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10.1080/10447318.2022.2076309

This is an Accepted Manuscript of an article published by Taylor & Francis in INTERNATIONAL JOURNAL OF HUMAN-COMPUTER INTERACTION on 30/05/2022, available online: [http://www.tandfonline.com/10.1080/10447318.2022.2076309](http://www.tandfonline.com/10.1080/10447318.2022.2076309).


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Determinants of Intention to Use e-Wallet: Personal Innovativeness and Propensity to Trust as Moderators

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Abstract

This study aims to investigate the determinants of intention to use e-wallets. Drawing on the Technology Acceptance Model (TAM), the conceptual framework was developed. The study extends the TAM model in the context of e-wallets, by testing the influences of product-related factors namely perceived compatibility, perceived risk, and perceived emotions and investigating the moderating impacts of personal innovativeness and propensity to trust. To conduct an empirical study, the data were collected from Malaysian individuals with no experience with e-wallets using an online survey. Data from 374 participants were obtained and analysed using the partial least squares technique. The results showed that perceived usefulness, perceived ease of use, perceived risk, and perceived emotions significantly influence intention to adopt e-wallet. Although personal innovativeness negatively moderates the effect of perceived compatibility on intention to adopt, it moderates positively the influence of perceived emotion. Propensity to trust moderates positively the impacts of perceived usefulness and perceived ease of use and moderates negatively the influence of compatibility on intention to use e-wallets. The study extends the literature by extending the TAM model in the e-wallet context and testing the moderating effect of personal innovativeness and propensity to trust. The findings enable e-wallet service providers, marketers, and policymakers to consider target market and personal related factors in developing an e-wallet platform and promoting its usage.

Keywords: Adoption; e-wallet; Technology Acceptance Model; Mobile Payment

1. Introduction

The digital economy growth has led to the introduction of the electronic payment system (e-payment system) as a new form of payment method for transactions (Flavian et al., 2020; Foroughi et al., 2019; Teng & Khong, 2021). Within the e-payment system, electronic wallet (e-wallet), which allows individuals to link their bank cards to the digital wallet to make payments has gained great attention (Karim et al., 2020). The benefits such as convenience, time-saving, and cost-saving provided by the e-wallets have motivated many countries to implement e-wallets as a part of their daily transaction payment option (Abbasi et al., 2022;
Hassan et al., 2021). However, although governments have invested heavily in e-wallets, the penetration rate of e-wallets in many countries is low (Karim et al., 2020). For instance, although the Malaysian government has invested highly in promoting e-wallets and more than 42 e-wallet providers exist in Malaysia, e-wallet adoption is growing at a slow rate (Andrew & Tan, 2020; Karim et al., 2020). According to the Nielsen report in 2019, the e-wallet adoption rate is low in Malaysia and although 88% of Malaysian are familiar with it, only 10% of them use e-wallets (The Malaysian Reserve, 2022). Furthermore, PwC (2018) reported that banking on the e-wallet in Malaysia lags behind regional players, such as China, India, and Singapore, due to its low adoption rate in Malaysia. Accordingly, it is necessary to identify the determinants of e-wallet adoption and this study aims to unpack what factors affect the decision to use e-wallets in Malaysia.

The research on the intention to use (IU) innovative technologies is based mainly on the Unified Theory of Acceptance and Use of Technology (UTAUT), Diffusion of Innovation Theory (DOI), and Technology Acceptance Model (TAM) (Junadi, 2015; Chan et al., 2020; Singh & Sinha, 2020). Among these theories, TAM is the most commonly used theory that has demonstrated a high power in explaining individuals’ IU technologies. Although perceived usefulness (PU) and perceived ease of use (PEU), as two core concepts of the TAM model, play a crucial role in adopting new technology, the TAM model needs to be extended by adding contextual factors (Lin & Xu, 2021; Rafique et al., 2020). The studies on mobile banking, online banking, e-commerce, and mobile payments have found perceived compatibility and perceived risk as significant contextual determinants of adopting these systems (Jung et al., 2020; Kaur & Arora, 2020). Furthermore, Junadi (2015) found perceived emotion significantly influence IU the e-payment system. This study aims to extend the explanatory power of TAM in the e-wallet context by adding perceived compatibility, perceived risk, and perceived emotions to constructs of the TAM model. PEU, PU, compatibility, perceived risk, and perceived emotion are product-related factors (Pham & Ho, 2015). Besides product-related factors, personal-related factors significantly influence IU new technologies. Although the influences of both product-related factors and personal-related factors have been discussed in the literature (Iskandar et al., 2020; Singh & Srivastava, 2020) the interactions between these factors have received less attention (Taufan & Yuwono, 2019). Personal propensity to trust (PPT) and personal innovativeness (PI) are two personal related factors that have shown significant influence on attitude and intention towards a new technology adoption (Kaushik et al., 2020; Pandey & Chawla, 2020). As understanding the role of personal-related factors is
crucial in motivating target adopters and taking proper strategies at different stages of diffusion, testing the moderating influence of personal-related factors is important for both practical and theoretical purposes. This study proposes PPT, and PI moderate the influence of product-related factors on IU e-wallets. As the individuals with high PI have a tendency to be the first to adopt new technology, it is expected that rational and emotional drivers of adopting new technology such as PU, PEU, perceived risk, compatibility, and emotion have less effect on their decision to adopt compared to the individuals with low PI. Early adopters and innovators play important role in the success of new technologies as they are leading individuals within marketplaces and provide suggestions and information about new technologies to other potential adopters (Khazaei & Tareq, 2021). Furthermore, the PPT is expected to boost the influence of other factors in the decision to adopt new technology. For instance, individuals may find e-wallet as a useful payment platform but due to lack of trust in the system of e-wallet have low IU e-wallet. Accordingly, this study aims to address the following objectives:

1. To test the determinants of IU e-wallet by extending the TAM model with product-related.
2. To examine the moderating influences of PI and PPT on the association between IU e-wallet and its determinants.

The findings of the study extend the literature in two ways. Firstly, the study extends the TAM model in the e-wallet context by testing the influences of perceived compatibility, perceived risk, and perceived emotion. Secondly, the interaction between personal related factors and product-related factors were investigated in the study. The findings will enable e-wallet policymakers, marketers, and service providers to have a better understating of determinants of e-wallet adoption and consequently develop application design and marketing strategies more effectively.

2. Technology Acceptance Model

Various theories such as TAM, TAM2, TAM3, DOI, UTAUT, UTAUT2, and Theory of Planned Behaviour (TPB) have been used in the literature to explain the technology adoption and usage (Kaba & Touré, 2014; Suki & Suki, 2017; Seethamraju et al., 2018). For instance, Jadil et al. (2021), Purwanto and Loisa (2020), and Sarfaraz (2017) have utilised UTAUT in identifying determinants of mobile banking. Furthermore, DOI has been used to identify the determinants of IU mobile payments (Lou et al., 2017; Johnson et al., 2018; Mori & Mlambiti,
2020). Some studies have integrated two or three theories in investigating factors on technology adoption (Abbas et al., 2018; Ahmad et al., 2020; Di Pietro et al., 2015). Although, TAM has undergone revisions (e.g., TAM2, TAM3, and UTAUT), the basic TAM was chosen as a theoretical lens to explain the intention to use e-wallet for various reasons. Firstly, Among these theories, the TAM (Davis, 1989) is the most widely accepted theory (Kalinić et al., 2019). Secondly, TAM has been used extensively and the significance of its factors (PU and PEU) has been widely validated in the pre-adoption stage (Richardson et al., 2019; Zhang et al., 2019). The importance of newly added constructs to TAM in the revised version has been rejected in many studies. For instance, many studies have found the additional constructs of UTAUT and UTAUT2 (social influence, facilitating conditions, price value, hedonic motivation, and habit) have no significant effect on the intention to use technology. For instance, Duarte and Pinho (2019) found social influence, facilitating conditions, and price value as insignificant drivers of mobile health adoption. In another study, Thusi and Maduku (2020) found that social influence, facilitating conditions, hedonic motivation, and price value have an insignificant influence on intention to use mobile banking apps. Thirdly, some of the added constructs of revised versions are not suitable for the e-wallet context. For instance, facilitating conditions refer to the availability of resources such as the internet and smartphone to use e-wallets. The penetration rates of mobile internet connection (67%) and smartphones (86%) are among the highest in the Asia Pacific region (GSMA, 2021). As such, facilitating conditions are not a concern and are expected to play an insignificant role in the decision to adopt e-wallets. Furthermore, as e-wallet is a free application, price value is irrelevant to the context. Fourthly, TAM was chosen as the study aims to provide practical suggestions for e-wallet policymakers, marketers, and service providers. Davis (1989) cited practical goals as the reason for developing TAM. Finally, this study aims to explain the determinants of intention to use e-wallets. However, the main focus of TAM2 and TAM3 is to identify the determinants of PEU and PU which is not align with the aim of this study.

Davis (1989) claimed that two variables of the model; PU and PEU jointly determine the individuals’ behavioural IU information systems. However, the non-consideration of the effect of external variables led to an open debate on the TAM’s applicability (Chuttur, 2009). Therefore, many extensions to the TAM have been proposed and tested to enhance its predictive power (Patel & Patel, 2018; Koenig-Lewis et al., 2015). In terms of theory extension, some studies combined two theories, while others included contextual factors (Alalwan et al., 2018; Chi, 2018; Dutot, 2015). Extending theory by adding contextual factors has been
considered as a more appropriate approach as contextual factors are related to the context of the study and provide practical benefits (Tynkkynen et al., 2018). We conducted a meta-analysis on the contextual factors tested in the previous studies and found perceived risk, perceived compatibility, and perceived emotion as potential contextual drivers of IU e-wallet. Munoz-Leiva et al. (2017), Natarajan et al. (2017), and Agrebi and Jallais (2015) claimed that perceived emotions significantly affect IU mobile. Furthermore, perceived risks and perceived compatibility play important roles in shaping IU mobile commerce (Cozzarin & Dimitrov, 2016; Chhonker et al., 2017). Shin (2010) found perceived risk as the most important determinant of adopting mobile payment systems. If the risk concerns are not addressed, the individuals will be reluctant to use the payment system (Park et al., 2019). Furthermore, compatibility is expected to be an important factor in the e-wallet context as attractive alternatives such as credit cards and online banking exist. According to Pham and Ho (2015), compatibility becomes a more important factor when customers have attractive alternatives to choose from. Therefore, this study extends the TAM in the e-wallet context by adding perceived compatibility, perceived risks, and perceived emotion as related contextual factors.

Individuals have different characteristics that significantly influence their decisions. Patil et al. (2020) claimed that PI and PPT play a crucial role in the customers’ decision to use mobile banking. Although the impacts of PI and PPT have been discussed in the literature, the potential moderating effects of these factors have not been tested in the e-wallet context. The previous studies have shown the associations between perceptions and individuals’ behaviours highly depend on the individuals’ characteristics (Iranmanesh et al., 2017; Faqih & Jaradat, 2015). Accordingly, the moderating influences of PI and PPT were proposed and examined in the study. The rations of proposed relationships were explained in the following section.

3. Hypotheses

3.1 Perceived Usefulness (PU)

PU refers to “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989, p. 320). In this study, PU measures the individual’s belief of the extent e-wallet makes payments more effective. PU is considered as one of the key predecessors of using a technology, which relates to the utilitarian values that a certain technology or system provides to individuals (Nayanajith,
Ayyub et al. (2020), Zailani et al. (2015), and Beh et al. (2021) found that PU positively influences the IU new technologies. Furthermore, Natarajan et al. (2018) and Zhao et al. (2019) indicated that PU is one of the key factors influencing the IU payment services with smartphones. According to Singh et al. (2021), once individuals perceive using a system is useful and provides quick, faster, and convenient transactions, they intend to use the system. The ubiquity of the service is one of the unique characteristics of e-wallets which enables individuals to perform transactions anytime and anywhere (Al-Amria et al., 2016). Therefore, e-wallets enable individuals to conduct transactions at their own convenience time. Individuals with a better understanding of e-wallet usefulness are more likely to use them as their preferred transaction option (Al-Amria et al., 2016). Accordingly, we proposed.

**H1.** PU positively affects the IU e-wallets.

### 3.2 Perceived Ease of Use (PEU)

PEU refers to “the degree to which a person believes a particular system would be free from effort” (Davis, 1989, p. 320). In this study, PEU measures an individual’s belief of the extent using e-wallets is free of effort. Extensive research has found a positive association between PEU and IU (Asadi et al., 2022; Iranmanesh et al., 2022; Iskandar et al., 2020). Asnakew (2020), Malaquias and Silva (2020), and Singh and Srivastava (2020) found PEU as a significant driver of IU mobile banking. According to Upadhyay and Jahanyan (2016) and Amin et al. (2014), clear function keys, simple payment processing steps, and help function facilitate performing a transaction and consequently lead to a higher IU mobile banking. Razak (2016), Rapidah et al. (2018), and Othman et al. (2019) found that PEU is an important driver of using online banking services. Accordingly, a positive association between PEU and IU e-wallets is expected and the study proposed:

**H2.** PEU positively affects the IU e-wallets.

### 3.3 Perceived Compatibility

Rogers (2003, p. 223) defined compatibility as “the degree to which an innovation is perceived to be consistent with the adopters’ beliefs, lifestyle, existing values, experience, and current needs”. Compatibility of e-wallets refers to the degree to which individuals perceive using e-
wallets fits with their needs, lifestyles, and payment preferences. According to Kaabachi et al. (2019) and Singh and Sinha (2020), an innovation which incompatible with individuals’ values and beliefs would not be accepted and used as fast as a compatible innovation. As individuals can use a compatible technology without making huge lifestyle changes, compatibility plays a critical role in individuals’ decision to use a technology (Pathirana & Azam, 2017). The need to break habits and to start new routine limits the chance of adopting new technology (Sheth, 2020). Weerapanpong and Rattanawicha (2016), Yuen et al. (2018), and Yang et al. (2021) found a positive association between compatibility and IU technology. Accordingly, it is expectable that compatibility between e-wallet and payment styles of individuals affects positively their IU e-wallets. Hence, the study proposed:

**H3.** Perceived compatibility positively affects the IU e-wallets.

### 3.4 Perceived Risk

Perceived risk refers to user perception of the extent to which using technology could cause loss due to fraud or hacking (Featherman & Pavlou, 2003). Alalwan et al. (2018) found perceived risk as a key barrier to adopting internet-based systems. There is a positive association between perceived risk and resistance to adopting new technologies (Hong et al., 2020). Namahoot and Laohavichien (2018) reported that online customers usually perceive that digital payment platforms are not secure and could possibly be interrupted. As online transaction systems can be attacked by attackers (Wu et al., 2020) and individuals have no direct interaction with service providers, perceived security risk can play important role in the online environment (Mbama & Ezepue, 2018). Natarajan et al. (2018), Liébana-Cabanillas et al. (2020), and Wang et al. (2020) found a negative association between perceived risk and IU technology. Chan et al. (2020) found perceived security risk as a key determinant of IU e-wallet. Thus, we proposed:

**H4.** Perceived risk positively affects the IU e-wallets.

### 3.5 Perceived Emotion

Perceived emotion can be described as a positive or negative feeling that an individual perceives towards an object or service experience (Mesurado et al., 2018). Positive emotions
consist of emotions such as excitement, pleasure, and comfort (Mesurado et al., 2018). Having positive emotions towards using a technology triggers IU (Choi & Kim, 2016). Normalini et al. (2017), Kim et al. (2019), and Brusch and Rappel (2020) reported a positive relationship between perceived emotion and IU smart technologies. Individuals who experience positive emotions such as pleasure or enjoyment by using technology are more likely to use that technology in comparison to others (Joo et al., 2017). Junadi (2015) revealed that the IU e-payment systems is affected by perceived emotion as individuals receive the enjoyment of using cards, internet, and mobile in a single platform. Accordingly, the positive emotion of individuals towards using an e-wallet is expected to positively influence the IU e-wallets and we proposed:

**H5.** Perceived emotion positively affects the IU e-wallets.

### 3.6 Personal Innovativeness (PI)

PI refers to “the willingness of an individual to try out any new information technology” (Agarwal & Prasad, 1998, p. 206). Innovative individuals are curious and information seekers, and therefore, PI is positively associated with the IU new technologies (Brusch & Rappel, 2020). Early adopters and innovators are at ease with taking risks (Abubakre et al., 2020; Cheng, 2014). Furthermore, individuals with high PI have a strong intrinsic motivation towards trying new technologies as they have a positive perception of using technology (Soliman et al., 2019). Marketplace highly valued these innovative individuals as they tend to take a risk and purchase new products, and consequently act as opinion leaders in the spreading of new technologies. Matute-Vallejo and Melero-Polo (2019) and Agarwal and Prasad (1998) revealed that PEU and compatibility have less effect on individuals with high PI and they have the intention to adopt new technologies regardless of their complexity. Iranmanesh et al. (2017) found that individuals with high PI tend to be the first mover and they can cope better with uncertainties. Individuals with higher PI are open to change and are persuaded to take risks of using new technologies (Tech, 2020). This argument was confirmed by Chauhan et al. (2022) observing that higher innovative individuals tend to accept higher risks. Yen (2022) found personal innovativeness moderates negatively the association between perceived risk and usage intention. Innovative individuals are more likely to experience a flow state, which is a mental state immersed due to energized focus, full involvement, and enjoyment of a new activity (Hamari et al., 2016). As a result of the flow state, the benefits of new technology have a low
effect on the decision to adopt individuals with high PI. They are informed that new
technologies may not deliver all their expected benefits but yet they are enthusiastic to be the
early adopters (Khazaei & Tareq, 2021). Furthermore, innovators tend to ignore system
complexity and lack of performance in their adoption decisions as they seek out new
experiences and want to be a pioneer (Cheng, 2014). Accordingly, it is expected that the extents
to which using e-wallets is useful, easy to use, compatible, and risky have less effect on the
decision to adopt of individuals with high PI compared to the ones with low PI. Matute-Vallejo
and Melero-Polo (2019) also found that PI negatively moderates the associations between PEU
and using online business simulation games. Thus, we proposed:

**H6.** PI negatively moderates the impacts of (a) PU, (b) PEU, (c) compatibility, (d) perceived
risk and (e) perceived emotions on IU e-wallets.

### 3.7 Personal Propensity to Trust (PPT)

The PPT refers to the willingness to trust new products, services, or technologies (Agag & Eid,
2019). Lu et al. (2019) argued that individuals are different in terms of the level of their trust
in new systems or technologies when they have insufficient information. When individuals
make the decision to use a new system, they evaluate whether they could trust the system, and
thus, trust propensity is a major determinant of their usage (Furner et al., 2021). Talwar et al.
(2020) found that PPT positively affects IU the wireless internet for financial transactions.
Hallikainen and Laukkanen (2018) claimed that when individuals do not have experience with
a system, their PPT plays a crucial role in their decisions to adopt. Lack of trust forms a
suspicious feeling on a new system and individuals with low trust propensity are less likely to
use the system (Gu et al., 2016). Accordingly, lack of trust in e-wallets may offset the influence
of PU, PEU, compatibility, and perceived emotion on IU e-wallets. It means, the customers
may find e-wallets as useful and easy to use systems but due to the lack of trust may decide to
not use e-wallets. Therefore, we hypothesised.

**H7.** PPT positively moderates the impacts of (a) PU, (b) PEU, (c) compatibility, (d) perceived
risk, and (e) perceived emotions on IU e-wallets.
Figure 1 presents the conceptual framework of the study. We proposed PU, PEU, compatibility, perceived risk, and perceived emotions as determinants of IU e-wallets. The study also investigated the moderating influences of PI and PPT.

**Figure 1.** Conceptual Framework

### 4. Research Methodology

#### 4.1 Research Instrument

To test the proposed relationships, data were collected using a survey questionnaire. All items of the study were adapted from previous studies to ensure content validity. Scales of PEU (3 items) and PI (4 items) were adapted from Shankar and Datta (2018) and Thakur and Srivastava (2014) respectively. The items of PU (4 items), compatibility (4 items), perceived emotion (4 items), and PPT (4 items) were adapted from Kim et al. (2010), Chatterjee and Bolar (2019), Wu et al. (2017), and Oliveira et al. (2014) respectively. The measurements of perceived risk (5 items) and IU (4 items) were adapted (Johnson et al., 2018). All the items were measured using a five-point Likert scale anchored by “strongly disagree” to “strongly agree”. Items were provided in Table 2.

#### 4.2 Participants and procedure

The Malaysian individuals with no experience with e-wallets form the population of the study. Since access to the list of all members of the study population is impossible, we used the non-
probability convenience sampling method (Foroughi et al., 2022; Nikbin et al., 2019). The data collection process involved posting the link of the online survey on pages of social media groups with Malaysian members and asking the ones who have not adopted e-wallets to participate. Furthermore, filtering question was used to ensure that respondents have no experience of using e-wallets. Data collection lasted two months and 385 data were collected. Out of 385 received responses, 11 responses were excluded due to limited response variance and 374 responses were usable. According to Reinartz et al. (2009), a minimum sample size of 100 is required to run Partial Least Squares (PLS). In addition, according to G*Power, a minimum sample of 146 is required to achieve the power of 0.8 (Faul et al., 2009). Accordingly, the sample of 374 is adequate to test the model of this study. As data were collected using a survey, the data were subjected to non-response bias. Following Armstrong and Overton (1977), we compared the early and late responses using an independent t-test. There were no significant differences, indicating the results were not affected by non-response bias (Armstrong & Overton, 1977).

As data were collected from a single respondent using a self-reported survey, Common Method Bias (CMB) may influence the accuracy of the results. We used two approaches namely the statistical remedies technique (Lindell & Whitney, 2001) and Harman’s single-factor approach (Podsakoff et al., 2003). A marker variable (i.e. “attitude toward buying green products”) was used to perform statistical remedies (Maroufkhani et al., 2022). No significant correlations between study constructs and the marker variable were detected, suggesting CMB is not a concern (Lindell & Whitney, 2001). According to the result of Harman’s single factor, as a sole factor does not explain more than 50% of the total variance, CMB is not an issue (Fuller et al., 2016).

According to descriptive analysis (Table 1), 58.3% of the respondents were female and 41.7% were male. Most of the respondents were between 26 and 35 years old (27.3%), followed by 18-25 years old (25.1%), 36 to 45 years old (23.0%), 46 to 55 (16.3%), and above 55 years old (8.3%). In terms of education, respondents mostly held a bachelor’s degree (43.0%), and the rest followed by a master’s degree (23.8%), diploma (22.2%), PhD (8.3%), and Others (2.7%).
Table 1. Profile of Respondents

<table>
<thead>
<tr>
<th>Variables</th>
<th>Categories</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>218</td>
<td>58.3</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>156</td>
<td>41.7</td>
</tr>
<tr>
<td>Age</td>
<td>18-25</td>
<td>94</td>
<td>25.1</td>
</tr>
<tr>
<td></td>
<td>26-35</td>
<td>102</td>
<td>27.3</td>
</tr>
<tr>
<td></td>
<td>36-45</td>
<td>86</td>
<td>23.0</td>
</tr>
<tr>
<td></td>
<td>46-55</td>
<td>61</td>
<td>16.3</td>
</tr>
<tr>
<td></td>
<td>Above 55</td>
<td>31</td>
<td>8.3</td>
</tr>
<tr>
<td>Race</td>
<td>Malay</td>
<td>160</td>
<td>42.8</td>
</tr>
<tr>
<td></td>
<td>Chinese</td>
<td>117</td>
<td>31.3</td>
</tr>
<tr>
<td></td>
<td>Indian</td>
<td>97</td>
<td>25.9</td>
</tr>
<tr>
<td>Marital status</td>
<td>Single</td>
<td>134</td>
<td>35.8</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>221</td>
<td>59.1</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>19</td>
<td>5.1</td>
</tr>
<tr>
<td>Educational Background</td>
<td>Diploma degree</td>
<td>83</td>
<td>22.2</td>
</tr>
<tr>
<td></td>
<td>Bachelor degree</td>
<td>161</td>
<td>43.0</td>
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<td></td>
<td>Master degree</td>
<td>89</td>
<td>23.8</td>
</tr>
<tr>
<td></td>
<td>PhD</td>
<td>31</td>
<td>8.3</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>10</td>
<td>2.7</td>
</tr>
</tbody>
</table>

4.3 Data Analysis

PLS is a suitable technique for the predictive-orientation models and accordingly, this technique was selected to test the proposed relationships (Hair et al., 2019). Following the two-step analytical approach, the measurement model was evaluated in the first step to assess the validity and reliability of the constructs, followed by testing the hypotheses (Hair et al., 2019).

5. Results

5.1 Assessment of Measurement Model

The convergent validity of the constructs of the study was assessed using factor loadings, average variance extracted (AVE), and composite reliability (CR). The loadings of the items were above 0.40 and AVE and CR values were well above 0.5 and 0.7 respectively (Table 2), indicating adequate convergent validity (Hair et al., 2019).
Table 2. Convergent Validity and Reliability Assessment

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Factor Loadings</th>
<th>CR</th>
<th>AVE</th>
<th>f^2</th>
<th>Q^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Usefulness (PU)</td>
<td>Using e-wallets would enable me to pay more quickly.</td>
<td>0.756</td>
<td>0.925</td>
<td>0.756</td>
<td>0.036</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using e-wallets makes it easier for me to conduct transactions.</td>
<td>0.916</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using e-wallets would be advantageous.</td>
<td>0.908</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I would find e-wallets a useful possibility for paying.</td>
<td>0.890</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Ease of Use (PEU)</td>
<td>I believe that when I use e-wallets, the process will be clear and understandable.</td>
<td>0.913</td>
<td>0.945</td>
<td>0.852</td>
<td>0.029</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I believe that e-wallets are easy to use.</td>
<td>0.919</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatibility (COM)</td>
<td>Using e-wallets is compatible with all aspects of my lifestyle.</td>
<td>0.921</td>
<td>0.960</td>
<td>0.858</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using e-wallets is completely compatible with my current situation.</td>
<td>0.936</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I think that using e-wallets fits well with the way I like to buy.</td>
<td>0.938</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Using e-wallets fits into my lifestyle.</td>
<td>0.911</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Risk (PR)</td>
<td>I feel secure about the transactions performed using e-wallets.</td>
<td>0.918</td>
<td>0.936</td>
<td>0.749</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The provider takes security measures to protect my payments.</td>
<td>0.944</td>
<td></td>
<td></td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The provider has the ability to verify user's identity to ensure payment security.</td>
<td>0.916</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The provider can ensure the security of e-wallet.</td>
<td>0.924</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I feel safe making transactions using e-wallet.</td>
<td>0.565</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Emotion (PEM)</td>
<td>I think using e-wallets ……</td>
<td>0.882</td>
<td>0.660</td>
<td>0.152</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>... is funny.</td>
<td>0.552</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>... is enjoyable.</td>
<td>0.893</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>... is pleasant.</td>
<td>0.915</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>... is exciting.</td>
<td>0.836</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intention to Use e-wallet (IU)</td>
<td>I plan to use e-wallet services in the future.</td>
<td>0.909</td>
<td>0.958</td>
<td>0.849</td>
<td>0.465</td>
<td></td>
</tr>
<tr>
<td></td>
<td>I intend to use e-wallet services when I purchase items.</td>
<td>0.940</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I intend to use e-wallet services in the future.</td>
<td>0.942</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I intend to recommend the use of e-wallets to friends.</td>
<td>0.895</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Innovativeness (PI)</td>
<td>Among my peers, I am the first one to try out new information technologies.</td>
<td>0.856</td>
<td>0.900</td>
<td>0.694</td>
<td>0.018</td>
<td></td>
</tr>
<tr>
<td></td>
<td>In general, I am not hesitant to try out new information technologies.</td>
<td>0.831</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I like to experiment with new technologies.</td>
<td>0.724</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personal Propensity to Trust (PPT) I don’t use new technologies. (R)</td>
<td>0.909</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I avoid the use of new services like e-wallet. (R)</td>
<td>0.931</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I avoid the use of non-classical means to transact money. (R)</td>
<td>0.906</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>I’m cautious with the financial transactions I execute. (R)</td>
<td>0.608</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. CR: Composite Reliability; AVE: Average Variance extracted; f^2: Effect Size; Q^2: Predictive Relevance; R: Reverse

The study tested discriminant validity using the “Heterotrait–Monotrait (HTMT) criterion” (Henseler et al., 2015). Table 3 illustrates all HTMT values were lower than 0.85, indicating acceptable discriminant validity (Kline, 2016).

Table 3. Heterotrait-Monotrait Ratio (HTMT_{85})

<table>
<thead>
<tr>
<th></th>
<th>PU</th>
<th>PEU</th>
<th>COM</th>
<th>PR</th>
<th>PEM</th>
<th>IU</th>
<th>PI</th>
<th>PPT</th>
</tr>
</thead>
<tbody>
<tr>
<td>PU</td>
<td>0.632</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEU</td>
<td>0.677</td>
<td>0.666</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COM</td>
<td>0.139</td>
<td>0.452</td>
<td>0.264</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PR</td>
<td>0.418</td>
<td>0.618</td>
<td>0.560</td>
<td>0.630</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEM</td>
<td>0.517</td>
<td>0.664</td>
<td>0.535</td>
<td>0.515</td>
<td>0.743</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IU</td>
<td>0.540</td>
<td>0.714</td>
<td>0.725</td>
<td>0.440</td>
<td>0.647</td>
<td>0.642</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PI</td>
<td>0.168</td>
<td>0.186</td>
<td>0.117</td>
<td>0.203</td>
<td>0.240</td>
<td>0.304</td>
<td>0.225</td>
<td></td>
</tr>
<tr>
<td>PPT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5.2 Structural Model Evaluation

The proportion of variance explained ($R^2$) of the IU e-wallets was 0.559 expressing the predictive accuracy of the model is 55.9%. Furthermore, the Stone-Geisser $Q^2$ of the IU was greater than zero (0.465), signalling the model has adequate predictive relevance (Chin, 2010). To assess the structural model, we used the non-parametric bootstrapping procedure with 5000 replications (Hair et al., 2019). According to the results (Table 4), all direct relationships were supported except the relationships between compatibility and IU ($\beta=0.013; p>0.05$). As such, H1, H2, H4, and H5 were supported and H3 was rejected. To compare the impacts of determinants on IU, we assessed the effect size (Table 1). According to the results, among the factors, perceived emotion has the highest effect on IU ($f^2 = 0.152$).

The study used orthogonalization (Little et al., 2006) to test the moderating effect of PI and PPT. PI negatively moderates the influence of compatibility ($\beta=-0.125; p<0.05$) and positively moderates the impact of perceived emotion ($\beta=0.137; p<0.05$) on IU. Among the hypotheses related to PI, H6c was supported as the study proposed the negative moderating effect of PI. Furthermore, the PPT moderates positively the influences of PU ($\beta=0.092; p<0.05$) and PEU ($\beta=0.190; p<0.01$), and negatively the influence of compatibility ($\beta=-0.161; p<0.05$) on IU. As we proposed PPT moderates positively the relationships, H7a and H7b were supported and H7c, H7d, and H7e were rejected.

Table 4. Hypotheses Testing Results

<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Relationships</th>
<th>Path Coefficients</th>
<th>T Values</th>
<th>P Values</th>
<th>Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1</td>
<td>PU -&gt; IU</td>
<td>0.196</td>
<td>3.027***</td>
<td>0.001</td>
<td>Supported</td>
</tr>
<tr>
<td>H2</td>
<td>PEU -&gt; IU</td>
<td>0.148</td>
<td>1.954*</td>
<td>0.025</td>
<td>Supported</td>
</tr>
<tr>
<td>H3</td>
<td>COM -&gt; IU</td>
<td>0.013</td>
<td>0.190</td>
<td>0.425</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H4</td>
<td>PR -&gt; IU</td>
<td>-0.126</td>
<td>2.078*</td>
<td>0.019</td>
<td>Supported</td>
</tr>
<tr>
<td>H5</td>
<td>PEM -&gt; IU</td>
<td>0.337</td>
<td>5.185***</td>
<td>0.000</td>
<td>Supported</td>
</tr>
<tr>
<td>Moderating Effect of Personal Innovativeness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H6a</td>
<td>PI*PU -&gt; IU</td>
<td>0.085</td>
<td>1.583</td>
<td>0.057</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H6b</td>
<td>PI*PEU -&gt; IU</td>
<td>-0.030</td>
<td>0.428</td>
<td>0.334</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H6c</td>
<td>PI*COM -&gt; IU</td>
<td>-0.125</td>
<td>1.707*</td>
<td>0.044</td>
<td>Supported</td>
</tr>
<tr>
<td>H6d</td>
<td>PI*PR -&gt; IU</td>
<td>-0.069</td>
<td>1.227</td>
<td>0.110</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H6e</td>
<td>PI*PEM -&gt; IU</td>
<td>0.137</td>
<td>1.689*</td>
<td>0.046</td>
<td>Not Supported</td>
</tr>
<tr>
<td>Moderating Effect of Personal Propensity to Trust</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H7a</td>
<td>PPT*PU -&gt; IU</td>
<td>0.092</td>
<td>1.655*</td>
<td>0.049</td>
<td>Supported</td>
</tr>
<tr>
<td>H7b</td>
<td>PPT*PEU -&gt; IU</td>
<td>0.190</td>
<td>2.640**</td>
<td>0.004</td>
<td>Supported</td>
</tr>
<tr>
<td>H7c</td>
<td>PPT*COM -&gt; IU</td>
<td>-0.161</td>
<td>2.122*</td>
<td>0.017</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H7d</td>
<td>PPT*PR -&gt; IU</td>
<td>0.057</td>
<td>1.054</td>
<td>0.146</td>
<td>Not Supported</td>
</tr>
<tr>
<td>H7e</td>
<td>PPT*PEM -&gt; IU</td>
<td>-0.071</td>
<td>1.126</td>
<td>0.130</td>
<td>Not Supported</td>
</tr>
</tbody>
</table>

Note. *p<0.05; **p<0.01; ***p<0.001 (one-tail)
Figure 2 and Figure 3 illustrate the significant moderating influences of PI and PPT on the associations among product-related factors and IU e-wallets.

![Figure 2. Moderating Effects of Personal Innovativeness](image1)

![Figure 3. Moderating Effects of Personal Propensity to Trust](image2)

6. Discussion

This study extended the TAM model and tested the influences of perceived compatibility, perceived risks, and perceived emotions besides TAM core constructs (PU and PEU) on IU e-wallet by considering PI and PPT as moderators. The proposed model illustrated a high explanatory power and explained 55.90 percent of the variance of the IU e-wallets. According to the results, PU, PEU, and perceived emotion positively and perceived risk negatively influence IU e-wallet. The association between perceived compatibility and IU e-wallet was
not supported. PI moderates negatively the influence of perceived compatibility and moderates positively the impact of perceived emotion on IU e-wallet. Furthermore, although PPT moderates positively the influences of PU and PEU on e-wallet adoption, it moderates negatively the influence of perceived compatibility.

The study found that PU positively influences the IU e-wallets, which is in line with the results of Ayyub et al. (2020) and Singh et al. (2021) who found PU as a significant driver of IU new technologies. This implied that the e-wallet’s superiorities in terms of overall usefulness, convenience, efficiency, and speed of performing transactions play an important role in individuals’ IU e-wallets. Furthermore, the results confirm the positive association between PEU and IU. This finding is consistent with the studies of Brusch and Rappel (2020) and Iskandar et al. (2020). It means individuals have more IU e-wallets if they find the payment process is clear and understandable, easy to use, and matches their skills.

The association between perceived compatibility and IU e-wallets was not supported. The result contradicts the findings of Yuen et al. (2018) and Yang et al. (2021) who found perceived compatibility as a significant driver of IU technology. The high penetration rate of smartphones in Malaysia and the familiarity of Malaysians with smartphones can be the potential reason for the insignificant effect on perceived compatibility. According to GSMA (2021), around 86% of Malaysians had smartphones in 2020. As such, no significant change in lifestyle is needed to use smartphones for payment activities as Malaysians are highly literate in using smartphones. Furthermore, Chuah et al. (2019) reported that credit card is the most popular form of transaction payment in Malaysia. The process of paying by credit card and mobile phone is similar and no additional effort is required in learning the process of paying by mobile phone. Developing e-wallet systems with similar features with commonly used apps can be considered as another potential reason for the insignificant role of perceived compatibility. It means as the e-wallets systems’ visual appeal is similar to other apps that people commonly use and are familiar with, compatibility is not a concern. As such, compatibility has no significant influence on the IU e-wallets.

The study found a negative relationship between perceived risks and IU e-wallets. The result is in line with Liébana-Cabanillas et al. (2020) and Wang et al. (2020) who found that perceived risk is a crucial factor for IU technologies. The result indicates that the higher the uncertainty, the greater the reluctance to use e-wallets. Furthermore, the proposed positive effect of perceived emotions on IU e-wallet was confirmed. This result is consistent with the results of
Lee et al. (2019) and Brusch and Rappel (2020). The results indicate that positive emotions such as excitement, pleasure, and comfort trigger individuals’ IU e-wallets in their daily activities.

The findings confirmed that PI moderates the relationship between perceived compatibility and IU. This result denotes that the influence of perceived compatibility on IU is higher amongst the individuals with low PI compares to those with high PI. Innovative individuals adopt technologies regardless of their complexity. Compatibility of e-wallet is important for individuals with low PI and they evaluate whether using e-wallet fits with their lifestyle, current situation and the way that they pay for goods and services. Therefore, the influence of compatibility on the decision to use e-wallets is higher among individuals with low PI compared to the ones with low PI. Surprisingly, PI moderates positively the association between perceived emotion and IU. It means perceived emotion plays a more important role in the decision to use e-wallets of individuals with high PI. The importance of emotion for high innovative individuals was confirmed by previous studies (Agarwal & Prasad, 1998; Matute-Vallejo & Melero-Polo, 2019). This finding implies that emotion-related factors are important in motivating individuals with high PI. So, e-wallet marketers should use emotional advertisements in the early stages of the e-wallet adoption life cycle.

According to the results, the PPT moderates positively the influences of PU and PEU. Although PEU and PU positively influence the IU of individuals with a high PPT, they have almost no effect on the IU of individuals with a low PPT. Lack of trust in a new system offsets the influence of PEU and PU on IU the system. Individuals with a low PPT may find e-wallet useful and easy to use but due to low trust in the system, they decide to not use e-wallet for performing transactions. Against our expectations, the PPT moderates negatively the impact of perceived compatibility. It indicates, although compatibility is an important factor for individuals with a low PPT, it has no effect on the decision to adopt of individuals with a high PPT. As such, the e-wallet marketers should highlight the compatibility of e-wallets to promote their usage among people with a low PPT. Highlighting the advantages of using e-wallets and their ease of use is a more effective strategy for promoting e-wallets among individuals with a high PPT.
7. Theoretical and Practical Contributions

The study contributes to the literature on e-wallets in various ways. The study extends the TAM in the context of e-wallets by adding contextual factors. The results confirmed that PU, PEU, perceived risks and perceived emotions are significant factors. The extended TAM worked well in explaining the IU e-wallets and explained 55.9% of the variance of the IU. Furthermore, to our best of knowledge, this study is one of the first that investigated the moderating influences of personal-related factors on the associations among product-related factors and IU e-wallets. The previous studies have only investigated the direct influence of personal-related factors and the potential interactions between personal- and product-related factors have received less attention. The results confirmed that, PI moderates the influences of perceived compatibility and perceived emotion on e-wallet adoption. Furthermore, the PPT moderates the impacts of PU, PEU, and perceived compatibility on IU e-wallets.

Apart from its theoretical implications, the findings provide implications for the e-wallet service providers, marketers, and policymakers. The results will help service providers and policymakers to identify the factors that result in the IU e-wallets. According to the results, PU, PEU, perceived emotion, and perceived risk influence IU e-wallets. As such, e-wallet service providers should focus on developing a more user-friendly, productive, attractive, and secure e-wallets. Governments can also play role in boosting the adoption of e-wallets by developing regulations that support the security of transactions through e-wallets. Furthermore, marketers also should highlight the benefits of using e-wallets, the ease of using these platforms, and their security in the functional type of advertisements. Furthermore, as perceived emotion plays a significant role in shaping IU e-wallets, the marketers can use emotional advertisements and illustrate how using e-wallets can be enjoyable and exciting. Testing the moderating effects of PI and PPT enables the marketers to change their marketing strategies based on the stage of the e-wallet adoption lifecycle and the personal characteristics of the target groups. As in the early stages of promoting e-wallets, innovators and early adopters should be targeted, emotional advertisements can be more effective. The main aim of advertisement should be to provoke the feelings of customers as perceived emotion plays a crucial role in the decision to adopt e-wallets of innovators. Furthermore, the marketers should decide to focus on ease of use, usefulness, and compatibility of e-wallets based on the level of trust in e-wallets in society. If the customers have low trust to e-wallets, ease of use and usefulness of e-wallets should not be the focus of marketing activities and the markers should communicate the security and
compatibility of the e-wallets with customers. When trust is created, the marketers should highlight the ease of use and usefulness of e-wallets.

8. Limitations and Future Research

The study has some limitations that should be considered in future studies. Firstly, the respondents were limited to Malaysian respondents. Although testing the moderating influences of PI and PPT enhances the generalizability of the findings, future studies can examine the model of the study in other countries. Secondly, the study investigated the determinants of e-wallet adoption, and the result may not be applicable to the post-adoption stage. Future studies need to investigate the drivers of continuance IU e-wallets. Finally, we recommend future studies to test the moderating influences of marketing activities such as marketing communication approaches (media advertisement and word of mouth) and advertisement types (functional and emotional advertisements). Testing the moderating impacts of marketing activities enables marketers to develop more effective marketing strategies.

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