The Impact of Intelligent Operations Management on Customer Satisfaction, Customer Perceived Value, and Customer Loyalty in Taekwondo Gymnasiums

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Abstract

This study investigates the impact of intelligent operation and management of taekwondo gyms on customer satisfaction, customer perception, and customer loyalty with respect to the current development of intelligent taekwondo clubs in China. Using a descriptive research design and quantitative research methodology, this study empirically investigates the intelligent operation and management of taekwondo clubs using statistical methods such as frequency analysis, confidence analysis, correlation analysis, and simple regression analysis, aiming to find out how it affects customer satisfaction, customer perceived value, and customer loyalty. The study finds that smart operation management, perceived usefulness, perceived ease of use, service quality, and perceived value affect customer satisfaction, which in turn affects customer loyalty. This study contributes to both the theoretical and practical aspects of sports management, providing valuable insights for sports clubs to improve their management practices and better serve their members, and providing information for future research in this field.

Keywords

Intelligent Management, Customer Perceived Value, Customer Satisfaction, Customer Loyalty

Introduction

In 2015, China put forward the concept of "supply-side reform" to adapt to the new normal of economic development. The purpose is to moderately expand total demand, focus on strengthening supply-side structural reform, improve the quality and efficiency of the supply system, enhance the driving force for sustainable economic growth, and promote comprehensive leaps in China's social productivity. In 2021, the Chinese Ministry of Education and four other departments issued the "Opinions on Comprehensively Strengthening and Improving School Health and Health Education Work in the New Era". The latest exposition and regulations on health education insist on putting health first, enhancing students' health literacy, and increasing physical exercise time. It emphasizes the standardization and systematization of health education and focuses on practical effectiveness, which also provides a new chance for the development of Taekwondo clubs.

The aspiration for an enhanced quality of life and the cultivation of both physical and mental well-being have become prevalent practices. Among these practices, an increasing number of individuals are opting for Tae-

kwondo as a significant avenue to elevate their quality of life. On the contrary, there has been a notable rise in commercial Taekwondo clubs in recent years, transforming from exclusive recreational venues in major urban areas to commonplace essential amenities widely available. More and more people are willing to spend on fitness, choosing to come to Taekwondo clubs after work or during their leisure time for self-regulation of mind and body. Under the intelligent mode, Taekwondo enthusiasts can obtain more scientific, reasonable, and standardized training plans and prescriptions in a more convenient manner. This helps to improve the efficiency of the club members in utilizing equipment and facilities, enabling a highly shared resources and information, which is precisely what contemporary commercial clubs need.

In recent years the operation of Taekwondo gyms is deteriorating due to overheated competition between gyms and, in particular, the gradual decline in membership of individual gyms as a result of the increase in the number of Taekwondo gyms, sports and fitness clubs, fine arts colleges, piano academies, and other types of training colleges. This current overheated competition in Taekwondo gyms does not lead dominantly to the education needed by members of Taekwondo gyms, but rather leads to the negative result of passively providing the education needed by members and parents, which in turn causes a decline in the quality of Taekwondo education. Therefore, in order to effectively run a Taekwondo gym, while it is also important to recruit new members who are potential external customers-children-it is even more important to minimise drop-outs among internal customers-members who are currently in training, thereby extending the duration of training. This should be achieved by adopting a defensive marketing strategy that emphasises increasing training loyalty and minimising member attrition, rather than offensive marketing such as attracting new members and increasing market share. Defensive marketing is intended to create a customer satisfaction operation, improve the quality of service provided to customers, and ultimately increase customer loyalty.

Research focus

China currently has over 100,000 urban communities. With the rapid advancement of urbanization and the aging of the population, the diverse demand for sports and fitness among the public is becoming increasingly urgent. However, the modern governance capability and public service level of the sports industry are relatively insufficient. Improving the service capabilities of the sports industry is both important and urgent. As one of the sports venues, sports clubs are an important material foundation for promoting the development of China's sports industry. Currently, most sports clubs in China have problems such as low utilization rates, poor hardware facilities, and inadequate operational efficiency and profit models, which makes it difficult for them to fully play a decisive role in market allocation resources.

Undoubtedly, smart sports clubs serve as a progressive avenue for the advancement of the sports industry. They embody the practical implementation of cutting-edge information technology within the management paradigm of the sports sector, while encompassing a multifaceted and comprehensive system architecture. This architecture extends across various dimensions, including the innovation of management concepts, optimization of resources, cultivation of technical expertise, and revolutionary marketing models. Enhancing the integration of technology innovation and sports, meeting the development needs of urban renewal, and achieving organic unity between the sports industry and public welfare and market-oriented development.

Smart sports clubs are a win-win situation for the government, operators, and individual consumers. First,

they break down the barriers between government supervision, management, and service, effectively linking sports administrative departments, venue operators, and the needs of the public, promoting the informationization, scale, and professionalization of public service management, greatly improving the efficiency and service level of sports venue public services. Second, they meet the needs of operation and management, control club operation status in real-time through intelligent terminals, and comprehensively manage the club's consumer groups. This helps club managers to form decision-making reference opinions based on data mining and thus activate club resources. Third, they meet the needs of consumers. Users can access all club resources in their city through mobile phones or websites, obtain online appointment courses, event activity notifications, experience feedback information, evaluate club services and other real experiences.

For Chinese Taekwondo clubs, this study can provide scientific and effective guidance for clarifying training goals, correcting self-positioning, adjusting professional settings, strengthening teacher training, improving teaching quality, and other aspects in the process of researching member satisfaction. The development of national physical health is intricately linked to every facet of social progress and advancement. In the context of "intelligentization," studying the loyalty of Chinese Taekwondo club members is beneficial to guiding the self-improvement of Taekwondo clubs, improving their professional level, and expanding the learning experience and improving the comprehensive abilities of members. The issue of intelligent operation and cultivation is a new educational theme in the new era. Research on this issue is conducive to scientifically analyzing the problems of improving the loyalty of Chinese Taekwondo club members in the current context and gradually improving the quality of loyalty cultivation of Chinese Taekwondo club members, accelerating the rapid improvement of national physical fitness.

In summary, this research holds significant importance as it has the potential to contribute to both theoretical advancements and practical implications in the field of sports management. By examining the impact of smart operation management on member loyalty and satisfaction in Taekwondo clubs, this study can provide valuable insights into how sports clubs can improve their management practices to better serve their members, and can inform future research in this area.

Literature review

Theories Related to Taekwondo

The Definition of Taekwondo, as defined by Yue (2004), can be described as follows: "Taek" refers to the use of kicking, stepping and body collision, while "Kwon" refers to the use of punching. "Do" refers to the philosophy, methodology, art, and spirit of Taekwondo. Taekwondo is primarily a lower-body activity and is a type of martial art that uses hand and foot attacks. It can be divided into two types: competitive taekwondo and recreational taekwondo. Competitive taekwondo focuses on competition, where athletes participate in strict competitions and rules to achieve excellent athletic results. Recreational taekwondo, on the other hand, focuses on fitness as its core. It has developed into forms such as Taekwondo clubs, training centers, and martial arts schools in the Taekwondo industry. The students are generally the general public, and the teaching content focuses on basic fitness. In addition to fitness, they also learn Taekwondo etiquette, posture, and performance art. Liu (2001) discussed the origin and development of Taekwondo. In the late primitive society, the prototype of ancient Taekwondo had already existed in Korea. Through continuous development in various stages, Taekwondo has become a traditional combat sports project in Korea. The International Taekwon-

do Federation was founded in 1966, marking a significant milestone in the development of Taekwondo. Subsequently, in 1973, the inaugural World Taekwondo Championships were organized by the World Taekwondo Federation. The year 1980 witnessed a momentous event as the World Taekwondo Federation gained recognition from the International Olympic Committee. Building on this achievement, Taekwondo was included as a demonstration sport in the 1988 Olympic Games, further enhancing its global prominence and visibility. In 1995, the first National Taekwondo Championships were held, and in 2000, Taekwondo became an official Olympic sport. Since then, the Taekwondo sport has experienced unprecedented development.

Theories Related to Intelligent Operation Management of Taekwondo Clubs

This study concludes that the intelligence of Taekwondo clubs consists of four main aspects: facility intelligence, service intelligence, management intelligence and marketing intelligence.By leveraging these methods, Taekwondo clubs aim to enhance their marketing strategies, target specific audiences more effectively, generate engaging and relevant content, and utilize data-driven insights to make informed marketing decisions. The goal is to achieve greater visibility, attract and retain customers, and ultimately drive business growth. Through data analysis tools, Taekwondo clubs can collect and analyze user data, including browsing and purchasing records, behavioural preferences, and more, to better understand user needs and engage in targeted marketing activities. Moreover, creating engaging copywriting and video content can convey the brand image and service advantages of the Taekwondo club to potential customers, ultimately improving user awareness and trust in the club.

At present, there is relatively little research on the intelligent operation of sports clubs internationally, but some scholars in China have conducted research in this area. He and Tang (2018) pointed out that traditional sports clubs adopt a pyramid management model, which is characterized by personnel expansion, cumbersome institutions, high management costs, poor information transmission, and low management efficiency. They also have large investment areas and high rents, and their sales strategy mainly relies on the pre-sale of annual and multi-year cards. The profit model is mainly based on personal training sales and membership sales. Liu et al. (2017) proposed that commercial sports clubs currently have several problems, including single fitness content and inadequate supporting facilities, insufficient customer promotion and marketing, inadequate service quality, lack of concepts and intensity in publicity and promotion, insufficient talent development, and a lack of management talent with both professional fitness knowledge and business theory, as well as a shortage of sports coaches with professional knowledge and practical ability. Li (2017)conducted a comparative study of intelligent shared fitness clubs and traditional fitness clubs, and found that the former had potential issues related to facilities, information security, and course content. The study also suggested that intelligent shared fitness clubs need to further promote themselves, enhance their influence, accelerate their transformation and upgrading, improve user information security, and comprehensively improve service quality. Zheng and Xie (2017) proposed that with the development of Internet of Things technology, the technical conditions for transforming traditional exercise modes and conducting sports health management have been met. By combining traditional offline teaching aids with online intelligent means, intelligent recognition, connection, and information services can be achieved between people and exercise equipment, exercise equipment and smart terminals (smart TVs, mobile phones, tablets, etc.), which provides application possibilities for creating a new interactive and personalized health promotion business model. Lou and Li (2019) improve services through intelligent means, bringing better experiences to fitness enthusiasts in terms of fun, convenience, practicality, and flexibility, which is the future development direction of indoor fitness clubs in

China. H. Sun et al. (2018)believe that intelligent shared gyms are characterized by selecting public places for exercise, placing fitness equipment, and using QR codes for use, which is developed and managed through Internet technology systems and adopts an online-to-offline consumption model. Meanwhile, Cao (2016) examined the well-known domestic fitness brand, Lefit Fitness Club, analyzed its business status, and explored various marketing models such as "Internet + WeChat official account," "Internet + reputation," "Internet + relationships," and "Internet + advertising" based on the "Internet +" strategy. Han (2016) pointed out that as a profit-making organization, Chinese sports clubs must find a balance between short-term interests and long-term development, which requires them to optimize their own structure to solve a series of problems such as redundant officials and expenses to increase their own revenue. Only with revenue can they provide better services, establish a good brand image and achieve a virtuous cycle of development for Chinese sports clubs. T. Sun et al. (2018) pointed out that a new trend of low-cost operation and market segmentation has emerged in the European fitness market. Combining with the development of the Chinese fitness market, they predict that the scale of the future Chinese fitness market will continue to expand, "online + offline" will become a new trend, intelligentization will become a new development force, and the market will be further segmented and concentrated.

Theories Related to Taekwondo Club Operation

According to Liu (2010), Taekwondo clubs in China mostly exhibit a social organization sports pattern, which is dominated by individual management. However, there are issues with incomplete institutional systems and unclear functional authority. Zhong and Li (2011) suggest that in order to improve the profitability of Taekwondo clubs, the emphasis should be on intelligent management and high-quality services. Gao (2010) and Wang (2012) believe that Taekwondo clubs are fully responsible for operations, including student enrollment, publicity and promotion, coach hiring, and even direct participation in student management. Huang (2009) put forward a service-oriented strategy. Being a service-oriented industry in the field of sports, the quality of services plays a significant role in determining the success or failure of Taekwondo club management. Hu (2008) asserts that the operator's role is particularly crucial in the development of clubs. Operators should adapt to the demands of the market economy in order to enhance consumer recognition of the club. Zhang and Yu (2012) emphasizes that Taekwondo should be people-oriented, with humanized training content and a comfortable environment for consumers to exercise. Liu (2007) suggests that to improve the overall level of coaches, it is necessary to improve regulatory systems, establish a reasonable and efficient mechanism for competition, management, and training, enrich the coach team, and increase learning opportunities. Bao and Chen (2011) point out that the business level, management skills, experience and vision, comprehensive cultural qualities, and personality characteristics of managers all directly affect the operating conditions of Taekwondo clubs. The adoption of the form of a Dojo or a club to meet people's needs for learning and practicing Taekwondo in their leisure time (Wang & Gao, 2011). Bian (2010) summarizes that the comprehensive quality of the highest supervisor in Taekwondo gyms is a key factor affecting the development of Taekwondo gyms.

The studies conducted by these authors suggest that the majority of Taekwondo clubs exhibit a social organization sports pattern, with individual management as the mainstay. However, there are issues with inadequate institutional structures and unclear functional authorities. To enhance the efficacy of clubs, it is essential to prioritize intelligent management and the provision of high-quality services. In the context of being part of the sports service industry, Taekwondo clubs should place significant emphasis on the quality of their ser-

vices. The success of their operations is heavily reliant on the caliber of the services they offer. The development of the clubs depends significantly on the managers who need to adapt to the market economy's requirements to enhance consumer recognition of the clubs. To create a comfortable and enjoyable environment for the consumers, the training content should be humanized, and the training should emphasize people-oriented approaches. The scholars' research demonstrates that adopting appropriate marketing methods and management strategies is necessary to promote the development of Taekwondo clubs. From the perspective of consumer motivation and behavior, it is essential to consider how to improve the Taekwondo club's development model, provide paid services to consumers, encourage positive consumption psychology, and balance social and operational benefits. However, there is limited research on how to attract more consumers to participate in Taekwondo consumption, which is a problem that needs attention. It is of practical significance for the development of Taekwondo, national fitness, and management to study this issue and stimulate consumer motivation and behavior in Taekwondo consumption.

Methods

Population and Sample

In this study, the members of Chinese taekwondo clubs were selected as the research object. The sampling in this study was conducted by the convenient sampling method , in which 40 clubs with the largest number of members were selected from 34 provinces, municipalities, and autonomous regions in China in 2022, and 25 members were selected from each club for the survey by using the systematic random sampling technique. A total of 1000 questionnaires were distributed. The survey was conducted in China in the summer of 2022. By analysing the survey responses from Taekwondo club members, the researchers may be able to investigate the mechanisms of how Taekwondo's intelligent operational management affects member loyalty. The survey was completed voluntarily by participants. Club managers were asked to assist in the survey process. They briefly explained the purpose of the study, encouraged respondents to answer honestly, and collected completed questionnaires. Of the 1000 questionnaires sent out, 58 were not returned, making a total of 942 questionnaires returned. After careful scrutiny and elimination of questionnaires with incorrect content, 912 valid questionnaires were left for analysis and the general characteristics of the sample study population are shown in Table 1.

Table 1 Target audience

Demographic variables	Survey Participants (N=912)	Valid percentage
Gender (N=912)		
Male	613	47.41%
Female	680	52.59%
Age (N=912)		
Under 29	69	5.34%
30-34	355	27.46%
35-39	301	23.28%
40-44	244	18.87%
45-49	185	14.31%
Over 50	139	10.75%
Education level(N=912)		
Elementary school and below	86	6.65%
Junior high school	128	9.90%
Senior high school	203	15.70%
Junior college	231	17.87%
Undergraduate	409	31.63%
Graduate school and above	236	18.25%

Career (N=912)		
Student	90	6.96%
Government officials/civil servants	34	2.63%
Business managers	45	3.48%
General staff	304	23.51%
Professionals	170	13.15%
Ordinary workers	216	16.71%
Commercial service workers	118	9.13%
Self Employed/Contractor	104	8.04%
Freelancers	112	8.66%
Agriculture, forestry, animal husbandry and fishery laborers	18	1.39%
Retirees	26	2.01%
Unemployed	34	2.63%
Others	22	1.70%
Monthly Income (N=912)		
Less than ¥ 2000	114	8.82%
¥ 2001~¥ 3000	31	2.40%
¥ 3001~¥ 5000	516	39.91%
¥ 5001~¥ 8000	304	23.51%
¥ 8001~¥ 10000	206	15.93%
More than ¥ 10001	122	9.44%
Membership Category (N=912)		
Annual membership	322	24.90%
Quarterly membership	483	37.35%
Monthly membership	328	25.37%
Ordinary member	160	12.37%

Questionnaire method

(1) Composition of the questionnaire

The research instrument used in this study is a questionnaire based on various validated scales and additional questions from the literature. The use of previously developed scales is preferred as they benefit from expert input and save time in new development .The questionnaire design process includes three steps. First, reference mature scales related to the variables of interest and develop an initial questionnaire based on relevant research. Second, conduct expert review using quantitative analysis to explore the rationality of the questionnaire items and the normativity of expression, and revise the questionnaire. Third, conduct a pilot study using a small sample to test the questionnaire. Analyze the structural validity and reliability of the questionnaire through exploratory factor analysis and internal consistency testing, optimize the questionnaire based on the analysis results, and finally develop the formal survey questionnaire. Prior to its use in the sample, the instrument underwent human subject review in Harbin, Heilongjiang Province, China.

Table 2 Main constituent indicators and content of the questionnaire

Indicator	Component	Questions	Subtotal
Population background	Gender, age, education, occupation, monthly income, etc.	6	6
Intelligent Operations Managemen	The intelligence of service personnel management, educational administration, marketing management, financial management, facility management	5	5
Customer Perceived Value	Perceived Price, Quality, Gain and Sacrifice	4	4
Customer Satisfaction	Corporate Image	4	20
	Attendants	4	
	Convenience	4	
	Promotion	4	
	Entity equipment	4	
Customer Loyalty	Behavioural Loyalty	4	8
	Attitudinal loyalty	4	

The research instrument utilized in this study comprises several subscales intended to assess the independent and dependent variables under investigation. In the initial stage of analysis, the independent variable is the perception of intelligent operation management in Taekwondo clubs across China. The corresponding dependent variables surveyed include perceived usefulness, perceived ease of use, and service quality. In the subsequent stage of analysis, perceived usefulness, perceived ease of use, and service quality are treated as independent variables, while perceived value, customer satisfaction, and customer loyalty are considered as dependent variables. In the third stage of analysis, various demographic variables such as age, income, occupation, gender, and race are incorporated as independent variables. These demographic variables are known to influence perceptions of intelligent operation management, perceived usefulness, perceived ease of use, service quality, perceived value, customer satisfaction, and customer loyalty.

The first section of the survey includes common demographic information. The second section is a measurement scale for the intelligent operation management of Taekwondo clubs and related variables perceived by customers. Each measurement is divided into seven levels using a Likert scale, where 1 = very inconsistent, 2 = inconsistent, 3 = somewhat inconsistent, 4 = average, 5 = somewhat consistent, 6 = consistent, and 7 = very consistent. Respondents answer questions based on their actual feelings. The third section is a customer satisfaction scale for commercial swimming clubs. The satisfaction scale consists of five factors, including corporate image, staff, convenience, promotion, and ease, were used to construct participation constraints. The questionnaire scoring system uses a Likert scale, divided into seven levels, where 1 = very dissatisfied, 2 = dissatisfied, 3 = somewhat dissatisfied, 4 = average, 5 = somewhat satisfied, 6 = satisfied, and 7 = very satisfied. Respondents should answer questions truthfully. The fourth section is a loyalty scale for customers of commercial swimming clubs. The scale is based on Huang's (2003), Wu's (2005), and Lim's (2006) studies. The researchers modified some of the questionnaire items to fit the research model of customer loyalty. Participation constraints were constructed using two factors, attitude loyalty and behavioural loyalty. Each measurement is divided into seven levels using a Likert scale, where 1 = very unwilling, 2 = unwilling, 3 = somewhat unwilling, 4 = average, 5 = somewhat willing, 6 = willing, and 7 = very willing. Respondents should answer questions truthfully. The following scales are used to measure the independent and dependent variables.

The questionnaire consisted of 43 questions, including 6 questions on demographics, 5 questions on intelligent operations management, 20 questions on customer satisfaction, 4 questions on perceived customer value, and 8 questions on customer loyalty.

Mathematical and statistical methods

In this study, the data that completed the questionnaire responses were recovered, and the Window with SPSS 23.0 program was used to exclude from the analysis the data whose responses were considered unreliable or not credible. In order to understand the general characteristics of the study population according to the purpose of data analysis, and to check the reliability of frequency analysis and questionnaire, the reliability test was implemented, and to understand the relationship between the variables, correlation analysis and simple regression analysis were used.

Results

Credibility of the questionnaire

The reliability results of the validation questionnaire are shown in Table 3, and the reliability was verified using Cronbach's α. Cronbach's α is a credibility check in which each question is treated as an independent individual and the internal consistency of the questions is sought (based on the predicted value of credibility in terms of checking the degree of homogeneity between the questions). method. As shown in Table 3, the total number of questions on intelligent operation management shows 0.882, the total number of questions on customer satisfaction shows 0.906, and the lower variables of economic satisfaction of Corporate Image shows 0.793, Attendants shows 0.799, Convenience shows 0.789, and Promotion shows 0.808, Entity equipment shows 0.807. Customer perceived value 0.807. All questions of customer loyalty shows 0. 879, Attitudinal loyalty as a lower variable shows 0.791, and Behavioural loyalty shows 0.795. It can be seen that the reliability of the questionnaire used in this study Cronbach's alpha shows 0.789 to 0.906, so the internal consistency of the questionnaire used in this study is high enough to satisfy the general adoption criterion of 0.7 for trustworthiness, and it can be assumed that the measurement props used in this study are trustworthy.

Table 3 Reliability of the questionnaire

		Cronbach's α
Intelligent operation management	The intelligence of service personnel management, educational administration, marketing management, financial management, facility management	0.882
Perceived value	Perceived value	0.807
Customer satisfaction	Corporate Image	0.793
	Attendants	0.799
	Convenience	0.789
	Promotion	0.808
	Entity equipment	0.807
Customer loyalty	behavioural loyalty	0.795
	Attitudinal loyalty	0.791

Correlation between variables

From Table 4, all the factors such as Intelligent Operations Management, Corporate Image, Attendants, Convenience, Promotion, Entity equipment, Customer Perceived Value, Attitudinal Loyalty, and behavioural Loyalty show positive (+) correlation, which is consistent with the factor relationships proposed in the research hypotheses, and therefore it can be be considered as satisfying the validity criteria. In the correlation matrix, it is important to note the correlation between the factors, while the correlation coefficient must not be equal to 1. If the null hypothesis that the correlation coefficient is 1 is can celled (i.e., all the factors are consistent), the factors can be considered to have discriminant validity. Looking at the Pearson's product-moment correlation coefficients, if they show less than the base 0.80 for multi col-linearity, then the problem of multi-col linearity is considered to be ignored. Table 4 shows that the correlation values of intelligent operation management, customer satisfaction, customer perceived value, and customer loyalty are 0.301 to 0.601, which can satisfy these criteria, and therefore the problem of multi-col linearity is considered negligible. Customer satisfaction (r = 0. 601) shows a correlation. Customer Perceived Value (r = 0. 469) also shows to have a correlation and Customer Loyalty (r = 0. 360) also shows to have a correlation.

Table 4 Relevant analysis results N=912

	IOM	PV	SAT	CL
IOM	1			
PV	0.469**	1		
SAT	0.601**	0.428**	1	
CL	0.360**	0.278**	0.301**	1
M	4.684	4.691	4.709	5.152
SD	1.282	1.421	1.044	1.04

Note: * indicates p < 0. 05, ** indicates p < 0. 01 (IOM:; PV:; SAT:; CL:).

The Relationship between Intelligent Operations Management and Customer Perceived Value in Taekwondo Gyms

The first hypothesis of this study is: "Relationship intelligent operations management in Taekwondo gyms will have an impact on customer perceived value." To test this hypothesis and in order to perceive the effect of intelligent operations management on customer perceived value, a simple regression analysis was conducted.

Table 5 Impact of intelligent operational management of Taekwondo gyms on perceived customer value

	B	SEB	Beta	t	p	VIF	Tolerance
Constant	2.255	0.132	-	17.087	0.000**	-	-
IOM	0.520	0.027	0.469		0.000**	1	1
D-W = 1.929	R^2 = .220	F = 366.468	Sig F= .000				

In Table 5, it is shown that Intelligent Operations Management (IOM) has a statistically significant effect on customer perceived value. Linear regression analysis using IOM as the independent variable and PV as the dependent variable shows from the above table that the model formula is: PV = 2.255 + 0.520*IOM and the model R-squared value is 0.220, which implies that IOM explains 22.0% of the variation in PV. The F-test of the model found that the model passes the F-test (F=366.468, p=0.000<0.05), which means that IOM will definitely have an impact relationship on PV, and finally the specific analysis shows that: the regression coefficient of IOM has a value of 0.520 (t=19.143, p=0.000<0.01), which means that IOM will have a significant positive impact on the PV Relationship.

Intelligent Operation and Management of Taekwondo Gymnasiums, Relationship between Customer Perceived Value and Customer Satisfaction

The second hypothesis of this study is: "Relationship wise operations management in Taekwondo gyms will have an impact on customer satisfaction." The third hypothesis of this study is: "Customer perceived value of Taekwondo gyms will have an impact on customer satisfaction." To test the hypotheses and in order to see the effect of intelligent operations management and customer perceived value on customer satisfaction, simple regression analysis was used.

Table 6 The effect of intelligent operations management and customer perceived value on customer satisfaction in Taekwondo gyms

	B	SEB	Beta	t	p	VIF	Tolerance
Constant	2.104	0.095	-	22.143	0.000**	-	-
IOM	0.418	0.02	0.514	20.899	0.000**	1.282	0.78
PV	0.137	0.018	0.187	7.61	0.000**	1.282	0.78
D-W = 2.033	R^2 = .389	F = 412.871	Sig F= .000				

In Table 6, it is shown that intelligent operations management has statistically significant effect on customer satisfaction and customer's perceived value also has statistically significant effect on customer satisfaction. From the above table, IOM,PV is taken as the independent variable while SAT is taken as the dependent variable for linear regression analysis, from the above table it can be seen that the model equation is SAT = 2.104 + 0.418*IOM + 0.137*PV and the model R-squared value is 0.389 which means that IOM,PV explains 38.9% of the variation in SAT. The F-test of the model found that the model passed the F-test (F=412.871, p=0.000<0.05), which means that at least one of the IOM,PV will have an impact on the SAT, in addition, the test for the model's multiple covariance found that all of the VIF values in the model are less than 5, which means that there is no covariance; and the D-W value is around the number 2, which means that there is no auto correlation in the model. Thus, it shows that there is no auto correlation in the model, there is no correlation between the sample data, and the model is better. The final specific analysis shows that:

The regression coefficient value of IOM is 0.418 (t=20.899, p=0.000<0.01), which means that IOM will have a significant positive influence relationship on SAT.

The regression coefficient value of PV is 0.137 (t=7.610, p=0.000<0.01), implying that PV will have a significant positive influence relationship on SAT.

Summarizing the analysis, it can be seen that all of IOM, PV will have a significant positive influence on SAT.

The Relationship Between Intelligent Operations Management and Customer Loyalty in Taekwondo Gyms

The fourth hypothesis of this study is: "Intelligent operational management of Taekwondo gyms will have an impact on customer loyalty." The fifth hypothesis of this study is: "Customer satisfaction factors of Taekwondo gyms will have an impact on customer loyalty." The sixth hypothesis of this study is: "Customer perceived value of Taekwondo gyms will have an impact on customer loyalty." In order to test the hypotheses and to see the effect of intelligent operations management on the sub-factors of customer loyalty (attitudinal loyalty, behavioural loyalty), simple regression analysis was used.

Table 7 The effect of intelligent operational management, customer perceived value and customer loyalty on customer loyalty in taekwondo gyms

	B	SEB	Beta	t	p	VIF	Tolerance
Constant	3.333	0.131	-	25.459	0.000**	-	-
IOM	0.195	0.027	0.240	7.167	0.000**	1.714	0.583
PV	0.088	0.022	0.120	4.051	0.000**	1.34	0.747
SAT	0.105	0.033	0.106	3.23	0.001**	1.637	0.611
D-W = 2.019	R^2 = .152	F = 77.218	Sig F= .000				

From the above table, IOM,PV,SAT are taken as independent variables while CL is taken as dependent variable for linear regression analysis, from the above table, the model equation is CL = 3.333 + 0.195*IOM + 0.088*PV + 0.105*SAT and the model R-squared value is 0.152, which means that IOM,PV,SAT explains 15.2% of the CL reason for the change. The F-test of the model found that the model passed the F-test (F=77.218, p=0.000<0.05), which means that at least one of the IOM, PV, and SAT will have an effect on the CL. In addition, the test for multidisciplinary of the model found that all the VIF values in the model are less than 5, which means that the problem of covariance does not exist; and the D-W value is around the number 2, thus indicating that the model is not auto-correlated. The D-W values are around the number 2, thus indicating that there is no auto correlation in the model, there is no correlation between the sample data and the model is better. The final analysis shows that:

The value of regression coefficient of IOM is 0.195 (t=7.167, p=0.000<0.01), which means that IOM will have a significant positive influence relationship on CL.

The regression coefficient value of PV is 0.088 (t=4.051, p=0.000<0.01), implying that PV will have a significant positive influence relationship on CL.

The regression coefficient value of SAT is 0.105 (t=3.230, p=0.001<0.01), implying that SAT will have a significant positive influence relationship on CL.

Summarizing the analysis, it can be seen that all of IOM, PV, and SAT will have a significant positive influence on CL.

Discussion

The Relationship between Intelligent Operations Management and Customer Satisfaction in Taekwondo Gyms

In this study, intelligent operations management positively affects customer satisfaction.Through intelligent operations management, taekwondo clubs can manage their operations more efficiently, thus shortening service time, improving service quality, and enhancing customer satisfaction. Intelligent operations management can help taekwondo clubs better understand customer needs, quickly make improvements based on customer feedback, and improve service quality, thereby increasing customer satisfaction. Intelligent operations management can optimize operational processes, improve efficiency, reduce costs, and enhance the competitiveness of taekwondo clubs, further increasing customer satisfaction.

The Relationship between Intelligent Operations Management and Customer Perceived Value in Taekwondo Gyms

In this study, intelligent operations management has an impact on customer perceived value.Intelligent operational management can encompass a range of management and service activities, such as automated membership management systems, precision marketing strategies, intelligent coach management, and training program development. Service perception quality is the evaluation criteria used by members to assess the services provided by the club. Intelligent operational management can improve service perception quality. In the service industry, the implementation of intelligent operational management is expected to significantly enhance the perceived service quality, which in turn influences customer satisfaction with the club.

The Relationship Between Intelligent Operations Management and Customer Loyalty in Taekwondo Gyms

Taekwondo gyms basically increase satisfaction by strengthening bonding relationships with members, targeting new and long term members, establishing a pricing strategy to maintain the right level, applying it according to the rank, and thus continuing to maintain a good relationship with the members, and, in order to increase the loyalty of the members, establishing a strategy that the members are able to pursue at their own will. In general, attitudinal loyalty can be seen as a psychological concept, which is the psychological and emotional love of members for the Taekwondo gym. This type of member's friendly attitude or love for the Taekwondo gym is influenced by consumers with high credibility.Intelligent operations management can automate, optimize, and streamline internal business processes and operations, improving efficiency and reducing costs for enterprises. This facilitates users in experiencing expedited and more efficient services, thereby enhancing their perception of usefulness and ease of use. Moreover, it enables the provision of services that are personalized according to users' specific needs and preferences, further bolstering their perception of usefulness and ease of use. By monitoring and analyzing product or service usage and user feedback, intelligent operations management can identify and resolve issues promptly, improving product or service quality and reliability. This can increase users' trust in the product or service, further enhance customer loyalty.

Intelligent operation and management can be considered as a Taekwondo gym that is truly working for the benefit of its customers when it understands the dissatisfaction of its members through constant examination and improves services for dissatisfied members, and then provides brand new services that can convert dissatisfaction into satisfaction. The responsibilities and authority of front-line managers who are in direct contact with members and provide services should be strengthened, and the system should be improved so that they can quickly handle and respond to members' grievances and receive them through multiple channels. A long-term perspective should be taken to change members' behaviours and attitudes through intelligent operations management and to provide continuous services through intelligent operations management, so that members will naturally buy the services provided by the dojang again and convey friendly attitudes to the surrounding crowd, which in turn will naturally increase the number of members and improve the profitability of the taekwondo dojang.

The Relationship between Customer Satisfaction Factors and Perceived Customer Value in Taekwondo Gyms

Customer satisfaction in this study has an impact on customer perceived value. The relationship in which

customer satisfaction has an impact on the perceived value of customers is the relationship expansion stage, which is also the stage in which the interaction and co-operation between the company and its customers increase, and which not only enhances the satisfaction and the perceived value of the long-term relationship, but also enhances the scope and the depth of interdependence. In summary, intelligent operations management is the part of the endeavour to maintain the ongoing relationship between the taekwondo gym and its members by guiding the members to positively evaluate the taekwondo gym in which they are located. That is, members who go to a taekwondo gym feel happy when using the gym's facilities, and will love the gym even more, forging an ongoing relationship. Therefore establishing a taekwondo gym that satisfies its customers is the right option to choose in order to keep the members loyal on an ongoing basis.

The relationship between customer satisfaction factors and customer loyalty in taekwondo gyms

All of the customer satisfaction factors in this study have an impact on customer loyalty. That is, this study now shows that if members of a taekwondo gym feel satisfied, their loyalty to the gym will increase. As mentioned above, the more satisfied members feel, attitudinal loyalty or behavioural loyalty, i.e. rejoining intention, active promotion, will increase more, which reveals that we should continuously maintain members' satisfaction with taekwondo gyms. Moreover, most of the members of taekwondo gyms train taekwondo in the state of paying a certain one-time fee, and since the cost of using the supporting facilities or programmes is quite small, non-material benefits should be given to the long-term training members or those with high loyalty, which in turn maintains the ongoing relationship.

The relationship between perceived customer value and customer loyalty in taekwondo gyms

The customer's perceived value to the company will not only have an impact on post-purchase attitudes, but will also have an impact on future customer loyalty. Members will continue to use a taekwondo gym if they are satisfied with their choice and trust the gym. The customer perceived value in this study has an impact on both attitudinal and behavioural loyalty, the sub-factors of customer loyalty, i.e. the higher the perceived value of the Taekwondo gym members to the intelligent operations and management, the higher their attitudinal or behavioural loyalty will be. This result is due to the influence of emotional responses such as trust and concentration and uneasiness on consumer behaviour, and the influence of emotions experienced by customers on the behavioural related variables - customer satisfaction and willingness to repurchase. And the emotional response level will behave differently depending on the relevant variables. That is, in order to continuously and reliably maintain the relationship with customers, sincere service is important, and it is also important to make customers trust and focus on the company that provides the service, and then purchase behaviour occurs. In addition, people with friendly and positive promotional intentions can play a role in reaching consumers' positive behavioural intentions.

In summary, taekwondo gyms should implement intelligent operational management to provide customised services to members and form long-term positive relationships. If members focus on the Taekwondo gym through their trust in the gym, they will show positive purchase intentions to continue to use the current services and programmes, and subsequently increase re-purchase, and the gym's revenue will increase.

Conclusion

The proposed research hypotheses are validated:

(1) Intelligent operations management in Taekwondo clubs has an impact on customer satisfaction.

(2) Taekwondo club intelligent operations management has an impact on customer perceived value.

(3) Taekwondo club intelligent operations management has an impact on customer loyalty sub-factors (attitudinal loyalty and behavioural loyalty).

(4) Customer satisfaction has an impact on customer trust.

(5) Customer satisfaction has an impact on the sub-factors of customer loyalty (attitudinal loyalty and behavioural loyalty).

(6) Customer perceived value has an effect on the sub-factors of customer loyalty (attitudinal and behavioural loyalty).

The research findings indicate a positive correlation between customer satisfaction and customer loyalty in taekwondo clubs. This finding holds significant implications. To establish loyal customers, taekwondo clubs must focus on creating satisfied customers. The research results demonstrate that in order to create satisfied customers, taekwondo clubs need to prioritize intelligent operation management, perceived value, perceived usefulness, perceived ease of use, and service quality. Loyal customers contribute to repeat business. Moreover, satisfied customers are more likely to recommend the taekwondo club to friends and family. According to the research findings, intelligent operation management significantly influences customer satisfaction and serves as a fundamental factor in influencing customer satisfaction. Therefore, as the level of intelligent operation management increases, customer satisfaction also increases. Higher customer satisfaction leads to higher customer loyalty. Intelligent operation management indirectly affects customer loyalty. Consequently, it can be concluded that taekwondo club owners should effectively enhance the level of intelligent operation management. When customers appreciate intelligent operation management, their satisfaction increases. Simultaneously, their behavioural or attitudinal loyalty also improves, resulting in a stable customer base for the taekwondo club.

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