Consumer Adoption of Alipay in Malaysia: The Mediation Effect of Perceived Ease of Use and Perceived Usefulness

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ABSTRACT

Despite a growing trend in m-wallet services in Malaysia, the actual level of usage is considered low among all of the non-cash payment methods. The Malaysian government has taken a serious initiative in spurring the use of m-wallets by providing a one-off RM30 incentive to all eligible Malaysians. As such, it is important to understand the motivations behind m-wallet usage by examining Alipay, which is favoured in the international, as well as Malaysian markets. This research investigates the effects of mobile payment knowledge, personal innovativeness, self-efficacy, convenience, and compatibility on the actual adoption of Alipay in Malaysia with perceived ease of use and perceived usefulness, as the mediators. Using importance-performance map analysis (IPMA) and Variance Accounted For (VAF), based on Partial Least Squares - Structural Equation Modelling (PLS-SEM) on 260 respondents, it was discovered that compatibility and perceived usefulness demonstrated high importance in improving the performance of Alipay adoption. The results also showed a direct effect between compatibility and mobile payment knowledge. Additionally, perceived usefulness was shown to be an essential mediator in influencing the impact of compatibility and convenience on the actual adoption of Alipay. This study has

produced essential policy recommendations for both mobile wallet providers and policymakers on how to further promote the adoption of mobile wallets in Malaysia.

Keywords: Alipay, importance-performance map analysis, mobile commerce, mobile payment, mobile wallet, technology acceptance model

INTRODUCTION

Mobile commerce is a growing trend in Malaysia, and it changes how consumers make payments for both goods and services, as well as for transferring money to each other. The increased use of mobile commerce will boost the adoption of mobile wallets (m-wallets), in facilitating electronic transactions between individuals or organisations. An m-wallet is an application installed typically on a smartphone and can be used to store money and perform financial transactions instantly (Madan & Yadav, 2018). In comparison to traditional payment methods, m-wallets offer faster payment processing and require less effort. The number of m-wallet users in Malaysia keeps growing every year, as more service providers have penetrated the mobile payments market.

Despite the availability of numerous m-wallet providers, this has not assured a high rate of adoption, as compared to other payment methods, such as non-contact payment modes and credit cards (Garrett et al., 2014). Debit cards remain the top non-cash payment method in Malaysia with 63% of total users, as compared to m-wallets,

with only 8% (Bank Negara Malaysia, 2019). According to Ondrus et al. (2009), m-wallets are not widely accepted by users, particularly in the developing countries of Asia, although users are aware of their existence. M-wallet service providers must fully comprehend the determinants of m-wallet adoption for users, which will allow them to take practical measures to boost the usage of their m-wallet services. Besides, a better understanding of the determinants and adoption of m-wallets could assist the government in heightening m-wallet usage among Malaysians, which is in line with the blueprint of Malaysia's government[1].

Understanding the impact of individual users' characteristics in using an m-wallet is critical, as the traits of users will affect their adoption behaviour for the technology. The adoption of an m-wallet may be subject to individuals who are sometimes concerned with different aspects of mobile payment services, including the perceived benefits and hindrances (Pal et al., 2015). When an m-wallet serves as a mechanism for payment, as individuals do not have full control over the application, it may raise concerns over its fidelity. Thus, this lack of control and virtuality of transactions has created high uncertainty in the cashless society (Yan & Yang, 2015). In addition, users are also concerned about how much they are spending through m-wallets, as no physical cash is present. Overspending may

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[1] To accelerate the country's migration towards electronic payments, in order to increase the efficiency of the nation's payment systems (Bank Negara Malaysia, 2019).

happen, as some consumers believe that physical cash provides better control over their expenses (Nielson, 2019), subsequently leading to a lower level of self-efficacy to adopt m-wallets.

This study pays attention to the world's largest mobile payment platform, namely; Alipay (Arvidsson, 2014), which is also the largest third-party mobile payment application in China (Pham & Ho, 2015). Over the years, the number of registered Alipay users has increased rapidly (Bailey et al., 2017), which reinforces its popularity among m-wallet users. It is believed that Alipay makes network payments more dependable and narrows the perceived distance between merchants and consumers (Arvidsson, 2014). As one of the booming countries in implementing mobile payments, Malaysia has over 18,000 merchants who now accept Alipay nationwide. Malaysia was ranked 9th out of 10 countries that dominated overseas spending on Alipay in 2018. Besides, a 106% increase in spending, per Alipay user, and a 511% increase in total spending, as compared to 2017 were also recorded in 2018 (Tan, 2018). Moreover, Alipay has partnerships with Malaysia's top listed banks, such as CIMB Bank, Maybank, and Public Bank, as well as a collaboration with Touch 'n Go Sdn Bhd. Despite there being many local m-wallets available in the market, Alipay is recognised worldwide for its reliable financial services (Arvidsson, 2014) and accepted by numerous local and overseas stores, which gives a competitive advantage over other local m-wallets, which mostly focus on Malaysian stores only.

After the penetration of the mobile payments market by Alipay, the use of m-wallets among Malaysian consumers has increased markedly among different age groups. The number of m-wallet users aged between 25-34 years old increased by 5% over six months in 2016 (Lim, 2017). Such an increase in mobile users will predominantly drive mobile payment growth in Malaysia. However, the ascent of the adoption of mobile payment services in Malaysia does not seem to be fully achievable, due to the rivalry of the numerous existing service providers. The fierce competition among m-wallet providers in Malaysia has affected Malaysia's adoption rate of mobile payment services. Most local m-wallet providers in Malaysia have had to cede profits by offering zero merchant fees, incentives, discounts, and many have devised tactics to boost the adoption of their m-wallet applications (Pikri, 2018). Sen (2019) discovered that there was an extreme level of competition within the crowded m-wallet space in Malaysia, as many mobile wallet apps had been introduced, both from local and international providers.

It is important to address the issues highlighted above, regarding the adoption of m-wallets among Malaysians. Considering that Alipay is the world's largest m-wallet platform, it may be able to provide hints from the user perspectives, in terms of perceived ease of use (PEOU) and perceived usefulness (PU), by investigating the individual differences and the characteristics of mobile payments. Meanwhile, this study also bridges the gap between theory

and practice by employing importance-performance map analysis (IPMA), as an extension of PLS-SEM. IPMA can prioritise constructs and their indicators to improve a target construct (Ringle & Sarstedt, 2016). This leads to a predominant benefit in the study of m-wallets, based on the specific important insights from individual differences and mobile payment systems, together with the mediators of the PEOU and PU.

LITERATURE REVIEW

In this section, the theoretical background of the study has been developed by a review of the literature on technology acceptance theories, mobile wallets, individual differences, and mobile payment system characteristics. A proposed research model and hypotheses have also been included.

Theoretical Background

Several research models, such as; Theory of Planned Behaviour (TPB), Theory of Reasoned Action (TRA), and Unified Theory of Acceptance and Use of Technology (UTAUT) can explain the usage behaviour of information systems. However, the Technology Acceptance Model (TAM) remains a pioneering and significant theoretical model that explains users' adoption of information systems (Davis et al., 1989). The TAM was initially developed by Davis (1989) and, since then, it has become one of the most prevalent theories, which has been broadly studied and applied in the IS field (Surendran, 2012). The TAM details the antecedents

of computer acceptance across a wide range of end-user computing technologies and user populations (Rondan-Cataluña et al., 2015). Thus, it can anticipate user acceptance of certain information system applications. Although many new versions have emerged from the TAM, the two core beliefs, namely; PEOU and PU are the most relevant constructs, and both have been used in this study, as consumer actual adoption depends on whether a proposed system is favoured by the respondents (Taherdoost, 2018). Several recent pieces of literature have adopted PEOU and PU, as mediators in the TAM, such as in the studies by Gu et al. (2019), Moslehpour et al. (2018), and Nuryyev et al. (2020). Testing the mediating effects of PEOU and PU will demonstrate their important role in influencing the actual adoption of m-wallets.

In a similar research model, namely; UTAUT (Venkatesh et al., 2003), there are four important variables, which are the main determinants of users' behavioural intentions and usage behaviour. Some of the key constructs in UTAUT are somehow identical to the constructs in TAM. Nevertheless, UTAUT has moderating constructs that will moderate the impact of the four main variables towards usage intention and behaviour, thus, it cannot measure the direct impact of m-wallet adoption. For instance, S. Kim and Baek (2018) used TAM to examine the determinants of the behavioural intention to use mobile payments, as UTAUT had moderating effects that could affect the overall results. Besides, TAM has been continuously

improvised by many scholars and extended to the usage of new information systems, such as m-wallet applications. Some recent literature, which have employed the TAM to examine human behaviour towards online payment acceptance includes Martens et al. (2017) and Ramos-de-Luna et al. (2016). In this study, TAM has been extended with several external factors that have been grouped into 2 dimensions, namely; individual differences and mobile payment systems.

Mobile Wallet, Individual Differences, and Characteristics of Mobile Payment System

With the continuous improvements that have been made in m-wallets, it is undeniable that m-wallets are acceptable in various business models for the convenience of merchants, including; small-sized business owners (Singh & Sinha, 2020). Sorensen (2018) revealed that mobile wallets were capable of embedding various payment technologies, such as Near Field Communication (NFC) and QR codes to perform both in-store and remote payments. Hoofnagle et al. (2012) claimed that m-wallets were not used just for keeping payment data, but also for storing many kinds of loyalty cards and coupons, which offered additional benefits for users. Furthermore, the ubiquity of m-wallets enables users to make online transactions, anytime and anywhere, providing that the mobile device is connected to the Internet.

The study of the intention to use, or adopt, is commonly found in prior literature. The relationship between the intention to use and actual adoption has been confirmed in existing studies regarding mobile payment services, such as those by Jaradat and Al-Mashaqba (2014) and Rashed et al. (2014). Furthermore, some more recent studies have concentrated on the actual adoption of mobile payments, and have predominantly relied on the TAM, together with additional constructs, for example, H.-Y. Kim et al. (2017), Martens et al. (2017), and Ramos-de-Luna et al. (2016). It is interesting to embed actual adoption as the main endogenous variable, to be tested with PEOU and PU. Besides, few studies have so far considered mobile payment system characteristics and individual differences in a single research model as the determinants of actual consumer adoption of m-wallets (C. Kim et al., 2010). Therefore, it is recommended to have multiple perspectives in examining m-wallets and their diffusion; challenges, complexity, dynamism, market-level, as well as behavioural facets, to explain the diffusion of mobile payment systems (Ondrus et al., 2009).

Individual differences and system characteristics are two dimensions that are often included as external exogenous variables in the TAM to determine the information systems usage (Taherdoost, 2018). Existing literature has studied the link between individual characteristics and the acceptance of information systems using the TAM (Agarwal & Prasad, 1998; Venkatesh, 2000). Those studies have confirmed the roles of individual differences in influencing users' behaviour with innovativeness, m-payment knowledge

and self-efficacy, as constructs (C. Kim et al., 2010; Pal et al., 2015; Pham & Ho, 2015). System characteristics are also vital, as the design characteristics of a system will bring significant effects towards the ease of use and usefulness of the system (Davis, 1989). The characteristics of mobile payment systems play an essential role in influencing the adoption of m-wallets among individuals, however, this has rarely

been studied empirically (C. Kim et al., 2010).

Research Model

The proposed research model used in this study consists of two dimensions with five constructs. All constructs will be examined directly with the actual adoption as well as its mediating effects with PEOU and/or PU as shown in Figure 1.
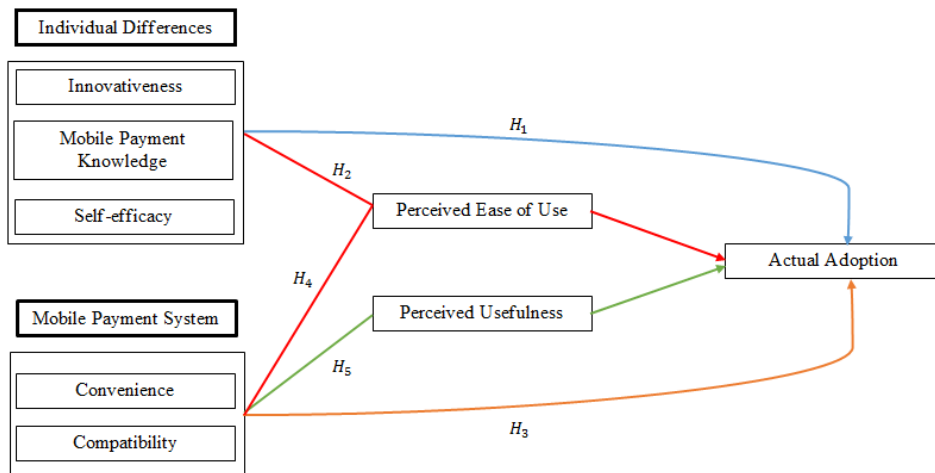

Figure 1. Research model (Adapted from C. Kim et al. (2010) and G. Wang et al. (2019))

Individual Differences. Individual differences are highly relevant to mobile commerce applications. C. Coursaris and Hassanein, (2002) and C. Kim et al. (2010) discussed that there was a huge growing interest in individual differences with mobile payment user behaviour studies. The individual differences consist of three constructs, which are; personal

innovativeness, mobile payment knowledge and self-efficacy.

Personal Innovativeness. One of the individual differences used in this study was personal innovativeness, which can be referred to as the degree of willingness of an individual to try a particular innovation (Agarwal & Prasad, 1998). It

is believed that individuals with higher personal innovativeness will have higher positive perceptions and intentions to use a particular innovation. Pham and Ho (2015) investigated the relationship between personal innovativeness and the intention to adopt mobile payment services in Taiwan. A positive relationship was confirmed, in the sense that early adopters and individuals with innovativeness had a strong willingness to learn and use mobile payment services. The term innovative individuals usually refers to people with a high level of curiosity to discover and seek information with regards to a new idea. Other similar studies related to personal innovativeness include Li et al. (2014), Shaw (2015), and Yang et al. (2012). It is believed that innovative individuals find m-wallets easy to use, as they have no issue with adapting to such new technology. Thus, this study offers the following hypotheses:

H_{1a}: Personal innovativeness will have a significant positive relationship with the actual adoption of Alipay in Malaysia.
H_{2a}: Personal innovativeness will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.

Mobile Payment Knowledge. A notion claims that m-wallets are relatively easy to use for individuals with higher mobile payment knowledge, as compared to individuals without such knowledge (C. Kim et al., 2010). Rogers (1995) proposed that sufficient knowledge from different channels was needed for individuals to be aware of the innovation and its benefits. Li et al. (2014) found that mobile payment knowledge was positive and significant to the behavioural intention of mobile payment adoption in China. They contended that consumers who possessed information and knowledge of mobile payment services tended to have a higher willingness to use mobile payment services. Other studies that have examined the relationship between mobile payments knowledge and PEOU include; C. Kim et al. (2010) and Pal et al. (2015). These studies believed that users, particularly the early adopters, who knew mobile payment services, would perceive them as easy to use, no matter how complex was the new technology. Thus, this study offers the following hypotheses:

H_{1b}: Mobile payment knowledge will have a significant positive relationship on the actual adoption of Alipay in Malaysia.
H_{2b}: Mobile payment knowledge will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.

Self-efficacy. Self-efficacy refers to an individuals' belief in their ability to perform a specific activity, or use an innovation (Bandura, 1997). Self-efficacy, in this study, refers to an individuals' belief that they have the skills and ability to use an m-wallet. Literature related to self-efficacy has been discussed in various domains of innovation adoption, such as the adoption of online shopping, mobile data services, and apparel retailing technologies. Nevertheless, it has been given less attention in the context of m-wallet adoption. Bailey et al. (2017)

conducted a similar study using an extended version of the TAM in the US and they argued that self-efficacy would lead to the adoption of mobile payments through PEOU because users would be convinced about the capabilities of mobile payment services, such as having a user-friendly interface. This was in line with other studies, such as Shaw (2015) and Alalwan et al. (2016). Thus, this study offers the following hypotheses:

H_{1c}: Self-efficacy will have a significant positive relationship on the actual adoption of Alipay in Malaysia.

H_{2c}: Self-efficacy will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.

Mobile Payment Systems. In this study, we expected the characteristics of mobile payment systems to have a direct effect on PEOU and PU, as past literature has proved a strong relationship between the TAM and system characteristics (Davis, 1993; Pal et al., 2015; Venkatesh & Davis, 2000). Four common constructs have been used in previous literature, namely; mobility, reachability, convenience, and compatibility. However, mobility and reachability were excluded in this study, as m-wallets in Malaysia are considered new and the Internet infrastructure is not fully developed[2].

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2   There have been many complaints made by broadband users regarding dismal connectivity, although they are being promised improved services by the telco's, while the MCMC is currently concluding its National Fiberisation and Connectivity Plan (NFCP) (The Star, 2019).

Convenience. Convenience is a principal characteristic of mobile payments, which provide on-time utility and place to the consumers (C. Kim et al., 2010). Convenience refers to the situation where m-wallets, as a technology, will reduce any difficulty related to common tasks, therefore, making people's lives easier, so that users enjoy the benefits of using it (Obe & Balogun, 2007). Using the Technology Readiness Index (TRI) model, Humbani and Wiese (2018) confirmed the positive and significant association between convenience and the adoption of mobile payments. The authors found that more male users were concerned with the convenience factors offered by mobile payment systems, which include the ability to integrate payments among different mobile payment applications. Other similar studies have also supported convenience as a vital construct that influences mobile payment adoption (Humbani & Wiese, 2018; C. Kim et al., 2010; Pal et al., 2015; Shin, 2010). These studies believed that mobile payment systems had a high degree of usefulness and ease of use related to their features of portability and flexibility. As mobile devices and their user interfaces have improved over the years, this study offers the following hypotheses:

H_{3a}: Convenience will have a significant positive relationship on the actual adoption of Alipay in Malaysia.

H_{4a}: Convenience will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.

H_{5a}: Convenience will be mediated by the PU towards the actual adoption of Alipay in Malaysia.

Compatibility. Compatibility refers to the degree of consistency on the perception of potential users towards a particular innovation with their experience, values, and needs (Rogers, 1995). Compatibility relies on how well the technology (mobile payments) is integrated into users' daily lives (Yang et al., 2012). Some extant literature has confirmed compatibility as among the consistent determinants for the adoption of mobile-technology-based services (Al-Jabri & Sohail, 2012; Lin, 2011; Mallat, 2007). Based on a study concerning the adoption of mobile payments using NFC-enabled technology in China, Li et al. (2014) supported a positive significant impact of compatibility on the PU. They argued that users' concerns were related to the simplicity and versatility of mobile payments. Yang et al. (2012) found that users were concerned with the emotional appeal, rather than the functionalities offered in mobile payment applications, which supported the relationship between mobile payments and compatibility. Hence, this study offers the following hypotheses:

H_{3b}: Compatibility will have a significant positive relationship on the actual adoption of Alipay in Malaysia.
H_{4b}: Compatibility will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.

H_{5b}: Compatibility will be mediated by the PU towards the actual adoption of Alipay in Malaysia.

RESEARCH METHODS
Survey research was used to analyse the linkages between the exogenous constructs and endogenous constructs through interceding variables. Cross-sectional data were used to observe specific phenomena at single points of time. Such correlational research design provided a huge amount of data through the real-world observation of m-wallet users.

Sampling Design
This study adopted a purposive sampling technique to identify qualified survey respondents who were individuals owning a smartphone with the Alipay application installed. The respondents must have been using Alipay for the previous three months to ensure that the data collected was compatible with the latest application version. The capital city of Malaysia, Kuala Lumpur was selected as the sampling location since Kuala Lumpur is the major economic, financial, and cultural hub of Malaysia. The penetration rate of mobile phones in Kuala Lumpur was 186 per 100 inhabitants, which was the highest among all of the cities in Malaysia (Malaysian Communications and Multimedia Commission [MCMC], 2017). Besides, the city itself has a fair balance of major ethnic groups to represent the general population characteristics of Malaysia. Furthermore, Kuala Lumpur is one of the

cities that has achieved the digital maturity level of digital payments (Kadar et al., 2019). A minimum of 195 respondents was required, following the general thumb-rule (Hair et al., 1998). However, this study distributed 300 questionnaires, and a total of 260 questionnaires were successfully collected over 8 weeks.

Research Instrument

The multiple-item questions in the questionnaire were measured using a five-point Likert scale starting from 1 (strongly disagree) to 5 (strongly agree). Using a five-point Likert scale minimised confusion, improved response rates, and quality and ensured higher reliability. To begin with, a sample questionnaire was reviewed and pretested by several experts in the mobile commerce field. A pilot test was subsequently conducted with 30 respondents who were heavy Alipay users. The next step was to obtain ethical clearance from the University, whereby, the questionnaire would be reviewed and approved by the Ethical Clearance Committee (ECC).

Data Analysis Methods

Partial Least Square (PLS) Smart program version 3.0 (SmartPLS 3.0) was used to perform significance and normality testing through the t-test statistic from the bootstrapping procedure. PLS is highly recommended for this type of study because it is related to theory building and predictive applications (Gefen et al., 2000). It is also able to maximise the explanation on the variance of a model using a small sample size (Hair et al., 2013).

RESULTS AND DISCUSSION

Descriptive Analysis

The descriptive analysis examined the demographic profile of each of the respondents. Table 1 indicates that female users (56.549%) possessed a higher level of adoption of Alipay in Malaysia, as compared to male users (43.46%). Besides, young adults (aged 25-39 years old) and teenagers (aged below 24 years old) were keen to use Alipay, which represented the largest percentages of 50 percent and 42.31 percent, respectively. Meanwhile, none of the elderly, aged 55 years old and above, were using Alipay. This showed that younger consumers were familiar with mobile technology, while the elderly resisted using this form of new technology.

Besides, most of the sampled Alipay users were working adults (80%) and hold a Bachelor's degree (83.85%), indicating a high consciousness in using m-wallet. Surprisingly, the lower-middle-income group (RM3,000-RM4,500), and low-income (RM1,501-RM3,000) occupied the highest rankings for the adoption of Alipay, which can be explained by these groups of consumers aiming to increase their savings by gaining discounts and promotions while using Alipay. However, most Alipay users (78.85%), merely carried out transactions between one to three times per month. This illustrated that the adoption of Alipay in Malaysia was less popular, as compared to Alipay's usage in China.

Table 1

Descriptive data

Demographic Characteristics		Frequency	Percentage (%)
Gender	Male	113	43.46
	Female	147	56.54
Age (years)	Below 24	110	42.31
	25-39	130	50
	40-54	20	7.69
	55 and Above	0	0
Educational Level	Primary or below	0	0
	High School/ Secondary level	8	3.08
	College Diploma	18	6.92
	Bachelor Degree	218	83.85
	Master Degree	14	5.38
	Doctorate Degree or higher	0	0
Occupation	Student	31	11.92
	Private employees	208	80
	Retired/Unemployed	0	0
	Self-employed	11	4.23
	Civil servant	10	3.85
	Others	0	0
Monthly Personal Income	Below RM1,500	28	10.77
	RM1,501-RM3,000	92	35.38
	RM3,001-RM4,500	118	45.38
	RM4,501-RM6,000	16	6.15
	More than RM6,000	5	1.92
Alipay monthly usage	1-3 times	205	78.85
	4-6 times	43	16.54
	7-10 times	10	3.85
	More than 10 times	2	0.77

Scale Measurement

Outer Loading. Table 2 depicts that the majority of outer loadings for the respective indicators were greater than 0.70, which is the accepted level recommended by Nascimento and Macedo (2016). The lowest outer loading values; PEOU1 (0.563) and SE5 (0.568) were greater than 0.40, thus, they did not need to be removed from the measurement models (Henseler et al., 2014). It showed that all of the latent variables explained a substantial part of each indicator's variance. The measurement model was also illustrated in Figure 2.

Table 2

Outer loading

	AA	COM	CON	MPK	PEOU	PI	PU	SE
AA1	0.736							
AA2	0.712							
AA3	0.761							
AA4	0.755							
AA5	0.725							
COM1		0.721						
COM2		0.767						
COM3		0.784						
COM4		0.781						
COM5		0.649						
CON1			0.705					
CON2			0.805					
CON3			0.801					
CON4			0.651					
CON5			0.691					
MPK1				0.744				
MPK2				0.736				
MPK3				0.799				
MPK4				0.779				
MPK5				0.745				
PEOU1					0.563			
PEOU2					0.741			
PEOU3					0.730			

Table 2 *(Continued)*

	AA	COM	CON	MPK	PEOU	PI	PU	SE
PEOU4					0.709			
PEOU5					0.687			
PI1						0.710		
PI2						0.666		
PI3						0.725		
PI4						0.717		
PI5						0.720		
PU1							0.732	
PU2							0.741	
PU3							0.763	
PU4							0.741	
PU5							0.779	
SE1								0.705
SE2								0.646
SE3								0.722
SE4								0.705
SE5								0.568

Construct Reliability and Validity Test

Table 3 consists of the tests of composite reliability, convergent reliability, and discriminant reliability. These tests were applied to examine the internal consistency and reliability of the model. In Table 3, each of the respective constructs showed a high level of internal consistency, as the values of composite reliability were between .80 and .90, which is greater than the suggested threshold of .60 (Hair et al., 2014). Cronbach's alpha is used to measure the internal consistency of a test, connected to the inter-relatedness of the items (Lunneborg, 1979). All of the reflective constructs were found to have a high level of interrelatedness between the items, as the values of Cronbach's alpha were greater than .70.

The average variance extracted (AVE) was used to assess the convergent validity in the indicator constructs (Hair et al., 2014). Fornell and Larcker (1981) claimed that an AVE of .4, or below, was still acceptable, as long as the composite reliability value was greater than .60. Thus, the values of the AVE for all of the reflective constructs had an adequate level of convergent validity, as shown in Table 3.
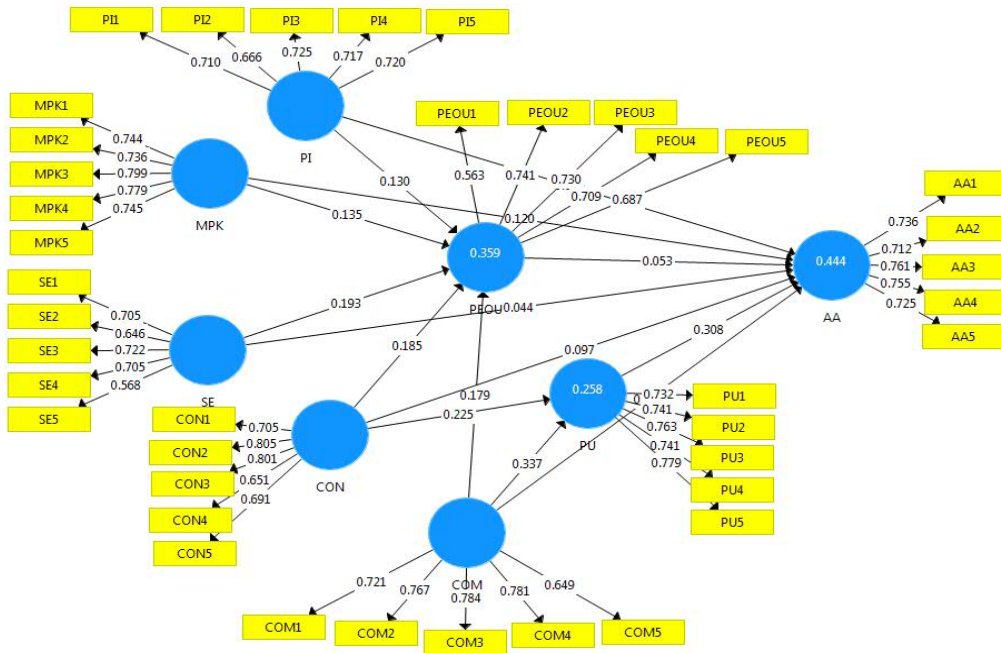
Figure 2. PLS-SEM measurement model

Table 3

Construct reliability and convergent validity

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
AA	.795	.803	.857	.545
COM	.796	.807	.859	.551
CON	.782	.784	.852	.537
MPK	.820	.827	.873	.579
PEOU	.723	.734	.817	.474
PI	.755	.761	.834	.501
PU	.807	.808	.866	.565
SE	.704	.686	.803	.451

Discriminant Validity Test

Fornell –Larcker Criterion. The Fornell-Larcker criterion compares the square root of the AVE with the correlation of latent constructs. Hair et al. (2017) supported that the square root of each construct's AVE should be greater than the correlations with other latent constructs. Table 4 shows that the diagonal values of each variable

were found to be greater than the off-diagonal inter-construct correlation values, respectively.

Cross Loading Criterion. The Cross-loading criterion evaluates the impact of an indicator, in comparison with all of the other indicators (Hair et al., 2014). To determine the strong representation of the latent variable from the discriminant validity, the loading value of an indicator should be greater than all of the other indicators in the construct. Table 5 illustrates that the

diagonal value of each indicator's cross-loading was greater than the other indicators in the construct, respectively.

Heterotrait-Monotrait Ratio (HTMT). Kline (2011) asserted that HTMT values should fall below 0.85 for conceptually distinct constructs. Based on Table 6, the highest HTMT value was recorded as 0.798, which fell below 0.85. This illustrated that the true correlation between the two constructs was reliable, with no error.

Table 4

Fornell-Larcker criterion

	AA	COM	CON	MPK	PEOU	PI	PU	SE
AA	0.738							
COM	0.540	0.742						
CON	0.469	0.619	0.733					
MPK	0.435	0.387	0.413	0.761				
PEOU	0.467	0.470	0.467	0.430	0.689			
PI	0.280	0.361	0.326	0.528	0.376	0.708		
PU	0.572	0.477	0.434	0.497	0.620	0.313	0.752	0.67
SE	0.371	0.402	0.375	0.416	0.424	0.258	0.402	1

Table 5

Cross loading

	AA	COM	CON	MPK	PEOU	PI	PU	SE
AA1	0.736	0.457	0.389	0.351	0.488	0.212	0.579	0.243
AA2	0.712	0.333	0.256	0.168	0.187	0.176	0.307	0.248
AA3	0.761	0.371	0.314	0.169	0.287	0.190	0.316	0.324
AA4	0.755	0.386	0.395	0.387	0.381	0.212	0.486	0.276
AA5	0.725	0.413	0.332	0.455	0.288	0.233	0.326	0.288
COM1	0.369	0.721	0.558	0.346	0.368	0.309	0.365	0.331
COM2	0.354	0.767	0.417	0.323	0.333	0.361	0.324	0.278

Table 5 *(Continued)*

	AA	COM	CON	MPK	PEOU	PI	PU	SE
COM3	0.494	0.784	0.370	0.258	0.400	0.219	0.379	0.339
COM4	0.444	0.781	0.497	0.297	0.367	0.225	0.397	0.328
COM5	0.311	0.649	0.481	0.212	0.256	0.251	0.288	0.187
CON1	0.341	0.432	0.705	0.321	0.337	0.216	0.265	0.219
CON2	0.332	0.476	0.805	0.427	0.393	0.380	0.343	0.257
CON3	0.310	0.521	0.801	0.313	0.382	0.270	0.317	0.233
CON4	0.413	0.375	0.651	0.213	0.280	0.148	0.350	0.338
CON5	0.315	0.462	0.691	0.231	0.312	0.168	0.305	0.324
MPK1	0.248	0.336	0.358	0.744	0.352	0.477	0.338	0.322
MPK2	0.189	0.264	0.323	0.736	0.293	0.420	0.336	0.328
MPK3	0.429	0.291	0.337	0.799	0.305	0.415	0.373	0.293
MPK4	0.413	0.263	0.277	0.779	0.308	0.375	0.415	0.304
MPK5	0.317	0.323	0.290	0.745	0.377	0.344	0.416	0.346
PEOU1	0.155	0.255	0.330	0.333	0.563	0.292	0.228	0.215
PEOU2	0.278	0.246	0.301	0.204	0.741	0.270	0.377	0.277
PEOU3	0.364	0.439	0.395	0.378	0.730	0.406	0.361	0.331
PEOU4	0.348	0.294	0.290	0.287	0.709	0.137	0.555	0.298
PEOU5	0.409	0.339	0.283	0.263	0.687	0.173	0.581	0.315
PI1	0.242	0.280	0.302	0.316	0.202	0.710	0.201	0.134
PI2	0.249	0.201	0.100	0.192	0.127	0.666	0.153	0.117
PI3	0.159	0.158	0.227	0.319	0.278	0.725	0.139	0.169
PI4	0.135	0.288	0.246	0.347	0.320	0.717	0.268	0.177
PI5	0.219	0.324	0.252	0.596	0.348	0.720	0.307	0.277
PU1	0.407	0.358	0.367	0.360	0.493	0.142	0.732	0.370
PU2	0.418	0.378	0.415	0.396	0.512	0.196	0.741	0.365
PU3	0.437	0.378	0.326	0.421	0.401	0.295	0.763	0.235
PU4	0.396	0.337	0.244	0.304	0.448	0.302	0.741	0.248
PU5	0.486	0.338	0.268	0.379	0.474	0.247	0.779	0.289
SE1	0.258	0.243	0.208	0.380	0.217	0.249	0.258	0.705
SE2	0.255	0.196	0.151	0.196	0.125	0.057	0.178	0.646
SE3	0.231	0.262	0.242	0.209	0.210	0.118	0.244	0.722
SE4	0.235	0.267	0.168	0.244	0.284	0.152	0.281	0.705
SE5	0.247	0.318	0.387	0.309	0.445	0.225	0.320	0.568

Table 6

Heterotrait-Monotrait Ratio (HTMT)

	AA	COM	CON	MPK	PEOU	PI	PU	SE
AA								
COM	0.654							
CON	0.577	0.794						
MPK	0.496	0.479	0.517					
PEOU	0.581	0.594	0.617	0.552				
PI	0.362	0.463	0.409	0.640	0.481			
PU	0.677	0.588	0.541	0.603	0.798	0.388		
SE	0.490	0.497	0.461	0.521	0.537	0.314	0.500	

Model_Fit. Table 7 shows the model fit measures, such as SRMR, NFI, and RMS_theta. The SRMR was estimated as .089, which was less than .10, hence, the model was considered to be a good fit. Besides, the NFI was recorded as .562 that aims to be closer to 1. The value of .133 for RMS_theta was closer to zero, which also proved a good model fit, where the correlations between the outer model residuals were relatively small.

Multivariate Skewness and Kurtosis. Table 8 indicates the estimation of the multivariate skewness and kurtosis, including excess kurtosis. In conjunction with the standard deviation, the kurtosis values were relatively smaller. On the other hand, the skewness indicates the negative, or left side, of the data distribution where the estimated values ranged from -0.706 to -2.05.

Common Method Bias. According to Kock and Lynn (2012), the full collinearity

Table 7

Model fit

	Value
SRMR	.089
NFI	.562
RMS_theta	.133

VIF are generated to assess the common method bias in the model. Table 9 shows that the values of all of the VIFs from the full collinearity test were less than 3.3, whereby, the model was considered to be without common method bias.

Importance-Performance Map Analysis (IPMA)

Figure 3 shows that the two direct predecessors, COM and PU, possessed predominantly high importance. Based on Table 10, COM (0.406) was considered to have a higher importance than PU (0.343). However, COM had a relatively low performance of 62.689. Besides, the relatively high performance of PU also

Table 8

Multivariate Skewness and Kurtosis

	Mean	Standard Deviation	Excess Kurtosis	Skewness
AA	3.477	0.757	0.352	-0.561
COM	3.508	0.705	0.270	-0.234
CON	3.456	0.747	0.846	-0.706
MPK	3.689	0.741	0.624	-0.506
PEOU	3.658	0.645	0.023	-0.205
PI	3.605	0.656	-0.001	-0.207
PU	3.664	0.685	0.086	-0.510
SE	3.718	0.603	0.481	-0.391

Table 9

Full Collinearity VIF

	AA	COM	CON	MPK	PEOU	PI	PU	SE
Common Method Bias	1.797	1.998	1.816	1.820	1.904	1.482	2.093	1.402
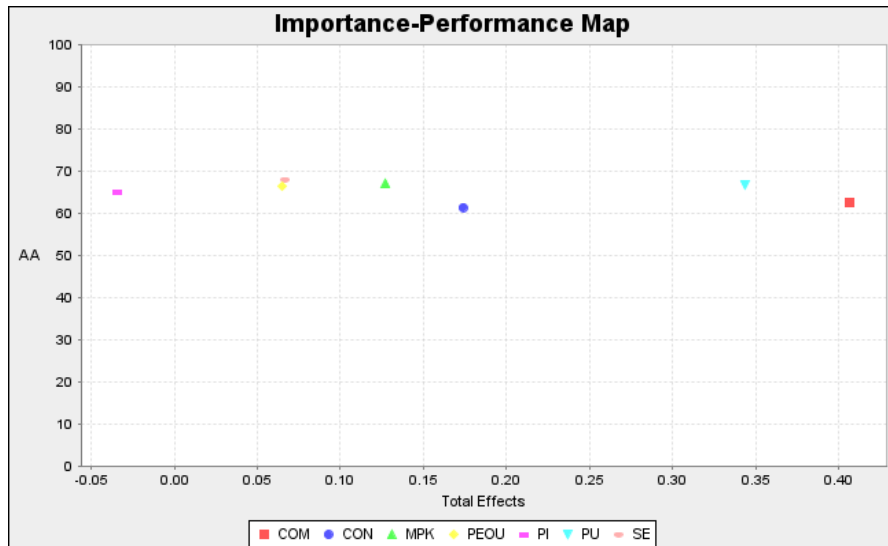
Figure 3. Importance-performance map (construct level) of target construct AA

indicated that it should be focused to improve the performance of target construct AA. Therefore, managerial action should emphasise on improving the performance of COM towards AA, followed by PU, which would also mediate the effect between COM and AA. The PLS path model and IPMA results were illustrated in Figure 4.

The results show that compatibility was the strongest predictor for Alipay adoption, followed by PU. The importance of compatibility has been demonstrated in prior studies, such as S. Kim and Baek (2018) and Ozturk et al. (2016). It implied that when Malaysians perceived that the adoption of Alipay fitted well with the way they like to make payments, they would switch to mobile payments. This study also discovered the essential role of PU in enhancing Alipay usage in Malaysia, either directly or indirectly, as a strong mediator between compatibility and actual adoption. The results were in line with previous literature that suggested that the enhancement of job performance by using mobile technology would contribute to its adoption (Chi, 2018; Koksal, 2016).

Table 10
Data of importance-performance map for construct AA

	Importance	Performances
COM	0.406	62.689
CON	0.174	61.399
MPK	0.127	67.227
PEOU	0.065	66.453
PI	-0.034	65.126
PU	0.343	66.611
SE	0.067	67.943

Figure 5 displays the indicator COM3 ("Alipay fits into my lifestyle"), which possessed a relatively high level of importance when concentrating on the construct COM, while performance still could be improved. Therefore, the Alipay company should fully comprehend the Malaysian lifestyle, in terms of geographical, cultural, and social diversity, to ensure the compatibility of its mobile wallet service. In fact, various past studies have looked into the relationship between lifestyle practices and consumers' behaviour or attitudes towards certain technologies (Axsen et al., 2012; C. K. Coursaris, & Van Osch, 2015).

On the other hand, the indicator PU2 was discovered to be the most important indicator to improve the level of Alipay adoption for the PU construct. It is vital to enhance the ease of payment, based on the users' feeling of controlling and managing, the speed of digital interaction, and the
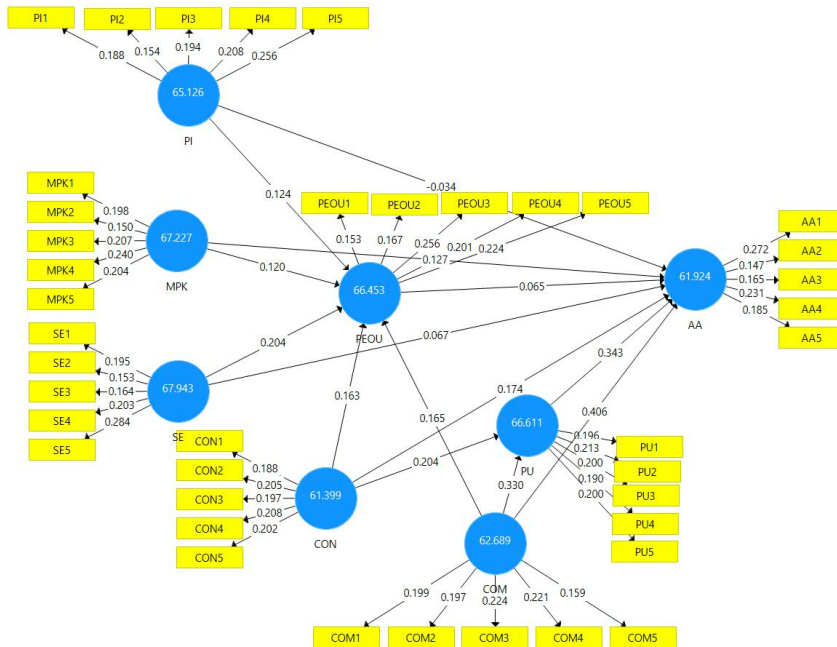
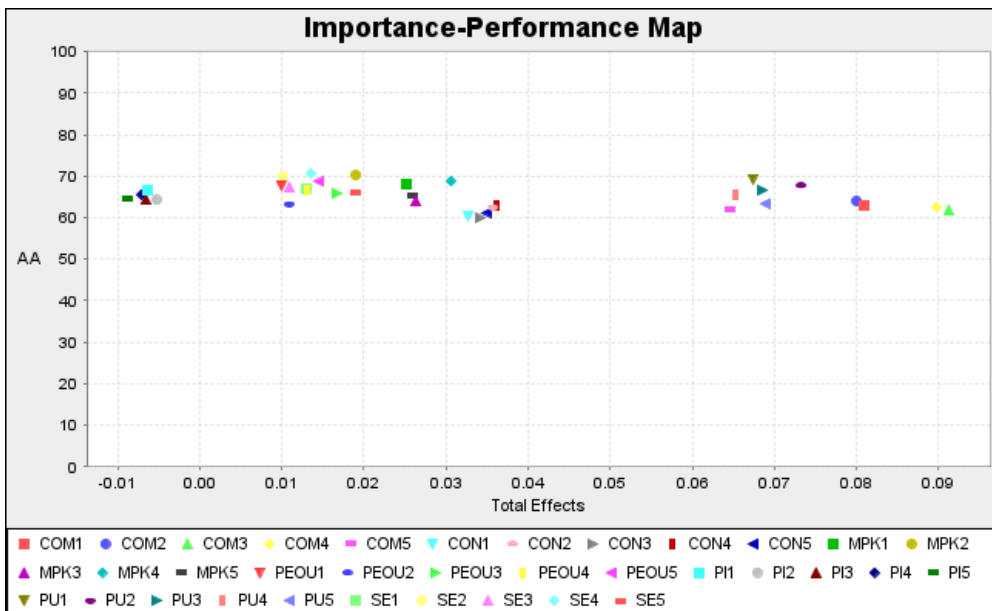*Figure 4.* PLS path model and IPMA results

Figure 5. Importance-performance map (indicator level) of target construct AA

receipt of notifications that complement their smartphone functions and features. According to previous studies, such as that of Jahmani et al. (2018), what facilities a technology can offer, influences users' satisfaction towards using that technology. This can, in turn, affect the actual usage of the said technology.

Direct Effect

Based on Table 11, only compatibility (COM) had a significant positive relationship with the actual adoption of Alipay, which indicated that consumers would select Alipay if the mobile wallet service was more integrated with their daily lives, or needs (Al-Jabri & Sohail, 2012; Lin, 2018; Mallat, 2007). This finding was supported by Cheng (2015) and Isaac et al. (2019) who found that compatibility contributed a significant impact, leading to the high rate of adoption of high new technologies in the IS field.

Diversely, the hypothesis of H1b was supported at the 10% significance level, where mobile payment knowledge (MPK) might affect, but at a lower level, on the adoption of Alipay. This indicated that sufficient knowledge regarding the technology would cause consumers to use the mobile payment service (Pal et al., 2015). This reflects more on the younger generation, rather than the elderly. Youngsters are more familiar with m-wallets and possess more knowledge about new technology, thus, encouraging them to adopt such technology. Such finding was supported by the descriptive analysis, as the majority of Alipay users were found to be young adults and teenagers.

The other factors, such as personal innovativeness, self-efficacy, and convenience were found to have no relationship with the actual adoption of Alipay. The findings were in agreement with Kabra et al. (2017) and Zainab et al. (2017) who revealed that personal innovativeness and self-efficacy did not affect the usage of technology. This may indicate that Malaysians are lacking confidence and skills in adopting mobile payment services due to inadequate exposure. Thus, the public should be educated on how to use mobile payment services so that the technology can become an integral part of people's lives.

Table 11

Hypothesis testing for direct effect

Hypothesis	Path Coefficient (C)	P-Values (P)	Confidence Intervals Bias Corrected		Supported
			2.5%	97.5%	
H$_{1a}$: Personal innovativeness will have a significant positive relationship on the actual adoption of Alipay in Malaysia.	-.036	.599	-.168	.096	No

Table 11 *(Continued)*

Hypothesis	Path Coefficient (C)	P-Values (P)	Confidence Intervals Bias Corrected		Supported
			2.5%	97.5%	
H₁ᵦ: Mobile payment knowledge will have a significant positive relationship on the actual adoption of Alipay in Malaysia.	.120	.069	-.011	.249	No (5% sig. level) Yes (10% sig. level)
H₁꜀: Self-efficacy will have a significant positive relationship on the actual adoption of Alipay in Malaysia.	.044	.540	-.105	.179	No
H₃ₐ: Convenience will have a significant positive relationship on the actual adoption of Alipay in Malaysia.	.097	.134	-.036	.218	No
H₃ᵦ: Compatibility will have a significant positive relationship on the actual adoption of Alipay in Malaysia.	.257	.000	.128	.396	Yes

Mediation Effect

The mediation effect between the explanatory variables and the actual adoption of Alipay was determined based on a two-stage estimation that was, (1) significance of mediation effect on indirect effect and (2) strength of mediation effect using the Variance Accounted For (VAF). Based on Table 12, surprisingly, PEOU had no mediation effect on all of the explanatory variables and the actual adoption of Alipay. This might have been due to the Alipay wallet not being easily adopted in Malaysia. For example, the English language version of Alipay is not comprehensive for all Malaysians, as the application is mostly displayed in the Chinese language.

The mediator of the PU was found to partially mediate the relationship between convenience and compatibility towards the actual adoption of Alipay. The convenience variable was not directly related to the actual adoption of Alipay but was mediated by the PU to form a significant relationship. This implied that convenience might not be the main concern unless consumers believed that using Alipay would enhance their payment performance through mobile

devices. Besides, compatibility was found to be a strong determinant of the adoption of Alipay in Malaysia. The partial mediation signified that the relationship between compatibility and the actual adoption of Alipay was also linked through the PU. Consumers who believed that the use of Alipay was to fulfil their needs would adopt it without hesitation. Besides, the result of the PU influencing actual adoption was consistent with the findings from previous studies (e.g. Liu et al., 2018; Z. Wang & Dong, 2016), which demonstrated that new inventions with a higher PU tended to be easily accepted by consumers.

Table 12

Hypothesis testing for mediation effect

Hypothesis	Indirect Effect		Confidence Intervals Bias Corrected		Variance Accounted For (VAF)	Supported
	Coefficient	P-values (P)	2.5%	97.5%		
H_{2a}: Personal innovativeness will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.	.007	.587	-.013	.039	-	No
H_{2b}: Mobile payment knowledge will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.	.007	.595	-.013	.045	-	No
H_{2c}: Self-efficacy will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.	.010	.580	-.022	.052	-	No
H_{4a}: Convenience will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.	.010	.582	-.017	.060	-	No

Table 12 *(Continued)*

Hypothesis	Indirect Effect		Confidence Intervals Bias Corrected		Variance Accounted For (VAF)	Supported
	Coefficient	P-values (P)	2.5%	97.5%		
H₄ᵦ: Compatibility will be mediated by the PEOU towards the actual adoption of Alipay in Malaysia.	.009	.595	-.019	.055	-	No
H₅ₐ: Convenience will be mediated by the PU towards the actual adoption of Alipay in Malaysia.	.069	.005	.027	.122	39.20% (Partial Mediation)	Yes
H₅ᵦ: Compatibility will be mediated by the PU towards the actual adoption of Alipay in Malaysia.	.104	.000	.059	.168	28.03% (Partial Mediation)	Yes

CONCLUSION AND POLICY IMPLICATIONS

Alipay has grown tremendously over the years and overtook PayPal as the world's largest mobile payment platform in 2013. Its introduction changed the users' behaviour in carrying out financial transactions, as they no longer needed to depend on physical cards to make payments. However, the penetration of mobile payment services, particularly m-wallets, in Malaysia is still considered low. In this regard, this study analysed the issue from the perspective of the actual adoption of Alipay, in the context of Malaysia.

This study provided the following findings. First, compatibility had a direct relationship with actual adoption. Similarly, knowledge about mobile payment services affected the actual adoption of mobile payment services directly. Second, the PU played the role of a mediator in influencing the effect of compatibility on actual adoption. Likewise, the linkage between convenience and actual adoption was mediated by the PU. Third, the PEOU did not act as a mediator in influencing the effects of innovativeness, mobile payment knowledge, self-efficacy, convenience, and compatibility on actual adoption. Fourth, personal innovativeness, mobile payment knowledge and self-efficacy were found to not contribute any significant effect on the adoption of m-wallets.

Theoretical Implications

The present study adds to the limited literature available on the actual adoption of m-wallet by adapting the framework used by C. Kim et al. (2010) and G. Wang et al. (2019). This study serves as the forerunner in engaging structural equation modelling to focus on the mediation effect of consumers' PEOU and PU on m-wallet adoption. For this reason, this study fills the gap of comprehending the main factors that influence consumers' adoption of m-wallet and provides a better understanding of mobile payment platforms, in the context of Malaysia.

Additionally, each item of the constructs had specific importance. However, existing literature ignores this strand of research. In this regard, IPMA was used to measure the performance of each item; from significant constructs, such as perceived usefulness and compatibility. Hence, taking the performance of each indicator, from all of the constructs into consideration, was proven to be sound in providing diversified views and enhancing the existing knowledge about mobile payments adoption, particularly in the context of Alipay.

Practical Implications

To increase the actual adoption of m-wallet services in Malaysia, the following practical implications are suggested, based upon the study's findings. First, service providers are suggested to emphasise compatibility, to ensure that their services can meet users' current needs, values, and lifestyles. The service providers should incorporate additional features that could integrate with Malaysian lifestyles, so that, if users find these additional features are valuable and functional, they will start to adopt the mobile payment services.

Second, as knowledge of mobile payment services plays a vital role in stimulating actual adoption, it is essential to increase consumer awareness about the technology and its benefits. The service providers could improve consumers' knowledge of mobile wallets via various channels, such as roadshows, social media, and advertisements. It is necessary to educate the potential young users about m-wallet benefits. Apart from an effective payment tool, m-wallet could also be used to receive and send money instantly, with no additional charges, as well as to provide several money-saving opportunities via cashback, discounts, loyalty points, and rewards redemption.

Third, the government is suggested to provide incentives (e.g. tax relief/ exemption) to businesses in order to encourage them to conduct their business transactions using mobile payment services. As more businesses use mobile payment services, throughout the country, consumers' convenience in adopting the technology could also be enhanced. However, as shown by the results, convenience can only be translated into actual adoption with a high level of PU. In such a case, mobile wallet providers should improve the PU of their products, as only mobile wallets with a greater level of PU are likely to be adopted by consumers.

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