

Assessing The Adoption of Mobile Payment Services Among University Students During Covid-19: The Role of Perceived Risk and UTAUT Factors

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ABSTRACT

This study examined the acceptance of mobile payment services among postgraduate students during the COVID-19 pandemic, following the World Health Organization's call for contactless transactions to minimize SARS-CoV-2 transmission. It examined key determinants, including social influence, performance expectancy, facilitating conditions, effort expectancy, and perceived risk, based on the Unified Theory of Acceptance and Use of Technology (UTAUT). Data were collected from 155 postgraduate students at a Malaysian public university using a structured questionnaire. Findings revealed that performance expectancy and perceived risk significantly influenced mobile payment acceptance, accounting for 65.8% of the variance. The results underscored how students perceived mobile payments as both efficient and risk-mitigating during health crises. This study contributes to the understanding of technology acceptance by illustrating the dual role of mobile payments in enhancing convenience and public safety. It also provides actionable insights for policymakers, educational institutions, and financial technology providers to enhance digital payment adoption and resilience strategies in the event of future pandemics.

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1. INTRODUCTION

The COVID-19 pandemic, officially named SARS-CoV-2, is not the first pandemic in history, but its global impact has been profound, as noted by the World Health Organization (WHO) in 2020. Originating in Wuhan, China, in December 2019, the virus spread rapidly across the globe (Daragmeh et al., 2021). Symptoms ranged from mild to severe, including coughing, loss of smell and taste, muscle discomfort, fever, breathing difficulties, headaches, nasal congestion, and sore throat (WHO, 2020). In response, new norms emerged, such as social distancing, mask-wearing, and heightened hygiene practices. Countries worldwide implemented WHO-recommended measures, including lockdowns, stay-at-home orders, physical distancing, travel restrictions, and quarantines, leading to significant disruptions in global supply chains and widespread business closures (Daragmeh et al., 2021; Zhao et al., 2021; Herget et al., 2021; Di Crosta et al., 2021).

In this context, mobile payment services, which allowed transactions via mobile devices such as smartphones and PDAs using technologies like NFC, QR codes, SMS, and mobile wallets (Liébana-Cabanillas, 2017; Goddard, 2021), gained prominence. These services facilitated both remote and proximity payments for digital content, physical goods, and services (Chen & Adams, 2005). The pandemic significantly accelerated the adoption of mobile payments, as consumers shifted away from cash transactions in favor of contactless methods, endorsed by governments and the WHO to reduce the risk of virus transmission (WHO, 2020).

In Malaysia, the usage of mobile payment services had surged, driven by high smartphone penetration and supportive government initiatives. Smartphone ownership in the country rose from 75.9% in 2017 to 94.8% in 2021, with around 29 million users reported in 2021 (MCMC; Statista). Government projects like e-Tunai Rakyat, which provided RM30 in e-wallet credits, further encouraged the adoption of e-wallets. The pandemic accelerated this shift towards cashless transactions, fundamentally altering consumer behavior.

User acceptance of mobile payments is a complex process, influenced by individual expectations and attitudes (Alwi & Abdullah, 2021; Alwi & Najihah, 2019). The Technology Acceptance Model (TAM) and its successor, the Unified Theory of Acceptance and Use of Technology (UTAUT), identified key factors such as perceived ease of use, usefulness, performance expectations, effort expectancy, social influence, and facilitating conditions that predicted user acceptance of new technologies (Venkatesh & Davis, 2003; Venkatesh & Xu, 2012). Prior to COVID-19, mobile payments in Malaysia were predominantly used by foreigners, while Malaysians preferred cash. However, the WHO's recommendation for contactless payments to mitigate virus spread and Malaysia's "Phase 1" lockdown on June 1, 2021, dramatically shifted consumer behavior towards online transactions, boosting demand for mobile payments. The government's e-Tunai Rakyat program also played a significant role in promoting cashless transactions during the pandemic.

According to Chui YM (2020), over 69% of Malaysian respondents reported an increased use of mobile payment services during the pandemic. As more contagious variants of the virus emerged, promoting mobile payments as a safer alternative to cash became critical for public health. This heightened concern for personal well-being led to a significant surge in mobile payment usage. This study investigated the acceptance of mobile payment services during the COVID-19 pandemic, focusing on key factors: social

influence, performance expectancy, facilitating conditions, effort expectancy, and perceived risk. Specifically, the research aimed to explore how these factors, social influence, performance expectancy, facilitating conditions, effort expectancy, and perceived risk, affect the adoption of mobile payment services. By examining these relationships, the study sought provide a comprehensive understanding of the factors driving mobile payment adoption during a public health crisis.

While prior studies have extensively examined mobile payment adoption using established frameworks such as the UTAUT, most have been conducted under normal conditions, with limited attention to crisis-driven behavioural shifts. The COVID-19 pandemic represented an unprecedented external shock that has altered consumer risk perceptions, hygiene concerns, and transaction preferences. Despite emerging studies in this area, empirical clarity remains lacking on how perceived health-related risk interacts with core UTAUT constructs to shape mobile payment acceptance, particularly in developing economies such as Malaysia.

Furthermore, although perceived risk has been examined in financial technology contexts, its dual role during a public health crisis remains theoretically underdeveloped. Specifically, prior literature predominantly conceptualises perceived risk as a barrier to adoption (e.g., financial or privacy risks), yet in the context of COVID-19, risk associated with physical cash use may, conversely, encourage digital payment adoption. This paradox has not been sufficiently theorised nor empirically validated within UTAUT-based studies.

Therefore, this study addressed two critical gaps: the limited integration of pandemic-induced risk perception within UTAUT, and the insufficient understanding of how perceived risk reconfigures technology adoption behaviour during crisis conditions. By extending UTAUT with perceived risk in a pandemic context, this study provides a more contextually grounded explanation of mobile payment adoption behaviour among university students in Malaysia.

2. LITERATURE REVIEW

Over the past decade, mobile payments have gained widespread popularity globally (Karsen et al., 2019). The term "mobile payment," which emerged around 2000, now encompasses a variety of services designed to meet diverse consumer needs (Karsen et al., 2019). In Malaysia, credit cards served as the primary cash alternative for approximately 15 years, with limited initial promotion of debit cards by the Central Bank of Malaysia (Malaysia FinTech Report, 2021). However, inspired by the success of platforms like Alipay and WeChat Pay, mobile payments have become the second most popular cashless payment method in the country, supported by services such as Grab Pay, Touch 'n Go, Big Pay, and Boost.

Several factors have driven the growth of mobile payments in Malaysia. Access to traditional credit cards is often restricted by the need for good credit, limiting their availability to a broader audience. This, coupled with a competitive credit card market, has spurred interest in alternative payment methods. The COVID-19 pandemic further accelerated the shift towards contactless transactions as physical distancing measures became the norm (Alwi & Abdullah et al., 2021). In response, the Malaysian government has introduced various initiatives, including the Short-Term National Economic Recovery Plan and e-Penjana, aimed at promoting electronic and mobile payments to stimulate spending and advance the transition to a cashless

society (Kee & Mahadi et al., 2021). Programs such as e-Tunai Rakyat and e-Belia specifically encouraged cashless transactions among the population. Additionally, the Central Bank of Malaysia (BNM) supported this shift by reducing e-payment fees and issuing 47 e-money licenses, thereby fostering a robust non-cash payment ecosystem (BNM, 2022).

According to the Malaysia FinTech Report (2021), there were 38 active mobile payment services in the country. The combined influence of government incentives and pandemic-induced lockdowns has catalyzed a shift from cash to contactless payments. Although mobile payments were gradually gaining traction before the pandemic, COVID-19 dramatically accelerated their adoption, with an increase of over 80% in usage driven by physical distancing guidelines (Kee & Mahadi et al., 2021).

The appeal of cashless payments lay in their availability, safety, and simplicity, attributes that became even more critical during the pandemic. Mobility restrictions necessitated cashless transactions, underscoring the importance of mobile payments (Kee & Mahadi et al., 2021). Policies enforcing physical separation and self-quarantine heightened the interest in contactless transactions, prompting businesses and vendors to encourage mobile payment options. Concerns about handling cash safely further contributed to a decline in cash usage (Edeh & Teh et al., 2021).

The acceptance of mobile payment services during the pandemic had been significantly influenced by factors such as performance expectancy, effort expectancy, social influence, facilitating conditions, and perceived risk. These factors played a critical role in predicting user acceptance of mobile payment technologies, as conceptualized within the UTAUT. Developed by Venkatesh et al. (2003), the UTAUT is a comprehensive model that integrates elements from several prominent theories of technology acceptance, including the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), and others.

In the context of this study, UTAUT provided a valuable framework for understanding the determinants of mobile payment adoption among users during the COVID-19 pandemic. The theory posits that four key constructs; performance expectancy, effort expectancy, social influence, and facilitating conditions; directly influence the behavioral intention to use technology and ultimately the actual usage behavior. Performance expectancy refers to the degree to which an individual believes that using a particular technology will help them achieve gains in job performance, which in this context translates to the perceived benefits of using mobile payments over traditional cash transactions. Effort expectancy relates to the ease of use associated with the technology, while social influence pertains to the degree to which an individual perceives that important others believe they should use the new system. Facilitating conditions involved the external factors that support the use of the technology, such as infrastructure and technical support.

Moreover, perceived risk, although not originally included in UTAUT, is increasingly recognized as a significant factor in technology adoption, particularly in financial services. During the pandemic, concerns about the safety of cash transactions and the potential risks of using mobile payment services became prominent. These concerns, which encompass privacy, security, and financial risks, may either hinder or encourage the adoption of mobile payments depending on how the users perceive them.

By applying UTAUT in this study, the research sought to explore how these factors—performance expectancy, effort expectancy, social influence, facilitating conditions, and perceived risk collectively

influence the acceptance and use of mobile payment services during the pandemic. The theoretical framework, illustrated in Figure 1, visually represents the relationships among these variables and their impact on mobile payment adoption in the context of COVID-19. This approach not only validated the relevance of UTAUT in the study of mobile payment services but also extended its application by incorporating the unique challenges and opportunities presented by a global health crisis.

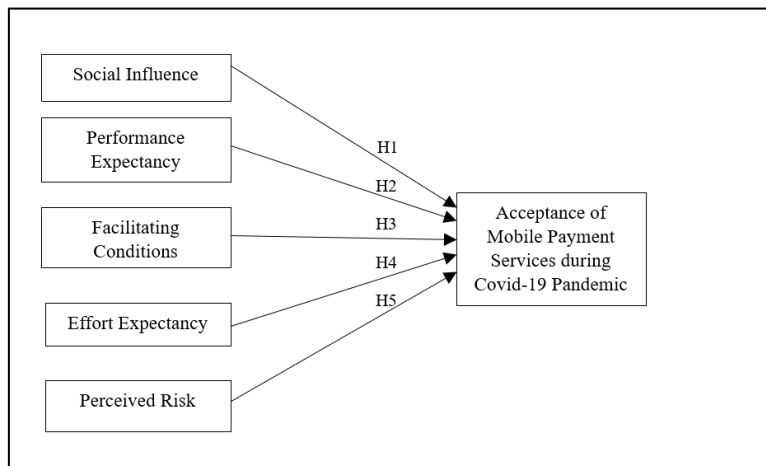


Fig. 1. Theoretical framework on acceptance of mobile payment services during COVID-19 pandemic

2.1 Hypotheses development

While UTAUT explains technology adoption through performance expectancy, effort expectancy, social influence, and facilitating conditions, it does not explicitly account for contextual risk perceptions, particularly those arising from external crises. Drawing on risk theory and health behaviour perspectives, perceived risk can function as both a deterrent (financial/security concerns) and a motivator (health safety concerns). In the context of COVID-19, this duality became critical, as users may avoid cash transactions due to concerns about contamination while simultaneously assessing the security risks of mobile payments. Accordingly, this study conceptualises perceived risk as a context-dependent construct, extending UTAUT by incorporating both technology-related and pandemic-induced health risks, thereby strengthening the model's explanatory power.

Social influence and acceptance of mobile payment services during the COVID-19 pandemic

Social influence is the extent to which a community, including relatives and colleagues, agrees that using mobile payment services aligns with accepted norms (Venkatesh & Davis, 2003). People are more likely to follow group norms if they find them significant. During the pandemic, guidance from influential figures greatly shapes users' decisions (Daragmeh et al., 2021; Zhao et al., 2021; Al Nawayseh, 2020; Koch et al., 2020; Revathy, 2020). Celebrity endorsements positively impacted online purchasing behavior in Bangladesh during COVID-19 (Miah & Neger, 2022; Wei & Chang, 2021; Zhao et al., 2021). Studies in various contexts have explored how social influence affects mobile technology adoption (Morosan, 2016; Venkatesh & Davis, 2003). Thus, the hypothesis formulated was as follows:

H1: There is a significant relationship between social influence and acceptance of mobile payment services during the COVID-19 pandemic.

Performance expectancy and acceptance of mobile payment services during the COVID-19 pandemic

Users are likely to embrace mobile payment services when they believe these services can deliver fast, reliable, consistent, and accurate outcomes, thereby enhancing service quality (Venkatesh & Davis, 2003). Numerous studies have indicated that the performance expectancy of mobile payment services plays a crucial role in their adoption. Research has consistently demonstrated that users' expectations regarding performance significantly influence their intentions to adopt mobile payment systems (Daragmeh et al., 2021; Zhao et al., 2021; Liébana-Cabanillas, F. et al., 2020; Al Nawayseh, M.K., 2020; Koch et al., 2020). Therefore, the proposed hypothesis is as follows:

H2: There is a significant relationship between performance expectancy and acceptance of mobile payment services during the COVID-19 pandemic.

Facilitating conditions and acceptance of mobile payment services during the COVID-19 pandemic

Facilitating conditions refer to consumers' views on the resources and support available for mobile payments (Brown & Venkatesh, 2005) and the organizational and technological infrastructure supporting their use (Venkatesh & Davis, 2003). Users with the necessary knowledge and smartphones are more likely to adopt mobile payments (Venkatesh & Davis, 2003). However, the impact of these conditions on mobile payment acceptance varied across studies (B. Sivathanu, 2018; Oliveira et al., 2016; Edeh et al., 2021; Wei et al., 2021; Daragmeh et al., 2021; Wong & Ismail, 2020). Therefore, the following hypothesis was proposed:

H3: There is a significant relationship between facilitating conditions and acceptance of mobile payment services during the COVID-19 pandemic.

Effort expectancy and acceptance of mobile payment services during the COVID-19 pandemic

Using mobile payment services can be challenging due to communication barriers between users and the complexity of these services, requiring significant effort to overcome (Venkatesh & Davis et al., 2003). Despite the pandemic, several studies have indicated that there was no major change in user behaviour or intentions during this period (Daragmeh et al., 2021; Wei & Chang et al., 2021; Zhao et al., 2021; Liébana-Cabanillas, F. et al., 2020). Previous research on technology acceptance had shown that the ease of use of a technology system significantly influences the behavioural intention toward various technologies (Oliveira et al., 2016; Abrahão et al., 2016; Venkatesh & Davis et al., 2003). As a result, the following hypothesis was proposed:

H4: There is a significant relationship between effort expectancy and acceptance of mobile payment services during the COVID-19 pandemic.

Perceived risk and acceptance of mobile payment services during the COVID-19 pandemic

The COVID-19 outbreak had changed behaviors to ensure personal safety and prevent disease transmission (Durr, 2020; Prathap, 2020). Concerns about the virus spreading through surfaces, including physical currency, have increased awareness of the risks. Researchers have suggested that mobile payment services can encourage healthier behaviors and increase their use to reduce COVID-19 risk (Durr, 2020; Prathap, 2020). In Malaysia, COVID-19 had led to an 80% rise in e-wallet use, promoting cashless

payments (Kee & Mahadi et al., 2021). People who perceived cash as a virus risk switched to non-cash options, thereby influencing their payment habits (Yu, 2022; Hendy Mustiko Aji et al., 2020; Daragmeh et al., 2021; Huterska, 2021; Di Crosta et al., 2021). Therefore, the following hypothesis was proposed:

H5: There is a significant relationship between perceived risk and acceptance of mobile payment services during the COVID-19 Pandemic.

3. RESEARCH DESIGN

3.1 Sampling procedures

This study targeted postgraduate students at a public university in Malaysia, specifically those aged 25 to 60 years who were currently enrolled. Postgraduate students were chosen for this study due to their advanced level of education and exposure to diverse technological tools, making them an ideal group to assess the behavioral acceptance of mobile payment services. This demographic was likely to have a higher engagement with digital platforms and financial technologies, providing rich insights into the factors influencing the adoption of mobile payment systems, particularly in the context of the COVID-19 pandemic. Additionally, their varied age range (25 to 60 years) allowed for the examination of acceptance behaviors across different stages of life, contributing to a more comprehensive understanding of the adoption process in an academic setting. The total population consisted of 259 postgraduate students, as reported by the Postgraduate Office. To determine the appropriate sample size, a sample size calculation was conducted using the SurveyMonkey platform, resulting in a required sample of 155 students.

Although the minimum required sample size was 155 respondents, only 113 valid responses were obtained and retained for analysis after data screening. This reduction was primarily due to incomplete responses and failure to meet inclusion criteria (e.g., lack of mobile payment usage experience during COVID-19). Despite this, the final sample size remained acceptable, as it exceeded the minimum threshold (30% threshold) suggested by Bartlett et al. (2001) and met the acceptable response rate criteria outlined by Sekaran and Bougie (2016). Nevertheless, this reduction was acknowledged as a limitation, as it may slightly affect the statistical power and generalizability of the findings.

3.2 Data collection and analysis procedures

This study employed an Internet-based, self-administered questionnaire created with Google Forms to collect sufficient data from the target populations. Using this questionnaire format not only facilitated respondents' completion but also simplified data collection and analysis for researchers (Saunders et al., 2009). The primary tool for this study was a 7-point Likert-scale questionnaire. The questionnaires were organized into three (3) sections. In Part A, respondents provided demographic information, including gender, age, marital status, mode of study, and postgraduate student status, and their experience using mobile payment services during COVID-19. Part B focused on inquiries into the dependent variable, user acceptance, while Part C delved into the independent variables that influenced user acceptance of mobile payment services during COVID-19: social influence, performance expectancy, facilitating conditions, effort expectancy, and perceived risk.

Data coding and analysis were performed using SPSS version 12.0. Initially, descriptive analysis (Pallant, 2010) examined the data's basic characteristics. A normality test was then conducted to check

whether the data were normally distributed, followed by a reliability test to assess the measurement tool's consistency. The VIF values were examined to assess multicollinearity among the variables. Finally, a regression analysis was conducted to evaluate the relationship between the independent variables (social influence, performance expectancy, facilitating condition, effort expectancy, and perceived risk) and the dependent variable (acceptance of mobile payment services during the COVID-19 pandemic).

4. ANALYSIS AND DISCUSSION

4.1 Examining Response Rate

Since this research employed online survey methods, the researchers adhered to the guidelines proposed by Hussey and Hussey (1997), which suggested achieving a minimum response rate of 10% to prevent sample bias. Additionally, recommendations outlined in a "table for determining the minimum sample size for a given population size for continuous and categorical data (Bartlett, Kotlik, and Higgins, 2001) were considered. This table indicates a minimum respondent sample size of 85 for a population of 300. Furthermore, Uma Sekaran and Bougie (2016) proposed that a response rate of 30% was considered acceptable. Therefore, in this study, the 113 responses received out of the total number of online survey links sent were deemed sufficient to proceed with the analysis.

4.2 Demographic Profile

Descriptive analysis was utilized to examine the demographic characteristics of participants, encompassing gender, age, postgraduate status, mode of study, marital status, and experience with mobile payment services during COVID-19. The findings, presented in Table 1, elucidated the demographic composition of respondents.

Table 1. Demographic Profile

Demographic Information (N=113)	Frequency (N)	Percent (%)
Gender		
Female	88	77.9
Male	25	22.1
Age		
25 - 34 years	69	61.1
35 - 44 years	33	29.2
45 - 54 years	11	9.7
56 – 60 years	0	0
Postgraduate student		
Malaysian Student	106	93.8
International Student	7	6.2

Demographic Information (N=113)	Frequency (N)	Percent (%)
Mode of Study		
Full-time Study	41	36.3
Part-time Study	72	63.7
Marital Status		
Single	70	61.9
Married	41	36.3
Widowed	1	0.9
Divorced	1	0.9
Experience using mobile payment services during COVID-19		
At least one time per day	51	45.1
At least one time per week	43	38.1
At least one time per two weeks	10	8.2
At least one time per month	7	6.4
Not at all	2	1.8

Source: Developed for This Study

According to the findings, 77.9% of the 113 participants were female, while 22.1% were male. Regarding age distribution, the majority, comprising 61.1%, fell within the 25-34 age group. The 35-44 age group accounted for 29.2%, the 45-54 age group for 9.7%, and none for the 55-60 age group. Malaysian students constituted the most respondents at 93.8%, with international students making up 6.2%. In terms of marital status, the majority were single (61.9%), followed by married individuals (36.3%), and only one respondent reported being widowed or divorced (0.9%). Regarding experience with mobile payment services during COVID-19, most respondents (45.1%) reported using them at least once daily. This was followed by at least once per week (38.1%), at least once per two weeks (8.2%), at least once per month (6.4%), and only a small percentage (1.8%) reported never utilizing mobile payment services.

4.3 Reliability Test

This study used Cronbach's Alpha to evaluate the questionnaire's reliability and ascertain satisfactory consistency for each item. Cronbach's Alpha coefficients typically range from 0 to 1, with higher values indicating stronger internal consistency and lower values suggesting less consistency. According to the generally accepted guidelines, Cronbach's Alpha coefficients equal to or exceeding 0.90 and 1.0 were considered excellent, those between 0.80 and 0.89 were deemed good, those between 0.70 and 0.79 were considered acceptable, those between 0.60 and 0.69 are considered questionable, those between 0.50 and 0.59 were seen as poor, and values equal to or less than 0.40 were regarded as inadequate (George & Mallery, 2010). This reliability assessment ensured the stability of the employed tool (Sekaran & Bougie, 2016).

In this study, the Cronbach's alpha values for the following variables were as follows: 0.846 for acceptance of mobile payment services during the COVID-19 Pandemic, 0.807 for social influence, 0.887 for effort expectancy, 0.818 for facilitating conditions, and 0.832 for perceived risk. According to George and Mallery (2010), these values suggested good internal consistency and reliability for these variables. The Cronbach's alpha for performance expectancy was 0.931, indicating excellent internal consistency and reliability. In conclusion, all 34 items were considered reliable based on these results.

To assess multicollinearity, the Variance Inflation Factor (VIF) values were examined. All VIF values were below the threshold of 10, indicating no multicollinearity issues, as suggested by Aiken et al. (1991).

4.4 Hypothesis Testing

This study examined the hypotheses and assessed the independent variables that influence the dependent variable: social influence, performance expectancy, facilitating conditions, effort expectancy, and perceived risk.

Table 2. Regression Model Summary

Model	R	R ²	Adj. R ²	SE of the Estimate
1	0.811 ^a	0.658	0.642	0.46047

a. Predictors: (Constant), Perceived Risk, Facilitating Conditions, Social Influence, Performance Expectancy, Effort Expectancy

b. Dependent Variable: Acceptance of Mobile Payment Services during the COVID-19 Pandemic

Table 2 illustrates that, in the multiple regression analysis of this research model, the focus was on R-squared, with a value of 0.658 for the acceptance of mobile payment services during the COVID-19 pandemic. This value indicated that 65.8% of the variability in user acceptance of mobile payment services during the pandemic can be explained by the independent variables: perceived risk, facilitating conditions, social influence, performance expectancy, and effort expectancy. The adjusted R-squared of 0.642 indicated that 64.2% of the variance in acceptance of mobile payment services during the COVID-19 pandemic was explained by perceived risk, facilitating conditions, social influence, performance expectancy, and effort expectancy, after accounting for sample size and multiple independent variables. It was crucial to note that the adjusted R² reflects the proportion of variance explained by the model after adjusting for the number of predictors and sample size. The beta values signified the influence of each independent variable on the dependent variable. As outlined by Pallant (2010), the highest beta value indicated the greatest impact of an independent variable on the dependent variable in the research. A negative beta value indicated an inverse relationship between the independent and dependent variables (Pallant, 2010). Table 3 below shows the influence of each independent variable on the dependent variable.

Table 3. The Result of Multiple Regression

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		β	SE	(β)		
1	(Constant)	0.994	0.444		2.242	0.027
	Social influence	0.061	0.058	0.078	1.059	0.292
	Performance expectancy	0.622	0.079	0.607	7.908	0.001
	Facilitating conditions	0.085	0.090	0.084	0.942	0.348
	Effort expectancy	0.144	0.095	0.141	1.512	0.134
	Perceived risk	-0.095	0.035	-0.158	-2.738	0.007

a. Dependent Variable: Acceptance of Mobile Payment Services during COVID-19 Pandemic

The results as in Table 3 illustrate that social influence did not significantly influence the acceptance of mobile payment services during the COVID-19 pandemic ($\beta=0.078$, $p>0.05$). Consequently, H1 was rejected. The results, aligned with previous research on medical teleconsultation conducted amid the epidemic. The authors proposed that the impact of social influence was more pronounced when applied to a creative solution, suggesting that medical teleconsultation, viewed as a videoconference, could be a novel concept for patients (Baudier et al., 2021). Additionally, the findings supported earlier research indicating that social influence did not affect user acceptance (Burnaz & Aydin, 2016; Zelly Alfany & Lalu Edy Herman Mulyono, 2019; Herget et al., 2021). This may be attributed to the notion that the opinions of others among users did not sway their decision to use mobile payment services during COVID-19, or it could be because individuals around users did not utilize mobile application payment services amid the pandemic.

The findings as in Table 3 indicated that performance expectancy significantly influenced the acceptance of mobile payment services during the COVID-19 pandemic ($\beta = 0.607$, $p < 0.05$). Therefore, H2 was accepted. The finding aligned with previous research that identifies performance expectancy as the primary factor influencing users' inclination to adaptively use mobile payment technology during a pandemic (Oliveira et al., 2016; Zhao et al., 2021; Herget et al., 2021). Thus, the significance of performance expectancy supported Zhao et al.'s (2021) assertion that the utility and practicality of mobile payments enhanced users' payment efficiency in emergencies. The strong influence of performance expectancy (Beta = 0.607) suggested that during a crisis, a system's practical utility and perceived safety become the primary drivers of adoption. Consequently, amid the pandemic, mobile payments were increasingly regarded as a valuable and secure payment method, mainly due to their speed, which enabled individuals to avoid direct and indirect contact with others (Zhao et al., 2021).

Furthermore, the facilitating conditions did not significantly influence the acceptance of mobile payment services during the COVID-19 pandemic ($\beta = 0.084$, $p > 0.05$). Consequently, H3 was rejected. The findings aligned with earlier research, indicating that the relationship between facilitating conditions (FC) and the acceptance and usage of mobile payment was not statistically significant (Khalilzadeh et al.,

2017; Oliveira et al., 2016; Slade, Dwivedi, et al., 2015). This suggested that support considerations may be more significant in the practical use of mobile payments than in the phase of intention to adopt.

The results also showed that effort expectancy did not significantly influence the acceptance of mobile payment services during the COVID-19 pandemic ($\beta = 0.141$, $p > 0.05$). Therefore, H4 was rejected. Following a previous study addressing technology acceptance issues in telemedicine and the adoption of mobile payment systems in China, the hypothesized relationship concerning effort expectancy was not supported (Baudier et al., 2021; Oliveira et al., 2016; Zhao et al., 2021). This lack of support for the hypothesized relationship was also reflected in the context of mobile payment usage in Portugal (Oliveira et al., 2016). Furthermore, Baudier et al. (2021) assessed the adoption of telemedicine technology during the pandemic and found it to be non-significant. This finding aligned with Zhao et al. (2021) research in China during the pandemic, which also found no significance. Zhao et al. (2021) attributed this to the integration of smartphone features into users' daily lives, resulting in higher skill levels among users in smartphone use through various applications. This perspective differed from that of Baudier et al. (2021), who argued that the lack of a valid and reliable relationship is consistent with previous studies in the healthcare industry.

Lastly, the outcomes presented in Table 3 revealed that perceived risk significantly influenced the acceptance of mobile payment services during the COVID-19 pandemic with ($\beta = -0.158$, $p < 0.05$). Therefore, H5 was accepted. While the pandemic encouraged contactless use to avoid health risks, users remained cautious of the digital security risks inherent in financial technology. Previous studies have demonstrated a negative relationship between perceived risk and intention levels (Kassim & Ramayah, 2015; Marafon et al., 2018). In this study, users' adoption of mobile payment services was notably influenced by their perceptions of COVID-19-related risks. Conversely, this suggested that the perception of COVID-19 risk was inversely related to the inclination to use physical currency (Kassim & Ramayah, 2015; Marafon et al., 2018).

Table 3 shows that acceptance of mobile payment services during the COVID-19 pandemic was strongly predicted by performance expectancy ($\beta = 0.607$, $p = 0.001$). The positive standardized coefficient ($\beta = 0.607$) indicated that when users believed the mobile payment service will help them achieve their goals, they are much more likely to accept it. The negative coefficient ($\beta = -0.158$) for perceived risk, which is statistically significant ($p = 0.007$), indicated that higher perceived risk is associated with lower acceptance of mobile payments. Concerns about security, privacy, or potential financial loss can deter people from using these services. The R-squared value in Table 2 indicated that the five independent variables explained 65.8% of the variation in acceptance of mobile payment services during the COVID-19 pandemic.

Table 4. Summary of the Hypotheses Result

Model	Result
1 There is a significant relationship between social influence and acceptance of mobile payment services during the COVID-19 pandemic.	Reject
2 There is a significant relationship between performance expectancy and acceptance of mobile payment services during the COVID-19 pandemic.	Accept

Model		Result
3	There is a significant relationship between facilitating conditions and acceptance of mobile payment services during the COVID-19 pandemic.	Reject
4	There is a significant relationship between effort expectancy and acceptance of mobile payment services during the COVID-19 pandemic.	Reject
5	There is a significant relationship between perceived risk and acceptance of mobile payment services during the COVID-19 pandemic.	Accept

In this study, social influence referred to the extent to which influential individuals, such as friends and family, believe that the user should utilize mobile payment services during COVID-19. This research indicated that social influence did not affect the user acceptance of mobile payment services. The study evaluated the adoption and acceptance of mobile payment applications, revealing that social influence does not affect the behavioral acceptance of these applications, aligning with the study's outcomes. Consequently, users were not swayed by the opinions and recommendations of family and friends regarding mobile payment services (Aydin & Burnaz, 2016; Zelly Alfany & Lalu Edy Herman Mulyono, 2019; Herget et al., 2021). Similarly, a study on the intention to adopt mobile payments during the COVID-19 pandemic in Germany (Herget et al., 2021) found that many individuals perceived as important by users were unable to use mobile payment services, and the opinions of family and friends around the respondent did not significantly influence the user's decision.

Based on the outcomes of this study, performance expectancy exerted the most significant influence on postgraduate students' acceptance of mobile payment services at the Malaysian Public University, who were poised to use them during the COVID-19 pandemic. This observation held despite the presence of other variables that influence the behavioral acceptance of these students. It suggested that the greater the perceived usefulness of mobile payment services, the more efficient activities such as grocery shopping and overall shopping become, and the higher users' inclination to accept and use them. This finding aligned with the conclusions of Davis et al. (1989) in their research to identify the most influential factors affecting individuals' intentions to use technology. According to their findings, the perceived usefulness of technology was the most crucial factor influencing users' intentions to adopt it. In line with previous studies, facilitating conditions had not significantly influenced the behavioral acceptance of mobile payment services (Khalilzadeh et al., 2017; Oliveira et al., 2016; Slade, Dwivedi et al., 2015). This suggested that users perceive the need for support and assistance when using mobile payment services during COVID-19 as less critical. Such support became more crucial during the actual utilization of mobile payment services than during the phase of intention to adopt. This research demonstrated that effort expectancy did not significantly influence the user acceptance of mobile payment services among postgraduate students.

This discovery contradicted the findings and models presented in prior technology acceptance research (Chong, 2013; Venkatesh & Davis, 2003; Davis et al., 1989). Furthermore, this outcome aligned with the conclusions of a study on telemedicine during COVID-19 (Baudier et al., 2021), which similarly found no significant relationship between the anticipated effort and the intention to adopt telemedicine during the pandemic. It was found that user acceptance of mobile payment services was significantly and negatively influenced by perceived risk. The study revealed that concerns about the risks related to mobile payments

significantly hindered their adoption. People who perceived mobile payments as risky were less inclined to use them, highlighting a major obstacle to widespread acceptance. Given that the use of physical currency has been likened to a potential vector for virus transmission, it is reasonable for users to consider transitioning to cashless transactions. This finding aligned with previous research, where users were apprehensive about virus transmission and anticipated the ubiquity of cashless transactions across various establishments. This anticipation stemmed from their reluctance to use physical currency due to concerns about potential virus infection (Ather et al., 2020; Daragmeh et al., 2021; Aji et al., 2020a; Auer et al., 2020; CC and Prathap, 2020; Durr, 2020).

The findings extend the UTAUT by demonstrating that performance expectancy remains the dominant predictor even under crisis conditions, suggesting that utilitarian value continues to drive technology adoption regardless of external disruptions. However, the significance of perceived risk introduced a critical nuance: unlike traditional financial risk perspectives, the pandemic context reframes risk as both a barrier (security concerns) and a catalyst (health safety concerns). This dual interpretation aligned with emerging socio-technical perspectives, in which external environmental shocks reshape user cognition and behavioural intentions. The non-significance of effort expectancy and facilitating conditions further suggested that mobile payment technologies have reached maturity, where usability and infrastructure are no longer primary concerns among digitally literate users.

5. CONCLUSION

This research had several limitations that should be acknowledged. The study focused on postgraduate students at a public university in Malaysia, restricting its scope to individuals with personal experience using mobile payment systems. Excluding students from other Malaysian universities may limit the generalizability of the findings. Additionally, the online survey questions may have been too narrow, potentially overlooking critical details and limiting the effectiveness of data collection. The study's age range of 25 to 60 years, reflective of postgraduate students at a Malaysian public university, also limited its ability to represent the broader population, as different generations may have varied experiences with mobile payment services. The conclusions of this study specifically applied to the external factors influencing mobile payment adoption during the COVID-19 pandemic. While the research provided valuable insights into mobile payment acceptance during this period, its theoretical implications were somewhat limited, as the model may not fully account for emergency circumstances in which transmission characteristics differ from those of COVID-19.

Despite these limitations, this study made several important contributions. First, it extended UTAUT by incorporating context-sensitive perceived risk, demonstrating that risk perception was not uniformly inhibitory but can function as an adoption driver in crisis contexts. Second, it provided empirical evidence from a developing economy, offering insights into how pandemic conditions reshape digital payment behavior. Third, it contributed to the broader technology adoption literature by highlighting the importance of external environmental shocks in moderating established theoretical relationships, thereby advancing a more dynamic and context-aware perspective of technology acceptance.

Moreover, the study provided valuable information for policymakers in the education and health sectors, emphasizing the importance of promoting contactless payment systems to minimize health risks during

pandemics and other public health crises. From an educational standpoint, it underscored the role of higher education institutions in fostering the adoption of innovative financial technologies, suggesting the integration of mobile payment education into curricula.

To enhance the accuracy and generalizability of future research, collaboration across different academic institutions is recommended. Expanding the age range to include a more diverse group of respondents, spanning generations X, Y, Z, and baby boomers, will provide a more comprehensive understanding of technology acceptance levels across demographics. Additionally, ongoing research on the relationship between mobile payment services and the COVID-19 pandemic is essential. Further exploration will identify the factors that promoted mobile payment adoption during such crises, with the aim of mitigating the impact of these crises. As evidence continues to accumulate, the case for mobile payment adoption during pandemics becomes increasingly robust and conclusive, underscoring the critical need for continued investigation in this area.

In summary, this study offers valuable criteria for future researchers in selecting respondents by considering their behavioral acceptance of mobile payment services during the COVID-19 pandemic. These insights can guide the design of future studies, ensuring that the selected participants reflect diverse perspectives and behaviors toward mobile payment adoption in crisis situations. Additionally, the findings contribute to a deeper understanding of how specific demographic factors and perceived risks influence technology acceptance, which can be pivotal in shaping future research frameworks. By building on these criteria, researchers can enhance the relevance and applicability of their findings in the evolving digital finance landscape, particularly in the context of public health emergencies.

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7. CONFLICT OF INTEREST STATEMENT

The authors agree that this research was conducted in the absence of any self-benefits, commercial or financial conflicts and declare the absence of conflicting interests with the funders.

8. AUTHORS' CONTRIBUTIONS

'Ain Nabilah Bukhari: Conceptualisation, methodology, formal analysis, and investigation; **Intan Salwani Mohamed:** Conceptualisation, methodology, and validation; **Siti Nur Shuhada Nazuri:** Conceptualisation, methodology, and writing manuscript; **Machmudin Eka Prasetya:** review and editing, and validation ; **Nurhidayah Yahya:** review and editing, and validation.

9. DATA AVAILABILITY/SUPPLEMENTARY MATERIALS

Available upon request:

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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