation stems from the system limitations, offline stadium reservation and understanding of the service process is more cumbersome, requiring users to spend a lot of time to understand the basic situation of the stadium and the operation process. And it is easily booking failure and lacking in effective information. On the other hand, most of the stadiums in the online service provide service channels and service effect is overly single. For example, the user's access to the stadium and the booking of the stadium is limited to the specified app of the stadium [3]. However, the download of the app is a barrier in itself, and there is no connection between the apps of different stadiums. It is difficult for users to quickly and accurately understand and download the official apps of all stadiums, and after installing the corresponding apps of all stadiums, users are required to search for the stadiums that meet their requirements and availability one by one, which consumes a lot of time and low efficiency. In addition, some public sports facilities lack scientific and reasonable management and operation methods, and most of them are operated by a third party, which drastically reduces the free hours and increases the number of charged courses, making consumers and citizens dissatisfied with the operation and social welfare [4].

2.2. User requirements issues

Stadiums generally have the issue of unsatisfied user needs and the inability to understand the user's needs. Some of the stadiums are excessively old, which cannot withstand the normal sports needs of the users, and it is difficult to collect data on the needs of the users of sports equipment [3, 5]. The opinions of the lost users due to the stadium equipment problems are even more difficult to be acquired by the stadiums individually, so the stadiums are not able to optimize and update the facilities in a specific direction, and thus are unable to attract new users. In addition, the comprehensive services of most stadiums are inadequate, including the updating and introduction of sports information, exhibition publicity, and other user needs that are difficult to meet [3, 5]. For users who have coaching service needs and equipment purchase needs, it is difficult for the gymnasiums to quickly match with appropriate course recommendations and buyer recommendations.

2.3. Applied technical issues

The management system of most stadiums is outdated and lacks modern management concepts and investment in information construction, so it is impossible to realize intelligent updating of the current management system of stadiums. The management system, including front desk consulting service, reservation service, or water and electricity management of the stadiums, cannot simplify the management process and approach through the intelligent management systems. In addition, different venues introduce different sources of management technology and systems, making the overall situation of disparity [3, 5]. The stadiums are overly independent of each other, which is not conducive to the promotion of technology, and thus it is difficult to reach a unified management form on the operation of the facilities and the promotion of consistent front desk services.

2.4. Causes of the problem

The reasons for the various problems in sports stadiums are related to the fact that the world is changing at a fast speed, and a major reason for the fast speed of society is that the world tends to be informatized [6]. Under this trend, people can use a variety of IT and social platforms to efficiently search for the information needed. And they can compare the product or service information, such as the more affordable price in the similar target store, or the better equipment in the same kind of entertainment place. Therefore, the information society can rapidly collect and integrate the demands of consumers and optimize the products or services. In particular, diversified information platforms enable users to obtain the goods or services they need quickly while collecting data on user preferences in a timely manner.

3. The role of SaaS systems for stadium systems

In order to match the information-based society, the sports industry should also popularize information technology to all areas of the industry, and re-plan and launch products or services that are underutilized and do not match the needs of users [7]. This can effectively make the social groups that are highly dependent on informatized web search more accessible to sports facilities and increase the number of available users. SaaS system is a kind of application service encompassing platform service and infrastructure service, and its role in the sports industry can effectively publicize the data of multiple stadiums joining the system to the public [8]. Moreover, compared with other non-SaaS information systems, which are overly single-function and lack information organization and data comparison, the SaaS system has the advantage of assisting in the simultaneous management of multiple venues and equipment, effectively connecting the data of various sports venues and integrating and recommending them, as well as completing the user's demand for a convenient choice of a simple operation that has multiple roles. Under the framework of SaaS system, the sports industry can be integrated and managed into several parts, including stadium information and reservations, feedback and evaluation, events and activities, commodity and training, so as to compensate for the shortcomings of the previous stadiums to achieve the purpose of meeting the demands of users and strengthening the informatization of the stadiums.

3.1. Integrated Management

3.1.1. Stadium Information and Reservations

The solution of the problem weakens the difficulties of arenas and target customers to locate each other. The stadium information is all deployed to the cloud through the SaaS system, and the problem of difficult communication and management of individual stadiums is eliminated through

the online unified management of stadium booking [9]. Users can directly access the Internet to effectively understand the number and location of local stadiums, avoiding the problems of unknown stadium locations and difficulty in finding reservation methods. The multiple stadium management software allows the user to quickly compare the stadiums that they intend to go to and select the best choice in terms of facilities and prices, rather than being limited to the familiar stadiums. For example, it can inform the user exactly which stadiums exist in the area and the prices, as well as the different sports facilities contained therein, including one stadium for a single sport or two stadiums for multiple sports, etc., and then the user can enter the booking operation after confirming the venues. This convenience and the availability of information can promote user participation.

3.1.2. Feedback and evaluation

Requirements feedback and evaluation are used to solve the problem that stadium resources are difficult to identify user needs and targeted rehabilitation. The cloud service of the SaaS system allows for cross-system data interaction. After the official operation of the system in the cooperative stadium, regional information can be collected, and the data from different SaaS platforms can be integrated and centralized according to the needs of the stadium management, which can assist the stadium in understanding the user feedback and the preferences of users in booking the stadiums [9]. In addition, the system can provide venue managers with data analysis tools to optimize decision-making and update old venues based on the public's tendencies and choices.

3.1.3. Events and activities

Event arrangements and activities can effectively improve the comprehensive services of the stadium. The system can notify users about events held at the stadium, attracting users as well as promoting sports exhibitions and community sports activities. As a trusted platform, the SaaS system is also trusted by some large-scale sports competitions that are jointly organized due to its security and stability [10]. Users can buy tickets or participate in events based on secure and trusted information. This allows users to have a reliable and timely source of information and solves most of the problems of purchasing tickets.

3.1.4. Commodity and training

The integration of product purchase and training courses can help match target customers with suitable sellers. The ability level test for users who need training in related sports activities and matching them with suitable coaches can effectively avoid the situation where the ability does not match the demand, and at the same time, it can be more suitable to provide reasonable choices for both the users and the vendors. This way to bring a better consumer experience at the same time, can reduce the user's consumption of upfront costs and consumption risk, and can also help suppliers to reduce the cost of publicity and stabilize the customer base.

3.2. Harmonized management approach

All kinds of intelligent venue service management of sports venues are unified and promoted under SaaS system. Through the SaaS system, stadiums can manage their hardware in a cloud environment. Under the role of software tools and applications, all stadiums joining the SaaS system can manage the daily maintenance of the stadiums through unified and centralized management, including water, electricity, maintenance and other technical aspects. While quickly

understanding the status of the venue's hardware, it solves the problem of independent technology updates that plague many venues.

3.3. Feasibility of SaaS systems

SaaS system applications have been proven to bring significant positive impact to sports venues. The Anhui Sports Center Smart Stadium Project realizes the integrated intelligent operation and management of multiple stadiums by accessing the Wanshitong Smart Sports Platform, while passenger flow data is synchronized to the provincial platform and the General Administration Platform for supervision. Through the smart venue system, users can utilize the Internet to obtain services such as ticket booking, sports reservation and mobile payment. And the system is also responsible for offline venue management, ticketing management, commodity management, training management, financial management, intelligent hardware management and other venues standard service process system construction. Through the member card daily average 100+ online orders, online booking rate is more than 95% [11-12]. It can be seen that SaaS system in the actual application can indeed play a role in efficient management of operations, improve the demand situation, optimize the role of technical issues.

4. PEST analysis

Politically, the Chinese government is promoting the sports industry and supporting national fitness to enhance physical fitness [13]. Since 2014, sports have been supported as a green industry. Regarding the existing problems of stadiums, the government promotes the improvement of stadium utilization, effective use of stock resources, and further opening of stadiums at multiple levels [14]. In this regard, the government has also given strong financial support to give impetus to the construction of stadiums [15]. The application of this system can effectively integrate and efficiently demonstrate the government's demand for updating and upgrading sports, which proves that the implementation of stadium informatization in the political aspect is promising and supportive.

In terms of economy, the whole world has been in a positive attitude towards the development of sports activities in the past hundred years. Expenditures on sports have been rising gradually, including national governments actively organizing residents to participate in sports activities, arranging various sports events, including sports in daily education, educating the importance of sports, and increasing the consumption of exercises, etc. [16-17]. The SaaS system can satisfy the needs of consumers for daily sports teaching, and can match coaches who meet the needs and abilities of coaches, and help coaches who meet the needs and abilities of coaches, and help coaches who meet the needs and abilities of coaches, and help coaches to meet the needs and abilities of coaches. coaches that meet the needs and competencies, and contributes to the organization of sports events and their promotion with state appropriations, so the system can be a perfect fit for the state's tendency to give economic support to programs in sports. The investment and emphasis on sports can also lead to the rise of sports economy.

For the social level, people should strengthen the physical exercise in recent years the development of science and technology is also particularly important. Technological development has allowed forms of work to change considerably in the last 30 years. Sedentary work has become a common form of work, and dietary habits have shifted towards greasy and sugary. Hypertension, hyperglycemia and hyperlipidemia have become common diseases, and the number of hypertensive individuals has almost doubled in the last few decades to 1.2 billion [18]. Adolescents also have common physical grooming problems such as scoliosis due to prolonged study. The emergence of these social phenomena is closely linked to changes in work and study patterns, but physical

activity participation has not increased in line with the changing needs of society, but rather has fallen below the level of daily activity required and has led to the rejuvenation and prevalence of disease. Studies have shown that the prevalence of disease in high-income countries is more than twice as high as in low-income countries, which reinforces the fact that the more the country becomes rich and powerful, the more physical activity should not be neglected [19]. Physical activity participation in adolescence has a certain relationship with the degree of physical disease, and insufficient activity can even make the disease rate reach 90% [20]. Therefore, it is necessary to promote sports to adapt to the informationization of the times to meet the social changes brought about by other informationization industries, which can help society to reduce the stress and diseases caused by other changes in work and life. The need for the sports industry to increase in line with other lifestyle changes has been a major trend, and following the informatization of society as a whole has become an appropriate way to help keep pace with other industries.

In terms of technological support, information technology is a strong force in recent years. SaaS system maintenance and information collection does not rely on a single sports or information companies, successful operation can effectively manage the construction of the required equipment and venues, quickly locate the needs of the masses, which are today's big data and Internet technology has matured the function [21]. And the application of the vacancy information location required by the sports industry can become a desired progress.

5. Responding to the development needs of the times

Nowadays, all industries in the society are developing towards informationization, and the frequency and coverage of computer and cell phone use have shown a surge in recent decades, and the development trend of informationization in life has also appeared as a result. Most of the users are more inclined to obtain information through cell phones, or through a simple APP operation to quickly obtain the products and services they desire, and businesses are also inclined to understand user needs and optimize their products and services from user feedback.

In this case, the traditional sports stadium because of too cumbersome booking process, as well as too much cluttered information source display, will let the target users who are used to the unified operation of the information and rapid access to information app bored and reduce the tendency to participate in, but also difficult to realize the stadium self-improvement. The use of SaaS system can be a reasonable solution to this problem, fast and simple booking process and tournament push can attract the attention of users to solve the risk of customer turnover, but also through the user's demand for data to give merchants a reasonable demand for feedback, thus promoting the development of the sports industry and enthusiasm. In addition, it can also solve the problem of diseases due to social development by increasing participation in sports activities. The lack of physical exercise brought about by the convenience of life brought about by the development of new-age technology and the ease of access to information on the Internet can also attract more users through the information-based sports platform. At the same time, the use of Internet technology allows people to renew their interest in sports, thus enhancing their health index.

6. Conclusion

Through an in-depth analysis of the current management status of stadiums, this paper reveals the current problems of stadiums in terms of management efficiency, user demand fulfillment, and technology application, and proposes an informatization solution based on SaaS system. Through SaaS system, stadiums can realize unified management and efficient sharing of information, optimize resource allocation, enhance user experience, and promote the information transformation of the sports industry. PEST analysis shows that the application of SaaS system has significant

advantages and broad development prospects from four aspects: political, economic, social and technological. Practical cases further validate the effectiveness of SaaS systems in enhancing the operational efficiency and user engagement of sports venues. With the continuous development of information technology, the sports industry needs to follow the trend of the times and improve the management level and service quality through information technology to better meet the needs of society and promote the high-quality development of the sports industry. In the future, sports venues should continue to deepen the construction of informationization and explore more innovative management modes and service modes, so as to make greater contributions to the improvement of national health and the promotion of the development of sports industry.

However, the analysis in this paper is only based on literature, lacks relevant social research and data analysis, and mainly focuses on the application of stadiums in China. The subsequent research direction will focus on the analysis of the actual application effect of SaaS, and add relevant social research and experiments to analyze the continuity of the application of SaaS system.

References

- [1] General Administration of Sport of China. *Statistics and Survey Data of National Sports Venues in 2020* [EB/OL]. [2021-08-20]. <https://www.sport.gov.cn/gdnps/content.jsp?id=20995775>
- [2] Chen Y.X. & Wang J. (2011). *Financial Comparative Analysis of the Operation Status of Stadiums (Gymnasiums) of Different Natures in China* [J]. *China Sport Science*, 31(5): 20 - 26.
- [3] Chen Y.X., Chen L., Li Z., Ji, Q., Zhang, Q., Yang, J.E., Qiu, Q., Fang, X.M., Li, J.Y. & Zhou, B. (2022). *Direction and Path of Concept of New Development Leading the High-Quality Development of Large-Scale Stadiums*[J]. *Journal of Shanghai University of Sport*, 46(1): 72-85. DOI: 10.16099/j.sus.2021.06.29.0004.
- [4] Luo M.R. (2023). *Research on the Demand Level and High Quality Development of Public Stadium Services in Chengdu City in the Post-Great Games Period* [C]. *Proceedings in the 13th national convention on Sport Science of China (Sports Management Branch)*. Tianjing, China. 3, 545-547. DOI: 10.26914/c.cnkihy.2023.064466.
- [5] Zhang, Q., Wang, J.H. (2021). *Operation and Management of Smart Stadiums in China in New Era*. *Journal of Wuhan Institute of Physical Education*, 55(11).
- [6] Romansky, R. (2021). *Informatization of the Society in the Digital Age*. *Biomedical Journal of Scientific & Technical Research*, 33(3), 25902-25910. DOI: 10.26717/BJSTR.2021.33.005418
- [7] Babenko, V., Perevozova, I., Mandych, O., Kvyatko, T., Maliy, O., & Mykolenko, I. (2019). *World informatization in conditions of international globalization: Factors of influence*. *Global Journal of Environmental Science and Management*, 5, 172-179.
- [8] Tsai, W., Bai, X., & Huang, Y. (2014). *Software-as-a-service (SaaS): perspectives and challenges*. *Science China Information Sciences*, 57, 1-15.
- [9] Zheng, X., Fu, M., & Chugh, M. (2017). *Big data storage and management in SaaS applications*. *Journal of Communications and Information Networks*, 2(3), 18-29.
- [10] Zhu, H., Bayley, I., Younas, M., Lightfoot, D., Yousef, B., & Liu, D. (2015, June). *Big saas: The next step beyond big data*. In *2015 IEEE International Congress on Big Data* (pp. 775-784). IEEE. doi: 10.1109/BigDataCongress.2015.131.
- [11] Chen, Y.D. (2020). *Research on the Construction and Promotion Strategies of the Community Smart Sports Service System in Anhui Province* [D]. *Beijing Sport University*. DOI:10.26961/d.cnki.gbjtu.2020.000045.
- [12] Saleem, M., Warsi, M. R., & Islam, S. (2023). *Secure information processing for multimedia forensics using zero-trust security model for large scale data analytics in SaaS cloud computing environment*. *Journal of Information Security and Applications*, 72, 103389. <https://doi.org/10.1016/j.jisa.2022.103389>.
- [13] The State Council of the People's Republic of China. (2014, October 20) *Several Opinions of the State Council on Accelerating the Development of the Sports Industry and Promoting Sports Consumption*. https://www.gov.cn/zhe ngce/content/2014-10/20/content_9152.htm.
- [14] The State Council of the People's Republic of China. (2016, November 28) *Opinions of the General Office of the State Council on Further Expanding Consumption in Tourism, Culture, Sports, Health, Elderly, Education and Training, etc.* https://www.gov.cn/zhengce/content/2016-11/28/content_5138843.htm.
- [15] General Administration of Sport of China. (2018, April 3) *Announcement by the General Office of the General Administration of Sport on Releasing the List of Large - scale Sports Venues Subsidized by Central Fiscal Funds in 2018*. <https://www.sport.gov.cn/n315/n20001395/c20028561/content.html>.

- [16] Gratton, C., Liu, D., Ramchandani, G., Wilson, D. (2012, 21st August). *The Global Economics of Sport*. 1st edition. Routledge, London. <https://doi.org/10.4324/9780203807248>.
- [17] Murphy, K. R. (1964). *Contrasts in Spending by Urban Families: Part I. Trends Since 1950*. *Monthly Labor Review*, 1249-1253.
- [18] Cureau, F. V., Fuchs, F. D., Fuchs, S. C. P. C., Moreira, L. B., Schaan, B. D. A., Cisneros, J. Z., & NCD Risk Factor Collaboration. (2021). *Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants*. *The Lancet*. London. Vol. 398, no. 10304 (Sep. 2021), p. 957-980.
- [19] Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2018). *Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants*. *The lancet global health*, 6(10), e1077-e1086.
- [20] Guthold, R., Stevens, G. A., Riley, L. M., & Bull, F. C. (2020). *Global trends in insufficient physical activity among adolescents: a pooled analysis of 298 population-based surveys with 1·6 million participants*. *The lancet child & adolescent health*, 4(1), 23-35.
- [21] Sagioglu, S., & Sinanc, D. (2013, May). *Big data: A review*. In *2013 international conference on collaboration technologies and systems (CTS)* (pp. 42-47). IEEE.