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The impact of sports event platforms on user experience an empirical analysis of tencent sports events

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This study focuses on two issues: first, what are the factors that bring different user experiences to viewers on sports event platforms, and second, how should operators of sports event platforms better optimize the user experience of sports event platforms according to the influencing factors of viewers' experiences. This paper takes the Tencent sports event platform as an example, and takes the technology acceptance model as the basis, introduces the user experience wheel model, and the relevant variables of the information construction theory to construct the user experience model of the sports event platform. conducted an online survey on the viewers of Tencent's sports platform, and the complete replies of 312 individuals were included in the analysis. The regression model shows that improving service functions effective elements from the user's perspective and enhancing brand design implementation elements from the perspective of sports event platforms can both have a significant positive impact on user experience, and the impact of service functions effective elements is stronger than that of brand design implementation elements. This study expands the applicability of relevant models and theories, enriching the empirical research system of user experience on sports event platforms. In practice, factors influencing user experience of sports event platforms have been discovered and verified, providing some reference opinions for optimizing platform information architecture, graphic interface design, increasing the commercial value of sports event platform brands, and promoting the sustainable development of the platforms.

Keywords Sports event platforms, User experience, Technology acceptance model, User experience wheel model, Information construction theory

With the emergence of digital platforms, the consumption patterns of sports events have undergone significant changes, shifting from traditional broadcast television to various online streaming services. This evolution has not only democratized access to sports content but has fundamentally changed the way audiences engage with sports events[1]. The sports event streaming market in China is developing rapidly. According to a survey by the China Internet Network Information Center[2], by June 2021, the number of internet users in China had reached 1.011 billion, with 246 million consumers of live sports events.

Sports event platforms as a new form of platform have facilitated closer connections between sports fans and their favorite teams and players. This was particularly evident during the COVID-19 pandemic, which led to the suspension of sports competitions starting in 2020. In the absence of live audiences, sports organizations collaborated with sports live streaming platforms (SLSP) to live stream games and maintain fan engagement. The advent of high-speed internet and digital technologies such as VR and 360-degree views has further enhanced the audience experience, surpassing passive television broadcasts. Consequently, SLSP provides a digital, immersive, and interactive viewing environment[3].

Since the London Olympics, Tencent Sports has continuously enriched its football event coverage, incorporating major events such as the World Cup and the Asian Cup, and has built a comprehensive sports reporting system that has significantly enhanced the dissemination of event content, broadened distribution channels, and improved communication effectiveness. In 2015, Tencent signed a five-year exclusive broadcasting and content rights agreement with the NBA for China, valued at approximately $500 million. Additionally, through Tencent's popular social networking service WeChat, an additional $200 million in revenue-sharing

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agreements is expected, making Tencent the NBA's most valuable international digital partner[1]. At the 2016 Sports Business Annual Summit and Awards Ceremony, Tencent Sports won the Best Sports Media Award and the Best Sports Marketing Case Award for its excellent operation and dissemination of sports events. In 2017, Tencent Sports became the strategic partner of the Chinese women's volleyball team. That same year, Tencent Sports secured exclusive live broadcasting rights for the NBA, NHL, and NFL in China, showing its strong media platform advantages and increasing global influence.

User experience plays a crucial role in the development of sports event platforms. A good user experience not only enhances user satisfaction and loyalty but also increases user engagement and the commercial success rate of the platform. Studies have shown that a satisfying user experience can significantly boost users' repeat usage rates and willingness to recommend the platform, thereby creating a word-of-mouth effect[4]. Moreover, an excellent user experience, by improving interface design, enhancing interactive features, and upgrading technical performance, allows users to easily access event information, watch live broadcasts, participate in interactions, and make purchases[5]. Therefore, user experience is one of the core driving forces for the development of sports event platforms and is key to maintaining a competitive edge.

Unfortunately, while these studies provide valuable insights into the overall dynamics of sports event platforms, there is still a significant gap in empirical research specifically focused on the factors influencing user experience on these platforms. My research aims to address this gap by developing a user experience model for sports event platforms based on the Technology Acceptance Model, incorporating relevant variables from the User Experience Wheel Model and Information Construction Theory. This research extends the applicability of related models and theories, enriching the empirical research framework for user experience on sports event platforms. The goal is to provide a reference for future research on user experience in similar sports event platforms.

This study focuses on the Tencent Sports event platform, extracting factors that influence user experience on sports event platforms and combining them with theoretical relationships to set up a hypothetical model. A questionnaire is designed according to the hierarchical elements, and after collecting feedback from a pilot test, the questionnaire is revised and finalized for distribution and collection. In terms of data analysis, methods such as descriptive statistical analysis, reliability and validity tests, factor analysis, and the establishment and analysis of multiple regression models are used to determine the interrelationships between elements. This process validates the hypothetical model, leading to universally applicable conclusions regarding influential factors and model conclusions.

Literature review

The digital transformation of sports consumption

The advent of digital technology has revolutionized the sports industry, particularly through the proliferation of live streaming platforms. A study examined the impact of sports e-commerce on consumer behavior via short video live broadcast platforms, highlighting how interactivity, identity, personalization, and entertainment foster consumer attachment and drive consumption behavior[6]. Similarly, some researchers explored value co-creation on sports live streaming platforms (SLSPs), emphasizing the importance of viewer engagement[7]. Qian and Seifried[8] and Wu et al.[9] extended these findings, showing that virtual interactions and factors like signal delay and advertising significantly influence viewer intentions and profitability. The role of live streaming in enhancing viewer satisfaction, flow experience, and media loyalty was further detailed by Huang et al.[10], while Shi and Ren[11] focused on the motivations behind e-sports viewership in China, identifying key factors such as skill improvement and social bonding. Gasparetto and Safronov[12] also contributed to understanding the streaming demand for eSports by analyzing viewer preferences and the factors influencing viewership. Xu et al.[13] investigated young educated sport customers' perceptions of watching live sports on OTT services, revealing insights into user behavior and adoption of these technologies. Additionally, research by Wang and Fan[14] used topic mining of real-time discussions to understand what catches the attention of live-streaming esports viewers. Further studies explored how e-sport fans' motivations and the transition from TV to digital influence the adoption of streaming services[15,16].

Broader implications of digital media transitions

In addition to understanding viewer behavior, researchers have also delved into the broader implications of digital media transitions. Hutchins et al.[1] discussed the transformative impact of over-the-top (OTT) services like Tencent Video, DAZN, and Amazon Prime Video, highlighting a shift from traditional TV to more user-controlled viewing experiences. This transition is further complicated by copyright issues, as discussed by Wong[17] and Gong et al.[18] Several studies emphasize the importance of value co-creation and the challenges posed by digital piracy[19,20]. Moreover, the integration of new technologies, such as augmented reality (AR) and bullet-screen features, offers innovative ways to engage viewers, as explored by Kim and Manoli[21] and Li et al.[22]. The potential of these technologies to transform sport consumption is further supported by findings from Meneses et al.[16], who analyzed the transition from TV to digital in the Portuguese market, and by Naseralla[23], who examined how sports content adds value to streaming services. The impact of COVID-19 on sports organizations' usage of social live streaming services was explored by Wymer et al.[24], who highlighted the need for digital strategies to maintain fan engagement. Additionally, the cultural implications of live streaming and the politics of watching play were discussed by Elam and Taylor[25]. Further research emphasized the role of viewer engagement in shaping the value co-creation process on sports live streaming platforms[7]. Naseralla[23] and Havard, Ryan, and Hutchinson[26] examined the economic and fan engagement aspects of streaming services, respectively, providing insights into how streaming platforms can better cater to sports fans' needs.

Psychological and social dynamics of live streaming

The psychological and social dynamics of sports live streaming are also pivotal. Kim and Kim[15] demonstrated that social live streaming services (SLSSs) enhance users' social well-being and mitigate loneliness through team identification and flow experiences. Liu, Tan, and Pawar[27]explored how viewer perceptions and satisfaction influence gifting behavior, a crucial aspect of live streaming platforms' revenue models. Further, studies by Cabeza-Ramírez et al.[28] and Bailey[29] examined the co-existence of gaming and viewing activities and the economic potential of live streaming for sports leagues. The psychological consequences of social live streaming service usage were also explored by Kim and Kim[15], showing its impact on social well-being. Additionally, research by Jarrett[30] on the affective economy of League of Legends' free-to-play model provided insights into the economic dynamics of e-sports. Liu et al.[27] examined value co-creation from a microfoundations perspective, emphasizing the role of external actors in creating competitive advantages for SLSPs. Furthermore, the study by Kim and Kim[3]on the psychological consequences of viewing sports online together highlights the social benefits of SLSSs. Research by Qiu, Zuo, and Zhang[31] on the use of live streaming to mitigate the impact of travel restrictions during the COVID-19 pandemic revealed the potential of this technology to transform various industries. Lastly, the exploration of sport fan usage of on-screen ephemeral posts during live stream sessions by Li et al.[32] underscored the interactive nature of modern sports consumption. Additional studies by Liu, Tan, and Pawar[27] on predicting viewer gifting behavior and Kim and Manoli[21] on transforming sport consumption through AR live streaming provided further insights into viewer engagement and behavior on sports live streaming platforms. Studies further highlight the implications of digital streaming and piracy, the evolution of competitive gaming, and the need for sports leagues to adapt to changing viewer habits and legal landscapes[17,29,33].

At present, academic research on digital platforms for sports events is still in the preliminary stage. It mainly focuses on the research on the integration and presentation of digital technology with various sports event fields. He et al.[34] developed a sports-related public welfare platform, focusing on supporting the needs of individuals who are disabled due to their participation in sports and those with disabilities who aspire to participate in sports activities. Through multi-sensor data fusion algorithms, improved the data collection and analysis speed of the platform.Virtual reality viewing (VRS) is becoming an emerging trend in sports media consumption, as it provides the best experience to maximize user satisfaction.In order to gain a clear understanding of media user experience in VRS, Kim and Ko[35] investigate how media individual, and game factors affect audience streaming experience, and examine the impact of streaming experience on it.

The impact and mechanism of sports event platforms on sports participation. Sports participation refers to the sports activities that users engage in on or through sports event platforms, including watching, commenting, sharing, voting, tipping, purchasing, registering, participating, etc.Sports event platforms can attract and promote user participation in sports by providing rich information, interactive opportunities, motivational means, and convenient services, thereby increasing user satisfaction and loyalty, as well as the social and economic benefits of sports events.

For example, Teare & Taks reviewed literature on the impact of sports events on sports participation, summarized the types, factors, mechanisms, and methods and indicators of impact assessment of sports events on sports participation, as well as the research gaps and challenges in the impact of sports events on sports participation[36]. A successful event platforms needs to invest more resources, pure text reporting has become the opportunity and challenge of media development, video presentation is more and more popular, with the help of telematics and virtual reality technology, the production, distribution and reception of the product is no longer limited to a specific physical space, which enriches the fans' viewing samples[37]. In the operation and industry ecology of sports event platforms, the enhancement of the user experience of can be constrained by the original sports event communication ecology, business expansion, and the offline operation mode of sports events. However, the academic community still needs to conduct more in-depth research and exploration to obtain more comprehensive theoretical guidance and methodological support on the specific issues of how to enhance the audience's online viewing experience on sports event platforms. Therefore, to find the key elements affecting the enhancement of user experience and seek a breakthrough, through the research based on theories of user experience theory, technology acceptance model and information construction, aiming at exploring the influencing factors of user experience on digital platforms of sports events as well as targeted enhancement strategies, which is of great practical significance in promoting the formation of a development orientation of digital platforms of sports events with a focus on viewers' perspectives.

Theory selection and questionnaire design

User experience theory

User Experience (UX) encompasses all the feelings and experiences that a user has when interacting with a product, system, or service.The ISO 9241 − 210 standard defines UX as "the perceptions and reactions that a person has through the use or anticipated use of a product, system, or service[38]. This definition emphasizes that UX involves not only the functionality and usability of a product, but also the emotional responses and psychological feelings of the user. In the field of UX design, The Elements of User Experience, a five-element model proposed by Jesse James Garrett, provides a systematic framework divided into five tiers. The first layer is the strategy layer, which focuses on defining the product's goals and user needs. The second layer is the scope layer, which defines the functionality and content requirements of the product. The third layer is the structure layer, which designs the information architecture and interaction structure. The fourth layer is the framework layer, which plans the interface layout and navigation system. Finally, there is the presentation layer, which realizes the visual design and sensory experience. This model ensures that UX design meets both user needs and business objectives through a layer-by-layer approach[39].

Information Construction Theory is a theory of information organization and management which was originally proposed by American Richard Saul Wurman in 1975. The main purpose of information construction theory is to help users to mine and manage information by designing sub-systems such as organization, labeling, searching and navigation so as to satisfy users' information needs[40]. The information construction theory is particularly important for modern sports event platforms, where effective content awareness is crucial to the success of the platform.

The user acceptance model is mainly based on the rational behavior theory, which aims to explain why users adopt the platform. The Technology Acceptance Model (TAM) was proposed by Davis in 1989, aiming to explain and predict users' acceptance and usage behavior of new technologies. The model is based on two core concepts: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Perceived Usefulness refers to the degree to which users believe that using a technology will improve their job performance, while Perceived Ease of Use refers to the degree to which users perceive the technology to be less difficult to use.The TAM model works through the interaction of these two factors to influence users' attitudes and intentions to use, which in turn determines the actual application of the technology[41].

Model construction ideas

Based on user experience research, this study combines the technology acceptance model, information construction theory and user experience wheel model to construct a model of the influencing factors of the user experience of sports event platforms. The model extracts the corresponding elements and their interrelationships from the user experience wheel model to form a basic framework. In order to enhance user experience, the model is divided into six levels in the horizontal dimension, and the corresponding underlying influencing factors are selected. Taking Tencent Sports Platform as a case study, we analyzed the questionnaire survey and data, and conducted statistical analysis using SPSS software, including reliability and validity assessment, exploratory factor analysis and regression analysis. We extracted public factors based on the size of the eigenvalues, determined the dimensions and elements of the model, and finally constructed a complete influence factor model.

Extraction of influential factors on user experience of sports event platforms

Inspired by the User experience Hive Theory, Magnus Revang designed the User Experience Wheel to provide a structured framework for setting and achieving user experience design goals[42]. The User Experience Wheel model comprises six fundamental elements: Findability, Accessibility, Desirability, Usability, Credibility and Usefulness. There are also 5 specific sub-elements under each element that describe in detail the specific requirements of each element. The 30 influencing factors proposed in the UX Wheel model are listed in Fig. 1.

Based on the above theoretical foundation, combined with relevant user experience metrics questionnaire[6,10,15], the user experience elements applicable to sports event platforms can be screened out. Based on these elements, their influencing factors can also be counted and categorized, so as to list the specific and targeted elements, as shown in Table 1.

Based on the UX elements framework and the above theoretical structure, the overall construction of a sports event platforms can be categorized into the following influencing factor dimensions. These dimensions correspond to the construction process of the sports event platforms from the concept creation stage to the specific development and platform page design. For the different elements under each influencing factor dimension, according to the specific interpretation of its variables and the selection and arrangement of the elements in the user experience wheel model, combined with the characteristics of the sports event platforms, based on the technology acceptance model, the information construction theory, and the user experience wheel model, the user experience influencing factor model of the sports event platform is constructed, as shown in Fig. 2.

According to the relevant theoretical analysis, the variables in this model are defined as shown in Table 2:

Design of the questionnaire

Arnie Lund developed a questionnaire designed to evaluate the effectiveness, satisfaction, usability, and learnability of user experiences[43]. The questionnaire consisted of basic information about the respondents and the factors influencing the user experience of the sports event platforms. Positive descriptions were required for each rating item, and users were asked to indicate the level of agreement on a Likert scale scale. The USE ease of use (ease of use,) questionnaire was utilized in the influencing factors section of the survey. This questionnaire asked respondents to select their level of agreement with each item's description on a 5-point Likert scale, where "1" indicates no influence and "5" indicates strong influence. A pre-survey was conducted in this study by posting the questionnaire on three platforms: questionnaire star, WeChat and Weibo. Data statistics and analysis of the distributed questionnaires were carried out by using SPSS 22.0 statistical software, and feedback and modifications were made based on the results of common degree analysis and principal component analysis. Finally, a formal questionnaire survey was conducted. In the questionnaire, the questionnaire topics corresponded to the influencing factors and their measurement dimensions one by one, as shown in Table 3 below:

Findings

After obtaining approval from the Institutional Review Committee for the detailed research plan and survey questionnaire project, This survey used online channels for questionnaire distribution, including WeChat, Weibo and QuestionStar website. The questionnaire was distributed from September 5, 2022 to September 5, 2023.In order to improve the reliability of the questionnaire results, we conducted targeted advertising for people who use the sports event platform. When screening the answer results, we excluded questionnaires with regular distribution and those with answer times shorter than 1 min. A total of 312 valid questionnaires were collected,

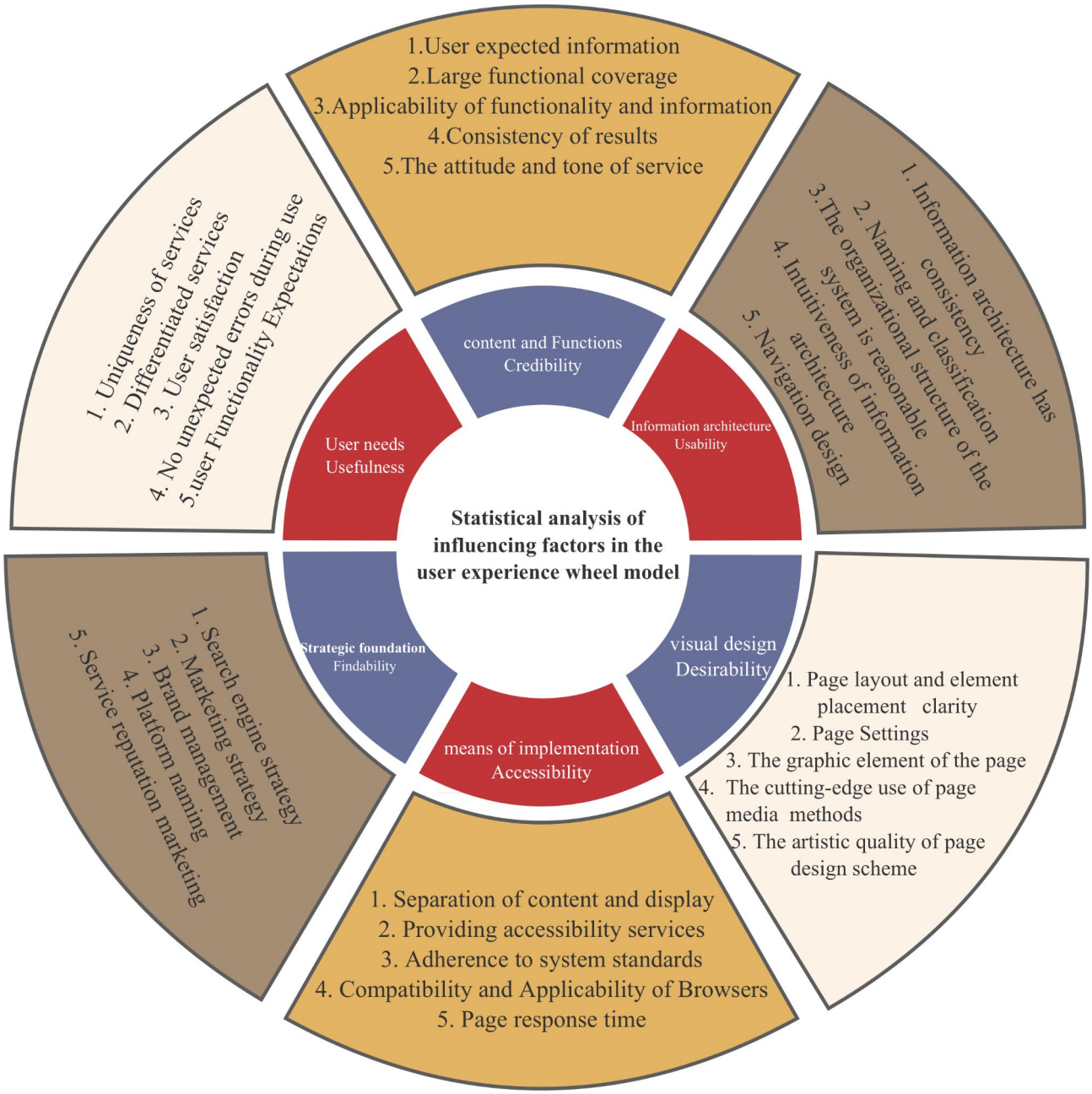

Fig. 1. Statistics of influencing factors of the user experience wheel model.Source: Magnus, R. (2007). The User Experience Wheel. Obtained from: https://userexperienceproject.blogspot.com/2007/04/user-experience-wheel.html.

meeting the intended sample size. All data statistics and analysis are based on these valid questionnaires. Please refer to Table 4 for the basic information of the survey respondents:

Table 4 collects the basic information of the respondents. Among the respondents, 70 of them are male, accounting for 22.44%%, and 242 of them are female, accounting for 77.56%, which demonstrates large differences. In terms of the age distribution, most respondents are young and middle aged people under the age of 30; This study was set to consider using the Tencent Sports Event Platforms more than five times per month in the past year as regular use, three times to five per month times as occasional use, less than three times a month as infrequent use. As for the frequency of use, most of the respondents use it occasionally or seldom use it, and people who never use it account for 15.38%. The questionaire was given to 312 persons and 48 of them suggested that they have never used Tencent Sports Events Platform. To ensure that they could provide feedback based on actual usage experience, we included an application link during the survey. Participants first experienced the Tencent Sports Event Platform in its entirety through this link before taking the survey. This methodology was designed to ensure the authenticity and validity of the data, so that participants' feedback was based on their actual usage experience.

Factor	Influence properties	User experience wheel correspondence	Dimension of measurement	Explicit explanation
User functional requirements	Usefulness	User needs	Basic Functions	Expectations and demands for products and service
Service function coverage	Credibility	Content and Functions	Consistency in the content of information resources	Satisfy users' expectations for information, provide diverse functions, and ensure that the functions and information content meet actual needs
Brand promotion marketing	Findability	Strategic foundation	Punch	The visibility of the platform in search engines, the implementation of diversified marketing strategies, and the expansion of brand influence through active word-of-mouth communication
Information organizational structure	Usability	Information architecture	Information design	The platform has a consistent and intuitive information architecture and a reasonable organizational structure, allowing users to quickly find the information they need and enhance the overall user experience
Technology applicability breadth	Accessibility	Means of implementation	Accessibility	The platform maintains stable and easy-to-use-high-quality experience across different devices and user groups by providing accessible services, adhering to system standards, and ensuring browser compatibility
Visual design experience	Desirability	Visual design	Multimedia usage	The platform page layout and element placement are clear and reasonable, using advanced media technology, combined with artistic design schemes, to provide users with an intuitive and attractive visual experience

Table 1. Extracted factors influencing user experience on sports event platforms with explanations

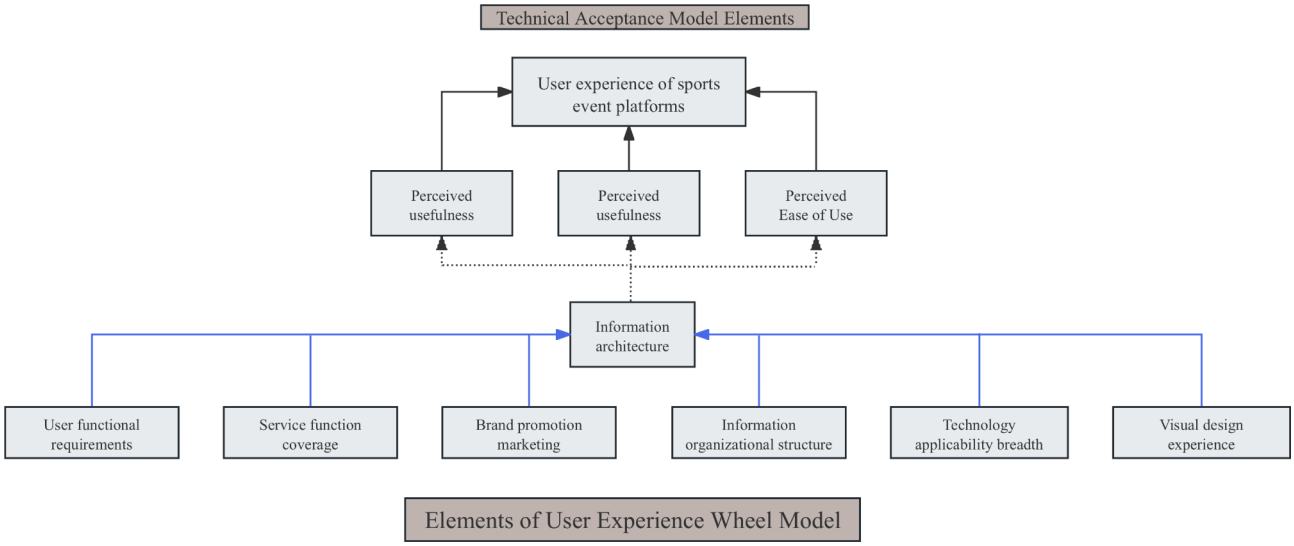

Fig. 2. Model assumptions of user experience influencing factors of sports digital platforms.

Reliability test - Cronbach's alpha coefficient

In this paper, the Cronbach coefficient, a commonly used reliability test in the Likert attitude scale method, was chosen. As shown in Table 5, the test results show that the overall Cronbach's coefficient of this questionnaire is 0.961 which is greater than 0.9, so the overall measurement of this questionnaire is very reliable and passed the reliability test. In addition, in terms of "CITC value", the CITC values of the analyzed items are all greater than 0.4, which indicates that there is a good correlation between the analyzed items, and also indicates that the level of reliability is very good. In summary, the reliability coefficient value of the research data is higher than 0.9, which comprehensively indicates that the data reliability is of high quality and can be used for further analysis.

Validity tests - KMO and Bartlett's sphericity tests

In order to test whether the questions in the questionnaire effectively express the connotative information of the research variables and to achieve the purpose of verifying the validity of the questionnaire, it is necessary to check the consistency of the measurement results with the content of the research when conducting the questionnaire.

In this scheme, some significant factors are extracted by factor analysis of each influencing factor or variable based on the scores of the survey results, and the questions are categorized with the help of the loadings of each variable on the factors. When different variables under the same theoretical concept can fall on the same factor, it means that the questionnaire used has a good structural validity.

Before conducting factor analysis, the data must be tested for suitability for factor analysis. For this purpose, the variables need to be tested using KMO and Bartlett's test of sphericity. The test results are shown in Table 6 below, which shows that: the KMO is 0.969, which is greater than 0.6 and meets the prerequisite requirements

Rationale or basis	Variable name	Variable Description
User experience wheel model	User functional requirements	Basic expectations and actual needs of users for various functions when using sports event platforms
	Service function coverage	Satisfy user' expectations for information, provide diverse functions, and ensure that the functions and information content meet actual needs
	Brand promotion marketing	The visibility of the platform in search engines, the implementation of diversified marketing strategies, and the expansion of brand influence through active word-of-mouth communication
	Information organizational structure	The platform has a consistent and intuitive information architecture and a reasonable organizational structure, allowing users to quickly find the information they need and enhance the overall user experience
	Visual design experience	The platform page layout and element placement are clear and reasonable, using advanced media technology combined with artistic design schemes to provide users with intuitive and attractive visial experiences
	Technology applicability breadth	The platform maintains a stable and easy-to-use high-quality experience across different devices and user groups by providing accessible services, adhering to system standards, and ensuring browser compatibility
Information construction theory	Information architecture	Well-designed organization, presentation, navigation and search systems that effectively help people discover and manage high-quality information
Technology Acceptance Model	Perceived usefulness	The degree of effectiveness of users' access to sport event resources and service functions when using the system
	Perceived Ease of Use	Learning and labor-saving for the user when using the system
User experience		The purely subjective psychological experience formed when acquiring and using information products or services, this experience is the user's subjective perception.

Table 2. Definitions of variables in the model.

User functional requirements	Basic functions	The platform provides differentiated live streaming, date analysis, and interactive experience services. The service quality, functional experience, and content of the platform meet the recognition of users. The search system provided by the Platform covered most of my questions in the field of "sports events" with a high level of search results and integration.
Service function coverage	Consistency in the content of information resources	The platform provides accurate and comprehensive event related information in a timely and reliable manner. The platform provides a rich and diverse range of sports event resources, including live recording and other forms. The carious functions and information provided by the platform can meet actual needs, ensuring that the functions are easy to use, the information is accurate and relevant
Information organizational structure	Information design	The Platform website navigation design labels are very logical and actionable. The navigation bar labels have consistency with the pre-used functions. The information layout design of the platform is clear at glance, with distinct levels.
Technology applicability breadth	Accessibility	The platform's website provides an accessible service model for the visually impaired and hearing impaired. The platform follows industry technical specifications and design standards to ensure stable and safe operation. The platform can maintain consistent performance across multiple browsers and adapt to different devices.
Visual design experience	Multimedia usage	Clear distribution of platform text, images, and other elements' positions. The Platform's website is relatively new in its utilization of emerging multimedia. Platform page design is beautiful and elegant, with coordinated color matching and exquisite graphics.
Brand promotion marketing	Punch	Platform related content is easier for users to find. Publicity to increase the visibility of the platform in different channels. The platform focuses on user feedback and service quality, actively creating a good reputation and brand credibility.

Table 3. Correspondence between the questionnaire questions and the measurement dimensions of the influencing factors.

Basic information	Options (as in computer software settings)	Number	Frequency (%)
Distinguishing between the sexes	Male	70	22.44
	Women	242	77.56
Age distribution	Under 18	10	3.21
	19–30	256	82.05
	31–40	16	5.13
	41–50	23	7.37
	51 years and over	7	2.24
Frequency of use	Regular use	67	21.47
	Occasional use	114	36.54
	Seldom used	83	26.60
	Never used	48	15.38

Table 4. Statistics of basic information of respondents.

Item	Correction Item Total Correlation (CITC)	Deleted alpha coefficients for item	Cronbach's alpha coefficient
Service word-of-mouth marketingof services	0.653	0.960	0.961
User satisfaction	0.834	0.958	
Uniqueness of services	0.713	0.959	
Service function coverage	0.707	0.959	
User Functional expectations	0.749	0.959	
Cutting-edge use of media tools on the page	0.701	0.959	
User expected information	0.891	0.957	
Browser compatibility and suitability	0.805	0.958	
Compliance with system standards	0.783	0.958	
Rationalization of the organizational structure of the system	0.772	0.958	
The artistry of the page design solution	0.734	0.959	
Consistency in information architecture	0.786	0.958	
Search engine strategy	0.817	0.958	
Intuitiveness of information architecture	0.686	0.960	
Clarity of page layout and placement of page element	0.704	0.959	
Providing accessibility services	0.744	0.959	
Marketing strategy	0.668	0.960	
Applicability of functions and information	0.687	0.960	
Standardized Cronbach alpha coefficient: 0.961			

Table 5. Cronbach's confidence analysis.

KMO value	0.969	
Bartlett's spherical test	Approximate cardinality	4895.501
	df	153
	p-value	0.000

Table 6. KMO and Bartlett's test of sphericity.

for factor analysis, implying that the data can be used for the factor analysis study, and the data passed the Bartlett's sphericity test ($p < 0.05$, the result is significant), which indicates that the research data is suitable for factor analysis.

Factor analysis

Factor analysis is a multivariate statistical analysis method that extracts common factors from a group of variables by dimensionality reduction. To perform factor analysis, firstly, the data need to be factor analyzed through the extraction of principal components, and the factors with eigenvalues greater than 1 are extracted to get the correlation matrix results. By analyzing the common degree of each variable, the results obtained that the variance of the common factor of each variable is greater than the critical value of 0.5, which indicates that the information of each question item can be effectively extracted, and thus further common factor extraction and factor rotation can be carried out.

Table 7 Based on the above table, it can be seen that a total of 2 factors were extracted from the factor analysis and the eigenroot values of these 2 factors were greater than 1. After that, factor rotation of the data was adopted using the maximum variance rotation method in order to find out the correspondence between the factors and the study items. After the rotation, the variance explained for these 2 factors were 35.783% and 34.796% respectively and the cumulative variance explained after the rotation was 70.579%. In Table 8, the information extraction of the factors for the study items and the correspondence between the factors and the study items can be seen. It is worth noting that all the research items correspond to a common degree value higher than 0.4, which means that there is a strong correlation between the research items and the factors, and thus the factors can extract information effectively.

Table 8 shows that Factor 1 has a high degree of explanation for the nine variables, which are, intuitiveness of information architecture, user expected information, uniqueness of services, rationalization of the organizational structure of the system, user statisfaction, service function coverage, user functionality expectations, applicability of functionality and information, and consistency in information architecture, respectively. Corresponding to the user experience wheel model, Factor 1 covers the content and function elements, user needs elements, and information architecture elements of the hypothesized model variable elements. The three elements simultaneously reflect the functional effectiveness of the user-oriented services of the sports event platforms, Therefore, factor 1 is named as user service functions effective elements.

Factor 2 also has a high degree of explanation for the nine variables, which are, search engine strategy, providing accessibility services, cutting-edge use of media tools on the page, clarity of page layout and placement

Factor number	Feature roots			Explanatory rate of variance before rotation			Post-rotation variance explained		
	Characteristic root	Variance explained %	Cumulative %	Characteristic root	Variance explained %	Cumulative %	Characteristic root	Variance explained %	Cumulative %
1	10.922	60.680	60.680	10.922	60.680	60.680	6.441	35.783	35.783
2	1.782	9.898	70.579	1.782	9.898	70.579	6.263	34.796	70.579
3	0.516	2.867	73.445	-	-	-	-	-	-
4	0.507	2.815	76.261	-	-	-	-	-	-
5	0.464	2.578	78.838	-	-	-	-	-	-
6	0.451	2.504	81.342	-	-	-	-	-	-
7	0.415	2.305	83.647	-	-	-	-	-	-
8	0.396	2.201	85.848	-	-	-	-	-	-
9	0.363	2.016	87.864	-	-	-	-	-	-
10	0.359	1.995	89.858	-	-	-	-	-	-
11	0.322	1.790	91.648	-	-	-	-	-	-
12	0.300	1.668	93.316	-	-	-	-	-	-
13	0.279	1.551	94.867	-	-	-	-	-	-
14	0.236	1.311	96.178	-	-	-	-	-	-
15	0.226	1.254	97.433	-	-	-	-	-	-
16	0.205	1.140	98.573	-	-	-	-	-	-
17	0.164	0.913	99.486	-	-	-	-	-	-
18	0.093	0.514	100.000	-	-	-	-	-	-

Table 7. Table of variance explained.

Item	Factor loading coefficients		Commonality (common factor variance)
	Factor 1	Factor 2	
Applicability of functions and information	0.739	0.283	0.627
Service function coverage	0.776	0.273	0.677
User functionality expectations	0.753	0.351	0.691
User satisfaction	0.784	0.429	0.799
User expected information	0.810	0.477	0.884
Uniqueness of services	0.807	0.251	0.715
Compliance with system standards	0.390	0.754	0.721
Rationalization of the organizational structure of the system	0.802	0.336	0.756
Intuitiveness of information architecture	0.822	0.203	0.716
Consistency in information architecture	0.684	0.470	0.689
The artistry of the page design solution	0.454	0.628	0.600
Browser compatibility and suitability	0.431	0.743	0.737
Cutting-edge use of media tools on the page	0.272	0.766	0.660
Providing accessibility services	0.278	0.813	0.738
Search engine strategy	0.356	0.831	0.818
Clarity of page layout and placement of page element	0.281	0.760	0.657
Marketing strategy	0.247	0.747	0.620
Service word-of-mouth marketingof services	0.234	0.739	0.600

Table 8. Table of factor loading coefficients after rotation.

of page element, compliance with system standards, browser compatibility and suitability, marketing strategy, service word-of-mouth marketing of services, and the artistry of the page design solution. Corresponding to the user experience wheel model, which is the same as that of the hypothesized model in this chapter. Factor 2 covers the strategic foundation element, means of implementation element and visual design element of the hypothetical model variable elements in this chapter. Combined with the attributes of the sports event platform, the three elements reflect the degree of realization of the brand strategy and design attributes of the sports event platform at the same time, Therefore, factor 2 is named as brand design implementation elements.

Multiple regression modeling and analysis

In this section, it is necessary to use factor analysis for weighting. This involves creating a matrix of component score coefficients, which will then be used to establish the relationship equations between the factors and the study items, as shown in Table 9.

Before calculating the factor scores, Service functional coverage is assigned as X1, Uniqueness of services is assigned as X2, User functional expectations is assigned as X3, User expected information is assigned as X4, Intuitiveness of information architecture is assigned as X5, Compliance with system standards is assigned as X6, Rationalization of the organizational structure of the system is assigned as X7, Browser compatibility and suitability is assigned as X8, Consistency in information architecture is assigned as X9, The artistry of the page design solution is assigned as X10, Cutting-edge use of media tools on the page is assigned as X11, Search engine strategy is assigned as X12, Clarity of page layout and placement of page element is assigned as X13, Marketing strategy is assigned as X14, Providing accessibility services is assigned as X15, Service word-of-mouth marketingof services is assigned as X16, Applicability of functions and information is assigned as X17, and User satisfaction is assigned as X18. From the table, the corresponding factor score 1 and factor score 2 are:

$$\begin{aligned} F1 =& 0.186 \times X1 + 0.201 \times X2 + 0.160 \times X3 + 0.149 \times X4 + 0.217 \times X5 \\ & - 0.052 \times X6 + 0.179 \times X7 - 0.036 \times X8 + 0.110 \times X9 - 0.001 \times X10 \\ & - 0.092 \times X11 - 0.081 \times X12 - 0.088 \times X13 - 0.096 \times X14 \\ & - 0.101 \times X15 - \ 0.098 \times X16 + 0.171 \times X17 + 0.151 \times X18 \\ F2 =& - 0.092 \times X1 - 0.106 \times X2 - 0.061 \times X3 - 0.032 \times X4 \\ & - 0.126 \times X5 + 0.158 \times X6 - 0.077 \times X7 + 0.145 \times X8 \\ & - 0.005 \times X9 + 0.101 \times X10 + 0.189 \times X11 + 0.192 \times X12 \\ & + 0.186 \times X13 + 0.190 \times X14 + 0.204 \times X15 \\ & + \ 0.190 \times X16 - 0.008 \times X17 - 0.042 \times X18 \end{aligned}$$

Among them, Factor 1 and Factor 2 represent service functions effective elements and brand design implementation elements, respectively.

The composite score is calculated by accumulating the variance explained after rotation, i.e., the product of normalization and factor scores. The formula for the current data is: F = (35.783%F1 + 34.796%F2)/70.579% =0.507F1 + 0.493F2.

From this model, it can be concluded that both factor 1 and factor 2 are positively correlated for user experience, and that, all other things being equal, for every unit of improvement in factor 1, user experience increases by 0.507 units; and for every unit of improvement in factor 2, user experience increases by 0.493 units.

Analysis of factors influencing user experience on sports event platforms

From the previous factor analysis and multiple regression model analysis, it can be seen that the modeling assumptions proposed in the initial theoretical model have been supported by the data to a certain extent, and through the validation, the results of the specific modeling assumption study are shown in Fig. 3.

Item	Ingredients	
	Component 1	Component 2
Service functional coverage	0.186	− 0.092
Uniqueness of services	0.201	− 0.106
User functional Expectations	0.160	− 0.061
User expected information	0.149	− 0.032
Intuitiveness of information architecture	0.217	− 0.126
Compliance with system standards	− 0.052	0.158
Rationalization of the organizational structure of the system	0.179	− 0.077
Browser compatibility and suitability	− 0.036	0.145
Consistency in information architecture	0.110	− 0.005
The artistry of the page design solution	− 0.001	0.101
Cutting-edge use of media tools on the page	− 0.092	0.189
Search engine strategy	− 0.081	0.192
Clarity of page layout and placement of page element	− 0.088	0.186
Marketing strategy	− 0.096	0.190
Providing accessibility services	− 0.101	0.204
Service word-of-mouth marketingof services	− 0.098	0.190
Applicability of functions and information	0.171	− 0.08
User satisfaction	0.151	− 0.042

Table 9. Matrix of component score coefficients.

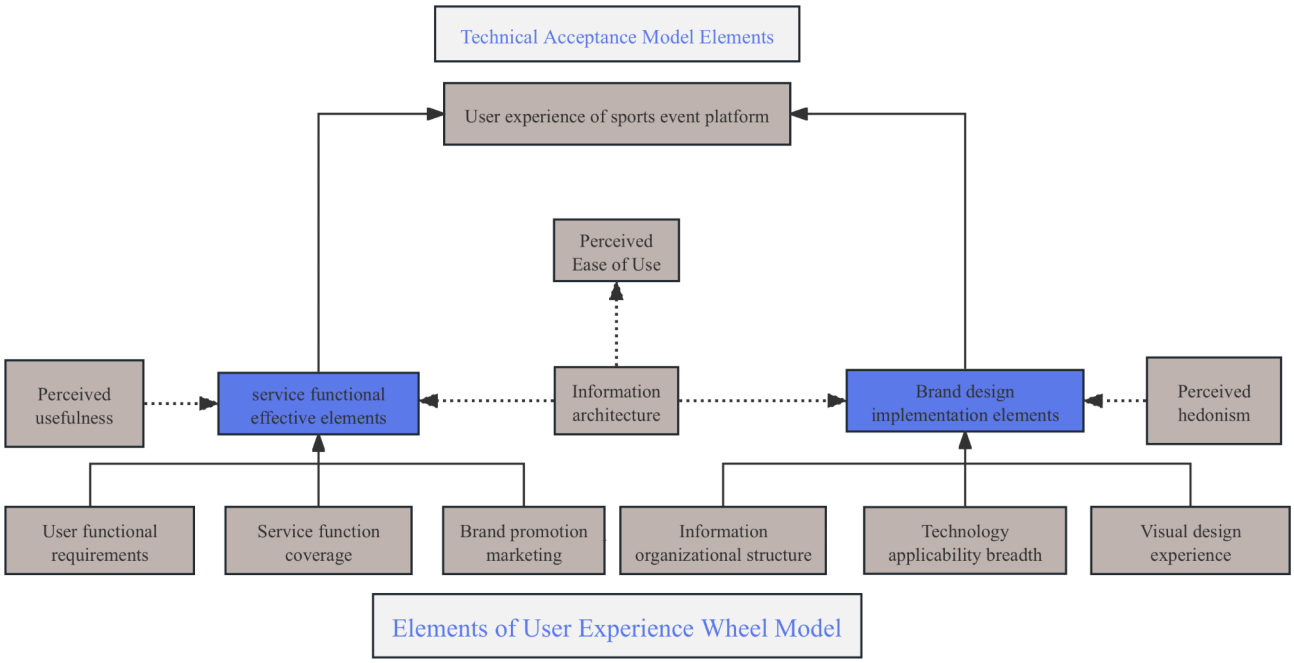

Fig. 3. Adjustment of the model of user experience influencing factors on platforms for sports events.

Through factor analysis, the six types of influencing elements in the user experience wheel model are assembled in two factors, and these two factors have a positive influence on the improvement of user experience through multiple regression analysis. That is to say, the content and function elements, user needs elements and information architecture elements are gathered in the service functions effective elements, and the platform brand strategy elements, art visual design elements and means of implementation elements are gathered in the brand design implementation elements.

In the factor analysis, it can be learned that the consistency in information architecture, as one of the key sub-elements of the information architecture exhibits strong correlation with the two factors at the same time, and the information architecture is directly related to the information construction variables in the hypothetical model corresponding to the information construction theory, that is to say, the information construction is the basic element to support the realization of the two factors, in line with the theoretical basis of the model assumptions.

According to the multiple regressivity analysis, it can be seen that improving the service functions effective elements from the user perspective and improving the brand design implementation elements from the perspective of the sports event platforms can both form a more obvious positive impact on user experience, and the impact of the value of the service functions effective elements is stronger than that of the brand design implementation elements. This paper hypothesizes that the sports event platforms user experience influence factor model to get the theoretical support of the technology acceptance model, the information construction theory and the user experience wheel model, and the model hypotheses proposed by the study are verified.

Discussion

The main objective of Information Construction Theory is to design systems, including subsystems such as organization, identification, search, and navigation, to help users find and manage information to meet their needs[44]. By providing clear architecture and consistency, users can more effectively locate content, thereby improving the user experience[45]. In the context of sports event platforms, this theory emphasizes combining functional and informational elements, allowing for efficient navigation through page headings and descriptions[46]. This directly relates to the "perceived ease of use" attribute of the Technology Acceptance Model (TAM)[47]. Optimizing information architecture and search systems can enhance content access efficiency, ultimately improving user satisfaction[48].

The UX Wheel Model suggests that users seek both tangible and intangible value from products or services[42]. A positive user experience benefits both consumers and producers by meeting user needs and achieving platform goals[49]. Based on the user experience wheel theory, the user experience of sports event platforms can be optimized through six dimensions: usefulness, credibility, accessibility, findability, usability, and desirability. The platform meets user needs through rich event information and interactive functions, maintains high realiability at critical moments, and provides a simple and intuitive interface to enhance usability and convenience. At the same time, vivid visual design and real-time interaction are used to increase the sense of pleasure, and deep analysis and personalized recommendations are used to enhance users' participationin competitions and emotional connections. This multi-dimensional optimization not only meets the basic needs of users, but also enhances their overall experience and loyalty[11] .

The technology acceptance model continuously strengthens organizational performance by constructing a user information system acceptance system and clarifying the factors affecting users' intention to accept the sports event platform[50]. This model suggests that by influencing users' [perception of usefulness and ease of use, their attitudes and behavioral intentions can be changed. In addition, the model emphasizes the influence of external variables on user behavior. These influences relate to actual platform usage[51]. In TAM's extended model, perceived hedonic was added as a new variable to explain users' positive attitude towards technology when experiencing pleasure. In this article, perceived hedonic is similar to the technological elements of platform strategy.

The increased value of service functions effective elements has a significant positive impact on user experience, and user functional requirements factor examines the platform usefulness dimension. User hope to quickly and accurately obtain event information, and the platform needs to provide real-time updateed content to meet this core requirement. In addition, the sports event platforms should provide online differentiated services for users, which can help meet the personalized and diversified needs of user experience and enhance the user's stickiness to the platform. Sports event platforms should continuously improve the credibility and richness of its content and functional elements[52].

This involves continuously updating resources with offline events for users, providing effective event consulting services and functional services with a wide coverage of event content, reducing users' doubts and confusion in the process of use, and allowing users to focus more on enjoying the experience of sports events provided by the platform, so as to provide users with a better experience of use[53]. Sports Event Platforms need to enhance the usefulness of the services, features and socialization needs of their users. This element is directly related to the perceived usefulness in the technology acceptance model, which covers that the content retrieval system provided by the platform for sports events can solve most of the expected problems of users, and the retrieval results and the degree of integration are high, the platform website can borrow digital technologies such as algorithms and artificial intelligence, etc., and provide users who are watching the matches at with the functions of sharing the matches at, and exchanging information among peers, and so on[54,55].

The improvement of brand design implementation elements has a significant positive impact on user experience. As a communication medium, the sports event platforms should synchronously display the brand image and enhance viewability through elements like interface design, color schemes, icon matching, and visual elements[56]. This aligns with the psychological expectations of users, where a well-designed platform with cohesive branding can strengthen brand perception and enhance user experience[57]. The integration of brand strategy and visual design elements, such as page layout, color schemes, and graphic styles, is essential for creating a positive user experience that reinforces brand identity.Research has shown that platforms that focus on the synergistic construction of brand strategy and visual art can significantly enhance users' emotional connection to the brand, leading to improved user engagement and satisfaction[13]. Specifically, the effective use of visual elements, multimedia, and logical page design strengthens both the aesthetic appeal and functional usability of the platform, contributing to a seamless user experience. Differentiation between page levels and sections can further ensure clarity and prevent user confusion, thereby enhancing the overall usability and experience of the platform.

Information architecture has a significant positive impact on user experience, and platforms need to pay particular attention to strengthening the usability of information architecture elements[58]. Information architecture refers to the organization, classification, and navigation system design of platform content, with the core of improving user usability and ease of use through optimizing information structure and interaction paths[59]. On sports event platforms, this is reflected in presenting core content such as live broadcasts, schedule arrangements, core statistics, team and athlete data in a hierarchical and modular manner, enabling users to quickly understand the content layout and find the required information.

In terms of information architecture, the sports event platforms can carry out reasonable design of architecture and proper classification of information according to specific use functions, especially the need to ensure that website navigation design labels are intuitive and operable, while maintaining consistency between navigation labels and their respective functions[60]. Only when the functions corresponding to the text or picture elements on the platform page are intuitive and learnable can users get started easily, completing their intended operations more quickly. This intuitiveness contributes to an increase in the frequency of user visits and ultimately improves platform activity.

With the help of the Technology Acceptance Model, Information Construction Theory, and User Experience Wheel Model, this research has successfully identified relevant elements and formulated an influencing factor model based on these conceptual relationships. Through the use of questionnaire surveys and data analysis, the suitability of these elements for digital sports event platforms was explored, and their interrelationships were analyzed. Consequently, two key influencing factors were extracted: the service functions effective elements and brand design implementation elements, both of which confirm and enhance the influencing factor model[61]. These findings have significant practical implications for improving user experience on sports event platforms and contribute to the development of a more user-centered and strategically effective platform[49].

Limitations and future studies

Despite the comprehensive nature of this study on the influence of sports event platforms on user experience, several limitations should be acknowledged. First, the research is primarily based on Tencent Sports, which may limit the generalizability of the findings to other sports event platforms with different features, user bases, and cultural contexts. Second, the study relies on self-reported data from surveys, which can introduce biases such as social desirability bias and recall bias. Third, the rapid technological advancements in digital platforms mean that the study's findings may quickly become outdated as new features and technologies are introduced.

Future research should aim to address these limitations by adopting a more comparative approach, examining multiple sports event platforms across different regions and cultures to enhance the generalizability of the findings. Longitudinal studies could provide deeper insights into how user experience evolves with continuous use and how emerging technologies influence this evolution. Additionally, experimental designs could be employed to isolate the effects of specific platform features on user experience. Exploring the role of advanced technologies, such as artificial intelligence and virtual reality, in enhancing user engagement and satisfaction on sports event platforms would also be a valuable avenue for future research. Finally, incorporating qualitative methods, such as interviews and focus groups, could provide richer, more nuanced understandings of user experiences and preferences.

Data availability

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation. Interested parties may contact the corresponding author for access to the data.

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Author contributions
Fengwei Gao helped to organize the study, prepared datasets, performed the statistical analysis, and drafted the manuscript. Zhenmiao Niu conducted study design and prepared datasets. Fengjie Qiao, Panpan Yan contributed to study design. Yongzhi Ma contributed to study organization and revision of the manuscript. All authors read and approved the final manuscript.

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Declarations

Competing interests
The authors declare no competing interests.

Informed consent
The individuals taking part in this research manifested their informed permission.

Ethics approval
Research involving humans has been approved by Tsinghua University. Research was conducted in accordance with local legislation and institutional requirements. Participants provided written informed consent to participate in this study.

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