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**Article**

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## Analysing consumer adoption of cashless payment in Malaysia

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### ABSTRACT

This study examines factors influencing the adoption of cashless payment in Malaysia using a well-established unified theory of adoption and use of technology, UTAUT2. A total of 301 completed and usable questionnaires were collected from Malaysian consumers to test the hypotheses. Analysis of a moment structures (AMOS) was applied to the data using Structural Equation Modeling. The results show that performance expectancy, and facilitating condition have the most significant influence on the adoption of cashless payments. Perceived technology security also has a strong relationship with the adoption of cashless payment. The results also find that hedonic motivation, social influence, and innovativeness are positively related to the adoption of cashless payments. These findings may assist policymakers to address existing consumer concerns for a successful transition towards a cashless society.

### 1. Introduction

Cashless societies and technological innovation have become increasingly popular around the world (Fabris, 2019). Cashless payments refer to financial transactions in which consumers make financial transactions in the absence of physical cash (Bilińska-Reformat & Kieźel, 2016), mainly using cards or electronic methods. Cashless payment systems have been used much more intensively in some countries such as the Netherlands, Germany, and most notably in the Scandinavian countries (Krüger & Seitz, 2014; Sreenu, 2020). According to the World Payments Report (2020) and Global Trade (2020), global cashless transaction volumes have grown by 14% during 2018–2019 to reach 708.5 billion, the highest growth rate recorded in the past decade. Usage of cheques has globally declined by 13.4%, and the debit card-to-credit card ratio has interestingly shifted from 59:41 to 90:10 during the last ten years (World Payments Report, 2018). Cashless transactions globally are expected to increase at a compound annual growth rate (CAGR) of 10.9% between 2015 and 2020 (World Payments Report, 2020), while in emerging Asia, growth is expected to increase by a CAGR of 30.9% due to sustained digital innovation and adoption of digital payments for financial inclusion (Research & Market, 2020).

Pikri (2019) reported that for Malaysia, in terms of transaction volumes, e-money is used most frequently at 58.4 (56.2%) times per person, followed by internet banking at 18.7 (18%) times per person on average. Most of the high-value payment is performed via internet banking. It may be a fact that

many Malaysian consumers make payments for their insurance, car, and home via internet banking. Bank Negara Malaysia (2019) reported that credit card ownership was 10.3 million as opposed to 42.5 million debit card users in 2018. The number of consumers of non-cash methods has increased by 32.4 million in 2018 compared to 30.7 million in 2014 (Bank Negara Malaysia, 2019). Growth of other non-cash methods such as ATM and e-banking in Malaysia is stable. Mering (2019) reported that 63% of Malaysian consumers use cashless payment with debit cards and 57% use online banking, mostly to make payments for phone and internet bills.

Adopting cashless payments has numerous advantages for consumers. Cashless payments offer convenience and speed (Teo, Tan, Ooi, Hew, & Yew, 2015). Unlike traditional cash transactions, cashless payments discourage robbery and other cash-related crime (Armey, Lipow, & Webb, 2014) as people hold fewer physical cash when they shop. Thomas, Jain, and Angus's (2013) study of 33 countries around the world going cashless placed Malaysia in the inception category 5 years ago whereby only 2% of consumer transactions are cashless. However, within that same grouping, Kenya, South Africa, UAE and Poland show strong growth trajectories due to innovation in payment solutions and strong expansion in credit and debit. Their study noted that the pre-requisites for consumers' cashless readiness include access to financial services, as well as macro-economic and cultural factors. These are some of the factors affecting consumer adoption of cashless payments that are explored in our study.

Świecka (2019) reported that the issues associated with consumers' cashless payments are a crucial and diverse field of research in finance.

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One needs to develop the theoretical achievements against the pragmatic nature of the cashless payments. It is necessary to attain new knowledge of descriptive and exploratory character since such knowledge can help explain the studied phenomena. Additionally, this knowledge may help to formulate suggestions for business practice, as well as policy formulation, in cashless transactions. Today, cashless payments have become one of the crucial components of the global economy and it is perceived as an important determinant of economic expansion. To this end, this study intends to explore the success factors affecting the adoption of cashless payments among consumers. Based on the research objective of this study, we formulated the following research question, what are the success factors affecting consumers' adoption of cashless payment? The main contribution of this paper is to understand consumers' points of view in terms of their willingness to adopt cashless payments. Technology providers have a tendency to focus more on the system itself and inadvertently ignore consumers' preferences. In this study, a well-established unified theory of acceptance and use of technology, UTAUT2 model (Venkatesh, Morris, Davis, & Davis, 2003a, 2003b; Venkatesh, Thong, & Xu, 2012a, 2012b) is used to capture the adoption of cashless payment among Malaysian consumers.

A review of related literature on the adoption of cashless payments including non-cash payment, mobile payment, adoption, and technology information is discussed in Section two. Section three describes the theory of the UTAUT2 model (Venkatesh et al., 2012a, 2012b) and proposes a conceptual model together with the associated hypotheses. In Section four, we design the methodology in the context of this study, while Section five describes the data analysis and results. Section six discuss and conclude the study. Finally, in Section seven, we list out some of the limitations of this study and suggestions for future research.

## 2. Literature review

### 2.1. Cashless society in Malaysia

Bank Negara Malaysia (BNM) launched the Financial Sector Blueprint in 2010 which aims to roll out policy initiatives from 2011 until 2020 to increase cashless transactions in Malaysia (Taasim & Yusoff, 2017). The most recent initiative is the introduction of the Real-Time Retail Payments Platform system which allows customers the ability to make fund transfers via mobile devices using a proxy address (instead of banking information), saw Malaysia well underway towards becoming a cashless society (Pikri, 2019). Cashless payments allow for various types of transactions to occur without using cash such as payment via credit card in shops or online stores etc. Cashless payment electronic instruments include electronic money transfers and payment orders (Humani & Wiese, 2018).

Malaysia's move towards a cashless society is seen as a function of policy direction, as well as technology serving demand from certain market segments (Kadar, Sameon, Din, & Rafee, 2018). The trend towards going cashless is a global one, and we should be aware that what works in one country may not apply to others due to differences in infrastructure (technology) and culture (behaviour). Cashless payments may reduce opportunities for tax evasion, shadow economy, and corruption. However, the size of the tax gap due to tax evasion and the shadow economy is usually hard to measure accurately. Less cash will also lead to less crime (Din & Rafee, 2019) such as burglary, but cashless will also lead to cybercrime, electronic fraud, and digital crime/hacking. Cashless payments also can lead to an increase in financial inclusion, especially for the non-banked population. However, there are anecdotes from other countries, that have moved further along the cashless road, that certain segments of society may now be excluded such as the older generation that are not so tech-savvy, and communities with poor internet connectivity.

### 2.2. Adoption of cashless payments

Consumers' adoption of technology plays an important role in the Unified Theory of Acceptance and Use of Technology (UTAUT) model introduced by Davis (1989) and Venkatesh et al. (2003a, 2003b). Consumers'

adoption of using technology needs to be approached subjectively (Lee, Zailani, & Rahman, 2020). The concept of cashless payment systems is not established at its maturity stage in developing countries particularly to Malaysian consumers. Cashless payment systems are expected to continue to increase (Tee & Ong, 2016), despite the segment facing challenges in adoption by Malaysian consumers (The Malaysian Reserve, 2019). Payments Network Malaysia Sdn Bhd (PayNet) group CEO said that there is a growing trend of cashless transactions, but there are also challenges that come along with it. The cashless exchange system has transcended all the boundaries of the currency exchange where consumers can buy a cup of coffee and pay bills on their smartphones (Narasimhaiah & Sam, 2015).

Consumers' perception of monetary value is changing due to advanced innovativeness, perceived technology security, social influence, hedonic motivation, facilities, and performance expectancy. Ferrer, Dew, and Apte (2010) stated that although that cashless payment systems are developing at a very fast pace, it also creates uncertainties and risks. Consumers may face uncertainty in using cashless payment systems as the risk they perceive may be overwhelming compared to traditional ways of payments. Ozturk (2016) reported that cashless payments may be perceived as a complex technology where consumers' knowledge and skills about their capabilities to use the technology may influence their acceptance. Thus, there is a need for a better understanding of the factors affecting consumers' adoption of cashless payments.

### 2.3. Performance expectancy

Performance expectancy refers to the degree in which consumers expect that using the system will assist them to accomplish their work performance (Chua, Rezaei, Gu, Oh, & Jambulingam, 2018). People are more likely to adopt new technologies when they believe that it will assist them to perform their work. Chakraborty and Al Rashdi (2018) and Venkatesh et al. (2003a, 2003b) integrated five concepts from different models into performance expectancies such as relative advantage, extrinsic motivation, perceived usefulness, job-fit, and outcome expectations. These concepts are similar to that of performance expectancy which refers to an individual's perceptions to use the technological system that will enhance their performance on the job and the following studies have assessed the importance of performance expectancy.

Performance expectancy is found to be an important factors of predicting adoption behaviour in the mobile banking context (Merhi, Hone, & Tarhini, 2019). Chauhan, Jaiswal, and Kar (2018) also found similar results regarding voting machines. However, Ramírez-Correa, Rondán-Cataluña, Arenas-Gaitán, and Martín-Velicia (2019) found performance expectancy as an insignificant predictor of use of online games on mobile devices.

### 2.4. Facilitating condition

Facilitating conditions refer to an individual's perception of the availability of technological resources that can help in using information systems (Venkatesh et al., 2003a, 2003b). Based on the conceptualization of this construct, it may able to measure consumers' acceptance of cashless payments. The facilitating condition includes the availability of information systems, consumers' knowledge about information systems, skills, internal and external support to use information systems are all related to innovation. Koksals (2016) findings reveal that two direct determinants of usage behaviour are intention and facilitating conditions. Other studies also investigate the influence of facilitating conditions.

### 2.5. Social influence

Social influence refers to how an individual changes his/her behaviour to meet the demands of a social environment and, as a result, how the changed person perceive themselves relative to the influencer and other people and society. Kelman (2017) stated that social influence is derived from persuasive communications. Sair and Danish (2018) drew 441

participants for their study of mobile commerce adoption intention and found that consumers' intention to adopt m-banking is significantly affected by social influence. Lu (2014) reported that social influence has changed the pattern of influence on continuance intention. This factor is believed to be crucial in the initial adoption stage and its impacts diminish after adoption (Lu, 2014). Several recent studies have found social influence as an important predictor of intention to use (Arenas-Gaitán, Ramos, & Peral-Peral, 2019; Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019; Merhi et al., 2019; Sharif, Afshan, & Qureshi, 2019).

## 2.6. Innovativeness

Innovativeness refers to the new product adoption process (Manning, Bearden, & Madden, 1995). Cashless payment systems are the new mode of technology innovation, thus, innovativeness can reflect consumers' adoption of cashless payment systems in their financial transaction. Behavioural science suggests that personality traits such as personal innovativeness are potentially significant determinants of adoption (Kovářková, Grosová, & Baran, 2017; Xu & Gupta, 2009). It may be the most important element in potential consumers' decision to use cashless payment systems. Agarwal and Prasad (1998) suggested that an individual with higher personal innovativeness is likely to adopt an innovation earlier. Innovativeness should be reconceptualised to predict an individual's adoption towards technology. Lu (2014) argued that the person with higher levels of personal innovativeness in information technology is expected to develop more positive perceptions about innovation. As a result, an individual may have more positive intentions towards the adoption of cashless payments.

## 2.7. Perceived technology security

Perceived technology security is important in organizations that uses computers or technology. Technology security deals with detecting loopholes in a security system and discovers adequate solutions to address the risk of technology failure or consumer data hacking (Andreu, 2020). Perceived technology security is the process of systems designed to securely protect consumer information. The technology security system (e.g. in business or personal data) is important to safeguard exchanging information against any unauthorized access (Mohamad, Teh, Lai, & Chen, 2018). Shaikh and Karjaluoto (2015) argued that technology systems should minimize any kind of risk to consumers. Lee, Chung, Lee (2011) suggested consumers' trust can be earned by providing accurate and reliable information.

## 2.8. Hedonic motivation

Hedonic motivation refers to the users' technology adoption and pleasure in using technology (Kim & Hall, 2019). Hedonic motivation is measured by the fun and pleasure associated with using technology which makes for a positive attitude among consumers (Poong, Yamaguchi, & Takada, 2017; Tamilmani, Rana, Prakasam, & Dwivedi, 2019). Venkatesh et al. (2012a, 2012b) modified the Unified Theory of Acceptance and Use of Technology model by adding the hedonic motivation construct to influence information systems adoption by consumers. In a conceptual model, hedonic motivation is treated as an independent variable and has a significant impact on consumers' adoption (Venkatesh et al., 2012a, 2012b). They also proposed an extension of the UTAUT model by introducing hedonic motivation as an independent construct to render the conceptual model more appropriate in the context of consumer technology use.

## 2.9. Theoretical foundation and conceptual model

While there are several alternative models that can be utilized to measure the acceptance level and use of technological tools such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), Technology Acceptance Model (TAM) (Davis, 1989) and Theory of Planned Behaviour (TPB) (Ajzen, 1991), for the purposes of our study, we consider the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al.,

2003a, 2003b; Venkatesh & Zhang, 2010) as the most suitable model. The concept of adoption models recommends the relationship between changes in consumers' beliefs (Lu, 2014). Venkatesh et al., 2012a, 2012b stated that the most prominent theory is the UTAUT that incorporates the relationship between the construct in the model. The UTAUT has been used in many studies and found to have a high level of validity and reliability in the information systems field (Yu, 2012; Luo, Li, Zhang & Shim, 2010; Shaikh & Karjaluoto, 2015). However, while UTAUT was originally developed in the organizational context, Venkatesh et al., 2012a, 2012b proposed UTAUT2 as an extended version of the UTAUT model that is more suitable in the context of technology adoption by the end users. Thus, UTAUT2 is a more suitable model to analyze Malaysian consumers' adoption of cashless payments for their financial transactions. There are four key factors of the UTAUT2 model, but in this study we only use three factors including three additional factors related to the concept of UTAUT2 model for the appropriateness of Malaysian consumers' adoption of cashless payment context.

## 3. Research model and hypothesis development

The UTAUT2 can reflect consumers' usage of a particular method for their financial transaction (Tan, Chong, Loh, & Lin, 2010; Tan, Lau, & Young, 2016). Following the UTAUT2 model, this study postulated that performance expectancy, facilitating condition, social influence, innovativeness, perceived technology security, and hedonic motivation as the most critical factors that may affect the adoption of cashless payment. Hedonic motivation is used in this study while price value and habit are not important in the context of Malaysian consumers' adoption of cashless payment systems. The UTAUT2 can provide a refined view of how consumers' behavioural factors affect the adoption of cashless payments. These factors in information technology are primary sources of the adoption of cashless payments. Such factors may have an impact on the adoption of cashless payments either positively or negatively. Paul and Friday (2012) reported that cashless payments are the economic setting whereby consumers' products and services are transacted without cash through electronic transfer. Based on the above discussion of the review of literature, existing theoretical assessment of the UTAUT model (Venkatesh et al., 2003a, 2003b) and UTAUT2 model (Venkatesh et al. 2012a, 2012b), this study proposes a conceptual model along with six hypotheses (as per Fig. 1).

### 3.1. Performance expectancy on adoption of cashless payment

Performance expectancy is one of the most influential factors of adoption behaviour. For example, Al-Saedi, Al-Emran, Ramayah, and Abusham (2020) reported that performance expectancy is the main determinant of M-payment adoption. Koksal (2016) and Yu (2012) reported that performance expectancy has a positive and significant impact on information technology adoption. Singh and Srivastava (2018) showed that the core construct determining adoption is performance expectancy. Patil, Tamilmani, Rana, and Raghavan (2020) found that performance expectancy is positively related to consumers' attitude. Shaikh, Glavee-Geo, and Karjaluoto (2018) indicated that performance expectancy influences the adoption of mobile banking. Therefore, in this study, we postulate that

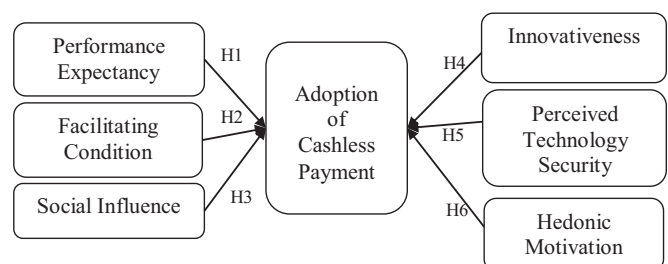


Fig. 1. Conceptual model.

performance expectancy may encourage consumer adoption of cashless payment, and the following hypothesis is proposed:

**H1.** Performance expectancy has a positive influence on consumers' adoption of cashless payments.

### 3.2. Facilitating condition on adoption of cashless payment

Like performance expectancy, the relationship between facilitating condition and adoption behaviour is well established. Several studies such as Khechine, Raymond, and Augier (2020) identified that facilitating conditions has a strong significant impact on technology adoption. Zhou, Lu, and Wang (2010) found that facilitating conditions has a significant influence on the adoption of mobile banking. Patil et al. (2020) identified that facilitating condition can influence consumers' attitude. Paul, Musa, and Nansubuga (2015) examined that facilitating condition is positively related to e-learning adoption. Sair and Danish (2018) indicated that facilitating conditions is the most critical construct among all the other constructs (e.g. social influence, effort expectancy, performance expectancy). As such, this construct may influence consumers' adoption of cashless payments. Based on these studies, it is suggested that facilitating conditions is likely to have a significant impact on the adoption of cashless payments among Malaysian consumers. Thus, the following hypothesis is postulated:

**H2.** Facilitating conditions has a positive influence on consumers' adoption of cashless payments.

### 3.3. Social influence on adoption of cashless payment

Social influence is found to be crucial in the initial adoption stage and its impacts diminish after adoption (Lu, 2014). Kulviwat, Bruner, and Al-Shuridah (2009) indicated that social influence has a significant influence on the adoption of high technology innovation. From a social perspective, very few studies explored its effect on the adoption of cashless payments. It can be argued that this social influence construct is an external motivation and it may have an impact on consumers' adoption of cashless payments. Therefore, the following hypothesis is suggested:

**H3.** Social influence has a positive influence on consumers' adoption of cashless payments.

### 3.4. Innovativeness on adoption of cashless payment

Sair and Danish (2018) indicated that innovativeness is a supplementary variable which extends the UTAUT model (Venkatesh et al., 2003a, 2003b; Venkatesh et al., 2012a, 2012b) and influences the adoption intentions towards mobile commerce among young consumers. Truong (2013) postulated that innovativeness is a well-established construct and it is universally accepted that all consumers are supposed to be similar when they willingly accept new things. Therefore, in this study, we propose that innovativeness may be a potential influencing factor of consumers' adoption of cashless payment systems, and the following hypothesis is proposed:

**H4.** Innovativeness has a positive influence on consumers' adoption of cashless payments.

### 3.5. Perceived technology security on adoption of cashless payment

Some studies provide guidelines concerning prioritising various antecedents and developing proper tactics to influence the adoption of cashless payments (Mukhopadhyay, 2016; Ozturk, 2016). Technology security may increase consumers' adoption of cashless payment. If perceived technology security is strong, organizations will be able to utilise the information to develop consumers' products and service involved with the adoption of cashless payment systems. Thus, the following hypothesis is proposed:

**H5.** Perceived technology security has a positive influence on consumers' adoption of cashless payments.

### 3.6. Hedonic motivation on adoption of cashless payment

Boonsiritomachai and Pitchayadejanant (2017) found that the hedonic motivation of mobile banking users is the most important factor motivating customers to adopt mobile banking. Studies in the areas of omnichannel commerce (Juaneda-Ayensa, Mosquera, & Sierra Murillo, 2016), and mobile commerce (Zhang, Zhu, & Liu, 2012), and have documented hedonic motivation as an important factors of new technology adoption by end users. In this study, the UTAUT perspective was included in an attempt to explore the effect of hedonic motivation on consumers' adoption of cashless payments. Therefore, it is posited that hedonic motivation affects the adoption of cashless payments, and the following hypothesis is developed:

**H6.** Hedonic motivation has a positive influence on consumers' adoption of cashless payments.

## 4. Methodology

### 4.1. Survey administration and sample

A self-administered questionnaire is used in this study to evaluate the proposed hypotheses of the conceptual model. As content validity is required for the questionnaire, we conduct a pre-test study to confirm the validity of the measurement items. We conducted a pilot test with 50 respondents to clarify the content validity of the study. The reliability test is done by applying Cronbach's alpha. The results ensured that the reliability of the instrument items for all constructs is at an acceptable value of 0.70 (Nunnally, 1978). The questionnaire is then translated from its English version into the local Malay language. Finally, two sets of questionnaires are distributed to respondents - the finalized English and Malay version questionnaires are then used for data collection.

Consumers are surveyed to understand the factors that motivate their adoption of the various cashless payment methods and to examine the factors affecting the adoption of cashless payments. The respondents were asked to indicate their level of agreeing/disagree, to measure the impact of behavioural factors (e.g. performance expectancy, facilitating condition, social influence, innovativeness, perceived technology security, and hedonic motivation) towards the adoption of cashless payments in Malaysia, using a 7-point Likert scale from strongly disagree (1) to strongly agree (7). The survey was conducted with Malaysian consumers who have used online banking transaction, non-cash transaction and other online transaction for purchasing product and services. Using a convenience sampling method, we distributed 500 questionnaires in the Klang Valley (between October and December 2019) face-to-face to Malaysian consumers and before asking them to complete the survey questionnaires, we confirmed with them whether they have used non-cash or online related financial transaction. We have chosen the Klang Valley area in Malaysia as it has the best access to the various payment services available in the country. As such, their perspective will be crucial to understanding the factors that affect consumer adoption of cashless payment in Malaysia. Out of 500 distributed questionnaires, 301 usable questionnaires were used for data analysis, which is a response rate of 60.2%.

### 4.2. Measurement of constructs

Multi-measurement items for all the constructs are employed in this paper to overcome the limitations of using a single item. A single item may not be able to cover all the attributes of the constructs because it is too specific (Churchill Jr., 1979). A single item may retain a high rate of measurement error. Thus, it is suitable that all constructs should be measured using more than two items. Specifically, seven items are used to measure the performance expectancy (4 items) and facilitating condition (3

items) which are modified from studies by Boonsiritomachai and Pitchayadejanant (2017), Onaolapo and Oyewole (2018), Sun, Wang, Guo, and Peng (2013), and Venkatesh and Zhang (2010). Three measurement items used to evaluate social influence is modified from Boonsiritomachai and Pitchayadejanant (2017), Sun et al. (2013), Sair and Danish (2018), while three items are modified from Sair and Danish (2018), Nisha, Iqbal, Rifat, and Idrish (2016) to measure innovativeness. From Boonsiritomachai and Pitchayadejanant's (2017) study, a total of six items are adapted for perceived technology security (3 items) and hedonic motivation (3 items), respectively. Three items related to adoption/intention from Ozturk (2016) and Sun et al. (2013) are used to evaluate the adoption of cashless payments.

#### 4.3. Respondents' information

The findings indicate that out of 301 respondents, 51.5% are males, and 48.5% females (refer to Table 1). In terms of their educational level, the highest percentages are of those who have obtained a bachelor degree (41.2%) and those with high school certificates (Sijil Pelajaran Malaysia (SPM) or Malaysia Certificate of Education) or its equivalent (34.2%) followed by others (19.3%) and postgraduate degree (5.3%). For income levels, the majority (45.2%) are those in the RM2,000 to RM3,999 income, while 26.6% are those with an income of less than RM2,000, and 29% earn RM4,000 and above. These findings determine that most of the respondents are on the lower income range and very few participants have a high income. In terms of the age range, a large portion of the respondents are between 21 and 35 years old. In other words, most of the respondents (69%) represent the Gen-Y category. However, those in the 36–50 years age range (Gen-X) make up 25% of the sample. Meanwhile, with regards to the consumers' industry profile, the top three are those from the services (41%), education (19%) and construction, manufacturing, and oil and gas industry (16%). Finally, with regards to the respondents' occupations, the survey data shows that 30% are those working as services and sales

**Table 1**  
Consumer profile.

Constructs	Characteristics	Frequency	Percent
Gender	Male	155	51.5
	Female	146	48.5
Level of Education	SPM (or equivalent)	103	34.2
	Bachelor's Degree	124	41.2
	Postgraduate	16	5.3
	Others	58	19.3
Income (Monthly)	< RM 2000	80	26.6
	RM 2000 – RM 3999	136	45.2
	RM 4000 – RM 5999	60	19.9
	RM 6000 – RM 7999	17	5.6
	RM 8000 – RM 9999	5	1.7
	RM 10,000 – RM 11,999	3	1.0
Age	> RM 12, 000	–	–
	< 20 years	12	4.0
	21–25 years	52	17.3
	26–30 years	100	33.2
	31–35 years	55	18.3
	36–40 years	32	10.6
	41–45 years	26	8.6
	46–50 years	20	6.6
Industry	> 50 years	4	1.3
	Finance	23	7.6
	ICT	20	6.6
	Services	124	41.2
	Construction, Manufacturing, Oil & Gas	49	16.3
	Education	56	18.6
Occupation	Others	29	9.6
	Manager	23	7.6
	Professional (e.g. doctor, lawyer, etc.)	26	8.6
	Technician and Associate professional	46	15.3
	Clerical support	40	13.3
	Service and sales workers	90	29.9
	Elementary occupation	26	8.6
	Others	50	16.6

workers, whereas 15% and 16% of them are professional technicians and those that work in other industries, respectively.

Fig. 2 summarises the result of Malaysian consumers' payment method. The findings reveal that the most frequently used type of cashless payments by Malaysian consumers is prepaid cards (60%) and internet payments (51%). Meanwhile, debit cards (46%) and payments through mobile phones (43%) are less frequently used but still represent a significant proportion. The least used is credit cards, where at least 66% of the consumers surveyed responded that they do not use credit cards. Cash is still preferred within consumers with 89% reporting frequent usage of cash as a mode of payment. Perhaps this preference for cash is partly due to the lower opportunity cost of holding cash (as interest rates have been low following the 2008 Global Financial Crisis), as is seen in other parts of the world such as Hong Kong SAR and Japan (Bank of International Settlement, 2018).

## 5. Data analysis and findings

### 5.1. Exploratory results and measurement model

The Structural Equation Modeling (SEM) was applied for the assessment of the measurement model and structural model analysis. By using this method, the sources of poor model fit can be identified easily (Anderson & Gerbing, 1988). We followed a 3-step approach to analyze the data. First, the respondents' profile is examined using the Statistical Package for the Social Sciences software (version 21.0). Second, the measurement model is tested to identify the confirmatory factor analysis (CFA). Third, the structural model is examined to find the path coefficient, from the direct relationship of the proposed model using SEM version 21.0.

The findings of the measurement model test (as per Fig. 3) are illustrated in Table 2. The results indicate that the measurement model is statistically significant and satisfactorily fit the goodness-of-fit index (chi-square = 1.920, root mean squared error of approximation (RMSEA) = 0.055, comparative fit index (CFI) = 0.942, goodness of fit index (GFI) = 0.900, adjusted goodness of fit index (AGFI) = 0.864). The composite reliability was measured using factor loading cut-off point between 0.60 and 0.94 which is sufficiently high as suggested by Bagozzi and Yi (1988). The minimum threshold point of Cronbach's alpha is 0.60, whereas the maximum is 0.87, which indicating internal consistency in the instruments. The result of the average variance extracted (AVE) is between 0.55 and 0.65 which implies that convergent validity is achieved as suggested by Hair, Ringle, and Sarstedt (2013).

Table 3 summarises the results of discriminant validity. To estimate the discriminant validity, Fornell and Larcker (1981)'s criterion were used in this study. The results revealed that the square root of AVE for each construct was higher than its correlation with other constructs, indicating that discriminant validity meet the recommended level (Fornell & Larcker, 1981).

### 5.2. Structural model evaluation and hypotheses testing

The maximum likelihood technique is used to test the hypotheses relationship. The results indicate a good model fit for the structural model, for example chi-square = 4.719, RMSEA = 0.067, CFI = 0.979, GFI = 0.965 and AGFI = 0.905. The threshold value for CFI, GFI, and AGFI should be greater than 0.90 (Hair, Hollingsworth, Randolph, & Chong, 2017) and RMSEA must be less than 0.08 (Guo et al., 2019). The model significantly explains the variance  $R^2 = 0.510$  to the adoption of cashless payments. Although the R-square value is adopted in various research disciplines, there is no standard guideline to determine the level of predictive acceptance. Henseler, Ringle, and Sinkovics (2009) proposed a rule of thumb for acceptable R-square value of 0.75, 0.50, and 0.25 described as substantial, moderate and weak, respectively. In the proposed model, performance expectancy, facilitating condition, social influence, innovativeness, perceived technology security, and hedonic motivation are used and tested as a direct predictor of the adoption of cashless payments. The results show that performance expectancy and facilitating condition have a higher

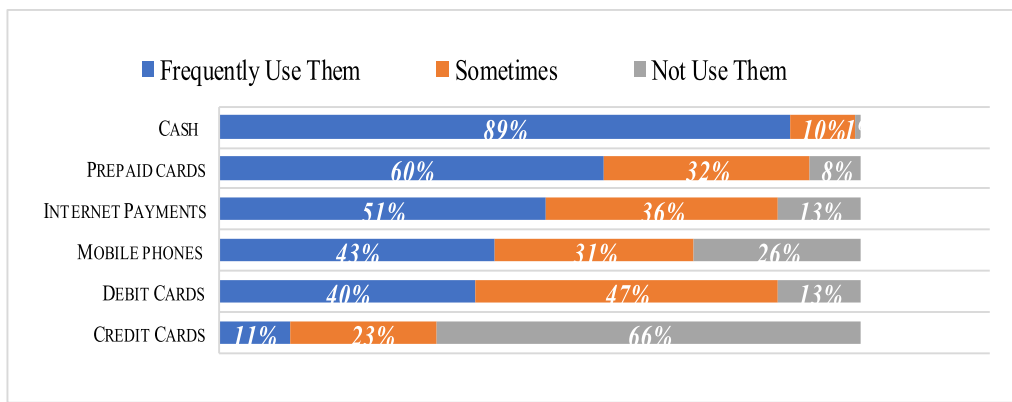


Fig. 2. Payment method currently in use.

significant impact on consumers' adoption of cashless payments ( $\beta = 0.255, p = 0.00$ ) and ( $\beta = 0.344, p = 0.00$ ), respectively. Perceived technology security is also strongly related to consumers' adoption of cashless payments ( $\beta = 0.308, p = 0.00$ ). The findings reveal that hedonic motivation, social influence and innovativeness also have a significant impact on consumers' adoption of cashless payments ( $\beta = 0.119, p = 0.014$ ), ( $\beta = 0.078, p = 0.036$ ), and ( $\beta = 0.093, p = 0.036$ ), respectively, which indicates that hypotheses H1, H2, H3, H4, H5, and H6 are supported. The results are presented in Fig. 4 and Table 4.

## 6. Discussion and implications

Although the adoption of cashless payments has been evolving, little is known about the role of performance expectancy, facilitating condition, social influence, innovativeness, perceived technology security, and hedonic motivation in explaining consumers' adoption of cashless payments. Also, despite its potential, cashless payment systems have yet to be widely and successfully adopted in emerging countries, particularly in Malaysia. Thus, the main purpose of this study is to develop a conceptual model that explains consumers' adoption of cashless payments, which aims to save them time and enables them to conduct tasks more quickly. Specifically, the results find that all the factors have a positive influence on the adoption of cashless payments.

The study asserted that the proposed model is extremely robust; this model statistically demonstrated how consumers' adoption of cashless payment systems may be formed. Indeed, the conceptual model involving these key factors has significant exploratory power for all the variables in predicting consumers' adoption of cashless payments ( $R^2 = 0.51$ ). Based on the findings, we find that consumers will be more willing to adopt cashless payments when their perceived values will be intensified. The results reported that performance expectancy and facilitating condition show statistically higher significant impact on the adoption of cashless payments. Perceived technology security also has a strong significant influence on the adoption of cashless payment. Additionally, social influence, innovativeness, and hedonic motivation are significantly related to the adoption of cashless payment. All these factors are important for consumers' adoption of cashless payments. The investigation of structured relationships among the key factors will provide policymakers valuable information for developing consumers' adoption of cashless payments systems in financial activities. These strategies may help future researchers gain a proper understanding of other stakeholders or oversee consumers' adoption of cashless payment systems.

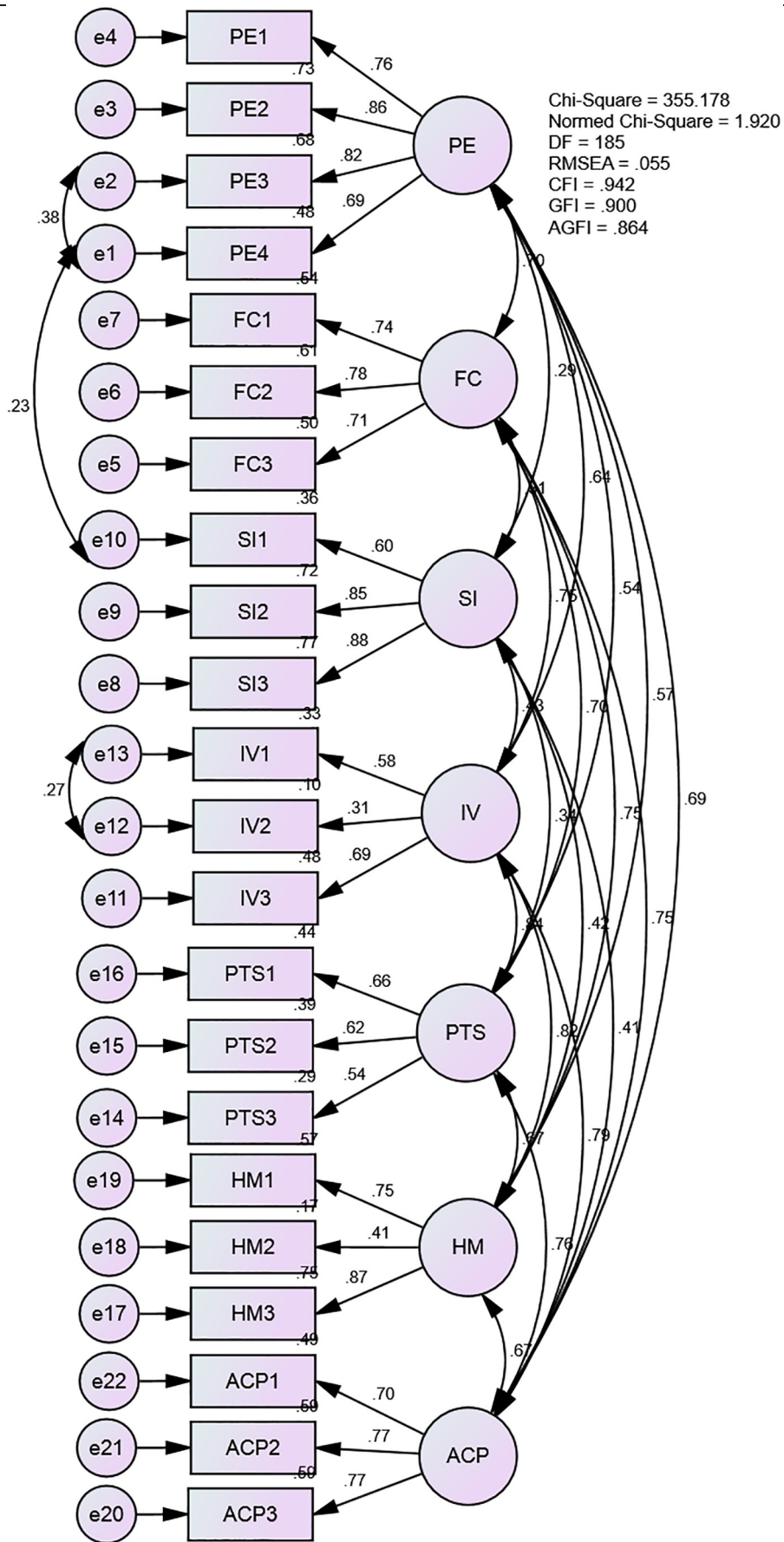
Our findings indicate that consumers who believe cashless payments will increase their overall work performance or performance expectancy would be willing to adopt cashless payments. This finding confirms the findings from a previous study (e.g. Patil, Dwivedi & Rana, 2017). This study contributes to the very limited literature on consumers' adoption of cashless payment systems in Malaysia. Policymakers or financial service

operators should recognise the essential role of consumers' performance expectancy and utilise it to develop efficient ways to maximise revenue in the financial service sector. If consumers are involved in any financial transaction, consumers' performance expectancy can influence the adoption of cashless payments. For example, the factor loadings (as per Table 2) indicate that consumers' adoption of cashless payment method is useful in saving time, improve work performance, increase productivity, as well as to conduct tasks more efficiently and quickly.

The results reveal that consumers' facilitating condition is important for the adoption of cashless payment systems. This variable is tested in several previous studies (e.g. Aggelidis & Chatzoglou, 2009; Lu, Yu, Liu, & Yao, 2003; Peñarroja, Sánchez, Gamero, Orengo, & Zornoza, 2019) where the empirical support was found for the proposed effect on adoption of technology. Our study's findings imply that the consumer has the resource and knowledge necessary to use cashless payments. The more consumers have knowledge and resources (facilitating condition) necessary to use cashless payments, the more they would be willing to adopt cashless payments. In line with this, we can assume that there are three main consumer concerns that should be addressed to enhance the growth of cashless payments in Malaysia. First, service providers must ensure that the cashless payment system increase consumers' overall work performance. Second, the system providers need to provide available resources and implement programmes to overcome the mindset of consumers to increase the adoption of the cashless payment system. Third, the regulator needs to develop an infrastructure that will address the safety concerns of consumers.

Our findings indicate that perceived technology security is the most important variable affecting the adoption of cashless payment. This variable is found in a few previous literature (such as Roche, 2019; Bertsch, 2019), in which they reported that perceived technology security is essential to increase business prosperity. This finding indicates that the more the consumers feel secure about making cashless payments, the faster they will adopt a cashless payment system. The factor loading found in our study implies that secure operating, payment and safety encourage consumers' adoption of cashless payments in financial transactions. Insecure technology is a wealth barrier. Thus, financial operators need to solve this financial barrier for long-term inclusion. In Africa, India, and China, technology is an enabler for financial inclusion. Reforms are happening out of economic necessity in developing countries.

In addition, our results reveal that social influence, innovativeness, and hedonic motivation have a significant impact on the adoption of cashless payments. In terms of social influence on cashless payment systems, few studies have been conducted on social influence in decision-making, for example, Cho and Chan (2019), reported that social influence will also play a role in the decision-making process. Our results indicate that celebrities, family members, and friends or colleagues may influence consumers' behaviour in the adoption of cashless payments. Consumer innovativeness is also widely used in the previous literature. Previous studies by Humbani and Wiese (2018), Mokhtar (2019), and Tiwari, Garg, and Singhal (2019)



(caption on next page)

**Table 2**  
Convergent validity.

Variable and Sources	Items	FL	CR	AVE	Alpha (α)
<b>Performance expectancy</b> Boonsiritomachai and Pitchayadejanant (2017); Onaolapo and Oyewole (2018), Sun et al. (2013).	[PE1] Cashless payment is useful to save time.	0.66	0.87	0.62	0.87
	[PE2] Cashless payment would enable me to conduct tasks (financial transfer, shopping) more easily.	0.76			
	[PE3] Cashless payment would increase my productivity.	0.93			
	[PE4] Cashless payment would improve my work performance.	0.78			
<b>Facilitating condition</b> Boonsiritomachai and Pitchayadejanant (2017); Onaolapo and Oyewole (2018), Venkatesh and Zhang (2010).	[FC1] I have the resources necessary to use cashless payment.	0.75	0.78	0.55	0.78
	[FC2] I have the knowledge necessary to use cashless payment.	0.81			
	[FC3] Cashless payment is compatible with other systems I use.	0.65			
<b>Social Influence</b> Boonsiritomachai and Pitchayadejanant (2017), Lee, Dean, and Jung (2008), Sun et al. (2013), Sair and Danish (2018)	[SI1] Celebrities can influence my behaviour in using cashless payment.	0.59	0.82	0.61	0.80
	[SI2] Family members can influence my behaviour in using cashless payment.	0.87			
	[SI3] Friends/colleagues can influence my behaviour in using cashless payment.	0.86			
<b>Innovativeness</b> Sair and Danish (2018), Nisha et al. (2016)	[IV1] Among my peers, I am usually the first to try out new information technologies.	0.86	0.84	0.65	0.60
	[IV2] In general, I am hesitant to change by established routines.	0.94			
	[IV3] New information technologies are making our lives more exciting	0.57			
<b>Perceived technology security</b> Boonsiritomachai and Pitchayadejanant (2017).	[PTS1] I feel completely secure operating with cashless payment	0.66	0.80	0.57	0.64
	[PTS2] Cashless payment is a secure means for sharing sensitive information.	0.71			
<b>Hedonic motivation</b> Boonsiritomachai and Pitchayadejanant (2017).	[PTS3] My safety concerns are only with online cashless payments.	0.88			
	[HM1] Using cashless payment is fun.	0.62	0.83	0.62	0.69
	[HM2] Depending on cash for payment is stressful.	0.90			
<b>Adoption of cashless payments</b> Ozturk (2016), Sun et al. (2013).	[HM3] Cashless payment makes me feel good.	0.82			
	[ACP1] I have been using cashless payment methods for some time now	0.60	0.81	0.60	0.79
	[ACP2] I am likely to increase the use of cashless payment in my daily life.	0.82			
	[ACP3] I always recommend to others to use cashless payments.	0.87			

Note: FL (Factor loading), CR (Composite reliability), AVE (Average variance extraction).

**Table 3**  
Discriminant validity.

	PE	FC	SI	IV	PTS	HM	ACP
PE	0.816						
FC	0.512	0.812					
SI	0.415	0.518	0.888				
IV	0.289	0.413	0.475	0.823			
PTS	0.350	0.441	0.408	0.487	0.762		
HM	0.193	0.183	0.230	0.308	0.406	0.832	
ACP	0.003	0.063	0.152	0.227	0.210	0.605	0.882

Note: Performance Expectancy (PE), Facilitating Condition (FC), Social Influence (SI), Innovativeness (IV), Perceived Technology Security (PTS), Hedonic Motivation (HM), Adoption of Cashless Payments (ACP).

also confirmed that an individual with high levels of personal innovativeness in information technology may develop more positive perceptions towards adoption of cashless payment systems. Our study also shows that consumer innovativeness regarding cashless payment positively influences the adoption of cashless payment systems in Malaysia. The factor loading result implies that new information technologies make consumers' lives more exciting when adopting cashless payment systems. Our study further finds that hedonic motivation has a significant influence on the adoption of cashless payments. This result is related to Salimon, Yusoff, and Mohd Mokhtar (2017) and Sivathanu's (2019) studies that reported hedonic motivation plays an effect on the adoption of e-banking. The factor analysis of hedonic motivation indicates that consumers' adoption of cashless payment makes them fun, motivational, and good.

Financial service providers need to provide different services to cater to niche markets. Mobile payment service has great potential to bridge the digital divide as smartphones are ubiquitous even in rural areas. Mobile apps that are easily understood and utilise can be developed to cater to this clientele. M-Pesa, a mobile banking service in Africa that allows consumers to store and transfer money, is a notable example. The security concern is important for cashless payment service providers because the payment systems and cashless products are exposed to scams and hackings. This is likely to lead towards a preference for safer options as consumers choose their preferred payment option, as we have seen consumers' preference for debit rather than credit cards. Those debit cards are likely linked to accounts with relatively low balances to mitigate the impact of any fraudulent transactions. E-wallets and prepaid cards are also preferred due to the lower risk of loss due to such risk factors.

Policymakers are aware that banks have an advantage over non-bank players in the cashless payment system, and they have strived to provide a much more level playing field. To this end, BNM has launched the Interoperable Credit Transfer Framework (ICTF) in 2018 to provide a shared payment infrastructure for both bank and non-bank e-money providers. The competition will hopefully lead to better products and choices for consumers, and perhaps lower costs. However, opening Malaysia's market for big international service providers before local players are better established, faces the risk that international competition will wipe them out completely. Tencent's WeChat pay (currently only for China tourists in Malaysia) is an experiment that policymakers should closely monitor. Market dominance by a large payment company may put the risk of the payment system at the whim of external power. Less support for local fintech players may lead them to relocate to other regional countries, as has been the case with some local tech startups. This will be a loss to

← Fig. 3. Measurement model. Note: Performance Expectancy (PE), Facilitating Condition (FC), Social Influence (SI), Innovativeness (IV), Perceived Technology Security (PTS), Hedonic Motivation (HM), Adoption of Cashless Payments (ACP).

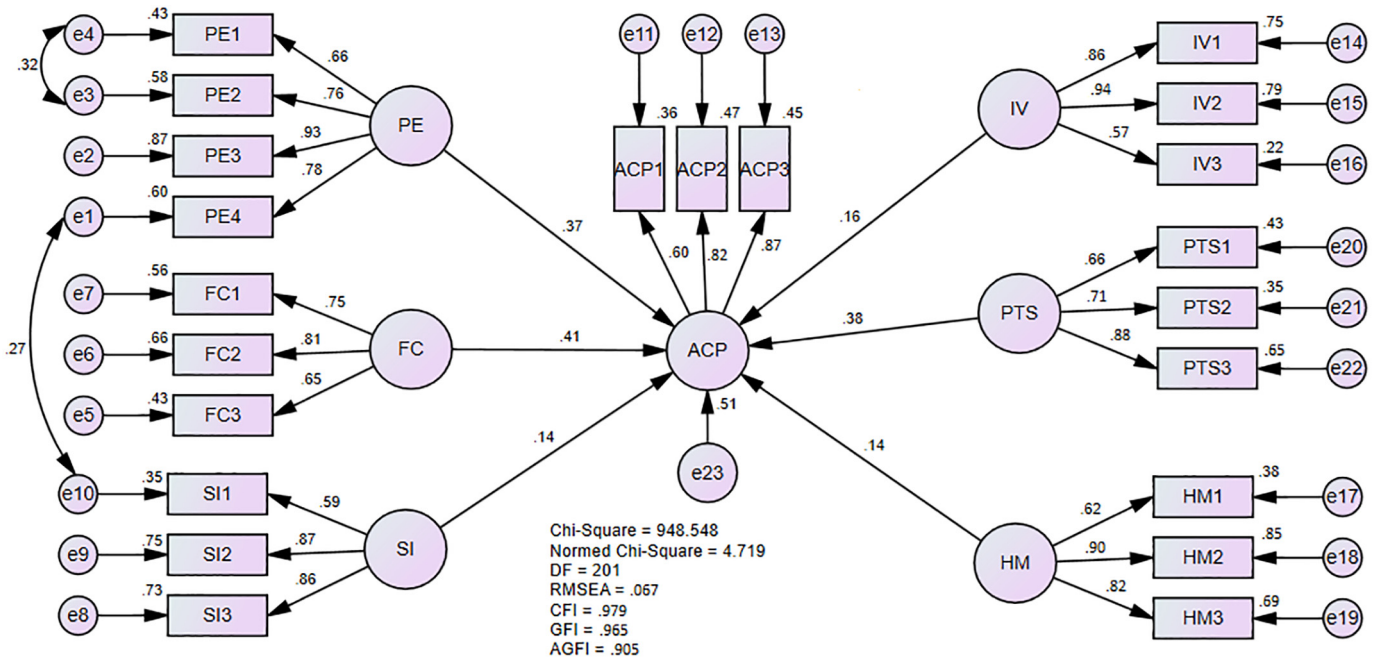


Fig. 4. Structural model. Note: Performance Expectancy (PE), Facilitating Condition (FC), Social Influence (SI), Innovativeness (IV), Perceived Technology Security (PTS), Hedonic Motivation (HM), Adoption of Cashless Payments (ACP).

Table 4  
 Hypotheses relationship.

Hypotheses	Relationship	Estimate	S.E.	C.R.	P-value
H1	ACP <--- PE	0.255	0.048	5.356	0.000
H2	ACP <--- FC	0.344	0.068	5.032	0.000
H3	ACP <--- SI	0.078	0.037	2.094	0.036
H4	ACP <--- IV	0.093	0.044	2.100	0.036
H5	ACP <--- PTS	0.308	0.072	4.252	0.000
H6	ACP <--- HM	0.119	0.049	2.449	0.014

Performance expectancy (PE), Facilitating condition (FC), Social influence (SI), Innovativeness (IV), Perceived Technology security (PTS), and Hedonic motivation (HM).

Malaysia in the long-term. Cash is a public good and it is free at the point of use. Cash handling costs get disperse in society. E-payments cost, on the other hand, is borne by users. If another means of payment is forced upon society, then policymakers should ensure that a free means of payment exist in the chain. Malaysia is now at the transitioning stage from cash to cashless. The country can provide ease of access to financial services for the people, uptake of cashless payment solutions by technology, merchants, cultural aspects, macroeconomic and development of infrastructure for a cashless society.

7. Limitation and future study

This study has limitations as it only focuses on the relationship between independent and dependent constructs. Future study can be conducted by using mediating and moderating effect of manufacturing services, industry performance for measuring customers' cashless payment systems. The study used structured questionnaires and formulated it in a Likert scale. Future study may be conducted using both survey and interview methods to capture customers' perceptions about the cashless society and increase the robustness of the study. In this study, the data was collected from urban citizens. Although a cashless society may not work as well in the rural areas where they are reliant on cash and have lower financial literacy compared to urban citizens, future studies may be conducted with rural citizens to understand their perception on cashless payment systems. Currently, the

issue of consumers' adoption of cashless payment has increased importance due to the Covid-19 pandemic, which is not covered in this study, thus, future study should be conducted to also incorporate consumers' cashless payment during Covid-19 pandemic in Malaysia.

Declaration of competing interest

We would like to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

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