The influence mechanism of service innovation on consumer mobile sharing in the age of digital intelligence

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Introduction: Digitalization is moving closer to traditional service companies. Consumers have new behavioral characteristics, and operators need to adopt new marketing strategies.

Methods: We used CiteSpace software to analyze the literature related to customer delight in CNKI and Web of Science databases. We constructed models and research hypotheses based on theoretical studies related to customer delight and mobile sharing. The data were collected through questionnaires and the article used structural equation modeling and regression analysis to test the mediating role of customer delight and the moderating role of individual innovativeness in the theoretical model.

Results: Among the four dimensions of service innovation, only interface innovation and delivery innovation, affect consumers' mobile sharing through customer delight, and customer delight has a very significant positive impact on mobile sharing. The mediating effect of customer delight is affected by the individual innovation of consumers in the path of delivering innovation.

Discussion: In the future, catering and takeaway companies can innovate the delivery process of product information to reach consumers, and provide a personalized interface to accurately meet the different needs of customers.

KEYWORDS

customer delight, service innovation, mobile sharing, personal innovation, takeaway marketing

1. Introduction

Affected by the epidemic in 2020, traditional business logic was forced to change. The wave of digital economy is coming, and digital intelligence is accelerating the penetration of local life. Take-out, efficiency, traffic, innovation, retail, digital intelligence, technology, innovation. These neglected or underappreciated fields have become the direction of reform and development of many catering enterprises. Digital intelligence refers to "digital + intelligence" (Daradkeh et al., 2023). JD.com regards digital "number" as the human brain, gives wisdom to the brain, regards the limbs as "intelligence", so it is like a superman, achieve efficiency. In the past, without digitization and intelligence, catering companies could develop well by relying on in-store, natural traffic, and random consumption, but today, they still rely on the traditional business model to only cover offline customers can no longer support them. Catering companies are forced to carry out digital transformation. For example, HEYTEA devolves the power of data decision-making to front-line positions, allowing them to collect front-line data and make decisions, and use data and intelligent management to achieve front-end and back-end linkage.

The scale of food delivery soared to 300 billion in 2020. Food delivery platforms pay special attention to the value of consumers' word-of-mouth, encourage consumers to post text comments or post photos of consumption scenarios, and share dining experiences on social media such as Moments, WeChat groups, and Weibo. Use silent word of mouth to publicize catering companies. The impact of the epidemic and the complete subversion of consumption habits such as food delivery, taxi-hailing, and payment indicate that "Internet +" and mobile Internet are comprehensively changing our consumers and our consumption choices, but consumption inertia makes it difficult for us to readily adapt to new technologies and new transaction methods, learning new operations, and even installing new apps. Under the "bait" of promotional offers, low-frequency applications have low activity, low loyalty, and low repeat usage. For consumers, in the new era of digital intelligence, new service methods can better meet individual needs. Online booking, offline consumption and online sharing in the catering industry have become a new O2O (Offline to Online) business model. Catering companies ask for praise, forwarding, and photo sharing. They often use interest stimulation, planning entertainment activities, and building unique and interesting photo scenes to tempt customers to share socially, among them, discounts, gifts and face-to-face requests are the most used methods. Faced with the external driving force of corporate sharing requirements, many customers are reluctant for privacy, not to harass Moments or other considerations, and even share in person to get preferential treatment, and delete the shared content when they turn around (Chen and Lin, 2020). From the aspects of big data analysis, innovative digital operation management, omni-channel sales, innovative customer relationship management, etc., to carry out digital and intelligent empowerment, to meet the individual needs of consumers, and to provide customers with multi-faceted services in a long-term and stable manner, so that consumers can actively sharing consumption information to help companies in marketing promotion, which is the goal that both traditional catering companies and online food delivery platforms are striving to achieve.

This paper is based on the customer delight research paradigm of the emotional genre, and takes the online food delivery of catering enterprises in the era of digital intelligence as the research background, and builds a research model on the effect of service innovation on customer delight. The model takes the four dimensions of service innovation as independent variables and takes customer delight as a mediating variable, individual innovation is used as the moderating variable for service innovation to affect customer delight, and mobile sharing is set as a dependent variable to carry out empirical research to deeply analyze the mechanism of service innovation and customer delight of catering enterprises in the era of digital intelligence.

2. Theoretical basis
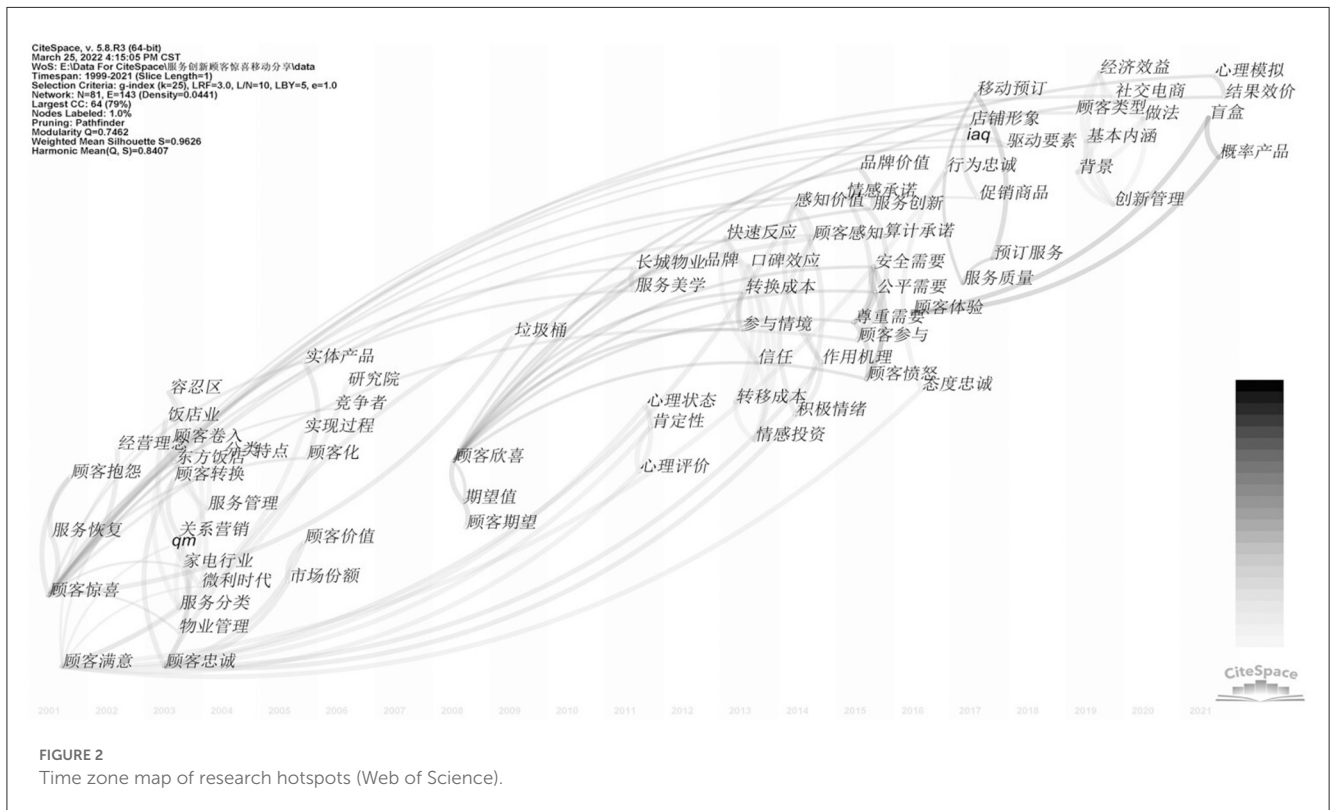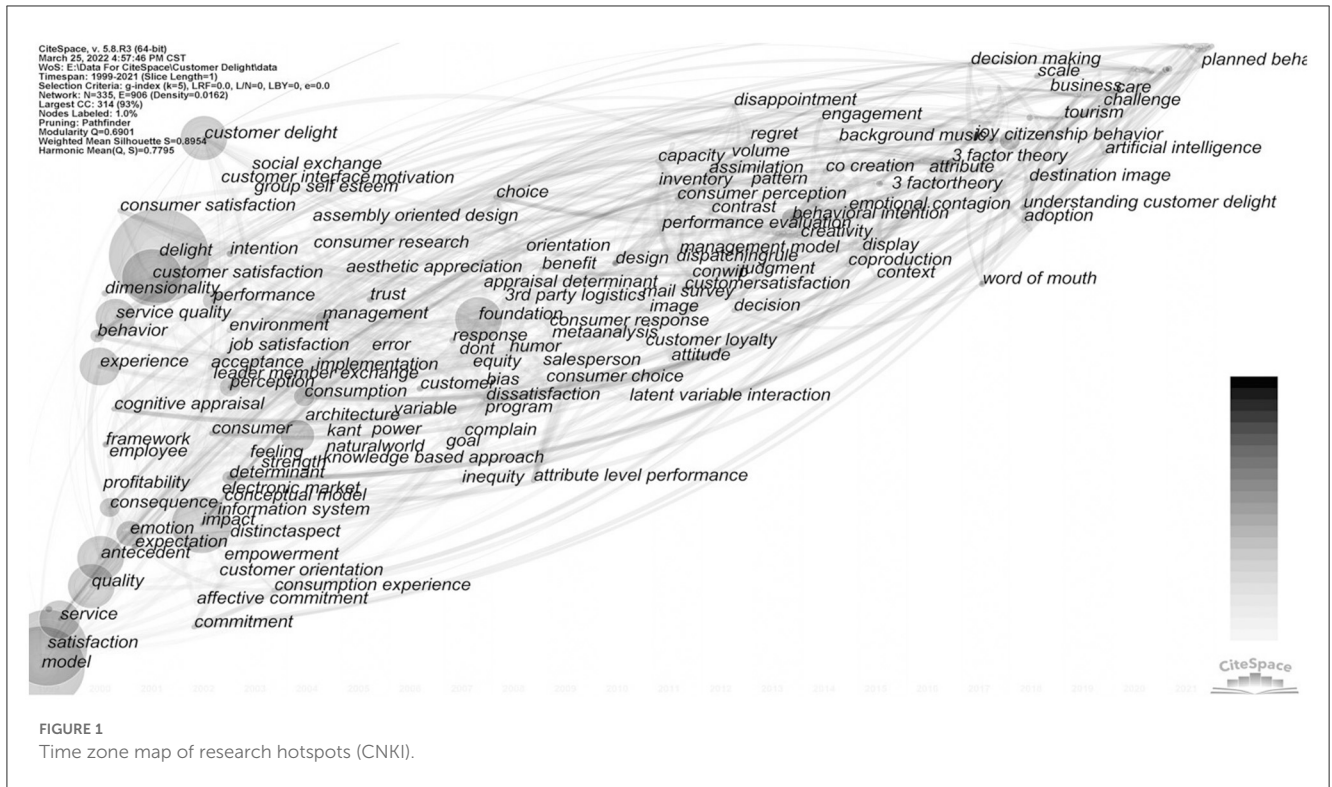
2.1. Customer delight

From the conception, the research on customer delight has formed two clear branches: the emotional genre and the cognitive genre. Westbrook and Oliver (1991) studied the pattern

of consumption emotion. "Customer Delight" is defined as the positive emotion generated by the perception exceeding expectations to a surprising degree, which is one of the basic consumption emotion patterns. From the perspective of emotion, customer delight is an important structural variable in empirical research, which can be measured from the aspects of pleasure, excitement, joy, happy, etc. (Finn, 2005), and a structural equation model can be constructed to study the mechanism of customer delight. Other scholars put forward the concept of customer delight from the perspective of cognition, they believe that the highest degree of customer satisfaction is customer delight (Chowdhury, 2009). The cognitive perspective does not exclude that customer delight is the essence of consumption emotion. The researchers believe that customer delight has upper and lower boundaries, When customer satisfaction degree is so high that it crosses the upper boundary, it will cause customer delight; when customer satisfaction degree is so low that it falls to the lower boundary, it will cause customer anger and complaints (Ngobo, 1999). The quantitative change of customer satisfaction degree will cause the qualitative change of customer emotion, the highest value of customer satisfaction can be used to measure customer delight (Zhang et al., 2013), and customer evaluation of services can be divided into four levels: anger, dissatisfaction, satisfaction, and delight, and the full-score comments reflect the customer delight (Crotts et al., 2008). Researchers can analyze the key factors that cause customer delight from the interview descriptions and written comments of the most satisfied customers.

Using the method of bibliometrics, we can comprehensively and clearly grasp the research status, frontiers and hotspots of customer delight in the past 10 years through quantitative analysis of literature characteristics and cited data. CiteSpace is an application software developed by Dr. Chen Chaomei to analyze, mine and visualize scientific research literature data. Through analysis, the research hotspot of a certain subject area is found and present them in a visual way. The data processing of the article adopts the 5.8.R3 version of CNKI and Web of Science data analysis section. Through CNIK, this article searches with the subject words or "customer delight", selecting journal articles and searching for exact matching, a total of 49 search results were obtained; through Web of Science, the core collection was searched with the subject words "Customer Delight", and 475 items were retrieved. By de-duplication, sorting, and deletion of the journal conference call for papers, the frontispiece, the introduction of personal academic achievements, the introduction of scientific research institutions, book reviews, and the entries signed by the research group and without authors, as well as irrelevant entries, finally we got 47 Chinese and 312 foreign related literatures, and the test results are shown in Figures 1, 2.

From the time distribution of the research, the research results of customer delight are concentrated in the past 10 years, and the trend has been intensive in the past 5 years. Customer delight is becoming one of the hot areas of research. It can be seen from Figures 1, 2 that over time, the research focus on customer delight extends from customer delight itself to innovation management.

Foreign English research results are relatively rich. Based on the emotional perspective, Oliver et al. (1997) proposed the first conceptual model of customer delight, the "ORV model", in order to reveal the mechanism of customer delight. They surveyed

FIGURE 1
Time zone map of research hotspots (CNKI).

FIGURE 2
Time zone map of research hotspots (Web of Science).

two groups of consumers, visitors to wildlife theme parks and listeners of symphony concerts, and validated the ORV model with grouped data. According to the results of the empirical analysis, the combined analysis of the two sets of data showed that the "surprising consumption" and "disconfirmation" felt by consumers cause "arousal" mental states and "positive emotions", Formed "customer delight", promoted "customer delight", and led to the willingness to spend again. A group comparison of the two

groups of data showed that the customer delight in theme parks had no significant effect on the willingness to spend again, and surprising consumption had no direct effect on customer delight. This means that there are subtle differences in the generation and action mechanisms of customer delight in different services. The ORV model is an important milestone in the study of customer delight. The model preliminarily describes the process of consumer experience as an external factor leading to the generation of consumers' internal emotions, the psychological mechanism of consumers' transformation from arousal and positive emotions to customer delight, and the positive effect of customer delight in promoting the willingness of re-consumption behavior. The ORV model measured and modeled customer delight as a research construct for the first time, and used structural equation model to test the hypothesis, which laid the foundation for subsequent empirical research on customer delight. Finn (2005) conducted an innovative measurement of the ORV model with a larger sample, extending the application of the ORV model from participatory entertainment services to consumer websites, confirming that customer delight and customer delight are two different constructs, and extended the measurement of customer delight from a single item to three items. Finn (2006) went on to re-examine the generality of the ORV model using data on shoppers from 20 Canadian online retail sites, it is found that for websites, customer delight has a greater impact on behavioral intention than customer satisfaction; when considering the interaction between website and customer factors, customer satisfaction is the more important factor. Loureiro and Kastenholz (2011) added the pre-variable company image and the intermediate variable perceived quality to the ORV model to investigate the tourism accommodation industry. The results of the empirical study showed that the basic framework of the ORV model is robust, and the newly added company image and perceived quality affect customers satisfaction and customer loyalty, but these two variables are not related to customer delight. Loureiro et al. (2014) continued to improve the ORV model, adding two intermediate variables, perceived quality and trust, to the ORV model. They found that in the utilitarian Fast Moving Consumer Goods (FMCG) retail scenario, some of the original paths of the ORV model became insignificant, and customer delight did not affect customers loyalty. These several literatures repeating the ORV model have verified the ORV model in different service contexts, and found that the ORV model is robust in its basic structure, however, the effect between research constructs was not significant in some service scenarios. It can be seen that the ORV model reveals the general mechanism of customer delight generation, which is both robust and somewhat service scenario dependent. The background of emotional genre research on customer delight was in the retail service industry, mainly in the offline tourism and hospitality service industry, including destinations, hotels, restaurants, etc.; followed by traditional online shopping. There is less research on customer delight in the context of the combination of online and offline, and the dual factors of online platform and offline sellers in the era of digital intelligence. Different from the previous research results of service quality, perceived value, customer satisfaction, and customer loyalty, the theoretical results of customer delight highlight the important role of customer emotion and provide new theoretical support for service

marketing innovation. Under different service backgrounds, there are certain differences in the influencing factors and mechanisms of customer delight, such as the effect of surprise, service quality, fairness, and esteem needs on customer delight and the effect of customer delight on customer loyalty. Different conclusions have been drawn in different studies, suggesting the need for further research.

The research results of Chinese forms of our scholars are relatively concentrated. Chen (2005) was the first to theoretically explain the value and role of customer delight. Zhang et al. (2013) conducted an in-depth analysis of the domestic and international literature on customer delight, focusing on comparing the relationship between customer delight and customer satisfaction and customer loyalty, and they then conducted an empirical study on the antecedents of customer delight and its effect on customer loyalty. At the same time, Chinese scholars have gradually published their research results on customer delight in mainstream foreign English journals (Wang, 2011; Ma et al., 2013), and domestic research had started to connect with the international level.

2.2. Mobile sharing

With the generalized socialization of the Internet, people can enjoy various services and receive various fragmented information without leaving home. People can recommend purchases from Sina Weibo at home, graphical messages from WeChat Moments and WeChat Groups, recommendation of good Things from WeChat official accounts, text links in friends' messages, and information retrieval to occur purchase behaviors. Consumers can also share their experience on these platforms. Consumers are not only the receiver of information, but also the disseminator of information. The Internet has reduced communication costs, innovated transaction channels, and created a space for mutual benefit and sharing. This means that online users are gradually accepting and trusting the shopping information shared on social applications. The concept of "mobile sharing" was based on these behavioral characteristics, which refers to people share consumer information through the mobile internet, including photos of consumption sites, comments on consumption, location of consumption places, forwarding of promotional information of merchants, and invitations to consumption. Mobile sharing has the performance form of information sharing and the marketing effect beyond Internet Word of Mouth (Chen and Lin, 2020).

Some scholars analyzed the influencing factors of social network information sharing through social network theory, and concluded that the structure of social networks negatively affects information sharing willingness through relational inertia, while the perceived structural autonomy of networks proves to affect information sharing willingness through negative moderating effects (Cheon et al., 2015). The research results of Internet Word of Mouth (IWOM) have been rich, and mobile sharing is a new situation of IWOM, which has the ability to surpass the traditional User Generated Content (UGC) (Ye et al., 2011) and Internet Word of Mouth (IWOM) (Lu and Feng, 2009; Kozinets et al., 2010). According to the mechanism of word-of-mouth communication

(Xu and Huang, 2004), the mobile sharing has the following characteristics: (1) the locations of mobile sharing information release are often the scene of consumption, with pictures and truth, so the content is more credible; (2) consumers more often share information in social platforms through cell phones, and the recipients of information are usually closer network friends, so the dissemination effect is better; (3) cell phones operate instantly, making sharing more convenient and consumers are more willing to share; (4) some of the shared (4) some of the shared information come with links, and the recipients of the information can click on the links to reach the merchants directly, which makes the marketing effect more direct. Many scholars have paid attention to and started to study the marketing value of information sharing behavior on social networks, for example, Yu et al. (2016) used narcissism as an individual characteristic moderating variable to analyze the mechanism of network size, network density and network diversity on the content creation behavior and content sharing behavior of mobile social network users. This study proposes the concept of "mobile sharing" and constructs a new mobile sharing model from the "stimulus-organism-response (S-O-R)" framework, trying to develop a theory of information sharing and IWOM.

3. Research model and hypothesis

3.1. The impact of service innovation on customer delight

Schumpeter put forward the "Innovation Theory" (Dai et al., 2012) who believed that innovation is the reorganization of new factors and conditions of production and their introduction into the production system; it is through innovation that companies promote economic development. Barras (1986) proposed the "Reverse Product Life Cycle Model", which depicted the dynamic evolution of service innovation, that is, the process of achieving innovation by improving efficiency, then quality, and finally providing new services, thus starting the research on service innovation. Service innovation refers to the application of new ideas and technologies to improve and transform service processes and service products, enhance service quality and efficiency, expand service markets, and add new service content, thus creating new value for customers (Xu and Lv, 2003).

Service innovation includes four mutually influencing dimensions of conceptual innovation, interface innovation, delivery innovation and technological innovation. The background of the four-dimensional model of service innovation is the business-oriented generation service, not the consumer-oriented life service. Wang and Wu (2007) extended the four-dimensional theory of service innovation to consumer service, and after a survey of travel agencies in Yunnan Province, it was proved that the service of travel agencies also contained these four dimensions. Liu (2011) collected data from enterprises and conducted a validation factor analysis to prove that there is an interaction between the four dimensions. The existing articles on service innovation in consumer service enterprises are relatively few and mainly focus on the service enterprises themselves, and no research on the word-of-mouth effect of service innovation from the perspective of consumer-enterprise interaction has been found. From the perspective of consumer-enterprise interaction, this research studies consumers' perception of enterprise service innovation and its effect on customers delight emotions, thereby promoting mobile sharing behavior and helping the value co-creation process of enterprise social media marketing, which is a supplement and development of the literature related to service innovation.

3.1.1. Concept innovation

Conceptual innovation is to provide customers with an improved or new service, or it can be the separation and reorganization of the original service content to produce a new form of service, which includes service products, service content, service interface, etc.

The conceptual innovation dimension requires an accurate understanding of the existing and new services provided by the company, as well as the services provided by competitors, and especially an accurate grasp of innovative features. Through the understanding of conceptual innovation, service companies can continuously develop new services and improve the original services according to the changing market environment, customer needs and competitors' behavior, and finally realize their own "business intelligence" (Wikhamn, 2019).

Chinese catering industry into the new development stage of the era of digital intelligence, the business logic of the development of food enterprises has changed, the Internet and digital economy is rewriting the traditional food industry. The era of digital intelligence to the tide, breaking the previous restaurant industry in time and space restrictions. Enterprises need to comply with these: modernization, branding, scientific management, chain, supply chain and the new digital economy is now in vogue. In the face of these new concepts, in the next competition, if restaurant entrepreneurs do not iterate and upgrade their knowledge, they will not see the changes in consumer demand, and then they will definitely lose the favor of consumers. Therefore, the following hypothesis is proposed.

H1a: Concept innovation has a positive impact on customer delight.

3.1.2. Interface innovation

How to communicate effectively with consumers? Due to the high level of interaction between the service provider and the service receiver during the service delivery process, the completion of the service requires a good service delivery interface (Chang and Chen, 2008). The customer interface in the takeaway context represents all the elements related to the restaurant brand that the customer has access to. The customer interface is divided into physical and virtual. The physical refers to the physical storefronts, facilities, and staff of traditional catering companies. The virtual refers to the design and functionality of the online ordering pages of these restaurants. First of all, based on the fact that individual catering enterprises have their own O2O platforms, such

as Haidilao hot pot, Pizza Hut, McDonald's and KFC, these well-known catering enterprises have a large number of physical stores at home and abroad offline, and have opened their own online takeaway services, people can place orders online in mini apps, WeChat official accounts, mobile apps and Alipay, and continue to expand their market share and enhance competitiveness by meeting people's demand for ordering food. Secondly, as the caterers of e-commerce platform do not have the ability to develop website system alone, some traditional caterers seize the opportunity to choose to cooperate with platforms such as Meituan and Ele.me, to provide one-stop service for customers. The products and services are increasingly customer-oriented, and customers are increasingly involved in the production and delivery process of services. To a certain extent, the customer interface is becoming increasingly important for winning the delight of customers. Therefore, the following assumptions are made.

H2a: Interface innovation has a positive impact on customer delight.

3.1.3. Delivery innovation

How to innovate the marketing model? How to innovate delivery methods? The "delivery innovation" dimension mainly emphasizes the innovative way of delivering new service products. The delivery system in the context of takeaway represents the operation and management system of traditional catering enterprises from the backstage to the front to the delivery of services to customers. The delivery system is divided into external delivery system and internal delivery system. From the external delivery system innovation, for large catering enterprises with organization and scale, they should increase functional delegation, improve decision-making efficiency, and mobilize the enthusiasm of front-line employees. For example, Hei Tea devolves data decision-making power to the front line, because it is the front-line employees who have direct contact with customers, so they can reflect market changes the fastest. At the same time, we innovate the channels through which product information is delivered to consumers and improve marketing methods; starting from the innovation of the internal delivery system, the front-end can understand the relevant information of customers through the back-end database, so as to provide customized services to customers more quickly and efficiently, and ensure that services are delivered from the back-end to the front-end and then to customers in the process of achieving all-round mutual collaboration. The backend of the restaurant company is responsible for the research and development of new dishes, the study of new service strategies, the collection and analysis of customer feedback on dining, network construction operation and maintenance; while the frontend is responsible for ensuring the quality of service and sales and business development.

Delivery innovation is not the core function of changing the service, but can improve customer interaction, innovative delivery methods and processes, etc. not only to obtain customer satisfaction, but also to improve the service efficiency and flow of services, thus creating economic value for the company (YU et al., 2015). Therefore, the following hypothesis is proposed.

H3a: Delivery innovation has a positive impact on customer delight.

3.1.4. Technological innovation

Today's society is in the wave of digital intelligence, and new technology is an inevitable requirement for businesses to be digitally empowered. The introduction of new technologies in the catering and take-out industries is an inevitable trend.

Technological innovation plays an important role in service innovation, and the relationship between "technological innovation" and "service innovation" is widespread, with the support of "technology", most services become more efficient (Burke, 2002). For example, with the use of ICT (Information and Communication Technology), when customers have after-sales problems with products purchased through the online platform, they can contact the after-sales center for help, without having to repeat the instructions, and by using a database, they can understand the problem at a glance, which improves efficiency and creates positive emotions among customers. Therefore, the following hypothesis is proposed.

H4a: Technological innovation has a positive impact on customer delight.

3.2. Impact of customer delight on mobile sharing

Mobile sharing can be posting text reviews of word-of-mouth on the mobile Internet, forwarding corporate tweets, or posting consumption-related photos in the moments. Mobile sharing goes beyond the form and scope of word-of-mouth reviews, but in the era of social media built by the mobile Internet, mobile sharing has a marketing effect that surpasses IWOM.

Based on a review of the word-of-mouth literature, Zhang and Dong (2011) pointed out that the main motivations for making a positive statement include a high level of satisfaction, gaining corporate rewards, and identifying with and helping the company. Yan et al. (2011) also proposed nine types of word-of-mouth motivations such as information return, emotional sharing, and supporting merchants through factor analysis. According to customer delight theory, customer delight will promote customer loyalty and bring positive word-of-mouth (Jiang, 2019). Therefore, the following hypothesis is proposed.

H5: Customer delight has a positive impact on mobile sharing.

3.3. Personal innovation and customer delight

Midgley and Dowling (1978) showed that personal innovation is an intrinsic personal characteristic that drives consumers to try new products. Im et al. (2003) show that personal innovativeness has a significant impact on consumer behavior in purchasing new products. Steenkamp et al. (1999) suggested that consumers

who are personally innovative are more likely to try new and different products or brands than their old consumption habits. In general, consumers who are personally innovative are usually more willing to try new products and services developed by companies. Higgins (2000) proposed a theory of trait-regulated orientation, which suggests that individuals can be divided into two categories: facilitative and defensive orientations, where facilitative orientations rely on the desire-to-approach strategy and defensive orientations rely on the caution-to-avoid strategy. For the early take-out industry, innovative consumers adopt the desire-to-approach strategy. The innovation of consumers represents the willingness of customers to adopt innovative products or services. Therefore, the differences of personal innovation degree will lead to different attitudes toward the adoption of innovative technologies. Those with a high level of personal innovation are willing to accept new things and are more likely to be influenced by them, thus generating surprise, while those with a low level of personal innovation are unmoved by the emergence of new things and are less likely to trigger surprise. It is reasonable to believe that the emergence of new service concepts, new service interfaces, new delivery methods and new technologies will generate different emotions for consumers with different levels of personal innovation, with highly innovative person being more likely to be surprised.

Therefore, this study concludes that innovative consumers are more likely to have positive emotions and the personal innovation of consumers will have a moderating effect on customer delight. The hypothesis is as follows:

> H6a: Personal innovation plays a moderating role in the effect of conceptual innovation on customer delight.
> H6b: Personal innovation plays a moderating role in the effect of interface innovation on customer delight.
> H6c: Personal innovation plays a moderating role in the effect of delivery innovation on customer delight.
> H6d: Personal innovation plays a moderating role in the effect of technological innovation on customer delight.

3.4. Research model

Based on the above theoretical analysis, this paper constructs the following theoretical model, as shown in Figure 3.

4. Questionnaire design

4.1. Measurement of variables

The study involved seven latent variables in the context of online takeaway, and the measurement questions of the four dimensions of service innovation referred to the four dimensions of service innovation definition, and carefully adapted the four-dimensional scale of service innovation for enterprises of Liu (2011); the customer delight measure integrated the definition of the emotional genre and cognitive genre and the literature review of Barnes and Krallman (2019). Mobile Sharing developed the measurement questions in accordance with the definition

of the topic and its embodiment in takeaway services; personal innovativeness was developed based on the existing literature. The subject of service innovation is the company, but the consumer, as the recipient of the company's service, can feel the innovation of the company's service, so the service innovation in this study is the consumer's perception of the company's service innovation. The latent variable measurement questions of this study were all taken on the 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). Because the measurement scales of both independent and dependent variables are relatively new, the research team tried to express the meaning of the latent variables in a way that consumers can easily understand through expert interviews, consumer interviews, and "internal testing" of the questionnaire, and made several revisions.

4.2. Survey method and sample composition

This study used questionnaire survey as the main data collection method. The questionnaires were posted on the "questionnaire.com", which can invite others to answer the questionnaire by copying the URL and scanning the QR code. This survey provided each respondent with a WeChat red packet of 2 yuan as an incentive to express their gratitude. In order to prevent the same person from answering the questionnaire multiple times, the survey was set to be answered only once by the same cell phone or computer. In order to ensure the validity and credibility of the questionnaire data, instead of sending a group message or posting it on moments, one-by-one private chat and offline meeting invitations were adopted. This questionnaire collected 214 valid questionnaires after screening out unqualified responses. The basic situation of the survey sample is shown in Table 1.

As can be seen from Table 1: there are slightly more women than men, the age is mainly 20–30 years old, and the education of the sample is relatively more with undergraduate or specialized subject, the proportion is 57.94%. The majority of the sample has an income below 3,500, mainly in the low-income group. These young people who have just entered society or are still studying have more demand for take-out. Meituan takeaway has the highest percentage of 65.42%, indicating that Meituan takeaway is still the leader. The sample characteristics of this survey are consistent with the overall characteristics of the take-out market, so the samples are well representative.

5. Data analysis and hypothesis testing

5.1. Reliability and validity testing

Reliability reflects the internal consistency of measurement results and the stability of repeated measurements. It is an important index to measure the reliability of questionnaires. Common reliability indicators include reliability coefficient, internal consistency and repeated measurement stability (Yang et al., 2012).

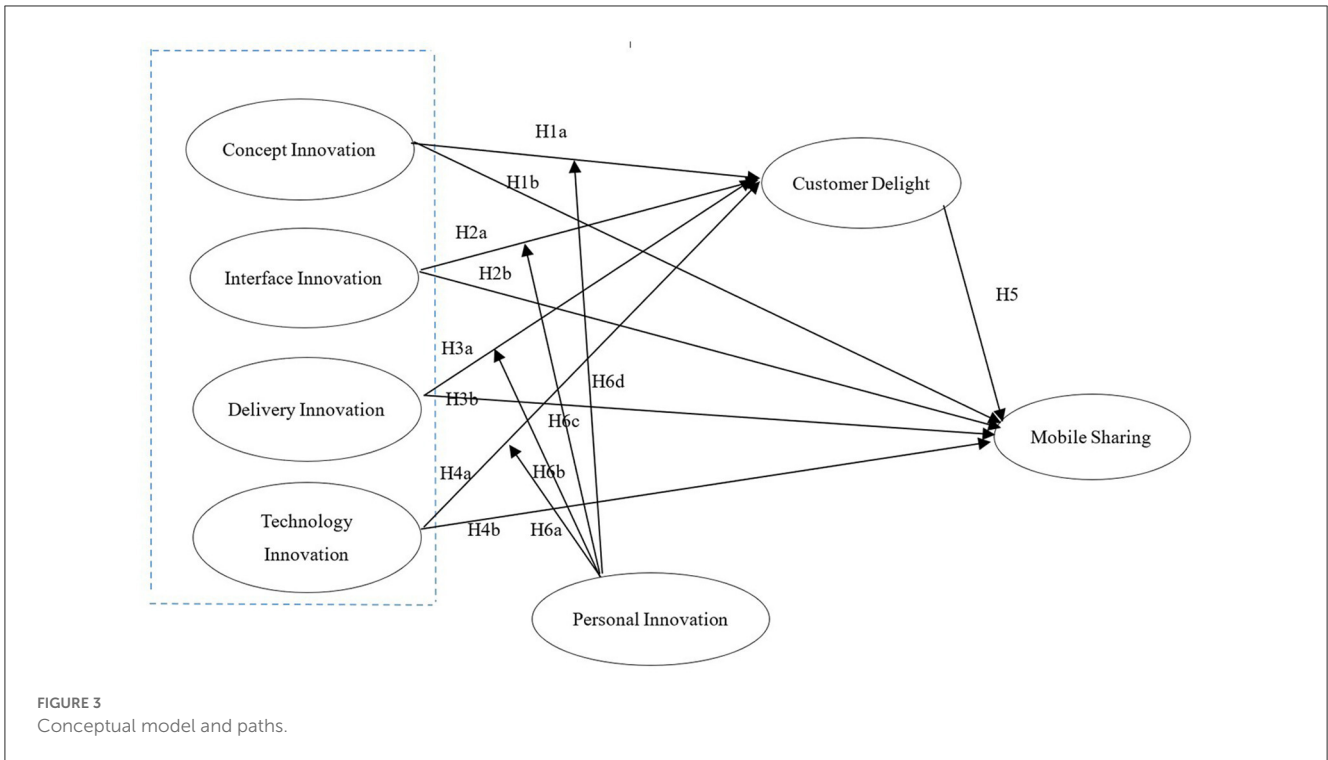The Cronbachα coefficient is a measurement used to measure the consistency within multiple measurement checks (MMT),

FIGURE 3
Conceptual model and paths.

TABLE 1 Demographic characteristics of the survey samples.

Variables	Options	Quantity	Proportion (%)	Variables	Options	Quantity	Proportion (%)
Gender	Male	94	43.93	Revenue	<1,000 RMB	61	28.50
	Female	120	56.07		1,000–3,500	56	26.17
Age	20 years old and below	36	16.82		3,501–5,000	28	13.08
	21–30 years old	126	58.88		>5,000 RMB	69	32.24
	31–40 years old	20	9.35	Used takeaway software	Meituan	140	65.42
	41–50 years old	20	9.35		Ele.me	58	27.10
	51 years old and above	12	5.61		Dianping	6	2.80
Education	Junior high school and below	15	7.01		Other	10	4.68
	High School and Technical secondary school	27	12.62	Use frequency	3~5 times	39	18.22
	Undergraduate or Specialized subject	124	57.94		6~10 times	23	10.75
	Master and above	48	22.43		11 times and above	107	50.00

where multiple variables present the same or related distribution pattern. This coefficient measures the consistency of multiple measurement checks in a particular field.

In this study, the reliability of the valid questionnaire was analyzed with the help of SPSS 23.0 software, and the test results are shown in Table 2. The test value of Cronbach's alpha is 0.923, which indicates that the overall reliability of the questionnaire is good, and the Cronbach's alpha coefficient of each latent variable is over 0.7, which indicates that the scale has good internal consistency and the questionnaire used and the model have high reliability.

Validity testing refers to a technique for evaluating the validity and accuracy of a measurement tool, such as a questionnaire. It compares the measurement tool with a similar benchmark standard to ensure that it not only indicates an in-depth interpretation of the actual program, but also measures the effectiveness of the behavior (Harrison et al., 2021).

Convergence validity refers to the relationship among the questions in the measurement scale, whether it can clearly indicate the characteristics to be measured, whether the content of the measurement scale is closely related, and whether it can focus on a certain aspect of a certain field. This study conducted

TABLE 2 Confirmatory factor analysis.

Latent variables	Observed variables	Factor load	Cronbach's alpha	CR	AVE
Concept innovation (CI)	CI1	0.858	0.864	0.866	0.764
	CI2	0.887			
Interface innovation (II)	II1	0.743	0.824	0.830	0.621
	II2	0.730			
	II3	0.886			
Delivery innovation (DI)	DI1	0.858	0.862	0.863	0.760
	DI2	0.884			
Technology innovation (TI)	TI1	0.901	0.891	0.889	0.727
	TI2	0.796			
	TI3	0.867			
Personal innovation (PI)	PI1	0.723	0.898	0.902	0.697
	PI2	0.912			
	PI3	0.829			
	PI4	0.867			
Customer delight (CD)	CD1	0.846	0.896	0.898	0.687
	CD2	0.845			
	CD3	0.826			
	CD4	0.797			
Mobile sharing (MS)	MS1	0.735	0.857	0.862	0.677
	MS2	0.852			
	MS3	0.869			

TABLE 3 Discriminant validity: Pearson correlation and AVE square root values.

	CI	II	DI	TI	CD	MS	PI
CI	**0.874**						
II	0.629	**0.788**					
DI	0.663	0.669	**0.872**				
TI	0.689	0.698	0.851	**0.853**			
CD	0.534	0.676	0.682	0.663	**0.829**		
MS	0.317	0.470	0.298	0.342	0.623	**0.823**	
PI	0.425	0.490	0.519	0.538	0.609	0.596	**0.835**

Diagonal bold numbers are AVE square root values.

confirmatory factor analysis (CFA) for a total of 7 factors and 21 analysis items. CFA helps to verify the accuracy of the data to determine if there is a correct relationship between them and to improve the accuracy of the observed variables. As can be seen from the Table 2, all of the AVE values corresponding to the total 7 factors are <0.5, and all of the CR values are higher than 0.7, implying that the data of this analysis has good convergent validity.

Discriminative validity refers to the relationship between the questions and questions in the measurement scale, whether specific questions can be raised for different subject areas or different aspects, and the relevant variables can be grasped

and measured, so that the measurement results can have higher discriminability. It is generally accepted that the AVE square root value is greater than the maximum value of the absolute value of the correlation coefficient between factors. In this paper, Pearson's method was adopted to test the discriminant validity. As shown in Table 3, the square root value of AVE for conceptual innovation (CI), interface innovation (II), technological innovation (TI), personal innovation (PI), customer delight (CD), and mobile sharing (MS) is greater than the maximum value of the absolute value of the correlation coefficient between the factors, which means that they have good discriminant validity.

TABLE 4 Model fitting indicators.

Common indicators	χ^2	df	p	Chi-square degree of freedom ratio χ^2/df	GFI	RMSEA	RMR	CFI	NFI	NNFI
Standard of judgment	-	-	>0.05	<3	>0.9	<0.10	<0.05	>0.9	>0.9	>0.9
Value	362.304	168	0.000	2.157	0.866	0.074	0.093	0.945	0.904	0.932

TABLE 5 Summary table of model regression coefficients.

X	→	Y	Non-normalized path coefficient	SE	z(CR value)	p	Standardized path coefficient
Concept innovation	→	Customer Delight	−0.009	0.071	−0.120	0.905	−0.008
Interface innovation	→	Customer Delight	0.384	0.070	5.514	0.000***	0.370
Delivery innovation	→	Customer Delight	0.342	0.093	3.695	0.000***	0.330
Technology innovation	→	Customer Delight	0.139	0.101	1.374	0.169	0.130
Concept Innovation	→	Mobile Sharing	0.071	0.114	0.627	0.531	0.047
Interface innovation	→	Mobile Sharing	0.292	0.119	2.464	0.014**	0.199
Delivery innovation	→	Mobile Sharing	−0.494	0.152	−3.248	0.001***	−0.337
Technology innovation	→	Mobile Sharing	−0.007	0.162	−0.045	0.964	−0.005
Customer delight	→	Mobile Sharing	0.987	0.109	9.066	0.000***	0.697

***p < 0.01, **p < 0.05 and *p < 0.1.

5.2. Model fitness test

After confirming that the measurement model has good reliability and validity, the structural equation model was subjected to path analysis and fit test using the great likelihood method, and the fit indices of the model are shown in Table 4. The NFI, NNFI, and CFI values of the model fit indices were all >0.9, which reached a good level, and the CMIN/DF was 2.157, which was between 1 and 3; the RMR value was 0.093, indicating that the model fit was excellent (Ding et al., 1995).

5.3. Model parameter estimation

Further testing the hypothesis, the individual normalized path coefficients in the model are shown in Table 5. from this, the following conclusions can be drawn.

Among the four dimensions of concept innovation, interface innovation, delivery innovation and technological innovation, only two dimensions, interface innovation and delivery innovation, act on customer delight, and the path coefficients are 0.370 and 0.330 respectively. From the degree of influence of both on customer delight, interface innovation is greater than delivery innovation, but the overall difference is not significant. It means the importance of service interface optimization to potential customers; the influence of concept innovation and technology innovation on customer delight fails the significance test, which indicates that the influence of both on customer delight is relatively weak, considering the popularization of take-out and rapid development of technology, people are used to take-out and technology and do not easily generate surprise emotions, so concept innovation and technology innovation are not strong explanations for customer delight and mobile sharing.

The standardized path coefficient value of the impact of delivery innovation on mobile sharing is −0.337 < 0, and this path presents 0.01 level of significance ($z = -3.248$, $p = 0.001 < 0.01$), thus indicating that delivery innovation has a significant negative influence on mobile sharing, which is inconsistent with the original hypothesis. The reason for this is that in the era of digital intelligence, the increasingly diverse needs of consumers in a fiercely competitive market environment have put forward higher requirements for services, consumers perceive that existing take-out services do not meet their personalized needs, which reduces consumers' willingness to share, and thus catering companies need to change their business practices to better serve the public; the influence of interface innovation on mobile sharing, the path presents a significance level of 0.05 ($z = 2.464$, $p = 0.014 < 0.05$), thus indicating that interface innovation will have a significant positive influence on mobile sharing and the original hypothesis holds. This reflects from the side that it is the interface innovation that most directly touches the consumer that drives the propensity for mobile sharing.

Customer delight also has a very good explanatory strength for mobile sharing. For the influence of customer delight on mobile sharing, the standardized path coefficient value is 0.697 > 0, and this path shows a 0.01 level of significance ($z = 9.066$, $p = 0.000 < 0.01$), thus indicating that customer delight will have a significant positive impact on mobile sharing, which is consistent with the expected original hypothesis.

5.4. The moderating effect of personal innovation

The moderating effect test can be used to test the validity of a model and show how specific independent variables affect the

TABLE 6 Summary table of regression models.

	Mobile sharing				Customer delight			
	β	SE	t-value	p-value	β	SE	t-value	p-value
Constants	0.237	0.529	0.449	0.654	−0.353	0.756	−0.466	0.641
Concept innovation	0.071	0.115	0.619	0.536	−0.014	0.068	−0.212	0.832
Interface innovation	0.292	0.120	2.426	0.016**	0.331	0.067	4.910	0.000***
Delivery innovation	−0.494	0.154	−3.204	0.002***	0.376	0.146	2.584	0.010**
Technology innovation	−0.007	0.164	−0.045	0.964	0.061	0.098	0.627	0.531
Customer delight	0.987	0.110	8.943	0.000***				
Personal innovation					0.375	0.170	2.211	0.028**
Conceptual innovation* personal innovation					0.032	0.028	1.140	0.255
Interface innovation* personal innovation					−0.017	0.028	−0.599	0.550
Delivery innovation* personal innovation					−0.019	0.027	−0.713	0.477
Technological innovation* personal innovation					−0.036	0.028	−1.299	0.195
Sample size	214				214			
R^2	0.440				0.613			
Adjustment R^2	0.424				0.600			
F value	$F_{(5,208)} = 32.697, p = 0.000$				$F_{(6,207)} = 54.599, p = 0.000$			

***p < 0.01,**p < 0.05 and *p < 0.1.

TABLE 7 Results of conditional indirect effect.

Independent variable	Level	Level value	Effect	BootSE	BootLLCI	BootULCI
Concept innovation CI	Low level (-1SD)	4.058	−0.029	0.097	−0.239	0.138
	Average value	5.241	0.009	0.088	−0.160	0.181
	High level (+1SD)	6.424	0.046	0.109	−0.133	0.295
Interface innovation II	Low level (-1SD)	4.058	0.336	0.109	0.129	0.553
	Average value	5.241	0.317	0.103	0.140	0.539
	High level (+1SD)	6.424	0.297	0.113	0.107	0.546
Delivery innovative PI	Low level (-1SD)	4.058	0.295	0.123	0.047	0.529
	Average value	5.241	0.272	0.123	0.025	0.509
	High level (+1SD)	6.424	0.250	0.136	−0.027	0.517
Technology innovation TI	Low level (-1SD)	4.058	0.081	0.122	−0.145	0.333
	Average value	5.241	0.039	0.116	−0.183	0.271
	High level (+1SD)	6.424	−0.002	0.126	−0.256	0.237

BootLLCI refers to the lower limit of the 95% interval for Bootstrap sampling, and BootULCI refers to the upper limit of the 95% interval for Bootstrap sampling.

model's predicted value. It is often used to assess how variables in a model affect their predicted value. To further examine the moderating effect of personal innovativeness on mobile sharing, the Process procedure developed by Andrew F. Hayes scholars was followed, Model7 was selected, and the moderating effects were analyzed in four independent variables one by one, and the results of the regression analysis obtained are summarized in Table 6 and the conditional indirect effects are summarized in Table 7.

For the mediating variable of customer delight, the boot 95% CI for conceptual innovation and technological innovation at low, mean, and high levels includes the number 0, implying no mediating effect at each level, and the mediating situation is

consistent across levels, indicating that there may be no moderating effect; when interface innovation at low, mean, and high levels, the boot 95% CI does not include the number 0, implying a mediating effect at each level, and the Effect value is 0.297, the mediating effect situation is consistent at different levels, indicating that there may not be a moderating effect; when delivery innovation at low level, boot 95%CI does not include the number 0, implying a mediating effect at this level, and the Effect value is 0.295; when it is at the average level, the boot 95% CI does not include the number 0, implying a mediating effect at this level, and the Effect value is 0.272; at the high level, the boot 95% CI includes the number 0, implying no mediating effect at this level, when delivery innovation

at different levels, the mediating effect is inconsistent, indicating that it has a moderating effect (Hayes and Scharkow, 2013).

In summary, the mediating role of customer delight is influenced by the personal innovativeness of consumers on the path of delivery innovation, and the regression equation of the moderating effect of personal innovation (PI) on the path from delivery innovation (DI) to customer delight (CD) is:

$$MS = 0.237 - 0.494^*DI + 0.071^*CI - 0.007^*TI + 0.292^*II + 0.987^*CD$$

$$CD = -0.353 + 0.376^*DI + 0.375^*PI - 0.019^*DI^*PI - 0.014^*CI + 0.061^*TI + 0.331^*II$$

5.5. Analysis of the mediating effect of customer delight

To further test the mediating effect of customer delight, the results are obtained in Table 8, and the results of the mediating effect amount are summarized in Table 9. The study shows that customer delight has a partial mediating effect in the role of interface innovation to mobile sharing, with an effect percentage of 56.46%; there is a degree of masking effect of customer delight in the role of delivery innovation to mobile sharing, that is, customer delight conceals the impact of delivery innovation on mobile sharing to a certain extent (Mrosovsky, 1999).

6. Research conclusion

Based on the results of the data analysis, this study concludes the following: in the four dimensions of service innovation, namely concept innovation, interface innovation, delivery innovation and technology innovation, only two dimensions, interface innovation and delivery innovation, act on customer delight and mobile sharing, but delivery innovation has a negative effect on mobile sharing, contrary to the hypothesis. Personal innovation plays a moderating mediating role in the delivery innovation-customer delight - mobile sharing path; customer delight has a partial mediating role in the role of interface innovation to mobile sharing; customer delight significantly affects mobile sharing, which verifies the hypothesis of this paper.

6.1. Theoretical contribution

Firstly, in the past studies, the research on service innovation mainly focused on the industrial services of manufacturing industry, and did not consider the four dimensions at the same time. In the existing research, the four-dimensional model of service innovation has not revealed the effects of four dimensions on other variables. This paper measures the four-dimensional model of service innovation from the perspective of consumers, and takes it as the independent variable of the study. It conducts theoretical modeling and empirical research on the mechanism of customer surprise and mobile sharing, studies the four-dimensional service innovation performance of consumer-oriented life services,

TABLE 8 Summary of mediation test results.

item	c Total effect	a	b	a*b Intermediary effect value	a*b (Boot SE)	a*b (z-value)	a*b (p-value)	a*b (95% BootCI)	c' Direct effect	Test conclusion
Technological innovation ≥ customer delight ≥ mobile sharing	0.130	0.139	0.987***	0.137	0.006	24.338	0.000	−0.065–0.258	−0.007	Insignificant intermediary role
Delivery innovation ≥ customer delight ≥ mobile sharing	−0.157	0.342***	0.987***	0.338	0.007	51.481	0.000	0.044–0.414	−0.494***	Masking effect
Interface innovation ≥ customer delight ≥ mobile sharing	0.670***	0.383***	0.987***	0.378	0.005	69.921	0.000	0.115–0.420	0.292**	Some agents
Concept innovation ≥ customer delight ≥ mobile sharing	0.064	−0.007	0.987***	−0.007	0.004	−1.611	0.107	−0.127–0.120	0.071	Insignificant intermediary role

***p < 0.01, **p < 0.05 and *p < 0.1.

TABLE 9 Summary of mediating effect size results.

item	Test conclusion	c Total effect	a*b Intermediary effect	c' Direct effect	Effect ratio calculation formula	Effectiveness ratio
Technological innovation ≥ customer delight ≥ mobile sharing	Insignificant intermediary role	0.130	0.137	−0.007	–	0%
Delivery innovation ≥ customer delight ≥ mobile sharing	Masking effect	−0.157	0.338	−0.494	$\mid a*b/c' \mid$	68.311%
Interface innovation ≥ customer delight ≥ mobile sharing	Some agents	0.670	0.378	0.292	$a*b/c$	56.462%
Concept innovation ≥ customer delight ≥ mobile sharing	Insignificant intermediary role	0.064	−0.007	0.071	–	0%

and further studies the different roles of the four dimensions of service innovation. It promotes the research of service innovation in the field of consumer services.

Secondly, there are few existing theories on the effect of service innovation on customer surprise. This paper starts from four dimensions of service innovation: concept innovation, interface innovation, transmission innovation and technological innovation. According to the research structure, enterprises can attach importance to interface innovation and transmission innovation, strengthen the innovation of these two aspects, and better win the surprise of customers, so that customers can generate sharing behavior and expand the visibility of enterprises.

Thirdly, this paper conducts an empirical study, which expands the theories of information sharing and network word-of-mouth. The service innovation of enterprises stimulates the surprise of customers, and the surprise of customers returns the enterprises with voluntary mobile sharing. This research model provides a new theoretical explanation for customer-firm value co-creation.

6.2. Management implications

According to the findings of this study, both take-out platforms and traditional caterers should actively innovate in terms of service concept, service interface, service delivery and service technology. Although only two of the four dimensions act on customer delight, the four dimensions are mutually reinforcing. In the highly competitive market, it is important to stimulate customer delight. Customer delight enables consumers to voluntarily share consumption information and helps companies achieve good marketing results. Taken together, this study proposes the following countermeasures:

First, upgrade the take-out platform into a comprehensive platform that carries the whole chain of services to the store, to the home and to the retail, rather than just a platform for delivering take-out. This will digitally empower more catering enterprises and help them to respond to the flood of the digital intelligence era and develop new adaptive operation models through new marketing tools and methods.

Second, from the perspective of delivery innovation impact, it is recommended that the instant delivery industry, which is

closely related to the catering industry, establish localization to the home and digital service system for merchants to achieve value co-creation; at the same time, catering enterprises and takeaways can cross-border marketing, cross-industry cooperation, such as inviting famous brands to co-brand, or inviting internet celebrities to carry out short video marketing, etc., to develop new tracks, while taking different marketing approaches for consumers with different personal innovative traits, such as opening up new product trial channels for consumers who like innovation.

Third, from the perspective of the impact of interface innovation, through digital empowerment and the use of data mining technology, it is possible to understand customer preferences and launch a consumer interface that is in line with mass consumption and has a wide audience. From the perspective of the food delivery platform, through the introduction of algorithms and the differentiation of user portraits, menus of "affordable models", "explosive models" and "light luxury models" can be launched to accurately meet the needs of consumers.

6.3. Limitations and recommendations for future research

First, the results of this study show that individual innovation plays a mediating role in the transmission of innovation-customer surprise-mobile sharing path, while it has no mediating effect on other paths, which may be due to the influence of age and gender. Future studies can be repeated taking into account the influence of potential factors.

Next, the questionnaires in this study were filled out in the form of one-to-one private chat and offline meeting invitation, which may have subjective bias in group selection, which may have a certain impact on the accuracy of the final survey results. In future studies, more diverse questionnaire filling methods can be used to reduce the subjectivity of group selection.

Third, this study mainly explores the mechanism of service innovation and customer surprise in the context of online delivery of catering enterprises, and a single context has a certain impact on the external validity of the study to a certain extent. Future studies can further explore the mechanism of service innovation and customer surprise in more situations.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Ethics Committee of Hubei University. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

HP developed the study model. SX collected the data and co-drafted the manuscript, providing constructive advice on the study design. MY participated in data analysis and editing the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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