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The Effect of Consumer Perceived Kiosk Service Quality on Use Satisfaction

Liting Ren[1], Yong Zhu[2], Shen Fan[2*]

[1] Ph.D. Student, Dept. of Global Business, Konkuk University, Seoul, South Korea
[2] Ph.D. Student, Dept. of Global Business, Kyonggi University, Suwon, South Korea

Abstract: The widespread adoption of self-service technologies, such as self-service kiosks, across various industries has made it increasingly crucial to comprehend consumers' perceptions of the quality of these self-service offerings and their influence on user satisfaction. This study investigates multiple facets of consumers' perceptions of kiosk service quality, encompassing system usefulness, ease of use, and convenience. Through an online survey, we gathered data from over 400 consumers who had prior experience using kiosk services. Employing quantitative analysis techniques, namely SPSS and AMOS, we discovered that consumers' perceptions of kiosk service quality can substantially predict their usage satisfaction. Specifically, our findings reveal that:

1.The interface design of the kiosk exerts a positive influence on consumer satisfaction.
2.Perceived usefulness positively impacts consumer satisfaction.
3.Perceived ease of use positively affects consumer satisfaction.
4.The convenience of the kiosk has a positive effect on consumer satisfaction.
5.The technical complexity of the kiosk negatively influences the usefulness of the design and consumer satisfaction.

The results of this study offer valuable insights for enterprises seeking to optimize their self-service systems, which can contribute to enhancing consumer experience and increasing their acceptance of these innovative service delivery models. Furthermore, we discuss the theoretical and practical implications of the study and highlight potential avenues for future research.

Keywords: Kiosk, Consumer satisfaction, Perceived Usefulness, Perceived Ease of Use

* Corresponding author: (First author) Liting Ren(17863125159@163.com), (Corresponding author) Shen Fan (beomxin@naver.com)
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1. Introduction

Kiosks are becoming an increasingly popular alternative for reducing labor costs through unmanned ordering systems. As the minimum wage rose significantly in 2018, the adoption rate of kiosks also saw a marked increase. This is largely due to the perception that kiosks help reduce customer wait times. Store owners cited different main reasons for introducing kiosks, depending on whether they did so when first opening their business or later on. Among stores that implemented kiosks from the start, 33.33% mentioned reducing customer wait times as the primary reason, while 37.50% cited lowering labor costs. In contrast, for stores that added kiosks after already being in operation, 69.44% stated that decreasing customer wait times was the main motivation, and 18.06% pointed to cutting labor expenses.(Cho Joon-mo, 2020)

The COVID-19 pandemic has accelerated the rapid spread of kiosks, as the public's health and hygiene awareness has dramatically increased due to the outbreak. In response, the Korean government is also promoting social distancing measures to curb virus transmission. This shift towards a contactless culture is driving the adoption of untact technologies in the hospitality industry, which has traditionally been dominated by face-to-face services (Hee-seok & Yoon-ok, 2020).

In the United States, a pioneer in researching and implementing kiosks, the market size for these devices is projected to grow from $2.577.5 billion in 2016 to $4.476 billion by 2024, according to Transparency Market Research. Kiosks are currently gaining traction not only in American fast food restaurants but also in casual dining establishments. They are being used for various functions such as menu ordering, summoning staff, and bill splitting(News, 2016).

As kiosks become increasingly recognized as essential for reducing labor costs, enhancing customer convenience, and promoting public health, the majority of existing research has focused on the digital disadvantaged with low digital literacy levels, emphasizing user interface and experience. However, kiosks are primarily being introduced in stores with a large proportion of young patrons first. There are limitations in reflecting the reality that even young people face difficulties in using kiosks (Jung-hyun, 2021). Furthermore, according to research by (Seongwon & Hyunseok, 2019), younger individuals prefer simple and straightforward face-to-face ordering.

While Korean consumers are well-acquainted with and have a solid understanding of various digital devices, there are still those who do not accept or cannot properly use services relying on digital devices, even if they do accept them (Soohee, 2019). This is particularly true for middle-aged and elderly individuals, whose level of digital literacy required for daily life and economic activities is only 64.3% that of the general population. They are experiencing challenges in the context of contactless services (Agency, 2020). The difficulties, burdens, and fears surrounding contactless service situations lead to seeking out traditional face-to-face services and can result in negative behaviors such as complaints directed at employees (Sojin & Jaeyoung, 2020). For the elderly, learning to use the digital devices necessary in a contactless service context is time-consuming, and the size, sound, and response speed of the software are often ill-suited to the physical characteristics of middle-aged and older individuals, making it challenging for them to use (Seungyoon & Hoon, 2019).

Kiosks, the quintessential untact service in the food service industry, provide a uniform design and usability despite being used by customers from diverse, unspecified backgrounds. Consideration for middle-aged and elderly customers is lacking (Pilsik & Kang-hyun, 2020). Moreover, COVID-19 has altered perceptions and behaviors related to untact services across all age groups. The shift from a preferred method used primarily by those in their 20s and 30s to a service that must be utilized by all age groups is accelerating (Seung-hwa & Jung-ho, 2020). It is crucial to investigate the service quality of kiosks, the most representative untact service method, for middle-aged and elderly individuals who are most vulnerable in contactless service situations. Previous studies on kiosk usage by middle-aged and older adults have primarily focused on identifying factors that influence their perceived convenience, such as button design, font design, and screen color, through research on kiosk interfaces that reflect the characteristics of these age groups in fast food restaurants and hospitals (Seo-young & Sung, 2020).

In the food service industry, kiosks have become commonplace and widely used. Building upon prior research, this study conducted a comparative analysis across all age groups(Sang-kyung, 2015). The aim is to uncover the reasons behind satisfaction and dissatisfaction with the service quality of food service kiosks among different age brackets. By identifying

attributes that can enhance satisfaction and minimize dissatisfaction, this research seeks to provide valuable insights for improving the kiosk experience for users of all ages.

2. Theoretical and literature foundation

2.1. Perceived Usefulness

The concept of perceived usefulness, first introduced by (Davis, 1989), is a model that applies the theory of rational and planned behavior. It indicates the extent to which users believe they can improve their quality of life and work efficiency by adopting new information technology. In other words, perceived usefulness can be defined as the degree to which individuals perceive that using technology and systems is more advantageous than not using them.

Users' perceived usefulness influences their attitudes, which in turn affect their behavioral intentions, ultimately impacting their actual actions (Kyung-tak & No-Minjin, 2011). Furthermore, perceived usefulness is influenced by perceived ease of use; the more user-friendly a new system is, the more useful it is perceived to be. This positive perception leads to a more favorable attitude towards the system, resulting in increased system usage(Davis, 1989).

In the context of online banking services, (Bhattacherjee, 2001) verified the direct effect of perceived usefulness on users' intention to continue using the information system, as well as its indirect effect through satisfaction. Similarly, (Kyeong-su & No-Minjin, 2015) confirmed that perceived enjoyment in mobile communication services had a significant positive effect on the intention to continue using the service, mediated by perceived usefulness and satisfaction.

(Jihyung & Kwon, 2012) defined perceived usefulness as the belief that the functional and personal attributes of smartphones will be beneficial for users' personal work and enhance their job performance. (Hyejin & Doyeon, 2011) described perceived usefulness as having a significant influence on the intention to adopt a system, and the extent to which users find an online purchase method useful and easy to use. (Jibong-gu & Gye-hee, 2010) defined the quality of a hotel information system in terms of perceived usefulness, and the degree to which users believe that the system's use has improved their work efficiency and ability.

2.2. Customer Satisfaction

Customer satisfaction is meeting customer expectations by achieving positive results for a product or service related to consumption. It is determined by the customer's judgment and is determined by the difference in perception between the customer's expected value and the provider's performance achievement. If the customer's perceived performance exceeds the expected result, they feel satisfied and, on the contrary, if the perceived performance feels less than expected, they feel dissatisfaction (Oliver, 1981). In other words, it is the process of evaluating a product or service from the consumer's point of view, and it is felt in the difference between prior expectations and perceived actual experiences in the stage of comparing and selecting.

Factors that directly affect customer satisfaction include price, employee competence, quality of products and food, service, convenience, and physical environment (Chebat & Michon, 2003), and consumer perception varies depending on the employee's customer response attitude and also affects customer satisfaction (Smith, Bolton, & Wagner, 1999).

Because customer satisfaction is a paradigm for consumer expectations and inconsistencies, it is possible to gain the upper hand in the competitive landscape by differentiating products or services for expectations (Hoon & Young-sook, 2019), and increase the rate of return by increasing the intention to recommend or repurchase (Chang & Hee, 2002).

2.3. Service Convenience

In the field of marketing, service convenience is defined as the time and effort expended when purchasing a product, rather than the characteristics of the product itself. As such, research on service convenience predominantly focuses on positive purchase outcomes centered around product acquisition (Brown, 1990). Studies related to kiosk service convenience can be considered in the following context: Service convenience aims to minimize the individual's time and effort in purchasing and

using services by treating these factors as costs. Ultimately, service convenience is a factor that influences marketing results, such as customer evaluations and purchasing behavior, and is considered a crucial element in maintaining customer relationships.

Service convenience can be regarded as reducing the time and effort required for customers to make purchase decisions (Anderson & Narus, 1990). Research has shown that service convenience not only promotes the development of convenient products and services but also serves as a major determinant of product purchase. Furthermore, its meaning has been formalized and developed into a research model (Joo-hwan & Young-taek, 2013).

(Berry, Seiders, & Grewal, 2002) subdivided the concept of service convenience and classified it into five categories: decision-making convenience, access convenience, transaction convenience, benefit convenience, and post-benefit convenience. Service convenience can reflect the various stages of consumers buying or using services, with the perceived time and effort related to each type influencing the overall evaluation of service convenience. Decision-making convenience pertains to the time and effort required for customers to make decisions about purchasing or using services. Transaction convenience relates to minimizing the time and effort associated with transactions that occur during the service usage process. Benefit convenience is the core convenience for customers using the service, as they desire to utilize the minimum time and cost to take advantage of the core benefits. Post-benefit convenience refers to the costs related to the time and effort perceived by the customer after using the service.

According to (Berry et al., 2002), research on service convenience can be classified into decision-making convenience, access convenience, benefit convenience, transaction convenience, and post-benefit convenience, based on the process of using the service. Consequently, several domestic and foreign researchers have presented convenience as various factors depending on the research perspective and situation. However, as convenience can be measured differently depending on the timing and environment of the empirical research, it can be presented as a single factor, and the results can be presented accordingly.

2.4. Ease of Use

Usability refers to the degree of ease with which a tool, human-made object, or service can be used to achieve its intended purpose. In other words, it pertains to whether the interaction between the product and the user is sufficiently proper for the user to effectively utilize the product. Usability can be applied to all systems and objects, ranging from simple functions to products with complex functionalities. It encompasses not only the mere use of the product but also the value of all cognitive and emotional experiences associated with its use. Thus, usability can be interpreted as synonymous with 'ease of use' in terms of the product's user-friendliness and the ease of learning required to operate it. This ease of use can also be defined as the extent to which consumers need not exert effort when using a system equipped with specific information technology (Davis, 1989).

(Rai, Lang, & Welker, 2002) and (Davis, 1989) presented a model that integrates the Technology Acceptance Model (TAM) and the Information System Success Model of (DeLone & McLean, 1992). They found that ease of use has a causal relationship with personal effect, which is an evaluation of the system's value, in addition to the user's attitude related to system usage. Furthermore, most studies explaining the consumer's acceptance process for information technology and systems have discovered that ease of use affects acceptance and behavioral intentions through usefulness (Venkatesh, 2000). Moreover, as ease of use increases, the cost of customer time and effort decreases, thereby enhancing the value perceived by customers.

As such, the concept of ease of use is gradually expanding in the service field where systems are integrated. (Young-hwan & Soo-il, 2009) found that consumer ease of use has a significant effect on satisfaction in relation to IPTV use. Additionally, research on the value and satisfaction of ease of use in the restaurant industry is actively underway. (Kijin, Tae-jong, & Won-gap, 2011) confirmed that a higher perception of ease of use, including the restaurant search function on smartphone applications, leads to a higher level of satisfaction.

2.5. Kiosk Interface Design

Kiosk interface design, from an academic perspective, refers to the research on user interface design for self-service terminals (Kiosks). The core objective of this research field is to optimize the interface design of Kiosks and enhance the user experience, particularly by developing targeted designs that cater to the specific needs of different user groups (such as the elderly and the disabled). The research content of Kiosk interface design encompasses multiple aspects. Firstly, it addresses interface layout and navigation design, focusing on the logical arrangement of interface elements to ensure clear navigation and minimize user confusion and difficulties during operation. Secondly, it explores the design of interaction methods, taking into account ergonomic principles for various interaction modes, such as touch screens and physical buttons, to ensure comfort and natural interaction. Thirdly, it investigates the optimization of information presentation methods, examining the effective use of visual elements like text, icons, and colors to improve interface readability and aesthetics.

Additionally, Kiosk interface design emphasizes the importance of accessibility, comprehensively considering the unique needs of different user groups (such as the elderly and the visually impaired) and providing auxiliary functions like audio prompts and enlarged text. Simultaneously, it focuses on process optimization, aiming to streamline operation steps, enhance task completion efficiency, and reduce error rates. Finally, it evaluates the emotional experience of the interface, acknowledging that factors such as interface aesthetics and emotional tone influence users' subjective perceptions and willingness to use the system.

In summary, Kiosk interface design is a multidisciplinary research field that integrates theories and methods from various disciplines, including human-computer interaction, cognitive psychology, and visual design. It emphasizes a user-centered approach to interface optimization, aiming to improve the usability and accessibility of self-service terminals, enabling diverse user groups to complete self-service tasks conveniently and enjoyably. This field holds significant theoretical value and practical implications. With the current trend of social informatization and intelligent systems, self-service terminals like Kiosks are being widely adopted across various industries. Designing high-quality, user-friendly Kiosk interfaces has become a crucial topic of interest in both academia and industry.

Future research in the field of Kiosk interface design necessitates deep integration with cutting-edge technologies (such as artificial intelligence, big data, AR/VR, etc.), continuously expanding application scenarios and service boundaries to de liver a more intelligent, personalized, and immersive self-service experience to users.

2.6 Technical Complexity

Kiosk technical complexity refers to the intricate challenges involved in the technical implementation of self-service terminal (Kiosk) systems. Compared to traditional manual service counters, Kiosks integrate a variety of hardware devices (such as touchscreens, printers, scanners, payment modules, etc.) and software systems (such as operating systems, applications, databases, etc.). These components need to be seamlessly integrated and coordinated within a limited space to achieve multiple functions, resulting in a high level of complexity in technical implementation.

The complexity of Kiosk technology manifests in several aspects. Firstly, hardware integration complexity requires selecting appropriate hardware devices based on specific application scenarios and functional requirements, ensuring compatibility and stability among devices. Secondly, software development complexity involves developing high-quality, user-friendly applications according to business processes and user needs, while integrating with back-end business systems and databases to ensure real-time data synchronization and consistency. Thirdly, operation and maintenance complexity arises from the unattended nature of Kiosks, necessitating real-time system monitoring to ensure continuous availability, as well as regular software and hardware updates and maintenance to promptly fix failures and vulnerabilities. Additionally, security protection complexity must be considered, as Kiosks often handle personal privacy data and financial payment information, requiring comprehensive protection from physical, network, and data security perspectives, providing reliable authentication, access control, data encryption, and other security mechanisms.

In summary, Kiosk technical complexity is a multidisciplinary and multifaceted comprehensive topic that requires consideration of technical challenges in hardware, software, operation, maintenance, and security aspects. Balancing system

high availability and security while controlling the complexity of technical implementation to reduce development and maintenance costs has become a focal point for both academia and industry. Future research on Kiosk technical complexity needs to deeply integrate with cutting-edge technologies (such as the Internet of Things, edge computing, artificial intelligence, etc.) to explore more intelligent and flexible system architectures and operation modes, continuously enhancing the performance and user experience of Kiosk systems, and promoting the rapid development of the self-service industry.

The complexity of Kiosk technology presents a significant challenge for researchers and developers alike. Addressing these challenges requires a holistic approach that takes into account the various aspects of the system, from hardware and software integration to operation, maintenance, and security. By leveraging advanced technologies and innovative approaches, researchers and developers can create more intelligent, flexible, and user-friendly Kiosk systems that meet the evolving needs of the self-service industry. As the demand for self-service solutions continues to grow, the importance of understanding and managing Kiosk technical complexity will only increase, making it a critical area of focus for both academia and industry in the years to come.

3. Hypotheses and Measures

3.1 Hypotheses

(Meuter, Ostrom, Roundtree, & Bitner, 2000) investigated factors influencing customer satisfaction with self-service technologies (SSTs). Through the Critical Incident Technique, they identified four key dimensions: ability to complete the task, ease of use, recovery from failures, and advantages in saving time and providing convenience. The study emphasizes considering SSTs' technological attributes and optimizing service design to enhance satisfaction, expanding satisfaction research in the service domain.(Meuter et al., 2000)Existing literature shows that ease of use and convenience are key factors affecting consumer satisfaction. Improvements in ease of use and convenience will have a positive impact on consumer satisfaction. Therefore, we propose the following hypothesis:

H1:Ease of use has a positive impact on consumer satisfaction

H2:Service convenience has a positive impact on consumer satisfaction

(Davis, 1989) proposed the Technology Acceptance Model (TAM), positing that perceived usefulness (PU) and perceived ease of use (PEOU) are key factors influencing users' acceptance of new technology. Empirical research found PU and PEOU significantly positively correlate with intention to use, with PU having a stronger influence. This study laid the foundation for TAM, with subsequent studies expanding on external variables and application contexts. (Davis, 1989)Existing literature shows that perceived usefulness is a key factor affecting consumer satisfaction. The improvement of perceived usefulness will have a positive impact on consumer satisfaction. Therefore, we propose the following hypothesis:

H3:Perceived usefulness has a positive impact on consumer satisfaction

(Parasuraman, 2000) developed the Technology Readiness Index (TRI) to measure consumers' readiness to adopt new technologies. The TRI consists of four dimensions: optimism, innovativeness, discomfort, and insecurity. The combination of scores reflects overall psychological readiness when faced with new technologies. The TRI enriches measurement tools in technology acceptance and provides consumer-oriented insights for introducing new technologies. (Parasuraman, 2000)Existing literature shows that technological innovation resistance is a key factor affecting consumer satisfaction and ease of use. Increased technological innovation resistance will have a negative impact on consumer satisfaction and ease of use. Therefore, we propose the following hypothesis:

H4：Technological innovation resistance has a negative impact on consumer satisfaction

H5：Technological innovation resistance has a negative impact on ease of use

(Lin & Hsieh, 2011) developed the SSTQUAL scale to measure self-service technology quality. Through interviews and factor analysis, they determined seven dimensions: functionality, enjoyment, security/privacy, assurance, design, convenience, and customization. The scale has cross-contextual applicability and correlates with satisfaction and behavioral intentions. This

study enriches service quality connotations and guides optimal SST design.(Lin & Hsieh, 2011)This article develops a self-service quality scale, in which interface design is an important dimension, and confirms the relationship between interface design and perceived ease of use and satisfaction. Therefore, we propose the following hypotheses:

H6:Kiosk interface design has a positive impact on ease of use

H7:Kiosk interface design has a positive impact on consumer satisfaction

The final research framework is shown in Figure 1

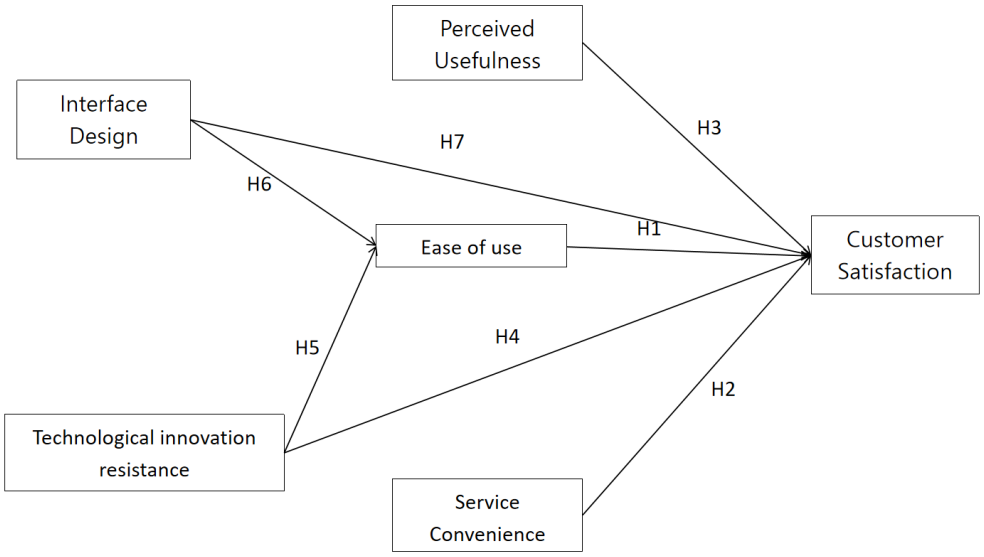

Figure 1. Research framework

3.2. Survey process

People who have used kiosks were selected as research subjects. A total of 472 questionnaires were distributed and collected from April 7, 2024 to May 22, 2024. SPSS 26.0 was used to test the data. Among them, 24 invalid questionnaires were collected, and 448 valid questionnaires were finally collected, with an actual recovery rate of 95%. Descriptive statistical analysis was performed on the basic information of the respondents (see Table 1).

TABLE 1| Descriptive statistics(N=448).

Variable	Project	Frequency	Percentage%
Gender	Male	248	54.9%
	Female	200	45.1%
Age	18-22	340	75.3%
	23-27	62	13.8%
	28-35	49	10.9%
Education	Junior College Education	113	25.1%
	Bachelor's Degree	289	64.1%
	Master's Degree	37	8.2%
	Doctoral Degree	12	2.6%
Major	Science and Engineering	189	41.9%
	Social Science	134	29.7%
	Medical Science	85	18.9%
	Art	43	9.5%

3.3. Measures

In the present study, data was collected through the questionnaire method. Participants had to respond to a series of statements using a Likert's five-level scale ("totally agree," "agree," "general," "disagree," and "totally disagree") The distribution is recorded as 5, 4, 3, 2, and 1, and the total score of each respondent's attitude is the sum of the scores gained from the answers to each item in the questionnaire. The total value can be said to be the attitude of each respondent or the different states on each scale.

The ease of use and perceived usefulness scales refer to the six scale items of (Davis, 1989); the customer satisfaction scale refers to the four scale items of (Oliver, 1993); the convenience scale refers to the four scale items of (Parasuraman, Zeithaml, & Berry, 1988); the kiosk interface design scale refers to the four scale items of (Orel & Kara, 2014); the kiosk technical complexity scale refers to (Thompson, Higgins, & Howell, 1991)

4. Empirical analysis

In this study, confirmatory factor and reliability analysis, discriminant validity and convergence validity analysis, and correlation analysis were conducted on the collected valid sample data of N = 451, and a structural equation model was constructed. The results obtained are shown in Tables 2–5.

As shown in Table 2, after the factor extraction of 18 items, six factors were finally extracted. The six factors that were extracted included EU (Ease of Use), PU (Perceived Usefulness), SC (Service Convenience), CS (Customer Satisfaction), ID (Interface Design), TC (Technical Complexity), and which were consistent with the theoretical assumption of scale structure. The standardized load factor (S.L.F.) was above 0.6, and the factor compliance was good. The questionnaire thus had good construction validity.

As depicted in Table 2, Cronbach's Alpha (α) value of EU, PU, SC, CS, ID, and CE is above 0.7, CR value is above 0.7, and AVE value is above 0.5. According to (Black, Babin, & Anderson, 2010), in validity evaluation, the absolute value of estimated factor load should be above 0.5 at least. The optimal index value is above 0.7, and the average variance withdrawal (AVE) index value should be above 0.5. This questionnaire thus has good convergence validity. The method proposed by(Fornell & Larcker, 1981) was also adopted to determine whether the convergence validity existed if the square root of AVE was higher than the correlation coefficient between the two variables. As shown in Table 3, the AVE square roots of EU, PU, SC, CS, ID, and CE were 0.932, 0.832, 0.884, 0.758, 0.858, and 0.713, respectively, which were all greater than their corresponding correlation coefficients, indicating that the questionnaire had good convergence validity.

According to the test method of (Bagozzi & Yi, 1988), from Table 4 that the fitting indexes of the model both reached ideal values, indicating that the fit of the structural equation model was good. As shown in Table 5, EU had a significant positive effect on CS ($\beta = 0.417$, $P < 0.001$). SC had a positive effect on CS ($\beta = 0.132$, $P < 0.05$), PU had a significant positive effect on CS ($\beta = 0.312$, $P < 0.05$), TC had a negative effect on CS ($\beta = -0.146$, $P < 0.05$), and on EU ($\beta = -0.128$, $P < 0.05$), ID had a positive effect on CS ($\beta = 0.142$, $P < 0.001$), however, the result of H6 is rejected since ID had nearly no effect on EU ($\beta = 0.082$, $P > 0.05$). Therefore, all seven of the hypotheses in this study were supported excepct H6.

According to the hypothesis testing results, the final model results were illustrated as figure 2.

TABLE 2 | Analysis results of reliability and convergent validity

Variable	Item	S.E.	S.L.F.	t-value	p	CR	AVE	α
Ease of Use	EU1		0.873	16.221		0.949	0.869	0.869
	EU2	0.038	0.921	14.131	***			0.865
	EU3	0.019	0.958	12.141	***			0.874
Perceived Usefulness	PU1		0.781	16.041		0.864	0.692	0.769
	PU2	0.083	0.807	16.285	***			0.774

	PU3	0.042	0.882	12.141	***			0.768
Service Convenience	SC1		0.857	16.041		0.843	0.782	0.762
	SC2	0.072	0.809	16.285	***			0.789
	SC3	0.038	0.761	12.141	***			0.732
Customer Satisfaction	CS1		0.652	12.296		0.719	0.576	0.712
	CS2	0.15	0.746	13.702	***			0.821
	CS3	0.095	0.675	10.211	***			0.791
Interface Design	D1		0.820	19.739		0.890	0.736	0.872
	D2	0.058	0.907	19.258	***			0.868
	D3	0.045	0.776	15.791	***			0.823
Technical Complexity	TIR1		0.754	24.311		0.721	0.509	0.721
	TIR2	0.109	0.803	18.745	0.005***			0.771
	TIR3	0.147	0.722	21.337	0.003***			0.812

***p < 0.001, **p < 0.01, and *p < 0.05.

TABLE 3 |The discriminant validity of the constructs

Variable	EU	PU	SC	CS	ID	TC
EU	0.932					
PU	0.876	0.832				
SC	0.843	0.813	0.884			
CS	0.663	0.759	0.732	0.758		
ID	0.932	0.829	0.818	0.606	0.858	
TC	-0.212	0.211	0.216	-0.313	0.157	0.713

TABLE 4 |Model index

Statistical test		Stander range	Value
Absolute fitness indicator	x2/df	<3	2.765
	RMSEA	<0.08	0.063
	GFI	>0.9	0.912
	AGGI	>0.9	0.903
Value-added fitness indicator	NFI	>0.9	0.933
	CFI	>0.9	0.965
	TLI	>0.9	0.954
	IFI	>0.9	0.942

TABLE 5 |Hypothesis testing

Hypothesis	Path	Standardization coefficient	S.E.	t-value	p	conclusion
H1	EU➡CS	0.417	0.385	4.650	0.000***	Supported
H2	SC➡CS	0.132	0.012	2.832	0.026**	Supported
H3	PU➡CS	0.312	0.528	2.323	0.042**	Supported
H4	TC➡CS	-0.146	0.796	-0.865	0.039**	Supported
H5	TC➡EU	-0.128	0.004	-0.632	0.032**	Supported
H6	ID➡EU	0.082	0.054	1.677	0.683	Rejected
H7	ID➡CS	0.142	0.048	3.984	0.000***	Supported

***p < 0.001, **p < 0.01, and *p < 0.05.

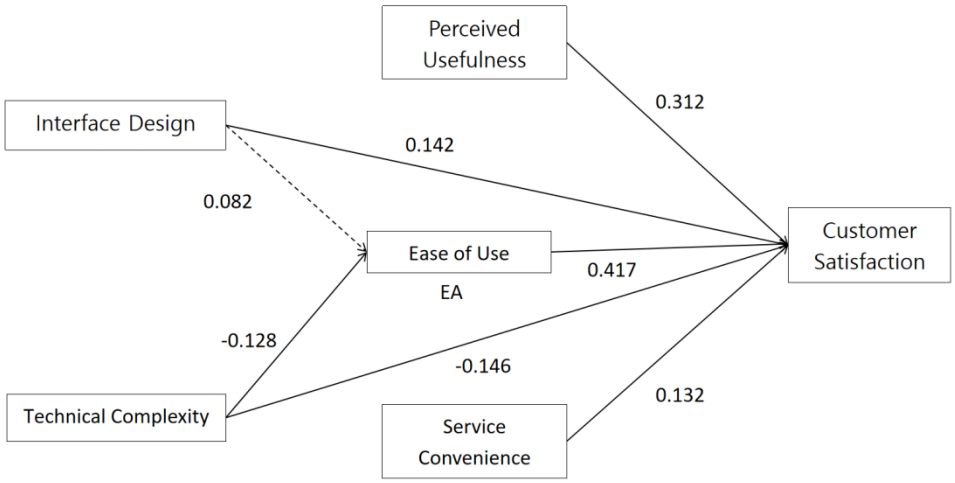

Figure 2. Final model results

5. Conclusion

5.1 Research results

Consumption methods in modern society are evolving in various forms, breaking away from the existing traditional methods. In other words, a new paradigm is continuously being created with technological evolution in research fields such as artificial intelligence, IOT, big data, and robots, and the emergence of new platforms. In particular, modern people are gradually weakening their tendency to perceive human-provided services as essential for their own consumption, and with this change in perception, untact services such as unmanned convenience stores, unmanned marts, and unmanned order systems and non-face-to-face services are rapidly emerging. In this study, a theoretical model was established assuming that the characteristics of the kiosk at the kiosk-used stores would affect customer satisfaction.

Therefore, the main purpose is to find out customer satisfaction according to the Perceived Usefulness, Ease of Use, Service Convenience, Customer Satisfaction, Interface Design and Technical Complexity of the consumer group using the kiosk. The results of this study are summarized as follows.

First, the Perceived Usefulness and the Ease of use of kiosk equipment in this study was found to have a positive (+) effect

on the satisfaction of users using kiosk devices. That is, the easier it is to use any tool, artifact or service to achieve its objectives, the greater the user's perceived role in using the product or tool, and the greater the customer's satisfaction. Back in Davis, F. The classic literature of (Davis, 1989)TAM model supports the effect of perceived ease of use and perceived usefulness on satisfaction.(Oh, Jeong, & Baloglu, 2013) The same results were validated in subsequent self-service application studies in hotel contexts.

Second, the Service Convenience of kiosk devices has been found to have a positive (+) impact on user satisfaction with kiosk devices. Research by (Seiders, Voss, Godfrey, & Grewal, 2007) shows that perceived service convenience is one of the key drivers of customer satisfaction.(Berry et al., 2002) also found that service convenience can increase customer satisfaction by delivering value to customers.(Yen, 2005) further confirmed that the convenience of self-service technology has a significant positive impact on user satisfaction.Therefore, when Kiosk devices have high service convenience, users will gain higher satisfaction in the process of using the device.

Third, the Interface Design of kiosk equipment has a positive (+) impact on the user's satisfaction with kiosk equipment. This result is consistent with relevant research on user interface design and user satisfaction.Research by (Wixom & Todd, 2005) shows that user satisfaction with the system interface is an important factor affecting user acceptance and use of the system.(Lee & Koubek, 2010)also found that good interface aesthetics and user experience can significantly improve user satisfaction with the product.Analytical research by (Coursaris & Kim, 2011) further confirms that usability design for mobile interfaces has an important impact on user satisfaction.Therefore, when the self-service kiosk equipment has a good interface design, users will get higher satisfaction in the process of use.

Fourth, The technical complexity of kiosk has a negative (-) impact on ease of use and customer satisfaction. (Venkatesh, Morris, Davis, & Davis, 2003)'s Unified Theory of Technology Usage and User Acceptance Model (UTAUT) noted that the complexity of technology affects perceived ease of use, which in turn affects intention to use and user behavior.Research by Calisir and Calisir (2004) also found that system complexity negatively affects user satisfaction with the system.(Meuter et al., 2000) further confirmed that the complexity of self-service technology reduces user perceptual convenience and satisfaction with the technology.Therefore, when the technical complexity of self-service ordering and payment devices is high, the user's easy-to-use sensitivity and satisfaction experience are reduced.

5.2 Practical suggestions

Based on the research findings on the factors influencing customer satisfaction with kiosk systems, the following recommendations can be proposed for enterprises providing kiosk services to enhance consumer satisfaction:

Simplify operation processes and improve the ease of use of kiosks. Design user-friendly interfaces and streamlined operation logic to reduce the learning cost of using kiosks and enhance customers' perceived ease of use.

Optimize kiosk functionality settings and reinforce their perceived usefulness. Fully consider customers' actual needs, integrate more practical functions, and enhance customers' perception of the usefulness of the kiosk system.

Emphasize service convenience design and provide a seamless self-service experience. Reasonably layout device locations, optimize critical processes such as payment and settlement, and maximize the convenience of using kiosks.

Invest in R&D to create excellent interface interaction design. Adopt humanized, visually appealing interface styles, and incorporate multi-modal interactions such as gestures and voice recognition to create a smooth and enjoyable user experience.

Continuously optimize system architecture and technical implementation to reduce kiosk complexity. Adopt advanced modular and service-oriented architectures to enhance system stability, maintainability, and reduce overall technical complexity.

Furthermore, this study reveals key factors influencing customer satisfaction with kiosks, contributing significantly to refining unmanned service theories and guiding practical applications. Theoretically, it enriches the application of the TAM model, service convenience theory, and customer satisfaction theory in unmanned service scenarios, expanding their applicability. Practically, it provides scientific evidence for optimizing design and operation strategies in emerging fields such as unmanned retail and intelligent services. Future research in related fields could further explore the impact of contextualized,

personalized, and intelligent trends on kiosk satisfaction.

5.3 Limitations and directions

There may be differences according to various variables or demographic characteristics in the relationship between the characteristics of the kiosk and the influence of customer satisfaction. In particular, elderly consumers may have significantly different needs from older layers for design such as usability and letters. Therefore, in future studies, it will be necessary to verify the demographic difference analysis by verifying the moderating effect through various variables or by dividing the age group.

References

Agency, K. C. (2020). Survey on Non-face-to-face Transactions of Older Consumers. Korea Consumer Agency.

Anderson, J. C., & Narus, J. A. (1990). A model of distributor firm and manufacturer firm working partnerships. Journal of marketing, 54(1), 42-58.

Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. Journal of the academy of marketing science, 16, 74-94.

Berry, L. L., Seiders, K., & Grewal, D. (2002). Understanding service convenience. Journal of marketing, 66(3), 1-17.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. MIS quarterly, 351-370.

Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis: A global perspective: Pearson.

Brown, L. G. (1990). Convenience in services marketing. Journal of Services Marketing, 4(1), 53-59.

Chang, B. Y., & Hee, K. N. (2002). A Study on how to activate the menu items of the local government's tourism information website: Centering on the website of Chungcheongnam-do Office: Centering on the website of Chungcheongnam-do Office. Tourism and Leisure Research, 14(2), 197-214.

Chebat, J.-C., & Michon, R. (2003). Impact of ambient odors on mall shoppers' emotions, cognition, and spending: A test of competitive causal theories. Journal of Business Research, 56(7), 529-539.

Cho Joon-mo. (2020). Impact of kiosk proliferation on employment in the restaurant industry. In: Korea Labor Institute.

Coursaris, C. K., & Kim, D. J. (2011). A meta-analytical review of empirical mobile usability studies. Journal of usability studies, 6(3), 117-171.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS quarterly, 319-340.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. Information systems research, 3(1), 60-95.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. Journal of marketing research, 18(1), 39-50.

Hee-seok, K., & Yoon-ok, L. (2020). A Review of Untact Marketing of Hospitality Industry Services in the Era of Corona, Journal of the Korean Entertainment Industry Association, Vol. 14, No. 7.

Hoon, P. S., & Young-sook, S. (2019). The Effect of Service Quality on Customer Satisfaction and Revisit Intention as Differentiating Factors of Roastery Coffee Shop. A Study on Food Service Management, 22(2), 295-316.

Hyejin, K., & Doyeon, K. (2011). Smartphone recognition and use for each stage of smartphone adoption. Journal of Korean Journalism, 55(4), 382-405.

Jibong-gu, & Gye-hee, L. (2010). The Effect of Hotel Information System Quality on Information System Acceptance and Performance. Journal of the Korean Society of Industrial Science and Technology, 11(12), 4803-4811.

Jihyung, P., & Kwon, S. G. (2012). The Effect of Usability Factors on the Satisfaction and Loyalty of Smartphone Users. Journal of the Korean Business Association, 25(2), 811-831.

Joo-hwan, S., & Young-taek, K. (2013). A Study on the Effect of Service Convenience of Korail App Users on Customer Satisfaction and Reuse Intention of Korail App. Journal of the Korean Railroad Association, 16(5), 410-417.

Jung-hyun, C. (2021). Designing a UI for kiosk simulation and usage for middle-aged people.

Kijin, K., Tae-jong, S., & Won-gap, L. (2011). A Comparative Study on the Effect of Ease of Use on Value and Satisfaction according to Food Service Information Search Experience using Smartphone Application. A Study on Food Service Management, 14(5), 113-131.

Kyeong-su, J., & No-Minjin. (2015). A Comparative Study on the Intention of Continuous Use of Mobile Communication Service Users in Korea and China. business administration research, 44(1), 215-246.

Kyung-tak, L., & No-Minjin. (2011). Factors influencing the intention to use social commerce: Relationship between perceived risk and technology acceptance model. Consumption and Culture Research Institute, 14(4), 165-182.

Lee, S., & Koubek, R. J. (2010). Understanding user preferences based on usability and aesthetics before and after actual use. Interacting with Computers, 22(6), 530-543.

Lin, J.-S. C., & Hsieh, P.-L. (2011). Assessing the self-service technology encounters: development and validation of SSTQUAL scale. Journal of retailing, 87(2), 194-206.

Meuter, M. L., Ostrom, A. L., Roundtree, R. I., & Bitner, M. J. (2000). Self-service technologies: understanding customer satisfaction with technology-based service encounters. Journal of marketing, 64(3), 50-64.

News, O. M. (2016). U.S. kiosk demand grows on minimum wage hike. Retrieved from https://dream.kotra.or.kr/kotranews/cms/news/actionKotraBoardDetail.do?SITE_NO=3&MENU_ID=180&CONTENTS_NO=1&bbsGbn=243&bbsSn=243&pNttSn=155483.

Oh, H., Jeong, M., & Baloglu, S. (2013). Tourists' adoption of self-service technologies at resort hotels. Journal of Business Research, 66(6), 692-699.

Oliver, R. L. (1981). Measurement and evaluation of satisfaction processes in retail settings. Journal of retailing.

Oliver, R. L. (1993). Cognitive, affective, and attribute bases of the satisfaction response. Journal of consumer research, 20(3), 418-430.

Orel, F. D., & Kara, A. (2014). Supermarket self-checkout service quality, customer satisfaction, and loyalty: Empirical evidence from an emerging market. Journal of Retailing and Consumer services, 21(2), 118-129.

Parasuraman, A. (2000). Technology Readiness Index (TRI) a multiple-item scale to measure readiness to embrace new technologies. Journal of Service Research, 2(4), 307-320.

Parasuraman, A., Zeithaml, V. A., & Berry, L. L. (1988). Servqual: A multiple-item scale for measuring consumer perc. Journal of retailing, 64(1), 12.

Pilsik, K., & Kang-hyun, L. (2020). Presentation of Design Direction of Unattended Order Kiosk Considering the Ease of Use by Elderly Customers: Focusing on the Hardware Interface of Korea's Top 5 Fast Food Brands Kiosk. A Study on Industrial Design, 14(2), 39-53.

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. Information systems research, 13(1), 50-69.

Sang-kyung, L. (2015). Analysis of the Properties of Restaurant Service in Tourist Destinations Using the Kano Model. hotel tourism research, 17(2), 218-236.

Seiders, K., Voss, G. B., Godfrey, A. L., & Grewal, D. (2007). SERVCON: development and validation of a multidimensional service convenience scale. Journal of the academy of marketing science, 35, 144-156.

Seo-young, J., & Sung, S. J. (2020). A Study on the usability evaluation of senior generation for hospital kiosk UI design - Focusing on Seoul H University Hospital kiosk UI design. Journal of the Korean Society of Design and Culture, 26(1), 411-421.

Seongwon, H., & Hyunseok, K. (2019). A Study on the User Experience of Unattended Order Payment Kiosk in Fast Food Restaurants. Journal of the Digital Content Society, 20(8), 1491-1501.

Seung-hwa, J., & Jung-ho, K. (2020). The theoretical background and outlook for the expansion of the untact industry. Journal of New Industry Management, 38(1), 96-116.

Seungyoon, H., & Hoon, C. J. (2019). A Study on the Kiosk UI of Fast Food Restaurants Reflecting the Characteristics of the Elderly. Journal of the Korean Society of Contents, 19(4), 556-563.

Smith, A. K., Bolton, R. N., & Wagner, J. (1999). A model of customer satisfaction with service encounters involving failure and recovery. Journal of marketing research, 36(3), 356-372.

Sojin, B., & Jaeyoung, Y. (2020). Improving the User Experience of Fast Food Restaurant Unmanned Ordering System for the Elderly. Journal of the Korean Society of Design and Culture, 26(2), 197-205.

Soohee, L. (2019). A Study on the Emotional Responses and Intentions of Use of Hotel Technology-Based Self-Service (TBSS). A Study on Hotel Resort, 18(4), 5-24.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. MIS quarterly, 125-143.

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. Information systems research, 11(4), 342-365.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. MIS quarterly, 425-478.

Wixom, B. H., & Todd, P. A. (2005). A theoretical integration of user satisfaction and technology acceptance. Information systems research, 16(1), 85-102.

Yen, H. R. (2005). An attribute-based model of quality satisfaction for internet self-service technology. The Service Industries Journal, 25(5), 641-659.

Young-hwan, K., & Soo-il, C. (2009). Effects of perceived service quality, usefulness, and ease on IPTV user satisfaction and continuous use intention. Journal of the Korean Society of Contents, 9(10), 314-327.