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Investigating Factors Influencing Athletes' Intention to Use Timing and Scoring Systems: A Case Study of the 2023 Track and Field League in Northern China

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Abstract

Purpose: This study explores the factors influencing athletes' satisfaction, and behavioral intention to use the timing and scoring system in 2023 Athletics Association Traditional Sports Programme School Athletics League (North Zone) in China. The seven variables were positive environmental impact, player performance, refereeing, e-service quality, satisfaction, security and behavioral intention. **Research design, data, and methodology:** Questionnaire was distributed to 500 athletes participating in the China 2023 Athletics Association Traditional Sports Programme School Athletics League (North Zone). Sampling methods include purpose sampling, convenience sampling, and stratified sampling. The index of item-objective congruence (IOC) and Cronbach's Alpha pilot test were used to test the validity and reliability of the questionnaire before sending out the questionnaire. Confirmatory factor analysis and structural equation modeling were used to analyze the data, verify the model's fit, and determine the causal relationship between variables. **Result:** The results show that the six hypotheses are supported. Environment, Player performance, Referees, and E-service quality have a significant impact on satisfaction and Satisfaction; Security has a significant impact on behavioral intention. **Conclusions:** The originality of this study is to determine the effectiveness of electronic timing to enhance better satisfaction and behavioral intention, and provide insights for better system improvement.

Keywords : Athletes, Scoring and timing system, Cognition, Satisfaction, Behavioral Intention

JEL Classification Code: E44, F31, F37, G15

1. Introduction

The 2023 Traditional Sports School Track and Field League competition of the Chinese Athletic Association is a sports-level event. The competition is divided into four divisions. The participating units are all traditional national or provincial track and field schools registered with the Chinese Athletic Association. The timing and scoring system were developed by The Fipress Company and formed a series of modern electronic information systems (Shaw, 2022). In 2023, seven provinces participated in the event in the north. The target population for this study is the athletes participating in the China 2023 Athletics Association Traditional Sports Programme School Athletics League (North Zone).

Large-scale sports events usually attract global attention, and thousands or even hundreds of millions participate through TV, the Internet, and other media. This makes sports events a global social focus with a cross-border social impact. Large-scale sports events provide a platform for people from different countries, cultures, and nationalities to communicate and compete in the arena. This helps to promote cultural exchanges and understanding and sometimes even improves international relations. A good social environment is essential for the success of sports technology. Since the 1980s, scholars have paid great

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attention to investigating sporting events (Hover et al., 2016).

The China 2023 Athletics Association traditional sports school track and field league (North District) adopted the timing and scoring system as a large-scale sports event. Timekeeping system: using timers or clocks to measure the time of a specific activity or task accurately. This is very important for mastering time management and ensuring the consistency of course progress. Suitable for all kinds of activities, such as examination time, group discussion, presentation reports, etc. Ensure that students or participants complete the task within the specified time. The system can set up warnings or reminders to help students or participants realize the remaining time and urge them to manage their time better. Some systems can automatically time to reduce the burden on teachers or examiners and provide more accurate time management.

Scoring system: Formulate clear scoring standards to ensure that all students or participants are evaluated consistently and fairly. A grading system is adopted to understand individual performance differences more specifically. Numerical scores, grades, or other symbols may be used. Use tables or scoring tables to list the detailed standards of each evaluation item to make the scoring more interpretable. To improve efficiency, some systems can score automatically through algorithms, especially when objective standards are involved. The system should be able to record the scoring data for comprehensive analysis when necessary and provide more personalized support. When evaluating team projects, the system should support individual and overall performance evaluation.

This study aims to explore the influencing factors of stakeholders' cognition, satisfaction, and behavioral intention to use the timing and scoring system. The researcher measured seven variables by taking the track and field league (North District) of the 2023 traditional sports school of the China Athletics Association as an example. Previous studies have also focused on cognition, satisfaction, and behavioral intention.

Service quality of sports electronic technology products: Service quality of sports electronic technology products is defined as the set of features and capabilities of sports-related electronic goods and services that can fulfill actual or projected demands and refers to how well the service provided meets the requirements of the individuals receiving it (Webb & Thelwell, 2015), and measure of how well the service provided satisfies the requirements of those receiving it (Webb & Thelwell, 2015). Electronic service quality is the fourth major element influencing the broad adoption of sports technology products, which is the availability of funding for their development and marketing. According to the academic literature, intangibility, inseparability, perishability, and variability are the four main features that set service industries apart from other sectors (Iacobucci, 2009).

Satisfaction is a mental condition describing how someone feels about their romantic connections (McKinney, 2002). consumer satisfaction is the positive emotion felt when a need has been met, and it is measured by comparing how the consumer felt before using the product or service to how they felt after using it. Consumer satisfaction is the foundation of brand loyalty (Ha & Stoel, 2012). As the sixth most influential factor, sports operators', players', and referees' satisfaction levels with sports technology products affect how widely they are promoted and used. Customer happiness and service excellence are critical to the success and growth of the sports technology industry (Chen et al., 2006).

Safety refers to using sports electronic technology that negatively impacts the health of players, officials, staff, fans, and anyone involved in the game (Wyld, 2008). The state of a country's scientific and technological safety is a reflection of four facets of national capacity: the first is the ability of the national interest to avoid the threat of foreign scientific and technological advantages and hostile forces and destructive forces by technological means; the second is the national interest to avoid the negative effects of scientific and technological development itself; the third is the ability of the country to maintain national security in the face of scientific and technological development (Cho et al., 2007). Radio Frequency Identification, or RFID, is expected to replace the ubiquitous bar code as the primary means of identifying physical objects in our economy (Herd et al., 2014).

This process revolves around the buyer's choice, which has far-reaching consequences for the process and the buyer's future purchases (Kim et al., 2020). People's behavioral intention (BI) was conceived of as the user's mental readiness before acting (Ajzen, 1991). The sixth crucial aspect influencing the usage and broad promotion of sports technology items is the behavioral intention of the staff, players, and referees of such devices (Kim & Manoli, 2023). The degree of attachment to the brand, relationship quality, and users' loyalty to the brand are essential elements determining users' behavioral intention (BI), and it has been observed that the perception of authenticity is a crucial precondition for brand trust (Portal et al., 2018).

2. Literature Review

2.1 Environmental Impact

Atmosphere is another definition of environment. According to studies conducted by Uhrich and Koenigstorfer (2009) in the fields of environmental psychology and

consumer behavior, the ambiance at large athletic events may significantly affect attendees. The word "atmosphere" is employed here in a purely aesthetic sense rather than its literal meaning of the "mixture of gases surrounding a celestial body" (Kotler, 1973). In common use, "atmosphere" refers to a place's or an event's "emotional background." Moods are the ambiance in the backdrop of experience, as Luomala and Laaksonen (2000) described.

Consequently, comments like "there was a great atmosphere" are often used to assess experiences at restaurants, concerts, and sporting events. Atmosphere research grounded on theory requires first providing a scientific description of the idea and developing a workable definition. We achieve this by considering prior efforts in the marketing literature to define and categorize environment. "environment" was first used in the marketing literature by Kotler (1973), who explained that it meant "the general atmosphere." 'Atmospherics' may be experienced via the five senses: sight, sound, smell, and touch. Kotler (1973) states that the physical environment is often described as "having an atmosphere" as a component inspiring positive emotion. He says that words like "good," "lively," and "depressing" might help describe a place's mood more accurately. Thus, a hypothesis is proposed:

H1: Environmental impact has a significant impact on satisfaction.

2.2 Player Performance

Players' performance is affected by more than just their physical ability and the number of games they have played. Ethical standards in the workplace, maturity, psychological fortitude, openness to change, and personality are also important (Ade et al., 2019). Research shows that a player's personality influences their behavioral performance and predictive ability, which are significantly associated (Hess, 1992). As a result of the COVID-19 epidemic, the NBA could not gather traditional information via training camps, including team combinations, medical tests, interviews, and scouting reports (Kim et al., 2020). Thus, a hypothesis is proposed:

H2: Player performance has a significant impact on satisfaction.

2.3 Referee

Referee: One of the most influential factors in how well a tournament does is the quality of the refereeing, which includes the referee's ethics and professional level. (Webb & Thelwell, 2015).The referee's ability of professional ability relates to the referee's assessment of the outcomes, the rules of competition, and the capacity to regulate the performance; hence, the moral and professional level of the referee has an indisputable bearing on the outcome of the sporting event (Webb & Thelwell, 2015). The referee, like the players on both sides, is a participant in the game's action and, like them, may impact the outcome. Referees, for instance, have been shown to favor the home side in past research (Nevill et al., 2002). Thus, referees are considered part of the game's technical excellence since their work affects both the playing experience and the final score (Louro et al., 2005). Thus, a hypothesis is proposed:

H3: Referees has a significant impact on satisfaction.

2.4 E-Service Quality

Considers quality to measure a product's worth in and of itself (Olshavsky, 1985). *Quality* is a universal standard by which values are evaluated (Holbrook & Corfman, 1981). Like attitude, quality service is a multifaceted measurement. One method of gauging the success of an endeavor is service quality assessment, which is based on the product quality management framework (Parasuraman et al., 1991). Thus, a hypothesis is proposed:

H4: E-service quality has a significant impact on satisfaction.

2.5 Satisfaction

Behavioral intention (BI) is the individual's propensity to act in a certain way depending on one's emotional state, mental state, or judgment of past events (Spears & Singh, 2004). Positive and negative behavioral intentions may be seen in this trend (Ladhari, 2009). The term "favorable behavioral intention" describes the desire to attend sporting activities again and recommend them to others (Zeithaml et al., 1996). Numerous marketing studies have shown that happy customers are more likely to repeat purchases (Kotler & Dupree, 1997). Satisfaction has been shown to strongly correlate with future behavioral intentions to repeat purchases in the sports-viewing literature (Cronin et al., 2000). Thus, a hypothesis is proposed:

H5: Satisfaction has a significant impact on behavioral intention.

2.6 Security

Safety in sports electronics means that users will not suffer any ill effects from using them (Wyld, 2008). This includes players, officials, medical staff, security, broadcasters, and fans. One of the most important elements influencing safety results is the prevalence of a "safety culture" or "safety atmosphere" (Christian et al. , 2009). Customers with a favorable behavioral intention toward a firm are likelier to say nice things about it, suggest it to others, stick with the brand, buy its products, and even pay more for

it (Huang & Zhao, 2020). Some examples of negative behavioral intention (BI) include disparaging comments about the company, leaving to work for a rival, filing formal complaints with outside bodies, and reducing business with the firm (Zeithaml et al., 1996). Individual behavioral intention based on experiencing, thinking, or evaluating events constitutes what is known as behavioral intention (Spears & Singh, 2004). Thus, a hypothesis is proposed:
H6: Security has a significant impact on behavioral intention.

2.7 Behavioral Intention

Behavioral intention (BI) refers to the subjective mental activity and objective physical actions individuals do while looking for, selecting, buying, using, assessing, and getting rid of items and services to satisfy their wants and requirements. The consumer's purchase decision is a multi-step procedure with many interconnected parts. This process revolves around the buyer's choice, which has far-reaching consequences for the process and the buyer's future purchases (Kim & Manoli, 2023)

). People's behavioral intention (BI) was conceived as the user's mental readiness before action (Ajzen, 1991). Ajzen and Fishbein (1980) reflected the likelihood that a single client would use the technological system and the behavioral intention was established. Behavioral intention was thought to be the point at which a person could carry out a certain action (Sripalawat et al., 2011). Behavioral intention is a predisposition to act in a certain way on the person's part (Belanche et al., 2012).

Kim and Manoli (2023) illuminate theory and practice; it is a great resource. The findings provide credence to the notion that customers' attitudes toward halal cosmetics may be predicted by factors including product quality, religious belief, and confidence in the products, all of which can be leveraged to increase repurchase intent and, by extension, brand loyalty. Moreover, the findings demonstrated that customers' buyback intention impacted their perspectives on halal cosmetics and their allegiance to the brands they already know and love.

3. Research Methods and Materials

3.1 Research Framework

Conceptual frameworks are previous research frameworks developed from research. Adapted from three theoretical models, the Technology Acceptance Model (TAM) and the models in Planned Behavior Theory (TPB) are all part of the Unified Theory of Technology Acceptance and Use (UTAUT). This study adopts a six-element conceptual framework. Hair et al. (2013) identified independent factors, mediating variables, and dependent variables. The term "independent variable" refers to any factor outside the study that may potentially affect the "dependent variable" (Clark-Carter, 2010). The conceptual framework of this study is shown in Figure 1.

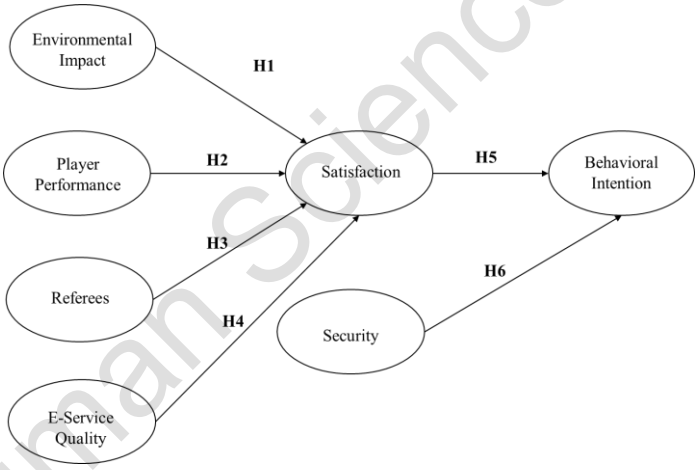

Figure 1: Conceptual Framework

H1: Environmental impact has a significant impact on satisfaction.
H2: Player performance has a significant impact on satisfaction.
H3: Referees has a significant impact on satisfaction.
H4: E-service quality has a significant impact on satisfaction.
H5: Satisfaction has a significant impact on behavioral intention.
H6: Security has a significant impact on behavioral intention.

3.2 Research Methodology

The quantitative investigation method was adopted in this study. In quantitative research, causality can be examined through representative samples and statistical analysis, and generalizable conclusions can be drawn (Creswell, 2014). This survey is well suited for quantitative analysis because it examines many interrelated factors in the context of a single technology application. In addition, using qualitative research is not appropriate because it cannot be easily generalized (Hennink et al., 2020). This study aims to provide information broadly applicable to higher education students in China. Experiments and surveys are the two most common methods for collecting quantitative data (Creswell, 2014). Even if trials provided statistically more reliable results, they could not be used here because it would interfere too much with the study. In this study, it was difficult, if not impossible, to properly control for students' previous e-learning experiences, institutional Settings, and attitudes. A survey may not be

controllable, but it may be constrained demographically and structurally to provide reliable findings (Fowler, 2014). Therefore, it applies to this study.

Before the data collection, The Index of Item-Objective Congruence (IOC) involves three experts, indicating that the item effectively measures what it is intended to measure, contributing to the validity of the assessment. A Cronbach's Alpha in the pilot test (n=50) suggests that the items are reliably measuring the intended construct, enhancing the overall trustworthiness of the test results with the score 0.7 and above (Nunnally & Bernstein, 1994). Afterwards, confirmatory factor analysis and structural equation modeling were used to analyze the data, verify the model's fit, and determine the causal relationship between variables.

3.3 Population and Sample Size

The researcher intends to study the people who competed in the 2023 Chinese Athletics Association (Northern District) and their attitude toward the time-scoring system. The researcher also aims to understand organizers' behavioral intention (BI) and purchase behavior. The sample size calculator using the structural equation model selected the sample size appropriate for this study. The target statistical power level was set to 0.8, the number of latent variables to 7, the number of observable variables to 24, and the probability scale to 0.05. The predicted effect size is 0.2. The minimum sample size of the model structure was determined as 145, the minimum detectable result was estimated at 425, and a suggested minimum sample size was 425. Using this sampling strategy, the study guarantees 500 samples for sufficient statistics to test the proposed hypotheses.

3.4 Sampling Technique

Sampling methods include purpose sampling, convenience sampling, and stratified sampling. When gathering information, questionnaires are among the most used tools; therefore, they have become the primary research method many researchers use in humanities management and other social sciences. The questionnaire may be defined as a survey instrument in which participants respond to the researchers' chosen questions (Check & Schutt, 2012).

Table 1: Sample Units and Sample Size

Sample	Population Size	Proportional Sample Size
The Changping Affiliated School of Beijing Normal University	60	12
Changping District No.2 Middle School, Beijing Municipality	55	11
Changping District Forward School, Beijing Municipality	55	11
Beijing No.80 Middle School	55	11
Beijing No.9 Middle School	55	11
Beijing No.12 Middle School	55	11
Beijing No.161 Middle School Huilongguan School	55	11
Beijing Niulanshan No.1 Middle School Experimental School	55	11
Niulanshan No.1 Middle School, Shunyi, Beijing	55	11
No.1 Middle School, Shunyi District, Beijing Municipality	55	11
Renhe Middle School, Shunyi District, Beijing Municipality	55	11
Yang zhen No.1 Middle School, Shunyi, Beijing	55	11
Hebei Pingshan ishe Middle School	55	11
Hebei Pingshan Middle School	55	11
Hebei Pingshan Middle School	55	11
Hebei Province, Lincheng Middle School	55	11
Hengshui No.1 Middle School	55	11
Shijiazhuang No.22 Middle School	55	11
Shijiazhuang No.27 Middle School	55	11
Shijiazhuang No.1 Middle School	55	11
Xingtai City first Middle School	55	11
Dengkou County the first complete middle school	55	11
Bayan Nur City Sports School	55	11
Baotou City No.6 Middle School	55	11
Baotou No.1 Middle School	55	11
Hohhot No.2 Middle School	60	12
Hohhot Experimental Middle School	55	11
The High School Affiliated to Inner Mongolia Normal University	55	11
Liaohai Foreign Language School affiliated to Beiwai University	50	10
Benxi Manchu Autonomous County No.1 Middle School	50	10
Dalian Hongqi Senior High School	50	10
Fushun Sifang Senior High School	50	10
Shenyang Guangquan School	50	10
Changchun No.87 Middle School	50	10
The No.2 Experimental Middle School of Changchun City	50	10
Changchun No.6 Middle School	50	10
Changchun No.7 Middle School	50	10

Sample	Population Size	Proportional Sample Size
Changchun No.17th Middle School	50	10
Changchun No.5 Middle School	50	10
Changchun No.15 Middle School	50	10
Changchun Automobile Economic and Technological Development Zone No.6 Middle School	50	10
Changchun Experimental Middle School	50	10
High School Attached to Northeast Normal University	50	10
Jilin Province Experimental Middle School	50	10
Jilin City No.1 Middle School	50	10
Jilin City Yaqiao Senior High School	50	10
Jilin Songhuajiang Middle School	50	10
Total	**2500**	**500**

Source: Constructed by author

4. Results and Discussion

4.1 Demographic Information

Performing descriptive statistics before statistical testing can help demonstrate the overall information of the data collection and detect any outliers. The analysis performed on descriptive statistics was on the characteristics of respondents from demographic information and the measurement of scale from data collection. Demographic information collected from respondents was gender, education level, and monthly income. Questionnaires were distributed in 500 sets. The respondents are 314 males and 186 females, representing 62.8 percent and 37.2 percent, respectively.

For the education level, three people's education level is Primary school degree account for 0.6 percent, 27 people's education level is Junior high school degree account for 5.4 percent, 56 people's education level is High school degree account for 11.2 percent, 92 people's education level is Higher vocational education account for 18.4 percent, 78 people's education level is Junior college degree account for 15.6 percent,185 people's education level is University degree account for 37 percent, 46 people's education level is Master's degree account for 9.2 percent, 13 people's education level is Higher vocational education account for 2.6 percent. For monthly income, six people's monthly income is 2000-4000 account for 1.2 percent, six people's monthly income is 4000-6000 account for 1.2 percent, 25 people's monthly income is 6000-8000 account for 5 percent, 109 people's monthly income is 8000-10000 account for 21.8 percent, 126 people's monthly income is 10000-20000 account for 25.2 percent, 105 people's monthly income is 20000-30000 account for 21 percent, 22 people's monthly income is 30000-40000 account for 4.4 percent, 37 people's monthly income is 40000-50000 account for 7.4 percent, 36 people's monthly income is 50000-60000 account for 7.2 percent, 28 people's monthly income is 60,000 and above account for 5.6 percent.

Table 2: Demographic Profile

Demographic and General Data (N=500)		Frequency	Percentage
Gender	Male	314	62.8%
	Female	186	37.2%
Education Level	Was not educated	0	0%
	Primary school degree	3	0.6%
	Junior high school degree	27	5.4%
	High school degree	56	11.2%
	Higher vocational education	92	18.4%
	Junior college degree	78	15.6%
	University degree	185	37%
	Master's degree	46	9.2%
	Graduate student or above	13	2.6%
Monthly Income	below 2,000	0	0%
	2000-4000	6	1.2%
	4000-6000	6	1.2%
	6000-8000	25	5%
	8000-10000	109	21.8%
	10000-20000	126	25.2%
	20000-30000	105	21%
	30000-40000	22	4.4%
	40000-50000	37	7.4%
	50000-60000	36	7.2%
	60,000 and above	28	5.6%

4.2 Confirmatory Factor Analysis (CFA)

In this study, Confirmatory Factor Analysis (CFA) was employed as a statistical method to assess the validity and reliability of the measurement model. CFA is particularly useful for testing the hypothesized factor structure of a set of observed variables, providing a rigorous examination of the relationships between the variables and the latent constructs they are supposed to measure.

The significance and acceptability of the factor loads were evaluated to determine the goodness of fit of the model, as suggested by Hair et al. (2006). Specifically, in Table 3, it was observed that the factor load values exceeded the threshold of 0.30, indicating a robust relationship between the observed variables and their underlying constructs. Additionally, the p-values were less than 0.05, further supporting the statistical significance of the factor loadings. Additionally, a Cronbach's Alpha established the reliability of the data with the score 0.7 and above (Nunnally & Bernstein, 1994).

To establish the reliability of the measurement model, two key criteria were considered. First, the cut-off points for composite reliability were set at values greater than 0.7, indicating a high level of internal consistency among the items within each construct. Second, the cut-off points for average variance extracted were set at values greater than 0.5, signifying that a substantial proportion of the variance in each construct was accounted for by its associated items (Fornell & Larcker, 1981).

Table 3: Confirmatory Factor Analysis Result, Composite Reliability (CR) and Average Variance Extracted (AVE)

Variables	Source of Questionnaire (Measurement Indicator)	No. of Item	Cronbach's Alpha	Factors Loading	CR	AVE
Environmental Impact (EI)	Zhang and Ma (2020)	6	0.891	0.678-0.802	0.580	0.892
Player Performance (PP)	Duan et al. (2019)	3	0.832	0.780-0.797	0.623	0.832
Referee (R)	Biscaia et al. (2013)	3	0.811	0.752-0.776	0.588	0.811
E-service quality (ESQ)	Pearson et al. (2012)	3	0.843	0.786-0.819	0.643	0.844
Satisfaction (SA)	Pearson et al. (2012)	3	0.825	0.752-0.790	0.614	0.827
Behavioral Intention (BI)	Duan et al. (2019)	3	0.827	0.752-0.809	0.616	0.828
Security (S)	Biscaia et al. (2013)	3	0.815	0.724-0.810	0.596	0.816

Hair et al. (2010) found that the confirmation factor analysis (CFA) matrix is widely regarded as the most effective method for evaluating and assessing variable performance. Their study utilized seven criteria to determine the model's fit. These criteria encompass the relative Chi-square (CMIN/df), Goodness of Fit Index (GFI), approximate root mean square error (RMSEA), Comparative Fit Index (CFI), structured fit index (NFI), Tuck-Lewis index (TLI), and Adjusted Goodness of Fit Index (AGFI). The model fit was presented by the acceptable values of goodness-of-fit indices in Table 4. The statistical values of indices were compared to the acceptable criteria. In which, the values were CMIN/DF =1.211, GFI = 0.959, AGFI =0.947, NFI=0.955, IFI = 0.995, TLI =0.994, CFI=0.995, and RMSEA = 0.015.

Table 4: Goodness of Fit for Measurement Model

Fit Index	Acceptable Criteria	Statistical Values
CMIN/DF	<3 (Hair et al., 2006)	1.112
GFI	>0.9 (Arbuckle, 1995)	0.959
AGFI	>0.8 (Sica & Ghisi, 2007)	0.947
NFI	>0.9(Hair et al., 2006)	0.955
IFI	>0.9(Hair et al., 2006)	0.995
TLI	>0.9(Hair et al., 2006)	0.994
CFI	>0.9(Hair et al., 2006)	0.995
RMSEA	<0.08 (Pedroso et al., 2016)	0.015
Model Summary		**Acceptable Model Fit**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = Goodness-of-fit index, AGFI = Adjusted goodness-of-fit index, NFI = Normed fit index, IFI = Incremental Fit Index, TLI = Tucker-Lewis index, CFI = Comparative fit index and RMSEA = Root mean square error of approximation

According to Fornell and Larcker (1981), testing for Fornell and Larcker (1981) proposed a method for assessing discriminant validity by calculating the square root of each average variance extracted (AVE). Their study found that the value of discriminant validity exceeded all inter-construct/factor correlations, indicating strong support for discriminant validity. As a result, both convergent and discriminant validity were established, providing sufficient evidence for construct validity.

Table 5: Discriminant Validity

	EI	PP	R	ESQ	SA	BI	S
EI	**0.762**						
PP	0.281	**0.789**					
R	0.239	0.304	**0.767**				
ESQ	0.351	0.224	0.24	**0.802**			
SA	0.361	0.434	0.393	0.391	**0.784**		
BI	0.441	0.398	0.429	0.506	0.559	**0.785**	
S	0.413	0.346	0.201	0.347	0.444	0.349	**0.772**

Note: The diagonally listed value is the AVE square roots of the variables
Source: Created by the author.

4.3 Structural Equation Model (SEM)

The goodness-of-fit indices were calculated in Table 5.9 based on the structural model. The results of statistical values were CMIN/DF = 2.328, GFI = 0.904, AGFI = 0.881, NFI=0.901, IFI=0.941, TLI = 0.933, CFI = 0.941 and RMSEA=0.052. The fitness of the structural model is confirmed. Therefore, the structural model was modified and recalculated good-of-fit.

Table 6: Goodness of Fit for Structural Model

Index	Acceptable	Statistical Values
CMIN/DF	<3 (Hair et al. 2006)	2.328
GFI	>0.9 (Arbuckle, 1995)	0.904
AGFI	>0.8 (Sica & Ghisi, 2007)	0.881
NFI	>0.9(Hair et al., 2006)	0.901
IFI	>0.9(Hair et al., 2006)	0.941
TLI	>0.9(Hair et al., 2006)	0.933
CFI	>0.9(Hair et al., 2006)	0.941
RMSEA	<0.08 (Pedroso et al., 2016)	0.052
Model Summary		**Acceptable Model Fit**

Remark: CMIN/DF = The ratio of the chi-square value to degree of freedom, GFI = Goodness-of-fit index, AGFI = Adjusted goodness-of-fit index, NFI = Normed fit index, IFI = Incremental Fit Index, TLI = Tucker-Lewis index, CFI = Comparative fit index and RMSEA = Root mean square error of approximation

4.4 Research Hypothesis Testing Result

The correlation magnitude among the independent and dependent variables proposed in the hypothesis is measured by regression coefficients or standardized path coefficients. As presented in Table 7, six proposed hypotheses were supported. Behavioral Intention was strongly impacted by satisfaction and security. Satisfaction was significantly driven by environmental impact, player performance, referee, and e-service quality,

Table 7: Hypothesis Results of the Structural Equation Modeling

Hypothesis	(β)	t-value	Result
H1: EI→SA	0.212	4.365*	Supported
H2: PP→SA	0.322	6.29*	Supported
H3: R→SA	0.274	5.31*	Supported
H4: ESQ→SA	0.287	5.667*	Supported
H5: SA→BI	0.550	9.495*	Supported
H6: S→BI	0.126	2.571*	Supported

Note: * $p<0.05$
Source: Created by the author

H1 has shown a significant influence of environmental impact on satisfaction; this structural pathway results in the standard coefficient value of 0.212 and t-value of 4.365.

H2 has shown a significant influence of player performance on satisfaction; this structural pathway results in the standard coefficient value of 0.322 and t-value of 6.29.

H3 has significantly influenced satisfaction with a standardized path coefficient of 0.274 and a t-value of 5.31.

H4 has significantly influenced satisfaction with a standardized path coefficient of 0.287 and a t-value of 5.667.

H5 has shown a significant influence on behavioral intention in satisfaction with a standardized path coefficient of 0.550 and a t-value of 9.495.

H6 has shown a significant influence on behavioral intention with a standardized path coefficient of 0.126 and a t-value of 2.571.

5. Conclusion and Recommendation

5.1 Conclusion and Discussion

The purpose of this study is to explore the influencing factors of the recognition; a study on the cognition, satisfaction, and behavioral Intention of stakeholders on the timing and scoring system in the 2023 Chinese Athletic Association Traditional Sports Schools Track and Field League (Northern District). Electronic timing scores in track and field, physical education, and physical tests have become increasingly common in recent years. This is largely due to the fact that modern, electronic, intelligent timing scores have reached a highly developed state across the country, and their many benefits are becoming increasingly obvious.

The researchers proposed five hypotheses to correspond to the defined research questions: environmental impact, player performance, referee, e-service quality, satisfaction, security, and behavioral Intention, which have a direct or indirect impact on stakeholders. Quantitative methods were used for data collection and analysis in this research. Participants are athletes in the China National Walking Championships, and data from 500 participants were acquired via a questionnaire survey, with information gathered using purpose, convenience, and stratified sampling.

The collected data was subjected to a confirmatory factor analysis (CFA) to determine the robustness and validity of the hypothesized model. Results from convergent validity-integrated reliability, Cronbach's alpha, factor loadings, mean-variance extraction analysis, and discriminant validity were utilized to examine the validity and reliability of the study's conceptual model. We apply a structural equation model (SEM) to examine and investigate the different components of LMS implementation. All of this serves to solve the stated research question and verify the research hypothesis.

The results showed that behavioral Intention was strongly impacted by satisfaction and security. Satisfaction was significantly driven by environmental impact, player performance, referee, and e-service quality. Furthermore, e-service quality had the greatest impact on the actual use of satisfaction; satisfaction had the greatest impact on the actual use of behavioral Intention. However, this specific study found that the effect of security on satisfaction was not directly confirmed. So, the effect of security on satisfaction was discussed in a broader context. In light of this, how can we better collect the competition information, process the competition results, and increase the use of technology solutions to improve the service capabilities and service quality of event operators and organizers to offer equitably?

The results showed that satisfaction was the strongest predictor of behavioral intention, satisfaction, and security have a corresponding positive effect on behavioral Intention. In this case study, the impact of security on satisfaction has yet to be explicitly proved and is an indirect approach to security impacting behavior and Intention. The theoretical significance of this study is that electronic timing can make the competition fairer and justifiers. The practical significance of this study is that electronic and intelligent timing will be more accurate than manual timing. Electronic

timing on a huge screen lets the audience know the specific situation, making the game fair and transparent. The originality of this study is to determine the availability of electronic timing by discussing the research of stakeholders' cognition, satisfaction, and behavior intention of time and scoring system in the track and field alliance (North District) of China Sports Association in 2023.

5.2 Recommendation

The sports timing and scoring system has evolved into a crucial component of any sporting event, as it ensures the event runs smoothly and provides the referee with the information, they need to make impartial calls. Therefore, it is important to consider the variables that influence these outcomes.

The researchers determined the influence of seven factors: Environmental Impact (EI), Player Performance (PP), Referee(R), e-service quality(e-SQ), Satisfaction (SS), Security(S), and Behavioral Intention (BI) on Chinese Athletic Association Traditional Sports Schools Track and Field League (Northern District).

Through this study, the sports electronic product has achieved good feedback in the large-scale competition. This product is suggested to be expanded to include more competition at all levels. Second, it is suggested that when researching and developing similar sports electronic products, developers should pay attention to the causality and importance of environmental impact (EI), athlete performance (PP), referee (R), electronic service quality (e-SQ), satisfaction (SS), security (S) and behavioral intention (BI). Third, the data collection, retention, analysis, and judgment based on the electronic sports product will impact the related events. Therefore, what aspects of training should be paid attention to in daily training? Fourth, strengthen the application of technical solutions to improve the serviceability and service level of event operators and organizers to provide fair, open, modern, information-based, and electronic services for athletes, referees, and the public.

To improve the overall serviceability and service level of event operators and organizers, there is a need to strengthen the application of technical solutions. This includes continuous innovation in software and hardware components to ensure the provision of fair, open, modern, information-based, and electronic services for athletes, referees, and the general public attending sporting events. By leveraging advanced technology, event organizers can enhance the spectator experience and elevate the overall quality of sporting competitions.

5.3 Limitation and Further Study

This study is only based on the traditional sports school track and field league (North District) of China 2023 Track and Field Association. It does not cover other regions and sports, so it has certain limitations.

While the sports event timing and the scoring system receive the bulk of the paper's attention, the production principle, application field, and marketing status of the sports event timing and scoring system's manufacturing process still need to be discovered. In addition, this paper focuses on the athletes, referees, and operation unit staff to better understand their knowledge, level of satisfaction, and likelihood of making a purchase. Since there is a dearth of public-facing psychological research, the social value of technological products used in sports events is often overlooked. This research cannot influence the stakeholders' subsequent conduct regarding marketing, which consisted mostly of promoting the event's time and scoring system after the competition.

For the future research direction of this project, let us put this project in a larger sports meeting, taking track and field as a reference and applying it to the measurement of other sports.

More elements may emerge as major influences on stakeholders in future research. We recommend further study on how to gather competition information, process competition outcomes, and enhance the system’s real-time performance as it relates to its role as the management software of sporting event display systems more effectively. Therefore, more research is needed to test the insignificant influence of social contact on behavioral intention or indirect influence on stakeholders, to comprehend the influence of Traditional Sports Schools Track and Field League, and to recruit a larger and more representative sample of students. To account for additional variables that may confound causality in future investigations, researchers may employ experimental approaches, such as defining a specific quality aspect to assess this independent variable's effect on the dependent variable's behavioral intentions. Alternately, qualitative studies might be integrated to learn more about how cognition, satisfaction, and behavioral Intention affect stakeholders.

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