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## **Self-service kiosks: an investigation into human need for interaction and self-efficacy**

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**Abstract:** The purpose of this study is to investigate various factors affecting customer response to kiosk services in psychological perspectives. This study aims to examine consumer response to kiosk services in view of the psychological mechanism, along with the need for interaction and self-efficacy. A survey was carried out among 247 individuals residing in the US who have experience using kiosks in quick service restaurants. Survey data were analysed by employing a structural equation model. A factor analysis identified five factors of kiosk services: rapidity, information quality, reliability, convenience and usefulness. The results show that convenience and usefulness have a negative effect on the need for interaction, whereas reliability and usefulness have a positive effect on self-efficacy. The ‘use intention’ of kiosks has been influenced positively by both the need for interaction and self-efficacy. Also, there exists an unexpected positive relationship between customers’ need for interaction and the ‘use intention’ of kiosk services. It seems that customers with satisfying experiences from interactive kiosk services can revisit and use kiosk services at the recommendation of employees. These findings can enhance both customers’ convenience and business profits through kiosk services.

**Keywords:** kiosk services; rapidity; information quality; reliability; convenience; usefulness; need for interaction; self-efficacy; intention of use.

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## 1 Introduction

Kiosk services are a type of technology based self-service system (TBSS) and their use has been spreading quickly in the quick service restaurant (QSR) industry due to their fast processing speed and convenience. Kiosk terminals are defined as unmanned touch screen style machines. Recent rises in labour costs and minimum wage have accelerated the use of kiosk services, which enable customers to search and order their own food and make simple payments for their selection. In Korea, a quick service chain restaurant, Lotteria, runs 460 (34%) stores nationwide equipped with kiosks services out of a total of 1,340 stores. McDonald's Korea is planning to convert 250 (57%) regular stores to those with kiosk services out of a total of 440 stores within 2017. In addition, the introduction of kiosk services both to one-man dining businesses and large-scale food courts is greatly increasing (Chosun-biz, 2017).

The market for kiosk services is growing fast in the USA. According to Transparency Market Research, the market size in North America is estimated at approximately \$ 2.57 billion, and is expected to reach upwards of \$ 4.47 billion by 2024. The dining industry in the US also reported that the use of kiosk services is expected to steadily increase. McDonald's USA announced that they would introduce kiosk services in 2,500 stores in the domestic market by the end of 2017. Wendy's has plans to introduce kiosk services in up to 1,000 stores by the end of 2017 in order to reduce labour costs (Tara, 2017). The restaurant industry in the US was the first to implement kiosk services, and now some stores are even providing fully automated unmanned systems. Eatsa, a fast food restaurant in San Francisco, has a fully automated unmanned system, from menu selection and payment to food service. Nowadays, kiosk services have extended to family restaurants as well. All kinds of services are available; menu search and selection, personal orders, call for employees, music requests, and separate billing and payment. Kiosk services are user-friendly systems which provide easy access to customers. Therefore, kiosk services will be further developed and widely used.

Existing studies mainly deal with the classification of kiosks (Rowley and Slack, 2003), the effect of kiosk installation on cost savings (Tung and Tan, 1998), and customers' acceptance factors and attitudes towards kiosk services (Peterson, 2006; Chang and Yang, 2008). Not many studies regarding kiosk services have been done to help customers understand kiosk service systems as a type of TBSS. It is necessary to establish a logical theory explaining why customers hold friendly attitudes and intent when using kiosk services.

Understanding customers' psychological intent to use kiosk services will enable practitioners or those in related industries plan not only for the efficient operation of a business but for customers' enhanced satisfaction.

In this study, the authors try to investigate various factors affecting customers' psychological intent to use kiosk services in the dining industry, specifically QSRs. Participating customers in the survey have experience using kiosk services in QSRs. The service attributes of kiosks are reclassified based on earlier studies regarding TBSS. To clearly identify factors affecting customers' intent to use kiosk services and the relationship between customers' need for interaction and self-efficacy, the service attributes are methodically studied.

Recently, the service industry has been changing rapidly in line with the Fourth Industrial Revolution; the rise of minimum wage has accelerated labour costs. Along with the trend of moving from human to unmanned technology, the authors try to examine the psychological process of customers' intent to use unmanned store services. In addition, this research helps the food service industry provide customers with efficient unmanned services, i.e., kiosks, by reducing customers' need for interaction and maximising their self-efficacy.

## 2 Theoretical background and hypotheses

### 2.1 TBSS and kiosk

As of the Fourth Industrial Revolution, the critical role of IT technology in the service industry has become significant. Many researchers have started to pay attention to related technology in the service industry and carried out studies on the subject.

It is TBSS that makes it possible for companies in the service industry under recent heavy competition to provide customers with fast and efficient service by reducing labour and other costs. Moreover, customers save time and money by using TBSS and enjoy its benefits: functionality, enjoyment, security, assurance design, convenience, and customisation (Lin and Hsieh, 2011).

**Table 1** Types of TBSS

<i>Classification</i>	<i>Phone</i>	<i>Internet/applications</i>	<i>Kiosk</i>
Information	Information service via phones	Parcel inquiry seat inquiry	Blood pressure monitor Travel Information
Transaction	Tele-banking	Online shopping Internet banking	Self-serve gas fueling Unmanned order and payment system

Earlier studies on TBSS were without specific classification (Bateson, 1985; Dabholkar, 1996; Langeard et al., 1981). Starting with ATMs, TBSS are available in various fields of business: unmanned air ticket issuing systems, F&B unmanned order and payment systems, and various applications for reservations. Therefore, it is necessary to study TBSS, focused on its specific type. Meuter et al. (2000) categorised TBSS according to both interface and purpose of use. Interface was categorised as phones, online, and interactive kiosks. The purpose of use was grouped by customer service, transaction, and self-help. TBSS was introduced to various fields and reconstructed as in Table 1 according to Meuter et al. (2000)'s theory.

Kiosks are one type of TBSS. The size of the kiosk market in the US in 2015 was estimated to be \$2.5 billion and is expected to exceed \$4.4 billion in 2024. The meaning of the word kiosk originates from Persian, meaning street stalls, yet the modern definition has changed. Nowadays, kiosks are defined as a type of touch screen information terminal provided in small stores or public places where customers can order a product or use a service without any employee contacts (Kim et al., 2013). They may also be referred to as Interactive Kiosks to differentiate them from physically structured stores. Examples are Unmanned Interactive Kiosks with a touch screen terminal, ordering machines on tables, and drive-through kiosks (Kim et al., 2013). The latest information technology development has accelerated demand for kiosk services, and the number of customers using interactive self-serving technologies is rapidly increasing. To sum up, kiosks are prevalent type of TBSS (Meuter et al., 2000).

## *2.2 Development of service attributes of kiosk by service quality of TBSS*

Measurement of service quality in the past was mostly judged by face-to-face service: the relationship between service providers and customers. Measuring the quality of TBSS is different from earlier forms of service, in that it measures the relationship between humans and technology. Therefore, TBSS requires its own quality measurement index (Dabholkar, 1996). Earlier studies on TBSS mostly dealt with new technology acceptance factors and customers' disposition. However, more recent studies are on topics such as the characteristics of TBSS which lead to customers' satisfaction or dissatisfaction. Dabholkar (1996) defined the attributes of TBSS as service speed, convenience, reliability, enjoyment, and control, based on existing qualitative studies. Dabholkar (1996) presented a service quality measurement model of TBSS, and investigated the relationship between service quality and customers' intent to use them. Meuter et al. (2000) qualitatively approached this topic by using a critical incident technique (CIT); the satisfying factors of TBSS were time and cost savings, ease of use, problem solving, related benefits, etc. Moreover, Meuter et al. (2000) mentioned that customers compared different attributes of TBSS with those of traditional services when assessing TBSS. The above studies demonstrated that the common attributes of TBSS were ease of use (convenience), initiatives, cost savings, accessibility, and aesthetics.

Dabholkar (1996) argued that the service industry presented a new alternative of technology based self-service to customers in order to reduce labour costs; the development of technology accelerated the progress. Technology based self-service is often used by mixing with the notion of self service technology (SST). SST means a technological interface enabling customers to produce a service independent of direct employee involvement (Meuter et al., 2000). Technology based self-service is an automated service system for customers, by producing direct service without interaction with employees. Therefore, technology based self-service and SST are the same notion. Rayport and Sviokla (1995) defined the market space as a virtual area where products and services exist in digital information. They insisted that self service technology was a typical example of a market space trade without contact of service buyers and its providers. Consequently, technology based self-service is a service system where customers are producing direct service, independent of employee involvement; kiosk services are a type of technology based self service.

In this study, the attributes of kiosk service are selected and classified as service speed, information quality (IQ), reliability, convenience, and usability. The definitions of the attributes are as follows.

Firstly, service speed is defined as customers' expectation for time taken to complete the service. Service speed is an effective factor for better service quality (Dabholkar, 1996). Current users are quite sensitive to the progression speed of a service or a system. Users feel occupied time is shorter than unoccupied time. Maister (1985) argued that slow service time affected the general recognition of service quality. Ledingham (1984) asserted that customers thought time saving was important when they worked or went shopping; time meaning not just service performance time, but also waiting time, and both were important to customers. In this study, service speed is defined as the quality of service when customers use kiosk services.

Secondly, IQ is defined as high quality information with variety, given to customers. IQ means the extent of value provided using calculated information and its contents (Negash et al., 2003). DeLone and McLean (2003) suggested in recent studies that measuring factors were information accuracy, relevance, understanding, integrity, dynamics, personalisation, and diversity. Vivid and specific information attracted more attention and was stored in the long term memory of information recipients, so that recipients could retrieve memories in detail and for a longer time than abstract information (Newman, 2003).

Thirdly, in earlier research, reliability was mostly composed of the concept of both privacy and security. Security meant protection from unauthorised intrusion or leaking of personal information (Nysveen et al., 2005). Perceived reliability was defined as information providers' expectation that they would not be deceived by the information system in a dangerous way (Corritore et al., 2003). In most existing studies, the fear of lack of security from the information system affected technology development (Lule et al., 2012).

Fourthly, convenience meant saving of time, as well as physical and mental resources in a self-service situation (Laukkanen and Kantanen, 2004). The notion of convenience was varied; works were done in an easy and comforting way (Oliver and Webster, 1990). Holbrook (1999) defined convenience as achieving goals with less time and effort (Holbrook, 1999). Most researchers explained and defined convenience on a single level. The conceptualisation of convenience was assessed from customers' behavioural aspects; the assessment was mostly done while customers were using products or services (Seiders et al., 2007). In this study, convenience means the degree of ease of use for kiosk services as a personal self-checkout register according to personal needs or demands.

Fifthly, usability is customers' appreciation of the effectiveness which new technology brings. This conceived usability is the level of effectiveness affecting the outcome, personal relations, and goal of attainment for organisations with information systems. Davis (1986) studied determinants affecting new technology adoption and individual users' access to the technology based on a technology acceptance model (TAM). As mentioned in theoretical backgrounds, conceived usability affects the accepting behaviour of a new technology. Adams et al. (1992) and Davis et al. (1989) presented that a high level of conceived usability positively affected customers' attitudes towards computer systems.

### *2.3 Relationship between need for interaction and service attributes of kiosk*

Interactive service was generally defined as direct interaction of persons in service environments (Solomon et al., 1985). It meant human interaction between service-providing employees and service-receiving customers; to maintain a good company image and customer relationship, it was necessary for service providers to play an important role in service interaction (Keaveney, 1995). Interrelation of service was defined as the direct interaction time between service providers and customers. Therefore, it was not simply focusing on personal relations, but rather on physical environments, service delivery, customer participation and attitudes, and the service environment (Bitner et al., 2000). To sum up, Interactive Service included not only interaction between service-providing employees and customers, but the physical and technical environment as well (Normann, 1991).

Along with information technology development, the size and extent of service delivery has extended (Bitner et al., 2000); self-service options were introduced (Dolen et al., 2002). Technology innovation has brought TBSS. This seems to be an essential part in steady customer-company relations. Technology based interaction was expected to be a significant factor for long term business success, and this would be a fundamental change in the service industry (Parasuraman and Grewal, 2000).

The need for interaction is electronically controlled, mediated communication process between a sender and a receiver. The traditional interaction process was a simple conversation between a sender and a receiver (Rogers, 1986). Rogers (1986) defined interaction as “the degree of control of mutual conversation and the degree of role exchange among participants in the communication process”. Taylor and Baker (1994) explained that service quality perception enhanced customer satisfaction through interaction with service employees, and this lead to positive value enhancement. Interaction, a communication action, is often used mixed with need for interaction. It is expected that customers’ need for interaction is not satisfied, if customers contact with service employees is minimised in a situation using kiosk services. Therefore, this study hypothesises as follows.

- H1 The service factors of kiosks have a negative effect on need for interaction.
- H1a Rapidity has a negative effect on need for interaction.
- H1b IQ has a negative effect on need for interaction..
- H1c Reliability has a negative effect on need for interaction.
- H1d Convenience has a negative effect on need for interaction.
- H1e Usefulness has a negative effect on need for interaction.

### *2.4 Relationship between service attributes of kiosk and self-efficacy*

Self-efficacy is defined as an individual’s belief in their innate ability to achieve goals (Bandura, 1997), or could be defined as a personal judgement of how well one can execute a specific action in a given situation (Peterson and Stunkard, 1992). In other words, it is a personal belief in one’s ability to succeed in specific situations or accomplish a task in the face of obstacles.

The most frequently cited element of personal characteristics in the study of information systems is self-efficacy on computers. Self-efficacy is the appreciation of one's own ability to accomplish a task in specific situations. Self-efficacy on computers is an individual capability to perform a specific computer task, or perceived self-confidence regarding one's ability to use a computer. Meuter et al. (2005) showed that self-efficacy was one of the leading factors of accepting TBSS. Individuals with high self-efficacy have a greater possibility to voluntarily accept new technology.

As mentioned above, kiosks aim to minimise service difficulties and aim to reduce the fear of using a technology like information systems. If one expected a technology was easy to use, he or she would have confidence in using technology, and, as a result, this would lead to a positive effect on an individual's attitude toward information systems. Therefore, this study hypothesises as follows.

- H2 The service factors of kiosk have a positive effect on self-efficacy.
- H2a Rapidity has a positive effect on self-efficacy.
- H2b IQ has a positive effect on self-efficacy.
- H2c Reliability has a positive effect on self-efficacy.
- H2d Convenience has a positive effect on self-efficacy.
- H2e Usefulness has a positive effect on self-efficacy.

### *2.5 Relationship among need for interaction, intention of use, and self-efficacy*

Behaviour intention has been defined as a person's will or belief that he or she would engage in a given behaviour after the person formed a certain attitude toward a specific subject (Ajzen and Fishbein, 1980; Boulding et al., 1993). To investigate customers' behaviour intention, the level of customers' satisfaction was measured. However, customers' behaviour intention and their level of satisfaction did not always match. When a customer made a decision on a specific brand in a given situation, the level of satisfaction in the past may have affected his or her decision. Therefore, customers' behaviour intention and their level of satisfaction seem to be related (Cronin and Taylor, 1992).

Continuous intention of use means customers' decision to continue to use a specific system or a service. It was identified as the core concept of maintaining a relationship between service-providing companies and customers, and a direct indicator of customers' intention to continuously use a product or service in the future (Dorsch et al., 2000; Venkatesh and Davis, 2000). It is customers' appreciation of a specific service that informs their intent of use.

Interrelation satisfaction in a service situation has been defined as a direct appreciation of a service where a customer and a service-providing employee interacted in a given situation; the importance of a customers' participation was confirmed by factors of both customers and employees (Dolen et al., 2002). The roles of both service-providing employees and customers were equally important. Earlier studies mostly focused on interaction and personal relations. It was because services occurred in an interaction between service-providing employees and customers (Keaveney, 1995; Solomon et al., 1985). In a given situation, interactive relations of customers and employees will affect customers' positive attitudes and behaviour intention. The results

suggest that customers pursuing a need for interaction may have low level of intention of use, whereas customers not pursuing need for interaction may have high level of intention of use. Therefore, this study hypothesises as follows.

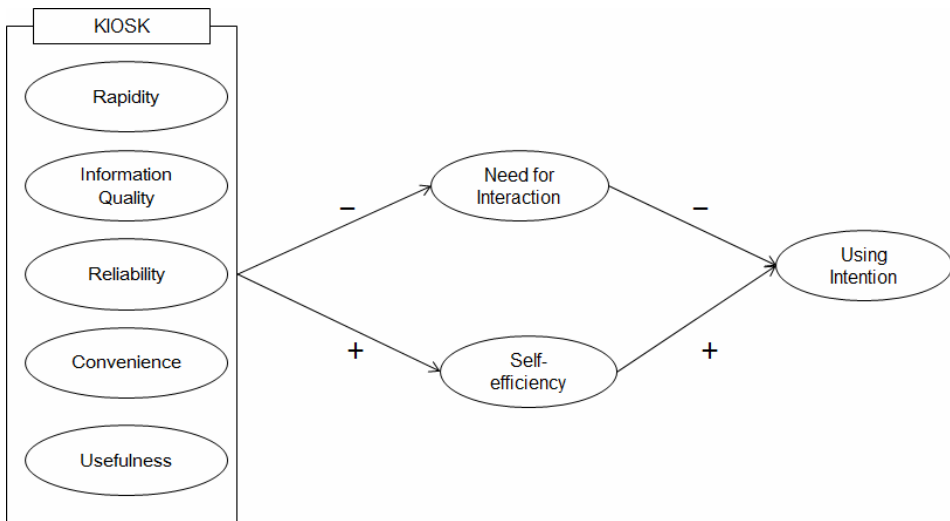
H3 Need for interaction has a negative effect on intention of use.

In an information technology environment, self-efficacy is the subjective appreciation of an individual’s ability when he or she accomplishes a given task. Self-efficacy makes possible for an individual to accomplish a goal by using information technology and to possess self-confidence that he or she can use it successfully. The importance of self-efficacy has been emphasised in learning theories; many studies on the subject consider self-efficacy as a leading variable of acceptance intention or use action (Hung et al., 2003; Agarwal and Karahanna, 2000). Compeau and Higgins (1995) insisted that self-efficacy was a significant factor affecting expectation of behaviour results and intention of actions. Therefore, this study hypothesises as follows.

H4 Self-efficacy has a positive effect on intention of use.

By reviewing theoretical backgrounds and earlier studies, the study model and hypotheses are established. At first, this study classified five service attributes of kiosk based on TBSS. Since customer satisfaction will be enhanced when a higher quality of service is given, the authors try to investigate the mediating role of need for interaction and self-efficacy, and the role of service attributes of Kiosk and intent to use. The study model is in Figure 1.

Figure 1 Study model





### 3 Empirical analysis

#### 3.1 Characteristics of samples and data collection

This study tried to examine the effect of customers' experience using kiosk services on their intent to reuse kiosk services. The online survey of this study was carried out among individuals residing in the USA who have experience using kiosk services in QSRs.

General definition and characteristics of kiosk services were explained and typical images of kiosks in QSRs were provided to respondents. If respondents do not have any experience using kiosk services, the survey was closed. If they did have experience using kiosk services, the respondents were asked to write down at least more than one name of QSRs. Most of the respondents had experience using kiosk services in QSRs, such as McDonalds, CaliBurger, KFC, Burger King, Dunkin', Shake Shack, Wingstop, and Wendy's.

A total of 497 persons participated in the survey. The final 250 responses were empirically analysed excluding 247 participants who had lacked adequate experience with kiosk services or did not respond. As for demographic characteristics, 93 participants were male (37.2%) and 157 female (62.8%). Groups were also divided by age as follows: 14 teenagers (5.6%), 120 in participants in their twenties (48%), 114 in their thirties (45.6%), and 2 over 40 (0.8%). Individuals in their twenties and thirties comprised a high proportion of the survey (see Table 1).

**Table 2** Demographic data

<i>Category</i>		<i>Frequency</i>	<i>Ratio (%)</i>
Gender	Male	93	37.2
	Female	157	62.8
Age	> 20	14	5.6
	20~29	120	48
	30~39	114	45.6
	40 <	2	0.8

#### 3.2 Variables

##### 3.2.1 Service factors of kiosks

In this study, variables affecting customers' using patterns of kiosk services were selected and applied among various TBSS variables used in TAM.

Service attributes of kiosks were classified as rapidity, IQ, reliability, convenience, and usefulness. The five service factors of kiosks were surveyed with a total of 18 questions, by using a five point Likert-scale: 1 = strongly disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, and 5 = strongly agree. Service speed was defined as time needed for service completion. The speed of service affects the general recognition of service quality (Maister, 1985). Reliability meant accuracy of service results (Bagozzi, 1990). IQ was defined as accessibility and transparency according to high quality information and given payment information for transactions (Rapp and Aubert, 2011; Diaz, 2009). The first three attributes, service speed, reliability, and IQ, were measured with a total of 10 question items: three questions for service speed, three

questions for IQ, and four questions for reliability. Convenience was described as “the level of belief in saving one’s efforts by using a specific product or a system”, and usability was “the level of belief in enhancing one’s achievement by using a specific product or a system” (Davis et al., 1989). These two factors are composed of questions made and modified by Venkatesh and Bala (2008) and Shamdasania and Malhotrac (2008): three questions were given for convenience and five questions for usability.

### *3.2.2 Need for interaction*

Need for interaction is one’s need for direct or indirect interrelations with others. In general, to fulfil or satisfy one’s own need, he or she needs others’ actions, and vice versa. In this study, four questions were designed to measure need for interaction based on questions developed by Dabholkar (1996). Four items for each construct were modified from the previous studies in accordance with this study and rated on a five point Likert-scale from ‘1’ strongly disagree to ‘5’ strongly agree.

### *3.2.3 Self-efficacy*

Bandura (1997) defined self-efficacy as an individual’s belief in a human’s innate ability to successfully accomplish or achieve his or her goals. In this study, three questions were used for measuring an individual’s ability to use a kiosk service by referring to those developed by Compeau and Higgins (1995) and Pedersen (2005). Self-efficacy was measured by three items by a five point Likert-scale from ‘1’ strongly disagree to ‘5’ strongly agree.

### *3.2.4 Intention of use*

Behaviour intention was defined as the possibility of a customers’ continued use of a specific system or a service, which meant customers’ intent to use a service by transferring their thoughts and attitudes into actions. It could also mean that a person’s will or a belief that he or she would engage in behaviour after the person formed a certain attitude toward a specific subject (Ajzen and Fishbein, 1980; Boulding et al., 1993). In this study, intention of use was measured by five items by considering customers’ intent to use kiosk services.

## *3.3 Analysis of reliability and validity*

In this study, AMOS 23.0 was used for the confirmatory factor analysis and estimation of the measurement model. The items for finally selected measuring factors are the service attributes of kiosks (service speed, IQ, reliability, convenience, and usability), need for interaction, self-efficacy, and intent to use. The higher concepts were also scaled by standardisation. Since these were validated by earlier exploratory factor analysis in earlier studies, the statistical factor analysis was satisfied. Therefore, confirmatory factor analysis was implemented.

In general, standardised factor loading should be measured at a value greater than 0.5 to satisfy validity and reliability of scaling. The internal consistency measuring index,

CR, should be more than the value of 0.7, and the average variance extracted (AVE) should be over 0.5 to show convergent reliability. As shown in Table 3, the standardised factor loading of selected data items was greater than 0.7 except for one item, IQ, included with a value of 0.46. There was a reason why the AVE of IQ does not meet the value of 0.50, and therefore the item was not eliminated because it satisfied the level of CR and has only a minor impact on the model fit.

**Table 3** Results of the conceptual reliability and intent validity test for independent variables

<i>Construct</i>	<i>Scale item</i>	<i>Stand. factor loading</i>	<i>C.R.</i>	<i>AVE</i>
Rapidity	The processing speed is faster at KIOSK service system.	.840	.749	.463
	KIOSK service system provides prompt services.	.840		
	KIOSK service system quickly meets customers' needs.	.826		
Information quality	KIOSK service system provides quality information regarding menu (or products).	.460	.740	.364
	KIOSK service system provides all the information I need.	.790		
	KIOSK service system provides various information of menu.	.784		
Reliability	I believe my personal information provided to KIOSK service system will remain confidential.	.818	.799	.545
	The transaction at KIOSK service system is safely processed.	.766		
	I do not worry about the security of KIOSK service system.	.678		
Convenience	Overall, KIOSK service system is safe.	.835	.749	.486
	It is complicated to use KIOSK service system.(r)	.866		
	It is a hard work to use KIOSK service system. (r)	.905		
Usefulness	It takes a while to use KIOSK service system.(r)	.830	.833	.675
	It is useful to use KIOSK service system.	.793		
	The quality level of KIOSK service system is high.	.785		
	KIOSK service system provides qualitative service.	.744		
	KIOSK service system is highly valued.	.811		
	It is reasonable to use KIOSK service system, considering my time and effort.	.804		

As in Table 4, the results of confirmatory factor analysis of dependent variables showed that all the standardised coefficients of finally selected items were greater than 0.7. Even though the AVE value of self-efficacy was relatively low, the existing item was used; it meets CR.

**Table 4** Result of the conceptual reliability and intent validity test for dependent variables

<i>Construct</i>	<i>Scale item</i>	<i>Factor loading (standardised)</i>	<i>C.R.</i>	<i>AVE</i>
Need for interaction	I enjoy the help of employees.	.696	.799	.532
	I think it is very important to order menu directly to employees.	.823		
	It bothers me to order at KIOSK service system.	.766		
	I like to interact with the employees.	.758		
Self-efficacy	I have confidence in using KIOSK service system.	.873	.747	.403
	I can use KIOSK service system without learning it.	.709		
	I can use KIOSK service system after watching other people use it.	.655		
Intention of use	I will preferably choose the places with KIOSK service system whenever I eat out.	.758	.833	.736
	I will definitely let people know about KIOSK service system.	.813		
	I will definitely recommend people about KIOSK service system.	.851		
	I will share information about KIOSK service system with people.	.872		
	I want to share method of use of KIOSK service system with people.	.884		

**Table 5** The result of discriminant validity

	<i>RAP</i>	<i>IQ</i>	<i>REL</i>	<i>CON</i>	<i>USE</i>	<i>NFI</i>	<i>SE</i>	<i>IU</i>
RAP	<i>.463</i>							
IQ	0.520	<i>.364</i>						
REL	0.479	0.574	<i>.545</i>					
CON	0.014	0.004	0.000	<i>.486</i>				
USE	0.543	0.573	0.566	0.007	<i>.675</i>			
NFI	0.011	0.002	0.008	0.358	0.001	<i>.532</i>		
SE	0.394	0.459	0.428	0.007	0.432	0.010	<i>.403</i>	
IU	0.391	0.389	0.372	0.005	0.606	0.014	0.267	<i>.736</i>

Note: \*Italics values in the diagonal are the AVE for each construct and values in lower diagonal cells are the squared correlations among constructs.

Construct reliability describes how different a potential factor is from others; if AVE value is higher than the squared value of correlation, construct reliability is confirmed. As in Tables 3 and 4, convergent reliability and construct reliability were confirmed in all items; all the correlation among factors and AVE in this study showed higher values than those of the squared correlation coefficients of other factors (see Table 5).

## 4 Validation of study hypotheses

### 4.1 Suitability of the model

Before the verification of the hypotheses, the fit of the model on structural equation was assessed. Full samples were analysed to assess the fit of the model. The maximum likelihood (ML) was assumed to estimate an optimised parameter. Since the ML assumed normal distribution for large-sized samples, it seems suitable for the study (Steiger, 1990).

As for GFI, a satisfactory fit is not met if the value is greater than 0.9, however, the value appears to designate an acceptable fit ( $0.8 < \text{GFI}$ ) (Tasmin and Woods, 2008). In addition, RMSEA statistics were at a value of less than 0.10, which explains that the model possesses adequate comprehensibility (Steiger, 1990) (see Table 6).

**Table 6** Fit of the model

<i>Model</i>	<i>Df</i>	$\chi^2$	$\chi^2/df$	<i>GFI</i>	<i>TLI</i>	<i>CFI</i>	<i>IFI</i>	<i>RMSEA</i>
Cut			<5	>.90	>.90	>.90	>.90	<.05
Model of the study	360	893.584	2.482	.836	.882	.902	.904	.077

### 4.2 Verification of study hypotheses

Amos 23.0 was used to test the hypotheses of the study by using path analysis, and the results were presented in Table 7 and Figure 2. To find more influential independent variables, standardised regression weight was used. Standard error (S.E.) values show stability and accuracy of the parameters. To adopt the hypotheses, the standard value of Critical Ratio (C.R.) should be 1.96 with a P-Value of less than 0.05.

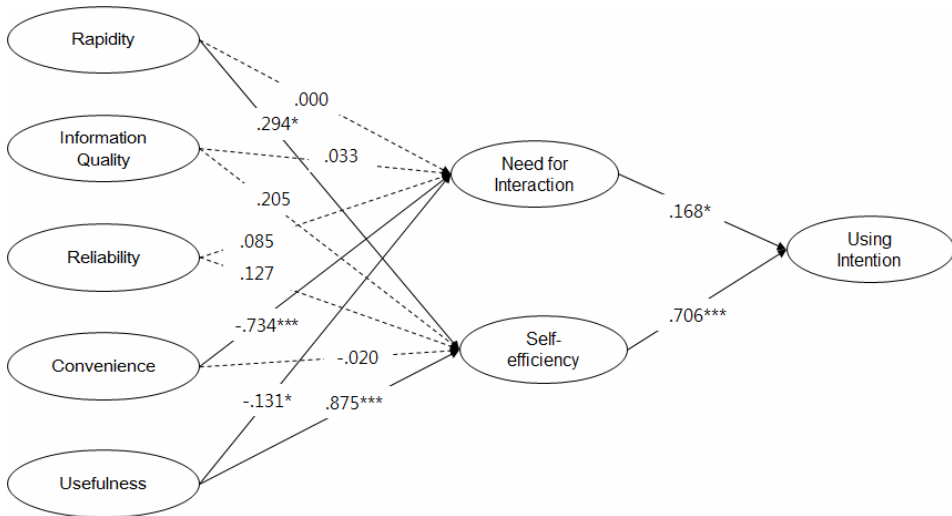
The study results show that convenience and usefulness negatively affected the need for interaction. Service speed, IQ, and reliability of perceived transactions are not statistically significant to the need for interaction. Rapidity and usefulness are positively related to self-efficacy, but IQ may positively affect self-efficacy by a significance level of 0.1. As for the effect of need for interaction and self-efficacy on intent to use kiosk services, the results confirm that self-efficacy is positively related to intent of use; need for interaction and intention of use are not negatively related but positively related. This shows that customers who emphasise importance on interaction with employees may also have the intention to use kiosk services as well. To sum up, if an employee explains how to use a kiosk service and its usefulness to a customer who is willing, the customer may form a positive intention to continuously use kiosk services. This result suggests that those customers will form faster psychological intention to use than those with no reaction to kiosk services.

**Table 7** The result of path analysis

Hypothesis		Standardised estimates	S.E.	C.R	P-value	Results
<hr/>						
←						
Need for interaction	Rapidity	.000	.070	.000	-	×
	Information quality	.033	.060	.315	-	×
	Reliability	.085	.092	.551	-	×
	Convenience	-.734	.055	-5.445	***	○
	Usefulness	-.131	.034	-2.314	*	○
Self-efficacy	Rapidity	.294	.081	1.988	*	○
	Information quality	.205	.070	1.833	-	×
	Reliability	.127	.105	.782	-	×
	Convenience	-.020	.031	-.289	-	×
	Usefulness	.875	.062	9.402	***	○
Intent of use	Need for interaction	.168	.120	2.340	*	○
	Self-efficacy	.706	.136	7.950	***	○

Notes: \*p-value <0.05; \*\*p-value <0.01; \*\*\*p-value <0.001

**Figure 2** The results of hypothesis test



Notes: \*p-value <0.05, \*\*p-value <0.01, \*\*\*p-value <0.001

※ Solid arrows represent significant paths; dotted arrows represent paths that were not significant

## 5 Conclusions and suggestions

Along with the development and expansion of TBSS, kiosk service technology has started to attract attention from customers and practitioners in the food service industry. To reduce time of ordering, payment, and waiting and to save labour and other costs, the

practical use of kiosk services in QSR is steadily increasing. Kiosk services enhance both customers' convenience and managerial efficiency. Therefore, the number of businesses in the dining industry using kiosk services is rapidly growing and customers are acclimating to the new trend of using technology supported self-service systems. However, there are not many studies available regarding customers' intention of psychological acceptance. Therefore, this study serves as a starting point for deeper and better understanding of customers' psychological processes in their intent to use kiosk services.

Participating customers already had experience using kiosk services to order and pay for items in the fast food industry. The independent variables in this study were carefully selected based on earlier literatures which identified affecting factors of customers' psychological intent to use kiosk services. The study model was built to show how service attributes of kiosks and individuals' characteristics, such as customers' need for interaction and self-efficacy, connect to customers' intent to use kiosk services. Kiosk services should increase practicality for customers' who visit dining places where kiosk services are available.

### *5.1 Key findings*

This study draws the service attributes of kiosks from the results of earlier studies on the service quality of TBSS. Five affecting factors were selected and their relationships were investigated: service speed, IQ, reliability, convenience, and usability as independent variables; need for interaction and self-efficacy as dependent variables. The empirical study results are as follows.

Firstly, service speed, IQ, and reliability do not significantly affect customers' need for interaction, whereas convenience and usability are negatively related to their need for interaction. This is against the earlier concern of customers' rejection of using kiosk services. The food service industry introduced kiosk service for managerial purposes, for the reduction of labour and other costs, but the industry worried about customers dissatisfaction or rejection, which may have caused customers' to abandon the service or lead to a waste of time and costs. However, the study results show that customers prefer simple manual kiosk services for menu decisions, ordering, and payment, leading to increase of customers' self-efficacy. Concerns over customers' dissatisfaction or rejection of systems not reliant on interaction with employees may be lowered or minimised.

Secondly, the service attributes of kiosk affecting self-efficacy are convenience and usability. This could be explained by the argument of Meuter et al. (2005). In their studies, they suggested that customers' concerns about the use of new technology information systems might cause a weak intention to use them, as compared to those with no concern or fear for the systems. This explains that self-efficacy has a significant effect on customers' use of kiosk services, helping customers to maintain positive attitudes toward using new technology. Experiences with kiosk services might enhance customers' self-efficacy, and eliminate or minimise concerns or fears for using a new technology without any human interaction.

Thirdly, need for interaction positively affects customers' intent to use kiosk services. This result is against Hypothesis 3, which hypothesises that need for interaction negatively affects intent to use. Earlier studies on need for interaction argued that need for interaction was the key factor for customers to build and maintain interrelations, so it was impossible to build a relationship with customers without interaction (Bezjian-Avery

et al., 1998). In other words, customers' reliability and satisfaction of interacting with others were the essential factor for customers' intent to revisit and repurchase. By adapting that result to this study, by interacting with employees of dining places, satisfied customers may have the intention to revisit and use kiosk services with the recommendation of the employees. In fact, stores with fully equipped kiosk services, often place employees to help or assist customers using kiosks. This effort will help expand the effect of customers' need for interaction.

Fourthly, self-efficacy positively affects intent to use kiosk services. Therefore, appropriate assistance for kiosk users to use the service efficiently, such as education on kiosk services and confidence programs for customers, will help customers accept and continuously use the service in the future.

## *5.2 Practical implications*

The use of technology-based kiosk services has been spreading quickly in the QSR industry for competitiveness. Without considering customers' satisfaction, however, the kiosk service use only for labour costs reduction might cause customer inconveniences. This may cause customers to leave, and thus, negatively affect the financial conditions of the industry.

Companies should be open to listen to customers' opinion and try to satisfy customers' need for interaction and maximise self-efficacy. Moreover, they should focus on maintaining customers' intent to use kiosk services in QSRs. If the process of customers' decision making, ordering and payments is simplified for their convenience, customers' self-efficacy will go up, satisfying their intent to use. In addition, the kiosk services should be upgraded to change or cancel the orders without any employee contacts.

Practical implications exist in this study. Unlike earlier concerns for customers' dislike or rejection of kiosk services, it may be an efficient and effective way for service-providing companies to reduce managerial costs. In addition, it enhances customers' convenience and usability. Kiosk services may also be a weak and incomplete technology compared to existing manpower service. However, the fast upgrade and improvement of kiosk services, which is a distinctive feature in the information technology industry, will help enhance management profits and customer convenience. Provided that the incomplete parts of kiosk service are improved and upgraded, the number of customers using kiosks will most certainly increase. Moreover, management profits in the dining industry are likely to increase, along with related business industry expansion; it is expected for customers with experience with kiosk services to revisit stores with kiosks.

On the occasion of fourth industrial revolution, TBSS makes it possible for companies in QSR industry to provide customers with fast and efficient service by reducing labour and other costs. As a result, the uses of kiosk services in QSRs are inevitable for consistent and convenient customer services. Therefore, this study will be used as an essential stepping stone for practical use of kiosk services in QSRs industry.

## *5.3 Limitations and future research*

As mentioned above, this study has theoretical and practical implications; however, there are limitations as well.



First, this study tried to investigate customers' psychological intent process to use kiosk services by mostly focusing on QSRs. Therefore, the study could not cover similar or different business types in the dining industry. Further research on various business fields is needed.

Second, the inconveniences of using coupons, points, or affiliated credit cards are not yet solved, so that customers may feel unsatisfactory when using kiosk services. These inconveniences could affect customers' psychological intent process, and therefore this factor should be considered and treated as an exogenous variable.

Third, the physical environments of stores were not measured in the study. The physical environment of a store might affect the service attributes of kiosks themselves. In fact, multiple kiosk installations in cramped small-sized stores may cause human traffic congestion, mixing people in both the waiting lines of kiosks and service circulation paths of employees. The size of a store should be considered as a controlled variable for further studies.

Forth and last, the concept of convenience using kiosk services for customers may vary depending on demographic characteristics of customers visiting QSR, such as age groups and occupation. Especially, higher age groups might find it difficult to use kiosk services. In addition, a gap may exist between the preference group and the non-preference group of kiosk services. Therefore, further studies should consider various social demographic variables.

Understanding the implications and limitations of this study will be of help to both researchers in academic fields and to practitioners to make plans for better business environments. Hopefully the findings of this study can enhance both customers' convenience and business profits, and serve as a stepping stone leading to the development of kiosk services as a prevalent type of TBSS.

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