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Adoption of Self-Service Kiosk Technology in Quick Service Restaurants: An Application of the Unified Theory of Acceptance and Use of Technology (UTAUT)

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Abstract: The research seeks to examine the impacts affecting customers' adoption of Self-Service Kiosk (SSK) technology, emphasizing Social Influence (SI), Effort Expectancy (EE), Performance Expectancy (PE), as well as Facilitating Conditions (FC) within Quick-Service Restaurants (QSRs). Grounded in the Unified Theory of Acceptance and Use of Technology (UTAUT) framework, the research adopted a quantitative design utilizing a self-administered questionnaire for data collection. This cross-sectional study gathered data from 149 respondents. Findings indicate that PE as well as FC possess a relevant impact on customer adoption, while EE and SI show no significant effect. These results have valuable implications for fast food restaurants, particularly those integrating technology into their service models, especially in Kuantan, Pahang.

Keywords: *Self-service kiosk technology, Customer usage, Unified Theory of Acceptance and Use of Technology (UTAUT), Technology acceptance, Food Service Industry.*

1. Introduction

The Quick-Service Restaurant (QSR) industry plays a central role in discussions on environmentally friendly products (Mawardi et al., 2024). A QSR is a fast-food establishment that employs focused and efficient service methods to offer a concise menu at relatively affordable prices (Mendocilla et al., 2021). On the other hand, Self-Service Technology (SST) includes automated systems that enable clients to perform service tasks independently, without external assistance (Chan & Petrikat, 2022). As Yoon (2023) noted, SSTs are ubiquitous in the contactless era, though they are not new developments. Recent advances in technology have led to the development of sophisticated SST solutions that provide superior customer service in comparison to traditional in-person options, offering organizations a competitive advantage (Chan & Petrikat, 2022). Furthermore, Jeon et al. (2020) highlighted that Self-Ordering Kiosks (SOKs) in fast-food establishments represent an advanced technical tool and offer value to customers. SOKs are expected to become a norm and a ubiquitous customer service in the future (Jeon et al., 2020). Such kiosks provide clients with distinctive experiences of service and they increase employee productivity (Jeon et al., 2020).

This research is carried out under the research objectives as given below:
RO1: To assess the significant impact of Performance Expectancy on customers' usage of self-service kiosk technology at quick-service restaurants.
RO2: To evaluate the significant impact of Effort Expectancy on customers' usage of self-service kiosk technology at quick-service restaurants.
RO3: To investigate the significant impact of Social Influence on customers' usage of self-service kiosk technology at quick-service restaurants.
RO4: To examine the significant impact of Facilitating Conditions on customers' usage of self-service kiosk technology at quick-service restaurants.

2. Literature Review

Self-Service Technology (SST)

Such technologies as self-service are not novel, but they have become the norm of the contactless era (Yoon, 2023). As per Meuter et al. (2003), SST represents the technological interfaces that enable consumers to utilize services without the direct help of company employees. The implementation of SSTs in food service is also motivated by the assumption that technological advances may enhance the quality of service and establish new and enjoyable customer experiences (Yaacob et al., 2021). Quality assurance in food service has been transformed by the introduction of innovation and the popularity of automation of services (Talukder et al.,

2023). Furtado et al. (2020) observed that technology use could lead to customer satisfaction, thereby increasing revenue at QSRs in relation to Social Influence.

Self-Service Kiosk (SSK)

The Self-Service Kiosk (SSK) is an automatic payment system through which its users are authorized to browse, choose, and buy menu options (Na et al., 2021). Wu et al. (2020) emphasized that technology-based services have many advantages compared to conventional services. This technological development makes consumers more empowered in the financial services sector, and both banking and non-banking firms can expand their operations (Furtado et al., 2020). According to Ketimin et al. (2021), the application of SSK technology enables customers to customize their products, which results in a greater degree of control over the meal-making process.

Performance Expectancy (PE)

One of the most important variables in the prediction of customer behavior in the use of technology is identified as Performance Expectancy (PE) (Venkatesh et al., 2012). It pertains to a person's assessment of the extent to which using technology can enhance their effectiveness or efficiency in completing a specific task (Rumangkit et al., 2023). Other than that, it can be described as a personal judgment of the degree to which the usage of technology is going to make them better or more efficient in handling a particular task (Rumangkit et al., 2023). PE in the food service industry involves a variety of restaurant-related activities that allow customers to utilize SOKs effectively. It entails an evaluation of the activities of the QSRs in the eyes of the industry, especially in relation to the use of technology by consumers via SOKs (Baba, 2021). Park et al. (2021) noted that because SST is a change in the delivery of traditional human-based services to self-services, customers have become their own service providers.

Effort Expectancy (EE)

Effort Expectancy (EE), just like the perceived ease of use with regard to the Technology Acceptance Model (TAM), describes the convenience and ease of using an information system (Venkatesh et al., 2012). Baba et al. (2020) demonstrated that the SOK within a QSR must be easy to use and can be adjusted to the technical abilities of the customer. Consumers might not be willing to adopt the technology if they feel that the technology is challenging to use (Twum et al., 2021). According to Seo (2020), the kiosk may be better accepted if it is perceived as easy to use and convenient. In this way, Baba et al. (2020) assumed that consumer utilization is positively associated with a SOK and its ease of use, and they relate this notion to the utilization intention.

Social Influence (SI)

The Social Influence (SI) is the extent to which significant individuals in the life of a person feel that they should utilize a new information system (Venkatesh et al., 2012). It entails the perceptions of consumers on beliefs of others, such as family and friends, about the use of new technology (Singh et al., 2020; Galdolage, 2020). SI takes place when a person follows someone else's suggestion to use a particular technology (Rashid et al., 2024). Note that consumer behavior is marked by frequent changes in lifestyle, habits, trends, desires, and demands, making it challenging to predict (Šoštar & Ristanović, 2023).

Facilitating Conditions (FC)

Facilitating Conditions (FC) denote the perception that adequate technical and organizational resources are in place to enable and support the adoption of new technologies (Venkatesh et al., 2012). According to Venkatesh et al. (2003), FC did not directly influence individuals' behavioral intentions. In the SOKs' context, QSRs can significantly contribute to FC (Baba et al., 2020). Meanwhile, Jeon et al. (2020) stated that SOK technology includes supportive conditions like touch speed, system configuration, and screen movement, which enhance the kiosk's usability. However, without guidance, adequate knowledge, or timely support, individuals might be hesitant to embrace new technologies such as SST (Kamaghe et al., 2020).

Customer's Usage of Self-Service Kiosk Technology

Park and Lee (2020) described continuous use intention as the intention to continue using kiosk-based order and payment services, which is also the result of user reviews of the service. The SST in restaurants comes with both advantages and disadvantages to customers (Jeon et al., 2020). As per Furtado et al. (2020), the higher the

satisfaction of the customers with technology, the more reliable and secure the service the customers feel. Moreover, the more clients have trust in SST, the less they need human interaction (Furtado et al., 2020).

Technology Adoption Underpinning Theory for Unified Theory of Acceptance and Use of Technology (UTAUT)

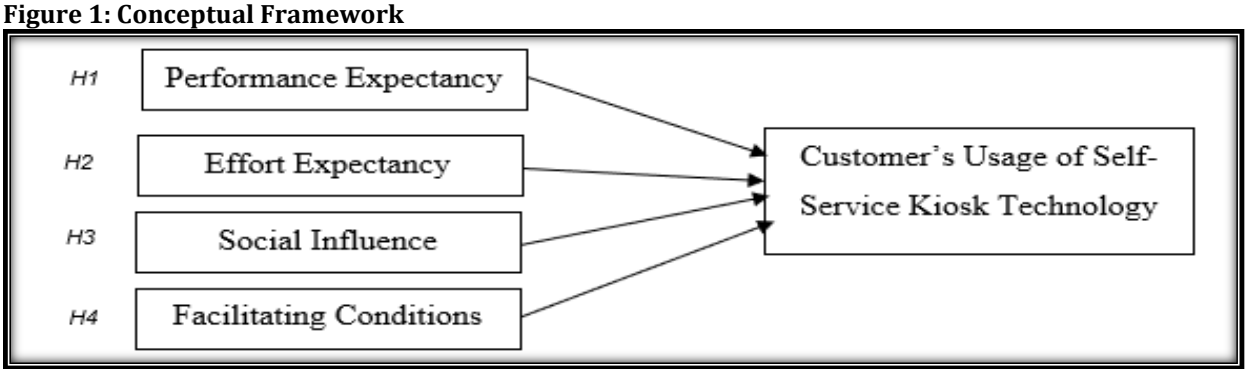
The theoretical framework that is used in this study is the Unified Theory of Acceptance and Use of Technology (UTAUT). In order to maximize the comprehension, as well as the prediction of technology adoption, Venkatesh et al. (2003) created the UTAUT, which is intended to incorporate the rival consumer acceptance theories. Venkatesh et al. (2003) defined PE as the extent to which one believes that the application of this system will enhance his/her performance at the workplace. Yang (2009) suggested that to distinguish their information systems among their competitors, organizations needed to do a thorough review of the variety of system qualities that proved beneficial to customers.

Consequently, the degree of ease linked to utilizing the system is the elucidation of EE (Venkatesh et al., 2003). Alsharif (2013) stated that the anticipation of effort becomes meaningful only if the individual has acquired adequate experience or training with the system. Here, the SI exerted by individuals surrounding will possess an indirect or direct impact on the individual's evaluation of the use of internet services. Venkatesh et al. (2003) defined SI as the degree to which a significant reference validates a specific behavior, which has the potential to impact an individual's information system.

Venkatesh et al. (2003) stated that FC expresses the extent of convenience in the technical infrastructure associated with consumer technology. Individuals who have first-hand experience with particular technologies are more likely to develop favorable opinions of those technologies (Taiwo & Downe, 2013). An additional support in the form of consumer-friendly interfaces will help reduce the barriers to adopting the new technology, which will, in turn, enhance the willingness to use the information system (Venkatesh et al., 2012).

The UTAUT model has been utilized in a number of recent studies on SSK technology. Jeon et al. (2020) indicated that the UTAUT model is used to understand how people adopt and utilize technology and pinpoint the variables that can affect the intentions of consumers to utilize SST in restaurants. On the same note, El-Said and Tall (2019) analyzed different variables that determine the behavioral intentions of customers to use SSKs. The results of their studies revealed that effort and PE are both significantly and positively related to the perceptions of the value of a product by customers, as well as PE bears a greater influence.

Figure 1: Conceptual Framework



Hypotheses Development

Performance Expectancy and customers' usage of self-service kiosk technology

The PE is an important element, and it influences the manner in which customers utilize technology, as per various research (Venkatesh et al., 2012). Note that performance expectation relates to the appraisal of actions related to the QSRs in the foodservice industry. Specifically, it dwells on consumer application of technology, including SOKs (Baba, 2021). Park et al. (2021) added that customers can act as the providers of services to themselves by moving away from the traditional human-oriented services to SST.

H1: Performance Expectancy positively affects customers' usage of self-service kiosk technology.

Effort Expectancy and customers' usage of self-service kiosk technology.
The EE strongly influences users' intentions to adopt a technology during its initial introduction phase, but this impact diminishes over time as users gain familiarity with the device (Jeon et al., 2020). Baba et al. (2020) argued that the adoption of modern technology will result in the integration of more complex and advanced functionalities. Hence, Baba (2021) suggested that the customer's willingness to utilize an SOK can be affected by highlighting the ease and user-friendliness of the kiosk system.
H2: Effort Expectancy positively affects customers' usage of SSK technology.

Social Influence and customers' usage of self-service kiosk technology.
Singh et al. (2020) defined SI as the consumer's assessment of the attitudes held by others, including their relatives and friends, towards the adoption of a new technology. The SI hypothesis explores how social institutions, interpersonal interactions, as well as the process of individual socialization affect people (Naeem, 2020). In addition to personal relationships, the physical restaurant itself can have a significant influence on consumers' first and continued inclination to visit (Baba et al., 2020). Conversely, consumers frequently make purchasing decisions based on the choices made by their peers (Brugarolas et al., 2020).
H3: Social Influence positively affects customers' usage of self-service kiosk technology.

Facilitating Conditions and customers' usage of self-service kiosk technology.
QSRs possess the ability to contribute to the various FC within the realm of SOKs (Baba et al., 2020). Consequently, Baba (2021) stated that customers who have a better set of FC are more inclined to adopt and utilize a particular technology. The study further notes that SOKs introduced in QSRs are expected to have limited customer adoption and usage, particularly in terms of their technical characteristics. Customers employ an organized method in assessing the quality of an application and its ability to perform seamlessly, irrespective of any temporary or technological challenges (Baba, 2021). Meanwhile, Jeon et al. (2020) defined SOK technology as a system that facilitates easy access to the kiosk's screen through various supporting variables, such as touch speed, system composition, and screen movement.
H4: Facilitating Conditions positively affect customers' usage of self-service kiosk technology.

3. Methodology

The researcher adopted a quantitative approach for the study's design, using convenience sampling to gather data from respondents in Kuantan, Pahang. The study utilized a cross-sectional research design to focus on a particular point in time. The analysis centered on individual respondents who had experience using SSKs at QSRs in Kuantan, Pahang. Data were gathered through a five-point Likert scale questionnaire. The surveys, available in both English and Malay, were confidential and for educational purposes only. To enhance reliability, a pilot study was conducted. The questionnaire was shared online through Google Forms, Facebook, and the researcher's personal WhatsApp. Additionally, offline surveys were self-distributed by the researcher. Using G-Power, the sample size was calculated to be 129 respondents, with an effect size f^2 of 0.15. The study used non-probability convenience sampling, and data analysis was performed utilizing SPSS version 28.0.

Demographics Profile
Of the 149 respondents, 75.2% (n = 112) were female, with fewer male participants. In terms of age, 18.1% (n = 27) were between 18 and 22 years old, 46.3% (n = 69) were aged 23 to 27, 16.8% (n = 25) were 28 to 32, and 18.8% (n = 28) were 33 years old or older. Most respondents had a bachelor's degree (47%, n = 70), while 27.5% (n = 41) held a diploma. Additionally, 18.1% (n = 27) had completed secondary school, while the lowest percentage (7.4%, n = 11) held a master's degree. In terms of employment status, 65.8% (n = 98) were employed, 7.4% (n = 11) were unemployed, and 26.2% (n = 39) were students. Only 0.7% (n = 1) of respondents were retired. Regarding usage of SSKs, 55% (n = 82) used them 1-3 times per month, 42.3% (n = 63) used them 4-6 times per month, and 2.7% (n = 4) used them 7-9 times per month. The most common location for kiosk usage was East Coast Mall (36.9%, n = 55), followed by Taman Tas (34.9%, n = 52) and Indera Mahkota (12.8%, n = 19). Other locations included Teluk Chempedak (10.1%, n = 15) and Jalan Pasar (5.4%, n = 8).

4. Results and Findings

Measurement model assessment

Table 1: Results of Correlation Test

Correlations						
		Performance Expectancy	Effort Expectancy	Social Influence	Facilitating Condition	Customers Usage
Performance Expectancy	Correlation	1	.538**	.513**	.451**	.468**
	Sig. (2-tailed)		<.001	<.001	<.001	<.001
	N	149	149	149	149	149
Effort Expectancy	Correlation	.538**	1	.712**	.774**	.608**
	Sig. (2-tailed)	<.001		<.001	<.001	<.001
	N	149	149	149	149	149
Social Influence	Correlation	.513**	.712**	1	.757**	.618**
	Sig. (2-tailed)	<.001	<.001		<.001	<.001
	N	149	149	149	149	149
Facilitating Condition	Correlation	.451**	.774**	.757**	1	.708**
	Sig. (2-tailed)	<.001	<.001	<.001		<.001
	N	149	149	149	149	149
Customers Usage	Correlation	.468**	.608**	.618**	.708**	1
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	
	N	149	149	149	149	149

**. Correlation is significant at the 0.01 level (2-tailed).

This study explored the relationships between several factors as well as customers' adoption of SSK technology. Firstly, hypothesis H1 proposed that PE possesses a positive effect on usage. The results showed a weak positive correlation (R = 0.468) with a statistically significant p-value (< .001). Second, hypothesis H2 suggested that EE positively affects usage. A moderate positive correlation was found (R = 0.608), also with a p-value of < .001. Third, hypothesis H3 stated that SI positively impacts usage. The results indicated a moderate positive relationship (R = 0.618) with a p-value of < .001. Fourth, hypothesis H4 posited that FC positively influences usage. The analysis showed a strong positive correlation (R = 0.708) with a highly significant p-value (< .001). The t-values and p-values showed that the PE (p = 0.029) and FC (p <.001) were found to be statistically significant, and EE (p = 0.680) and SI (p = 0.202) were not.

5. Conclusion

This paper employs the UTAUT to investigate the SSK usage by customers in Malaysian QSRs. The results have much value in terms of customer behavior, in which the elements of PE, SI, expectancy of effort, as well as FC, possess a high impact on the use of kiosks. With the help of the UTAUT framework, QSRs in Malaysia will have an opportunity to tweak their strategies to encourage the use of new technologies. By improving the user experience and eliminating possible obstacles, restaurants can be more responsive to the needs of customers, increase the efficiency of operations, and improve their role in the competitive market.

Theoretical Implications

This paper makes a valuable contribution to theoretical and academic knowledge, providing a great insight to scholars. It gives a more detailed insight that can guide scholars to find more informative data in the discipline, as well as improve the literature reviews. Through this, the researchers are able to delve into more advanced subjects, especially on topics like SSKs, QR codes, as well as robot services. By analyzing the application of technology within the context of food service organizations, the study of food service technology enables academics to refine models regarding technology acceptance, diffusion, and impact. Such results provide great guidance to future studies and practice. In the case of food service businesses, this research paper highlights

the role of enhancing organizational practices in technological advancement. It advises and trains food service organizations to embrace new technologies through raising awareness on how to improve PE, SI, EE, as well as FC. This also encourages academics to research more on technology in the food industry. Businesses that adopt technology will be in a better position to compete in the fast-changing environment as they are able to adapt to changing customer needs, industry variations, and innovations.

Practical Implications

The study provides insight into the food service sector, as it uses practical applications. The study identifies several benefits of technology in food service restaurants, where its adoption is increasingly common. Innovative strategies, for example, the usage of SSKs, are employed to encourage customer adoption of technology. These kiosks allow restaurant operators to reduce costs by automating and streamlining the order and payment process, minimizing the need for front-of-house staff (Baba et al., 2020). SSKs enhance the speed and accuracy of order processing compared to manual methods, reducing errors and incomplete orders. Restaurant managers anticipate that these kiosks will improve customer service and shorten peak-hour wait times (Leung et al., 2021). Governments also play a role in supporting the food service industry by raising performance standards and facilitating technological integration. Their provision of support can facilitate the adoption, usage, and enhancement of the technology-based solutions in providing efficiency, customer satisfaction, as well as growth of the industry. Moreover, governments must make sure that their respective technologies are easy to use and minimize the lag times but retain control of customer service and experience.

Limitations and Future Studies

This research paper points out the theoretical and practical implications, yet it also has limitations and suggestions. A significant threat that has been observed is the changing customer tastes. Emerging technologies and the change in the generation, as well as the change in the social norms, can rapidly affect the customer preferences, expectations, as well as behaviors toward SSKs. Additionally, the acceptance and use of SSKs can be influenced by regulatory changes, socioeconomic conditions, as well as industry development, with the differences depending on location and time. Rashid et al. (2021) suggested that future studies should embrace more Malaysian states and age groups. The sample can be extended to include people in different states to increase the diversity and representativeness of the results. This addition will enable the study to offer a more well-rounded analysis of the use of SSKs, quality of service received, and customer satisfaction among the varying demographics, thus helping to increase the reliability and validity of the theoretical implications of the study. The research in the future should also examine the attitude of restaurant owners on the readiness of customers to use SSKs. The readiness of the restaurant owners and managers to adopt SSKs can demonstrate the organizational aspects that can affect their adoption and use. It is important to know their perception of the strengths and weaknesses of SSKs and the resources they need to implement them. Moreover, analyzing the perception of the business owners on the consumer preparedness and using kiosks can shed some light on the discrepancy between customer expectations and organizational goals that would help in improving SSKs to satisfy the needs of the consumers. Moreover, further research ought to address how customers address their ethical concerns about SSKs, such as the problem of data privacy, the use of algorithms in decision-making, as well as the employment opportunities that kiosks represent to customers. The navigation by customers through ethical dilemmas related to the utilization of SSKs must be taken into consideration.

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