The forefront of mobile shopping: an emerging economy's perspective

Chi-Yang Hng and Pik-Yin Foo*

Faculty of Business and Finance,
Universiti Tunku Abdul Rahman (Kampar Campus),
Jalan Universiti,
Bandar Barat,
31900 Kampar, Perak, Malaysia
Email: conan_hcy1004@hotmail.com
Email: foopy@utar.edu.my
*Corresponding author

Ai-Fen Lim and Radha Krishnan Nair

Faculty of Business and Information Science,
UCSI University Kuala Lumpur Campus,
No. 1, Jalan Menara Gading,
UCSI Heights (Taman Connaught),
Cheras 56000, Kuala Lumpur, Malaysia
Email: limaf@ucsiuniversity.edu.my
Email: RadhaNair@ucsiuniversity.edu.my

Abstract: The primary objective of this research is to identify the main factors affecting the intention to use mobile shopping in Malaysia. The theoretical base of this study was based on the mobile technology acceptance model (MTAM) as well as other theories such as diffusion of innovation (DOI). Data collection for this study spanned from May 2018 to September 2018. The survey was done via the distribution of questionnaires in selected local shopping malls. A total of 300 usable responses were collected for further analysis using the partial least square structural equation modelling (PLS-SEM) approach. The findings identified that mobile ease of use (MEU) and mobile usefulness (MU) influenced an individual's intention to use (IU) significantly while perceived playfulness (PP) is not a significant predictor. In addition, reachability (R) also influenced MEU and MU significantly whereas mobility (M) has no significant influence on both MEU and MU. Empirical findings from this study contribute by providing useful and practical insights to the academics, mobile technologies developers and the general public.

Keywords: mobile shopping; partial least square structural equation modelling; PLS-SEM; mobile ease of use; mobile usefulness; perceived playfulness; reachability; mobility; intention to use; survey; Malaysia.

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Biographical notes: Chi-Yang Hng is currently working in the order processing department of a MNC company. He is responsible for the management and processing of products and services received from the sales staff. In 2018, he has successfully completed his Master's in Business Administration at Universiti Tunku Abdul Rahman, Malaysia. He is keen on learning to explore more opportunities in academic research areas.

Pik-Yin Foo is an academic at the Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Malaysia. She obtained her Bachelor's in Commerce Accounting from Universiti Tunku Abdul Rahman, Malaysia back in 2011. She has also completed Master of Philosophy (a pure research programme) at Universiti Tunku Abdul Rahman, Malaysia in 2020. Besides this, she has also completed 13/14 papers for ACCA and is keen on learning and mastering the art of researching. She worked in the Finance Department of a MNC for almost four years prior to joining the academic world.

Ai-Fen Lim is a Lecturer at the Faculty of Business and Information Science, UCSI University, Malaysia. She received her BA (Hons) Accounting in 2010 and MBA specialisation in Finance in 2012, both from University Utara Malaysia. Currently, she is pursuing her Doctor of Philosophy (Business and Management). She is a member of Malaysian Institution of Accountants and a member of Chartered Institute for Securities and Investment. She worked as an Auditor in one of the Big Four accounting firms and executive officer at the GCFO's office in a MNC for almost five years before joining the academic industry.

Radha Krishnan Nair is a Lecturer at the Faculty of Faculty of Business and Information Science, UCSI University, Malaysia. She completed the examination of The Chartered Institute of Management Accountants (CIMA) in 1994 and was admitted as an associate of the institute in 2000. She obtained her MSc in Strategic Business Management from the Manchester Metropolitan University (UK) in 2014. She is currently pursuing her Doctor of Philosophy (Business and Management). She has about 15 years of industrial experience in the field of audit, accounting and family business before joining the academic industry in 2010.

1 Introduction

In this era of technology, mobile internet usage has increased exponentially and resulted in an unprecedented surge in mobile shopping (Hew et al., 2018; Tan et al., 2018). Additionally, the e-commerce activities have grown due to better and lower mobile shopping costs in Malaysia (Hew et al., 2019). According to a survey conducted by the Malaysian Communications and Multimedia Commission in year 2016, the proportion of Internet users was 76.9%. There are approximately 24.5 million internet subscribers, a difference of 24.1 million while compared to year 2015 (Malaysian Communications and Multimedia Commission, 2017). The proportion of mobile device subscribers is as high as 144% in Malaysia, exceeding that of the UK and the USA (The World Bank Group, 2019) and smartphone has increasingly become a competitive necessity rather than a luxurious item (Teo et al., 2015b; Wong et al., 2015c). There is an upward trend in mobile shopping due to its convenience, ubiquity, safe and reliable payment methods, on

top of captivating interactions with the sellers during mobile shopping (Teo et al., 2015a; Wong et al., 2014, 2015b).

According to Tan et al. (2012) and Tan and Ooi (2018), mobile shopping essentially involves undertaking shopping activities by using mobile devices such as smartphone and tablet equipped with a wireless telecommunications network. Sim et al. (2014), Tan et al. (2014a, 2014b), and Wong et al. (2016) further posited that mobile shopping offers consumers a unique, interesting and satisfying shopping experience due to the capability of mobile devices being ubiquitous (meaning consumers can conveniently perform mobile shopping anytime and anywhere so long as their mobile devices are connected to the Internet securely). This unique ubiquity is the distinct competitive advantage offered by the mobile shopping platform that is not available in the conventional personal computer (PC)-based online shopping environment (Balachandran and Tan, 2015; Sim et al., 2012). Advantages such as mobility, convenience and personalisation offered by mobile shopping open up new opportunities for businesses to reach their customers (Pan et al., 2015; Yap and Tan, 2017). As recently reported by Mastercard Mobile Shopping Survey 2017, the aspect of convenience is one of the main drivers for shoppers to opt for mobile shopping as their primary shopping channel (Mastercard, 2017). Customers are expected to expend less effort and resources while shopping through mobile devices as opposed to using conventional PCs (Sim et al., 2011). Evidently, mobile shopping has shown tremendous growth for the past few years among the Asia Pacific countries (Ooi et al., 2018a; Tan et al., 2010).

Recently, a few companies have launched mobile shopping apps for smartphone users to generate additional spending opportunities for existing and potential consumers. This marketing strategy helps companies to boost sales by playing the role of an effective advertising channel that is able to overcome traditional geographical barriers and hence reach a much wider customer base.

1.1 Problem statement

According to the prediction of Deloitte 2015 holiday survey, different types of shopping information and activities were obtained from 78% of shoppers via mobile devices. Examples include the search for product information and assessments, comparison of prices, et cetera (Deloitte Development LLC, 2015). Traditional shopping requires more time since the consumers need to travel to reach their destination which will be a chosen fixed location to do their shopping and they need to queue up to make the payment. According to Ooi and Tan (2016), there are limited people who have so much time to go shopping in the mall due to heavy workloads in their life. Additionally, due to the heavy traffic in Malaysia, the drawbacks of consumer intention to go for shopping becomes higher.

There are other restrictions in mobile shopping on information processing, such as difficulty in browsing due to limited screen size, typing errors due to clumsiness of the keyboard on the mobile device, or problem of unstable mobile network connection that is able to cause interruptions in the shopping process. Consumers who show a tendency to maximise their choices will encounter inherent difficulties in making purchase decisions (even if they have fewer options to shop in a physical store because they have restricted intention to find the best product).

Customers can access to the companies of their own choice conveniently with the portability of mobile devices. Then again, additional costs need to be incurred for this portability. The limited screen size and functions of the mobile device have become an obstacle to users and as a whole caused changes to the consumer's search intention. Additionally, the searching cost of customers to use mobile internet is more than desktop computer (Ghose et al., 2013). In another study, Ghose and Park (2013) indicated that users refused to buy niche products via mobile shopping. Customers tend to fall back to old habits when facing time or resources constraints (Wood and Neal, 2009). Therefore, customers refused to pay for the searching costs but just want to accommodate to their customised needs. Searching with a limited screen size that needs a lot of scrolling operations will restrict the variety and quantity of information that the consumers access (Shankar et al., 2010). Although mobile devices provide consumers with the benefit of portability, however, the higher searching cost will influence their ability to search for or recall network information. Hence, an empirical research study regarding the degree of effectiveness of the selected set of predictors to influence the behavioural intentions to adopt mobile shopping among Malaysian consumers is well-warranted in order to shed some light and provide valuable insights to the commercial industry what are some of the most important factors that are highly effective in driving mobile shopping among Malaysian consumers.

According to Wong et al. (2012), many past studies have demonstrated the impact of mobile Internet towards the consumer behavioural intention. However, there is a lack of empirical studies that focus on mobile shopping, especially from the Malaysian perspective. Moreover, what sets this research study apart from others is the major limelight of this research study involves the investigation of the deciding factors for consumers' behavioural intention to adopt mobile shopping in the context of an emerging and developing economy, i.e. Malaysia; whereas a majority of past studies concerning mobile shopping focused on advanced economies such as South Korea (Lee et al., 2014), Japan (Funk, 2007), UK (Alshurideh, 2014), USA (Yang, 2010) and the European Union (San-Martín et al., 2015); which makes it more pressing to investigate which are the effective predictors that drive mobile shopping in the Malaysian climate.

1.2 Research objective

1.2.1 General objective

To investigate specific determinants which can affect customers' intention to adopt mobile shopping.

1.2.2 Specific objectives

1 To investigate the relationship between mobile usefulness (MU) and consumers' behavioural intention to adopt mobile shopping.

2 To investigate the relationship between mobile ease of use (MEU) and consumers' behavioural intention to adopt mobile shopping.

3 To investigate the relationship between mobility (M) and MU.

4 To investigate the relationship between mobility (M) and MEU.

5 To investigate the relationship between perceived playfulness (PP) and consumers' behavioural intention to adopt mobile shopping.

6 To investigate the relationship between reachability (R) and MU.

7 To investigate the relationship between reachability (R) and MEU.

1.3 Research questions

Which determinant(s) have the highest effect on customers' behavioural intention to adopt mobile shopping?

1.4 Significance of the study

1.4.1 Theoretical significance

The research aims to understand some of the factors that influence consumers in adopting mobile shopping. There are numerous researchers who have done studies on mobile shopping however there is little from the Malaysian perspective. This study intends to provide further information and add more values to some existing literatures about mobile shopping adoption by using the mobile technology acceptance model (MTAM) together with other few variables namely mobility (M), PP and reachability (R). These additional variables are integrated into the research framework to get valuable insights from other different types of perspectives.

1.4.2 Practical significance

This article emphasises the factors of consumer behavioural intentions when shopping on mobile devices. The results of this paper are expected to provide meaningful contribution for the marketing industry and help mobile and digital marketers, and application developers, by assisting them in appointing the suitable marketing strategies in order to satisfy consumers' expectations. In addition, it tends to provide targeted audiences with better-informed information and to develop the right channel for adoption of mobile shopping. A better understanding about mobile shoppers' psychology and consumer behaviour by marketers and application developers will create a better pathway for more effectively develop the right channels to protect, attract and inspire shoppers to use mobile devices for shopping.

2 Literature review

2.1 Mobile technology acceptance model (MTAM)

MTAM was proposed by Ooi and Tan (2016) by building on and extrapolating on the technology acceptance model (TAM) concept. The factor why MTAM is chosen instead of TAM is due to the difference in the adoption of different types of technologies, such as PC and mobile (Teo et al., 2012). MTAM was developed to accommodate mobile applications instead of other technologies (Ooi and Tan, 2016). MTAM has two main determinants: MEU and MU. However, since the model only considers two variables, hence, additional constructs are added, such as PP (Çelik, 2011; Moon and Kim, 2001),

to increase the predictive power of the user's behavioural intentions to adopt the mobile game.

2.2 Diffusion of innovation (DOI)

According to Rogers (2003), the theory of innovation diffusion [diffusion of innovation (DOI)] helps to communicate how an idea or product gains motivation and spreads over time in a particular social system or large group of people. Rogers (2003) introduced the DOI model, which consists of five groupings represented by a bell curve. First group is innovators, who are considered adventurous, while second group involves early adopters who are the respected pioneers. The third group is early majority, and they must consider it for a while before fully accepting new ideas. The fourth group is late generations who are known as being skeptical, and new innovations will only be adopted after being accepted or tried by others. The last group involves laggards who are the most conservative people and are bound by traditions. They are skeptical about change and are the strongest group against the adoption of new innovations (Rogers, 2003).

In addition, there are five main factors that can put pressure or impact on the adoption of innovation. These five main elements include comparative advantage, compatibility, complexity, observability, and scalability. The comparative advantage shows to some extent that innovation seems to be far more promising than this idea. The comparative advantage also has the same intentions with convenience or perceived usefulness. Compatibility refers to consistency in the innovation and the needs of the adopters, beliefs and past experiences. Complexity indicates whether the innovation is easy to understand and user-friendly. Scalability indicates a degree of innovation may be tested before it is fully committed to innovation. Finally, observability refers to an extension of the results of innovation that is able to detect by others.

2.3 Intent to use mobile shopping

Past studies show that some factors may alter consumers' behavioural intentions**.** According to Ding et al. (2016), one of the most popular research models for studying consumer behavioural intention is the TAM. According to Ajzen (1991), behavioural intentions represent a person's willingness to demonstrate particular behaviours. It also shows how much effort a person is willing to commit and what they plan to do to accomplish their goals (Nedra et al., 2019). In addition, it was found that intention has a direct relationship with the acceptance of latest inventions and technologies by individuals (Tseng and Wei, 2020). Wong et al. (2015a) used intentions to determine a consumer's willingness to adopt mobile shopping. In addition, a recent example explained by Tan et al. (2017) is to investigate whether consumers intend to use mobile application as other alternatives for purchasing some products and services related to travelling.

3 Hypotheses development

3.1 Mobile usefulness (MU), 1st independent variable

According to Kim et al. (2013) and Ooi and Tan (2016), MUs are similar to the meaning of PUs from a mobile perspective, such as comparative advantage and extrinsic

motivation, and explain on how improvements can be demonstrated in the performance of specific individuals. PU refers to the perceived enhancement of usefulness to potential adopters when using mobile devices. In general, Zarmpou et al. (2012) confirmed that perceived usefulness has a positive effect on behavioural intentions to use mobile services. In this study, perceived usefulness means the extent of people's belief about adopting a mobile device to shop online will increase his/her job performance. Therefore, a mobile device with high perceived usefulness is in turn a mobile device that mobile users believe has a positive use performance connection (Davis, 1989). Venkatesh and Davis (2000) argued that the PU of technology is considered as one of the significant factors of shoppers' willingness to buy. If consumers can get benefits such as saving time, convenience and other aspects, they are more likely to shop online. Tan et al. (2014a) and Leong et al. (2013) indicated that MU resulted in a higher intention to pay through NFC mobile payment system in Malaysia. Teo et al. (2015b) also illustrated the similar results to save time and portability with mobile payments. Tan et al. (2014b) further elaborated that the usefulness of innovation will ultimately lead to higher adoption intentions. 500 college students in Taiwan were selected as sample study to investigate their intention to adopt mobile shopping, and Wong et al. (2012) found that perceived usefulness had a significant impact on consumer's intention. The unique ubiquity feature offered by smart phones has rendered consumers having the convenience to perform mobile shopping transactions 24 hours a day, without any time and location constraints (provided that the smart phones are connected to the internet). Additionally, Sit et al. (2011) explained that consumers will be very eager to adopt mobile shopping if they can compare the prices of products and services by using the price comparison software that is accessible via the mobile internet. Therefore, if m-shopping is proven to be able to save time, improve the quality of life, bring convenience and enable consumers to compare product prices on-the-go, consumers will tend to embrace mobile shopping.

H1 MU has a positive relationship with consumer's intention to adopt mobile shopping.

3.2 Mobile ease of use (MEU), 2nd independent variable

According to Ooi and Tan (2016), MEU has consistent meaning with the ease of use and complexity of adopting a specific IT/IS system. MEU essentially refers to the perception of complexity to learn and use mobile devices. PEOU means the degree of a consumer's belief that adopting a certain system will be effortless. As mentioned by Moon and Kim (2001), IT systems which are easy to use will require less effort and thus encouraging continued patronage due to enjoyment. If a system is perceived to be complicated and difficult to be managed, the consumer will be less likely to adopt that particular system (Tan et al., 2014b). Adoption of new technologies can be prevented by complex features. This is the reason why online retailers strive to optimise their mobile web pages in order to enhance user-friendliness. A NFC mobile payment study in France involving 320 smartphone users has revealed that MEU has a significant relationship with IU (Dutot, 2015; Venkatesh, 2000).

On a side note, Lu and Su (2009) found that most of the mobile devices face restrictions in terms of battery power, memory capacity, multimedia capabilities, and bandwidth distribution, thus challenging online retailers when planning data display methods. Lee and Park (2006) believed that the procedure of entering credit card information through a mobile device during a transaction could be cumbersome. Mobile

devices must have a simple navigation structure, simple design and processing capabilities (Venkatesh et al., 2002). Yang (2010) also pointed out that customers will perceive mobile shopping as user friendly if they are able to navigate mobile social media easily. Similarly, consumers who perceive the system to be fairly easy to use usually have a better attitude (Nysveen et al., 2005).

H2 MEU has a positive relationship on intention to use mobile shopping.

3.3 Mobility (M), 3rd independent variable

Kim et al. (2010) explained that in the field of mobile payment applications, it was found that mobility can improve the efficiency and performance of users. Besides this, mobility features are also believed to enhance mobile users' perception of MEU (Wong et al., 2015a). In addition, mobility greatly compensates for the limitations in terms of screen size or low battery life of mobile devices by allowing consumers to get information anytime and anywhere and enhance consumer's recognition of mobile services to effectively reap the rewards of mobile-based learning.

Mobility essentially means the ability to access services through wireless networks by using different types of mobile devices (Anckar and D'Incau, 2002). Au and Kauffman (2008) labeled the advantage of mobile technology as 'calculation anytime, anywhere'. The multi-perspective mobility encompasses dimensions such as the independence of time and place, and the computing power that allows access to information, communications and services, anytime and anywhere. The unique ubiquity feature possessed by mobile devices allows on-the-go consumers to be able to access the internet and perform mobile shopping transactions anytime and anywhere. The resulting comparative advantages such as convenience, effective communications, and safe and secure mobile payment options have resulted in consumers having a better perceived usefulness by adopting mobile shopping.

H3 M has a positive relationship with MEU.

H4 M has a positive relationship with MU.

3.4 Perceived playfulness (PP), 4th independent variable

Moon and Kim (2001) posited that PP is one of the intrinsic motivations that affects an individual towards accepting a new system. Moon and Kim (2001) described PP as a power of belief to generate the users' intrinsic motivation while they interact with the system. Following the theory of mobility, PP is an interesting construct in the TAM, because PP invokes positive emotions among users during interactions with the system (Moon and Kim, 2001). Cheong and Park (2005) and Hur et al. (2017) also found that PP has a significant positive impact on consumer's intention in adopting innovative mobile application services. In their empirical research, Cheong and Park (2005) defined PP as the intensity of positive emotions brought on by entertainment and leisure activities via mobile applications. Cheong and Park (2005) subsequently found that consumers are more willing to adopt mobile shopping due to PP.

H5 PP has a positive relationship with consumers' intention to adopt mobile shopping.

3.5 Reachability (R), 5th independent variable

The mobile system allows service providers to constantly stay connected with consumers at any time. This encourages consumers to use mobile system more frequently because it can ensure on time continuous support, especially any ad-hoc issues that popped out during the use of mobile payment service. The service provider guarantees instant support for the users. There are some mobile coverage problems in the remote areas of some developing countries, especially during data transmission. Following Leong et al. (2013) and Tan et al. (2014a), although the initial investment cost of NFC technology is high, nonetheless it can offer a higher degree of reliability and also increase accessibility to end users.

All in all, the reachability of mobile devices allows people to connect anytime and anywhere by overcoming geographical and time-zone limitations (Au and Kauffman, 2008). Wong et al. (2015a) posited that this feature enables mobile shopping service providers to provide 24/7 on-the-go access and support to mobile shopping users. On the other hand, mobile payments involve the active participation of service providers (Teo et al., 2015b). In some cases, it may be necessary for mobile shopping providers to contact the mobile shoppers for additional details regarding the shoppers' transactions. For instance, mobile shopping providers may try to contact users to notify them about the latest mobile transactions and account balances. The reachability feature greatly enhances the ability of mobile service providers to contact customers frequently to obtain information, make clarifications over the phone, and send e-mails or messages via mobile devices. Therefore, as mobile shopping systems provide greater accessibility, users will have a higher intention to adopt mobile shopping.

H6 R has a positive relationship with MEU.

H7 R has a positive relationship with MU.

3.6 Mobile shopping

The advancement in mobile commerce has altered the traditional way of doing business by offering a relatively higher degree of convenience to consumers, such as allowing consumers to perform mobile shopping and mobile payment transactions on-the-go. Mobile shopping has become one of the trendiest shopping methods among all mobile commerce services in recent years. According to PricewaterhouseCoopers' 2016 comprehensive retail report, about three-quarters of respondents in Malaysia claimed that they mainly purchased various promotional products when shopping through social media (Mahalingam, 2016). In fact, Southeast Asian consumers have demonstrated a strong need to use social media to keep in touch with their preferred products of certain brands.

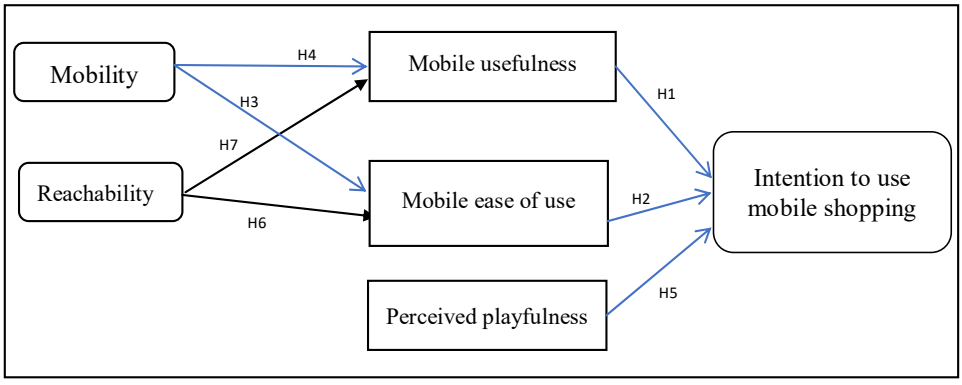
PricewaterhouseCoopers further revealed that about 70–75% of respondents from Malaysia, Singapore and Thailand reported that they frequent mobile shopping (Mahalingam, 2016). In the above three Southeast Asian countries, mobile phone purchases have exceeded the global average of 54%.

4 Rationales behind the conceptualisation of research framework

The proposed framework for this research study was developed by integrating MTAM together with mobility, reachability and PP that have been proven by past studies to be useful in predicting the behavioural intention of users in the acceptance of new technology.

For this research study, both constructs in MTAM namely MU and MEU were applied since both constructs are useful in predicting the behavioural intention of users. Furthermore, several additional constructs that are expected to contribute towards the predictive power of the model were added. Researchers have extended the MTAM model by integrating mobility and reachability as variables and examining their impact on ME and MEU. The rationale behind this move is because the strength and connectivity of mobile shopping depends on the characteristics and capability of the mobile device on the mobile platform.

Figure 1 Conceptual framework (see online version for colours)



Source: Adapted from Ooi and Tan (2016), Moon and Kim (2001) and Ko et al. (2009)

5 Methodology

5.1 Research design

Burns and Bush (2014) explained that a research design refers to an organised and structured plan that directs the research towards achieving its research objectives. This study adopts a deductive/quantitative approach to provide insights regarding the influencing factors such as mobility and reachability towards consumers' intention to adopt mobile shopping. It stresses on collecting numerical data as well as generalising it among groups of respondents (Babbie, 2010). Questionnaire is the most commonly used research tool because it is easy to administer and it tends to yield higher response rate compared to other survey strategies. Moreover, it is relatively inexpensive, efficient and flexible (Mathers et al., 2009). Hence, we have utilised survey questionnaire to be our data collection method. This study adopted cross sectional approach because it studied a particular phenomenon and the data will be collected only once in the same period. The

longitudinal approach is inappropriate for this study since it requires the same respondents to participate in the same survey again after a specific period (for example 3 years) to capture any differences in terms of responses from the same respondents after a specific duration (Stephen and Ledger, 2006).

5.2 Target population and sampling

According to Webster (1985), the sample represents a part of the statistical population and its characteristics are studied to arrive at the conclusion of the entire population. Sampling means an act of choosing a satisfactory quantity of elements as sample from the entire target population. By using sampling method, researchers can collect and analyse data in order to generate results to reach conclusions for the entire population without incurring a lot of resources.

According to Sekaran and Bougie (2010), a target population is identified by certain types of external tangible characteristics. Target population refers to geographical areas such as regions or countries, gender, and also age groups. In order for the results of this research study to be a good representation of all Malaysian consumers, hence, any consumers who come from Malaysia will constitute the target population in this research. Specifically, the Malaysian consumers who purchase products or services through mobile devices will be focused in this research.

All persons who are involved in research study are known as sampling elements (Zikmund et al., 2010; Zikmund, 2003). It also means that each person from the targeted area or population is a sampling element. In this research, the sampling element will be any consumer who is a Malaysian citizen and at the same time owns mobile device(s) that are connected to a wireless telecommunications network or is accessible to the mobile internet. Besides this, the respondents also must have the knowledge and past experiences of using debit/credit cards to purchase goods and services online.

5.3 Sample size

According to Sekaran and Bougie (2010), the sample size can be described as the number of samples in the research study. The quantity of variables, the significance of decision making, the nature of the research and analysis, and the limitations of resources will determine the number of samples needed (Malhotra et al., 2012). Moreover, due to adoption of PLS-SEM method, the sample size also depends on several other factors, namely the level of significance, the minimum coefficient of determination, the statistical power, and the maximum number of arrows pointing to the latent variable (Hair et al., 2013). In general, marketing research tends to have a 5% significance level with a minimum factor of 0.25 and a statistical power of 80% (Wong, 2013). Based on these criteria, Marcoulides and Saunders (2006) suggested that total number of arrows pointing to potential variables in the model will determine the minimum sample size in this study. For this research study, a sample size of 300 is sufficient to accurately analyse the results.

5.4 Sampling location, sampling period, sampling frame and sampling technique

The location where questionnaires are being disseminated to respondents is known as the sampling location. Perak was the sampling location chosen for this study because its mobile phone penetration rate remained at around 133.4% in 2017, which is relatively high and can be fully counted upon. In addition, for years 2015 to 2017, the penetration rate in Perak has steadily increased year by year, which means that Perak residents have become increasingly likely to adopt the latest innovative technologies.

In particular, the city of Ipoh in Perak was chosen as the place to collect responses since Ipoh has higher opportunities and exerts a stronger appeal which attracts Malaysians originating from different states, ethnicities, cultures and other demographic backgrounds to do mobile shopping. The questionnaires were distributed at various shopping centers in Ipoh because the shopping malls were somewhere people from different backgrounds gathered. This is essential to make sure there is a better representation of the Malaysian population. The period when the questionnaires were distributed to complete the prescribed research objectives is known as the sampling period. The sampling period for this research was from 29th June, 2018 to 8th July, 2018.

The list of elements that determines which particular samples should be picked up from the population served as the role of a sampling frame. However, it may not be appropriate in this research since it is not possible to obtain the complete name list of consumers who visited these shopping malls in Ipoh. Hence, non-probability convenience sampling technique was used in this research due to the huge number of target respondents who visited the shopping malls.

5.5 Pretesting

Pre-testing involves conducting smaller-scale surveys to help researchers assess the understandability and validity of the survey questionnaire. This is an important process because it allows researchers to rectify any errors spotted in the questionnaire before rolling it out on a larger scale. A total of 30 randomly selected respondents provided constructive feedback regarding the clarity, grammar and comprehensibility levels of the questionnaire as well as the amount of effort required to complete the survey questionnaire. After the pre-test was completed, the overall feedback showed a promising sign, hence the questionnaire was subsequently used for the purpose of collecting data on a much larger scale.

5.6 Constructs measurement

Table 1 Question origin

Variables	*Number of items*	*Sources*
Mobile usefulness (MU)	5	Adapted from Ooi and Tan (2016)
Mobile ease of use (MEU)	5	Adapted from Ooi and Tan (2016)
Perceived playfulness (PP)	4	Adapted from Tan et al. (2014a)
Mobility (M)	2	Adapted from Tan et al. (2014a)
Reachability (R)	3	Adapted from Tan et al. (2014a)
Intention to use (IU)	4	Adapted from Tan et al. (2014a)

5.7 Data processing

Data were collected at the same time after the distribution of questionnaires. Transforming data into usable information was the next step. Data processing (which consists of procedures such as data checking, data editing, data coding, data transcribing and data cleaning) is essential to organise and process the data which consists of a lot of numerical data, so that it can be converted into useful information.

5.8 Data analysis technique

5.8.1 Statistical analysis

PLS-SEM statistical technique was used in this study because the main research objective of this study was exploratory theoretical development (Ringle et al., 2005). Besides this, PLS-SEM is able to provide a comprehensive approach to evaluating and modifying theoretical models (Anderson and Gerbing, 1988). In addition, PLS-SEM provides clues in explaining the variances of the dependent variable and the characteristics of the measurement model (Ooi et al., 2018b). Furthermore, another advantage of using PLS-SEM is that it can tolerate smaller sample sizes while providing good prediction accuracy (Foo et al., 2018).

6 Data analysis

6.1 Response rate

Three hundred twenty-four surveys were randomly administrated to the general public who visited the shopping malls. Out of the 324 questionnaires, only 300 were usable. Thus, the response rate for this study amounted to 92.16%. According to Sekaran and Bougie (2010), a research study is considered as practicable if it is able to achieve at least a response rate of 30%.

6.2 Descriptive analysis

Table 2 shows that a majority of the target respondents are females (54%) whereas male respondents took up 46%. Based on Table 2, the highest number of respondents were aged 21–30 years old (at 35%) whereas the lowest number of respondents were aged below 20 years old (at a mere 18%). A total of 56% of respondents were Chinese followed by 36% and 8% of Malay and Indian respondents respectively. The highest number of respondents were working professionals (43.33%) followed closely by students (42.67%) whereas the least number of respondents fall into the self-employed category (at only 14%). Majority of the respondents earned monthly income in the range of RM1001–RM2000 (at 70%) followed closely by monthly income below RM1000 (at 21%) while the least number of respondents fall into the RM2001–RM3000 category (at only 9%). 48% of the respondents were utilising mobile shopping 1–5 times in the past 12 months whereas 40% of the respondents utilised mobile shopping 6–10 times. Meanwhile, the least number of respondents utilised 11–15 times and 16–20 times at 8.67% and 3.33% respectively.

Table 2 Demographic profile of respondents

	f	%
Gender		
Male	139	46
Female	161	54
Age		
Below 20 years old	54	18
21–30 years old	106	35
31–40 years old	55	18
41–50 years old	85	28
Race		
Malay	108	36
Chinese	168	56
Indian	24	8
Occupation		
Working Professional	130	43.33
Self employed	42	14
Student	128	42.67
Individual monthly income		
Below RM1000	63	21
RM1001–RM2000	210	70
RM2001–RM3000	27	9
Frequency of utilising mobile shopping		
1–5 times	144	48
6–10 times	120	40
11–15 times	26	8.67
16–20 times	10	3.33

6.3 Measurement model evaluation

6.3.1 Reliability and convergent validity

Table 3 illustrates the composite reliability and Cronbach's α of every variable. Since both the composite reliability and Cronbach's α exceeded the minimum threshold of 0.70 and 0.60 respectively, it shows that the constructs have achieved the internal constructs reliability. To determine whether this research model is valid, convergent and discriminant validity tests were conducted. Average variance extracted (AVE) was used to establish the convergent validity of the model whereas factor loadings, Fornell Larcker test and HTMT criterion were used in determining the discriminant validity. According to Hair et al. (2013), the AVE value should achieve a minimal value of 0.50. Since the AVE of each construct has exceeded the minimum criterion of 0.50, hence, convergent validity of the model has been confirmed.

Table 3 Reliability and convergent validity analysis

Constructs	*AVE*	*Composite reliability*	*Cronbach's alpha*
MU	0.737	0.933	0.913
MEU	0.711	0.924	0.907
PP	0.748	0.922	0.907
M	0.712	0.830	0.877
R	0.571	0.791	0.735
IU	0.692	0.899	0.852

Notes: MU = mobile usefulness; MEU = mobile ease of use; PP = perceived playfulness; M = mobility; R = reachability; IU = intention to use.

6.3.2 Discriminant validity

To examine discriminant validity, the extraction of factor loadings and cross loadings of every item was conducted on every variable. Fornell and Larcker (1981) advocated that the minimum value of factor loading for each item is 0.70. Since M1 did not meet the criteria, hence it was removed due to poor loading. The factor loadings and cross-loadings for every item are shown in Table 4. As shown in Table 5, since AVE for each variable is larger compared to its correlations of other variables, hence, discriminant validity is achieved. Table 6 shows the HTMT inference test that is used to assess discriminant validity. Since the findings did not show a value of 1 in any confidence interval, it means discriminant validity is validated by HTMT approach. Generally, this measurement model has successfully attained reliability and validity.

Table 4 Factor loadings and cross loadings

	IU	*M*	*MEU*	*MU*	*PP*	*R*
IU1	*0.810*	0.071	0.311	0.307	0.222	0.499
IU2	*0.896*	0.114	0.340	0.368	0.253	0.484
IU3	*0.894*	0.072	0.298	0.398	0.205	0.478
IU4	*0.715*	–0.024	0.294	0.379	0.180	0.298
M2	0.080	*0.945*	0.189	0.130	0.228	0.211
M3	0.024	*0.729*	0.080	0.077	0.119	0.142
MEU1	0.220	0.147	*0.732*	0.370	0.254	0.265
MEU2	0.346	0.155	*0.867*	0.525	0.390	0.311
MEU3	0.329	0.192	*0.881*	0.532	0.387	0.361
MEU4	0.341	0.136	*0.876*	0.536	0.430	0.296
MEU5	0.325	0.113	*0.851*	0.570	0.402	0.352
MU1	0.372	0.072	0.520	*0.840*	0.327	0.316
MU2	0.368	0.106	0.532	*0.875*	0.355	0.344
MU3	0.382	0.111	0.475	*0.857*	0.311	0.349
MU4	0.403	0.144	0.573	*0.886*	0.381	0.371
MU5	0.359	0.118	0.503	*0.833*	0.403	0.316

Table 4 Factor loadings and cross loadings (continued)

	IU	*M*	*MEU*	*MU*	*PP*	*R*
PP1	0.173	0.172	0.404	0.365	*0.827*	0.179
PP2	0.213	0.161	0.376	0.352	*0.868*	0.243
PP3	0.224	0.168	0.378	0.352	*0.887*	0.257
PP4	0.268	0.247	0.394	0.366	*0.876*	0.322
R1	0.184	0.482	0.145	0.178	0.215	*0.491*
R2	0.394	0.107	0.298	0.266	0.193	*0.839*
R3	0.532	0.084	0.364	0.402	0.273	*0.877*

Table 5 Fornell-Larcker test

	IU	*MEU*	*MU*	*M*	*PP*	*R*
IU	*0.832*					
MEU	0.374	*0.843*				
MU	0.439	0.607	*0.858*			
M	0.071	0.176	0.129	*0.844*		
PP	0.259	0.447	0.414	0.220	*0.865*	
R	0.529	0.378	0.396	0.216	0.297	*0.756*

Table 6 HTMT inference (with bootstrapping)

	Original sample (O)	*Sample mean (M)*	*Standard deviation (STDEV)*	*2.50%*	*97.50%*
MEU -> IU	0.426	0.424	0.059	*0.304*	*0.539*
MU -> IU	0.498	0.496	0.059	*0.379*	*0.609*
MU -> MEU	0.665	0.663	0.047	*0.570*	*0.750*
M -> IU	0.099	0.135	0.048	*0.026*	*0.154*
M -> MEU	0.209	0.215	0.072	*0.094*	*0.370*
M->MU	0.158	0.167	0.068	*0.055*	*0.297*
PP -> IU	0.293	0.295	0.070	*0.141*	*0.422*
PP -> MEU	0.497	0.497	0.060	*0.356*	*0.598*
PP->MU	0.461	0.462	0.064	*0.315*	*0.565*
PP -> M	0.263	0.264	0.073	*0.130*	*0.408*
R -> IU	0.680	0.682	0.052	*0.565*	*0.772*
R->MEU	0.477	0.480	0.075	*0.319*	*0.607*
R-> MU	0.497	0.498	0.073	*0.345*	*0.626*
R-> M	0.460	0.487	0.068	*0.314*	*0.573*
R -> PP	0.395	0.395	0.074	*0.242*	*0.530*

6.4 Hypotheses Testing

The ability to predict 21.4% of variance of the dependent variables is shown by this research model. Out of the seven hypotheses tested, four of them (H1, H2, H6 and H7)

were supported whereas the remaining 3 hypotheses (H3, H4 and H5) were not supported.

Figure 2 Result for structural model (original sample) (see online version for colours)

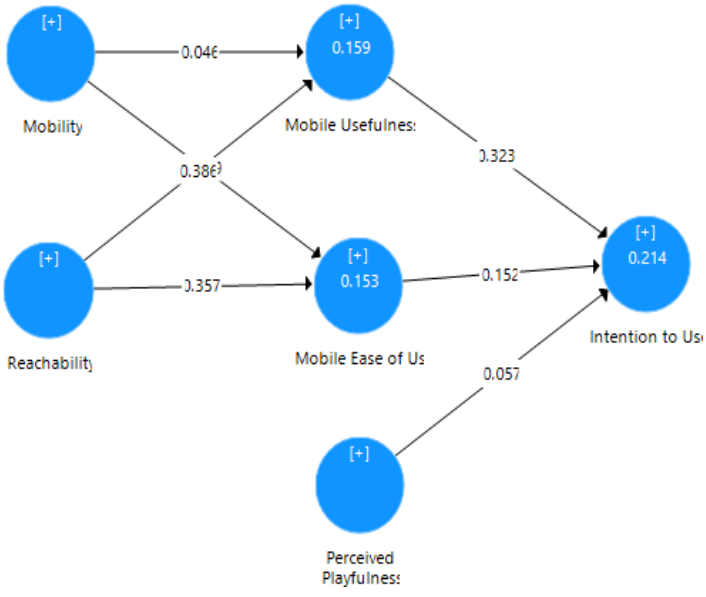
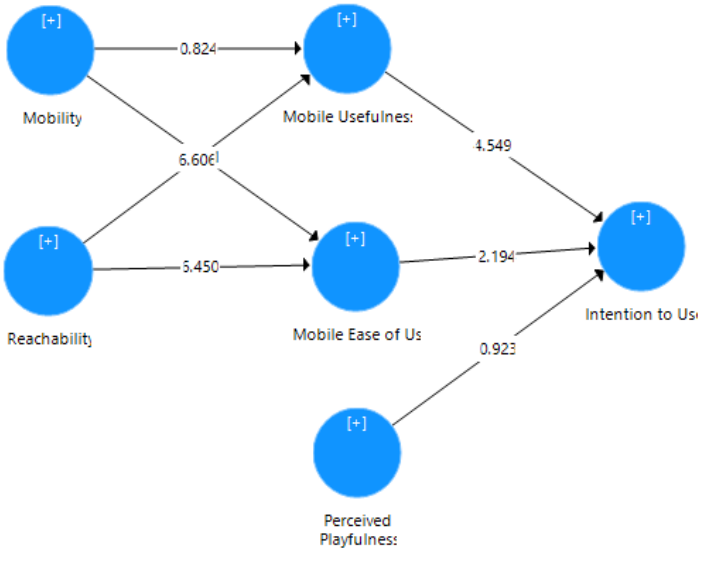


Figure 3 Result for structural model (t-statistics) (see online version for colours)



As mentioned above, PLS-SEM was used to evaluate the proposed hypotheses in this study. Figure 2 shows that 21.4% of variance in intention to adopt mobile shopping was explained in this structural model. Table 7 shows that MU ($\beta = 0.323$, $p < 0.001$) and MEU ($\beta = 0.152$, $p < 0.001$) have a significant relationship with a consumer's intention to

adopt mobile shopping, whereas PP ($\beta = 0.057$, $p > 0.001$) does not have a significant relationship with a consumer's intention to adopt mobile shopping. Additionally, the path coefficients of M ($\beta = 0.046$, $p < 0.01$), and R ($\beta = 0.386$, $p < 0.001$) showed a weak impact on MU with the explained variance of 15.9%. Similarly, M ($\beta = 0.386$, $p < 0.001$) and R ($\beta = 0.357$, $p < 0.001$) also have a weak impact on MEU with the explained variance of 15.3%.

Table 7 Outcome of the structural model examination

Hypotheses	*Original sample (O)*	*Sample mean (M)*	*Standard deviation (STDEV)*	*T statistics (|O/STDEV|)*	*P values*	*Results*
H1: MEU -> IU	0.152	0.154	0.069	*2.194**	*0.028*	*Supported*
H2: MU -> IU	0.323	0.32	0.071	*4.549****	*0*	*Supported*
H3: M -> MEU	0.099	0.104	0.055	1.811	0.071	Not supported
H4: M -> MU	0.046	0.049	0.056	0.824	0.41	Not supported
H5: PP -> IU	0.057	0.065	0.062	0.923	0.356	Not supported
H6: R -> MEU	0.357	0.362	0.055	*6.45****	*0*	*Supported*
H7: R -> MU	0.386	0.388	0.058	*6.606****	*0*	*Supported*

6.5 Assessing the predictive power

Table 8 shows the Stone-Geisser's (Q^2) value of this structural model to evaluate the predictive relevance. This value determines the relevance of the structural model in illustrating the endogenous variables (Hair et al., 2014). According to Cohen (1988), Stone-Geisser's values are categorised into three levels, namely small, medium and large with 0.02, 0.15 and 0.35 respectively. Since Table 8 shows that the Q^2 values of IU, MEU and MU are 0.135 (≈0.15), 0.099 ($0.02 < 0.099 < 0.15$) and 0.107 ($0.02 < 0.099 < 0.15$) respectively, hence, this shows that the predictive relevance of IU, MEU and MU are medium, close to medium and close to medium respectively.

Table 8 Predictive relevance (Q^2)

	SSO	*SSE*	*Q^2 (=1 – SSE / SSO)*
IU	1,200.00	1037.45	0.135
MEU	1,500.00	1351.48	0.099
MU	1,500.00	1339.34	0.107
Mobility	600.00	600.00	
PP	1,200.00	1200.00	
R	900.00	900.00	

Table 9 illustrates each path coefficient regarding the effect sizes. According to Hair et al. (2014), a high effect size value signifies that the particular exogenous variable strongly explains the endogenous variable. Similar to predictive relevance (Q^2), effect sizes (f^2) can also be divided into three levels with the same values of 0.02, 0.15 and 0.35 for small, medium and large effect sizes respectively. Table 9 demonstrates that MU has a moderate effect on IU ($f^2 = 0.081$; $0.02 < 0.081 < 0.15$) whereas MEU and PP have a small effect on IU (with MEU: $0.017 < 0.02$ and PP: $0.003 < 0.02$). Besides that, M also

have a small effect on MU and MEU (with $f^2 < 0.02$). Lastly, R has a medium effect on MEU and MU (with $f^2 \approx 0.15$).

Table 9 Effect sizes, f^2

	IU	*MEU*	*MU*	*M*	*PP*	*R*
IU						
MEU	0.017					
MU	0.081					
M		0.011	0.002			
PP	0.003					
R		0.143	0.169			

7 Discussion and policy implication

7.1 Discussions of major findings

7.1.1 MEU -> IU

H1 MEU has a positive relationship with the intention to adopt mobile shopping.

Based on the findings, MEU has a significant positive relationship with a consumer's intention to adopt mobile shopping. The exact findings were supported by Teo et al. (2015b) who found that MEU is able to influence a consumer's intention to adopt mobile shopping significantly. Kim et al. (2010) further found that ease of use of mobile payment service played a significant role in influencing a consumer's intention to adopt mobile shopping. Since complexity is a barrier to influence a consumer's intention to adopt new technologies, hence in recent years, online retailers begun to optimise their mobile web pages in order to boost user friendliness. Thus, MEU is crucial towards influencing the intention to adopt mobile shopping.

7.1.2 MU -> IU

H2 MU has a positive relationship with the intention to adopt mobile shopping.

Based on the results, MU has a significant positive relationship with a consumer's intention to adopt mobile shopping. This result is being supported by Pan et al. (2015) and Ooi and Tan (2016), who found that MU is a significant predictor of a consumer's intention to adopt mobile shopping due to the many useful attributes and capabilities offered by smart mobile devices that enable consumers to perform any mobile shopping transactions ubiquitously.

7.1.3 M -> MEU

H3 Mobility has a positive relationship with MEU.

According to the results, the hypothesised relationship between mobility and MEU is surprisingly not supported. This finding is consistent with Anthony and Mutalemwa (2014) who reported that mobility can indirectly influence the intention to adopt mobile

payment but is negatively related to perceived ease of use. The negative effects of mobility and infrastructure on the intention to adopt m-payment service is due to the poor mobile network coverage in Tanzania (Anthony and Mutalemwa, 2014).

7.1.4 M -> MU

H4 Mobility has a positive relationship with MU.

Based on the results, mobility does not have a significant positive relationship with MU. The negative effects of mobility and infrastructure on the intention to adopt m-payment service is due to the poor mobile network coverage in Tanzania (Anthony and Mutalemwa, 2014). This finding is consistent with the research conducted by Anthony and Mutalemwa (2014) who reported that mobility can indirectly influence the intention to adopt m-payment service with a negative relationship with perceived usefulness (Anthony and Mutalemwa, 2014).

7.1.5 PP -> IU

H5 PP has a positive relationship with IU.

Based on the results, PP does not have a significant positive relationship with IU. This finding is supported by the study of Mandilas et al. (2013) who indicated that PP influenced IU negatively because consumers' shopping habits are better served through traditional shopping and there seems to be not much interest on a mobile shopping environment.

7.1.6 R -> MEU

H6 Reachability has a positive relationship with MEU.

According to the results, reachability has a significant positive correlation with MEU. This finding is consistent with the study of Kim et al. (2010) who indicated that reachability has a positive relationship with MEU. This is because mobile system allows sellers to constantly stay connected with consumers at any time. This encourages consumers to easily use the mobile system more frequently because it can ensure on time continuous support, especially any ad-hoc issues that popped out during the use of mobile payment service. The service provider guarantees instant support for the users. In a nutshell, reachability correlates positively with MEU because the seller and consumer would need to reach each other and be connected in the first place before the consumer can explore the seller's interactive mobile webpages and appreciate the ease of use and navigation while doing mobile shopping (Blakeman, 2018).

7.1.7 R -> MU

H7 Reachability has a positive relationship with MU.

According to the results, reachability has a significant positive correlation with MEU. This finding is consistent with the study of Au and Kauffman (2008) who indicated that the adoption of mobile systems enabled service providers to maintain a positive relationship with customers anytime. This allows the user to adopt particular systems frequently, as continuous support is ensured when necessary. As telecommunications

technological advances, mobile payment service providers can upgrade these system features without substantial cost being incurred. All in all, the reachability of mobile devices allows people to connect anytime and anywhere by overcoming geographical and time-zone limitations (Au and Kauffman, 2008). Wong et al. (2015a) posited that this feature enables mobile shopping service providers to provide 24/7 on-the-go access and support to mobile shopping users. On the other hand, mobile payments involve the active participation of service providers (Teo et al., 2015b).

7.2 Implications of study

7.2.1 Theoretical implications

First of all, most of the past studies on personal behavioural intentions of mobile shopping are based on the TAM model. Contribution of adopting the MTAM that is extended from TAM served to fill the research gap of past studies. Additionally, the study extends the MTAM model by incorporating innovation theory diffusion and other structures of PP. The expanded MTAM model is expected to provide more in-depth explanations of mobile shopping adoption than the separate MTAM. In addition, the research model could be applied to future research to study the topic from different perspectives to better predict user intention to use mobile shopping.

7.2.2 Managerial implications

Since MEU is very important for BI, in order to improve MEU, developers must ensure that mobile web design is not too complicated and users will be able to learn and navigate faster. The user interface (UI) is one of the main reasons for mobile shoppers to participate. If mobile shopping behaviour requires too much complicated efforts, users may be overwhelmed, which makes them prefer traditional shopping (Wong et al., 2012; Tan et al., 2012). The next factor affecting BI is MU. Practitioners should emphasise the development of shopping related software, such as price comparison software, online purchase consultants and recommended software.

Additionally, practitioners may conduct marketing campaigns by highlighting the usefulness of adopting mobile shopping. The 'always on' and 'portable' features of mobile phones and the convenience related to shopping should be concerned on this promotion. Developers can keep introducing new features and content on a regular basis to increase the usefulness to the mobile shopping user. Since reachability is important for predicting mobile usability and MU, mobile shopping service providers can attempt to contact mobile shopping users more frequently to notify them of recent mobile transactions, account balances to ensure the validity of the transaction. It ensures that users' information can be obtained by phone or by sending an email from anywhere via the mobile device. It can increase the participation of mobile shoppers. The results of this research can provide valuable insights for mobile commerce, mobile application developers, merchants, banks or other interested parties to adopt mobile shopping.

8 Limitations and future research directions

Most of the samples collected in this study belong to the younger generation between the ages of 21 and 30 from the Chinese race. Having said that, the assumption cannot be made since they cannot be the only representative of possible adopters, because elders or people from different age groups often have inconsistent kind of behaviours towards using innovation of technology (Tan et al., 2012). The recommendation for subsequent studies is to study different age groups and races of individual behaviour to prevent any biasness to occur.

Another limitation of this study was, this survey was drawn at the shopping centers in Ipoh, Malaysia only. Caution should be taken when promoting research to prevent failure to represent the entire population of Malaysia. Encourage future research to conduct research at more sampling locations outside Ipoh Mall. Therefore, future researchers should increase or expand the sample size to a certain extent to represent the entire Malaysian population.

Future research can examine various other variables included in the MTAM model to further explain the user's intention to use mobile shopping. These understandings will help marketers provide effective information for different types of mobile shopping target groups.

9 Conclusions

In short, this article studied about the individual's intention to adopt mobile shopping in Malaysia. It integrates MTAM model with some other variables such as PP, reachability and mobility. The findings of this paper indicate that significant relationship between MEU, MU and PP towards BI is supported. Besides this, survey results also show that IU depends on MEU and MU. In addition, it was found that R has an effect on MU and MEU. The results of this research are believed to have made a contribution to the theoretical and managerial perspective of the market. This study could also play a guidance role for future researcher on mobile shopping adoption.

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