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The disruptive mobile wallet in the hospitality industry: An extended mobile technology acceptance model

Susan Lew^a, Garry Wei-Han Tan^{b,c}, Xiu-Ming Loh^a, Jun-Jie Hew^a, Keng-Boon Ooi^{b,d,*}

^a Faculty of Business and Finance, Universiti Tunku Abdul Rahman, Kampar, Malaysia

^b Faculty of Business and Management, UCSI University, Kuala Lumpur, Malaysia

^c School of Finance and Economics, Nanchang Institute of Technology, Nan Chang City, China

^d College of Management, Chang Jung Christian University, Tainan City, Taiwan

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ABSTRACT

Given that the mobile wallet has become a disruptive innovation, especially in the Malaysian hospitality industry, this study investigates the adoption of mobile wallet in the hospitality industry among consumers. Different from the extant literature, this study extends the newly proposed mobile technology acceptance model with self-efficacy theory, critical mass theory, and flow theory to explain the behavioural intention to adopt. A self-administered questionnaire was utilised to collect data from mobile wallet users who have used a mobile wallet while dining out in restaurants and cafes. Other than technology self-efficacy and perceived critical mass, mobile usefulness, mobile ease of use, mobile self-efficacy, and perceived enjoyment were discovered to have a positive and significant association with the behavioural intention to adopt mobile wallet in the hospitality industry. The findings also suggested there were interrelationships between the constructs employed. Overall, the extended model was able to explain 61% of the variance in behavioural intention to adopt mobile wallet.

1. Introduction

In the last few years, technology has been developing at a rapid pace, especially in the mobile arena [1,2]. This has brought about significant changes in the area of consumer behaviour [3] and the way businesses run their operations [4]. Under the financial and commercial aspects, mobile devices (m-devices) enable customers to procure goods and services through the utilisation of a mobile wallet (m-wallet) [5]. M-wallet is a service that enables users to store their debit or credit card information, pay for goods and services, and request/send money from/to their contacts [5]. Just like a physical wallet, a m-wallet can store credit card numbers, electronic cash, owner identity, information of contact, billing or shipping details and other information [6]. As the popularity of m-devices continues to increase, m-wallet is expected to be a prevalent payment method in the future for various financial transactions [4].

Recently, the utilisation of m-devices and m-wallet in the hospitality industry is steadily rising [7] and this could be attributed to the widespread digitalisation of mobile services such as AirBnB, Grab, and others. At present, some of the most commonly used m-wallet in

Malaysia include Touch'n Go, Alipay, GrabPay, FavePay, and Boost [8]. The Central Bank of Malaysia has been continuing its efforts to accelerate the promotion of m-wallet adoption and use [9]. M-wallet is expected to play a pivotal role in catalysing new consumer behaviours that move users away from cash and towards electronic transactions. However, it is surprising that m-wallet is infrequently utilised in Malaysia as consumers prefer to pay by cash or debit cards. In particular, 93% of Malaysians still prefer to pay cash when dining out [10]. In other words, the utilisation of m-wallet is only at a maximum of 7% in this context. This suggests that it is urgent to shed light on the drivers of m-wallet adoption as the country looks to shift to a cashless society [11]. This is especially true in the restaurant industry, a sub-industry under the hospitality industry [12]. Given that the restaurant industry is essential for travellers [13] and affects the Malaysian economy significantly [14], this study focuses solely on the restaurant industry.

The extant literature of m-wallet adoption, either in a general context [e.g. Ref. [15–17], or in the hospitality context [e.g. Ref. [3,18], is largely based upon the long-established technology use and acceptance theories, for instance, the technology acceptance model (TAM) and unified theory of acceptance and use of technology (UTAUT/UTAUT2).

* Corresponding author. Faculty of Business and Management, UCSI University, Kuala Lumpur, Malaysia.

E-mail addresses: susanlew06@gmail.com (S. Lew), GarryTan@ucsiuniversity.edu.my (G.W.-H. Tan), lohxm@utar.edu.my (X.-M. Loh), hewjj@utar.edu.my (J.-J. Hew), ooikb@ucsiuniversity.edu.my (K.-B. Ooi).

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Given this, this study differentiates itself from the extant literature by adapting the mobile technology acceptance model (MTAM) that was newly established by Ooi and Tan [19] as the foundational model. This study further extends the MTAM with the self-efficacy theory [20,21], critical mass theory [22], and flow theory [23]. It is believed that such an integrated model is novel in the extant literature of m-wallet adoption, especially in the hospitality context.

Looking at the practical significance, the emergence of m-wallet has become a disruptive technology as it alters the basis of competition [24]. This is especially true in the hospitality industry, as m-wallet users could gain additional values such as cash-back returns when making payments through m-wallet [25,26]. Also, owing to the COVID-19 pandemic that demands everyone to practice a “new normal”, m-wallet is encouraged over cash in making payments to avoid infection [27,28]. Therefore, m-wallet provides the organisations within the hospitality industry, such as the restaurants, with more business opportunities if they accept m-wallet as a payment channel. This would, ultimately, enhance their competitive advantage compared to those who are accepting cash as the only payment method. However, the low utilisation of m-wallet by Malaysian users in the restaurant industry, a sub-industry under the hospitality industry [12], must be taken note of [10]. As such, this study could provide insights and findings that could help the stakeholders in the hospitality industry to develop strategies in encouraging the use of m-wallet.

2. Literature review

2.1. Mobile technology acceptance model (MTAM)

TAM was developed by Davis [29] to look into the antecedents that affect people’s intentions to accept new technology. This is one of the most widely recognised and frequently used models in examining the intention to adopt innovative technology [30,31] given its simple theoretical foundation [32]. However, this strength serves as its main weakness. Hence, there are other revisions of TAM that have been developed to overcome the limitations of the original TAM. One of which is the MTAM established by Ooi and Tan [19]. This model tackles one of the primary limitations of TAM, which is its original definition. In its truest form, the definitions of variables for TAM are confined within an organisational context. This is a problem as technology adoption beyond the workplace varies on numerous aspects such as the types and intricacies of tasks [33]. Furthermore, Ooi and Tan [19] argued that numerous academicians have made reference to variables from studies of other related fields for the context of mobile technology. This emerges as an issue in terms of applicability as many users respond differently to an electronic and mobile setting. For example, mobile users’ perceived ease of use would be different from those using desktop computers when it comes to battery life and screen size [34].

As such, MTAM was developed to address these issues. Firstly, this model tailors explicitly to the needs of the mobile environment for information technology research. Ooi and Tan [19] comprehensively looked into and provided extensive elaborations on prominent information technology models utilised to comprehend the adoption of innovative technology and their limitations in mobile research. Based on that, MTAM which comprises of mobile usefulness (MU) and mobile ease of use (MEOU) was developed from references to prior mobile technology studies in order to capture the mobile technology’s characteristics. Both variables have been adapted to better reflect the mobile setting to provide a more holistic picture. On the other hand, TAM alone is not sufficient to fully elaborate on the adoption of innovative technology [35]. TAM was found to hardly be able to account for 40% of the changes in usage intention and behaviour of innovative technology adoption [36]. This is because the model only consists of two determinants. As such, TAM lacks other variables that would be considered vital in influencing the adoption of new technology [37].

To overcome this drawback, Phan and Daim [38] suggested that

more variables should be added to shed light on the adoption of innovative technology, in particular, the mobile services. As such, it would be comprehensive if both technological and non-technological elements that influence the adoption decision are examined in a research model [39]. Other researchers have also endorsed this method for future mobile technology adoption studies [40,41]. The study by Ooi and Tan [19] was the first to propose the MTAM as an extended model. They studied the adoption of smartphone credit card using MU and MEOU with other additional constructs that are relevant to the context of smartphone credit card. Within the hospitality industry, the usefulness and ease of use of mobile technology (which are the central constructs of the parsimonious MTAM) are equally vital for travellers and hotel consumers in adopting mobile technology during travels [42–44]. Given the relevance of MU and MEOU in the hospitality industry, this study proposes to extend these central constructs of the parsimonious MTAM with other non-technological adoption drivers (i.e., factors that are not related to the characteristics of mobile technology) to better illustrate the adoption of m-wallet within the hospitality industry.

2.2. Self-efficacy theory

As cited in Schunk [45], the self-efficacy theory developed by Bandura [20,21] postulates that individuals who feel a low sense of self-efficacy in performing a task might consequently avoid it, but those who believe that they are capable would readily perform. Also, the self-efficacy theory proposes that the self-perception of individuals serve as the best predictors of their behaviours in specific situations [45]. Ever since its inception, the role of self-efficacy has been explored in different research domains [46], including technology adoption and acceptance [47,48]. In this study, self-efficacy is defined as an “individual’s personal belief about his or her ability to initiate, persist in, and be successful in behaviour” (p.141) [49]. Principally, if individuals have a favourable perception of their self-efficacy in using technology, they are more willing to adopt and accept new technology [50]. Self-efficacy not only is crucial for potential technology adopters but also matters in the hospitality industry as studies have shown that self-efficacy has effect over hospitality employees’ behaviours [51,52]. As the self-efficacy theory is dealing with personal belief, it could complement the MTAM that primarily deals with technological factors. For this reason, the self-efficacy theory is being integrated with the parsimonious MTAM in this study. Following Tan et al. [53], the self-efficacy theory is operationalised as two distinct constructs namely mobile self-efficacy (MSE) and technology self-efficacy (TSE).

2.3. Critical mass theory

In accordance with Markus [54], the critical mass theory proposed by Oliver et al. [22] attempts to predict the effectiveness of group action in pursuit of a public good. In the context of technology adoption, the critical mass theory could be applied to understand the influence of others on individuals’ technology use within an organisation [55]. Specifically, the number of individuals adopting a technology could induce the favourable perceptions of potential adopters as critical mass theory asserts that the choices of individuals depend on their membership in communities (for e.g., organisations) [56]. As observed by Lee et al. [57], a critical mass of users indicates the state of successful group acceptance, which has a significant impact on subsequent adoption and use of technology. With this, Shen et al. [58] opined that individuals’ perceived critical mass (PCM) of a piece of technology will subsequently affect their adoption behaviour. Similarly, studies have also revealed the significant role of PCM in technology adoption and use within the hospitality industry [57,59]. In view that the PCM represents one’s subjective perceptions of others in terms of technology use, its integration with the parsimonious MTAM is deemed to have complemented the technological factors within MTAM.

2.4. Flow theory

Getzels and Csikszentmihalyi [23] described flow as an enjoyable experience in paying full concentration when performing a task. When experiencing flow, an individual becomes highly concentrated and filter out unrelated thoughts, perceptions, and ideas. The periphery of their consciousness gradually shrinks, and they only respond to specific goals and immediate feedback [60]. Understanding the role of flow in adopting m-wallet is essential. This is because m-wallet uses less time to complete a transaction which could be a reason for enjoyment [60]. In recent years, numerous studies have applied the flow theory when investigating the interaction between customers and technology [61,62] as well as in the tourism and hospitality industry [63]. Generally, the flow has been perceived as a desired intrinsic reward when performing an activity [64] and, therefore, serves as an influential construct in technology use [65] and within the hospitality industry [66,67]. Given that the flow theory is an intrinsic motivation or hedonic motivation perceived by individuals throughout the process of using technology [68], it is being integrated into the parsimonious MTAM to complement its technological beliefs that concern only the mobile technology's characteristics. Similar to Koufaris [69], the flow theory is operationalised as perceived enjoyment (PEJ) in this study to measure the level of intrinsic enjoyment or hedonic motivation of using m-wallet in making payments.

3. Hypotheses development

MU refers to the degree of perceived performance enhancement in utilising a mobile technology or service [19]. Specifically, mobile technology or service resembles the m-wallet in this study. The effect of usefulness on m-payment adoption has been established in many studies from varying perspectives. Liébana-Cabanillas et al. [70] distributed a survey through online channels to investigate the factors that affect the behavioural intention (BI) to adopt mobile payment (m-payment) services in Spain. Secondly, Nyaboga et al. [71] did their study on the factors that affect the BI to use m-payment services in Kenya through the distribution of a structured questionnaire to the consumers of customer care centres in leading mobile operators. In another research, Koenig-Lewis et al. [72] performed their study on the factors that affect the adoption of m-payment services in France by distributing an online questionnaire to students of two business schools. All three studies found that the usefulness of m-payment services has a significant influence on users' BI. Furthermore, Ooi and Tan [19] discovered that MU is significantly and positively related to the BI to adopt m-payment in Malaysia. Thus, it is hypothesised that:

H1. MU is related to BI positively.

MEOU refers to the perceived degree of easiness in learning and utilising a mobile technology or service [19]. Contextually, in this study, mobile technology or service refers to the m-wallet. Various past studies have found support that ease of use is a vital factor in influencing the BI to adopt m-payment. Arvidsson [73] looked into the consumers' attitudes when starting to use m-payment services in Sweden. In another research, Nyaboga et al. [71] distributed questionnaires to the consumers of customer care centres in top mobile operators to study the factors that affect the intention to use m-payment services in Kenya. Besides that, Shankar and Datta [74] investigated factors that affect the BI to adopt m-payment in India through the distribution of online and offline survey to potential m-payment service users. All three studies found that MEOU significantly influences consumers' BI to adopt m-payment. Specifically, in Malaysia, Tan et al. [34] discovered that MEOU is related to the BI to adopt m-payment positively and significantly. Thus, it is hypothesised that:

H2. MEOU is related to BI positively

PCM is a component of social influence that plays an influential role

in driving an individual's behaviour [75]. According to Mahler and Rogers [76], critical mass is the point in which the minimum number of adopters of a specific innovation that allows the rate of adoption to be self-sustaining. The idea of PCM is somewhat similar to the effect of bandwagon [77] and network externality [61]. The influence of network externalities on m-payment adoption was investigated by Qasim and Abu-Shanab [78]. Furthermore, Zhou et al. [79] studied the relationship between referent network size and PEJ in their mobile-related research. A significant relationship between referent network size and PEJ was found in their study. This indicates the importance of examining the effect of PCM on the PEJ of shared experiences involving new technologies. Thus, it is hypothesised that:

H3. PCM is related to BI positively

H4. PCM is related to PEJ positively

PEJ is the degree to which the engagement of the technique is considered enjoyable notwithstanding the expected performance consequence [80]. It is a form of intrinsic motivation or hedonic motivation [61,81], consisting of fun, entertainment, enjoyment and playfulness, and it is significant with regards to customers' BI to use new applications and systems [80,81,110]. Rouibah et al. [82] studied the effects of PEJ on the BI to use online payment systems from Kuwait. In addition, Chin and Ahmad [83] looked into the relationship between PEJ with Malaysian consumers' BI to use electronic payment. Both studies suggested that PEJ could be a major determinant in the adoption of m-payment services. Therefore, it is hypothesised that:

H5. PEJ is related to BI positively

In this study, MSE is defined as one's perceived ability to make payments using m-wallet [84]. Keith et al. [85] stressed the need of developing unique self-efficacy constructs for different contexts, especially for the context of mobile technology, as mobile technology requires a different skill-set from the users, for example, dexterity. In order for m-wallet to be successful, a high level of MSE is necessary [86], as MSE was found to have a positive impact on the use of mobile devices [87]. Besides, Sezgin et al. [88], together with Nikou and Economides [89], discovered that MSE is related to the ease of use of mobile technology. In another study of mobile application adoption [85], it was discovered that the MSE is related positively to consumers' perceived benefits of adoption (i.e., usefulness and ease of use). The same findings were concurred by Bailey et al. [84] and Tan et al. [53] in their studies of m-payment and mobile social media advertising. Hence, a high level of MSE shall lead to a higher intention to adopt m-wallet, while boosting the perceptions of MU and MEOU pertaining to m-wallet. Thus, it is hypothesised that:

H6. MSE is related to BI positively

H7. MSE is related to MU positively

H8. MSE is related to MEOU positively

A high level of MSE does not always translate to a high level of TSE [85], which is defined as one's personal belief that he or she has an adequate level of skill in successfully dealing with technology-related tasks [90]. Other than the ability in using m-wallet to make payment (i.e., MSE), using m-wallet requires other technological skills (i.e., TSE), for example, verifying the m-wallet account by uploading the identity card image [91]. Generally, a higher level of TSE would lead to greater usage intention of technology-based services [92]. In mobile technology studies [17,93], the relationship between TSE and intention is confirmed. Besides, Yang [94] opined that the consumers with a great level of TSE would have a higher tendency to view mobile technology as easy to use. In this vein, Tan et al. [53] looked into TSE and its effect on MU and MEOU in their mobile-related study carried out in Malaysia. Their findings revealed that both MU and MEOU are significantly affected by TSE. Thus, it is hypothesised that:

- H9. TSE is related to BI positively
- H10. TSE is related to MU positively
- H11. TSE is related to MEOU positively

From the hypotheses, the conceptual model of this study is provided in Fig. 1.

4. Research methodology

The target population of this study is Malaysian m-wallet users who have used m-wallet in the hospitality industry. This is because, despite the efforts to shift Malaysia into a cashless society, cash is still presently king among the payment methods available. It was found that 93% of Malaysians still use cash when dining out [10]. The sample was collected from m-wallet users who were dining out in restaurants and cafes in the Perak state. Perak was selected to be the sampling location because it has the sixth-highest number of smartphone users in Malaysia [95]. As the sample of this study requires a level of filtering, purposive sampling was utilised [96]. Under this sampling technique and similar to the past literature on m-payment, only participants who have used a m-wallet in the past 12 months were selected [17,39] as they could provide the most relevant insights [97]. As such, purposive sampling would allow the data to be more reflective of the situation at hand [98].

A total of 450 questionnaires were distributed and only 413 responses were eligible for data analysis. This translates to a response rate

of 91.78%. A self-administered questionnaire with adapted measurement items from past studies was used as the survey instrument. A Likert scale with seven points ranging from “(1) Strongly Disagree” to “(7) Strongly Agree” was utilised to measure the perceptions of respondents pertaining to the measurement items. Table 1 showcases the measurement items and sources.

5. Data analysis

5.1. Respondents’ profile

As shown in Table 2, there are 33.9% male and 66.1% female respondents. They are predominantly young as the 21–30 years old age bracket made up 69.5% of the total respondents. There were more single respondents (61.5%) as compared to the married ones (38.5%). Also, most of them are graduated with tertiary education (85.0%), currently working (83.1%), and earning a monthly income of RM2001-RM3000 (32.7%). The respondents also reported that they are frequently using m-wallet in the past 12 months.

5.2. Statistical analysis

Partial least squares structural equation modelling (PLS-SEM) analysis was engaged in this study to obtain the inferential statistics. As proposed by Tan et al. [53], PLS-SEM could accommodate studies that violate the normality of data distribution. Using Web Power online tool,

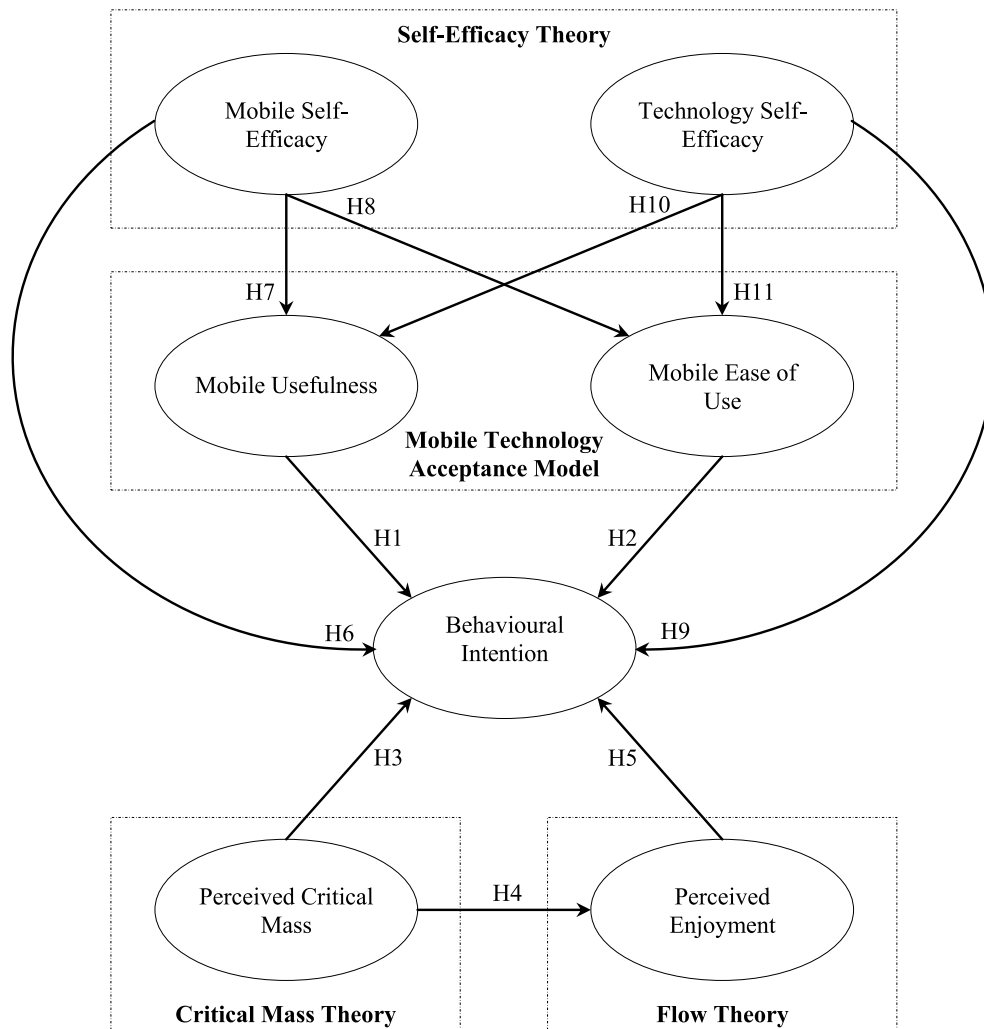


Fig. 1. Proposed conceptual model.

Table 1
Measurement items.

Constructs	Measurement Items	Sources
Mobile Usefulness	MU1: I find mobile wallet to be advantageous.	Ooi and Tan [19]
	MU2: Using mobile wallet would improve my effectiveness in my daily life.	
	MU3: Using mobile wallet would save times in paying.	
	MU4: Using mobile wallet enhances my productivity in paying.	
	MU5: Using mobile wallet enables me to pay quicker.	
Mobile Ease of Use	MEOU1: I think using mobile wallet is easy for me.	Ooi and Tan [19]
	MEOU2: I think learning to use mobile wallet is easy.	
	MEOU3: I think finding what I want through mobile wallet is easy.	
	MEOU4: I think becoming skillful at using mobile wallet is easy.	
Perceived Critical Mass	PCM1: Most of my colleagues frequently use mobile wallet for paying.	Tan and Ooi [61]
	PCM2: Most of the people I communicate with use mobile wallet for paying.	
	PCM3: Most people in my group use mobile wallet.	
	PCM4: Many people I communicate with regularly use mobile wallet.	
	PCM5: Most of my friends frequently use mobile wallet for paying.	
Perceived Enjoyment	PE1: I find using mobile wallet for paying is fun.	Nysveen et al. [99]
	PE2: I find using mobile wallet for paying pleasant.	
	PE3: I find using mobile wallet for paying exciting.	
	PE4: I find using mobile wallet for paying entertaining.	
Mobile Self-Efficacy	MSE1: I would be able to use mobile wallet if I had first gone through a lesson on how to use it.	Mahat et al. [86]
	MSE2: I would be able to use mobile wallet even if there was no one around to tell me how it works.	
	MSE3: I would be able to use mobile wallet even if I had never been exposed to mobile wallet before.	
	MSE4: I would be able to use mobile wallet if I could refer to someone for help if I face difficulties.	
	MSE5: I would be able to use mobile wallet only if I had seen someone else experience it before I try it myself.	
	MSE6: I would be able to use mobile wallet if someone assisted me to get started.	
Technology Self-Efficacy	TSE1: I feel confident in my ability to figure out what to do when a feature does not work in the mobile wallet (e.g. uploading a picture, tagging links).	Kim et al. [41]
	TSE2: I feel confident turning to an online discussion group in the mobile wallet.	
	TSE3: I feel confident understanding the terms or words that are needed to use the mobile wallet.	
	TSE4: I feel confident learning advanced features in the mobile wallet.	
Behavioural Intention	BI1: I am likely to use mobile wallet in the near future.	Tan et al. [34]
	BI2: Given the opportunity, I will use the mobile wallet.	
	BI3: I am willing to use mobile wallet in the near future.	
	BI4: I intent to use mobile wallet when the opportunity arises.	
	BI5: I will think about using mobile wallet.	

Table 2
Descriptive statistics.

Demographic characteristic	Frequency	Percentage (%)	
Gender	Male	140	33.90
	Female	273	66.10
Age	20 years old and below	21	5.10
	21–30 years old	287	69.50
	31–40 years old	57	13.80
	41–50 years old	31	7.50
	51 years old and above	17	4.10
Education level	No college degree	62	15.00
	Diploma/Advanced diploma	176	42.60
	Bachelor's degree/Professional qualification	132	32.00
Marital status	Master/PhD degree	43	10.40
	Single	254	61.50
Occupation	Married	159	38.50
	Unemployed	13	3.10
Monthly income	Working Professional	82	19.90
	Self-employed	146	35.40
	Private employed	115	27.80
	Student	57	13.80
	Below or equal to RM1000	43	10.40
Experience of using m-wallet in the past 12 months	RM1001-RM2000	57	13.80
	RM2001-RM3000	135	32.70
	RM3001-RM4000	103	24.90
	RM4001-RM5000	42	10.20
	RM5001 and above	33	8.00
Experience of using m-wallet in the past 12 months	1-5 times	130	31.50
	6-10 times	99	24.00
	11-15 times	80	19.40
	16-20 times	66	16.00
	21-25 times	11	2.70
More than 25 times	27	6.50	

the study confirmed that the data collected was not multivariate normal given the results of Mardia's multivariate skewness ($\beta = 9.01, p < 0.001$) and Mardia's multivariate kurtosis ($\beta = 90.03, p < 0.001$). Hence, PLS-SEM is suitable for the context of this study.

5.3. Common method bias

As the questionnaire was compiled using a self-report approach, common method bias could be an issue that threatens the validity of the results. Hence, a common method factor analysis was conducted to evaluate the magnitude of common method bias's adverse impact on the data [100]. All the items' substantive factor loadings are significant whereas most of the method factor loadings are not significant with negative values, suggesting that common method bias shall not be a major concern in this study.

5.4. Assessing the outer measurement model

In order to evaluate reliability, composite reliability and Dijkstra-Henseler's rho (ρ_A) were utilised. Based on Table 3, all the values of composite reliability and ρ_A exceed the minimum value of 0.7. This implies that all the measurement items for the constructs in this study are reliable [101]. Moreover, the same table suggests the achievement of convergent validity as all the average variance extracted values of all constructs are beyond 0.50 and all measurement items are having an outer loading value of at least 0.70 [102]. Besides, to assess discriminant validity, the Hetero-Trait-Mono-Trait (HTMT) inference was utilised. As the results in Table 4 shows none of the confidence intervals includes the value of one, all the constructs are truly distinct from each other by empirical standards [102].

Table 3
Loadings, Composite Reliability, Dijkstra Henseler's rho and Average Variance Extracted.

Constructs	Items	Loadings	Composite Reliability	rho_A	Average Variance Extracted
BI	BI1	0.902	0.948	0.932	0.783
	BI2	0.893			
	BI3	0.875			
	BI4	0.879			
	BI5	0.875			
MU	MU1	0.847	0.926	0.902	0.714
	MU2	0.809			
	MU3	0.890			
	MU4	0.850			
	MU5	0.826			
MEOU	MEOU1	0.846	0.919	0.885	0.741
	MEOU2	0.875			
	MEOU3	0.894			
	MEOU4	0.826			
PCM	PCM1	0.895	0.963	0.955	0.838
	PCM2	0.927			
	PCM3	0.936			
	PCM4	0.915			
	PCM5	0.904			
PEJ	PE1	0.925	0.96	0.946	0.858
	PE2	0.931			
	PE3	0.939			
	PE4	0.911			
MSE	MSE1	0.866	0.942	0.927	0.730
	MSE2	0.832			
	MSE3	0.847			
	MSE4	0.878			
	MSE5	0.836			
	MSE6	0.868			
TSE	TSE1	0.872	0.931	0.903	0.772
	TSE2	0.851			
	TSE3	0.915			
	TSE4	0.875			

Notes: BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PEJ=Perceived Enjoyment; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.

Table 4
Hetero-Trait-Mono-Trait (HTMT inference).

Paths	Original Sample (O)	Sample Mean (M)	Bias	2.50%	97.50%
MEOU - > BI	0.260	0.258	-0.002	0.122	0.403
MSE - > BI	0.190	0.190	0.000	0.059	0.346
MEOU - > MEOU	0.323	0.326	0.003	0.171	0.463
MSE - > MU	0.401	0.405	0.004	0.214	0.576
MU - > BI	0.298	0.298	0.001	0.164	0.434
PCM - > BI	0.052	0.052	0.000	-0.013	0.121
PCM - > PEJ	0.358	0.359	0.001	0.252	0.449
PEJ - > BI	0.276	0.274	-0.002	0.192	0.367
TSE - > BI	-0.132	-0.129	0.002	-0.286	0.026
MEOU - > MEOU	0.443	0.441	-0.002	0.302	0.589
TSE - > MU	0.383	0.380	-0.003	0.210	0.561

Notes: BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PEJ=Perceived Enjoyment; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.

5.5. Inspecting the inner structural model

Variance inflation factors (VIF) of all values ranged from 1.000 to 3.831 which are below the minimum acceptable limit of five [61], suggesting the absence of multicollinearity. Fig. 2 and Table 5 show that nine out of the 11 hypotheses were supported. Besides H3 and H9, all other hypotheses were supported. MEOU ($\beta = 0.260, p < 0.001$), MU (β

$= 0.298, p < 0.001$), MSE ($\beta = 0.190, p < 0.01$), and PEJ ($\beta = 0.276, p < 0.001$) are significantly associated with the BI to adopt m-wallet. Conversely, two constructs, namely TSE ($\beta = -0.132, p > 0.05$), and PCM ($\beta = 0.052, p > 0.05$) could not explain an individual's BI to adopt m-wallet.

Overall, the variables utilised in this study were able to explain 61% of the variance in BI to adopt m-wallet. Furthermore, both MSE ($\beta = 0.401, p < 0.001$) and TSE ($\beta = 0.383, p < 0.001$) were able to explain 56.6% of the variance in MU. The results also revealed that MSE ($\beta = 0.323, p < 0.001$) and TSE ($\beta = 0.433, p < 0.001$) were crucial determinants of MEOU, having accounted for 54.1% of its variance. In addition, PCM ($\beta = 0.358, p < 0.001$) was able to account for 12.6% of the variance in PEJ. In short, H1, H2, H4, H5, H6, H7, H8, H10, and H11 were supported.

5.6. Predictive relevance and effect size

In assessing the predictive relevance, the cross-validated redundancy was used to calculate the Stone-Geisser's Q^2 in this study as it was recommended to be the best approach by Hair et al. [102]. Table 6 shows that the Q^2 values for BI, MU, MEOU, and PEJ are 0.454, 0.381, 0.382, and 0.103 respectively. As such, it is affirmed that the model has predictive relevance as the Q^2 values of all endogenous constructs are all larger than zero [103]. For the effect size, f^2 is assessed to establish the intensity of relationships among variables [103]. The intensity is categorised as small, medium, or large if the f^2 value ranges from 0.020 to 0.149, from 0.150 to 0.349, or 0.350 and beyond respectively [104]. If the f^2 value is less than 0.020, there is no effect [105]. Table 7 shows that PCM (0.006) and TSE (0.011) do not affect BI while MSE (0.023), MEOU (0.063), MU (0.080), and PEJ (0.122) all have small effects on BI. Furthermore, TSE and MSE have weak effects on MU and MEOU, whereas PCM (0.147) is having a small effect on PEJ.

6. Discussion and implications

As hypothesised, the central constructs of the parsimonious MTAM (i.e., MU and MEOU) have positive and significant relationships with BI. Therefore, H1 and H2 are supported. These results show that customers in the hospitality industry are adopting m-wallet due to the easiness in learning and the advantages of using it. However, the results show that H3 is not supported as PCM does not have a significant relationship with BI. Although this finding is unexpected but it echoes with Chen et al. [75]. This finding is plausible in view that Malaysia is a collectivistic society [106] and the adoption rate of m-wallet in the hospitality industry remains low among Malaysians [10]. In this case, given the number of users has not reached a critical mass level, it is normal for PCM, an important factor under a collectivistic society, to lose its influence over BI [58]. In this study, despite that the current degree of PCM is not strong enough to encourage adoption, it is enough to stimulate PEJ. Hence, H4 is supported. As the current m-wallet supports funds transfer among users [6], m-wallet users would find m-wallet enjoyable especially when some of their friends and relationship partners are using m-wallet. For instance, within the hospitality industry, m-wallet users could easily split the bill when eating out with friends [107]. Additionally, PEJ was found to have a significant relationship with BI and this supports H5. This finding suggests the intrinsic motivation or hedonic motivation perceived by m-wallet users throughout the process of using m-wallet is driving their usage intention. Furthermore, MSE was found to have a statistically significant relationship with BI; hence supporting H6. In general, the use of m-wallet in making payments requires the individual to have confidence in doing so. Therefore, those with a higher level of MSE would have a higher intention to use m-wallet in the hospitality industry. On the contrary, TSE does not have a significant effect on BI. Therefore, H9 is not supported. Although this result is surprising but Shin [108] discovered the same finding under the context of m-payment. The insignificant path

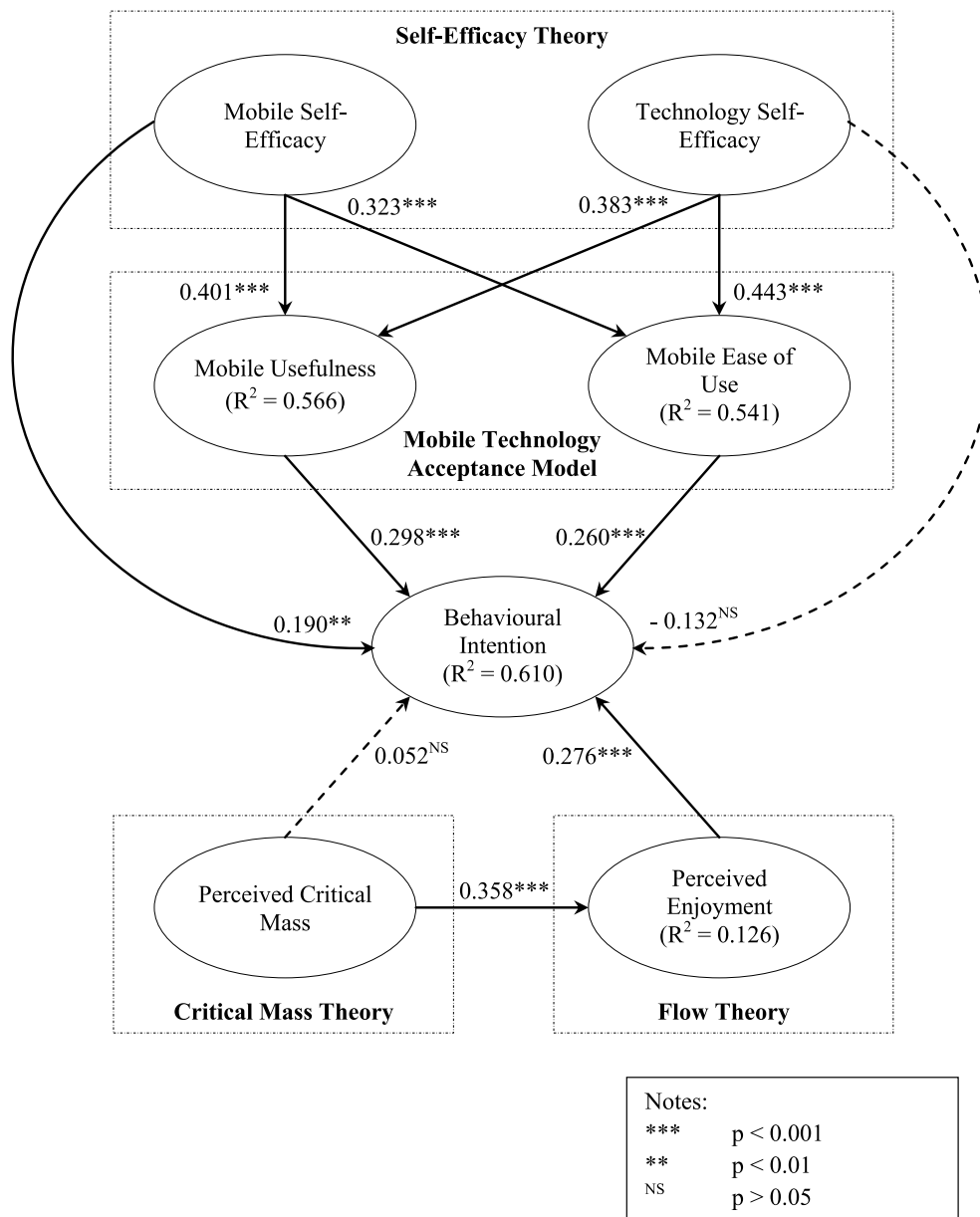


Fig. 2. Structural model testing.

could be due to the fact that m-wallet is already useful and easy to use in providing the basic function (i.e., making payments) without requiring many other technological skills (e.g., verification of account). This should be the case as both MSE and TSE have significant relationships with MU and MEOU. Given that m-wallet users with high levels of MSE and TSE are confident with using m-wallet to make payments and technology-related tasks, it would be easier for them to discover the benefits of using m-wallet (i.e., usefulness and ease of use) to make payments in the hospitality industry. Hence, H7, H8, H10, and H11 are supported.

Theoretically, the proposed model in this study has extended the parsimonious MTAM with non-technological adoption drivers based on three theories, namely the self-efficacy theory [20,21], critical mass theory [22], and flow theory [23]. The extended MTAM was advocated by several researchers [38,109] who suggested to include more variables to illustrate the adoption of innovative technology, in particular the mobile services [19]. Further, other researchers recommended incorporating non-technological variables for future mobile technology studies [40,41]. The extended MTAM has been found to enrich the

theoretical understanding by obtaining more comprehensive findings as compared to the parsimonious MTAM which consists only of technological factors. Besides, the results revealed that the extended model has good explanatory power as 61% of the variance in BI could be explained. Thus, it endorses the robustness of this model to better comprehend users' adoption of m-wallet in the hospitality industry. Moreover, based on the Q², the structural model has a high level of predictive relevance. As such, the extended MTAM can serve as a valuable theory and provides an extensive understanding of the adoption of m-wallet in the hospitality industry.

Practically, in order to cultivate the adoption rate of m-wallet within the hospitality industry, m-wallet providers are encouraged to enhance the usefulness and ease of use of m-wallet. Given the mobile nature of m-wallet, the m-wallet providers could consider incorporating a recommendation system that suggests the restaurants which are accepting m-wallet as a payment method according to the current location of users, along with some useful information such as ratings and promotions. For the practitioners within the hospitality industry, in particular, the restaurant owners, should consider encouraging the use of m-wallet by

Table 5
Hypotheses testing.

Hypotheses	Paths	Path Coefficients	T Statistics	P Values	Remarks
H1	MU → BI	0.298	4.268***	0.0000	Supported
H2	MEOU → BI	0.260	3.636***	0.0000	Supported
H3	PCM → BI	0.052	1.5100 ^{NS}	0.1310	Unsupported
H4	PCM → PEJ	0.358	7.339***	0.0000	Supported
H5	PEJ → BI	0.276	6.195***	0.0000	Supported
H6	MSE → BI	0.190	2.640**	0.0080	Supported
H7	MSE → MU	0.401	4.256***	0.0000	Supported
H8	MSE → MEOU	0.323	4.389***	0.0000	Supported
H9	TSE → BI	-0.132	1.6620 ^{NS}	0.0970	Unsupported
H10	TSE → MU	0.383	4.175***	0.0000	Supported
H11	TSE → MEOU	0.443	6.209***	0.0000	Supported

Notes: a. BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PEJ=Perceived Enjoyment; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.
b. ***p < 0.001, **p < 0.01, ^{NS}p > 0.05.

Table 6
Predictive relevance, Q².

Constructs	Q ² (=1-SSE/SSO)
BI	0.454
MU	0.381
MEOU	0.382
PEJ	0.103

Notes: BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PEJ=Perceived Enjoyment.

Table 7
Effect Size, f².

	BI	MEOU	MU	PEJ
MU	0.080			
MEOU	0.063			
PCM	0.006			0.147
PEJ	0.122			
MSE	0.023	0.064	0.105	
TSE	0.011	0.121	0.095	

Notes: BI=Behavioural Intention; MU = Mobile Usefulness; MEOU = Mobile Ease of Use; PCM=Perceived Critical Mass; PEJ=Perceived Enjoyment; MSE = Mobile Self-Efficacy; TSE = Technology Self-Efficacy.

hosting promotional campaigns, such as giving a free taste of new menu items, for the customers who pay with m-wallet. On top of making m-wallet an enjoyable payment channel among consumers and promoting the new menu items, this shall eventually enhance the adoption rate, hence boosting the critical mass level. Besides, policymakers could assist in elevating both MSE and TSE of potential m-wallet users by including the use of m-wallet to pay under the restaurant case scenario in the official tourism promotional video. By looking at the video, it is believed that the potential m-wallet users would have a higher self-efficacy level.

7. Limitations and future directions

Like any other study, this study has several limitations that need to be aware of. Firstly, as this study was conducted in a developing country, the findings might not truly reflect the m-wallet adoption in other countries. As such, caution should be practiced in generalising the

findings and researchers should consider conducting out a cross-national study that could enhance the generalisation of results. Additionally, despite being able to account for a considerable amount of the variance in BI to adopt m-wallet, there are still other factors excluded in this study. Future studies can eliminate the insignificant variables and further extend the model to include additional variables. Finally, as this study employs a cross-sectional setting that captures the data at a single point of time, future studies could consider choosing the longitudinal approach that accounts for the time difference.

CRedit authorship contribution statement

Susan Lew: Conceptualization, Methodology, Validation, Formal analysis, Investigation, Resources, Data curation, Writing - original draft. **Garry Wei-Han Tan:** Conceptualization, Methodology, Validation, Formal analysis, Investigation, Writing - review & editing, Supervision, Project administration. **Xiu-Ming Loh:** Validation, Formal analysis, Writing - review & editing. **Jun-Jie Hew:** Validation, Formal analysis, Writing - review & editing. **Keng-Boon Ooi:** Validation, Writing - review & editing.

Declaration of competing interest

None.

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