International Journal of Innovative Research and Scientific Studies, 8(6) 2025, pages: 2295-2307

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Behavioural insights into older adults' intention to use self-service technology in restaurants

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Abstract

Businesses are switching to self-service technology to meet the growing demand of customers and improve customer satisfaction. Although these technologies are becoming more common nowadays, the adoption and usage of self-service technology remain relatively underexplored, especially among older adults. Therefore, this study aims to explore the factors influencing older adults' intention towards self-service technologies by integrating Technology Acceptance Model and Theory of Planned Behaviour. Data for the study was collected from 102 older adults aged 55 and above in Klang Valley, Malaysia. Findings revealed that perceived ease of use, perceived behavioural control, subjective norm, and ICT knowledge positively influence perceived usefulness and attitude towards self-service technology in restaurants. This suggests that older adults find self-service technology easy to use and they are more likely to view self-service technology as beneficial and adopt a favourable attitude towards it. This study highlights the need for technology developers and policymakers to prioritise user-centric designs, particularly for older adults, when designing self-service technologies. Future research should address the study's limitations by exploring new variables and employing longitudinal approaches to better understand older adults' attitudes and intention towards self-service technologies.

Keywords: Intention, Older adults, Self-service technology, Technology Acceptance Model, Theory of Planned Behaviour.

DOI: 10.53894/ijirss.v8i6.10109
Funding: This study received no specific financial support.
History: Received: 9 July 2025 / **Revised:** 13 August 2025 / **Accepted:** 15 August 2025 / **Published:** 19 September 2025

Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Received: 10 July 2025 / **Revised:** 14 August 2025 / **Accepted:** 18 August 2025 / **Published:** 19 September 2025
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: The study was conducted in accordance with the protocols and approved by the Multimedia University Research Ethics Committee (Approval Number: EA1012024).
Acknowledgments: The authors are grateful for the assistance from respondents who participated in this study and the editors as well as reviewers of the Journal.
Publisher: Innovative Research Publishing

1. Introduction

As the world embraces the era of digital revolution, more and more companies have accelerated technology adoption.

Technologies such as self-service, restaurant kiosks, smartphone apps, and online reservations are common nowadays in different industries, such as food and beverages, healthcare, and retail. In this study, self-service technology primarily refers to the interactive kiosks in restaurants that revolutionised customer interaction by providing different functionalities which allow customers to browse menus, place orders, and make secure payments. With these technologies, businesses can reduce manpower and staffing costs while ensuring an efficient delivery process and growing revenue.

Self-service technology is commonly used in the modern world. Self-service technology (SST) refers to the technologies that help to enhance the delivery process and customers' ability to deliver a service independently without direct involvement of service employees [1]. Customers will be able to make transactions at their own pace and businesses can reduce operating costs in the long run. While controlling the costs, SST adoption also helps in improving customers' experiences [2]. Though SST helps to increase customer convenience and improve efficiency, not all customers are comfortable with the technology-driven experiences, especially the elderly who are less tech-savvy than younger generations.

Though many older adults are motivated to learn new technologies during the COVID-19 pandemic to stay connected with others, they also face challenges in technology adoption [3]. Older adults who cannot keep up with the rapid pace of technology development or have no access to digital technology will often be left behind, leading to a grey digital divide. Grey digital divide is a concept developed by Millward [4] which describes the low Internet use of older adults and the challenges they face regarding access, skills, and opportunities [5]. Though many older adults use digital technologies regularly, some older adults have no access to the technologies and sometimes less inclined to use modern technology [6]. While numerous past studies examined the role of information and communication technology and customers' attitudes towards digital menus [7] little is known about the customers' readiness and intention to use SST in restaurants, especially older adults. Nevertheless, the successful introduction of SST to food and beverages industries and the realisation of benefits lie in the acceptance of the customers. Therefore, this study aims to fill the research gap by examining factors influencing older adults' intention to use self-service technology in restaurants by integrating the Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB).

2. Literature Review

2.1. Self-service Technology in Malaysia

Past studies have attempted to examine the factors affecting the intention to use SST in different contexts, for instance, in the context of tourism [1] and restaurant [8]. In contrast to past researchers that extended TAM to examine the adoption and intention to use SST, this study has applied TAM to further explore the factors influencing intention to use SST, especially among older adults in Malaysia. In this study, SST refers to the technology offered to the customers so as to make orders or transactions in a restaurant, such as menu kiosks, digital menus on a tablet, digital menus by scanning the QR code, and online reservations

According to Grand View Research [8] the global SST market was valued at USD 34.03 billion in 2022, and it is projected to grow at a compound annual growth rate of 13.8% between 2023 and 2030. The market sees an increase in the demand for SST on a worldwide scale as COVID-19 pandemic has radically shifted customer and business behaviours to adopt self-assisted technologies. Younger adults are accustomed to using new technologies, but it is challenging for older adults to use SST. It is common to hear that older adults struggle and are resistant to use SST as they lack of skills to use it. There are calls for urgent education of older adults in digital technologies skills, especially in developing countries. For instance, some older adults are interested in using the technologies but they have little chance and skills to learn due to lack of education [9, 10]. Developing country like Malaysia also faces the similar obstacles. In this increasingly digital world, older adults who are not skilled at using smartphones might find online activities complicated and inaccessible. They might face obstacles in carrying out basic tasks such as ordering food and drink in a restaurant because most of the systems are digitized [11]. Though some older adults can get immediate assistance from family members as joint living family system is common in Malaysia, it is important to ensure that older adults are able to participate and benefit from the digital revolution.

2.2. Technology Acceptance Model

Technology Acceptance Model (TAM) was developed by Davis [11] 9 to explain the individuals' acceptance of information systems. TAM has become one of the most influential frameworks for exploring the issues regarding technology acceptance and rejection [12]. TAM has been widely studied in different areas, such as online shopping [13] healthcare [14] electric vehicles [15] Internet banking [16] online education [17] and accommodation sharing platform [18].

According to TAM, potential users of information technology decide whether to use particular technologies based on the perceived usefulness and perceived ease of use [19]. Perceived usefulness (PU) is defined as the degree to which an individual believes that his job performance would be enhanced by using a particular system [17]. In this study, perceived usefulness refers to the individual's belief that self-service technology would enhance the performance and efficiency of ordering in a restaurant, whereas perceived ease of use (PEOU) is defined as the degree to which an individual believes that using a particular system would require little or no effort [17]. Perceived ease of use, in this study, refers to the degree to which an individual believes that he will only need little effort to use self-service technology to make an order or transaction in a restaurant.

Jang, et al. [20] revealed that PU and PEOU significantly influenced attitude, which aligned with past studies mentioned that users who perceive the particular technology as easy to use and useful tend to have more favourable attitudes towards the technology. However, Vahdat, et al. [13] suggested that PU does not have a significant and positive

effect on attitude, probably due to different research contexts and backgrounds. Nevertheless, the restaurant should provide assistance to older adults on how to use SST so that they will become confident and comfortable using the technologies in the future.

Vahdat, et al. [13] revealed that PEOU has a significant effect on attitude towards technology, probably because the respondents come from a country where people regularly use technology in their daily lives. Thus, using technology such as mobile apps is not challenging at all. Although most of the TAM studies found that PEOU significantly affects users' attitudes towards technology, Zheng and Li [21] revealed a non-significant relationship between the two variables as technology nowadays is generally user-friendly, making them no challenges for users to use it. Another study by Ly and Ly [16] also found that PEOU has no significant impact on attitude, which could be explained by the perception that users though using SST was as simple as traditional ordering systems, thus they did not expect to face any issue and difficulties. Nevertheless, a study by Zhou, et al. [17] suggested that PEOU positively influences PU and PU significantly influence the intention to use the technology. In other words, when individuals find a particular technology is easy to use, they will be more likely to feel that the technology is useful, leading to higher intention to use it.

However, the study of Zhou, et al. [17] found no relationship between PEOU and intention, which suggests that the ease of using the technology could not directly drive individuals to use the particular technology. The different backgrounds of the study could explain the non-significant relationship and also the respondents where the respondents focus on other contexts (i.e. whether the technology will improve job performance or learning efficiency) rather than the intention to use the technology.

A study by Troise, et al. [22] which aimed to examine the main drivers of users' intention to use food delivery app has highlighted that PEOU significantly and positively affect PBC. The study suggested that when users find the technology is easy to use, they are more likely to think it is easy to use or deal with.

Nonetheless, Padilla-Meléndez, et al. [23] suggests that more potential factors that may influence the users' technology acceptance should be included in a study as TAM only provides general information about intention and willingness of users to accept a technology. For that reason, this study extended TAM by integrating it with TPB and the additional variables, such as information and communication technology knowledge.

2.3. Theory of Planned Behaviour

Theory of Planned Behaviour (TPB), which originates from Theory of Reasoned Action, is a psychological theory that explains the human behavioural intention [24]. TPB has been widely used to explain human behaviour in different contexts and literature, such as intention to revisit a tourist destination [25] and organic food [26]. In TPB, behavioural intention is the determinant of behaviour, which is affected by the perceived behavioural control, subjective norm, and attitude.

Perceived behavioural control (PBC) is the perception of an individual of the difficulty of performing a behaviour [27]. This normally reflects the perception of past experiences and expected difficulty in influencing an individual's specific behavioural decisions. For instance, if an individual has good experiences in using a particular technology, he tends to perceive the technology is easy to use and under his control, thus the individual will be more likely to use the technology. Numerous past studies have confirmed that perceived behavioural control has significant effect on attitude and behavioural intention [28, 29]. The studies have confirmed that the higher the PBC, the higher the chances that the individuals will engage in the behaviour. According to Chang, et al. [29] that integrated TAM and TPB to identify factors infleuncing intention to use SST, perceived behavioural control appeared to be the most significant factor that influence intention because the study found that SST generally is not complicated and easy to use, especially when support is available between users and technologists. However, PBC has not always been proven to be a significant predictor of intention. Rahman, et al. [30] examined the factors affecting the acceptance of a technology and found out that PBC negatively influences intention, which was inconsistent with the principles of TPB. The study discovered that the effect of PBC on intention remained positive until attitude is included in the model. In other words, the negative relationship between PBC and intention only happened when attitude was integrated with the model.

Subjective norm refers to the perceived social pressure whether to perform a specific behaviour [24]. Previous researchers have confirmed that subjective norm has a significant and positive effect on intention [31, 32]. However, Kumar, et al. [33] proved otherwise, in which the study found out that subjective norm does not have direct and significant effect on intention. Instead, it has an indirect effect on intention through perceived usefulness. Another study by Wang, et al. [34] which aimed to examine undergraduates' intention to adopt online courses also found that subjective norm does not significantly explain intention. Furthermore, Jang, et al. [20] study discovered that subjective norm positively and significantly affect perceived usefulness, and subjective norm plays an important role in attempting new technologies. When users are encouraged by close ones to use SST and the perceived level of subjective norm is high, it is more likely for them to perceive SST is useful, thus leading to a higher level of perceived usefulness.

In TPB, attitude can be defined as the feeling, either positive or negative, felt by the individuals in performing a particular behaviour [24]. In this study, attitude takes individuals' point of view about how they feel about SST and the action they take as a result of attitude towards SST. Past studies have revealed that attitude has significant effect on intention to use technology [13, 35]. When people have favourable attitude towards the technology, they tend to have higher intention to use the technology.

Intention refers to the likelihood that an individual will likely use the self-service technology in a restaurant. In TAM, intentions are reflected by PEOU and PU whereas in TPB, intentions are reflected by perceived behavioural control, subjective norm, and attitude. Meng and Cui [36] have recommended that the TPB model should be extended with additional variables to enhance its predictive power. Thus, this study has integrated TAM and TPB, as well as added

information and communication technology knowledge to the framework so as to better understand the behavioural intention to use SST, especially among older adults.

2.4. Information and Communication Technology (ICT) Knowledge

Information and communication technology (ICT) knowledge refers to the ability of an individual to work with technology Amushigamo, et al. [37]. Heponiemi, et al. [38] suggested that ICT knowledge is a vital predictor for the acceptance of new digital health servic, and by providing ICT training to older adults, their competence and skills in using technology can be improved. A study by Jang, et al. [20] who applied TAM to explore teachers' perception of integrating AR and VR in teaching and learning, revealed that knowledge significantly influenced PEOU and PU as teachers with technology knowledge tend to be more aware of the ease of use and usefulness of the particular technology.

2.5. Integration of Technology Acceptance Model and Theory of Planned Behaviour

Technology Acceptance Model (TAM) and Theory of Planned Behaviour (TPB) are similar in nature as TAM originated from TPB ands often applied by researchers to better understand the key predictors of human behavioural intention [39]. Both TAM and TPB have been frequently applied in past studies to examine the factors influencing behavioural intention, especially in the research area related to technology acceptance and adoption [40]. Several past studies have integrated TAM and TPB to explain the user acceptance and behaviour in different domains, such as robotic restaurants [41] and online food delivery services [22]. For that reasons, this study has integrated TAM and TPB to understand the key factors influencing users' intention to use SST, especially among older adults. Figure 1 shows the conceptual framework of this study and the following hypotheses were formulated for this study.

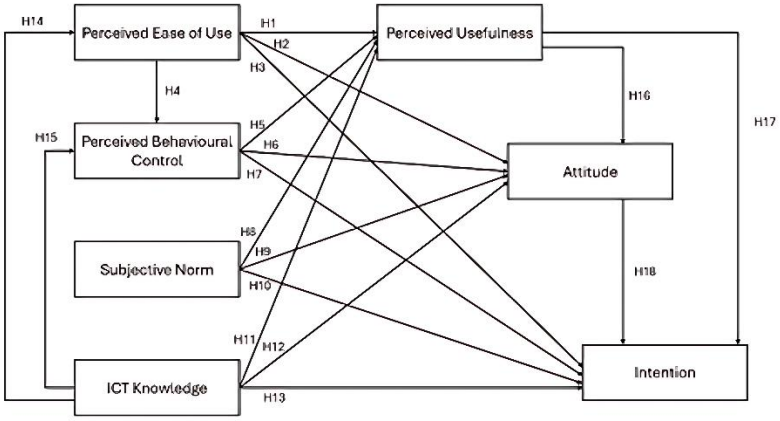

Figure 1.
Conceptual framework.

3. Materials and Methods

This study is quantitative in nature and the measurement scales of the constructs were adapted from existing validated scales. Four items of perceived usefulness, four items of perceived ease of use, and four items of intention were adapted from Ly and Ly [16]. Four items of perceived behavioural control were adapted from Sohn and Kwon [42]. Five items of subjective norm were adapted from Ly and Ly [16] and Sohn and Kwon [42]. Four items of ICT knowledge were adapted from Jokisch, et al. [7] while three items of attitude were adapted from Yang, et al. [19]. All the scales were measured using a 5-point Likert scale as per suggested by past study [19] and presented in the Appendix 1.

This study's target respondents are older adults aged 55 and above, and live in Klang Valley, Malaysia. Klang Valley was selected as it has the highest number of older adults population, which is 28% of total elderly population in Malaysia [43]. A stratified random sampling technique was employed to ensure representation across various demographic factors such as gender and socio-economic status. A total of 102 responses was collected via online and face-to-face methods. An analysis technique such as SPSS and SmartPLS were used to test the relationships between the variables in this study.

4. Results

4.1. Demographic Profile

According to Table 1, 65.7% of the respondents are women and most of the respondents (72.5%) aged 65 and above. The percentage of respondents is fairly average for ethnicity and marital status, with 42.4% of the respondents are Chinese and 57.8% are married. For the education level, all of the respondents have attended at least primary school level. More than half of the respondents (58.8%) are currently living with their partners or family members. All respondents have the experience of eating out, but only 80.4% of them ever used self-service technology in a restaurant. In terms of the ordering system, 58.8% of respondents prefer traditional ordering system over self-service ordering device.

Table 1.
Demographic profile of respondents.

Categories	Frequency	Percentage (%)
Gender		
Male	35	34.3
Female	67	65.7
Age group		
55-59	12	11.8
60-64	16	15.7
65-69	39	38.2
70 and above	35	34.3
Ethnicity		
Malay	22	21.6
Chinese	43	42.2
Indian	37	36.3
Education level		
Primary school	46	45.1
High school	36	35.3
Certificate / Diploma	11	10.8
Bachelor Degree	7	6.9
Postgraduate Degree	2	2
Marital status		
Single	43	42.2
Married	59	57.8
Current living arrangement		
Living alone	42	41.2
Living with partner or family members	60	58.8
How often do you eat in restaurants?		
Always	9	8.8
Often	31	30.4
Sometimes	40	39.2
Rarely	22	21.6
Never	0	0
Have you ever used self-service technology in a restaurant?		
Yes	82	80.4
No	20	19.6
If a restaurant has both traditional ordering system with human interaction and self-service ordering device, which one would you prefer?		
Traditional ordering system	60	58.8
Self-service ordering device	42	41.2

4.2. Reliability Analysis

A reliability analysis was conducted to examine the consistency and reliability of the measurement scale. As suggested by Rosaroso [44] the acceptable standards for Cronbach's Alpha is 0.8 or above. According to the reliability analysis results in Table 2, all the variables have Cronbach's Alpha of more than 0.8. Therefore, all the variables and items are retained in this study as they have acceptable strong internal consistency.

Table 2.
Reliability analysis.

Variables	Number of Items	Cronbach's Alpha
Perceived Usefulness	4	0.921
Perceived Ease of Use	4	0.936
Perceived Behavioural Control	4	0.925
Subjective Norm	5	0.940
ICT Knowledge	4	0.961
Attitude	3	0.939
Intention	5	0.950

4.3. Multiple Regression Analysis

Based on Table 3, the R and R-square values range from 0.940 to 0.969, which indicates strong correlations. The R2 value of 0.940 indicates that 94% of the variance in the dependent variable is explained by the independent variables, which suggests strong relationships between the variables and indicates the model provides a good fit to the data.

Table 3.
Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.969a	0.940	0.936	0.25265

Note: a. Predictors: (Constant), AT group, PU group, ICT group, SN group, PEU group, PBC group.

The coefficient table as shown in Table 4, illustrates the significance of the variables and magnitude with which the variable impacts the dependent variable in this study. Perceived ease of use (t= 18.216, p<0.05), perceived behavioural control (t=21.078, p<0.05), subjective norm (t=17.721, P<0.05), and ICT knowledge (t=17.710, p<0.05) significantly influence perceived usefulnesss with t-values > 1.96 and p-value < 0.05, thus H1, H5, H8, and H11 are supported. The study also revealed that perceived ease of use (t=20.896, p<0.05), perceived behavioural control (t=19.988, p<0.05), subjective norm (t=19.835, p<0.05), ICT knowledge (t=18.187, p<0.05), and perceived usefulness (t=15.305, p<0.05) significantly influence older adults' attitude towards self-service technology in restaurants. Therefore, H2, H6, H9, H12, and H16 are supported. Nevertheless, the results show that only perceived ease of use (t=3.168, p<0.05) and attitude (t=7.491, p<0.05) are the two significant factors affecting older adults' intention to use self-service technology in restaurants, thus H3 and H18 are supported. The remaining variables such as perceived behavioural control (t=0.585, p>0.05), subjective norm (t=0.596, p>0.05), ICT knowledge (t=1.593, p>0.05), and perceived usefulness (t=0.578, p>0.05) are not significant factors influencing intention. Therefore, H7, H10, H13, and H17 are not supported.

In addition, this study also examines the relationship between perceived ease of use and perceived behavioural control. The result shows that perceived ease of use significantly influence perceived behavioural control (t=21.243, p<0.05), thus H4 is supported. Moreover, ICT is also found to have significant influence towards perceived ease of use (t=19.934, p<0.05) and perceived behavioural control (t=21.701, p<0.05), thus H14 and H15 are supported. The beta value indicates that subjective norm (β=0.975) has the strongest effect on attitude towards self-service technology, while attitude (β=0.492) strongly affects older adults' intention to use self-service technology in restaurants.

Table 4.
Coefficient table and hypotheses testing.

Hypotheses	Unstandardised B	Coefficients Std. Error	Standardised Coefficients Beta	t	Sig.	Results
H1: PEOU → PU	0.826	0.045	0.877	18.216	0.000	Supported
H2: PEOU → AT	0.953	0.046	0.902	20.896	0.000	Supported
H3: PEOU →INT	0.221	0.070	0.230	3.168	0.002	Supported
H4: PEOU → PBC	0.911	0.043	0.905	21.243	0.000	Supported
H5: PBC → PU	0.857	0.041	0.903	21.078	0.000	Supported
H6: PBC → AT	0.952	0.048	0.894	19.988	0.000	Supported
H7: PBC → INT	0.045	0.077	0.047	0.585	0.560	Not supported
H8: SN → PU	0.848	0.048	0.871	17.721	0.000	Supported
H9: SN → AT	0.975	0.049	0.893	19.835	0.000	Supported
H10: SN → INT	0.039	0.065	0.039	0.596	0.553	Not supported
H11: ICT → PU	0.811	0.046	0.871	17.710	0.000	Supported
H12: ICT → AT	0.916	0.050	0.876	18.187	0.000	Supported
H13: ICT → INT	0.104	0.065	0.109	1.593	0.115	Not supported
H14: ICT → PEOU	0.884	0.044	0.894	19.934	0.000	Supported
H15: ICT → PBC	0.892	0.041	0.908	21.701	0.000	Supported
H16: PU → AT	0.939	0.061	0.837	15.305	0.000	Supported
H17: PU → INT	0.039	0.068	0.039	0.578	0.565	Not supported
H18: AT → INT	0.492	0.066	0.542	7.491	0.000	Supported

Note: PU=Perceived Usefulness, PEOU=Perceived Ease of Use, PBC=Perceived Behavioural Control, SN=Subjective Norm, ICT=ICT Knowledge, AT=Attitude, INT=Intention.

5. Discussion

H_1: Perceived ease of use (PEOU) on perceived usefulness (PU)

This hypothesis aims to investigate the effect of perceived ease of use on the perceived usefulness of SST for older adults. The significant positive effect between perceived ease of use and perceived usefulness was noted in the regression result-an outcome well aligned with the theoretical results of earlier studies in the literature [11, 45]. Specifically, Davis [11] outlined that users are inclined to consider a system useful when use is effortless, since it minimises the mental effort necessary to deal with the technology. This hypothesis is supported by Venkatesh and Davis [45] who observed that older adults, when facing user-friendly technologies, should be able to better appreciate the perceived advantages, therefore increasing the chances of technology adoption. Moreover, the results by Hu, et al. [46] support this in revealing that less

complicated systems increase the level of usability and task performance, which in turn enhances perceived usefulness of the technology by older users. Thus, the hypothesis H1 is supported; perceived ease of use of SST use positively influences perceived usefulness of it for older adults.

H_2: Perceived ease of use (PEOU) on attitude (AT)

This hypothesis was aimed to test whether perceived ease of use of technology affects older adults' attitudes to the use of technology. Regression analysis puts forward that there is a significant relationship between perceived ease of use and attitude since perceived ease of use positively influences the attitude towards SST. This relationship is in line with the findings of Morris, et al. [47] and Chen and Chan [48] who reported that the perceived ease of use of health-tracking and communication technologies was significant in shaping older adults' attitudes towards them. According to the Technology Acceptance Model (TAM), perceived ease of use is a key determinant in the formation of positive attitudes towards technology, which in turn influences adoption behavior [11]. In line with this, older adults who find technology easier to use are more likely to develop favourable attitudes, making them more inclined to accept and regularly use the technology. Consequently, H2 is supported, signifying that perceived ease of use significantly influences the attitude of older adults toward self-service technologies.

H_3: Perceived ease of use (PEOU) on intention (INT)

This hypothesis was targeting to assess the extent to which perceived ease of use affects the intention to use self-service technologies among older adults. The regression analysis provides support for this hypothesis by showing a significant positive relationship between perceived ease of use and intention. The result is in line with the TAM, which states that perceived ease of use is a very strong determinant of behavioural intention to use technology [45]. These findings are also supported by Khosravi and Ghapanchi [49] who established that older adults who view technology as being easy to use will have a higher chance of developing a strong intention to incorporate technology into daily activities, such as communication, social participation, and information gathering. These findings indicate that simplifying technology interfaces for older adults could greatly improve their intention to adopt and continue to use technology, given the crucial role of intention in the adoption of technology. Thus, H3 is supported, which confirms perceived ease of use directly influences older adults' intention to use SST.

H_4: Perceived ease of use (PEOU) on perceived behavioural control (PBC)

The hypothesis tested whether perceived ease of use affects the older adults' perceived control with respect to self-service technology use. These findings have illustrated a significant relationship between perceived ease of use and perceived behavioural control, suggesting that when older adults find technology easy to use, their confidence in controlling the technology also increases. This finding is consistent with the Technology Acceptance Model (TAM) and extends to older adults' adoption behaviors [11]. Studies in Malaysia have specifically noted that the perceived ease of use of technologies such as mobile payments and e-wallets significantly enhances older adults' confidence in their ability to handle these technologies [50]. Therefore, the easier the technology, the more the older adults perceive control, which greatly enhances their chances of adopting it. Thus, H4 is supported, which states that perceived ease of use enhances perceived behavioural control, hence facilitating the adoption of SST among older adults.

H_5: Perceived behavioural control (PBC) on perceived usefulness (PU)

This hypothesis was to test whether perceived control in using technology by older adults affects the perceived usefulness of the technology. There is a significant positive relationship between perceived behavioural control and perceived usefulness, meaning when older adults feel that they can use self-service technologies, the more useful these technologies will be. This is consistent with previous research on health-monitoring devices and communication tools, where perceived control was found to positively affect the perception of usefulness [47, 48]. The Technology Acceptance Model (TAM) further supports this relationship, as perceived control over technology use has been shown to enhance the perception of its utility [11]. H5 is supported, indicating that perceived behavioural control significantly influences the perceived usefulness of SST among older adults.

H_6: Perceived behavioural control (PBC) of use on attitude (AT)

The regression analysis reveals a significant relationship between perceived behavioural control and attitude toward technology, indicating that the hypothesis H6 is supported. Research confirms that when older adults perceive themselves as capable of using technology, their attitude toward it becomes more favourable [51]. This positive attitude facilitates higher adoption rates and sustained use. In the context of telemedicine adoption, for example, older adults' confidence in their ability to use the technology significantly enhances their attitude toward it, thus promoting greater usage [48]. Moreover, self-efficacy plays an important role in this regard by reinforcing the belief that the technology is easy to use and effective. The results thus confirm the acceptance of H6, indicating that a feeling of control and confidence in older users is an important stimulator for positive attitudes and technology adoption.

H_7: Perceived behavioural control (PBC) of use on intention (INT)

On the other hand, the regression analysis results show an insignificant relationship between perceived behavioural control and the intention of adopting technology by older adults. Therefore, this nullifies hypothesis H7. This is consistent with the findings of the previous study by Morris, et al. [47] which suggested that perceived behavioural control is not

always a stronger determinant of the intention to adopt technology, especially in situations when attitude or subjective norms play a higher role. Previous studies indicate that older adults may not base their intention to use technology solely on their perceived control over it. Rather, external support and technological assistance can alleviate concerns about usability, reducing the impact of perceived control on adoption intention [52]. This would therefore indicate that though perceived control can affect attitude, it does not really enhance the motivational propensity to adopt technology, hence the rejection of H7.

$H_{8:}$ Subjective norm (SN) on perceived usefulness (PU)

The regression analysis results in a significant relation between subjective norm and perceived usefulness, which supports the acceptance of hypothesis H8. It is indicated in the literature that subjective norms can enhance perceived usefulness of technology in general, and among the elderly in particular. When people perceive that important people in their lives such as family or friends think they should use technology, they are more likely to perceive the latter as valuable. This result is consistent with the study of Venkatesh and Davis [45] which proved that subjective norms could affect perceived usefulness in both mandatory and voluntary technology contexts. In the context of self-service technologies, older adults are likely to perceive the technology to be more useful if people surrounding them encourage its use or highlight its benefits. The hypothesis H8 is, therefore, accepted, underlining the influence of social influence on older adults' perceptions about technology's utility.

$H_{9:}$ Subjective norm (SN) on attitude (AT)

The regression analysis shows that the relationship between subjective norm and attitude is significant, hence accepting hypothesis H9. Studies have found that subjective norms of older adults directly contribute to their attitudes toward technology, which then influences their intention to use the technology [53]. Indeed, there are studies that prove that older adults are more likely to adopt telemedicine when they perceive that others in their social circles support or expect them to use it. This social influence then makes them positive in attitude and more open to adopting the technology. These results are, therefore, in agreement with existing literature that subjective norms have a real effect on the attitude of older adults, thus supporting the acceptance of H9.

$H_{10:}$ Subjective norm (SN) on intention (INT)

The regression analysis yields a non-significant association between subjective norm and intention; hence, hypothesis H10 is rejected. Although several studies suggest that subjective norms significantly predict older adults' intention to use technology, this study found that social pressure does not significantly affect the intention to use self-service technology in restaurants. This might be related to the nature of the technology context; for instance, in social networking site use or online medical services, social influence is more salient because of the presence of direct interactions or recommendations. However, self-service technology in restaurants is more task-oriented and independent, hence weakening the impact brought about by social expectations. Besides, the familiarity of the technology and the perception about its relevance again might play their role. Older consumers may view the self-service technologies at restaurants as non-essential, thereby weakening the subjective norms that can affect their adoption intention. Therefore, H10 is not supported, which underlines that the relationship between subjective norms and technology adoption is context-dependent.

$H_{11:}$ ICT knowledge (ICT) on perceived usefulness (PU)

This, therefore, provides evidence for a significant relationship between the knowledge of ICT and perceived usefulness, and hence, hypothesis H11 is accepted. Previous studies show that older people with higher levels of knowledge in ICT are more likely to perceive technology as useful and hence have more positive effects on their decisions to adopt [54]. In other words, as confidence and competence increase, knowledge of ICT enhances the ability to derive extra value from technology. Digital literacy programs for older adults have increased perceived usefulness, especially in health management and communication, as stated by Fung, et al. [55] and Czaja [56]. As more and more knowledge are acquired, the perceived utility of the technology will be realised, entrenching the acceptance of H11.

$H_{12:}$ ICT knowledge (ICT) on attitude (AT)

The regression analysis reveals a significant relationship between ICT knowledge and attitude, supporting the acceptance of hypothesis H12. Research indicates that higher ICT knowledge leads to more favourable attitudes toward technology adoption. When older adults feel confident and knowledgeable about using digital tools, they develop positive attitudes, which promote greater acceptance and use. Studies have shown that digital literacy training for older adults enhances their self-efficacy and improves attitudes toward using devices like smartphones and computers [57]. These findings underscore the importance of fostering digital literacy to positively influence attitudes, supporting the acceptance of H12.

$H_{13:}$ ICT knowledge (ICT) on intention (INT)

The regression analysis revealed that the relationship between ICT knowledge and intention is not significant, and thus hypothesis H13 should be rejected. Although many studies consider the impact of ICT knowledge on technology adoption, this research proved that knowledge will not necessarily translate into a greater intention by older adults to adopt self-service technology. Research has indicated that factors such as anxiety, perceived ease of use, and personal motivation often play a more significant role in technology adoption [19]. For example, despite having a basic understanding of ICT,

older adults may still require a supportive environment to foster adoption [58]. Therefore, H13 is rejected, emphasising the need for other factors beyond ICT knowledge to drive intention.

H_{14}: ICT knowledge (ICT) on perceived ease of use (PEOU)

The regression analysis point to a significant relationship, thus the support of hypothesis H14, between ICT knowledge and perceived ease of use. Specifically, research showed that the more knowledgeable the elderly are about ICT, the easier to use they perceive technology. In their possible enlargement of digital tools with which they are familiar and confident about their own ICT skills, they find technology more manageable and user-friendly. Therefore, this findings align with the TAM which stresses that perceived ease of use is significant in adopting technologies [59]. Hence, older adults with better ICT knowledge view self-service technologies as intuitive and, therefore, find them easier to use, facilitating broader adoption, which means accepting H14.

H_{15}: ICT knowledge (ICT) on perceived behavioural control (PBC)

The regression analysis reveals that the contribution of ICT knowledge to the perceived behavioural control is significant enough to support the acceptance of hypothesis H15. According to the literature, ICT knowledge enhances older adults' confidence and perceived capability to manage technology and, therefore, their perceived control over its use. Research has shown that the greater the digital literacy, the more active the elderly are in mastering health-related technologies, which enhances their perceived control in maintaining health and other activities [55, 59]. This increased belief in using technology within daily activities will, therefore, directly affect adoption decisions. Hence, H15 is accepted, which states the critical role ICT knowledge plays in fostering perceived behaviour control.

H_{16}: Perceived usefulness (PU) on attitude (AT)

The regression analysis shows that perceived usefulness is significantly related to attitude, thus supporting the acceptance of H16. Past research also demonstrates that when older adults perceive a technology as useful and beneficial to their daily activities, they are more likely to develop a positive attitude toward adopting it. Various literatures have supported this relationship, most especially in the electronic means of paying and access to some online services. The older adult who finds them useful is more likely to hold a good attitude toward using them. A study by Barry and Jan [60] proves it. In Malaysia, perceived usefulness has been found to influence older adults' attitudes toward using technologies in sectors like banking and mobile payments. This underlines the need to show concrete benefits to the elderly; it encourages favourable attitudes and technology adoption. Thus, H16 is accepted.

H_{17}: Perceived usefulness (PU) on intention (INT)

This is supported by the regression analysis, which presents a non-significant relationship between perceived usefulness and intention. Hence, hypothesis H17 is rejected. Older adults may recognise the usefulness of the technology, but this recognition does not result in a strong intention to adopt it. Research indicates that other factors, such as digital literacy, security concerns, and trust, play a more significant role in shaping older adults' technology adoption intentions [61]. For example, older adults might recognise the benefits of online shopping or digital services but still hesitate to adopt these technologies due to unfamiliarity or concerns over privacy and security. Hence, even though they perceive usefulness, other barriers remain a significant challenge in driving their intention to adopt technology. Therefore, H17 is rejected.

H_{18}: Attitude (AT) on intention (INT)

The regression analysis supports a significant relationship between attitude and intention, confirming the acceptance of hypothesis H18. Positive attitudes toward technology, especially shaped by its perceived ease of use and usefulness, strongly influence the intention to adopt it among older adults. Several studies have established that favourable attitudes increase the likelihood of technology adoption [62]. Older adults who have had positive experiences through mobile health applications or telemedicine services will continue their integration into daily life. This infers how important it is to create positive attitudes in order to widen the circle of technology users among older adults, so that it benefits digital inclusion, improves active participation, and increases financial inclusion. Therefore, H18 is supported, indicating that attitude plays a crucial role in determining adoption intentions.

6. Conclusion

This study examines the factors that influence SST adoption by older adults, centering on perceived ease of use, perceived behavioural control, subjective norms, ICT knowledge, and perceived usefulness, or PU. By incorporating theoretical models such as the Technology Acceptance Model and the Theory of Planned Behaviour, this research supported a deeper understanding of the various contributing factors towards the attitude formation of older adults regarding SST. The results provide valuable insights from theoretical and practical perspectives, thus laying out several implications for the design and adoption of SST for older adults while revealing some of its limitations and suggesting avenues for further research.

6.1. Theoretical Implications

Theoretically, this study enhances existing literature on technology adoption with empirical support for the application of TAM and TPB in understanding the adoption of SST among older adults. It verifies that perceived ease of use and perceived usefulness remain significant factors that mould attitude and adoption intention, as supported in earlier studies

[45]. However, this research also extended the theories by incorporating ICT knowledge as an important determinant that influences perceived ease of use and perceived behavioural control. It shows the relevance of digital literacy for enhancing confidence in the use of self-service technologies among older adults, which has not been given enough attention in the literature. The research also emphasises the underestimated role of ICT knowledge in the adoption of SSTs. These findings imply that merely having ICT knowledge does not significantly explain variations in older adults' intentions to use SST and new models that take into consideration emotional comfort, physical limitations, and technology design are needed. Models for the future must integrate these insights into understanding the specific needs of older adults and advancing digital inclusivity.

This study also extends the application of subjective norms in the context of SST adoption by proving the effects on perceived usefulness and attitude but, at the same time, offering a more critical perspective by showing that social influence could be different across contexts [45]. Therefore, the lack of a direct effect of subjective norms on intention to use in this study would suggest that other factors, such as personal experiences with technology and social support, supersede the pressures of peer or societal expectations in certain settings.

6.2. Practical Implications

The findings of this study have consequential practical implications for both technology developers and policymakers. When designing self-service technologies, they should be centered around the users, primarily the elderly. This study showed very strongly that ease of use is one of the most important factors affecting attitudes and perceptions of usefulness, suggesting that developers should prioritise intuitive interfaces, which minimise complexity and cognitive load. This means, designing user-friendly interfaces with easy navigation, larger text, and support on site for older customers. Training programs or user guides aimed at enhancing the knowledge of ICT are necessary for improving digital literacy so that there is a possibility of increasing the likelihood of SST adoption among the elderly.

In addition, policymakers can work on creating environments that will eventually help older adults to be more confident in using technology, whether through community programs or some form of digital literacy, so the elderly population does not suffer from potential barriers because of lack of digital skills. Other significant barriers include technological anxiety and low digital literacy; simplified SST designs and streamlined processes are key to increasing accessibility. Moreover, the greater the perceived behavioural control in the adoption intentions, the easier it is to ensure help-desk support and options for troubleshooting are easily available to resolve difficulties with the technology.

6.3. Limitations and Suggestions for Future Research

While this study offers a number of valuable insights, it also has its limitations. First, the sample was limited to the specific demographic of the restaurant industry; therefore, it may or may not be representative of all older adults across different sectors or regions. Future studies should examine SST adoption in other contexts, such as healthcare or banking, to test for generalizability of the findings. Moreover, the study was mainly based on self-reporting data, which may introduce biasedness; therefore, considering behavioural data or longitudinal studies might give a better representation of how the actual use of technology evolves over time.

Another limitation involves the cross-sectional nature of the study design, which reflects the snapshot of the users' attitudes and intentions at one point in time. The reliance on self-reported data introduced possible bias, where the participants may have misreported the experiences or provided socially desirable responses. A longitudinal approach may offer greater insight into how attitude and behaviour change over time as the experience of older adults with SST increases. While this study focused on perceived ease of use, perceived behavioural control, and social influences, other psychological factors such as trust or privacy concerns might play an important role in the diffusion process of SST and should be considered in future studies.

Thirdly, the unwillingness of the people aged 65 years and above to be involved in this study hindered the ability to record diversified responses, and most of them had a problem in filling out the questionnaires by themselves, which affected the response rates and incomplete data. In respect to these, the alternative methodologies for data collection, for instance, could be through home visits or community events, in which better facilitation of participation may be realised. Data completion may be improved by offering incentives or collaborating with caregivers to complete the surveys. Further research might study how family members, friends, or caregivers influence the adoption of technology by older adults in situations where technological complexity is high. Understanding these dynamics could help design more inclusive technologies that cater to the social and emotional needs of older users.

Finally, the current study did not exploit the role of social support networks in facilitating SST adoption. Further research might seek to examine how the level and type of family, friends, or caregiver involvement in the technology adoption process by older adults impacts on adoption in contexts where technological complexity is high. These could help in designing more inclusive technologies that meet the social and emotional needs of the older users.

In conclusion, this study has contributed to our understanding of the factors that affect the use of self-service technologies by older adults. Accordingly, ease of use and ICT knowledge and social influences have emerged as some important and sensitive variables that shape the adoption behavior. The study gives useful implications for practitioners in the design and implementation of self-service technologies for older adults while at the same time contributing to the theoretical understanding of technology acceptance. Future research should focus on overcoming the limitations identified, testing new contextual variables, and examining the long-term adoption patterns of older adults in order to provide a more holistic view of their interaction with self-service technologies.

References

[1] F. Safaeimanesh, H. Kılıç, H. Alipour, and S. Safaeimanesh, "Self-service technologies (SSTs)—the next frontier in service excellence: Implications for tourism industry," *Sustainability,* vol. 13, no. 5, p. 2604, 2021. https://doi.org/10.3390/su13052604

[2] E. Considine and K. Cormican, "Self-service technology adoption: An analysis of customer to technology interactions," *Procedia Computer Science,* vol. 100, pp. 103-109, 2016. https://doi.org/10.1016/j.procs.2016.09.129

[3] F. Sin, S. Berger, I.-J. Kim, and D. Yoon, "Digital social interaction in older adults during the COVID-19 pandemic," *Proceedings of the ACM on Human-Computer Interaction,* vol. 5, no. CSCW2, pp. 1-20, 2021. https://doi.org/10.1145/3479524

[4] P. Millward, "The'grey digital divide': Perception, exclusion and barriers of access to the Internet for older people," *First Monday,* vol. 8, no. 7, 2003. https://doi.org/10.5210/fm.v8i7.1066

[5] S. Alexopoulou, J. Åström, and M. Karlsson, "The grey digital divide and welfare state regimes: a comparative study of European countries," *Information Technology & People,* vol. 35, no. 8, pp. 273-291, 2022. https://doi.org/10.1108/ITP-11-2020-0803

[6] P. Bharathi and T. Vijayakumar, "A glimpse of Grey Digital Divide: Challenges and barriers for rural elderly," *Tuijin Jishu/Journal of Propulsion Technolog,* vol. 44, no. 6, pp. 3115–3121, 2023.

[7] M. R. Jokisch, L. I. Schmidt, and M. Doh, "Acceptance of digital health services among older adults: Findings on perceived usefulness, self-efficacy, privacy concerns, ICT knowledge, and support seeking," *Frontiers in Public Health,* vol. 10, p. 1073756, 2022. https://doi.org/10.3389/fpubh.2022.1073756

[8] Grand View Research, *Self-service technology market size, share & trends analysis report by product type (ATM, kiosks, vending machines), by application (retail, QSR, banking, healthcare), by region, and segment forecasts, 2023–2030*. San Francisco, CA: Grand View Research, 2022.

[9] C. Y. T. Chan and D. Petrikat, "Self-service technology: Benefits and challenges," *Journal of Computer Science and Technology Studies,* vol. 4, no. 2, pp. 118-127, 2022. https://doi.org/10.32996/jcsts.2022.4.2.14

[10] F. Mubarak and R. Suomi, "Elderly forgotten? Digital exclusion in the information age and the rising grey digital divide," *INQUIRY: The Journal of Health Care Organization, Provision, and Financing,* vol. 59, p. 00469580221096272, 2022. https://doi.org/10.1177/00469580221096272

[11] F. D. Davis, "Perceived usefulness, perceived ease of use, and user acceptance of information technology," *MIS Quarterly,* vol. 13, no. 3, pp. 319-340, 1989. https://doi.org/10.2307/249008

[12] A. T. Lee, R. K. Ramasamy, and A. Subbarao, "Understanding psychosocial barriers to healthcare technology adoption: A review of TAM technology acceptance model and unified theory of acceptance and use of technology and UTAUT frameworks," *Healthcare,* vol. 13, no. 3, p. 250, 2025. https://doi.org/10.3390/healthcare13030250

[13] A. Vahdat, A. Alizadeh, S. Quach, and N. Hamelin, "Would you like to shop via mobile app technology? The technology acceptance model, social factors and purchase intention," *Australasian Marketing Journal,* vol. 29, no. 2, pp. 187-197, 2021. https://doi.org/10.1016/j.ausmj.2020.01.002

[14] B. C. Tan, S. M. Pang, T. C. Lau, Y. T. Lo, and A. H. P. Tan, "Enhancing elderly well-being through the adoption of medication adherence system," in *International Conference on Mechatronics and Intelligent Robotics (pp. 109-127). Singapore: Springer Nature Singapore*, 2023.

[15] N. Shanmugavel and M. Micheal, "Exploring the marketing related stimuli and personal innovativeness on the purchase intention of electric vehicles through Technology Acceptance Model," *Cleaner Logistics and Supply Chain,* vol. 3, p. 100029, 2022. https://doi.org/10.1016/j.clscn.2022.100029

[16] B. Ly and R. Ly, "Internet banking adoption under technology acceptance model—Evidence from Cambodian users," *Computers in Human Behavior Reports,* vol. 7, p. 100224, 2022. https://doi.org/10.1016/j.chbr.2022.100224

[17] L. Zhou, S. Xue, and R. Li, "Extending the Technology Acceptance Model to explore students' intention to use an online education platform at a University in China," *Sage Open,* vol. 12, no. 1, p. 21582440221085259, 2022. https://doi.org/10.1177/21582440221085259

[18] J. Jung, E. Park, J. Moon, and W. Lee, "Exploration of sharing accommodation platform airbnb using an extended technology acceptance model," *Sustainability,* vol. 13, no. 3, p. 185, 2021. https://doi.org/10.3390/su13031185

[19] K. Yang, J.-G. Choi, and J. Chung, "Extending the Technology Acceptance Model (TAM) to explore customer's behavioral intention to use Self-Service Technologies (SSTs) in Chinese budget hotels," *Global Business & Finance Review,* vol. 26, no. 1, pp. 79-94, 2021. https://doi.org/10.17549/gbfr.2021.26.1.79

[20] J. Jang, Y. Ko, W. S. Shin, and I. Han, "Augmented reality and virtual reality for learning: An examination using an extended technology acceptance model," *IEEE Access,* vol. 9, pp. 6798-6809, 2021. https://doi.org/10.1109/ACCESS.2020.3048708

[21] J. Zheng and S. Li, "What drives students' intention to use tablet computers: An extended technology acceptance model," *International Journal of Educational Research,* vol. 102, p. 101612, 2020. https://doi.org/10.1016/j.ijer.2020.101612

[22] C. Troise, A. O'Driscoll, M. Tani, and A. Prisco, "Online food delivery services and behavioural intention–a test of an integrated TAM and TPB framework," *British Food Journal,* vol. 123, no. 2, pp. 664-683, 2021. https://doi.org/10.1108/BFJ-05-2020-0418

[23] A. Padilla-Meléndez, A. R. del Aguila-Obra, and A. Garrido-Moreno, "Perceived playfulness, gender differences and technology acceptance model in a blended learning scenario," *Computers & Education,* vol. 63, pp. 306-317, 2013. https://doi.org/10.1016/j.compedu.2012.12.014

[24] I. Ajzen, "The theory of planned behavior," *Organizational Behavior and Human Decision Processes,* vol. 50, no. 2, pp. 179-211, 1991. https://doi.org/10.1016/0749-5978(91)90020-T

[25] G. A. Abbasi, J. Kumaravelu, Y.-N. Goh, and K. S. Dara Singh, "Understanding the intention to revisit a destination by expanding the theory of planned behaviour (TPB)," *Spanish Journal of Marketing-ESIC,* vol. 25, no. 2, pp. 282-311, 2021. https://doi.org/10.1108/SJME-12-2019-0109

[26] S. M. Pang, B. C. Tan, and T. C. Lau, "Antecedents of consumers' purchase intention towards organic food: integration of theory of planned behavior and protection motivation theory," *Sustainability,* vol. 13, no. 9, p. 5218, 2021. https://doi.org/10.3390/su13095218

[27] D. Arli *et al.*, "Predicting intention to recycle on the basis of the theory of planned behaviour," *International Journal of Nonprofit and Voluntary Sector Marketing,* vol. 25, no. 2, p. e1653, 2020. https://doi.org/10.1002/nvsm.1653

[28] N. Ali, S. Nakayama, and H. Yamaguchi, "Using the extensions of the theory of planned behavior (TPB) for behavioral intentions to use public transport (PT) in Kanazawa, Japan," *Transportation Research Interdisciplinary Perspectives,* vol. 17, p. 100742, 2023. https://doi.org/10.1016/j.trip.2022.100742

[29] C.-C. Chang, W.-L. Chang, and Y.-C. Chin, "User acceptance of self-service technologies-an integration of the technology acceptance model and the theory of planned behavior," in *International Conference on Enterprise Information Systems. Vol. 1. SCITEPRESS*, 2009.

[30] M. M. Rahman, M. F. Lesch, W. J. Horrey, and L. Strawderman, "Assessing the utility of TAM, TPB, and UTAUT for advanced driver assistance systems," *Accident Analysis & Prevention,* vol. 108, pp. 361-373, 2017. https://doi.org/10.1016/j.aap.2017.09.011

[31] N. M. Noor, S. Noranee, M. F. Zakaria, N. Unin, and M. A. H. M. Suaee, "Online shopping: The influence of attitude, subjective norm and perceived behavioral control on purchase intention," in *Proceedings of the 2020 the 6th International Conference on E-Business and Applications*, 2020.

[32] D. T. Wijayati, H. Fazlurrahman, H. K. Hadi, and I. D. C. Arifah, "The effect of entrepreneurship education on entrepreneurial intention through planned behavioural control, subjective norm, and entrepreneurial attitude," *Journal of Global Entrepreneurship Research,* vol. 11, pp. 505-518, 2021. https://doi.org/10.1007/s40497-021-00298-7

[33] J. A. Kumar, B. Bervell, N. Annamalai, and S. Osman, "Behavioral intention to use mobile learning: Evaluating the role of self-efficacy, subjective norm, and WhatsApp use habit," *Ieee Access,* vol. 8, pp. 208058-208074, 2020. https://doi.org/10.1109/ACCESS.2020.3037925

[34] K. Wang, S. F. van Hemmen, and J. R. Criado, "The behavioural intention to use MOOCs by undergraduate students: incorporating TAM with TPB," *International Journal of Educational Management,* vol. 36, no. 7, pp. 1321-1342, 2022. https://doi.org/10.1108/IJEM-11-2021-0446

[35] T. Teo, "Factors influencing teachers' intention to use technology: Model development and test," *Computers & Education,* vol. 57, no. 4, pp. 2432-2440, 2011. https://doi.org/10.1016/j.compedu.2011.06.008

[36] B. Meng and M. Cui, "The role of co-creation experience in forming tourists' revisit intention to home-based accommodation: Extending the theory of planned behavior," *Tourism Management Perspectives,* vol. 33, p. 100581, 2020. https://doi.org/10.1016/j.tmp.2019.100581

[37] A. P. Amushigamo, M. H. Hidengwa, and S. N. Herman, *Enhancing large classes with active learning pedagogical skills. In V. Wang (Ed.), Handbook of research on pedagogical models for next-generation teaching and learning*. Hershey, PA: IGI Global, 2018.

[38] T. Heponiemi, A.-M. Kaihlanen, A. Kouvonen, L. Leemann, S. Taipale, and K. Gluschkoff, "The role of age and digital competence on the use of online health and social care services: A cross-sectional population-based survey," *Digital Health,* vol. 8, p. 20552076221074485, 2022. https://doi.org/10.1177/20552076221074485

[39] N. Marangunić and A. Granić, "Technology acceptance model: A literature review from 1986 to 2013," *Universal access in the information society,* vol. 14, pp. 81-95, 2015. https://doi.org/10.1007/s10209-014-0348-1

[40] R. Nadlifatin, B. Miraja, S. Persada, P. Belgiawan, A. Redi, and S.-C. Lin, "The measurement of University students' intention to use blended learning system through technology acceptance model (TAM) and theory of planned behavior (TPB) at developed and developing regions: Lessons learned from Taiwan and Indonesia," *International Journal of Emerging Technologies in Learning (iJET),* vol. 15, no. 9, pp. 219-230, 2020. https://doi.org/10.3991/ijet.v15i09.11517

[41] J. Y. Choe, J. J. Kim, and J. Hwang, "Innovative robotic restaurants in Korea: merging a technology acceptance model and theory of planned behaviour," *Asian Journal of Technology Innovation,* vol. 30, no. 2, pp. 466-489, 2022. https://doi.org/10.1080/19761597.2021.2005466

[42] K. Sohn and O. Kwon, "Technology acceptance theories and factors influencing artificial Intelligence-based intelligent products," *Telematics and Informatics,* vol. 47, p. 101324, 2020. https://doi.org/10.1016/j.tele.2019.101324

[43] S. C. Lim, Y. M. Chan, and W. Y. Gan, "Social and health determinants of quality of life of community-dwelling older adults in Malaysia," *International Journal of Environmental Research and Public Health,* vol. 20, no. 5, p. 3977, 2023. https://doi.org/10.3390/ijerph20053977

[44] R. C. Rosaroso, "Using reliability measures in test validation," *European Scientific Journal,* vol. 11, no. 18, pp. 369–377, 2015.

[45] V. Venkatesh and F. D. Davis, "A theoretical extension of the technology acceptance model: Four longitudinal field studies," *Management Science,* vol. 46, no. 2, pp. 186-204, 2000.

[46] Z. Hu, S. Ding, S. Li, L. Chen, and S. Yang, "Adoption intention of fintech services for bank users: An empirical examination with an extended technology acceptance model," *Symmetry,* vol. 11, no. 3, p. 340, 2019. https://doi.org/10.3390/sym11030340

[47] M. E. Morris *et al.*, "Smart-home technologies to assist older people to live well at home," *Journal of Aging Science,* vol. 1, no. 1, pp. 1–9, 2013.

[48] K. Chen and A. H. Chan, "A review of technology acceptance by older adults," *Gerontechnology,* vol. 10, no. 1, pp. 1–12, 2011. https://doi.org/10.4017/gt.2011.10.01.006.00

[49] P. Khosravi and A. H. Ghapanchi, "Investigating the effectiveness of technologies applied to assist seniors: A systematic literature review," *International Journal of Medical Informatics,* vol. 85, no. 1, pp. 17-26, 2016. https://doi.org/10.1016/j.ijmedinf.2015.05.014

[50] N. S. Shamsuddin, N. S. Zakaria, and T. Tuan Ismail, "Food quality and online food delivery services during Covid-19 pandemic: Are customers satisfied?," *International Journal of Academic Research in Business and Social Sciences,* vol. 13, no. 5, pp. 399 – 410, 2023. https://doi.org/10.6007/IJARBSS/v13-i5/17045

[51] W. Li, J. Guo, W. Liu, J. Tu, and Q. Tang, "Effect of older adults willingness on telemedicine usage: An integrated approach based on technology acceptance and decomposed theory of planned behavior model," *BMC Geriatrics,* vol. 24, p. 765, 2024. https://doi.org/10.1186/s12877-024-05361-y

[52] P. Stehr, H. Luetke Lanfer, and C. Rossmann, "Beliefs and motivation regarding physical activity among older adults in Germany: results of a qualitative study," *International Journal of Qualitative Studies on Health and Well-Being,* vol. 16, no. 1, p. 1932025, 2021. https://doi.org/10.1080/17482631.2021.1932025

[53] J. Wu and S. Song, "Older adults' online shopping continuance intentions: Applying the technology acceptance model and the theory of planned behavior," *International Journal of Human–Computer Interaction,* vol. 37, no. 10, pp. 938-948, 2021. https://doi.org/10.1080/10447318.2020.1861419

[54] X. Ma, X. Zhang, X. Guo, K.-h. Lai, and D. Vogel, "Examining the role of ICT usage in loneliness perception and mental health of the elderly in China," *Technology in Society,* vol. 67, p. 101718, 2021. https://doi.org/10.1016/j.techsoc.2021.101718

[55] K.-k. Fung, S. S.-l. Hung, D. W. Lai, M. H. Shum, H.-w. Fung, and L. He, "Access to information and communication technology, digital skills, and perceived well-being among older adults in Hong Kong," *International Journal of Environmental Research and Public Health,* vol. 20, no. 13, p. 6208, 2023. https://doi.org/10.3390/ijerph20136208

[56] S. J. Czaja, "The impact of aging on access to technology," *ACM Sigaccess Accessibility and Computing,* vol. 83, pp. 7-11, 2005. https://doi.org/10.1145/1102187.1102189

[57] H. Lee, J.-A. Lim, and H.-K. Nam, "Effect of a digital literacy program on older adults' digital social behavior: A quasi-experimental study," *International Journal of Environmental Research and Public Health,* vol. 19, no. 19, p. 12404, 2022. https://doi.org/10.3390/ijerph191912404

[58] H. R. Marston, R. Genoe, S. Freeman, C. Kulczycki, and C. Musselwhite, "Older adults' perceptions of ICT: Main findings from the technology in later life (TILL) study," *Healthcare,* vol. 7, no. 3, p. 86, 2019. https://doi.org/10.3390/healthcare7030086

[59] S. Nordin *et al.*, "The role of information and communication technology (ICT) for older adults' decision-making related to health, and health and social care services in daily life—A scoping review," *International Journal of Environmental Research and Public Health,* vol. 19, no. 1, p. 151, 2021. https://doi.org/10.3390/ijerph19010151

[60] M. Barry and M. T. Jan, "Factors influencing the use of m-commerce: An extended technology acceptance model perspective," *International Journal of Economics, Management and Accounting,* vol. 26, no. 1, pp. 157-183, 2018. https://doi.org/10.31436/ijema.v26i1.502

[61] M. Yazdani-Darki, Z. Rahemi, M. Adib-Hajbaghery, and F. S. Izadi-Avanji, "Older adults' barriers to use technology in daily life: A qualitative study," *Nursing and Midwifery Studies,* vol. 9, no. 4, pp. 229-236, 2020.

[62] M. Zhang, "Older people's attitudes towards emerging technologies: A systematic literature review," *Public Understanding of Science,* vol. 32, no. 8, pp. 948-968, 2023. https://doi.org/10.1177/09636625231171677