

RESEARCH ON THE CONSTRUCTION AND APPLICATION OF SMART SPORTS VENUES

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ABSTRACT

Wisdom sports venues as a new model of sports industry and information industry, with a new generation of information technology innovation breakthrough, digital economy and the real economy, wisdom society, wisdom city and the depth of sports fusion, promote the people-oriented development of public sports service concept and the formation of the pattern, become the development of the sports industry new growth point, sports consumption and promote the key means of sports supply side structural reform, but also meet the venue services to provide more high quality, diversified, personalized service realistic demand.

This study can not only deepen the understanding from all walks of life to the wisdom of sports venue management, to accelerate the development of the national fitness wisdom, promote the construction of wisdom sports venues, solve the fundamental pain points of venue operation, meet the demand of consumer audience experience and auxiliary wisdom city construction has important academic value and research significance.

This paper draws on stakeholder theory, holistic governance theory, experience economy theory, sustainable development theory, Using literature data, questionnaire survey, expert interview, field survey and other methods, Explains the connotation of smart stadiums, A three-layer system model for smart stadiums is proposed, Discuss the construction contents of different types of smart sports venues, Put forward five modes to realize the operation of smart sports venues, Designed four types of scene marketing, By building the index system of smart sports venues, The evaluation and analysis of some stadiums in 6 provinces in eastern and central and eastern China, Finally, put forward to promote the development of smart sports venues.

Keywords: Smart stadium; next-generation information technology; sports industry; operation pattern; Scene marketing; target system; Smart City

INTRODUCTION

A smart society is an important choice for China's economic and social development in the new era, and also a great change in the course of the development of human society. Under the macro background of the central government's supply-side structural reform and its importance to the construction of smart society, the realization of China's socialist modernization and smart society should include the modernization of sports governance and the modernization of venues and facilities. With the orderly promotion of the General Administration of Sport of China on the "transformation function and reform

mechanism" of sports venues and the increasing policy orientation of governments at all levels to develop smart sports, Strengthen the construction and application of smart sports venues, Not only to accelerate the construction of a strong sports country, Implementing the national fitness and the Healthy China strategy, To complement the key work of key sports areas and the weak links of venues; Take the initiative to adapt to new situations and new tasks, Release the potential energy of sports consumption, To expand the effective supply of sports industry: to improve the well-being of the people, With the people-centered approach, To improve the people's sense of gain and happiness for site services, To continuously meet the people's growing sports needs for a better life.

With the gradual promotion of the national strategy of building a sports power and national fitness, various international and domestic sports events have been held in major cities, and the planning and construction of sports facilities have ushered in a peak, and the public's demand for fitness and leisure has evolved into a daily rigid and sustainable social demand. However, the existing planned public venues and facilities with low technology content, poor safety performance and other practical conditions are difficult to provide a guarantee for the general public sports and fitness ". At present, our country is in the new urbanization construction and information technology rapid development stage, public sports services should also transition to the direction of wisdom, a new generation of information technology mature and application for the construction of modern venue facilities provides important technical support, wisdom sports venues construction is an important guide to promote the development of the national fitness long-term effect, is also a perception venues operation situation, open communication mechanism, auxiliary operation decision, improve the level of governments at all levels of public sports service important engine. Therefore, our country should be through the planning and construction wisdom sports venues series urban production and living, match to build a well-off society in an all-round way sports development and the general requirements of sports power, increase effective supply, realize high-tech, high quality, multi-functional development, attract more people into the venues to participate in sports leisure, create a healthy social atmosphere, promote urban development and improve residents' life happiness index.

OBJECTIVE

- 1.Explore the overall situation of the development of smart sports venues in China
- 2.Research on the construction of intelligent stadium system
3. Evaluation, analysis and research of smart sports venues

METHODOLOGY

"Smart stadium construction" is a mixed method research, a study that uses both qualitative and quantitative research. Make this study according to the study objectives. Therefore, the investigator identified the Study Process Population and Sample Study Tool Creation Study Tool Data Collection data analysis and statistics for data analysis as follows:

Sub-Section 1

The research to be carried out in accordance with the research methodology and in accordance with the objectives of the research Therefore, the researcher has defined the research process in 3 steps as follows:

Step 1 : Analysis and research on the construction of smart sports venues.

Step2 : Build an index system of smart sports stadiums.

Step3 : Confirm the index system and evaluation of smart stadiums through focus group discussion.

Sub-Section 2

2.1 Population and samples

Step 1

To meet the research needs, the authors conducted in-depth interviews and consultations with experts in the field of smart sports venues. These experts include: academic researchers familiar with the theory and method of stadium operation; practitioners with venue management experience; and suppliers or agents related to smart stadiums. The author used to participate in related sports venues academic BBS and research work, carefully designed the interview outline, and at the core of the wisdom sports venues focus, the government head, sports and architecture field experts, venues, venues, intelligent equipment suppliers of more than 30 people in the in-depth interview. In addition, the author also communicated with some venue grass-roots staff, so as to obtain first-hand experience, formed a clearer understanding of the related issues, and gained valuable suggestions and opinions, which provided important inspiration for the study of this paper.

Step 2

On the basis of the preliminary research, the relevant literature in the field of operation and management of stadiums, and the Comprehensive Evaluation System of Operation and Management of Large-scale stadiums, and the Intelligent Building Design Standard (GB50314-2015). The survey scope of the questionnaire covers some stadiums in Heilongjiang, Liaoning, Zhejiang, Guangdong, Hubei and Shanghai, and clearly requires the main person in charge of each venue to fill in truthfully according to the actual situation. The samples are selected from the eastern and central regions of China, with certain representativeness. A total of 65 questionnaires were distributed, and 62 questionnaires were recovered. Two invalid questionnaires were eliminated after screening, and the effective recovery rate was 92.3%, meeting the relevant requirements of statistics.

Step 3

In order to ensure the construction of the index system for the construction of smart stadiums, the selected personnel and samples are experts engaged in the operation and management of stadiums, including: 1. Professor in the field of stadium operation; 2. Operation manager of stadiums; 3. Director of the Industrial Guidance Center of sports Bureau; 4. Secretary general of the Stadium Association. A total of 15 people.

2.2 Research Tools

Step 1

The research tools used at this stage are structured interview.

Step 2

The research tool used in this stage is the questionnaire for the construction and application of smart stadiums, which is divided into three parts:

The first part involves the basic information of the venue and the cognition situation of the concept of the smart venue questionnaire.

The second part involves the questionnaire survey of the supply and demand of smart stadiums.

The third part will discuss the factors affecting the construction of smart stadiums and put forward suggestions on the construction of smart stadiums.

Step 3

The research method adopted in this paper is the group discussion mode, aiming to verify and confirm the accuracy, suitability and feasibility of the index system construction of smart stadiums.

RESULTS

1.1 Construction process of the index system of smart sports venues

In the first stage, the author and the research group will review the selected indicators, fully considering the correlation between the levels and the indicators, and focusing on the index system; due to the limitation of my own business level and subjectivity, the scientific feasibility of the indicators needs to be selected and judged by senior experts in venue management. By reading the policy text,

venue field research and interviewing with the leaders of venue management, this paper preliminarily constructed the pre-selected indicators including 4 first-level indicators, 13 second-level indicators and 47 third-level indicators.

1.2 Establishment of the index system of smart sports venues

In order to make the questionnaire scientific and standardized and the index system reasonable and effective, two rounds of index consultation were conducted to 15 experts and scholars engaged in the research and work of the planning, construction and operation management of stadiums in China. In the first round, experts were invited to judge whether the indicators in the questionnaire conform to the indicators of smart sports venues, and at the same time, the sentences prone to ambiguous or unclear meaning expression were corrected, and experts were invited to add new indicators according to their own experience.

The second theory of expert opinion consultation is to integrate the results of the first round of consultation and then give feedback to the experts in the form of anonymous consultation again. Finally, the index system of smart sports venues was formed (see Table 1).

Table 1
Smart sports venue index system

objective	Level 1 indicators	Secondary indicators	Level 3 indicators
Smart sports venue index system	infrastructure	Main hardware	Field LED screen, shake screen, ring screen Field light show system Front desk intelligent information display large screen
		Intelligent front desk	Mobile payment Touch-screen self-service all-in-one machine Admission intelligent identification gate Sports equipment credit rental
		Intelligent field control	Smart light control Intelligent water control and intelligent storage cabinet
		Online service	Specific area camera The venue portal website was established and put into operation online Mobile terminal 360, venue panoramic display Mobile phone online booking, ticket purchase intelligent parking system

Sports services	Transportation and Internet services	Full coverage of Wi-Fi in the venue Venue dynamic information release Athletes' data statistics and competition tracking Live video, record and download the virtual sports experience
	Body-sensing interactive service	The venue matches the smart wearable equipment (Including physical fitness monitor, physical fitness assessment instrument, etc.)
	Push and emergency services	Sports and health data were obtained in time Social platform interaction and online media sharing Surrounding food and beverage, entertainment and other push Use the modern communication and call system to accept consultation and complaints in time And safety calls for help Passenger flow monitoring
Venue Management	Information regulation	Statistical analysis of customer source Venue and ticket management Intelligent registration system for competition events
Venue Management	Safety precautions	Full-scene intelligent monitoring room and the screen wall Video Security Intelligence Analysis (Sky Eye System)
	Energy efficiency management	Energy consumption monitoring system Venue environment monitoring and release Member information development and protection Online assessment of employees and coaches

unified management	Office Automation System (OA) Venue data is connected to the unified service platform Establish a content link and information interaction mechanism with international and domestic well-known venues and operators
Online business development	Venue APP development or public account operation intelligent platform user development Collection, analysis, and assessment of fitness consumption preferences Venue facade LED screen and field advertising space development Use we-media to release events and performance announcements
Offline product promotion	Member personalized customized promotion program "Sports Bank" points exchange activity public welfare activity marketing Lottery promotion, member birthday wishes and other marketing interaction

1.3Evaluation and analysis of smart sports venues

According to the different focal points of the evaluation, the evaluation methods are mainly divided into two categories: the public evaluation mode (citizen satisfaction survey) and the professional evaluation mode. The fundamental starting point of the public evaluation model is to regard the public as the most important party among the stakeholders, and to evaluate it according to the public's satisfaction degree. Professional evaluation is the evaluation ① conducted according to the measurement standard formulated by the service provider or the third-party organization and the set index system. Due to the wisdom of stadiums in China is a new thing, about the construction and application belongs to the professional degree of evaluation, higher content, real sports consumers do not have the evaluation of wisdom stadiums professional knowledge and difficult to obtain wisdom venues related accurate information, unable to accurately determine the key content of the stadium construction and wisdom of application. Therefore, this study selects a professional evaluation method, and the main person in charge of the venue will evaluate the intelligent construction and application of the venue.

1.3.1Results of the "importance" evaluation

Through the analysis of the questionnaire data, we can understand the evaluation and ranking of the importance of each smart stadium index (see Table2), and grasp their demand preferences for the construction and application of smart stadiums. The data analysis results show that the total average of the "importance" evaluation of 47 indicators is 4.04, which indicates that the venue operation agencies attach great importance to smart stadiums.

1.3.2"Expresistic" evaluation results

For wisdom stadiums "performance" evaluation, this study through the head of the current situation of the existing facilities satisfaction evaluation, data analysis results (see table 2): 47 ask the average of "satisfaction" evaluation of the average is only 2.71, that the venue operation of the current venue facilities supply level satisfaction is low, the existing hardware facilities and software system supply is difficult to meet the demand of intelligent sports venues operation. The average satisfaction rate of the 47 indicators was between 2.05 and 3.90, and the average score of the 33 items was lower than 3.0, not reaching the "average" level considered by the venue operators.

Table 2

Mean values of the importance and satisfaction of smart sports venues

Smart sports venue indicators	Mean value of importance		Average satisfaction	
	mean value	compositor	mean value	compositor
Venue APP development or public account operation	4.71	1	3.19	6
Mobile phone online booking, ticket purchase	4.62	2	3.29	3
Member information development and protection	4.62	3	3.00	12
Mobile payment	4.52	4	3.90	1
Venue and ticket management	4.52	5	3.00	13
Admission intelligent identification gate	4.38	6	2.62	23
Intelligent parking system	4.38	7	2.86	17
Wi-Fi connection in the venue	4.38	8	2.48	31
Passenger flow monitoring	4.38	9	2.66	22
Statistical analysis of customer source	4.38	10	2.48	32
Specific area camera	4.33	11	3.71	2
Surrounding food and beverage, entertainment and other push	4.33	12	2.19	43
Development of intelligent platform users	4.33	13	2.57	25
Venue dynamic information release	4.29	14	3.19	7
Collection, analysis, and assessment of fitness consumption preferences	4.29	15	2.29	39
Use the modern communication call system to timely accept consultation, complaints and safety call for help	4.24	16	2.95	15
Smart light control	4.19	17	2.76	18
Intelligent water control	4.19	18	2.33	36
Energy consumption monitoring system	4.19	19	2.48	33
Built with LED screen, shake screen, ring screen	4.14	20	3.24	.5
Intelligent Analysis of Video Security (Sky Eye System)	4.14	21	2.52	28
Venue data is connected to the unified service platform	4.14	22	3.19	8
Full-scene intelligent monitoring room and the screen wall	4.10	23	3.00	14

Use we-media to release events and performance announcements	4.10	24	3.29	4
Public welfare activities marketing	4.10	25	3.10	9
Exercise and health data analysis	4.05	26	2.19	44
Member personalized customized promotion program	4.05	27	2.19	45
Smart storage cabinet	4.00	28	2.67	20
Social platform interaction and online media sharing	4.00	29	2.57	26
Venue facade LED screen and field advertising space development	4.00	30	3.10	10
Front desk intelligent information display large screen	3.95	31	2.57	27
Establish the venue portal website and conduct the online operation	3.90	32	3.10	11
Field light show system	3.86	33	2.52	29
Touch-screen self-service all-in-one machine	3.86	34	2.33	37
Office Automation System (OA)	3.86	35	2.95	16
The venue matches the smart wearable equipment	3.81	36	2.43	34
Intelligent management of event activities	3.81	37	2.62	24
Establish a content link and information interaction mechanism with international and domestic well-known venues and operators	3.76	38	2.52	30
The "Sports Bank" points exchange activity	3.76	39	2.24	42
Live video, recording and download	3.67	40	2.29	40
Athletes' data statistics and competition tracking	3.62	41	2.33	38
Online assessment of employees and coaches	3.57	42	2.67	21
Lottery promotion, member birthday wishes and other marketing interaction	3.52	43	2.73	19
Mobile terminal 360, venue panoramic display	3.48	44	2.43	35
Virtual sports experience	3.43	45	2.19	46
Venue environment monitoring and release	3.38	46	2.29	41
Sports equipment credit rental	2.71	47	2.05	47
overall mean	4.04	—	2.71	

1.4 Strategies to promote smart stadiums

1.4.1 Strengthen the operation of smart sports venues from the supply side

With the improvement of the national economic level, the basic sports venues can no longer fully meet the sports needs of all social income classes. The development environment, demand structure and business content of stadiums and related services show a new intelligent feature and are in the dynamic change and development. For example, venue APP development or public account operation, mobile online booking, ticket purchase, and the development and protection of member information rank the top three in the importance of smart sports venues, which reflects that the operating institutions are very concerned about the operation of smart venues. Therefore, the characteristics and dynamic change laws of smart sports venues need to be understood and concerned by all stakeholders. The above factors should be fully considered in the process of venue planning, design, reconstruction and capacity expansion, so as to provide services and products that meet the market demand.

1.4.2 We will promote the certification of smart sports venues

The analysis of "importance- -expression" of smart sports venues reveals the importance of strengthening the construction of intelligent hardware facilities and software system and improving the management and service standard system. To promote the improvement of wisdom stadium function, service quality, consumption environment, improve the efficiency of operating management, cultivate loyal consumer groups, suggest wisdom sports venues certification work, by the competent department of venues, venue association or entrust, professional third party to venue infrastructure, sports services, digital management, venue marketing and environmental protection effect comprehensive evaluation, according to each aspect of the index, comprehensive score results evaluation wisdom sports venues construction and application level, establish industry model.

1.4.3 Strengthen publicity and promotion to deepen public awareness

Wisdom sports venues service promotion directly affect the social public awareness and information access channels, although our country wisdom sports venues has obtained certain results, but a lot of services are not known, is difficult to experience, so improve the wisdom sports venues service penetration is low, depends on strengthening the recommendation of the service. Therefore, on the one hand, we should do a good job in publicity in the industry, constantly improve the understanding of government administrative departments, sports enterprises and employees, and fully realize that the era of network economy is subverting the traditional operation mode of venues., On the other hand, completes the propaganda of the user, analyze the current sports consumer accept venues information main channels, the front desk and staff to use a variety of ways to promote wisdom sports venues specific services, improve the effective perception of intelligent sports venues service system, enhance the user experience, so as to promote and motivate venue departments and operations to speed up the pace of wisdom sports venues construction and application.

CONCLUSION AND FUTURE WORK

CONCLUSION:

- (1) Smart sports stadium is a people-oriented collaborative body. From the perspective of the development process of stadiums, smart stadiums are advanced development concepts formed with the progress of information technology and the application of intelligent facilities, and are the advanced stage of the information development of stadiums. Compared with the Internet + stadiums and smart stadiums, the smart stadiums use the new generation of information technologies such as the Internet of Things, big data, cloud computing, artificial intelligence and 5G, reflecting their distinctive characteristics. Smart sports venues use new technologies to realize the perception interconnection between people and stadiums, deeply integrate resources and promote public sports participation through intelligent ways with cognition, judgment and response, realize efficient and convenient innovative application in all links of stadiums and gymnasiums, and optimize the resource allocation of sports venues.
- (2) The research constructs the system framework of smart sports venues, and the value exploration of smart sports venues is expanded and improved at the theoretical research level. The system architecture of intelligent sports venues, which consists of the technology layer, the resource layer and the application layer, at the model, including the technical support, intelligent hardware and database; the resource layer is at the middle layer of the system, including intelligent operation, resource integration and intelligent society; the application layer is at the top of the system, including new marketing system, intelligent service and unification.

- (3) Adhere to classified guidance, coordinate and design the development paths of different types of smart sports venues. The study concluded that according to the scale, location conditions and operation characteristics of stadiums, large smart stadiums should be built as "landmark" leisure and entertainment centers; small and medium-sized smart stadiums should be built as "regional" national fitness heating areas; and national fitness smart stadiums should be built as "node" sports health service points. From the dislocation development, the perspective of technology innovation, application orientation, so as to better guide the construction of smart stadiums and gymnasiums in China, and promote the sustainable and healthy development of smart stadiums and gymnasiums.
- (4) The operation modes of smart sports venues are diverse. Their essence is to improve the public service capacity of the stadiums, introduce the market mechanism, and promote the transformation of the sports industry to the modern service industry. The research shows that smart sports venues have obvious advantages in improving their operation capacity, optimizing human capital, reducing energy consumption cost, and realizing rapid replication. The operation of smart sports venues includes five modes: government investment and operation, enterprise investment and operation, government-chartered enterprise operation, government-led establishment of specialized agencies and the link mode of venue association.
- (5) According to different sports consumption needs to create smart sports venue scene marketing. In order to get rid of the situation of single revenue channel of sports venues and rely on government allocation as soon as possible, venue operators need to take the initiative to seek change and make full use of new technology and cross-border thinking to carry out scene marketing exchange and sports consumption links. Research according to the stadiums and sports industry to change the depth of development goals, user diversified consumer demand, extract pay attention to emotional release of entertainment scene, emphasize entertaining educational scene, advocate space differentiation aesthetic scene and satisfy the spirit of empathy scene four kinds of wisdom marketing experience, to promote the stadiums wisdom service system and the overall function to upgrade.
- (6) Build the index system of smart stadiums, and analyze and evaluate the development demands of smart stadiums. This paper through preliminary construction index structure, after two rounds of expert opinion consultation, formed four level index 13 secondary index of 47 tertiary wisdom stadium index system, designed the "wisdom sports venues construction and application research" questionnaire, with stadiums as the survey object, from the supply side of stadium construction expectations and demands, through the IPA evaluation analysis clear wisdom sports venues should be priority to improve the project.

FUTURE WORK:

Wisdom sports venues is a systematic project, through the venue management department leaders, venues and academic experts interview summary and meet problems in the research process, the author thinks that the future research on wisdom sports venues on the following several aspects to strengthen attention: one is to strengthen wisdom sports venues certification standard research, whether a sports venues built for wisdom sports venues, or a stadium whether transformation into wisdom sports venues, it is a lack of official authority or more mature scientific evaluation standards. Second, focus on the influence of new technology of wisdom sports venues, analysis of foreign advanced case to develop local solutions, from the user experience threshold to build new experience formats and improve the marketing service chain and further research space, venues big data how affect scene marketing combination design, this kind of problem is noteworthy, should be systematic application research, this for the future wisdom sports venues construction operation integration and normalized has important help. Third, smart sports venues are closely related to urban development. Therefore, smart sports venues should be placed under the development of smart city and smart society, and seek new breakthroughs and play more important value in promoting urban renewal. In addition, the existing research on smart stadiums focuses on the discussion of their positive value, but the negative impact on them needs to be further explored, such as protecting consumers' privacy and avoiding the abuse of venue information. The wisdom of the future sports venues operation inevitably need "skill", take the user as the center, focusing on experience, to the future, the inevitable choice of sports sports services, venue data and related industries and depth fusion, transformation venues development dynamic structure, change the way of public sports participation, this is the wisdom sports power operation reform and the construction of the common vision.

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