Adoption of Self-service Kiosks in Quick-service Restaurants

by

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ABSTRACT

ADOPTION OF SELF-SERVICE KIOSKS IN QUICK-SERVICE RESTAURANTS

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This study investigated the factors that influence the customer's decision to use an SSK in QSRs. Specifically, an integrated model incorporating Technology Acceptance Model (TAM) and Satisfaction model was developed to examine the relationship among trust, self-efficacy, perceived ease of use, perceived usefulness, perceived enjoyment, perceived value, satisfaction and behavioral intention toward using these kiosks in quick-service restaurants. In addition, the moderating impact of age, gender and past experience using the self-service kiosk was examined. Structural equation modeling and multiple regression analyses were applied for data analysis. The results indicate that (a) continued intention was directly influenced by customer satisfaction (b) intrinsic motivation (Perceived enjoyment) strongly influenced customer satisfaction, while extrinsic motivations (perceived usefulness and perceived ease of use) did not influence customer satisfaction (c) self-efficacy had a more significant impact on intrinsic motivation and extrinsic motivations than trust (d) no moderating effects were found between TAM constructs and Satisfaction model constructs. These findings provide theoretical and practical implications for future studies and quick-service restaurant managers who are considering SSKs or have already adopted them.

Key words: Self-service technology, Kiosk, Quick-Service Restaurant, Customer Satisfaction, Technology Acceptance Model

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CHAPTER 1: INTRODUCTION

Over the last two decades, the rapid growth of information and communication technology (ICT) has allowed hospitality operations to employ various technologies to facilitate customer service and to enhance customer experience and satisfaction (Dabholkar & Bagozzi, 2012). Self-service technology (SST) is one of the ICTs that allow customers to create service (e.g. personal service, self-service or combination of both) for themselves without the aid of, or with minimal help from, employees or service providers (Meuter, Ostrom, Roundtree, Bitner, & Encounters, 2000). Lin & Hsieh (2007) indicated that more and more consumers are willing to adopt these new technologies to create their own service, and thus 'high-touch and low-tech' tools or devices are gradually being replaced by 'low-touch and high-tech' ones. For instance, new research from the National Restaurant Association (NRA) shows that 36% of consumers are now more likely to adopt tech options in the restaurant industry now than they were two years ago (National Restaurant Association [NRA], 2017).

One widely used SST is the kiosk (Rowley & Slack, 2003). Kiosks have been a common feature in certain segments of the hospitality industry (e.g. airline self-service check-in kiosks and airport information kiosks). Restaurants and hotel businesses have also adopted this technology to efficiently and effectively serve their patrons or guests. Restaurants use self-service kiosks (SSKs) for customers to place, customize and pay for their food and drink orders while hotels utilize this technology device to provide hotel and area information and self-check in/out services. In particular, quick service restaurants (QSR) have aggressively adopted SSK technology because it reduces labour costs (Beatson, Lee, & Coote, 2007), improves speed of service (Kincaid & Baloglu, 2005), and accuracy of orders (Kincaid & Baloglu, 2005); increases sales due to up-selling; and is generally an attractive option for Millennial customer

and their younger counterparts.

With SSKs, customers can customize products for themselves, creating a meal based on their personal choices with more control over the process and can pay conveniently without standing in long lines. Almost 80% of consumers evaluate restaurant technology options as increasing convenience, and 70% of them evaluate restaurant technology as speeding up service and as increasing order accuracy (NRA, 2017). Perutka (2010) found that customers are willing to accept higher prices and to pay on average $ 2.47 USD more at QSRs, if the service is faster (Perutkova, 2010). Certainly, the promise of a shorter waiting time (i.e., faster service) appears to influence customers' decisions to use SSKs (Kokkinou & Cranage, 2015; Wang , Haris, & Patterson, 2012). All these factors suggest that the trend toward SSKs is likely to become increasingly important in the hospitality industry generally, but particularly in the QSR segment – a fact which reinforces the importance of the current study.

However, some customers are still reluctant to use SSTs because they perceive them as having design and security and flaws; (Curren & Meuter, 2005; Curran, Meuter, & Surprenant, 2003; Meuter, Bitner, Ostrom, & Brown, 2005; Meuter, Ostrom, Bitner, & Roundtree, 2003). For example, customers may worry about making mistakes while using the kiosk, because they feel its design is not user friendly or intuitive and that they lack the technological knowledge and self-efficacy to use it properly. Or they may be reluctant to provide any personal information or data, such as a debit card password, because they do not trust the security features of the kiosk. The NRA study shows that 49% of consumers prefer to interact with employees rather than with an SSK for these reasons (NRA, 2017).

These examples indicate that the customers' response to an SST (i.e., whether they embrace or reject it) will depend on their evaluation and perception of it (Mozeik, Beldona,

Cobanoglu, & Poorani, 2009). Therefore, restaurant providers have to know more about the customers' evaluation and perception of SSTs.

Many studies have contributed to our understanding of why customers use SSTs, identifying the specific factors that influence this choice. However, most technology adoption studies have focused on initial adoption rather than repeat use (Fernandes & Pedroso, 2017). Moreover, most SST studies in a hospitality context have been conducted in hotels and airport settings (Kim, Lee, & Law, 2008). Relatively few have been conducted in QSR settings (Morosan, 2011; Kim, Christodoulidou, & Choo, 2013), and even fewer have studied customer satisfaction with technology acceptance (Kim et al., 2008; Kim & Qu, 2014).

To address these gaps, this study presents a conceptual model that combines a technology acceptance model (Davis, 1986) and a satisfaction model (Cronin, Brady, & Hult, 2000)**.** The result sheds light on the customer's perception and evaluation of SSKs in QSRs. Specifically, this study aims to identify factors that influence the customer's decision to continued use an SSK in QSRs; and to explain the relationships among those factors. Furthermore, this study aims to investigate the impact of age, gender and past experience as a moderator. Previous studies have investigated the impact of individual differences (e.g. age, gender and past experience) in technology acceptance context. However, the results are inconsistent. For instance, in terms of gender, some recent studies show that there is no significant differences between males and females in adopting SSTs (Kincaid & Balouglu, 2005; Kim et al., 2013). However, previous studies indicate there are significant differences across gender in adopting SSTs (Nysveen, Pedersen, & Thorbjørnsen, 2009; Venkatesh & Morris, 2000).

The findings of this study will give readers more information about the reasons that people are, or are not, intent on using this technology. In particular, this study contributes to the existing literature by developing and testing an integrated technology acceptance model that includes the variables of enjoyment, trust and self-efficacy in the hospitality setting. It will also provide valuable information for QSR restaurant operators to guide their consideration of investing in and adopting an SSK.

CHAPTER 2: LITERATURE REVIEW

2.1 Self-service technologies in QSRs

Restaurant operators have experimented to use and offer self-service technologies to enhance customer satisfaction. Self-service technologies in the restaurant industry allow customers to have more control over their customized orders. The majority of adopted SSTs in a restaurant industry involve a screen display ordering system, which is placed at a table in a restaurant allowing customers to order their food, drink and submit their payments. while, the restaurant industry has historically been slow to adopt new technology, some Canadian quick-service restaurants are adopting SSTs to differentiate their service from their competitors (Tice, n.d). Some of the recent innovations in the QSRs industry include mobile ordering, online coupons, digital menu board, smartphone apps, and self-service kiosk (Tice, n.d). Kiosks are self-service machines with a large touch screen that enable customers to order food, customize their menu items and even pay their bill without interacting with employees. Kiosks are one of the most recent type of SST in QSRs in Canada. The main reasons why QSRs are adopting these kiosks are explained below.

Increased sales

Evidence suggests a relationship between increased sales and non-face-to-face orders with self-service technology (Allon, Federgruen, & Pierson, 2010). An SSK enables the customer to order freely, without the potential embarrassment caused by mispronouncing difficult menu items or the fear of being judged for his/her menu choices (Goldfarb, McDevitt, Samila, & Silverman, 2015). At least one study shows that customers avoid purchasing more complex items, items that contain higher calories, and items with difficult-to- pronounce names in front of others (Goldfarb et al., 2015). The option to use an SSK eliminates these obstacles, encouraging the customer to spend more freely.

Implementation of the kiosk in QSRs can also increase sales due to upselling. With every order, the kiosk constantly poses questions such as, "Do you want make it a combo"? or "Do you want add a drink"? The person behind the counter may forget or simply choose not to ask with every order. Paradoxically, given research suggests that SSKs are associated with faster service, while customers generally feel less rushed to make their order at a kiosk than at the counter. Consequently, they may feel more comfortable taking their time, with an SSK rather than with an employee, which may prompt them to order more and spend more money when using an SSK (Strauss, 2015).

Customer preferences

SSKs also increase customer satisfaction by facilitating customized ordering. With a kiosk, customers can customize products for themselves, creating a meal based on their personal choices. This ability may account for the findings of one recent study, which found that more than 50% of QSR diners believe restaurant technology makes their dining more fun with more than one-third of them prefering to choose restaurants with more technology options ("Restaurant and Win-Win Situation", 2017).

Certainly, an important part of QSRs target market, the Millennial generation, has shown a preference for self-service technology. Having grown up with digital technology, Millennial customers tend to be more comfortable than their older counterparts with self-service – even to the point of actively seeking it out because they see it as convenient and efficient (Sweeney, R., 2006).

Accessibility concerns

Other segments of the market that may benefit from SSKs are customers with accessibility issues: the hearing impaired; and those who do not speak the language fluently ("Hospitality Technology", 2017). For some individuals within two groups, the prospect of a face-to-face interaction might be an inhibiting factor, one that dissuades them from patronizing the restaurant for fear that they won't understand the employee or the employee won't understand them. From this perspective, an SSK "interaction" entails much less risk of frustration, embarrassment or error. Issues of pronunciation, grammar, diction and hearing acuity are completely irrelevant, which allows these customers to place and pay for their orders relatively easily, quickly and accurately. ("Hospitality Technology", 2017). In this way, SSKs can improve the customer experience.

Labour costs

Labour costs prompt service providers to consider options that allow customers to provide services for themselves, without the need of paid employees (Dabholkar, 1996; Shamdasani, Mukherjee, & Malhotra, 2008). Recent legislation in Ontario that raises the minimum wage by approximately 30%, from $11.40 in 2017 to $15.00 in 2019, will no doubt intensify this concern. Since approximately (52%) of workers in Ontario are currently being paid minimum wage, this increase represents a huge concern for QSR employers, motivating them to

look even more closely at implementing labor saving approaches such as SSKs.

These factors justify pursuing more knowledge in this area. However, researchers in the hospitality field have paid little attention to the technology adoption behaviour of QSRs. Furthermore, few studies have conducted to develop an acceptable research model for evaluating the factors that influence customer adoption of new technology in the restaurant industry and whether they are satisfied with their adoption of new technology or not.

2.2 Technology Acceptance Model

In order to understand and explain consumers' acceptance of a new technology, many theoretical approaches (e.g. theory of reasoned action; theory of planned behaviour; unified theory of acceptance and use of technology; motivational model) have been proposed. Of these, the technology acceptance model (TAM) has become the most accepted technique to explain users' intention to use a certain technology. Many empirical studies have shown evidence that this model accurately explain users' intention to adopt a new technology (Kim & Qu, 2011; Moroson, 2011).

Introduced by Davis (1986), TAM predicts and explains whether or not consumers will use a system, based on the consumers' motivation, which is influenced by external stimuli, such as the system's features and capabilities.

Davis drew TAM from the theory of reasoned action (TRA) (Fischbein & Ajzen,1997). TRA suggests that beliefs influence attitude which, in turn, shape intention to perform a behaviour and ultimately create an actual behaviour. Davis hypothesized that attitude can be predicted by two salient belief factors: perceived ease of use (PEOU) and perceived usefulness

(PU). PEOU refers to "the degree to which an individual believes that using a particular system would be free of physical and mental effort" (Davis, 1986, p.26). PU refers to "the degree to which an individual believes that using a particular system would enhance his or her job performance" (Davis, 1986, p.26). PEOU was hypothesized to have a significant, positive direct effect on PU. Furthermore, these two beliefs were hypothesized to be influenced by external variables. External variables include system characteristics, training, user participation in design, and the nature of the implementation process (Venkatesh & Davis, 1996).

Davis, Bagozzi, and warshaw (1989), further conducted a longitudinal study to measure users' intention to use a system and they found PU and PEOU have a direct effect on BI. They suggest that people may have a strong behavior intention to use a system without forming any attitude. They also proposed that attitude did not fully mediate PU and PEOU, and that attitude should be eliminated from TAM. Finally, Davis and Venktash (1996), eliminated attitude and introduced a final version of TAM.

The Extended TAM

TAM has been extended by researchers. Although PEOU and PU are the most powerful factors predicting user decision of whether to accept or reject a system, TAM does not explain the reasons a user will find a given system useful and easy to use (Davis & Venkatesh, 2000). More specifically, although the original TAM identified PEOU and PU as extrinsic sources of motivation, intrinsic motivation was not considered. According to self-determinant theory, extrinsic motivation is defined as the doing of an activity to achieve specific goals or rewards. In contrast, intrinsic motivation refers to the doing of an activity because it is inherently enjoyable rather than for some specific goals or rewards (Ryan & Deci, 2000). Consumers may adopt and use new technology for intrinsic reasons (Curran et al, 2003; Dabholkar, 1996; Davis, Bagozzi,

& Warshaw, 1992). Therefore, to address this issue, researchers have extended the model by incorporating additional external and internal variables.

SST characteristics and individual user differences are two main categories of antecedents that impact the customer's intention to use SSTs. The SST-related characteristics identified in these studies are trust, risk, control, self-efficacy and perceived enjoyment. (Curran & Meuter, 2005; Dabholkar, 1996; Lee & Allaway, 2002; Wang et al., 2012) Demographic variables (e.g. age, gender, income, and education) and technology readiness are investigated factors of individual differences (Ding et al., 2007; Simon & Usunier, 2007; Elliott & Hall, 2005; Meuter et al., 2005; 2003; Greco & Fields, 1991; Lee et al., 2003; Nilsson, 2007). Trust and self-efficacy have been cited in many SST studies as critical determinants of user intention (Compeau et al., 1995; Gefen et al., 2003; Wang & Emurian, 2005). However, most of the studies have investigated trust in the online setting in the hospitality context, while self-efficacy has been tested as an antecedent of PEOU in TAM studies. No research to date has tested the role of self-efficacy as an antecedent of both intrinsic and extrinsic motivations in TAM studies in the restaurant industry.

This study uses parts of final version of TAM as a theoretical foundation for several reasons. First, TAM proposes a parsimonious, simple and robust model which contains only two main determinants: PEOU and PU. Second, in the hospitality and tourism context, numerous empirical studies have applied and validated PEOU and PU in TAM to understand and explain consumer acceptance of various types of new technologies, including hotel self-service kiosks (Kaushik, Agrawal, & Rahman, 2015; Oh, Jeong, & Baloglu, 2013); online travel booking (Amaro & Duarte, 2015); hotel biometric systems (Moroson, 2011); and restaurant computing systems (Ham, Kim, & Forsythe, 2008).The results of these studies indicate that PEOU and PU

are major determinants for customers to make a decision to accept or reject a technology (Table 1).

Table 1- Overview of TAM Studies

Study	Technology	Methodology	Finding	PEOU (As a major antecedent)	PU (As a major antecedent)
Moroson, C., (2011)	Restautant biometric systems	Extending TAM	Biometric adoption is highly influenced by PU and security.	✓	
Kim & Qu (2014)	Hotel SSK	Proposing Structural model by using TAM	PU, PEOU, compatibility, and perceived risk influence traveler's attitude.	✓	✓
Moroson (2014)	Using smartphone app in air travel	Proposing Structural model based on TAM	PU is the strongest factor.	✓	
Kaushik, Agrawal & Rahman (2015)	Self-service hotel technology	Extending TAM	Trust has a most crucial impact on tourist attitude and intention towards self-service hotel technologies.		
Shang & Wu (2017)	Mobile shopping of food and non- food items	Integrated model by using TAM and EC	For online food m-shopper, while satisfaction and PEOU significantly influence different user group.	✓	

2.3 Satisfaction model

Companies in today's highly competitive market place are concerned about customers' post-purchase behaviour (i.e., the final stage of the customer decision process of their assessment whether they are satisfied or dissatisfied with the purchase). Customer's level of satisfaction or dissatisfaction of the product is directly related to the relationship between their initial expectation of the product (Pre-purchase) and their perception of the actual performance of the product (post-purchase). Previous studies show that customer decision making and their post-purchase behaviour in the QSR context is closely related to behavioural intention and related constructs such as customer satisfaction and perceived value (Lee & Ulgado, 1997; Brady, Robertson, & Cronin, 2001; Gilbert et al., 2004; Qin & Prybutok, 2008). Furthermore, these variables (customer satisfaction, perceived value, and behavioural intention) have been recognized as the main source of marketing advantage. Therefore, their relationship with post-purchase behaviour has received significant research attention (Tam, 2004; Sweeney et al. 1999; Brady & Robertson 2001; Cronin et al. 2000). Wang & Wu (2013), has indicated that satisfied customers will return to their favoured QSR and recommend it to others. On the other hand, dissatisfied customers tend to participate in negative word-of-mouth.

To date, studies have mainly concentrated on identifying factors affecting the customer's intention to use SST or not, while surprisingly few studies have investigated the customer's evaluation of SSKs in restaurants (Kim, Christodoulidou, & Choo, 2013).

Evaluations of these kiosks are critical as they may be able to provide information to help restaurants enhance customer satisfaction and increase revenue. To clarify the relationship between value, satisfaction and behavioural intention, Cronin et al (2000), identified several

competing evaluation models (value model, satisfaction model and indirect model), that explain how a customer evaluates the service encounter.

In the value model, value is a key construct to understand repeat purchase (Chang & Wildt, 1994; Sirohi, McLaughlin, & Wittink, 1998; Sweeney, Soutar, & Johnson, 1999). Based on this model (Cronin et al.,2000), there is no direct relationship between satisfaction and behavioural intention. Satisfaction indirectly, through value, affects BI. Customers intend to purchase if they perceive the product or service is really valuable for them.

The satisfaction model has been extensively studied (Andreassen, 1998; Athanassopoulos, 2000; Bolton & Lemon, 1999; Clow & Beisel, 1995; Ennew & Binks, 1999; Fornell et al., 1996; Hallowell, 1996; Mohr & Bitner, 1995; Spreng, Mackenzie, & Olshavsky, 1996). This model is completely opposite to the value model. According to the satisfaction model, customer satisfaction is a major determinant that directly affects a customer's behavioural intention.

The third model or the indirect model was derived from the literature that investigate the relationship between satisfaction and intention. This model proposed that perceived value has both direct and indirect effect on BI through satisfaction (Anderson & Sullivan, 1993; Gotlieb, Grewal, & Brown, 1994; Patterson & Spreng, 1997; Roest & Pieters, 1997). For example, Tam (2004) pointed out that customer satisfaction is a main determinant of BI. If a customer feels satisfied with a certain service, they are likely to repurchase, recommend, and encourage others to use it.

Therefore, to develop our understanding of customers' evaluation of SSK in QSRs, the present study borrows some parts of the third model or indirect model (satisfaction, perceived

value, and behavioural intention) (Cronin et., 2000). It is the most comprehensive model, because this model looks at both the direct and indirect impacts, integrating them into the TAM model. Furthermore, few studies have been conducted on multiple direct effects between value, satisfaction, and behavioural intention and even fewer have studied these variables simultaneously in the technology acceptance field to understand whether or not any or both variables (Value and satisfaction) directly influence behavioural intention.

2.4 Proposed model

The proposed model of this study is presented in Figure 1. By heavily drawing on the technology acceptance model and the satisfaction model, this proposed model attempts to better understand customers' behavioral intention to adopt a new technology and its antecedents in the restaurant industry.

Davis (1986) suggested future research should consider the role of additional (external) variables in TAM. In order to identify those external variables, this study extended TAM by adding additional variables such as trust and self-efficacy. External variables (trust and self-efficacy) are expected to have influence on PE, PU, and PEOU. PEOU may directly influence PU, and PU on PE. The model also show that PU and PEOU (as functional factors) and PE (as an emotional factor) may have a direct impact on perceived value and satisfaction. In addition, the model predicts that perceived value may affect BI directly or indirectly through satisfaction.
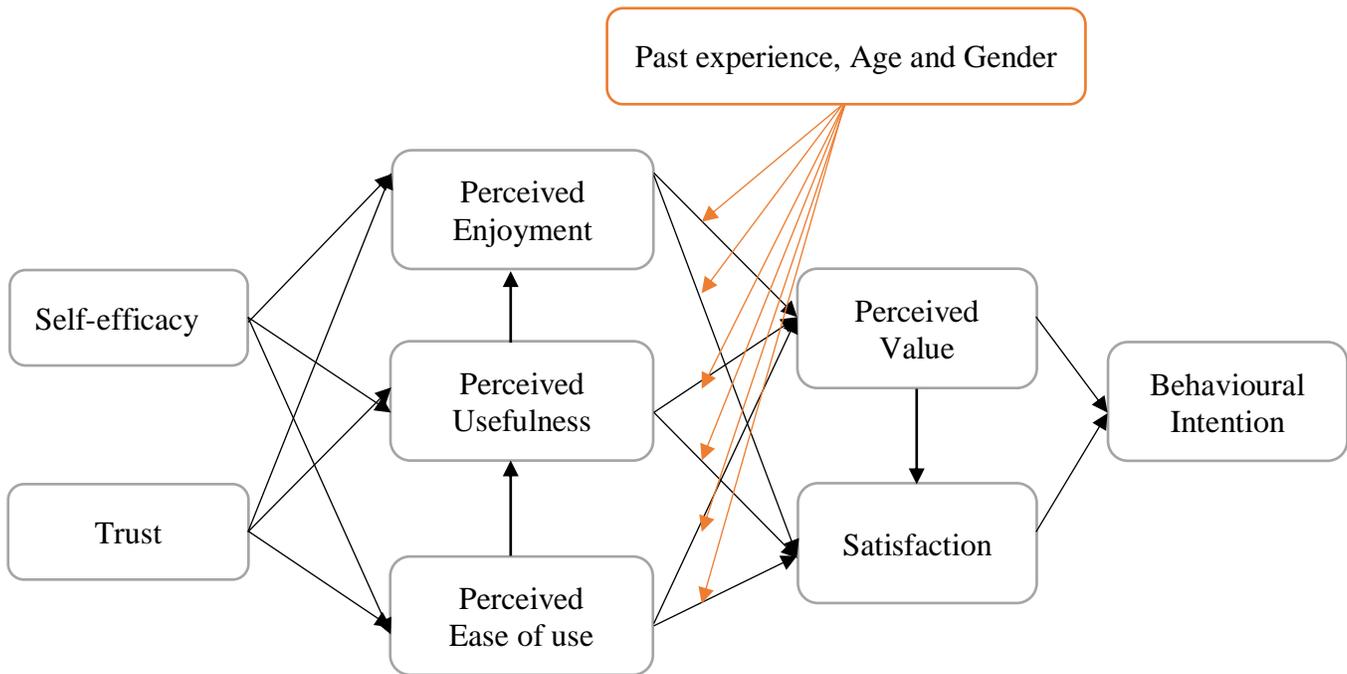
Figure 1-Proposed Model

2.5 Research Hypothesis

Perceived enjoyment

Studies have added and investigated perceived enjoyment (PE), as a source of intrinsic motivation (Davis et al, 1992; Moon & Kim, 2001; Pikkarainen et al, 2004). Perceived enjoyment is defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (Venkatesh,2000, p.351). PE plays a critical role in determining technology adoption (Venkatesh et al, 2012; Lewis & Loker, 2014). For example, if a MacDonald's customer enjoyed using the SSK to order their meal, they are more likely to use it on their next visit than if they did not enjoy using the SSK. Studies of technology acceptance have demonstrated that this enjoyment in using new technology is positively related to PU (Chen et al., 2017). Therefore,

based on these findings this study examines the key role of PE in SSK usage as this variable has been widely applied and validated as the key determinant in using SSTs. For the purpose of this study, perceived enjoyment is defined as the degree to which a person believes that adoption of SSK in QSRs is enjoyable. This study hypothesizes that:

H1: PU has a positive influence on perceived enjoyment.

Self-efficacy as an antecedent in TAM

Adopting and frequently using new SSTs require customers to develop new skills and to have a high level of confidence; therefore, investigating customer efficacy is an important step in understanding people's responses to new SSTs. Bandura (1977) defined self-efficacy as people's judgment of their ability to perform a particular behaviour that results in desired outcomes. In the technology acceptance context, self-efficacy is defined as a users' confidence in their ability to use a technology and achieve some favorable outcomes. Self-efficacy does not focus on the skills an individual has, but rather on a person's judgment of what they can do with the skills they have (Bandura, 1997).

Several studies extended TAM by using self-efficacy (SE) as an antecedent, finding SE is one of the main antecedents in a technology acceptance context. The more confident consumers feel with their ability to use a technology, the more likely they are to perceive benefits from that technology (Compeau & Higgins 1995; Hill, Smith, & Mann 1987). Moreover, studies on technology adoption show self-efficacy as a determinant of an individual's intention (Zhao et al., 2008; Wang et al., 2012). These studies indicate that an individual's beliefs about their capabilities to use technology could positively influence their decision to continue using SSTs. Kulviwat et al (2014), examined the effect of self-efficacy on technology adoption and found

that self-efficacy acts as determinant of PEOU, PU. In other words, the more confident individuals are with their ability to use technology, the more likely they are to consider it to be useful, easy to use, and enjoyable to use it. Hence, this study investigates customer's efficacy of using SSKs in QSRs to understand whether people believe that they have a sufficient knowledge, ability, and skills to use SSKs in QSRs, and proposes the following hypotheses:

> **H2**: Self-efficacy has a positive influence on PE
>
> **H3**: Self- efficacy has a positive influence on PU
>
> **H4**: Self-efficacy has a positive influence on PEOU

Trust as an antecedent in TAM

Trust is another variable which is considered a significant external factor of TAM (Gefen et al., 2003a; Grazioli & Jarvenpaa, 2000; Kim, Lee, & Law, 2008; Luhmann, 1979; Pavlou, 2003; Sun & Han, 2002). Trust is defined as "state of perceived vulnerability or risk that is derived from an individual's uncertainty regarding the motives, intention, and prospective action of others on whom they depend" (Kramer, 1999). For example, new technology users might worry about the security of their personal information and feel distrustful about conducting financial transactions via an SST as opposed to a face-to-face (Kaushik et al, 2015). Consequently, these users might avoid using SSTs because they do not trust the integrity of the technology (Gu, Lee, & Su, 2009).

While many previous studies have investigated the importance of trust in an online shopping setting (Corritore, Kracher, & Wiedenbeck, 2003; Elbeltagi & Agag, 2016; Flavian, Guinalíu, & Gurrea, 2006; Koufaris & Hampton-Sosa, 2004; Wen, 2010), this study examines the effect of trust in the restaurant industry, an offline setting. Based on an extensive literature

review, no known studies have examined the effect of trust on consumer's PEOU, PU, and PE in using SSK in QSRs. Therefore, this study considers trust as an external variable in the TAM, and proposes the following hypotheses:

H5: Trust positively influences the PE of customers using restaurant kiosks.

H6: Trust positively influences the PU of customers using restaurant kiosks.

H7: Trust positively influences the PEOU of customers using restaurant kiosks.

Customer satisfaction

Since Customer Satisfaction (CS), is a key concept in a business and marketing context, it has gained much attention from researchers for more than three decades (Tam,2004). CS is generally defined as consumer's emotional response resulting from a comparison between prior expectations and the actual performance of the product (Woodruff et al. 1991; Rust & Oliver, 1994). Another aspect of CS is the comparison between the service received and the costs of obtaining the service (Woodruff et al. 1991; Rust & Oliver, 1994). Zeithaml (1988), defined CS as the customer's evaluation of a product or service in terms of whether that product or service met their needs and expectations. In the IT context, understanding CS is important, because it is fundamental predictor of the intention to continue IT use (Limayem, Hirt, & Cheung,2007), key indicator of IT success (Bhattacherjee, 2001b), and an important IT-dependent variable which represents a user's overall feeling about the system (Bhattacherjee & Premkumar, 2004).**The**

Relationship between Customer satisfaction and PU, PEOU, and PE

Research has shown that if users perceive that using a system will improve their productivity and enhance their job performance, they tend to have a positive emotional response to that system. It means there is positive relationship between perceived usefulness and CS.

(Gelderman,1998; Rai et al, 2002; Hsu & Chiu, 2004). Cenfetelli et al (2005), asserted that PU positively influences CS in the IT context. Kim and Lee (2014), also identified that perceived usefulness is highly related to CS to adopt personal robot service.

Furthermore, studies have also confirmed the positive relationship between PEOU and CS (Stoel & Lee, 2003). Lin (2008), asserted that PEOU has a positive influence on CS.

In addition, a consumer's positive experience in an enjoyable environment is likely to increase their level of satisfaction and repurchase intention (Hirschman & Holbrook, 1982). In the hospitality context, studies have shown that entertainment and perceived enjoyment has a positive effect on CS and repurchase intention (Chiu et al., 2009; Li, 2016). Thus, in view of these findings, it is hypothesized that:

H8: PE positively influences customer satisfaction.

H9: PU positively influences customer satisfaction.

H10: PEOU positively influences customer satisfaction.

Perceived value

Perceived value (PV), has received increasing attention in recent years as it is one of the most important contributing factors to the success of service providers (Prebensen et al, 2014; Tabaku & Kushi, 2013). Perceived value is defined as "the consumer's overall assessment of the utility of a product based on perceptions of what is received and what is given" (Zeithaml, 1988). According to Woodruff (1997), perceived value is a trade-off between the benefits received and sacrifices given to obtain the service. Sacrifices include monetary (price) and non-monetary elements (time, physical and psychic effort) Cronin, et al., 2000; Dodds, Monroe, & Grewal,

1991; Monroe, 1991). In this study, perceived value is the result of customer's evaluation of what benefits they will receive by using SSK in QSRs against what they have to sacrifice (non-monetory).

Perceived value and PU, PEOU, and PE

In addition, several studies have demonstrated the relationship between PV and PU, PEOU, and PE is significant. Setterstrom, Pearson, & Orwig (2013), found the importance of PU and enjoyment as predictors of PV in web-enabled wireless technology. Wang and Wu (2014) have investigated the perceived value of the IPAD menu and its relationship to the behavioral intention to patronize a restaurant and they found both functional factors (i.e. PEOU and PU) and emotional factors (PE) significantly influence perceive value. Thus, this present study hypothesizes that:

> **H11:** PE increases a customer's perceived value towards SSK in QSRs.
>
> **H12:** PU increases a customer's perceived value towards SSK in QSRs.
>
> **H13:** PEOU increases a customer's perceived value towards SSK in QSRs.

Relationship between perceived value and CS

A significant number of hospitality studies have shown that perceived value has a strong and significant effect on CS (Anderson et al, 1994; Chen, Chen, & Chen, 2009; Lee, Yoon & Lee, 2007; Prebensen et al., 2014; Sweeny & Soutar, 2001). These studies have indicated that if a customer perceives and places a high value on a product or service, then their level of satisfaction will increase. McDougall & Levesque (2000), indicated that PV is an important driver of CS. Thus, it is hypothesized that:

H14: PV has a direct and positive impact on customer satisfaction.

Perceived value and BI

However, the direct linkage between PV and BI is not clear. Although, several studies argue that PV directly influences BI (Brady & Robertson, 1999; Cronin et al, 1997; Sweeney et al, 1999), others provided evidence to show that PV indirectly affects BI through CS (Patterson & Spreng, 1997). Shang and Wu (2017), asserted that PV is an important factor in using SST which positively influences customer's intention indirectly through CS. In accordance with these findings, this study suggests the following hypotheses:

H15: PV directly and positively influences customer's behavioural intention towards SSK.
H16: PV indirectly through satisfaction influences customer's behavioural intention towards SSK.

Customer satisfaction and behavioural intention

The positive and strong relationship between CS and BI has been addressed in several studies (Bearden & Teal, 1983; Cronin et al, 2000; Oliver, 1980; Oliver & Swan, 1989). Most of these studies have reported CS as a main determinant of repurchase intention, which, in turn, affects the company's revenue. A high level of CS, results in a high level of BI and a high level of repurchase and recommendation to others (Anderson & Sullivan, 1993; Yi,1991; Zehitaml, 1996). Therefore, the following hypothesis is proposed:

H17: Customer satisfaction positively and directly influences behavioral intention toward using SSK in QSR.

Moderating effect of age and gender

To better understand the characteristics of technology users, the roles of age and gender have been tested in many technology adoption studies (Darian, 1987; Kim et al.,2011; Kim,

2016; Wong et al., 2011). However, there is inconsistent results among previous studies in terms of age and gender. For example, some of them found single male and younger are more likely to use SSTs (Darian,1987; Sim & Koi,2002), while others show that there are no significant differences between men and women in the technology adoption in the hospitality setting (Kim et al.,2011; Wong et al., 2011). Therefore, based on the ambiguous impact of age and gender, this study examines the moderating effect of age and gender in the context of restaurant kiosk technology and develop the following hypotheses.

H18. Gender moderates the relationship between the three beliefs in the TAM (PE, PEOU and PU) and the satisfaction model (PV and satisfaction).

H19. Age moderates the relationship between the three beliefs in the TAM (PE, PEOU and PU) and the satisfaction model (PV and satisfaction).

Moderating effect of Past experience

Studies on the adoption of technology have found that past experience with technology increases the customer's intention to try out new technology options or use similar technology. For example, Wener (1985) found that customers experienced with technology required little introduction to the new technology. In the SSK context, previous studies show that having experience with SSKs positively influence customers' intention to use kiosk at airport, car-rental kiosk, ATM, and kiosk at QSRs (Zhue et al,2007; Kim et al, 2013). Kim et al (2013) show that having experience with SSKs positively influence customers' perception of their ability and their extrinsic motivation to use SSKs. Therefore, this study expects that customers who have experience with kiosks are more likely to use SSK at QSRs than those without experience, and examines the moderating effect of past experience, with this hypothesis:

H20: Past experience moderates the relationship between the three beliefs in TAM and satisfaction model.

CHAPTER 3: METHODOLOGY

This chapter addresses the methodology adopted for this study, including study context, sampling, data collection methods, instrument development, and measurements. Statistical methods adopted and validity and reliability scales applied in the data analysis are also discussed.

3.1 Study context

Since 2015, SSKs have been introduced in 70% of McDonald's restaurants in Canada. (Henderson, 2015). This quintessential – and leading -- QSR aims for 100% implementation by the end of 2017 (Henderson, 2015).

Customers have multiple options for ordering their food in McDonald's. One is the traditional method of ordering from an employee at the counter. The second, is via the "drive-thru" in which customers can order and buy their food while in their vehicle. The third, is via the newly introduced SSK.

McDonald's SSK has a touch screen display (Figure 2) that allows customers to "order and pay here". A stand-alone kiosk inside the restaurant encourages customers to customize their orders, or "create your own taste", by, for example, building their own burger from 30 different options (Strauss, 2015). The kiosk is in a very visible location inside the restaurant. Specifically, a pair of kiosks are connected to the floor near the counter where the customer can order face-to-face.

Figure 2-McDonald Self-service Ordering Kiosk Screens

3.2 Sampling and data collection

The target population for this study is QSR customers and the study population is McDonald's customers over the age of 18 who have used its SSK at least once in the last six months. Before data collection, to increase validity and reliability of the questionnaire, pre-tests were conducted using 10 graduate students who have used Mc Donald's SSK before.

To collect data, an online questionnaire was created and developed on the online survey website (Qualtrics) and distributed through Amazon Mechanical Turk (M-Turk) panel online. M-Turk is an online panel that is widely adopted by other researchers for some reasons. M-Turk allows researchers to reach larger population with different opinion in a shorter time and to access hard-to-find sample group very easily (Hung & Law, 2011; Cobos,2017).

At the beginning of the survey, all the participants were presented with the consent letter and then screening questions like "Are you older than 18 years old?" and "Have you used kiosk

in QSRs in the past six months?" were asked to filter out respondents who are not suitable for this study. If they answered "NO", they were not desire target population, therefore, the survey was ended with a thank you note. If they answered "YES", they could continue the survey and at the end of the survey they were presented with the validation code to receive $1.00 (USD) reward for participating in this study.

The proposed sample size for this study was 384. Confidence interval approach was used to determine sample size for this study:

SS = (Z-score) ^{2} * p*(1-p) / (margin of error) ^{2}

Z-score = standard error associated with chosen level of confidences (95%)

(Z-score = 1.96 for confidence level 95%)

p = estimated variability in the population (0.5)

e = acceptable error ±5

Qualtrics showed a total of 619 questionnaires were completed; however, this number includes the participants that were not eligible to participate in the study. Among the 598 completed questionnaire returned from M-Turk, 535 were approved, and 68 questionnaires were rejected. (The respondents of the rejected surveys still received the $1.00 CAD compensation for completing the survey). After data cleaning, 415 usable questionnaires were used for data analyses.

3.3 Measures

The main aim of this study is to explore the main determinants that influence the customer's decision to use SSKs in the QSR industry. To achieve this, this study adopts a survey approach to collect data. The survey consists of 32 questions, excluding demographic and past experience questions. which were assessed on a five-point Likert scale from 1 (strongly agree)

to 5 (strongly disagree). A Five-point Likert scale has an advantage over the four-point Likert scale because it allows participants to respond with a middle position if they uncertain or neutral about some questions and it does not force participants to decide between agree or disagree. Thus, it has an advantage over the seven-point scale and also 7-point scale can involve spurious difference between individual scores. For example, it may be difficult for some respondent to make a distinction between 3 and 4 out of a 7-point scale. Therefore, to avoid these problems the five-point scale is chosen for this study.

The survey questionnaire consists of three parts: 1) respondent's past experience with the kiosk 2) the measurement items for the key study variables (i.e. PU, PEOU, PE, trust, self-efficacy, PV, satisfaction, and behavioural intention) 3) respondents' socio-demographic characteristics. This information allows to exploration into the potential factors affecting customers' adoption of SSKs in QSRs. The first section of the questionnaire investigates how experienced the respondents are at using McDonald's SSKs. The second section of the questionnaire contains the measurement items for all of proposed constructs: PU (3 items), PEOU (4 items), PE (3 items), self-efficacy (7 items), trust (4 items), PV (11 items), satisfaction (4 items) and behavioural intention (3 items). And the last section asks for respondent socio-demographic information: age, gender, and education level.

The items measurement for the proposed constructs of this study are mainly adopted from prior studies and the wording changed slightly to fit the context of this study.

Key Measures

Perceived usefulness and perceived ease of use

PU and PEOU are the main constructs of TAM that have been frequently measured. PU and PEOU are measured by 4 items and 5 items respectively. The measurement items for PU were adopted from Wang & Wu (2014) where PU was tested using 5 items with composite reliability 0.86, which exceed minimal value. This scale for PU was selected because it was measured for technology adoption in the restaurant industry and the items are the best fit for study context. An example item for PU is "I think the self-service kiosk in the restaurant provides complete information such as meal choices and price".

PEOU was adopted from Davis et al., 1989. Davis tested PEOU with 6 items using 6 measurement factors (easy to learn, controllable, clear and understandable, flexible, and easy to become skillful) with Cronbach alpha 0.94 which exceed minimal value 0.70. This scale was chosen because it is widely used in hospitality context.

Perceived enjoyment

Three measurement factors (enjoyable', 'fun', and' pleasant') are used to measure PE. The measurement items for PE are adopted from Davis, Bagozzi, & Warshaw (1992)'s study where PE was tested using items with the Cronbach alpha ranging from 0.81 to 0.91, which are more than the minimum acceptable value of 0.70. An example items for PE is "Using the self-service kiosk for ordering food is an enjoyable experience".

Trust

The trust construct for this study is operationalized by four items adopted from Kaushik, Agrawal, & Rahman (2015), with composite reliability 0.92. Items like "The security policy for

credit card information on this system is clear" and "it is safe for me to provide my credit card information" were used to evaluate how customers trust a restaurant kiosk.

Self-efficacy

The self-efficacy measure is based off of past studies on self-efficacy. The measurement items of self-efficacy were adopted from two studies: Beuningen Van et al.'s (2009) and Compeau & Higgins, (1995). Van Beuningen et al.'s (2009)'s study measured self-efficacy with 5 items with Cronbach alpha ranging from 0.92 to 0.94. Additionally, 2 items were adopted from Compeau & Higgins, (1995), which are widley used in previous hospitality studies . All items measuring self-efficacy had high factor loading in the original scales.

Self-efficacy shows the degree to which customers believe in their ability to use technology. Measurement items like "I believe that ordering food via kiosk is a task on which I can perform well", "I believe it is possible for me to use SSK at the level I would like" and "I feel confident that my skills and abilities equal or exceed other users of these machines" reflect how customers feel about their ability.

Perceived value

Perceived value is the result of customer's evaluation of what benefits they will receive by using SSK in QSRs against what they have to sacrifice. Based on this definition, this study investigates non-monetary PV and focuses more on the behavioural price dimension which is adopted from Petrick (2002). Petrick tested behavioural price value with 5 items with Cronbach alpha ranging from 0.81 to 0.96. All items adopted from this study had high factor loadings, which fit with the context on this present study. An example item for PV is "Using kiosk makes my purchase easier".

Customer satisfaction

Satisfaction is measured by the scale developed by Cronin et al (2000) with 4 items measuring satisfaction with an acceptable composite reliability of 0.85. An example item for satisfaction is "I think I did the right thing when I used SSK".

Behavioral intention

Behavioural intention towards SSK is measured by using three items adopted from Cronin et al. (2000) with composite reliability 0.84. The items like "I would like to use SSK more in the future", "I would recommend the use of SSK to other consumers", "I plan to increase my use of restaurant SSK in the future", and "I am more likely to return to this restaurant because of kiosk" reflect customer's behaviour after using SSK.

3.4 Data Analysis

In order to answer the research question, several statistical methods including both descriptive and inferential statistics were used to examine the relationship among the proposed constructs.

First, to identify a demographic profile, frequency analysis of the samples and descriptive statistics was conducted via SPSS 25.0. Anderson & Gerbing 's (1999) two-step approach was used to analyze the proposed model: 1) Confirmatory factor analysis (CFA) for measurement model, 2) Structural equating model(SEM) for the hypothesis test. CFA is conducted to test the validity of measurements and to remove unnecessarily items via AMOS. After running CFA, items with factor loading lower than 0.50, will be eliminated to achive higher reliability. SEM was used to evaluate the relationship among variables, to test hypothesis, and to assess the model fit. Furthermore, multi-factor analysis was used to identify the differences in tech usage between individuals from different age groups and gender groups.

CHAPTER 4: RESULTS

4.1 Descriptive Statistics

Table 1 shows the socio-demographic characteristics of the respondents. To profile the respondent using socio-demographic variables, a series of frequency analyses were conducted using SPSS 25.0. A total of 619 questionnaires were collected through the Amazon Mechanical Turk (M-Turk) website between January 25, 2018 and February 6, 2018 from both Canada and United States. For the final analysis, 415 usable questionnaires were used. Of these, 51% were female, 72% were 26-45, 37% were highly educated and more than two third (70%) of the respondents had an income between $ 18000 to $72000.

Table 2- Sociodemographic profile of Respondents (N=415)

Characteristics	Variable	Frequency	Percentage
Gender	Male	210	49%
	Female	204	51%
Age	18-25	35	8%
	26-35	200	48%
	36-45	101	24%
	46-55	48	12%
	56+	29	7%
Education	High school or less	38	9%
	College	143	34%
	University	153	37%
	Graduate	66	16%
	Higher than graduate	13	3%
Household Income	Less than $18,000	29	7%
	$18,000 – $36,000	100	24%
	$36,001 – $61,000	133	32%
	$61,001 – $72,000	57	14%
	$72,001 – $90,000	42	10%
	More than $90,000	50	12%

4.2 Model assessment

CFA is a multivariate statistical procedure that is used to evaluate how well measured variables represent the latent variables or constructs (Wang & Wang, 2012). In other words, CFA is conducted to test the convergent and discriminant validity of the measurement model and to remove unnecessarily items. In this study, CFA was conducted using AMOS 25.0 to validate the measurement model. After running an initial CFA, items with low standardized factor loadings (<0.06) and high standardized residual (> 4.0) were eliminated to get higher reliability and to improve model fit (Hair, Black, Babin, Anderson, & Tatham, 2006). Only one item (TRU1) was deleted because of a high standardized residual (Chin, 1998; Hair *et al*., 2006). Finally, 29 items were retained in the model, showing a satisfactory level of model fit with the indices: Chi-square= 937.400, DF= 346, p<.01, NFI= .90, CFI= .94, RMSEA= 0.064. According to Hair et al (1998), the normed chi-square statistics ($\chi 2 /df$) less than 3 (2.709) are related with better fitting model. The Root Mean Square Error of Approximation (RMSEA) was 0.064 less than cut off point 0.08, representing how well this model fits the population (Heir et al., 1998).

To assess the reliability and convergent validity of the measurement model, standardized factor loading, composite reliability (CR) and average variance extracted (AVE) were calculated. As shown in Table2, the standardized factor loading of all the items ranges was above the threshold limit of .6, ranging from 0.65 to 0.95 at a significant level (p < 0.01) except one item (0.57). Chen & Tsai (2007) suggested that factor loadings greater than 0.5 are acceptable cut-off value for CFA and thus all the measurement factor loadings were in acceptable range. Composite reliability was calculated to assess the reliability of the latent constructs. CR of the all constructs were higher than the recommended threshold value 0.70. Also, to evaluate the convergent

validity as recommended by Fornell and Larcker 1981, the AVE was calculated for all the

constructs in the model. All the AVE values exceed the cut-off value of 0.50 (Hair, Black, Babin,

Anderson, & Tatham, 1998), indicating a good convergent validity. According to Fornell and

Larcker 1981, discriminant validity was evidence if the square root of AVE for each construct is

higher than its correlation with another construct. As shown in table 3, PEOU and SAT are two

scales with the correlation 0.543. The square of this correlation is .294 which is less than AVE

value for both constructs (0.667, 0.606 respectively), indicating good discriminant validity. Most

of the constructs of the model were discriminant from each other. However, discriminant validity

for BI, SAT and PV cannot be supported because of high correlation among the latent variables.

Table 3-The Factor Loading, Reliability, and Validity of Measurement Model

Items	Std. Factor Loading	CR	AVE
Trust		0.710	0.562
The security policy for credit card information on this system is clear.	0.570		
I feel that it is safe for me to provide my credit card information when I use the kiosk.	0.894		
Ease of Use		0.889	0.667
Learning to use the McDonald's kiosk is easy.	0.847		
I find it easy to use the McDonald's self-service kiosk.	0.842		
The instruction on the kiosk are clear and understandable.	0.797		
I could easily become skillful at using the kiosk.	0.778		
Usefulness		0.852	0.657
The kiosk provides complete information, such as meal choices and prices.	0.852		
The kiosk provides clear images of the different menu items.	0.827		

The kiosk allows me to browse the menu conveniently.	0.750		
Perceived Enjoyment		0.930	0.815
The self-service kiosk is fun to use.	0.866		
Using the kiosk is an enjoyable experience.	0.955		
Using the kiosk is a pleasant experience.	0.885		
Self-Efficacy		0.912	0.721
Ordering food via kiosk is a task which I can perform well.	0.841		
I have all technical knowledge I need to use a kiosk.	0.843		
I am certain I can use the kiosk well.	0.901		
I feel confident that my skill at using the kiosk is just as good or even better than others who use kiosk.	0.810		
Perceived Value		0.845	0.523
Using the kiosk makes my purchase easier.	0.800		
Using the self-service kiosk requires little energy to purchase.	0.647		
Using kiosk requires little effort.	0.684		
Using kiosk was a good value for money spent.			
Using kiosk was a good value for money spent.	0.764		
The kiosk lets me get my food in a timely manner.	0.709		
Satisfaction		0.860	0.606
I think I did the right thing when I used the kiosk.	0.766		
My choice to use the kiosk was a wise one.	0.853		
The kiosk offered by McDonald's exceeds my expectations.	0.699		
Overall, I am satisfied with the kiosk at McDonald's.	0.788		
Behavioural Intention		0.890	0.669
I would like to use the kiosk whenever it is available.	0.855		
I will recommend the kiosk to my colleagues, friends and/or family.	0.824		
I plan to use the McDonalds kiosk more in the future.	0.858		
I am more likely to return to McDonald's because of the kiosk.	0.729		

Note: Model fit: Chi-square= 937.400, DF= 346, p<.01, NFI= .90, CFI= .94, RMSEA= .064.
AVE = Average Variance Extracted; CR=Composite Reliability

Table 4-Results for Correlation matrix and AVEs

Variable	AVE	SAT	PEOU	BI	PV	SE	TRU	PE
SAT	0.606	1.000						
PEOU	0.667	0.543	1.000					
BI	0.669	0.851	0.430	1.000				
PV	0.523	0.783	0.552	0.755	1.000			
SE	0.721	0.507	0.841	0.382	0.488	1.000		
TRU	0.562	0.473	0.519	0.397	0.440	0.543	1.000	
PE	0.815	0.692	0.594	0.668	0.603	0.545	0.495	1.000
PU	0.657	0.506	0.784	0.376	0.498	0.775	0.537	0.560

Note: PE=Perceived Enjoyment, PU=Perceived Usefulness, PEOU=Perceived Ease of Use, TRU=Trust, SE= Self-Efficacy, PV=Perceived Value, SAT=Satisfaction, BI= Behavioural Intention

4.3 Structural equation modeling

The second step to evaluate the proposed model is structural equation modeling (SEM). SEM is used to evaluate the relationships among variables, to test hypotheses, and to assess the model fit. All the model fit indices indicated the structural model fit with the data at the acceptable level: $\chi 2/df$=2.748, GFI=0.856, NFI=0.90, IFI=0.94, CFI=0.94, and RMSEA=0.065.

Figure 3 shows the confirmed structural model with the coefficient in the standardized form. Most of the path coefficients were significant at the 0.01 and 0.05 level. Only one path was insignificant (PV→BI), therefore, it deleted. Moreover, R^2 value indicates the significant amount of variance that explained by the dependent variables: behavioural intention (94%), satisfaction (90%), perceived ease of use (87%), perceived usefulness (81%), perceived value (53%), and perceived enjoyment (40%). Table 5 exhibits the results for the hypotheses test. It indicates that among the 15 proposed hypotheses in a direct effect, 10 hypotheses were statistically significant. Perceived usefulness was found to significantly and positively influence enjoyment (β=0.402, t= 3.32, p<0.001), supporting H1.
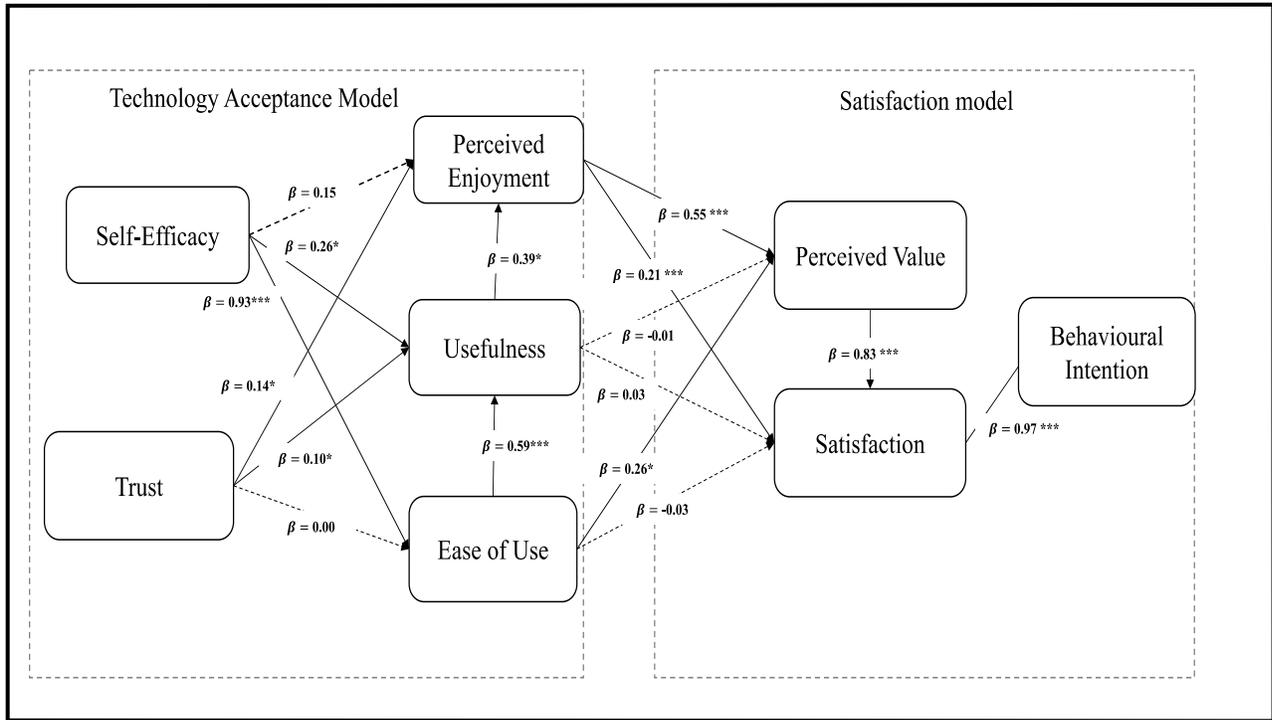
Figure 3-Structural Model

Note: ***=p<0.001; **=p<0.01; *=p<0.05

Table 5-Results for the Structural Model and Hypothesis Tests

Hypothesis	Standardized coefficient	t-value	Result
H1: PU → PE	0.402	3.326***	YES
H2: SE → PE	0.154	1.287	NO
H3: SE → PU	0.259	1.893*	YES
H4: SE→PEOU	0.933	15.129***	YES
H5: TRU→PE	0.128	1.957*	YES
H6: TRU→ PU	0.099	2.010*	YES
H7: TRU → PEOU	-0.008	-0.188	NO
H8: PE → SAT	0.203	3.925***	YES
H9: PU→ SAT	-0.088	-0.898	NO
H10: PEOU→SAT	-0.226	-0.396	NO
H11: PE → PV	0.553	8.595***	YES
H12: PU→PV	-0.008	-0.054	NO

H13: PEOU → PV	0.258	1.954*	YES
H14: PV → SAT	0.826	10.824***	YES
H17: SAT → BI	0.968	15.750***	YES

Note: PE=Perceived Enjoyment, PU=Perceived Usefulness, PEOU=Perceived Ease of Use, TRU=Trust, SE= Self-Efficacy, PV=Perceived Value, SAT=Satisfaction, BI= Behavioural Intention;
***=p<0.001; *=p<0.05

Hypothesis 2 was not supported because self-efficacy is not significantly related to enjoyment. However, the results show that self-efficacy is a predictor of perceived usefulness (β=0.260, t= 1.900, p<0.05) and perceived ease of use (β=0.933, t= 15.129, p<0.001), supporting H3 and H4. Hypotheses 5 and 6 were supported, because trust significantly impacts enjoyment (β=0.128, t= 1.96, p<0.05) and usefulness (β=.099, t= 2.010, p<0.05), but since there is a lack of significant relationship between trust and usefulness, H7 was not supported. H8 was supported because enjoyment significantly and positively influences satisfaction (β=0.203, t= 3.92, p<0.001). In addition, the hypotheses on the relationship between TAM constructs (PU and PEOU) and satisfaction (H9 and H10) were not supported. Hypothesis 11 was found to display a positive and significant effect on perceived value (ß=0.553, t= 8.59, p<0.001). The hypothesis on the relationship between usefulness and value was not supported (H12). However, the hypothesis on the relationship between ease of use and value (H13) was supported (β=0.26, t= 1.954, p<0.05). Perceived value was shown to have a positive and significant impact on satisfaction (ß=0.968, t= 15.750, p<0.001); therefore, H14 was supported. In terms of Hypothesis 15, because there was no direct relationship between value and intention, all proposed Cronin et al's models (value, satisfaction and indirect model) were tested to determine which model could be supported and related to this study context. After running data analysis again, Satisfaction model was supported that proposed perceived value, indirectly through satisfaction, influences

behavioural intention. Thus, Hypothesis 16 was supported. It is interesting to note that the largest

path coefficient was between satisfaction and behavioural intention (ß=0.968, t= 15.750,

p<0.001).

4.4 Multiple regression analysis

A series of multiple regression analysis were run to explore how independent variables

influence customer satisfaction and intention to use kiosks at the quick-service restaurant

(dependent variables) and to test the hypotheses. SEM results show that there is a high

correlation between some constructs in the proposed model (SAT-BI r=.988, SAT-PV r=.949,

BI-PV r=.896, SE-PEOU r=.928). Therefore, these analyses were done for cross-check. A

multiple regression analysis is a statistical technique that enables the researcher to explain the

relationship between one dependent variable and the set of independent variables. Two multiple

regression analyses were provided in this study. The first, identified the role of external variables

(trust and self-efficacy) with TAM and enjoyment as an intrinsic motivation (Table 6). The

second, explored the relationship between the TAM and the satisfaction model (Table 7).

Table 6-Multiple Regression Analyses1

	PE	VIF	Useful	VIF	Ease of Use	VIF
Self-efficacy	0.392***	1.418	0.686***	1.418	0.793***	1.418
Trust	0.281***	1.418	0.164***	1.418	0.089**	1.418
F-test	112.431		335.88		510.542	
R^2	0.353		0.620		0.713	

Note: Independent variables: Self-efficacy & Trust; Dependent Variables: Enjoyment, Useful,
Ease of use; ***=p<0.001; **=p<0.01; VIF= Variance Inflation factors

As shown in table 6, both external variables, self-efficacy and trust, positively and

significantly influence extrinsic motivations (PU and PEOU) and intrinsic motivation(PE), supporting H2, H3, H4, H5, H6, and H7.

Table 6 shows that trust (ß =.281, p < .001) had a slight positive effect and self-efficacy (ß =.392, p < .001) had a strong positive effect on the enjoyment and that both together explained 35% of the variance (F = 112.431, p < .001). Self-efficacy and trust had a positive effect on perceived usefulness (ß= 0.686 and 0.164, respectively) and explained 62% of the variance. (F = 335.88, p < .001). Self-efficacy and trust were found to be significant factors which determined perceived ease of use with coefficient ß, .793 and .089, explaining of the 71% of the variance in perceived ease of use. (F = 510.542, p < .001, p<0.01).

Table 7-Multiple Regression Analyses2

	PV	VIF	SAT	VIF	BI	VIF
PE	0.415***	1.604	0.327***	1.901		
Ease	0.253***	2.851	0.009	2.961		
Useful	0.067	2.868	0.036	2.693		
PV			0.564***	1.733	0.230***	2.558
SAT					0.670***	2.558
F-test	100.401		228.698		599.409	
R^2	0.423		0.691		0.744	

Note: Independent variables: PE, Ease, Useful, PV, SAT; Dependent Variables: PV, SAT, BI; PE=Perceived Enjoyment, PEOU=Perceived ease of Use, PU=Perceived Usefulness, PV=Perceived Value, SAT=Satisfaction, ***=p<0.001; VIF= Variance Inflation factors

In terms of the relationship between TAM and satisfaction model, enjoyment and ease of use had a positive effect on perceived value and perceived usefulness had no effect on perceived value with coefficient ß .415, .253, and .067 respectively, and explaining 42% of the variance on perceived value (F = 100.401, p < .001). Perceived enjoyment and perceived value were found to be significant factors which determined customer satisfaction with coefficient ß .327 and .564

and explains 69% of the variance (F = 228.698, p < .001). However, perceived ease of use and perceived usefulness had no effect on satisfaction. Finally, results show that perceived value and satisfaction positively and significantly related to behavioural intention with coefficient ß 0.230 and 0.670, together explaining 74% of behavioural intention (F = 599.409, p < .001). Therefore, H8, H11, H13, H14, H15, and H17 were supported.

4.5 Multicollinearity

The SEM results show that the discriminant validity for some constructs in the proposed model were questionable due to the high correlation among them (SAT-BI r=.988, SAT-PV r=.949, BI-PV r=.896, SE-PEOU r=.928). According to Field (2005), high correlation above .08 or .09 could be a sign of multicollinearity. Therefore, this study tested the multicollinearity due to the relatively high inter-correlated relationship among those constructs. Variance inflation factors (VIF) was adopted to test the multicollinearity. As shown in table 5 and 6, all VIF values ranged between 1.418 to 2.960 which is less than the proposed cut off threshold of 5 (Hair et al, 2011), suggesting on absence of multicollinearity.

4.6 Moderating effect

Multi-factor analysis was used to identify the differences in tech usage between individuals from different age groups, and gender groups, and with varying past experience levels.

Testing the moderating effect of gender

Hypotheses 18, gender moderates the relationship between the three beliefs in the TAM (PE, PEOU and PU) and the satisfaction model (PV and satisfaction), was tested. To do so, firstly, structural parameters were constrained in specific relationships which proposed in H18, to

be equal in each gender groups (male and females). Then the moderating effect was tested by the comparison between constrained model and unconstrained model and the difference in the two chi-squares were calculated. As shown in the table 8, there is no significant $\triangle\chi2$ between unconstrained model and all the significant relationship proposed in H18. Therefore, H18 was not supported and gender did not moderate the relationships between the three beliefs in TAM (PE, PEOU and PU) and satisfaction model (PV and satisfaction).

Testing the moderating effect of age

To test the H19 that age moderates the relationship between the three beliefs in the TAM (PE, PEOU and PU) and the satisfaction model (PV and satisfaction), the sample was divided into two groups [the younger groups including age range 18-45(N=336) and older group including 46-90(N=77)]. The moderating effect of this hypotheses was examined using chi-square differences test between constrained model (equality of constrained path across both groups) and unconstrained model. Table 9 shows that there was no significant age difference in the relationship between the three beliefs in TAM (PE, PEOU and PU) and satisfaction model (PV and satisfaction). Thus, H19 was not supported and age did not moderate this relationship.

Table 8-Results for the Moderating Effect of Gender and H18

Models		t-value	$\chi2$	df	$\triangle\chi2$	$\triangle$df	Results
Unconstrained model			1508.970	718			
PE→PV	Female	6.490***	1509.158	719	0.189	1	NO
	Male	6.459***					
PE→SAT	Female	3.626 ***	1509.443	719	0.473	1	NO
	Male	2.102*					
PEOU→PV	Female	1.990*	1509.410	719	0.440	1	NO
	Male	3.459***					

Note: The critical value for △χ2 is 3.84 at 95% confidence level (p<0.01), PE=Perceived Enjoyment, PV=Perceived Value, SAT=Satisfaction, PEOU=Perceived Ease of Use, ***=p<0.001; *=p<0.05

Table 9-Results for Moderating Effect of Age and H19

Models		t-value	χ2	df	△χ2	△df	Results
Unconstrained model			1589.450	718			
PE→PV	Young	7.926***	1589.761	719	0.311	1	NO
	Old	4.552**					
PE→SAT	Young	3.371***	1589.499	719	0.049	1	NO
	Old	2.689**					
PEOU→PV	Young	4.441***	1590.281	719	0.831	1	NO
	Old	0.694					

Note: The critical value for △χ2 is 3.84 at 95% confidence level (p<0.01), PE=Perceived Enjoyment, PV=Perceived Value, SAT=Satisfaction, PEOU=Perceived Ease of Use, ***=p<0.001; **=p<0.01

Testing the moderating effect of past experience

Finally, Hypotheses 20, past experience moderates the relationship between the three beliefs in TAM and satisfaction model, was tested next. To do so, mean split was calculated to divide the sample into the low-level experience (N=240) and high level experience (N=175). Then, the comparison between unconstrained model and constrained model was tested. The result indicates that moderating effect of past experience on the relationship between the three beliefs in TAM and satisfaction model was not significant.

Table 10-Results for Moderating Effect of Past Experience and H20

Models		t-value	χ^2	df	$\triangle\chi^2$	$\triangle$df	Results
Unconstrained mode			1522.468	718			
PE→PV	Higher Level	4.955***	1522.764	719	0.296	1	NO
	Lower Level	7.713***					
PEOU→PV	Higher Level	2.351*	1522.637	719	0.169	1	NO
	Lower Level	3.896***					
PE→SAT	Higher Level	3.074**	1522.507	719	0.039	1	NO
	Lower Level	2.721**					

Note: The critical value for $\triangle\chi^2$ is 3.84 at 95% confidence level (p<0.01), PE=Perceived Enjoyment, PV=Perceived Value, SAT=Satisfaction, PEOU=Perceived Ease of Use, ***=p<0.001; **=p<0.01; *=p<0.05

CHAPTER 5: DISCUSSION AND IMPLICATIONS

This chapter discusses the study findings, their contribution to the related literature, and their theoretical and practical implications for researchers and quick-service restaurant managers.

This study contributes to the existing literature on technology post-adoptive behaviour and repurchase intention in the hospitality industry by developing and testing an extended version of the TAM. This new version includes the variables of enjoyment, trust, and self-efficacy in an offline hospitality context: self-service kiosk adoption in QSRs. Earlier research (Davis, 1989) pointed out the need to consider the role of additional (external) variables in the TAM. This study addresses that need by testing and confirming the direct effect of external variables such as trust and self-efficacy on the TAM -- variables that had never been empirically tested together for kiosk adoption in QSRs.

The proposed TAM and hypotheses were tested through two approaches: structural equation modeling (SEM) and multiple regression analyses. Overall, the findings of both approaches show that customer satisfaction is the most powerful factor influencing the customer's decision to continue using SSKs. It means the more that customers are satisfied with the kiosk, the more likely they are to use kiosk service whenever it is available; and the more likely they are to encourage their friends and families to use it.

This result supports previous studies which have also identified satisfaction as the salient factor impacting behavioural intention (Bearden & Teal, 1983; Cronin et al, 2000; Oliver, 1980; Oliver & Swan, 1989). The challenge, therefore, is to understand what factors are associated with customer satisfaction when using SSKs.

This study investigated those factors by examining the antecedents of customer satisfaction. First, the findings of the multiple regression analysis indicate that self-efficacy has a positive and significant effect on PE, PU, and PEOU and is, thus, the main determinant of PE, PU, and PEOU. In other words, if people perceive that they have sufficient knowledge, ability, and skills to use SSKs in QSRs, they are more likely consider them to be useful, easy to use, and enjoyable to use. These new results are congruent with previous studies and extend the previous TAMs by adding self-efficacy as an external variable in the hospitality setting (Compeau & Higgins, 1995; Hill, Smith, & Mann, 1987; Kulviwat et al., 2014).

From a practical perspective, the results underscore the importance of nearby clear and accessible instruction on how to use the SSK. Some measures, therefore, that might increase self-efficacy include written instruction, videos and/or knowledgeable staff whose function is to explain, or assist customers with use of the SSK.

Unexpectedly, in the SEM result, self-efficacy was found to have an insignificant effect on perceived enjoyment, suggesting that one's confidence level in their ability to use an SSK does not drive feelings of enjoyment. A possible reason is the presence of perceived ease of use that is strongly and positively related to self-efficacy. Since most of the survey participants were relatively young, they are likely comfortable with technology, for them, the process of ordering food through a kiosk is not complex and their confidence to handle it does not influence their intrinsic motivation.

The second significant antecedent of PE, PEOU, and PU is trust. Trust was positively related to PE, PU and PEOU. That is, if the customers clearly understand and trust the kiosk, they are very likely to perceive that the SSK is enjoyable, easy to use and useful. These perceptions strengthen their satisfaction and increase the likelihood of their recommending the

SSK to others. Previous related studies on trust in the hospitality context were mostly conducted in an online setting (Corritore, Kracher, & Wiedenbeck, 2003; Elbeltagi & Agag, 2016; Flavia, Guinalíu, & Gurrea, 2006; Koufaris & Hampton-Sosa, 2004; Wen, 2010). This study confirmed their results in an *offline* setting, thereby enriching the research literature on trust and TAM.

This result also provides practical implications. Forty-four percent of the survey participants answered "disagree" or "neither agree nor disagree" in response to questions that asked whether they perceived the system as having strong security safeguards. Therefore, to increase customers' trust, a clear description about the SSK's security safeguards should be visible, and cash payments possible (in addition to credit and debit card payment options). Further, SSKs similar in design to kiosks that customers are already familiar with and have already adopted, such as ATMs, would likely enhance user trust. The other findings related to trust show that the respondents did not completely trust the nutritional information provided by the kiosk: 36% chose "disagree" or "neither agree nor disagree" when asked if they perceived the nutritional information as accurate.

However, in the SEM results, while trust positively and directly influenced PE and PU, trust had no significant effect on PEOU. This finding makes sense because customer's perception of easy to use was strongly influenced by their confidence level in using the kiosk rather than by their trust.

Notably, Both SEM and regression results demonstrated that of the two antecedents, self-efficacy and trust, self-efficacy had a much stronger impact on TAM than trust. This result suggests that customers are more concerned with their knowledge and ability to use the SSK than with their trust of the SSK's security features. One possible explanation may lie in the offline

setting of the SSK. Customers are physically visiting the kiosk in a busy quick service restaurant staffed with employees. If a mistake happens or if they sense a security error, the customer can immediately call for help. This kind of physical transaction contrasts sharply with the offline setting, where transactions are made in somewhat of a void, where help is not close at hand. Also, in the offline setting, the process of ordering from the SSK is public – which may prompt concerns about how others are judging their competence at operating the SSK. Confidence to complete the task, therefore, plays an important role.

On the other hand, the result supported the relationship between enjoyment and perceived usefulness. The result shows that perceived usefulness positively and significantly impacts perceived enjoyment. This finding is consistent with existing studies that found usefulness to positively influence enjoyment (Kang & Lee, 2014; Cobos, 2017). However, this relationship has not been explored in the previous TAM studies in the restaurant industry. This result also suggests the kiosk designer should focus more on enhancing SSKs practical performance features since these lead to enjoyment which ultimately leads to continued retention.

Furthermore, consistent with previous studies (Davis,1986), perceived ease of use positively affects perceived usefulness. Perceived usefulness can be viewed as a mediating factor between perceived ease of use and enjoyment.

One of the most important contributions of this study has been its integration of TAM and the satisfaction model to better understand users continued use of SSKs at QSRs and to examine the relationship between intrinsic and extrinsic motivations in the TAM and customer satisfaction components (PV, satisfaction, and behavioural intention). Previous TAM studies investigated only the direct effect of PU and PEOU on attitude or behavioural intention. In

contrast, this study tested the mediating role of perceived value and satisfaction between PU, PEOU and behavioral intention. Thus, our model enriches the research literature on TAM, continued intention, and satisfaction.

The findings indicate that the satisfaction model explains the largest proportion of variance. Therefore, the satisfaction model is superior to TAM. The SEM and regression findings suggest that intrinsic motivation has a stronger effect on value and satisfaction than extrinsic motivation. Satisfaction and value both mediate the relationship between enjoyment and behavioral intention. Therefore, customers are more satisfied with a SSK at a QSR if they perceive that using a kiosk is fun and enjoyable. This result is consistent with the previous studies and extends the previous studies related to intrinsic motivation in TAM. This finding is also consistent with previous studies that show enjoyment is a salient factor of satisfaction (Hirschman & Holbrook, 1982; Chiu et al., 2009; Li, 2016; Setterstrom, Pearson, & Orwig, 2013). That is, customers are more likely to continue using SSKs in QSRs and recommend them to their friends and family if they have a more enjoyable experience with the kiosk. For example, offering a variety of menu items, enabling customized ordering and providing detailed nutritional profiles about the menu items (e.g., identifying gluten-free products) make the customer's experience more enjoyable.

An important and surprising finding of this study is the insignificant relationship between PU-Sat and PU-PV. This result contradicts that of previous studies which have identified PU as a main antecedent of user satisfaction when using technology (Gelderman,1998; Rai et al, 2002; Hsu & Chiu, 2004). One possible explanation for this result is that most survey participants were relatively young (25-36 years old). For them, technology is so embedded within their lives that the question of its usefulness never arises. They may simply accept, without consideration, that

technology is necessary and useful. In other words, the question of whether a McDonald's SSK is useful may not even be a consideration for a younger age group.

Another surprising result of this study is that perceived ease of use did not have a significant effect on customer satisfaction. This result is inconsistent with the previous studies which indicate PEOU is highly related to satisfaction. However, this result supports Bruner and Kumar's (2005) study that found TAM models that include intrinsic motivation such as perceived enjoyment result in PEOU not having a direct effect on satisfaction and repurchase intention. Although the customers perceive that the SSK is easy to use and fast and accurate, this perception does not influence their satisfaction and repurchase intention.

One possible explanation for this finding is that PEOU and PU are now widely perceived basic requirements for any new technology. We expect our technology to be useful and easy to use. Therefore, the fact that a technology, such as an SSK in a QSR, meets those criteria is not enough for customers to register satisfaction with that technology. In earlier studies, PU and PEOU could have been relevant factors to consider when studying technology adoption decision making, but perhaps their relevance is of less importance in a newer, technology-ubiquitous world.

Additionally, both results reveal that perceived ease of use had small but significant positive effects on perceived value. When customers feel the instructions at an SSK in a QSR are clear and easy to follow, they are more likely to perceive its value as high. One possible explanation for this result is that the number of respondents were slightly greater for women (51%) than for men. Previous research shows that when it comes to technology adoption, perceived ease of use is a more salient factor for women than for men (Venkatesh &

Morris,2000).

For both results, perceived value is strongly and positively related to satisfaction. This result is in line with prior studies (Anderson et al, 1994; Chen & Chen, 2010; Lee, Yoon & Lee, 2007; Prebensen, 2013; Sweeny & Soutar, 2001). Moreover, while value is significantly related to satisfaction, the SEM results indicate no significant relationship between perceived value and behavioral intention. Therefore, the results support that value indirectly, through satisfaction, affects behavioural intention; and satisfaction strongly and positively affects repurchase intention. A possible reason could be the way it was operationalized. Perceived value was operationalized as a unidimensional (behavioural value). It is possible that five items of behavioural value inadequately explained customer's perception of value. The practical implication is as follows: a user-friendly restaurant kiosk could reduce user effort, and enhance perceived value. Offering different promotions is the other way to encourage repeat kiosk use and therefore enhance customer's perceived value.

However, the multiple regression findings reveal that perceived value and satisfaction both directly and positively influence repurchase intention where the effect of satisfaction was the highest.

Finally, this study found that neither age nor gender moderate the relationship between TAM constructs and satisfaction. In other words, there are no significant differences between men and women in SSK adoption in QSRs. Enjoyment has a significant impact on value and satisfaction for both younger and older customers. Also, there is no difference between high and low- experienced customers regarding the effect of usefulness, easiness, and enjoyment on satisfaction and repurchase intention. Enjoyable and easiness have a significant impact on value

and satisfaction for both high and low-experienced customers.

CHAPTER 6: LIMITATIONS AND FUTURE STUDIES

Although this study contributes to the existing TAM literature, there remain some

limitations, and some opportunities, therefore, for future research.

First, the participants were asked to recall their kiosk use in the past six months, which could

have challenged their long-term memory. Future studies should investigate more recent kiosk use

to reduce recall limitation. Second, data were collected from an online panel and the majority of

respondents (81%) were under 45 years old. Therefore, this study may have limited applicability

to older customers (above 45 years old) and to customers with limited computer skills. Third, the

scales used to measure the constructs for the proposed model display poor validity, which

suggests that some caution must be noted. However, this limitation provides opportunity for

future studies to investigate this proposed research model with different scales in the restaurant

industry. Fourth, this study only measured one dimension of perceived value (behavioral value).

Different dimensions of value may have a different result. Future studies should be focused on

different dimension or multi-dimensional of PV to improve our understanding about the effect of

value on repurchase intention. Fifth, the sample of this study was limited to McDonald's

customers in Canada and the United States. Consequently, caution must be exhibited when

generalising the study results. Sixth, since the importance of self-efficacy and trust as predictors

of PU, PEOU, and PE varied between two results in our study, future studies should investigate

this relationship to enhance our knowledge. Finally, considering the importance of perceived

enjoyment, future studies are needed to investigate the concept of fun and enjoyment through

open-ended questions to better understand which aspect of fun affect customer repurchase

intention.

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Appendix 1: Measurement items for each variable

Perceived usefulness (adopted from Wang & Wu,2014 with Composite reliability, 0.86).

PU1. I think the restaurant kiosk provides complete information, such as meal choices and prices
PU2. I think the restaurant kiosk provides a picture that enables me to see each dish clearly.
PU3. I think the restaurant kiosk provides good functionality that enables me to browse the menu conveniently.
PU4. I think the restaurant kiosk provides fast response, which is useful in the process of ordering meals.
PU5. Compared to a paper printed menu, I think the restaurant kiosk's features make it more convenient to order meals.

Perceived ease of use (Cronbach alpha, .94 adopted from Davis,1989)
PEOU1.learning to use the McDonald's self-service kiosk is easy (.97)
PEOU2.I find it easy to use the McDonald's SSK (.83)
PEOU3.The instruction on the self-service kiosk are clear and understandable (.89)
PEOU4.I could easily become skilful at using the self-service kiosk It would be easy for me to become skilful at using the SSK ordering system (.91)

Perceived enjoyment (Cronbach alpha, .81, .92, adopted from Davis et al,1989)

PE1. The self-service kiosk is fun to use (.81,.84)
PE2. Using the self-service kiosk for ordering food is an enjoyable experience (.83,.84).
PE3. Using the self-service kiosk to order meals is a pleasant experience (.82, .94).

Trust (CR=.92 and AVE=.83 , all factor loading are sig at 0.05, adopted from(Kaushik, Agrawal, & Rahman, 2015)

TR1.I think that the nutritional information provided by the McDonald's self-service kiosk is accurate
TR2.The security policy for credit card information on this system is clear.
TR3.It is safe for me to provide my credit card information.

Self-efficacy (CR = .92; AVE = .67) (CR = .92; AVE = .66) (CR = .93; AVE = .68) adopted from Van Beuningen et al.'s, 2009;(CR, .95 adopted from Compeau & Higgins, 1995)

SE1.I believe that ordering food via kiosk is a task on which I can perform well (.87, .86, .85)
SE2. I am certain I can use SSK well (.86, .84, .86)
SE3. I have all technical knowledge I need to use the restaurant SSK.89
SE4. I feel confident that my skills and abilities equal or exceed other users of these kiosk (.86)
SE5.I could use kiosk if someone else had helped to get started (.81)

Perceived value (CR=.91) adopted from (Petrick, 2002)
PV1.Using kiosk makes my purchase easier
PV2. Using kiosk required little energy to purchase
PV3.Using kiosk required little effort to order my meals
PV4.By using kiosk, my order is easily bought.

Satisfaction (CR, .85; adopted from Cronin et al,2000)

SAT1.I think I did the right thing when I used SSK.
SAT2.My choice to use of kiosk was a wise one.
SAT3.The kiosk offered by this restaurant exceed my expectations.
SAT4.overall, I am satisfied with SSK offered by this restaurant.

Behavioural intention (CR=.84 AVE= 64.3%) adopted from Cronin et al., 2000)

BI1.I would like to use SSK whenever it is available.
BI2.I would recommend the use of SSK to other consumers.
BI3.I plan to use the restaurant SSK more in the future.
BI4. I am more likely to return to this restaurant because of kiosk.