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RESEARCH ARTICLE

Developing a Model for Mobile Payment Adoption among Senior Citizens in Malaysia: A Pilot Study

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ABSTRACT

The global adoption of mobile payments experienced significant acceleration in the wake of the COVID-19 epidemic that emerged in 2020, driving widespread mobile payment adoption. A growing number of studies on mobile payments have been published in the past two years because of the rapid expansion of digital transformation among business communities. However, a growing percentage of Malaysians, particularly senior citizens, hesitate to use mobile payment methods. Notwithstanding, to lessen the nation's dependency on cash transactions, particularly during the pandemic, the Malaysian government promoted the widespread use of mobile payment options. Those aged 60 and above are in the stage of old citizens experiencing the aging process, which causes a decline in their physical and cognitive capabilities (physical condition), affecting their ability to adopt technologies. This pilot study investigates the model and questionnaire design based on three main factors of the Unified Theory of Acceptance and Use of Technology (UTAUT): performance expectancy, effort expectancy, and social influence. Three additional constructs combined digital skills, technology anxiety, and perceived physical condition to determine critical factors for mobile payment adoption among senior citizens in Malaysia. Although this pilot test was important in demonstrating that the questionnaire design could explain senior citizens' behaviour, a more extensive, thorough study with a more representative sample of senior citizens is needed in the future to develop a more advanced theoretical framework.

INTRODUCTION

The COVID-19 pandemic has acted as a catalyst for global adoption and usage of mobile payment methods. The pandemic has widened the divide between cash and online payments, as it increased mobile payment usage. Some countries such as China, India, Europe, and the United States have shifted to online and mobile payments to reduce cash usage (George et al., 2021; Greene et al., 2021; Liu et al., 2020; Kotkowski et al., 2021). The adoption rate of mobile payments in China as of December 2023 was over 87.3 percent. China's pioneers aggressively promoted mobile payments, leading to significant yearly growth (Slotta, 2024). In Malaysia, the number of mobile payment users surpassed 17 million, marking an increase of over two million compared to the previous year (Statista, 2024). The upsurge in portable electronic devices is drastic, impacting the rapid aging of countries. Japan, as one of The Organization for Economic Corporatization and Development (OECD) countries, holds the title of having the oldest population, where three-quarters of its citizens are already over the age of 65 years. South Korea also has the highest old-to-young ratio among the developed countries (Jones, 2022). According to Statista, Malaysia's population is projected to face the prospect of an aging population by 2022. The latest statistical data predicted that this would happen near

2030 as the senior citizen population in Malaysia over 65 years would be 7.9 percent, a drastic upsurge compared to 7.4% in the previous year.

The advent of digital technology has significantly affected how people conduct financial transactions (Gupta & Dhingra, 2021). Its aim is to transform the country into a digital economy by 2030. The Malaysian government has provided multiple initiatives to follow the pace of the revolution of the cashless payment system to encourage citizens and simultaneously provide awareness of the use of mobile payments. According to Malaysia's former Finance Minister, Lim Guang Eng stated that E-tunai was distributed through three major e-wallet operators–Grab Pay, Boost, and Touch n Go–to uplift e-wallet adoption among citizens (Yin, 2020). Minister Datuk Seri Dr. Adham Baba, in an interview with the New Straits Times, announced that Malaysia's Ministry of Health (MOH) had implemented cashless electronic payment methods for healthcare services at 139 hospitals, 144 health clinics, and four health institutes nationwide. He emphasised that this initiative aligns with the government's push for a cashless society, promoting contactless payments, and encouraging the use of online government services (Perimbanayagam, 2020). In a recent statement, Dr. Muhammad Akmal, Chairperson of the Health and Anti-Drug Committee in Melaka, highlighted the introduction of a policy aimed at accommodating senior citizens within the region's healthcare payment systems. Effective from the first of October, all government-operated health facilities in Melaka will commence the acceptance of cash payments. This measure was introduced to facilitate payment processes for senior citizens who frequently visit hospitals and clinics, addressing the accessibility challenges faced with digital payment methods. Furthermore, Dr. Akmal emphasised that adopting cashless payment methods will not be mandated across rural health facilities. This decision acknowledges the limited access to digital banking tools such as debit cards, credit cards, and electronic wallets among the senior population in these areas, ensuring that healthcare services remain inclusively accessible to all demographic groups (Ramli, 2022).

Many studies have argued that, by comparing young and middle-aged people, older adults would encounter more barriers and have more negative attitudes towards technology (Zhang, 2023). Based on a survey conducted by Rakuten Insight, 94% of the respondents aged between 25 and 34 years used e-payment methods, while 4% from that age group did not. Several studies have shown that the number of older adults using the internet is still low. Based on previous studies, 74 senior citizens were interviewed to explore the difficulties they encountered using mobile applications (Tajudeen et al., 2022). Older consumers may not fully grasp the e-wallet system because they perceive traditional methods as offering more security than unfamiliar and complex digital transactions do. According to an interview by Keertan Ayamany in Malaymail, 67-year-old interviewee Chin Lam expressed his concerns, saying,

"I feel like somebody can observe what I am doing, so I would rather go to the bank and get things done."

He further acknowledged that when necessary, he would rely on his daughter to handle online transactions and other banking activities (Ayamany, 2021). As older adults adapt to the digital era, it is crucial to be aware that they may need to share personal information such as their full name, email address, location, age, and identification card details on an unfamiliar platform. Sharing personal information online may lead to anxiety and uncertainty about the potential consequences of these requirements (Choudrie & Vyas, 2014). Chin Lam also mentioned that he tends to avoid using services that require passwords because of forgetfulness. The main challenges senior users face in online banking are their difficulty in getting started and their frustration and confusion with modern online banking systems (Ubam et al., 2021). Supported by a statement by Dr. Saizi Xiao in The New Straits Times in 2022, senior citizen users are yet to catch up, as users aged 45 and older are the least familiar with the e-wallet system. Those aged 60 and above are at the stage of old citizens experiencing the aging process, which causes a decline in their physical and cognitive capabilities. This affects their ability to adopt new technologies (Yap et al., 2022). A previous case study mentioned that 34 out of 36 senior citizens had impaired eyesight, 8 out of 36 had reduced hearing, and 2 out of 36 senior citizens had motor skill deterioration (Ubam et al., 2021).

Literature on technology adoption among senior citizens has increased. A technology gap exists because senior citizens struggle with the complex concept of mobile payments. Implementing outreach programs, initiatives, and awareness campaigns may be beneficial for promoting the greater adoption of mobile payment technologies among senior citizens in Malaysia.

This pilot study expands the UTAUT model to study the adoption behaviour of senior citizens towards technology by considering digital skills, technology anxiety, and perceived physical condition. The study concludes that performance expectancy, effort expectancy, and social influence are the most critical factors driving the adoption and acceptance of mobile payment. These three factors were found to have a significant impact on senior citizens' adoption behaviour. In exploring the nuances of technology adoption among senior citizens, this research advocates for a deliberate expansion of the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Recognising the unique challenges and considerations pertinent to this demographic, the proposed extension incorporates three additional factors. These factors aim to encapsulate the mental and physical dimensions that are critical to understanding and enhancing the adoption process for senior citizens. By delving deeper into these aspects, this research endeavours to refine the model's framework and the design of the accompanying questionnaire, thereby offering a more robust tool for analysing and facilitating technology acceptance within this significant user group.

2. LITERATURE REVIEW

2.1 Mobile Payment

Mobile payment refers to transactions to obtain products and services or make payments using wireless communication technologies on a cell phone, smartphone, or personal digital assistant (Singh and Sinha, 2020). Mobile payments represent a sophisticated cashless transaction mechanism that leverages various technological modalities, including QR codes, near-field communication (NFC), and One-Time Passwords (OTP). These transactions are executed using mobile devices, marking a significant shift in financial transactions from traditional physical currency to digital methodologies (Nur & Panggabean, 2021). Users must maintain digital currency (e-wallet) for every mobile payment transaction on their mobile device (Qi et al., 2020). New digital platforms are tools used to disseminate information, goods, and wealth. This is done cashless through mobile devices, without involving banking institutions (Agusta & Hutabarat, 2018; Shankar & Rishi, 2020)

2.2 Senior Citizen

The definition of senior or also of the “elderly” is different in chronological age in different countries and contexts. The chronological age of 65 and above is often considered seniors, whereby those from 65 to 74 years old are considered “early elderly,” and those over 75 are called “late elderly.” However, evidence for this definition is unknown (Orimo et al., 2006). In addition, according to a Nielsen study, “seniors” are defined as users aged 65 years or older, without providing an upper limit (Gatsou, Politis, & Zevgolis, 2017). In Malaysia, the National Policy on Senior Citizens covers those above the age of 60 years. This definition was provided by the World Assembly on Ageing 1982 in Vienna (Government Malaysia, 2024).

2.3 Extended Unified Theory of Acceptance and Use of Technology (UTAUT)

According to Zhang (2023), 44 articles referenced diverse frameworks for organising the principal determinants affecting older adults’ acceptance of technology. These frameworks include the Technology Acceptance Model (TAM) and its subsequent iterations, Unified Theory of Acceptance and Use of Technology (UTAUT) along with its extensions, and the Senior Technology Acceptance Model (STAM). The Unified Theory of Acceptance and Use of Technology is a widely used framework that seeks to understand and predict individuals’ acceptance and use of technology (Tamilmani et al., 2021). UTAUT is formed from eight technology acceptance models, including the theory of reasoned action (TRA), 17 technology acceptance models (TAM), the motivational model (MM), the theory of planned behaviour (TPB), combined TAM and TPB (C-TAM-TPB), the model of PC utilization (MPCU), innovation diffusion theory (IDT), and

social cognitive theory (SCT). Venkatesh et al. proposed it in 2003 and later expanded it with the development of UTAUT2. UTAUT comprises four primary constructs: performance expectancy, effort expectancy, social influence, and facilitating conditions. UTAUT2 comprises three additional primary constructs: habit, trust, hedonic motivation, and price value. Studies have demonstrated that the Unified Theory of Acceptance and Use of Technology (UTAUT) has been successfully applied across diverse contexts to predict individuals' acceptance and utilisation of technology. Facilitating conditions are one of UTAUT's primary constructs, as individuals believe that an organisation and technical infrastructure exists to support the use of the system (Venkatesh et al., 2003). It initially had an enormously beneficial impact on intention to use, but this effect became insignificant after the first usage. (Marikyan & Papagiannidis, 2023). According to UTAUT (Venkatesh et al., 2003), three factors impact the intended use of IT: performance expectancy, effort expectancy, and social influence. Mobile payment adoption by senior citizens is a salient example of how UTAUT can be applied. Additionally, researchers have expanded the UTAUT model in contexts with different cultural orientations to evaluate the acceptance of digital payment systems such as the JoMoPay system in Jordan. This study proposes a model that incorporates four new external constructs into the UTAUT2 framework: awareness, security, privacy, and culture. It also studies how the relationship between social influence and behavioural intention to use a digital payment system is moderated by culture (Al-Okaily et al., 2020). The flexibility of the UTAUT model and its potential for customisation suit diverse technological adoption contexts, such as mobile payment systems.

Ten studies mentioned the factor of 'facilitating conditions, but Macedo (2017) and Pan and Jordan-Marsh (2010) found limited effects of' facilitating conditions on actual use, possibly because the role of organizational and social support was no longer apparent once older people became proficient in use (Zhang, 2023). These results are consistent with those of Taiwo and Downe (2013), who, in a meta-analytic review of studies using UTAUT, found a small effect size for facilitating conditions on use behaviour, leading the authors to consider this relationship to be inconclusive. In the present study, a possible explanation is that facilitating conditions might be crucial in inducing individuals' intention to adopt technology. However, once they are involved in ICT activities, their role in actual use decreases and they are perceived as unimportant (Zhang, 2023).

Adding new external constructs to an existing theoretical UTAUT model significantly enhances its adaptability and practicality for studying technology adoption as it provides a crucial nuanced understanding of the motivations behind technology acceptance. Moreover, our research seeks to conduct a deeper investigation by adding new external exogenous constructs to the UTAUT approach. Digital skills were introduced as new exogenous constructs, and technology anxiety and perceived physical condition were introduced as new external constructs in the UTAUT approach.

Recent studies have explored the addition of new external constructs to the UTAUT framework. Beaudry and Pinsonneaulty (2010) proposed a framework for classifying emotions based on technology acceptance. Anxiety is one of the deterrence emotions, and results found that anxiety was the only negative emotion with a direct, significant negative influence on information system acceptance. Since the introduction of the UTAUT approach, the original paper has been cited 870 times in academic publications, with 450 complete articles being obtained from these journals (Khan et al., 2023). The UTAUT model is the most suitable approach for use as a model, with the addition of new constructs to study mobile payment adoption among senior citizens in Malaysia.

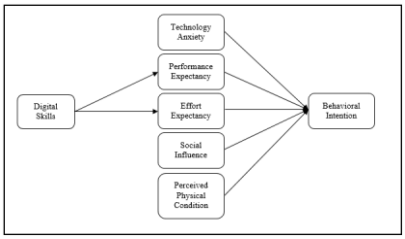

Figure 1: The proposed research model

2.4 Digital Skill

Digital skill is defined, most of the time, as not converging into one concept or construct because of the extensive research on the matter. The most common term used in this study was digital competence. Researchers define the terms that concern the comprehension of their studies, what knowledge they entail, and how technical they will be, as each term brings a big difference between the definitions. For instance, some researchers, such as Oberlander 2020 (Oberlander & Andrea Beinicke, 2020), prefer to use the term digital competencies, while others use the terms digital literacy (Martin, 2005) and digital competencies (Calvani et al., 2008). Digital Skills are used as substitutes for Digital Competencies (Couto, 2021).

This research is related to devices and applications and focuses on the skills of senior citizens who use them daily. This is based on the final theoretical, empirical, and cross-nationally consistent framework by Deursen and Helsper (2014). Mastering such digital skills is impactful, much more than the ability to use the Internet. Nevertheless, digital skills require development and learning, and their intention is to utilise them like any other skill. Despite the recognized importance of digital skills, a study surveying European Union citizens about their self-evaluation of DS found that the majority acknowledged having only "meager digital skills" and "low usage of the Internet." Vasilescu et al. (2020) also concluded that this was more noticeable in older participants. Moreover, digital competence significantly predicts effort expectancy. This result is similar to that of Nikou and Aavakare (2021), who found that a higher level of digital competence would directly affect effort expectancy regarding the use of digital technology for teaching and learning purposes. This suggests that individuals with a high level of digital competence are familiar with the access options and norms of new technology, and their level of comfort with new digital technology strongly affects the cognitive burden they encounter when utilizing it (Couto, 2021).

Previous research indicated that Digital Literacy directly influenced how easily people believed it to be to use technology, but it did not affect how beneficial people thought technology was (Nikou et al., 2022). In the context of UTAUT, Digital Literacy has been found to be positively associated with performance and effort expectancies (Aavakare Singh, 2015; Jang et al., 2020; Aavakare et al., 2021). The digital literacy variable would have a direct positive impact on the performance expectancy and Effort Expectancy of the administrative staff regarding the use of digital technology and a direct effect on the intention to use digital technology (Kabakus et al., 2023).

2.5 Performance Expectancy

The UTAUT approach is widely used to understand factors influencing the acceptance and adoption of new technologies. Performance expectancy is defined as a user's belief that using technology or a system can enhance their performance on a particular task (Chu et al., 2022; Schmitz et al., 2022; Venkatesh et al., 2012). It is one of the most essential antecedents related to technology, with 28 papers mentioning its notable impact on older people's attitudes or intentions to use technology (Zhang, 2023). This illustrates that successful technology adoption among older people is need-driven, and they care deeply about whether the use of technology makes them feel comfortable and enhances their efficiency in everyday life (Martín-García et al., 2021; Dequanter et al., 2022). In contrast, the declining performance expectancy for older people is the cause of low measurement accuracy and the risk of privacy leakage (accidental disclosure of personal information) (Pan et al., 2021; Li et al., 2019). In addition, recent studies have found that performance expectancy is an important construct that affects behavioural intention (Baudier et al., 2018; Cabrera et al., 2021; Cimperman et al., 2016; Shaw et al., 2019). This supported recent article underlines the importance of performance expectancy as a determinant of technology that supports the principles outlined in the UTAUT framework.

2.6 Effort Expectancy

According to the Unified Theory of Acceptance and Use of Technology, effort expectancy is a crucial factor in determining acceptance and adoption of technology. It denotes the "perceived ease of use" (Venkatesh et al., 2003) and is defined as the degree to which a user believes that mobile payment would be free of physical

and mental effort. It can be understood that effort expectancy is the level of ease of operating or using a system, so it does not require much effort (Latifah et al., 2021). Based on previous studies of mobile payment adoption, effort expectancy is one of the crucial constructs that influences mobile payment adoption (Al-Saedi et al., 2020; Alalwan et al., 2017), and according to Alalwan et al. (2017), the ease of mobile payment services is anticipated to increase users' behavioural intention.

2.7 Social Influence

Today, people are constantly connected through technology such as social media. This has led to a significant increase in interactions between individuals and communities, creating a social environment that impacts people's awareness and influences their decisions, goals, and outlook. This social setting included reference groups, family members, friends, colleagues, and others. (Cabrera-Sánchez et al., 2021). Social influence is similar to the subjective norms, social factors, and image constructs used in TAM2, TRA, TPB, CTAMTPB, MPCU, and IDT. This defines a person's perception that others believe that users must apply a new information system and technology (Venkatesh et al., 2003). Social influence is anticipated to be the most crucial and influential construct for predicting new technology acceptance (Al-Saedi et al., 2020). Recent studies have described social influence as a robust antecedent of the behavioural intention to use technology (Cabrera-Sánchez et al., 2018; Baudier et al., 2021). However, previous studies have argued that subjective norms are insignificant in determining ICT use among senior citizens (Jo & Hwang, 2021; Heart & Kalderon, 2013). In some cases, senior citizens may prioritize activities representing independence and consider using assistive technologies to adjust for limitations (Dermody et al., 2021; Peterson & Adams-Price, 2021; Safarov, 2021). Senior citizens occasionally view technology as intended for an even older or more susceptible demographic than themselves. They may demonstrate a sense of "maintaining independence" by refusing to use such technology (Dermody et al., 2021; Clifford & Mackenzie, 2020).

2.8 Technology Anxiety

Technology anxiety is derived from social cognitive theory (Bandura, 1986); however, in 2014, Chen and Chan developed Senior Technology Acceptance Model (STAM) to precisely measure older people's acceptance of technology by adding the factors of technology anxiety. The role of technology anxiety was validated in 11 articles, as it refers to feelings of worry and fear of making mistakes in information exposure and equipment operation (Zhang, 2023).

Technology anxiety is a negative emotional response that pertains to the fear of discomfort people experience when considering using technology (Hasan & Ahmed, 2010) and other aging-specific constructs associated with behavioural intention (Xue et al., 2012). In addition, technology anxiety has been shown to affect a variety of uses to positively disperse risk. In addition, technology anxiety has decreased user satisfaction and raised expectations for the release of new technology that complements technical safety and security problems (Jiang et al., 2021). Based on recent studies by Jiang et al. (2021), technology anxiety appears to be one of the crucial constructs influencing the use of diffusion patterns, satisfaction, and interest in future technology, as the results explained that anxiety in the use of technology must be resolved to increase user satisfaction. Studies by Xue et al. (2012) and Dyck et al. (1998) also stated that senior users have higher technology anxiety than young users. Supported by Deng et al. (2014), technology anxiety has a significant impact on the behavioural intention of older adults, and their declining physical and cognitive capabilities may cause them to experience a higher level of anxiety, which reduces their intention to use advanced technology.

2.9 Perceived Physical Condition

Perceived physical condition defines the beliefs of one's physical difficulties in vision, hearing, and motion that may be faced in everyday life using innovative technology. According to Deng et al. (2014), the aging process causes gradual losses to sensory and motor systems and a decline in physical and cognitive capabilities, which may cause the elderly to experience more significant difficulties in adopting innovative technologies. Some studies have mentioned that perceived physical conditions are significantly related to

perceived ease of use, which affects behavioural intention (Xue et al., 2012). Because of the limited number of studies on this factor, researchers may need to investigate it using different technologies to bridge this gap. Only two studies have been conducted, yielding different results and perspectives. Additionally, the physical condition of senior citizens was assessed based on their self-rated health condition, which could lead to inaccurate results, as senior citizens might underestimate or overestimate their health condition (Yap et al., 2022).

3. RESEARCH METHOD

3.1 Sample and Procedure

This pilot study used a purposive sampling method in which a structured questionnaire was adopted to test the model. The target sample for this pilot study was both genders of senior citizens in Malaysia aged 60 years and above. This study uses a quantitative research method. All findings are presented in tabular form. There were 30 questionnaires distributed to the elderly in Malaysia. Only 14 participants responded to the questionnaire provided through a Google Form because individuals aged 60 and over were unfamiliar with online formats. The remaining 16 participants were obtained through the distributed questionnaires. Before completing the questionnaire, senior citizens who filled out the distributed printed questionnaires were provided with a short briefing on the terms and how to answer the questions. For those who used Google Forms, personal contact information was provided for further assistance. Furthermore, they were encouraged to seek clarification from a research assistant if any confusion arose. This preparatory step was employed to minimise the likelihood of misunderstandings regarding the survey's content among the participants.

3.2 Questionnaire Scale and Measurement Items

These items were adapted from previous studies (Table 1). Each item was measured on a five-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (5). The range of “neutral” (3) indicates a neutral or undecided opinion. The items were also given in English and Bahasa Melayu, and revised based on the pilot study. The questionnaire's validation was ensured through expert review, encompassing its translation into Bahasa Melayu. The respondents answered the survey by choosing the extent to which they agreed or disagreed with the items.

The questionnaire was divided into three sections, A, B, and C, and the respondents were required to complete all three sections as required. In addition, it consisted of a closed-ended question in which all the target respondents were given predetermined responses from which answer to choose. In creating this questionnaire, all questions were adapted from previous studies and slightly adjusted to align with the mobile payment adoption model.

The Digital Skills scale was measured using five items and was adopted by Deursen in 2014. Performance Expectancy was measured using five items adopted by Widodo et al. (2019). Alalwan et al. (2018) adopted five measurement items for Effort Expectancy. Social Influence was adopted by Alalwan et al. (2018) with five measurement items and Technology Anxiety was adopted by Meuter et al. (2003) with five measurement items. Three measurement items for Perceived Physical Condition were adopted by Xue et al. (2011), and Behavioural Intention was measured by five items and adopted by Alalwan et al. (2018) and Verkijika (2019). Each construct typically comprises five questions when constructing the questionnaire. Notably, the construct concerning perceived physical condition deviated from this pattern, including only three questions. Consequently, the questionnaire consisted of 33 questions.

3.3 Data Collection

This pilot study used Statistical Package for the Social Sciences (SPSS) version 29 and partial least squares structural equation modeling (PLS-SEM) version 4 to test the model framework and questionnaires for mobile payment adoption among senior citizens. SPSS was used to enter the collected data and analyse the

demographic characteristics of respondents. The Partial Least Squares Structural Equation Modeling (PLS-SEM) is appropriate to examine the reliability, construct validity and to present the measurement model.

4. RESULTS AND DISCUSSION

4.1 Demographic

In Table 1, all respondents' personal information in terms of age, gender, race, employment status, level of education, computer skill level, and use of mobile payment are presented as frequencies and percentages from the study of 30 samples.

Table 1: Demographic of Respondents (n=30)

Demographic Profile		Frequency	Percent
Age	60-64 years old	18	60.0
	65-69 years old	8	26.7
	70-74 years old	4	13.3
	74-79 years old	0	0.0
	Above 80 years old	0	0.0
Gender	Male	12	40.0
	Female	18	60.0
Race	Malay	26	86.7
	Chinese	1	3.3
	Indian	3	10.0
Employment Status	Employed	6	20.0
	Unemployed	9	30.0
	Retired	15	50.0
Level of Education	SRP/PMR	6	20.0
	SPM/STPM	13	43.3
	Foundation/Diploma	3	10.0
	Bachelor's Degree	7	23.3
	Master/PhD	1	3.3
Economic Status	Low income	9	30.0
	Middle income	18	60.0
	High income	3	10.0
Computer Skill Level	Low level	9	30.0
	Middle level	19	63.3
	High level	2	6.7
Use Mobile Payment	Yes	12	40.0
	No	18	60.0

Table 1 illustrates respondents' personal profiles. The majority of the respondents were aged 60-64 years old (60%) out of 30 respondents, while the rest were aged 65-69 years old (26.7%) and 70-17 years old (13.3%). In addition, most of the respondents to this questionnaire were females (60%) and males (40%). The majority of computer skill levels were at the middle level (63.3%), followed by the low level (30%) and high level (6.7%). This indicates that computer skills affect the age of mobile phone users. Most respondents did not use mobile payments daily, with no percentage (60%) or yes (40%). The highest level of education, with a percentage of 43.3%, is SPM/STPM, meaning that most respondents are from SPM/STPM. Most of the 30 respondents were from the middle-income bracket (60%), and Malay answered most of the questionnaires (86.7%). Most are retired (50%), unemployed (30%), and employed (20%).

4.2 Reliability and construct validity

The mean, standard deviation, Cronbach's alpha, PLS loading, Average Variance Extracted (AVE) values, and Composite Reliability (CR) of the model are shown in Table 2. Based on the results shown in Table 2, the CR

and AVE values for all constructs exceed 0.9 and 0.5, respectively. Furthermore, the values of Cronbach's alpha were between 0.725 and 0.974. The loadings were above the threshold value of 0.7 except for DS4 which was only 0.236. This measurement item had to be recoded due to its negative wording. Hence, this measurement error arises probably due to ambiguity in the question wording design. It is therefore important to review the item carefully to ensure it is clear, unambiguous, and properly designed in the finalized version of the questionnaire before distributing it for the actual data collection.

Table 2: Validity

Construct	Measure Items	Mean	Standard Deviation	Cronbach's Alpha	PLS Loading	AVE	Composite Reliability (CR)
Performance Expectancy	PE1	3.500	1.088	0.954	0.921	0.844	0.961
	PE2	3.533	1.118		0.911		
	PE3	3.600	1.020		0.933		
	PE4	3.633	1.169		0.923		
	PE5	3.700	1.215		0.904		
Effort Expectancy	EE1	3.233	1.230	0.957	0.915	0.853	0.958
	EE2	3.267	1.093		0.938		
	EE3	3.233	1.116		0.921		
	EE4	3.400	1.114		0.927		
	EE5	3.233	1.174		0.917		
Social Influence	SI1	3.467	1.118	0.852	0.877	0.700	0.899
	SI2	3.300	1.069		0.837		
	SI3	3.400	0.917		0.885		
	SI4	3.300	1.100		0.757		
	SI5	3.700	1.069		0.819		
Digital Skill	DS1	3.100	1.165	0.711	0.906	0.640	0.908
	DS2	2.933	0.998		0.877		
	DS3	3.600	1.083		0.889		
	DS4	3.400	1.114		0.236		
	DS5	2.833	1.098		0.874		
Technology Anxiety	TA1	3.067	1.236	0.947	0.905	0.825	0.948
	TA2	3.167	1.157		0.946		
	TA3	3.100	1.106		0.934		
	TA4	3.067	1.340		0.868		
	TA5	3.200	1.222		0.885		
Perceived Physical Condition	PPC1	2.833	1.035	0.855	0.799	0.773	0.916
	PPC2	2.367	0.912		0.908		
	PPC3	2.400	0.879		0.925		
Behavioural Intention	BI1	3.433	0.955	0.979	0.937	0.922	0.979
	BI2	3.333	0.978		0.964		
	BI3	3.467	0.957		0.965		
	BI4	3.300	0.971		0.956		
	BI5	3.400	0.987		0.978		

This study chose the HTMT ratio to measure the discriminant validity. The Hetorotrait-Monotrait ratio of correlations (HTMT) is a statistical technique used to assess discriminant validity in business management research (Nawanir et al., 2019; Roemer et al., 2021). As shown in Table 3, discriminant validity was established according to the HTMT 0.90 criteria. The constructs on BI-PE, BI-EE, BI-SI, BI-TA, BI-PPC, DS-PE, and DS-EE correlate because all values are lower than 0.90. The acceptable level of discriminant validity is suggested to be less than 0.90 (Hair & Alamer, 2022). The validity of the discriminants was confirmed in this way.

Table 3: HTMT correlations

	Behavioral Intention	Digital Skills	Effort Expectancy	Performance Expectancy	Perceived Physical Condition	Social Influence	Technology Anxiety
Behavioral Intention	-						
Digital Skills	0.770	-					
Effort Expectancy	0.719	0.567	-				
Performance Expectancy	0.528	0.273	0.779	-			
Perceived Physical Condition	0.404	0.404	0.564	0.449	-		
Social Influence	0.731	0.579	0.674	0.592	0.286	-	
Technology Anxiety	0.356	0.589	0.392	0.129	0.804	0.145	-

4.3 PLS-SEM results for measurement model analysis

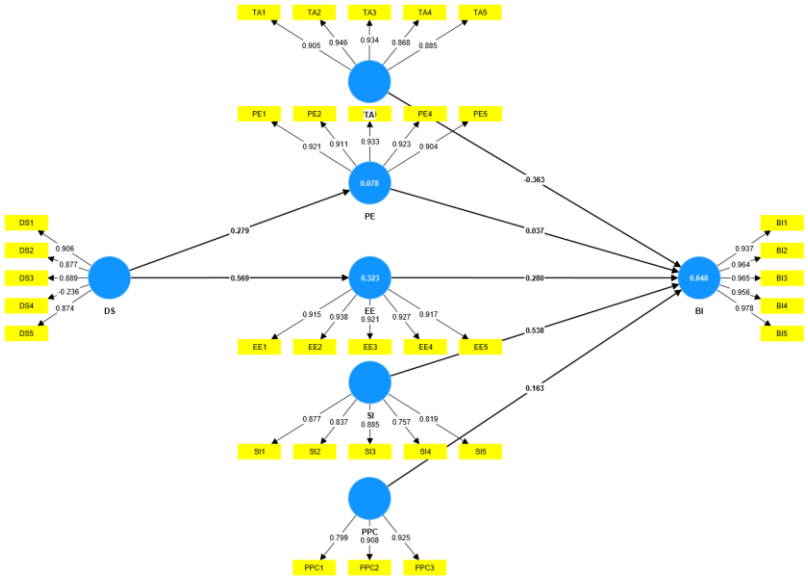

Figure 2: Results of PLS analysis

5. CONCLUSION

5.1 Implication of the Study

Conducting a study on senior citizens has a unique set of implications given the specific requirements and attributes of this age group. Most respondents preferred to be involved in paper-based questionnaires rather than digital ones, such as Google Forms. Therefore, accessibility is essential for conducting surveys. Given the potential cognitive decline and lower educational levels, the questions' simplicity of design and language must be clear and straightforward to avoid confusion and misunderstandings. Therefore, the questionnaire was designed in two languages, English and Bahasa Melayu, and each construct was defined so that the age group could understand the terms before answering.

5.2 Recommendations for Further Research

This study introduced and empirically examined a robust framework for comprehending the inclinations of senior citizens and individuals towards embracing mobile payments. The framework is centred on three primary concepts derived from the Extended UTAUT: performance expectancy, effort expectancy, and social influence. Past research has demonstrated that these three fundamental concepts positively correlate with behavioural intent. Hence, three additional constructs—digital skills, technological anxiety, and perceived physical condition—were incorporated to support a more comprehensive examination of mobile payment adoption. The extant literature on mobile payment adoption has primarily focused on the general consumer population, with specific emphasis on factors influencing adoption from the perspectives of customers, merchants, and technology providers (Liébana-Cabanillas & Lara-Rubio, 2017; Mallat & Tuunainen, 2008; Nguyen et al., 2023; Yeboah et al., 2020) However, there is a notable gap in the research regarding the adoption of mobile payment systems among senior citizens. This demographic may have unique needs and barriers to adoption, such as usability concerns, perceived complexity, and trust issues, which are not sufficiently addressed in the current body of knowledge.

Interestingly, while some studies have considered the role of emotions in the acceptance of mobile payment systems (Verkijika, 2019), and others have looked at post-adoption behavior (Singh, 2020), these aspects have not been specifically explored in the context of senior citizens. Furthermore, the influence of social influence and facilitating conditions has been mentioned as significant for mobile payment adoption (Nguyen et al., 2023), but how these factors influence senior citizens remains underexplored.

In summary, future research should focus on understanding the unique factors that influence mobile payment adoption among senior citizens, as this pilot study should widen its research area with more respondents from a wide variety of races and employment statuses to obtain more reliable results. Researchers or academics interested in this topic may add other relevant external influencing factors, such as security and perceived enjoyment. Further, in future studies, practitioners need to consider the role of emotion in mobile payment adoption, which focuses on senior citizens. Addressing these gaps will not only contribute to the academic literature but also provide practical insights for businesses and policymakers aiming to increase mobile payment adoption rates among this growing segment of the population.

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