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FOSTERING MOBILE PAYMENT ADOPTION: A CASE OF NEAR FIELD COMMUNICATION (NFC)

Fauzan Aris
Faculty of Business and Economics, Universiti Malaya

Kamisah Ismail[♣]
Department of Accounting, Faculty of Business and Economics, Universiti Malaya

Suhana Mohezar
Department of Management, Faculty of Business and Economics, Universiti Malaya

ABSTRACT

This study aims to investigate the adoption intention of NFC mobile payment services among consumers in Malaysia. Data collected from 218 respondents were analysed using Partial-Least-Square. The results reveal that consumers' technology readiness is positively related with perceived usefulness, perceived ease of use and intention to adopt NFC. Technology availability has also provided similar results regarding its relationship with perceived ease of use and intention to adopt NFC. The results also show the mediation effects of perceived ease of use and perceived usefulness of the technology in the relationship between technology availability and perceived usefulness, as well as between perceived ease of use and intention to adopt NFC, respectively. The findings of this study suggest the need for the industrial player to target the group of consumers who are innovative. It is also important for banking institutions to reinvent the card system to support NFC infrastructure, so that mass adoption could be created. This study fills the research voids by integrating the established mobile technology acceptance model with two constructs – consumers' technology readiness and technology availability.

Keywords: Technology Acceptance Model, Near-Field Communication, consumers' technology readiness, technology availability, perceived ease of use, perceived usefulness, intention to adopt.

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1. INTRODUCTION

The smartphone ownership around the globe is rising tremendously. Today, consumers are using smartphones as electronic gadgets to shop, enquire on product prices and discounts, look for product's reviews and information (Kang, Mun, & Johnson, 2015; Choi & Yang, 2018). According to Poushter (2016), the number of people that are connected by smartphones is estimated to be more than 2.5 billion. The rising of smartphone ownership and widespread use of mobile applications have led the industry stakeholders to increase the number of mobile services that could be offered to the smartphone users, including mobile payment service (m-payment).

♣ Corresponding author: Department of Accounting, Faculty of Business and Economics, University of Malaya, 50603 Kuala Lumpur, Malaysia. Telephone no.: +603-7967 3804, Fax no.: +603-7967 3810, E-mail: kamisah.ismail@um.edu.my

M-payment is referred to payment activities that use mobile terminals to conduct financial transactions (Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2014). Recently, short-range contactless technologies that use magnetic field induction, namely Near Field Communication (NFC), is incorporated in many smartphones, to replace common electronic payment method. Under this technology, users are required to scan a QR code to allow data transfer between them. Since NFC permits smartphone users to store account information into mobile application and transferring information securely, by touching or waving, this new method of m-payment is seen as convenient, secured and fast (Leong, Hew, Tan, & Ooi, 2013; Pham & Ho, 2015). Despite the potential benefits documented, the penetration rate however, is reported to be quite low and slow, in the developing country context (Madan & Yadav, 2016), due to the different consumers' behaviours, perceptions and values. In Malaysia specifically, Maybank, was the first local bank to launch the use of NFC-based mobile payment, followed by CIMB. In early 2017, Samsung has partnered with few other banks such as Standard Chartered and Hong Leong Bank to roll out the use of NFC. Bank Negara Malaysia has also collaborated with Bank of Thailand to launch mobile payment application with QR code-based to enable consumers to make cross-border payments (Phillips, 2021). Today, there are more than 40 NFC payment type existed in Malaysia implying that the technology is growing in the country (Alam, Awawdeh, & Muhamad, 2021). With the emergence of Covid-19 pandemic, the use of NFC technologies is proved to be crucial since contactless payment can avoid the spread of the virus. Malaysia recently was reported to lead the Asian region with the adoption rate of 40 per cent ahead of other neighbouring countries. In the early 2020, GrabPay alone was reported to achieve a growth of over 60 per cent. This phenomenon shows the potential of NFC technology in today's business environment. Owing to this situation, this study intends to determine the determinants of NFC technology usage intention in Malaysia, so that appropriate strategies could be put forth to further increase the adoption rate among the societies.

Within the literature, many scholars have empirically explored the motivations behind the adoption intention (e.g. Leong et al., 2013; Oliveira, Thomas, Baptista, & Campos, 2016; de Luna, Liébana-Cabanillas, Sánchez-Fernández, & Muñoz-Leiva, 2019) by adopted Technology Acceptance Model (TAM), as the underpinning theory and incorporated constructs from psychological science, behavioural control, trust, perceived risks, and security. Whilst they provide insights into the determinants of NFC technology adoption intention, the scopes covered are limited. First, they do not take into consideration on the consumer technology readiness. Consumer technology readiness refers to individual's psychological state of mind towards new technology, and their preparedness to adopt the technology (Lin et al. 2016). A person with higher degree technology readiness is believed to be more interested to experience "new" things and habitually enjoy discovering new information about potential benefits of new products or services in the market (Barrena-Figueroa & Garcia-Lopez-de-Meneses, 2012; Son & Han, 2011). On the contrary, those who possess low level of technology readiness will have a negative perception deriving from a sense of being overwhelmed by new technology and low self-control (Parasuraman, 2000; Walczuch, Lemmink, & Streukens, 2007). Secondly, the previous empirical works have not considered the role of technology availability. Being a developing country, it is also doubtful, whether the technology infrastructure is available in Malaysia to support NFC usage. Furthering this thought, in 2009, it was reported that, Maxis FastTap, the first Malaysia's mobile payment service, struggled to gain traction, due to lack of NFC-enabled smartphones and terminal reader facilities installed (The Star, 2016). Similarly, literature seems to emphasise that a well-equipped technology infrastructure is

more likely to support the penetration, since it would provide a conducive environment for the transactions (Lin & Lin, 2008). The aspect of local context which include different characteristics of communities and infrastructure provide a reasonable ground for a new study to be conducted.

Given these arguments, in this study therefore, we expand the existing literature by exploring the status of NFC adoption in Malaysia, being an example of a developing economy. We also extend the underlying theoretical perspective used in previous studies – mobile technology acceptance model, by incorporating consumers technology readiness and technology availability. The insights drawn from this study can be used by the stakeholders to ensure a more effective implementation of NFC could be done.

2. LITERATURE REVIEW

2.1. Mobile Payment and NFC Technology

Mobile payment is referred to the money transactions from the buyers' account to the merchants' accounts through wireless communication technologies (Liébana-Cabanillas, et al., 2014). Within the literature, Grassie (2007) highlighted that the characteristics of NFC technology, which is compatible with all existing mobile devices, offers wider range of financial services. The technology is also considered to possess higher security, since it requires proactive behaviours from users. Users are also not required to pay any licensing fee, offering economical attractions. There are also researches that have attempted to determine the usage behavioural of NFC payments. For example, Oliveira et al. (2016) concluded that technology characteristics, performance expectations, and social influence as factors influencing the adoption of mobile payment in Portugal. Similarly, Abrahãoa, Moriguchib, and Andradeba (2016) carried out a survey involving 605 Brazillian consumer. In Bangladesh, Hossain, Hossain, and Jahan (2018) suggested perceived usefulness and ease of use as two significant predictors for the NFC usage. In Malaysia, few studies existed to explain the adoption intention (Leong et al., 2013; Tan et al., 2014; Ooi & Tan, 2016). Their studies have noted the impact of social influences and perceived usefulness on NFC adoption. Extending on Ooi and Tan's (2016) work, Hng, Foo, Lim, and Nair (2020) found that reachability, which allows people to connect anytime and anywhere appear to influence customers' attitude towards the NFC payment.

Based on the literature reviewed, it appears that there are many existing studies on NFC adoption intention. However, their studies are mainly drawn from the perspective of UTAUT 2, DOI and TAM. In exception to Ooi and Tan (2016) and Hng et al. (2020), lack of studies has employed mobile technology acceptance model in assessing the NFC payment. It is also observed that whilst there are studies conducted in developing countries, only few are focusing on Malaysian perspective. They concentrated on psychological science, trust-based, behavioural control, perceived risks and security, compatibility, and financial resources. Despite the importance of the earlier studies conducted in Malaysia, it appears that they have not looked into consumer technology readiness and technology availability. These two dimensions are expected to play a crucial role, considering that NFC technology is still new in the Malaysian context; and being a developing country, it is doubtful whether the technology needed to support NFC is available widely.

2.2. Theoretical Framework and Hypotheses Development

The Technology Acceptance Model (TAM), which was developed by Davis (1986) asserts that users' behaviours towards a certain technology can be predicted by its perceived ease of use and usefulness as well as the users' attitude. Perceived ease of use is predicted to affect perceived usefulness; and these two variables would influence users' attitudes towards the technology, which in turn will determine their intention to adopt the technology. Since its introduction, the model has been modified to be applied in diverse research context. A systematic review conducted by Marangunic and Granic (2015) demonstrated that various studies in the field of management information system and computer technology have applied the model. They found that TAM had been used in the research involving digital libraries technology (Hong, Thong, Wong, & Tam, 2002), internet technology (Lee & Kim, 2009; Lee, Xiong, & Hu, 2012; Son, Park, Kim, & Chou, 2012), specialised system (Serenko, 2008; Chan & Lu, 2004; Nasri & Charfeddine, 2012), learning information system (Park, Lee, & Cheong, 2008; Farahat, 2012; Cheung & Vogel, 2013), healthcare information system (Pai & Huang, 2011; Kuo, Liu, & Ma, 2013) and mobile technology, particularly NFC payment service (Leong et al., 2013; Tan et al., 2014; Pal, Vanijjab, & Papasratorn, 2015; Ooi & Tan, 2016; Luna et al., 2016).

Despite the reliability and validity of TAM, Ooi and Tan (2016) argued that the model may not be able to provide a meaningful insight in the context of mobile technology since it was originally developed to explain individual's adoption of e-mail in organisational setting. In an organisational setting, the adoption of technology is mandatory. This is contradicted with the NFC setting, whereby such adoption is voluntary and mainly used for personal interests. The limitation of TAM has motivated Ooi and Tan (2016) to develop a mobile technology acceptance model. This model consists of two most important variable, namely mobile usefulness and mobile ease of use. They also included four other constructs trust, risks, compatibility, and financial resources. This model has been tested and extended by a much recent study, Hng et al. (2020). Differ from Ooi and Tan (2016), Hng et al. (2020) incorporated reachability and mobility as antecedents to mobile usefulness and mobile ease of use.

Given the applicability of mobile technology acceptance model, this study therefore employs the model as an underlying theory. In this study however, two new variables – consumer technology readiness and technology availability will be incorporated into the model. These two variables represent the external variables, which would affect the perceived usefulness and perceived ease of use. This is in line with Venkatesh and Davis (2000), who suggested that these two variables – usefulness and perceived ease of use may be affected by external factors, depending on the context of the study. Moreover, Ooi and Tan (2016) also indicated that in a mobile environment, there are various other factors that may influence technology adoption, besides mobile perceived ease of use and mobile perceived usefulness. The remainder of this section provides the hypotheses development and related literature.

According to Parasuraman and Colby (2015), consumers' technology readiness is interpreted as individuals' enthusiasm and comfortability to use new technological innovation to accomplish their works. Individuals who possess high levels of technology readiness are found to have high self-efficacy, be more receptive to new experiences, and they habitually enjoy obtaining new information relating to the new products (Albabidi, 2021). They appear to be among the first to get involved with the product and may also tend to influence other individuals' perceptions (Barrena-

Figueroa & Garcia-Lopez-de-Meneses, 2012; Karaarslan & ŞükrüAkdoğan, 2015). They often view the technology positively and tend to believe that the technology could potentially benefits them (Parasuraman, 2000; Walczuch et al., 2007; Liébana-Cabanillas, Japutra, Molinillo, Singh, & Sinha, 2020). Since they are more receptive to new products, they may build up higher level of perceived usefulness and ease of use towards the products. In relative to the NFC payment, consumers who possess high levels of technology readiness, may have greater propensity for risks taking behaviour, enabling them to face higher levels of uncertainty involved with adopting the technology. Following this argument, this study posits that:

H_1: Consumers' technology readiness is positively related to mobile perceived usefulness.

H_2: Consumers' technology readiness is positively related to mobile perceived ease of use.

H_3: Consumers' technology readiness is positively related to intention to use NFC payment.

In this study, technology availability is defined as the level of individuals' perceptions on the existence of sufficient technological infrastructure to support the use of NFC payment. The more robust the technical infrastructure exists to support NFC, the easier it becomes to use the technology. Being an emerging country, technological availability in Malaysia becomes a concern, as it may not be sufficient to sustain the use of NFC payment (Ezzaouia & Bulchand-Gidumal, 2020). Insufficient access to appropriate technical infrastructure at a suitable cost, may become a barrier to the NFC payment adoption, as the payment system may not be able to be accessed at any place and time. Considering this, this study posits that:

H_4: Technological availability is positively related to mobile perceived usefulness.

H_5: Technological availability is positively related to mobile perceived ease of use.

H_6: Technological availability is positively related to intention to use NFC payment.

Both mobile perceived usefulness and mobile perceived ease of use represent the primary beliefs of users towards a mobile technology (Hng et al., 2020; Ooi & Tan, 2016). According to Ooi and Tan (2016), mobile perceived usefulness has the similar meaning as perceived ease of used which is referred to an individual's perceptions on the potential benefits that could be gained through using a particular technology. Therefore, in this study, mobile perceived usefulness refers to the perceived enhancement of usefulness in using mobile technology, namely NFC payment. Mobile perceived ease of use refers to an individual's perception on the degree of easiness in using the mobile technology, NFC payment. Both factors are expected to positively influence intention to use NFC. Individuals who believe that using NFC are associated with various potential benefits, and not complex will be more willing to adopt NFC (Leong et al., 2013; Dutot, 2015). The fact that NFC payment can speed up the check-out process faster, using minimal effort may influence consumers to consider using such system (Ooi & Tan, 2016). It is also interesting to note that the extent of users' beliefs that using mobile payment such as NFC requires less cognitive burden, will lead to their beliefs that the technology is beneficial (Malik & Annuar, 2021). Based on these arguments, this study hypothesises that:

H_7: Mobile perceived usefulness is positively related to intention to use NFC payment.

H_8: Mobile perceived ease of use of NFC payment is positively related to perceived usefulness of NFC payment.

H_9: Mobile perceived ease of use of NFC payment is positively related to intention to use NFC payment.

A mediating or an intervening relationship exists when the relationship between independent and dependent variables exists, at least, partly, through a third variable. In such a case, the third variable plays the mediating role in the relationship between the other two variables (Mia & Clarke, 1999; Ismail et al., 2018a; Ismail et al., 2018b). Therefore, it is also important to note that there are seven indirect relationships that could exist in this framework via mediator variables:

H_{10}: The relationship between consumers' technology readiness and intention to use NFC payment is mediated by mobile perceived usefulness.

H_{11}: The relationship between consumers' technology readiness and intention to use NFC payment is mediated by mobile perceived ease of use.

H_{12}: The relationship between technological availability and intention to use NFC payment is mediated by mobile perceived usefulness.

H_{13}: The relationship between technological availability and intention to use NFC payment is mediated by mobile perceived ease of use.

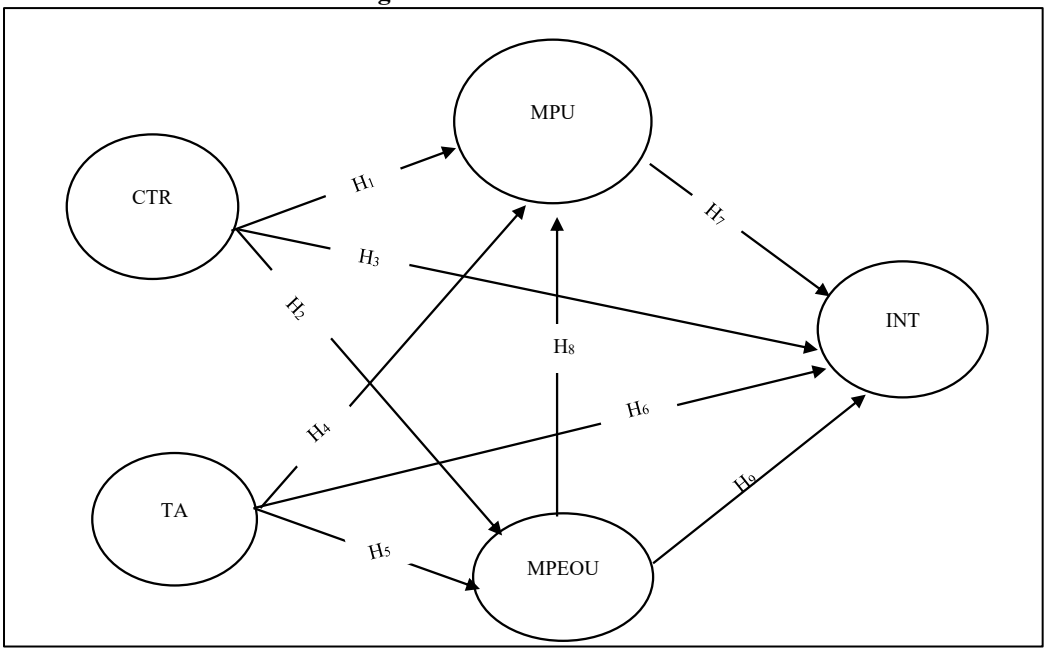
H_{14}: The relationship between mobile perceived ease of use and intention to use NFC payment is mediated by mobile perceived usefulness.

H_{15}: The relationship between consumers' technology readiness and mobile perceived usefulness is mediated by mobile perceived ease of use.

H_{16}: The relationship between technological availability and mobile perceived usefulness is mediated by mobile perceived ease of use.

Based upon the existing literature and hypotheses development, a conceptual framework (Figure 1) is established.

Figure 1: Research Framework



Notes: CTR= Consumer Technology Readiness, TA= Technology Availability, MPU= Mobile Perceived Usefulness, MPEOU= Mobile Perceived Ease of Use, INT= Intention to Adopt.

3. METHODOLOGY

Multiple items from the literature were adapted as measurements. Consumer technology readiness was assessed based on the technology readiness index 2.0 scale, developed by Parasuraman and Colby (2015). This variable measures the attitude of individuals in terms of their innovativeness, optimism, discomfort, and insecurity. Items measuring the technological capability were adapted from Nath, Bhal, and Kapoor (2013) and Dutot (2015). These items measure the extent to which the NFC technological infrastructure exists to support its usage. Perceived usefulness, perceived ease of use and intention to use were measured by items obtained from Davis et al. (1989), Ooi and Tan (2016) and Hng et al. (2020).

This study employed a survey method, using questionnaire to test the hypotheses developed. The target populations of this study are Malaysian consumers, who own credit/debit card, smartphones, use NFC payment or understand the NFC technology. The survey was conducted through mall-intercept technique, involving shoppers at the shopping malls in four selected areas – Petaling Jaya, Damansara Utama, Subang Jaya and Bukit Bintang. These four areas were selected, since they represent the centre of commerce (Department of Statistics Malaysia, 2015), and among the locations that draw higher shoppers. Since they are located in Klang Valley, they could represent a fair balance of gender, age and ethnicity of Malaysian general population (Ooi & Tan, 2016; Wordpopulationreview.com, 2016). Permission to distribute the questionnaires was granted by the respective mall before we commenced the survey. Prospective respondents were politely

approached as they exit the mall. They need to fulfil the criteria, which encompass of having smartphone and credit/debit card. Prior to the selection, they were also being asked about their knowledge and awareness on the existence of NFC payment as one of the mobile payment services. If they do not possess any knowledge or awareness on this technology, they were disqualified from the sampling frame. They were also reminded that the data collected would be exclusively used for research purposes and their participation is anonymous and voluntary.

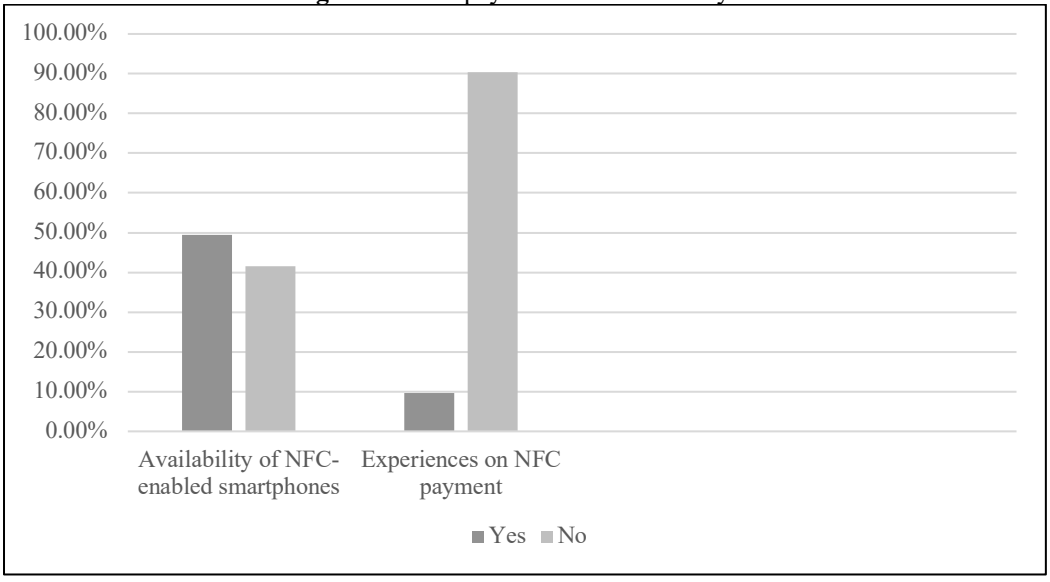
The sampling technique employed was based on systematic sampling, whereby the researcher approached every fourth person exiting the mall. Refusal by the potential respondent resulted in researchers intercepting the next potential respondent until a respondent agreed to participate in the survey. Upon obtaining a positive response, the intercept process returned to every fourth respondent. The data collection was conducted from 12 noon until 9 p.m. on Saturday and Sunday over four weekends. Of the 720 questionnaires distributed, 218 responses were collected, generating about 30.28 response rate. In this research, we determined the adequate sample size based on Goodhue, Lewis, and Thompson (2012), which suggested the sample size to be ten times larger than the number of paths examined. Since the research framework consists of 13 paths, we therefore argued that a sample size of 218 is sufficient (Marcoulides & Chin, 2013; Hair et al., 2016) for accurate analysis. Table 1 depicts the respondents' profiles.

Table 1: Demographic Profiles of Respondents

Categories		**Frequency**	**Percentage**
Gender	Male	91	41.7
	Female	127	58.3
Age	18-24 years	12	5.5
	25-34 years	137	62.8
	35-44 years	51	23.4
	45-54 years	10	4.6
	55 years and above	8	3.7
Highest educational level	High school/SPM/STPM	4	1.8
	Diploma/Advanced Diploma	4	1.8
	Bachelor Degree	109	50.0
	Professional Qualification	16	7.3
	Master degree & PhD	85	39.0
Profession	Student	30	13.8
	Homemaker/housewife	4	1.8
	Employed for wages	176	80.7
	Self-employed	8	3.7
Monthly income	No income	25	11.5
	Below RM 2,000	4	1.8
	RM 2,001 – RM 4,000	37	17.0
	RM 4,001 – RM 6,000	60	27.5
	RM 6,001 – RM 8,000	39	17.9
	RM 8,001 – RM 10,000	31	14.2
	RM 10,001 and above	22	10.1

As indicated in Table 1, majority of the respondents were females (58.3 %), with more than half of them age between 25 to 34 years old (62.8 %). Fifty per cent of the respondents possessed a bachelor's degree and earned between RM 4,001 to RM 6,000. When asked about the availability of NFC technology embedded in their smartphones, only half of the respondents (49.5%) indicated a positive answer, whilst around 40 per cent of the respondents did not install the application that allows them to use NFC. Of the respondents who owns an NFC-enabled smartphone, only 9.6 per cent were found to have used the NFC mobile payment, indicating that there is low level of NFC payment usage among the respondents (Figure 2). These could be because many of them do not possess the NFC-enabled smartphones. For the NFC payment to work, they need to upgrade their phones, since failure to do so will result in inability to access the application (de Luna et al., 2019). As this study was conducted before the outbreak of covid-19, the use of NFC payment may not be popular, and they may not perceive the importance of such technology in their daily life. In fact, they may be sceptical, and worry about the risks more than the benefits (Aji, Berakon, & Md Husin, 2020). For instance, they may concern of someone stealing their mobile devices and having access to the bank account. Lack of awareness among the societies about the benefits and threats of using NFC payment could contributes to the low usage (Alam et al., 2021).

Figure 2: NFC-payment trends in Malaysia



4. ANALYSIS AND FINDINGS

Following Anderson and Gerbing (1988), this study employed a two-stage model estimation, in which a confirmatory analysis is first performed, followed by structural model analysis. Both analyses were conducted using partial least squares path modelling (PLS-SEM).

4.1. Measurement Model Analysis

A measurement model, incorporating all the variables of interests was assessed based on convergent validity and discriminant validity to ensure that the multiple measures adapted agree with each other and do not resemble other variables (Hair, Hult, Ringle, & Sarstedt, 2016). The convergent validity was evaluated based on the values of factor loadings, composite reliability and average variance extracted (AVE). As depicted in Table 2, all variables achieved the composite reliability values of greater than 0.8, and AVE values of more than 0.6, indicating a good convergent validity. In addition, all the measures loaded significantly ($p<0.001$), with values more than 0.5 (Hulland, 1999), except item "TA1". Hence, this item was dropped from further analysis. As indicated in Table 3, all the variables seemed to have a higher square root AVE value as compared to their correlations with other variables, indicating discriminant validity (Fornell & Larcker, 1981). In summary, all the measures used in this study appeared to satisfy both convergent and discriminant validity, and thus can be used for structural model analysis.

Table 2: Convergent Validity

Variables	Items	Factor Loadings	Composite Reliability	Average Variance Extracted (AVE)
Consumer Technology Readiness	OPT1	0.898**	0.916	0.732
	OPT2	0.859**		
	OPT3	0.805**		
	OPT4	0.808**		
	INN1	0.686**		
	INN2	0.553**		
	INN3	0.849**		
	INN4	0.862**		
	DISC1	0.745**		
	DISC2	0.789**		
	DISC3	0.825**		
	DISC4	0.693**		
	INS1	0.608**		
	INS2	0.827**		
	INS3	0.729**		
	INS4	0.816**		
Technology Availability	TA1	0.130**	0.914	0.781
	TA2	0.691**		
	TA3	0.753**		
	TA4	0.882**		
Mobile Perceived Ease of Use	PEU1	0.850**	0.924	0.754
	PEU2	0.909**		
	PEU3	0.891**		
Mobile Perceived Usefulness	PU1	0.844**	0.822	0.609
	PU2	0.841**		
	PU3	0.883**		
	PU4	0.903**		
Behavioural Intention	INT1	0.808**	0.96	0.605
	INT2	0.904**		
	INT3	0.797**		
	INT4	0.907**		

Table 3: Discriminant Validity

	INT	PEOU	PU	TA	CTR
INT	**0.856**				
MPEOU	0.585	**0.884**			
MPU	0.712	0.638	**0.868**		
TA	0.304	0.318	0.251	**0.780**	
CTR	0.649	0.581	0.677	0.197	**0.778**

Notes: The bold numbers on the leading diagonals represent the square root of AVEs, INT=Behavioural Intention, MPEOU= Mobile Perceived Ease of Use, MPU= Mobile Perceived Usefulness, TA= Technology Availability, CTR = Consumer Technology Readiness.

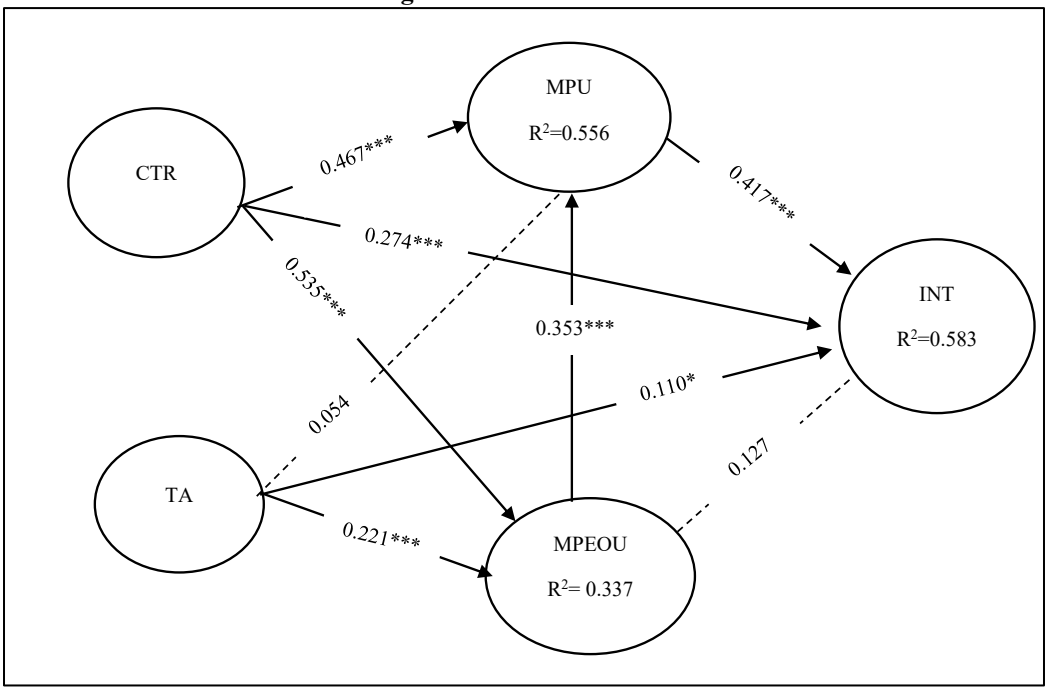
4.2. Structural Model Analysis

The results of structural model analysis (R^2) demonstrated that the model is capable of explaining 58.3 per cent variance in intention to adopt NFC payment, 55.6 per cent variance in perceived usefulness and 37.7 per cent variance in perceived ease of use. The relationship between the variables was then evaluated based on p-values and β estimates. The results indicated that the effect of consumers' technology readiness on intention to adopt NFC ($\beta = 0.274$, $p < 0.001$), perceived usefulness ($\beta = 0.467$, $p < 0.001$) and perceived ease of use ($\beta = 0.535$, $p < 0.001$) were significant. Hence, H_1, H_2 and H_3 were supported. This study also found that technology availability was significantly related with intention to adopt NFC ($\beta = 0.11$, $p < 0.05$) and perceived ease of use ($\beta = 0.221$, $p < 0.001$), supporting H_5 and H_6. In contrast, technology availability had no significant impact on perceived usefulness ($\beta = 0.054$, $p= 0.29$). Hence, H_4 was rejected. This study also found that perceived usefulness had a significant impact on intention to adopt NFC ($\beta = 0.417$, $p < 0.001$), providing support for H_7. Whilst the impact of perceived ease of use on perceived usefulness is significant ($\beta = 0.353$, $p < 0.001$), this study found its impact on intention to adopt NFC as insubstantial ($\beta = 0.127$, $p = 0.078$). Hence, there was not enough evidence to reject H_8, whilst H_9 was rejected. (Figure 2, Table 4).

To test the mediating effects, similar procedures to those recommended by Baron and Kenny (1986) and utilised by Bass et al. (2003), Ismail (2018a), and Ismail (2018b) were used. Evidence for full mediation is present when the following conditions are met: a path from the independent variable to the dependent variable is not significant but paths from the independent variable to the mediator and from the mediator to the dependent variable are significant (Wold, 1985). Partial mediation is present when all paths are significant.

In this study, the results also showed the mediation effects of perceived ease of use and perceived usefulness of the technology existed. Even though the direct path from technology availability to perceived usefulness was not significant ($\beta = 0.054$, $p= 0.29$), the relationship was found to be indirect via perceived ease of use. Perceived ease of use fully mediated the relationship between technology availability and perceived usefulness. Similarly, this study found that perceived usefulness fully mediated the relationship between perceived ease of use and intention to adopt NFC. Therefore, H_{14} and H_{16} were supported. These results indicated that, even though the technology is available, the consumers would not consider it as useful unless it is easy to use. Also, even if the technology is easy to use, the consumers would not adopt it if it is not perceived as useful.

Figure 3: Structural Model



Notes: *, **, *** denotes significant at p < 0.05, p < 0.01, p < 0.001 respectively. CTR = Consumers' Technology Readiness, TA = Technology Availability, MPU = Mobile Perceived Usefulness, MPEOU = Mobile Perceived Ease of Use, INT = Adoption Intention.

Table 4: Structural Model and Hypotheses Testing for Direct Effects

Hypotheses	Paths	Standardised estimate (β)	Results
H_1	CTR → MPU	0.467***	Supported
H_2	CTR → MPEOU	0.535***	Supported
H_3	CTR → INT	0.274***	Supported
H_4	TA → MPU	0.054	Not Supported
H_5	TA → MPEOU	0.221***	Supported
H_6	TA → INT	0.110*	Supported
H_7	MPU → INT	0.417***	Supported
H_8	MPEOU → MPU	0.353***	Supported
H_9	MPEOU → INT	0.127	Not Supported

Notes: INT=Behavioural Intention, MPEOU= Mobile Perceived Ease of Use, MPU= Mobile Perceived Usefulness, TA= Technology Availability, CTR = Consumer Technology Readiness.

Table 5: Structural Model and Hypotheses Testing for Indirect Effects

Hypotheses	Paths	Indirect / Mediation effect	Results
H_{10}	CTR → MPU → INT	Partial	Partially supported
H_{11}	CTR → MPEOU → INT	No	Not supported

Table 5: continued

H_{12}	TA → MPU → INT	No	Not supported
H_{13}	TA → MPEOU → INT	No	Not supported
H_{14}	MPEOU → MPU → INT	Full	Supported
H_{15}	CTR → MPEOU → PU	Partial	Partially supported
H_{16}	TA → MPEOU → PU	Full	Supported

Notes: INT=Behavioural Intention, MPEOU= Mobile Perceived Ease of Use, MPU= Mobile Perceived Usefulness, TA= Technology Availability, CTR = Consumer Technology Readiness.

5. DISCUSSION

This study incorporates two factors, technology availability and consumers' technology readiness with TAM to examine the underlying issues related to NFC payment adoption in Malaysia. This study is driven by the under-researched of NFC payment adoption in the Malaysian context. This is important considering the low number of mobile phone users in Malaysia that are engaged in NFC payment.

The finding demonstrates a positive association between consumers' technology readiness and perceived usefulness, perceived ease of use and intention to adopt NFC, in line with Barrena-Figueroa and Garcia-Lopez-de-Meneses (2012); Karaarslan and ŞükrüAkdoğan (2015). This finding suggests that consumers who are eager to find out information on the NFC payment, and are willing to try out and absorb risks associated with the technology will perceive that the innovation has potential values. Since they are more inclined to search and obtain information on the technology, they will feel that its adoption and usage are less complex. This result demonstrates that the innovative behaviour possessed by customers will affect the way they perceive the product. When consumers are aware of the NFC payment, they will adapt to the technology better, as they have enough knowledge; and this knowledge will reduce the level of anxiety and perceived complexity of the technology.

In line with the previous literature (for e.g.: Dutot, 2015), this study has demonstrated that technology availability is influencing the way consumer perceive ease of use and intention to use NFC. This finding suggests that the Malaysian consumers will feel more comfortable to use the technology, when the technology is mature enough, with the NFC-enabled reader terminal infrastructure available in many local stores and supermarkets. Only with the high accessibility, they will feel that the technology is convenient. Perhaps, majority of people in Malaysia is still sceptical, and are worried about the security issues, and are thus reluctant to adopt NFC, if they see that the infrastructure is less available (Tan et al., 2014). With the lack of trusted infrastructure in Malaysia (Povera, 2020), it is not surprising that there is low adoption rate of cashless payment.

This perception will offset the perceived ease of use associated with the technology. They will only do so after the innovators and early adopters have forged the way ahead and higher availability of NFC payments in the local stores and supermarkets. The lack of technology availability hinders the Malaysian consumers to see how the technology could ease the payment process, and influence their behavioural intentions.

In contrast with previous literature (for e.g.: Nath et al., 2013), the findings of this study did not provide substantial evidence on the impact of technology availability on perceived usefulness. The finding suggests that consumers in Malaysia do not perceive the NFC payment is useful, although the technology is available in the market. This phenomenon could be due to the fact that Malaysian consumers are still not aware of the technology. Whilst the NFC technology has been around since 2009 in the country, it appears that not many consumers are aware about the technology (Busu, Abd Karim, & Haron, 2018).

As expected, this study reports that there is a significant relationship between perceived usefulness and intention to adopt NFC payment. This finding is in line with Al-Aulamie (2013), among others. The results suggest that the respondents in this study are reluctant to adopt the NFC payment, if there are no perceived values associated with the technology. Surprisingly, this study found that perceived ease of use does not have an impact on intention to adopt. This finding is contradicted with studies conducted by Venkatesh and Davis (2000), and Chan and Lu (2004). This situation highlights that the Malaysian consumers are mostly pessimistic towards such NFC payment, although they do perceive that the technology is not complex, and understandable. This could plausibly be due to the fact that the technology is still in infancy stage in Malaysia. Whilst there are retailers and supermarkets who have installed the technology, perhaps the consumers themselves are not ready to replace cash with NFC payment. They still prefer to use conventional method for e-payment. Perhaps, many of them will embrace on NFC technology when they see many people are adopting it; and the technology has become matured enough.

6. CONCLUSION AND IMPLICATION

This study offers theoretical and practical contributions by demonstrating the applicability of TAM in determining the factors influencing behavioural intentions to adopt NFC payment. It further extends previous studies by incorporating consumer technology readiness and technology availability. The model is believed to offer a more accurate prediction of adoption intention compared to the traditional TAM. Despite there are studies on NFC payment, their results may not be easily generalised. Originating from a developing country, Malaysia has different technological infrastructure, and consumers' characteristics that may influence NFC usage.

Despite the fact that NFC payment is growing, the infrastructure to support the technology in Malaysia may not be sufficient to create mass adoption, leading to the complexity of using the technology. Consumers therefore may not be able to access the technology, anywhere and anyplace they want. In Malaysia, we can see that the spread of mobile payment is gradually increased with many banking institutions collaborating with technological companies, reengineering their card systems and applications to enable NFC payment transactions (Chew, Shen, & Ansell, 2020). This finding suggests a need for more banking institutions to move forward and reinvent the card system to support NFC payment. Yet, the infrastructure development is found not to be evenly spread across the country. Not all places or neighbourhood area can use the NFC payment due to the lack of infrastructure such as low internet connection (Alam et al., 2021). For those customers who are using NFC payment, they may not feel convenient. Ensuring a trusted technological infrastructure is also critical to instil confidence and encourage many people to adopt the NFC.

Whilst the importance of technological capability in shaping the consumers' perception on NFC cannot be denied, it is also important to note that the technological capability alone is not enough to foster positive perceptions and behaviour towards the innovation. Consumers in Malaysia are mostly unaware and have low level of knowledge on NFC payment, which affect their perceptions towards the usefulness of the technology. Only recently, they have started to use such mobile payment system, as they are worried that they would get infected by covid-19 viruses that be possibly transmitted through physical money (Aji et al., 2020). Despite this, the digital payment is still in infancy stage, with 92.5 per cent of the payments made are still cash based (Alam et al., 2021). In order to curb this problem, banking institutions and government agencies such as Ministry of Multimedia Communication should proactively educate the Malaysian consumers not only on the potential benefits of NFC payment, but also on the functional aspects and how the technology works, as this will help offset the perceived risks and complexity.

Whilst this study is able to fill the void in the literature, it contains some limitations. This is because our data are only confined to Malaysian consumers, who visited the shopping malls in Klang Valley area, which may limit the generalisability of the findings. Moreover, since the variance contributed towards intention to adopt NFC contributed by the factors examined in this study is lesser than 60 per cent, there are other factors that may affect such technological adoption. Thus future research could extends the framework by incorporating other variables that may influence the NFC payment in Malaysia. Future studies may integrate the mobile technology acceptance model with other relevant theories, to further explore this issues. They may also extend this study by applying the research framework in other developing countries' settings, since the consumers would have behaved differently due to differences in cultural and values. The insights obtained from this research could assist industry players to create a comprehensive business strategy and effective institutional instruments to foster the growth of NFC adoption.

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