

# Enhancing Customer Satisfaction Through Innovation Consciousness, Service Innovation, and Total Quality Management

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## Abstract

**Purpose:** To explore the impact of innovation consciousness, service innovation and total quality management on customer satisfaction, and test data analysis results show that: 1) The innovation consciousness scale, service innovation scale and total quality management scale have good reliability and validity, and can be used to accurately evaluate the innovation consciousness and service innovation level of enterprises; 2) Innovation awareness has a significant positive impact on service innovation. ; 3) Innovation consciousness has a significant positive impact on total quality management. 4) Innovation awareness has a significant positive impact on customer satisfaction. 5) Service innovation has a significant positive impact on customer satisfaction. 6) Total quality management has a significant positive impact on customer satisfaction. 7) Service innovation plays an intermediary role in the relationship between innovation awareness and customer satisfaction. 8) Total quality management plays an intermediary role between innovation awareness and customer satisfaction. Finally, it is revealed that: 1) Enterprise leaders should attach great importance to the concept of innovation and service; 2) Enterprises should establish a sound innovation reward mechanism to encourage employees to transform innovation consciousness into practical innovation actions.

**Keywords:** Innovation consciousness; Service innovation; Total quality management; Customer satisfaction.

## Introduction

More and more studies show that innovation awareness has an important impact on service innovation, total quality management and customer satisfaction. Service innovation and total quality management play an intermediary role between innovation consciousness and customer satisfaction, and there is a mutual influence relationship between them. The application of innovation consciousness to guide the service innovation and total quality management of enterprises can help improve customer satisfaction and bring rich returns to enterprises. It is worth mentioning that well-known enterprises at home and abroad, such as Haier Group, Vanke Group, Huawei, Apple, Google and Gree Electric Appliances, attach great importance to the guidance of innovation consciousness on enterprise service innovation and total quality management. For example, in 1992, Huawei established the Huawei Service Innovation Laboratory, which is specifically responsible for studying the application of innovation consciousness to service innovation, and the laboratory has also become an important platform for Huawei's technological innovation. The practice of these successful enterprises conveys a clear message to the public that service innovation under the guidance of innovation consciousness is crucial to the development of enterprises.

Storey and Kelly (2001) point out that both manufacturing enterprises and service enterprises have to continuously pay attention to the timeliness of their products, service quality and service processes to ensure their core advantages in market competition, and constantly strengthen the awareness of innovation, service innovation and total quality management. Byun, Yoon & Lee, J., (2012) pointed out that in the face of the intensifying competition in the integration of products and services, some multinational enterprises have turned their competition focus to innovation consciousness, service innovation and total quality management, trying to enhance their customer satisfaction with service innovation and total quality management, so as to increase the competitiveness of the industry.

Enterprise innovation determines national innovation, and innovation-oriented enterprises are the decisive force to build an innovation-oriented country. American management scientist Peter Drucker once said that in times of rapid change, the only constant truth is change itself! In the process of realizing the goal of an innovation-oriented country, innovation-oriented enterprises play a decisive role. Therefore, the innovation ability of an enterprise not only affects its own development, but also has a profound impact on the innovation and development of the whole country. In a competitive environment, the success and survival of enterprises depend on innovation and comprehensive quality management (Gregory, I., & Joseph, S., 2000). Whether an enterprise or country can achieve long-term development and customer satisfaction depends largely on its innovation awareness and innovative service level. Therefore, innovation has become one of the important factors for enterprises, countries and even the whole world to maintain long-term competitiveness. Only by accurately understanding and grasping the core elements of enterprise innovation consciousness, service innovation and total quality management can we improve customer satisfaction and achieve competitive advantage in the market. Therefore, this study introduces service innovation and total quality management as mediating variables to explore the influence of innovation awareness on customer satisfaction.

## **Theoretical basis and research hypothesis**

### **1. Definition of innovation consciousness, service innovation and total quality management**

Innovation consciousness is the spiritual leader of the formation of the growth path of innovative enterprises. Innovation is the soul of an enterprise, and innovation consciousness is the soul of innovation. For innovative enterprises with innovation as the core feature, the innovation consciousness of entrepreneurs and employees is the soul of enterprise innovation. The consciousness of innovation stimulates and enriches the culture of enterprise spirit, and comprehensively improves the spirit of enterprise innovation, entrepreneurship, learning, entrepreneurship, thinking and pioneering spirit, and the consciousness of innovation is the soul and essence of these spirits (Liu Li, 2006). The consciousness of innovation has injected rich elements into the spirit and culture of enterprises, covering many aspects and levels, and provided a steady stream of power for exploring the growth path of innovative enterprises. Domestic research on innovation consciousness is mainly based on psychological research. Zhao Xiaodi (2008) defines innovation consciousness as an individual's understanding and attitude towards innovation, which is the internal driving force for creative activities. Liu & Zhang (2012) pointed out that the innovation consciousness of enterprises can be studied from six dimensions: innovation value, innovation and education seeking, risk taking, talent

strategy, implementation and reflection and criticism. Wang Shibo et al. (Wang Shibo, 2013) divided innovation consciousness into two dimensions: motivation and interest and pointed out that innovation consciousness would have a significant impact on innovation behavior. Geng Yong believes that innovation consciousness reflects innovation willpower, which will induce enterprises to carry out continuous innovation activities, exercise their continuous innovation ability, and thus enhance their sustainable competitiveness. Enterprise innovation consciousness refers to the understanding and attitude of management and employees towards innovation, which reflects the enthusiasm and driving force for innovation activities. According to the definition of innovation consciousness by scholars, this paper holds that it represents the innovation willpower of all employees in an enterprise, or the subjective attitude and tendency to carry out innovation activities. Enterprise innovation consciousness means that the whole team develops the innovation potential of the enterprise in a positive attitude and makes use of existing resources to innovate. It depends on the intrinsic motivation and willingness of all employees to recognize and implement innovative services.

Service innovation is not only the innovation of product form. Or innovation in production procedures and technology, which is essentially based on the background of market competition and the use of technology-oriented services (Betz, 1987). However, due to the complexity of the service industry and the diversity of service innovation increase the difficulty of its definition, there is still no widely accepted authoritative definition. From the technical point of view, service innovation is a kind of soft technology innovation, its ultimate goal is to meet the needs of customers; From the perspective of value, service innovation refers to the process of adding additional economic value to specific products or services by adopting non-equivalent exchange methods. From the perspective of methodology, service innovation refers to the exploration and application of various ways and methods to improve the added value of products or services; Defined from multiple perspectives, service innovation simply means that all innovation activities are limited to services or related fields, which actually refers to the innovative behavior of the enterprise service industry (Lin Lei, Wu & Guisheng, 2017). Service innovation refers to the introduction of new technologies and guiding ideology to improve the service process and various links, improve product quality and service efficiency, create higher economic value-added for enterprises and customers, and ultimately transform into unique core competitiveness of enterprises (Sundbo, 2008). In this study, service innovation refers to the creation or introduction of a new service by an enterprise, which is relatively new compared with the current service products provided by the enterprise (Xu, M., & Lai, J., 2011). First, it is a new service that the enterprise has not created before. Secondly, it improves a certain process or service link, improves the service quality, and reduces the service cost; Third, it can achieve similar results by changing parts of the existing service production process. Fourth, it creates an unprecedented service product or develops a new service medium; Finally, these improvements or changes enable consumers to truly experience the improvement of service value, increase consumer psychological feelings, and improve customer satisfaction. According to the above conditions, we define the new service products that meet these conditions as enterprise service innovation.

Total Quality Management (TQM) is an integrated quality management framework designed to continuously improve business processes and contribute to the overall performance of an organization. The idea of TQM originated in the United States in the 1960s, but its ideological roots can be traced back to the early quality management movement (Ahsan & Orsag, 2011). In simple terms, TQM is a customer-centric management model that

achieves superior performance through continuous improvement of business processes. It focuses on the continuous improvement of product quality, service quality and overall organizational performance. TQM's goal is to increase efficiency, reduce costs, and enhance customer satisfaction through continuous improvement of products, services, and processes to achieve long-term business success. In the past years, most of the literature is more reflected in the basic elements of total quality management. However, Flynn, Smith & Giles (1994) defined the connotation of TQM from the perspective of methodology and believed that TQM was a method to achieve and maintain high-quality output. Total quality management (TQM) is a management philosophy that focuses on the overall performance and continuous improvement of an enterprise. Through a fully engaged, holistic, continuously driven and customer-focused approach, companies can achieve high quality, efficiency and customer satisfaction, thereby laying a solid foundation for long-term success. In the process of implementing total quality management, enterprises should pay attention to training, cooperation, improvement and incentive, etc., to ensure that this management strategy is effectively implemented.

## **2. Definition of customer satisfaction**

Customer satisfaction is a quantitative statistical indicator used to measure the difference between customer expectations of a product and the actual experience, and to reflect the degree of customer satisfaction. When a customer's actual experience exceeds their expectations, customer satisfaction increases and customers are likely to appreciate the product; Conversely, when a customer's actual experience falls short of their expectations, customer satisfaction decreases and customers may file complaints or be dissatisfied.

Cardozo first proposed the concept of customer satisfaction, and he believed that customer satisfaction could increase repeated purchases or increase the purchase of other goods (Cardozo, 1975). Anderson, Fornell and Lehman divided customer satisfaction into the satisfaction of a specific transaction and cumulative satisfaction. Customer satisfaction of a specific transaction refers to the customer's feelings after purchasing a certain product and provides targeted information on the value added of a certain product or service. Cumulative customer satisfaction refers to the overall evaluation of all goods purchased or services consumed by customers, which can provide an important indicator of operation performance for enterprises (Anderson E.W.,1994).

## **3. The relationship between innovation consciousness, service innovation, total quality management and customer satisfaction**

### **3.1 The relationship between innovation consciousness and service innovation**

In today's competitive environment, an important challenge for businesses is how to have more creative and innovative thinking and enhance the creativity of employees. Service innovation is a description of the perception of the working environment by the management and employees, and also the degree to which the members perceive that the working environment supports creativity and service innovation. If the company creates a good service innovation atmosphere, employees are more likely to be motivated to try innovation, more motivated to innovate, thus enhancing the creativity of employees and the enterprise's service innovation ability. The innovation consciousness of enterprises has an important impact on stimulating the intrinsic motivation of employees.

Enterprise innovation consciousness is the spiritual support of service innovation behavior. The subjective initiative of innovation consciousness is to put forward the goals, plans and methods of future service innovation on the basis of the understanding of the nature and law of service innovation, guide enterprises to carry out practical activities of service innovation, and turn the "ideologically existing" things into objective reality. Innovation consciousness is a kind of ideology that is crucial to the survival and development of enterprises, and it is an intangible asset that plays a decisive role in promoting service innovation. Innovative service is the natural result of the enterprise's innovation consciousness, and the enterprise's innovation consciousness is the basis to support the service innovation spirit. In concrete practice, this innovation consciousness is manifested in the following aspects: First, innovation consciousness is the core idea of service innovation. Service innovation takes innovation consciousness as its core ideological foundation. Innovation consciousness is an idea formed in the social environment of an enterprise, which is influenced by science and technology, economy, politics, and other factors, and is comprehensively determined by the enterprise's commodity production, business activities, personal experience, cultural literacy, thinking mode, values, ability and quality. Secondly, innovation consciousness is the primary condition for service innovation. Innovation consciousness is an indispensable condition for service innovation, and only the management and employees with innovation consciousness can jointly complete service innovation. Thirdly, innovation awareness is crucial to the operation of service innovation mechanism. Innovation consciousness and service innovation mechanism interact and promote each other. The existence of innovation consciousness makes the service innovation mechanism operate effectively and produce good results. Finally, the consciousness of innovation determines the tendency of service innovation. The innovation consciousness of the enterprise represents its initiative and foresight, which reflects the tendency of future service innovation. Based on the cognition of the nature and law of things, enterprises with innovative consciousness develop corresponding theories, plans and methods to guide practical activities, and transform concepts into reality by changing the specific form of the service system. Therefore, this study proposes the following hypothesis:

**H1:** Innovation consciousness has a significant positive impact on service innovation.

### **3.2 The relationship between innovation consciousness and total quality management**

Total quality management is a tool to promote innovation awareness. Innovation is a key driver of continuous improvement, and Total quality management (TQM) is an effective tool to promote innovation. TQM focuses on continuous improvement and optimization, which requires companies to constantly challenge the status quo and actively seek new solutions. In this process, employees need to think creatively to find new ways to solve problems. Through processes in TQM, such as the quality loop, 5W1H analysis, PDCA cycle, etc., companies can stimulate employees' awareness of innovation and drive product or service upgrades. Therefore, this study proposes the following hypothesis:

**H2:** Innovation consciousness has a significant positive impact on total quality management.

### **3.3 The relationship between innovation consciousness and customer satisfaction**

In the existing research, many domestic and foreign scholars have studied the relationship between the psychological index of customer satisfaction and its behavior intention, which provides a rich theoretical reference for this paper to explore the relationship between customer satisfaction and innovation consciousness. Female Berry and Parasuraman (1991) found that a good interactive relationship between customers and enterprises would significantly affect customer behavior. Specifically, when customers are satisfied with a high degree, they will not only make repeated purchases, but also actively and willingly take actions that are beneficial to the enterprise, such as word-of-mouth dissemination of the enterprise's products or brands, introducing people around or in the circle to buy, actively participating in the activities organized by the enterprise, and paying attention to the enterprise's brand promotion activities (Berry and Parasuraman, 1991). Juttner and Wehrh (1994) believe that consumers can understand and master the business philosophy and product development of enterprises through consumer participation, thus providing enterprises with new ideas and targeted strategies for their development. For customer satisfaction and enterprise innovation behavior, there is a common influencing factor: internal motivation (Juttner & Wehrh, 1994). According to the exchange theory, Hofma and gram (1992) point out that when an individual's income in an organization exceeds the expected income, the individual will actively and consciously repay the organization (KD Hoffman, TN Ingram, 1992). For the mutually beneficial relationship between consumers and enterprises, Bowen(1990) and Solomon (1995) used the social exchange theory to explain: when consumers have a high degree of satisfaction with certain products or services provided by enterprises, they will actively and consciously engage in beneficial behaviors for the enterprises (Bowen, 1990) (P Solomon. Jeffrey Draine, 1995). Gutek (1995) pointed out that in the process of purchasing or consuming consumer products, when the income obtained exceeds the psychological expectations, or when the products or sales services of the enterprise meet the initial expectations, there will be certain additional income for consumers. In this case, consumers will repay the enterprise in their own way (JJ Cronin.MK Brady, 2000) Ford(1995) further defines this behavior as "customer autonomy." Bettencourt (1997) clearly defined "customer autonomous behavior", which is "a kind of behavior that is self-led and self-decided by customers and beneficial to enterprise service improvement". In this behavior, consumers may become active communicators of enterprises, individual consulting experts of enterprises, and human resource service providers of enterprises (Bettencourt, 1997).

In the era of knowledge economy, many emerging industries are full of opportunities and risks. In the face of these new opportunities and challenges, enterprises must have a stronger sense of innovation, identify market opportunities, provide products and services to meet the needs, and lead and adapt to new needs. Only in this way, enterprises can survive, and continue to grow and develop, will not be eliminated by The Times. Therefore, this study proposes the following hypothesis:

**H3:** Innovation consciousness has a significant positive impact on customer satisfaction.

### **3.4 Relationship between service innovation and customer satisfaction**

The development of service innovation has a positive impact on customer satisfaction, and the change of customer satisfaction in turn promotes the further development of service innovation. To be specific, enterprises carry out service innovation by introducing new service items, improving service quality, or reducing costs, so as to achieve excess returns and improve customer satisfaction. However, due to the characteristics of service innovation, this innovation is easy to be obtained or imitated by competitors, and the fierce market competition encourages enterprises to constantly carry out service innovation to improve customer satisfaction. Therefore, all enterprises involved in service innovation can benefit from the innovation process of mutual cooperation and improve the overall level of industry competitiveness. At the national level, as the science and engineering community becomes more international and cross-border knowledge flows become more common, it is increasingly important for countries to take service innovation measures to improve the customer satisfaction of their own enterprises. The internal structure of global enterprises is also showing a trend of high specialization, with its core focus on service innovation.

The development process of enterprises is a spiral, in this process, service innovation and customer satisfaction changes play an important role. According to World Bank statistics, the proportion of total imports and exports of international trade enterprises in total global trade fluctuates from year to year. For example, it was 21.50% in 1980, rose to 26.99% in 1993, and then fell to 21.81% in 2011. It then recovered to 25.97% in 2015 but fell again by 2.27% in 2016. Due to the epidemic, the total amount in 2021 is only 20.4 trillion US dollars (data reference source: Chinanews.com); There will be a recovery in 2022, with total global trade reaching \$50.52 trillion (data reference source: People's Daily Online). This kind of performance is obviously inconsistent with the trend of urbanization of the world's population, market-oriented economic operation, monetization of economic exchanges, and service-oriented economic life, and is also inconsistent with the trend of global economic restructuring and industrial upgrading. A hidden problem is that in the overall international innovation services capacity framework, the strength of most countries, especially developing countries, lies in manufacturing, while a few developed countries have shifted their focus to services and innovation. Therefore, in the long run, the change basis of international trade in services is service innovation and customer satisfaction. Therefore, this study proposes the following hypothesis:

**H4:** Service innovation has a significant positive impact on customer satisfaction.

### **3.5 The relationship between total quality management and customer satisfaction**

Total quality management is a quality management method based on the participation of all employees in an organization. It emphasizes the formation of a culture of focusing on quality and continuous improvement within the enterprise and satisfies customer needs by improving product quality and service quality, thus obtaining long-term competitive advantages (Smith & Johnson, .2018).

In recent years, domestic and foreign scholars have done a lot of research on the relationship between TQM and CS. It is argued that Total Quality management (TQM) has a positive impact on customer satisfaction (CS). By implementing TQM, product quality can be improved, and customer satisfaction enhanced. Others argue that the relationship between TQM and CS is mediated by other factors, such as corporate culture and employee training.

These factors play an intermediary role between TQM and CS. It has also been suggested that there is an interactive relationship between TQM and CS. In the process of implementing TQM, customer feedback can provide enterprises with directions for improvement, thereby improving customer satisfaction.

There is a strong link between total quality management (TQM) and customer satisfaction. By implementing TQM, companies can improve product quality and service quality, thereby increasing customer satisfaction and achieving lasting success in the fierce market competition. This study provides beneficial guidance for enterprises to effectively use TQM in practice and provides reference and reference value for subsequent research. Therefore, this study proposes the following hypothesis:

**H5:** Total quality management has a significant positive impact on customer satisfaction.

#### **4. The mediating role of service innovation and total quality management**

Service innovation has a positive impact on the promotion of innovation awareness, while total quality management helps to improve customer satisfaction. However, the interaction between the two is not a simple linear relationship, but a synergistic effect through mutual promotion. For example, the implementation of total quality management can provide enterprises with stable quality assurance, thus providing a good foundation for service innovation; In turn, service innovation can guide the direction of total quality management and promote its continuous improvement.

In addition, the implementation of service innovation and total quality management is influenced by several factors, including corporate strategy, organizational culture, and employee training. These factors largely determine whether the interaction between the two can be fully developed. For example, if the enterprise does not pay enough attention and support to service innovation, the implementation effect of total quality management may be limited, thus limiting the synergy between the two. Therefore, this study proposes the following hypothesis:

**H6:** Service innovation plays an intermediary role between innovation awareness and customer satisfaction.

**H7:** Total quality management plays an intermediary role between innovation awareness and customer satisfaction.

## **Research Methods**

### **1. Data source**

In this study, 400 questionnaires were distributed, and 308 valid questionnaires were collected, with a recovery rate of 93.8%. We selected state-owned enterprises as research samples, aiming to explore the impact of enterprise innovation awareness, service innovation and total quality management on customer satisfaction, and examined the working life of managers and employees of state-owned enterprises, enterprise size and gender. In terms of enterprise innovation consciousness, we describe innovation demand and motivation consciousness, innovation means consciousness and value consciousness according to the actual situation, so as to understand the importance of innovation in various stages of enterprises. We strive to promote the development of new technologies and products, optimize management and operational processes, and improve business conditions. In terms of measuring service innovation, we investigated service culture and brand innovation, service



quality innovation, customer interface innovation, service process innovation and other aspects according to the actual situation of enterprises.

## 2. Variable measurement

To ensure the reliability and validity of the measurement tool, this study uses the maturity scale of previous relevant studies. The questionnaire in this study includes five parts, namely, personal background information innovation consciousness, service innovation, total quality management and customer satisfaction. Except personal background information, the remaining variables are scored by five-point Likert scale. Considering that age, education, years of work, and team size may have a certain impact on the interpretation of the research results, it is necessary to control the statistical analysis.

## 3. Empirical analysis

### 3.1 Descriptive statistical analysis

The results of descriptive statistical analysis show the mean and standard deviation of all variables and the correlation between variables. There is a significant positive correlation between innovation awareness and service innovation, total quality management and customer satisfaction, and there is also a significant positive correlation between service innovation, total.

### 3.2 Reliability and validity analysis

#### 3.2.1 Reliability analysis

Cronbach's for innovation awareness is 0.880, and Cronbach's for service innovation is 0.911. Cronbach's a of TQM was 0.932 and Cronbach's a of customer satisfaction was 0.905, both of which were greater than the critical value 0.7, which proved that the scales

	Mean value	Standard deviation	1	2	3	4
Innovation consciousness	3.448	1.313	0.843			
Service innovation	3.76	1.253	0.347*	0.851		
Total quality management	3.714	1.264	0.278*	0.339*	0.857	
Customer satisfaction	3.995	1.082	0.413*	0.482*	0.566*	0.810

\*  $p < 0.05$  \*\*  $p < 0.01$  Diagonal numbers are AVE square root values used in this study had good reliability.

#### 3.2.2 Validity analysis

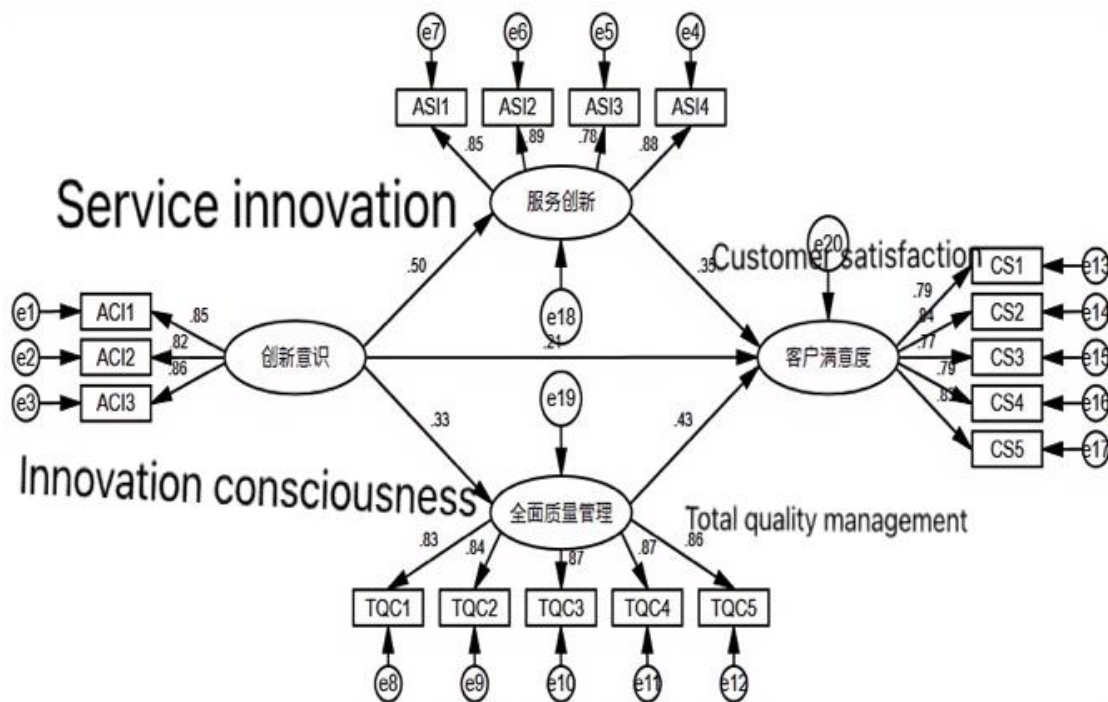
The results of confirmatory factor analysis on the data using Amos23.0 are shown in the following table. Compared with the other three models, all indicators of the four-factor model meet the fitting standard, and the fitting effect is optimal, indicating that there is good discriminative validity among variables, reflecting different isomorphisms. In addition, the confirmatory factor analysis results of the four-factor model showed that the combined reliability (CR) of each scale was greater than 0.7, the mean extraction variance (AVE) was greater than 0.5, and the standardized load coefficient of each item on its corresponding latent variable was between 0.775 and 0.894,  $P < 0.001$ . It indicates that the combination reliability and convergence validity of the scale used in this study are relatively good.

dimensionality	item	Estimate	SE	C.R.	p	CR	AVE
Innovation consciousness	ACI1	0.852	-	-	-	0.881	0.711
	ACI2	0.821	0.06	16.508	***		
	ACI3	0.856	0.058	17.211	***		
Service innovation	ASI1	0.855	-	-	-	0.913	0.725
	ASI2	0.894	0.052	20.473	***		
	ASI3	0.777	0.062	16.344	***		
	ASI4	0.876	0.053	19.826	***		
Total quality management	TQC1	0.834	-	-	-	0.933	0.734
	TQC2	0.841	0.057	18.121	***		
	TQC3	0.87	0.055	19.113	***		
	TQC4	0.876	0.05	19.341	***		
	TQC5	0.863	0.053	18.885	***		
Customer satisfaction	CS1	0.796	-	-	-	0.905	0.656
	CS2	0.845	0.067	16.541	***		
	CS3	0.775	0.063	14.799	***		
	CS4	0.799	0.065	15.381	***		
	CS5	0.833	0.068	16.228	***		

Discriminative validity test							
	$\chi^2/df$	RMSEA	CFI	IFI	TLI	NFI	SRMR
Four-factor model	1.11	0.019	0.997	0.955	0.996	0.968	0.022
Three-factor model	4.475	0.106	0.894	0.824	0.875	0.868	0.081
Two-factor model	11.741	0.187	0.666	0.565	0.615	0.647	0.166
Single factor model	14.594	0.21	0.574	0.496	0.513	0.558	0.141

Note: Four-factor model :ACI, ASI, TQC, CS;

Three factor model :ACI+ASI, TQC, CS; Two-factor model :ACI+ASI+TQC, CS; Single factor model :ACI+ASI+TQC+CS;



### 3.3 Data inspection

#### 3.3.1 Homologous deviation test

Since all questions in each questionnaire in this study were answered by the same person, Harman single factor test was needed to investigate whether there was homologous bias in the data. Spss24.0 was used for exploratory factor analysis of all items in the scale. The eigenvalues of 4 factors were more than 1, and the variance explained by the first factor was 23.423%, less than the critical standard of 40%, indicating that there was no serious common methodological bias in this study. The cumulative explanatory amount of the four common factors for the total variance is 77.512%. No problem that the explanatory rate of single factor is particularly large is found. Therefore, the homology of the data in this study has negligible influence on the results.

#### 3.4 Hypothesis testing

In this paper, the structural equation model is adopted for hypothesis verification. SEM can deal with complex recursive relationship problems and mutual causality problems, and the path relationship of this model is constructed according to the theoretical assumptions, as shown in the following figure: The structural equation model as shown in the figure is established to test the influence relationship between variables. Among them, the fitting test  $2/df=1.282<3$ ,  $RMSEA=0.030<0.08$ ,  $NFI=0.963>0.9$ ,  $IFI=0.992>0.9$ ,  $TLI=0.990>0.9$ ,  $CFI=0.991>0.9$ ,  $GFI=0.948>0.8$  showed that the structural equation model had a good fit. The overall fit is high.

Table. Test of path coefficients and hypothesis results

path			Path coefficient t	S.E.	C.R.	P
Service innovation	<---	Innovation consciousness	0.498	0.059	8.153	***
Total quality management	<---	Innovation consciousness	0.335	0.066	5.384	***
Customer satisfaction	<---	Innovation consciousness	0.209	0.052	3.457	***
Customer satisfaction	<---	Service innovation	0.346	0.052	5.962	***
Customer satisfaction	<---	Total quality management	0.432	0.045	7.833	***

Note: \*\*\* indicates significant at 0.01 level.

The standardized path coefficient of innovation awareness on service innovation is 0.498 ( $p < 0.05$ , C.R.=8.153), indicating that innovation awareness has a significant positive impact on service innovation, so hypothesis H1 is valid. The standardization path coefficient of innovation consciousness on TQM is 0.335 ( $p < 0.05$ , C.R.=5.384), indicating that innovation consciousness has a significant positive impact on TQM, so H2 is assumed to be valid. The standardized path coefficient of innovation awareness on customer satisfaction is 0.209 ( $p < 0.05$ , C.R.=3.457), indicating that innovation awareness has a significant positive impact on customer satisfaction, so hypothesis H3 is valid.

The standardized path coefficient of service innovation on customer satisfaction is 0.346 ( $p < 0.05$ , C.R.=5.962), indicating that service innovation has a significant positive impact on customer satisfaction, so hypothesis H4 is valid. The standardized path coefficient of TQM on customer satisfaction is 0.432 ( $p < 0.05$ , C.R.=7.833), indicating that TQM has a significant positive impact on customer satisfaction, so hypothesis H5 is valid. According to the suggestions of Preacher and Hayes, Bootstrap method is used to test the mediating effect. Compared with other methods, Bootstrap method does not need the hypothesis of normal distribution, which makes up the weak point that the significance of the mediating effect cannot be tested in the stepwise test method and has a good statistical effect. The model fitting method used in this study was maximum likelihood method, and the Bias-corrected test method and Percentile method were simultaneously used through Bootstrap and repeated sampling 5000 times under the condition of 95% confidence interval. According to the criterion of mediating effect proposed by Wen Zhonglin et al., if the variable does not include 0 in the value interval of 95% confidence interval, it indicates that the mediating effect is significant. In this study, the mediation effect of structural equation model was analyzed, and the specific results are shown in the following table:

Table. Results of mediation effect test

Parameter	Estimate	Bias-corrected 95% CI			Percentile-method 95% CI		
		Lower	Upper	P	Lower	Upper	P
Service innovation (indirect effect)	0.173	0.098	0.27	0.000	0.096	0.266	0.000
Total Quality Management (Indirect effects)	0.145	0.083	0.235	0.000	0.078	0.229	0.000
Innovation Awareness - Customer Satisfaction (Direct effect)	0.209	0.097	0.312	0.001	0.101	0.317	0.001
Innovation Awareness - Customer Satisfaction (Total effect)	0.526	0.411	0.623	0.001	0.423	0.635	0.000

The indirect influence coefficient of innovation consciousness, service innovation and customer satisfaction (indirect effect) is 0.173, and the confidence interval of Bias-corrected 95%CI indirect effect is (0.098, 0.270), and the confidence interval of Percentile-method 95%CI indirect effect is (0.096, 0.266), P values are all less than 0.05, indicating that service innovation plays an intermediary role between innovation awareness and customer satisfaction, so hypothesis H6 is valid. In addition, the coefficient of innovation consciousness and customer satisfaction (direct effect) is 0.209, the confidence interval of Bias-corrected 95%CI direct effect is (0.097, 0.312), and the confidence interval of Percentile-method 95%CI direct effect is (0.101, 0.317). All P-values are less than 0.05, indicating that the direct effect is significant. Therefore, it can be seen that service innovation plays a partial mediating role between innovation awareness and customer satisfaction. The indirect influence coefficient of innovation consciousness, total quality management and customer satisfaction (indirect effect) is 0.145, and the bias-corrected 95%CI confidence interval of indirect effect is (0.083, 0.235). Percentile-method 95% CI indirect effect confidence interval is (0.078, 0.229), and P values are all less than 0.05. It can be seen that total quality management plays an intermediary role between innovation awareness and customer satisfaction, so H7 is assumed to be valid. In addition, the coefficient of innovation consciousness and customer satisfaction (direct effect) is 0.209, the confidence interval of Bias-corrected 95%CI direct effect is (0.097, 0.312), and the confidence interval of Percentile-method 95%CI direct effect is (0.101, 0.317). All P-values were less than 0.05, indicating that the direct effect was significant. Therefore, it can be seen that total quality management plays a partial mediating role between innovation awareness and customer satisfaction.

## Results and Discussion

Through the in-depth study of the impact of innovation consciousness, service innovation and total quality management on customer satisfaction, this paper aims to provide more effective quality management methods for enterprises in the market competition, so as to improve customer satisfaction and achieve sustainable development of enterprises.

Through the review and evaluation of relevant literature and data analysis, it is found that innovation consciousness, service innovation and total quality management all have a positive impact on customer satisfaction. Improving innovation awareness helps enterprises to constantly explore new service models and products to meet customer needs and improve market competitiveness. Service innovation can improve customer experience, make enterprises stand out in the fierce market competition, and then obtain more customers and market share. Total quality management can ensure that all aspects of the enterprise can meet customer needs, improve customer satisfaction, so as to achieve long-term stable development. With the fierce market competition, improving customer satisfaction has become a key element of sustainable development of enterprises. In order to enhance customer satisfaction, enterprises begin to pay attention to innovation awareness, service innovation and total quality management. This paper aims to study the direct and indirect effects of these three factors on customer satisfaction, so as to enrich the research content in related fields and provide reference for enterprises in practice.

By exploring the influence of innovation consciousness, service innovation and total quality management on customer satisfaction, this study provides useful enlightenment for enterprises. First, enterprises should pay attention to the awareness of innovation, constantly introduce new products, or improve existing products to meet customer needs. Secondly, enterprises should enhance customer experience through service innovation to meet the diversified needs of customers. Finally, enterprises should implement total quality management, optimize processes and improve service quality, so as to improve customer satisfaction. In practice, enterprises should formulate corresponding strategies according to their own unique characteristics. For example, for product-centered enterprises, they should attach importance to innovation awareness and constantly carry out research and development of new products to maintain market competitiveness. For enterprises with service as the core, they should pay attention to service innovation and improve service quality to attract more customers. At the same time, enterprises should also take total quality management measures to ensure the steady improvement of product quality and service quality. Such an approach will help companies achieve better performance in the market. In the modern business environment, enterprise leadership plays an increasingly important role in promoting innovation awareness, service innovation and total quality management. The purpose of this study is to explore how corporate leadership influences and translates into actual innovation actions, and to make recommendations for the future.

### 1. Enterprise leadership and innovation consciousness

In promoting the formation of innovation consciousness, the leadership of enterprises plays a core role. Innovation awareness is nothing more than leading and promoting the introduction of innovative ideas, but also creating and establishing a culture and environment that supports innovation. Through words and deeds, leaders pass on innovative ideas to employees and stimulate their enthusiasm for innovation. At the same time, by setting up an innovation reward mechanism, leaders encourage employees to make innovative attempts at

work, so as to transform innovation consciousness into actual innovation actions.

### 2. Enterprise leadership and service innovation

The influence of enterprise leadership on service innovation is mainly manifested in two aspects: strategic planning and organizational culture. When making strategic planning, leaders should fully consider the importance of service innovation and guide employees to carry out service innovation based on customer demand. At the same time, in the organizational culture, leaders should emphasize customer first, encourage employees to pay attention to customer needs, and make innovative responses to customer feedback in a timely manner. In this way, business leadership can translate the idea of service innovation into actual innovation actions.

### 3. Enterprise leadership and total quality management

The influence of enterprise leadership on total quality management is mainly manifested in the shaping of quality concept and culture. Leaders should establish a strong sense of quality and guide employees to attach great importance to product quality. At the same time, leaders should also shape the quality culture of the organization through quality rewards and training, so as to ensure that the concept of quality can be translated into actual innovative actions. Given the above analysis, here are some suggestions:

## suggestions

(1) Business leaders should attach great importance to the concept of innovation and service, and positively influence employees through their own behavior to shape the organizational culture that promotes innovation and service.

(2) Enterprises should establish a sound innovation reward mechanism to encourage employees to make bold attempts at innovation at work and transform innovation consciousness into practical innovation actions.

(3) Enterprises should strengthen staff training, improve their awareness of quality management, and build a comprehensive quality culture to ensure that quality concepts can be transformed into actual innovative practices.

By exploring the role of corporate leadership in promoting innovation awareness, service innovation and total quality management, this study reveals how corporate leadership influences and translates into actual innovation actions. In the process, this study puts forward future recommendations to provide reference for business leaders. However, in practice, there may be various complications, so leaders should be flexible to adjust the strategy according to the actual situation of the enterprise. Future research can further investigate the specific mechanisms of corporate leadership in various industries and companies of all sizes, and how to promote innovation and total quality management more effectively. In addition, with the continuous development of The Times, new theories and ways of leadership will also emerge, which are worthy of our further study and discussion. Enterprise leadership plays an extremely important role in promoting innovation awareness, service innovation and total quality management. Only with a full understanding and application of corporate leadership can we effectively transform innovation and service concepts into practical innovation actions, thus enhancing the competitiveness and sustainable development ability of enterprises. Through in-depth research on the above issues, future research will help us better understand how enterprises can improve customer satisfaction and achieve sustainable development through innovation awareness, service innovation and total quality management. Through the in-depth research on the impact of innovation awareness, service innovation and

total quality management on customer satisfaction, this dissertation provides valuable reference and suggestions for future related research. In an increasingly competitive market environment, continuous innovation and quality service have become the key elements for companies to win customer satisfaction. Future research should focus on the interaction between these fields, as well as new development trends, to help companies achieve longer term development goals.

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