How to Generate Loyalty in the Mobile Payment Industry? An Integrative Dual SEM-ANN Analysis

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How to Generate Loyalty in Mobile Payment Services? An Integrative Dual SEM-ANN Analysis

Abstract

Purpose - The surging entrance of new mobile payment merchants into the growing market has prompted the need for an in-depth understanding of loyalty formation to retain customers. This study examines customers' loyalty generation process in mobile payment services by exploring the serial effect of cognitive drivers (i.e., brand awareness, perceived quality, brand image, perceived value, and layout) on affective response, satisfaction, and loyalty.

Design/methodology/approach - A survey using self-administered questionnaires was conducted. The data was collected from 370 consumers who have experience using mobile payment services in Vietnam. The data were submitted to partial least square structural equation modeling (PLS-SEM) and artificial neural networks (ANN) analysis.

Findings - The results indicated that all the proposed cognitive drivers show significant impacts on affective response, which, in turn, translates into satisfaction and loyalty. The post-hoc analysis revealed enjoyment as the vital affective response in determining satisfaction. Moreover, the multigroup analysis indicated that the relationship between affective response and satisfaction is stronger for the female group. In addition, the ANN's non-linear result revealed complementary insight into the importance of cognitive drivers.

Originality - The current study revealed both linear and non-linear mechanisms that explicate the roles of cognitive drivers and affective responses in fostering loyalty towards mobile payment merchants. The findings add to the existing literature that emphasizes consumers' initial mobile payment adoption.

Keywords

Mobile payment, Mobile Commerce, Cognitive drivers, Affective response, Loyalty, Vietnam, Gender, PLS-SEM

1. Introduction.

Driven by the prevalence of mobile technologies and innovations, the payment ecosystem is inevitably adapting to this dynamic environment, whereby we have witnessed the transition from cash to web payment as the major stream of payment methods. The revolution continues, and currently, mobile payment as a disruptive service innovation has come to the forefront of most businesses and emerged as one of the most popular consumers' choices of payment (Loh *et al*., 2021a). Mobile payment services refer to the payment for products and services via mobile devices such as smartphones, which enable both online and proximity-based transactions (Gong *et al.*, 2020a; Al-Sharafi *et al.,* 2022; Ooi and Tan, 2022). Some frontrunners in the mobile payment industry include Apple Pay, Alipay wallet, PayPal, and WeChat wallet. Many industries are eyeing the potential opportunities associated with mobile payment services, given that it is predicted that more than 2.7 billion consumers will adopt mobile payment for in-store transactions. Another report has shown that mobile payment is rapidly taking over the card payment market, and the mobile wallet market is forecasted to reach a high of $80 billion in 2026 (Samsukha, 2021).

The primary benefits of consumers' acceptance of mobile payment services include faster and more secure transactions while eliminating the need to carry cash and credit cards (Cham *et al.*, 2022; Loh *et al.*, 2022b; Wong *et al.*, 2015). More importantly, apart from the added value to consumers' lifestyle, mobile payment services are of firms' concern because they reduce transaction costs and enhance loyalty, while the massive data collected (e.g., consumption pattern and amount of expenditure) yield insights into formulating effective marketing strategies (Choudhary *et al.*, 2022; Dwivedi *et al.*, 2022; Tan et al. 2022; Wong *et al.*, 2022). With new entrants touting their services and products, competition in the mobile payment market is getting ever-intense. Notably, due to the homogeneous primary functions offered by mobile payment services, coupled with the easy accessibility to and wide options of mobile payment services in the market, consumers can switch their mobile payment providers easily (Tew *et al.*, 2022). Hence, the focus of mobile payment merchants is shifting from attracting potential customers to retaining existing customers as a way to safeguard the long-term viability of the business, thereby rendering the formation of customer loyalty a priority of mobile payment service providers (Gong *et al.*, 2021).

To clarify, customer loyalty denotes the commitment to consistently repurchase or support a product or service, despite the potential benefit given by attractive alternatives (Oliver, 1999; Goel *et al.*, 2022; Theadora et al., 2022). Prior research has indicated that building loyalty is paramount for online branded products, including mobile payment services, because loyal customers are less susceptible to negative brand information, more profitable, and able to promote significant word-of-mouth (Gong *et al.*, 2020b; Gong *et al.*, 2020c). Unfortunately, the current study on mobile payment services mainly focuses on identifying the elements that influence initial consumer adoption (Huang *et al.*, 2019; Johnson *et al.*, 2018). In the mobile payment literature,

many scholars have studied the drivers and inhibitors that foster the diffusion of mobile payment through good theories such as the Mobile Technology Acceptance Model (MTAM) (Tew *et al.*, 2021; Wong *et al.*, 2022), Unified Theory of Acceptance and Use of Technology (UTAUT) (Khalilzadeh *et al.*, 2017; Upadhyay *et al.*, 2022), and Expectation-Confirmation Model (ECM) (Gupta *et al.*, 2020). Despite the enriching insights generated from these studies, scant studies have looked into mobile payment loyalty which emerges as largely uncharted territory in the mobile payment literature (Yan *et al.*, 2021; Yuan *et al.*, 2020).

Thus far, a few studies have taken the cognitive perspective in approaching customer loyalty formation, yet the approach is inadequate to capture a complete understanding of mobile payment service loyalty (Yuan *et al.*, 2020). To bridge the gaps, we seek to unveil the mechanism fostering satisfaction and loyalty by probing the interplays between cognitive drivers and affective response, as it has been established that consumer behaviors are complex and involve both cognitions and emotions (Han *et al.*, 2018). Yet, the simultaneous examination of both the cognitive drivers and affective responses in mobile payment loyalty studies remains scant (Nguyen *et al.*, 2022).

In sum, the current study provides numerous contributions to the field of knowledge and industry practices. In terms of theoretical implications, the study provides empirical evidence for the hierarchy of effects model's relevancy, manifested by the cognitive drivers and affective responses in explaining mobile payment satisfaction and loyalty. The findings extended the conventional perspective taken in the mobile payment literature, which tends to concentrate on adoption behavior studies. Practically, the study adds value to the mobile payment industry by highlighting the relative importance of different cognitive drivers so to support mobile payment service providers' marketing strategies and decisions (e.g., marketing resources allocation for awareness building or service quality improvement).

We structured the paper as follows. Sections 2 and 3 detail the literature review theoretical development of the research, followed by Section 4, featuring the clarification of the methodology applied. Section 5 informs the statistical results. Section 6 presents the discussion of findings and implications. Section 7 discusses the limitations and future research. The paper is concluded with remarks in section 8.

2. Literature review

2.1 Mobile payment

Mobile payment has risen to the fore of the payment landscape, and in correspondence, there emerges a plethora of studies that examine mobile payment adoption (Dahlberg *et al.*, 2015; Migliore *et al.*, 2022). Prior studies mainly concentrated on the technology aspect of mobile payment by undertaking the theoretical grounds of established technology adoption theories such as the unified theory of acceptance and use of technology, technology acceptance model, and diffusion of innovation theory (Tew *et al.*, 2022; Yan *et al.*, 2021; Tan *et al.*, 2014; Arvidsson, 2014). In general, the studies concurred that perceived ease of use, perceived usefulness, and

relative advantage are drivers of the initial adoption of mobile payment. However, the understanding yielded by the studies becomes limited, given the rapid developments of mobile payment over the years.

Emerging research in the field has started to shift focus to explore post-adoption behavior, such as customer satisfaction and intent to continue using mobile payments (see appendix). For instance, Kar (2021) leveraged the combination of topic modeling and multiple regression to develop the "Digital Service Usage Satisfaction Model" concerning mobile payment usage satisfaction, suggesting several important antecedent factors such as information privacy, social influence, cost, and trust. Another stream of research revealed the importance of service and system qualities in driving satisfaction and continuance intention on mobile payment (Talwar *et al.*, 2020; Yuan *et al.*, 2020). Thus far, numerous attempts have been made to adopt and extend well-established theoretical models, such as UTAUT or TAM, but recent research has advocated for advancing the theoretical ground in the mobile payment literature (Cheng *et al.*, 2021), prompting the present study to embrace the lens of the hierarchy of effects model in approaching the mobile payment literature. The approach taken is expected to complement past literature that has largely overlooked the role of consumer psychology (i.e., cognition and affection), which is vital in determining technology usage decisions (Kulviwat *et al.*, 2007). Moreover, the existing mobile payment post-adoption behavior literature has been centered on continuance intention. The present study aims to take a further step to understand the underexplored area of mobile payment loyalty formation, given its relevance to the current competitive mobile payment market.

2.2 Theoretical foundation

Rooted in the psychology literature, the hierarchy of effects model has been recognized and frequently applied to understand consumer responses (Lavidge and Steiner, 1961). The model postulates that behavior is composed of three dimensions: cognitive, affective, and conative. The cognitive driver indicates consumers' perception and belief about a product/brand, typically measured by perceived information and sensory elements (Park *et al.*, 2008). The affective component is related to consumers' feelings and emotions about a brand product, encompassing the elements of involvement, liking, and caring (Oliver, 1997). Conation denotes the tendency to avoid or approach a brand product, which is often manifested in behavioral intention and commitment. The theory contends that consumers who judge a brand product favorably (cognition) tend to generate positive emotional responses (affection). To explain, customers initially form their beliefs about the brand attribute, promoting the pleasurable fulfillment derived from satisfactory brand performance, ultimately leading them to become conatively loyal and exhibit brand-specific commitment. Past research has validated the explanatory power of the hierarchy of effects model in predicting online service loyalty (Akroush and Mahadin, 2019). More specifically, this model enables the simultaneous examination of cognition- and affection-relevant mechanisms underlying loyalty towards mobile payment services, thereby offering a multi-layered knowledge of the foundation for turning consumer experience into action, thus suitable to be employed in the present study (Hsiao, 2020; Qin *et al.*, 2021).

3. Hypotheses development

3.1 The relationship between cognitive drivers and affective response

Reasoning about meta-cognitive beliefs and intents is considered cognitive, whereas reasoning about emotional and mental states is considered affection (Fischer *et al.*, 2017). Cognition refers to mental processes associated with knowledge acquisition and processing, which include aspects such as awareness, perception, reasoning, and judgment (Pawlik and d'Ydewalle, 2006). The theories in the field of consumer behavior and psychology contend that cognition precedes emotion (Fischer *et al.*, 2017), suggesting that a person's emotions usually stem from their cognitive evaluation. For instance, in the branding literature, it has been suggested that brand image refers to consumers' perceptions of brand features through which they derive symbolic value (Patterson, 1999). To further clarify, the means-end theory's demonstration of the categorization process of a product alternative supports this view. The theory outlines a hierarchy effect in which consumers derive psychological benefits from the functional implications of physical and sensory product attributes (Gutman, 1982). Inconsistent with Han *et al.* (2018), the study expects that cognitive drivers, including brand awareness, perceived quality, brand image, perceived value, and layout, can influence affective responses in the context of mobile payment services.

Brand awareness refers to a buyer's ability to recognise or memorise a particular brand within a specific category of product (Homburg *et al.*, 2010). In particular, brand recall and brand recognition are two crucial aspects of brand awareness. While the previous focus on consumers' capacity to recall the brand when its product category, category demands, or particular types of hints are mentioned, whereas the latter focuses on consumers' ability to confirm their experience with the brand when it is used as a cue. Typically, brand awareness serves as a decision heuristic, and it strongly impacts consumer decision-making. To explain, brand awareness, expressed in the forms of familiarity and recognisability, serves as a bridge for a company to foster favorable consumer attitudes through developing a set of convictions about the company and product attributes (Liu *et al.*, 2020). Consumers' prior knowledge and cognitive belief determine their brand evaluation and generate emotional attachment to the brand (Japutra Molinillo and Ekinci, 2020). According to previous research, advertising is thought to evoke emotional feedback in viewers (Chang, 2006), and therefore brand awareness can affect customers' emotional responses. As outlined by Ding and Tseng (2015), brand awareness offers cues that facilitate service evaluation, thus eliciting emotional responses. Besides, brand awareness and consumers' affective states have been shown to be positively related in the beverage service context (Han *et al.*, 2018). Hence, we hypothesize that:

H1: Brand awareness positively influences affective response.

Brand image is imperative in product/service consumption as consumers use brands to appropriate the symbolic meaning of consumption and facilitate their self-expression (Hughes *et al.*, 2019). Brand image is defined as the representation of a brand in the consumers' minds. In the service

context, brand image manifests the mental association with a service firm which serves as a means for differentiation and an assurance of quality (Bakri *et al.*, 2020). The brand image transference theory posits that the brand components or meanings, including emotional associations embedded in a brand, can have spreading activation and be transferred to the minds of consumers (Smith, 2004). Correspondingly, it has been found that a favorable image promotes a positive evaluation of the brand, which in turn facilitates the establishment of emotional attachment between consumers and the service firm (Barreda *et al.*, 2020; Balachandran et al. 2022). A favorable brand image enables the meaning of a brand to be strategically positioned in the consumers' minds (Faircloth *et al.*, 2001). Further evidence indicates that incongruence in terms of online and offline retailer's brand image can engender negative affective responses such as reduced flow experience and heightened psychological discomfort (Landers *et al.*, 2015). From the arguments above, we hypothesize that:

H2: Brand image positively influences affective response.

In the service sector, perceived quality refers to consumers' overall rating of a particular service firm as a result of comparing its performance to the consumer's general expectations of the standard performance in the industry (Parasuraman *et al.*, 2000). Unlike objective quality, perceived quality is subjective in nature and formed based on consumer perception. If consumer expectations exceed performance, perceived quality will be low, resulting in the feeling of discontent towards the service. Theoretical ground works have been established to indicate superior marketing characteristics as the basis for the formation of affective response, in which superior quality and value are offered to imply the behaviors performed by the brands in fulfilling their role as relationship partners. The outcomes go beyond the conventional cognitive view of commitment to the engendering of affective ties (Fournier, 1998; Grisaffe and Nguyen, 2011).

Perceived value is the trade-off between consumer consumption sacrifices and benefits (Sweeney and Soutar, 2001). The perceived value indicates consumers' overall evaluation of a product's or service's usefulness based on their perspectives of what they receive and spend. As one of the dominant streams of research in the marketing literature, perceived value has been identified as a well-established predictor of consumer behavior. For instance, past research has shown that perceived value stimulates consumer loyalty as manifested in store revisits and repurchases in-store (Aw *et al.*, 2019). In the mobile service context, Karjaluoto *et al.* (2019) revealed that perceived value toward mobile payment service application yields positive implications on consumers' commitment to their bank. Consistent with this view, the literature on service marketing supports perceived quality and perceived value as cognitive drivers of affective response. For instance, previous studies indicated that positive affective are functions of atmospherics and perceived quality stimuli (Jang and Namkung, 2009). A recent study found that perceived quality and perceived value derived from interaction with a service provider can induce feelings of pleasure and arousal (Han *et al.*, 2018). From there, it can be inferred that perceived

quality and perceived value have a significant relationship with affective response in the mobile payment service context. Therefore, we posit that:

H3: Perceived quality positively influences affective response.

H4: Perceived value positively influences affective response.

Finally, the layout can be understood as the design of a system interface that facilitates interaction with consumers. An easy-to-use system interface facilitates the technology service experience. Embedded in the mobile payment service context, the layout of a mobile payment system facilitates interaction and engagement between mobile payment service merchants and consumers (Gao and Waechter, 2017; Kuo, 2020). Colour, images, and shapes are among the features of the layout that can arouse users' emotional responses, an aesthetic sense, or a favorable impression. Deng and Poole (2010) argued that the information system landscape is shifting from task efficiency-focused to pleasure-seeking, prompting online service providers to allocate more resources to refining the visual design features of the webpage and system interface. The authors further contend that high complexity and low order webpage can be emotionally gratifying as it fulfills the need for a stimulating experience. In a similar setting, it has been shown that users' affective response is determined by the webpage aesthetic and other layout factors such as forms, textures, and color (Kim *et al.*, 2003). Based on the above reasoning, the following hypothesis is developed:

H5: Layout positively influences affective response.

3.2 The relationship between affective response and satisfaction

According to Kim *et al.* (2020), affective responses encompass the dimensions of enjoyment, emotional involvement, and flow state. Available evidence indicates that information technology systems elicit emotions in consumers during the usage stage (e.g., fondness, worry, fear) (Verkijika, 2020). Venkatesh *et al.* (2011) defined enjoyment as the degree to which the action of using a specific system is perceived as delightful in and of itself, independent of any performance outcomes connected with the system usage. An enjoyable user experience is expected during technological system usage in which scholars believe that delivering hedonic value (entertaining and fun) is equally important as a utilitarian value in forming positive attitudes toward mobile payment services (Park *et al.*, 2019). Emotional involvement is the degree to which an individual is attentive to and emotionally involved in a behavior (Schrempf and Strähle, 2015). The imaginative and emotional components of the online world may influence users' experience and level of pleasure (Marasco *et al.*, 2018). The flow state is defined as "the comprehensive sense that people encounter when they behave completely engaged" (Csikszentmihalyi, 2000, p.36). In other words, flow describes a state in which individuals become so absorbed in the event that they become unaware of their surroundings and may lose sight of time, space, and possibly self

(Csikszentmihalyi, 2000). In the absence of a flow state, users may easily become bored and anxious (Guo and Klein, 2009). Notably, flow is crucial to forming long-term connections in the digital marketplace between technology service suppliers and users.

Prior research (Han *et al.*, 2018; Yüksel, 2007) has been accepted by all parties that affective response is crucial in determining consumer satisfaction. To explain, the means-end chain theory postulates that one of the most important considerations in which consumers make product/service evaluations and purchases is the acquisition of perceived emotional benefits (Gutman, 1982). Li and Fang (2019) revealed that consumers' affective response (i.e., attachment) towards a mobile-branded application results in better enjoyment of the consumption experience and greater satisfaction towards the mobile application. Likewise, in the mobile payment service context, we posit that the development of positive emotions about mobile payment service is likely to contribute to overall satisfaction towards mobile payment service usage. Grounded in the reasoning above, the following hypothesis is formulated:

H6: Affective response positively influences satisfaction.

3.3 The relationship between satisfaction and loyalty

The concept of satisfaction denotes consumers' overall reaction to the user experience and their overall assessment of the products and services (Bhattacherjee, 2001; Mishra *et al.*, 2023). In the context of the mobile service industry, Hur *et al.* (2010) defined loyalty as consumers' continuous support and repurchase of a mobile service, despite marketing inducements from competitors. It is advocated that consumers need to believe that the firm's services/products continuously offer the best choice alternative to induce long-lasting loyalty. In addition, this need is to be accompanied by the act of naively shunning persuasive communications from market competitors (Oliver, 1999). Satisfied users are more likely to utilize a service frequently and generate greater loyalty than dissatisfied customers in this context because a high level of satisfaction renders the benefits of switching to another service provider low (Yuan *et al.*, 2020). Consumers are more likely to form long-term relationships with businesses that provide satisfying customer experiences. Considering this, the following hypothesis is proposed:

H7. Satisfaction positively influences loyalty.

4. Methodology

4.1 Data collection method and sample characteristics

Judgmental sampling was employed in the present study to recruit respondents who fit the study's purpose. To this end, two criteria were imposed: (i) the respondent must be Vietnamese, and (ii) have experience using mobile payment services. The sampling technique is deemed appropriate when only certain respondents possess the required information. A similar approach has been taken by prior research in mobile payment-related studies (Tan and Ooi, 2018; Teo *et al.*, 2015). The study took place in Ho Chi Minh City because it is the most technologically developed city and has the highest proportion of smartphone and mobile payment service users in Vietnam (Beutin

and Harmsen, 2019). An online survey questionnaire was administered in Google form. The survey was shared on social and private networks.G*Power 3 software was utilized to calculate the smallest possible sample size (Tan and Ooi, 2018). The required sample size for this study was 123. (After removing unqualified responses, we collected a total sample size of 370 responses, which exceeded the minimum sample size required.

4.2. Respondent profile

As shown in Table 1, females comprised 58.92% of the total sample. Regarding age, most respondents were 18-35 years old (61.89%), followed by 36-50 years old (20%). Occupation-wise, most of the respondents are either students (41.62%) or employed (37.57%). The majority of the respondents earned USD 201 to 400 (37.57%), followed by those who earned below USD 200 and below (33.24%), and 29.19% of respondents who earned USD 401 and above. Besides, 33.24 % of respondents indicated that they use mobile payment services almost every day, and 50% use mobile payment services 6-15 times each month. The amount of spending via the indicated mobile payment service platform in a single transaction was about USD 100 – 400 (57.3%). Lastly, the mobile payment service brand consumers use the most is Momo (67.3%), followed by Zalopay and Shopee pay with 11.4% and 10.3%, respectively.

----------*Insert Table 1 About Here*----------

4.3 Measurements

To ensure the credibility of the measurement structure, the question statements were adopted from prior studies, with slight changes to fit the mobile payment service setting. The measurement for the brand image was adapted from Aaker (1996). Perceived quality was adapted from Le *et al.* (2013). The brand image was adapted from Han and Ryu (2012). Perceived value was adopted from Parasuraman and Grewal (2000). The layout was adapted from Al-Qeisi *et al.* (2014). Satisfaction was adapted from Bhattacherjee (2001). Loyalty was adapted from Chang & Yeh (2017). The affective response is a second-order construct that comprises enjoyment, emotional involvement, and flow state, which were adapted from (Kim *et al.*, 2020). According to Kim *et al.* (2020, p. 79), "In comparison to first-order models with correlated factors, second-order factor models can provide a more parsimonious and interpretable model when researchers hypothesize that higher-order factors underlie their data." In view that affective response comprises sub-constructs that are distinct but closely related, enjoyment, emotional involvement, and flow state have been modeled as first-order constructs within the conceptual model. A 7-point Likert scale served as the foundation for all measurement items from 1 "completely disagree" to 7 "completely agree."

5. Data analysis

5.1 Statistical analysis

With a sample size of 370 and a large number of latent variables and items, partial least squares (PLS) are seen as an appropriate data analysis approach (Ooi and Tan, 2016). The advantages of this method include its suitability for small sample sizes, the ability to forecast multidimensional constructs, and the ability to simultaneously analyze the structural and measurement models (Ooi and Tan, 2016). In particular, according to Ooi *et al.* (2018), when the conceptual model is significantly intricate with second-order constructs, PLS-SEM demonstrated great statistical validity. Additionally, PLS-SEM is also ideal for non-normal data. As the p-values for Mardia's multivariate skewness and kurtosis were less than 0.001, the use of PLS-SEM in this study is further justified (Ng *et al.*, 2022).

5.2 Common method bias

Because of the cross-sectional design employed in the study, the potential threat of common method bias was evaluated using procedural and statistical methods (Tan and Ooi, 2018; Lee *et al.*, 2021). Procedurally, respondents were informed that there were no right or wrong answers, and the confidentiality and anonymity of responses were ensured. By conducting Harman's single-factor analysis, we discovered that a single component accounts for only 26.706 percent of the overall variation. To derive further confirmation, we conducted the full collinearity test with a random dependent variable and found the highest variance inflation factor (VIF) value to be 1.534, well below the 3.3 threshold (Kock and Lynn, 2012). Based on the findings, it may be assumed that there was no major common method bias contamination in the data.

5.3 Assessing the measurement model

During the analysis of the measurement model, construct reliability and validity must be evaluated, followed by Hair *et al.* (2017). Initially, the study examined construct reliability using composite reliability (CR) and Dijkstra-rho Henseler's (rh0_A). According to prior research, CR and rho_A values above 0.7 showed a significant level of reliability (Chong *et al.*, 2012; Teo *et al.*, 2015). As a result, in Table 2 below, the CR and rh0_A (both first-order and second-order) were in the range between 0.759 and 0.927, reaching the 0.7 minimum for both indexes. Second, individual factor loading and the average variance extracted (AVE) were used to determine convergent validity (Lew *et al.*, 2020). Factor loading should generally be greater than 0.7, while AVE should generally be greater than 0.5 (Hair *et al.*, 2017). All factor loadings above 0.70 and AVE values for all first-order constructs exceeded the 0.5 thresholds. Even though the factor loading of flow state (0.627) was less than 0.7 in the second-order construct, it is acceptable because the AVE value was larger than 0.5 (Hair *et al.*, 2017). Therefore, the results confirmed convergent validity for all first and second-order constructs. Thirdly, the study assessed discriminant validity by utilizing Heterotrait-Monotrait (HTMT) scores and HTMT inference ratios of correlations (Hair *et al.*, 2017). The results in Table 3 showed no issue with discriminant validity because the results

did not exceed the cautious 0.85 criterion for both first and second-order reflective structures (Hair *et al.*, 2017). Furthermore, the HTMT inference (using 5000 bootstrapping samples) also showed that the lower and upper bounds of the 99% confidence interval were lower than one (Ooi *et al.*, 2020). This indicated that each variable was statistically different from the others, and thus discriminant validity was established (Tan and Ooi, 2018).

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5.4 Assessing the structural model

The inferential statistics were obtained using the bootstrapping procedure, with 5,000 subsamples, no sign change, and 99 percent bias-corrected confidence intervals. The result of the hypotheses testing is shown in Figure 1 and Table 4. It is clear that all cognitive drivers, namely brand awareness ($\beta = 0.256$, $p < 0.01$), brand image ($\beta = 0.207$, $p < 0.01$), perceived quality ($\beta = 0.231$, $p < 0.01$), perceived value ($\beta = 0.235$, $p < 0.01$), and layout ($\beta = 0.221$, $p < 0.01$), had a significant correlation with affective response. Additionally, affective response had a significant impact on satisfaction ($\beta = 0.321$ $p<0.01$), and satisfaction also had a positive effect on loyalty ($\beta = 0.31$, $p < 0.01$). Thus, the hypotheses tested (H1, H2, H3, H4, H5, and H7) were confirmed. The blindfolded approach was used to determine the Q^2 value, representing the structural model's predictive accuracy. The research model was considered predictive as the Q^2 values were greater than zero. In addition, For the model to achieve a minimum standard of explanatory power, the R^2 values must exceed a predetermined threshold (greater than 0.1). In this case, the R^2 value on the outcome of interest (i.e., loyalty) was 0.519, suggesting substantial variance explained.

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5.5 Post-hoc analysis

To generate greater insights from the model and to test the model's robustness, we re-modelled the affective response variable as the first-order variable. While the overall findings remain largely unchanged, several changes were noticed. Firstly, results revealed that layout has a significant effect on enjoyment ($\beta = 0.241$, $p < 0.01$) and emotional involvement ($\beta = 0.208$, $p < 0.01$) but not flow state ($\beta = 0.082$, $p > 0.01$). Secondly, it was found that enjoyment has a significant effect on satisfaction ($\beta = 0.377$, $p < 0.01$) but not emotional involvement ($\beta = -0.048$, $p > 0.01$) and flow state ($\beta = 0.025$, $p > 0.01$).

Moreover, we conducted a multigroup analysis to identify the potential heterogeneity of gender. Before proceeding with the moderating effect of gender, we tested for measurement invariance following the MICOM (measurement invariance of composite models) procedure (Henseler et al., 2016) (see Table 5). Firstly, configuration invariance was attained by ensuring an

identical model setup for each group. Secondly, compositional invariance was established given that none of the values for c are significantly different from 1. Thirdly, equal composite's mean value and its variance were assessed across groups, and it was revealed that partial measurement invariance is established, thereby allowing the subsequent execution of multigroup analysis. As shown in Table 6, the PLS-MGA analysis demonstrated that there exists a significant difference in the paths between the affective response and satisfaction across gender groups, with a stronger effect found for women.

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5.6 Artificial Neural Network (ANN) analysis

The application of PLS-SEM examines the model from a linear assumption perspective, which does not consider the complexity of technology adoption and usage (Akter *et al.*, 2017; Wan *et al.*, 2021; Leong *et al.*, 2019). To analyze the non-linear relationships, the ANN was adopted. Lim *et al.* (2021) concluded that adopting ANN provides a more accurate forecast as it has the advantage of analyzing non-linear relationships such as U-shapes and S-shape distribution. Moreover, ANN can make predictions in the absence of hypotheses as it has the advantages of adaptive learning, real-time operations, and fault tolerance (Leong *et al.*, 2020). Figures 2, 3, and 4 depict the decomposition of the study's conceptual framework into three ANN models. The number of hidden neurons generated in ANN model A was 3, while in ANN models B and C, only one hidden neuron was formed.

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.----------.*Insert Figure 3 About Here.*----------.

.----------.*Insert Figure 4 About Here.*----------.

To prevent model overfitting, we applied a ten-fold cross-validation diagram with 10 ANN networks, with data partitioned 90:10 for training and testing (Wang *et al.*, 2022). The Root Mean Squared Error (RMSE) values for both training and testing are shown in Table 7. As all the values in the model are small, with a mean ranging from 0.109 to 0.191, it can be concluded that all three models are reliable (Wong *et al.*, 2021). The R^2 was calculated using the RMSE values of which models A, B, and C can predict affective response, satisfaction, and loyalty, with a precision of 77.33%, 85.14%, and 86.14%, respectively.

.----------.*Insert Table 7 About Here.*----------.

A sensitivity analysis was conducted utilizing the three ANN models to rank the relevance of each predictor, as shown in Table 8 (Lee *et al.*, 2020). The greatest influence on ANN model A is layout, as it has the highest normalized importance at (100%). This is followed by perceived

value (87.107%), perceived quality (81.681%), brand awareness (70.257%), and brand image (68.870%). Since there was only one neuron model in ANN models B and C, the sensitivity analysis displayed a 100% normalized importance. A comparative analysis between the results obtained in PLS-SEM and ANN was presented in Table 9. According to the PLS-SEM results, brand awareness was the most important factor of affective reaction, while the results from ANN revealed that layout was the most important predictor. The difference could be associated with the ability of ANN as a superior machine learning tool to capture non-linear relationships. Finally, ANN models B and C showed consistency with the PLS-SEM results, as there was only one predictor.

.----------.*Insert Table 8 About Here.*----------.

.----------.*Insert Table 9 About Here.*----------.

6. Discussion

Mobile payment service has gradually assembled a critical mass of customers across the mobile payment ecosystem and appeals to customers against traditional payment schemes. While more consumers are turning to mobile shopping and mobile payment as the new instruments in their shopping journey (Hoh *et al.*, 2022; Wong *et al.*, 2015), the pace of mobile payment service firms' future growth will hinge on their ability to address the concern of current customers in order to retain them. However, the existing studies are heavily devoted to consumers' adoption of mobile payment and, thus not keep pace with the industry's needs. Building a lasting bond with consumers entails an entirely different set of understanding compared to stimulating mobile payment uptake. Therefore, grounded in the hierarchy of effects model, our study strives to advance the literature by validating a framework outlining the inter-relationships between cognitive drivers (brand awareness, perceived quality, brand image, perceived value, and layout), affective response, satisfaction, and loyalty.

6.1 Theory and research implications

The present study expands the mobile payment literature in several ways. While the majority of work in the mobile payment area is largely centered on the initial adoption behavior, our focus is on mobile payment loyalty. In particular, past literature is grounded on established IS models such as TAM and UTAUT (Tew *et al.*, 2022; Yan *et al.*, 2021; Teo *et al.*, 2015). Although these models generally exhibit satisfactory power in explaining consumer behavior (i.e., acceptance and usage) in relation to information technology and system, they do not offer a salient mechanism for understanding consumers' interactions and relationship development with mobile payment service merchants. Loyalty is an indispensable component in technology system usage, indicating that overall experiential evaluation toward mobile payment service has been overlooked in past studies.

Our study represents an early effort to undertake the cognition-affection nexus in dealing with the mobile payment service loyalty phenomenon. The findings deepened our comprehension of the determinants of loyalty regarding mobile payment services by uncovering the links between

cognitive drivers, affective response, and satisfaction. More specifically, we identify the role of brand and service attributes in cultivating mobile payment service consumers' affective responses. We provide novel findings that cognitive factors can indeed exert an extended implication on consumers' emotion toward mobile payment service, which thus far is seldom explored in the mobile payment context. Besides, the influence of brand awareness and brand image on affective response adds to the current mobile payment system-focused understanding by articulating the importance of market positioning of mobile payment merchants (e.g., developing familiarity and memorable impressions) as an essential component that drives consumers to identify with the mobile payment merchant.

The post-hoc analysis yields a finer theoretical understanding. While the original second-order model indicates the significant positive impacts of cognitive factors on affective response, the first-order model revealed additional findings. The layout of mobile payment platforms yields insignificant in fostering the flow state. The finding can probably be attributed to the fact that the layout of mobile payment platforms in Vietnam remains rather static and serves largely functional purposes, thus is not able to induce a heightened psychological state that manifests deep cognitive absorption and time distortion. Furthermore, it has been shown that enjoyment overwhelms emotional involvement and flow state in determining satisfaction with the mobile payment service. The rather surprising findings add to the mobile payment body of knowledge by articulating the scenario where mobile payment landscape is changing, in which mobile payment service users are becoming more demanding and expecting beyond conventional payment features and seeking personal hedonistic fun and gratification. Our finding paves the way to understanding satisfaction and loyalty to mobile payment services through the "hedonistic within utilitarianism" view.

To add on, the positive correlation found between affective response and satisfaction implies that consolidating the emotional responses towards mobile payment service firms is imperative in fostering customer-firm relationships, complementing past research that advocated the dominant role of rational aspects. Interestingly, the post-hoc analysis finding adds further insights into understanding the path, whereby it has been found that the relationship between affective response and satisfaction is stronger for the female group. The finding lends support to the gender role theory and other studies that contend for perceptual differences toward technology attributes in men and women (Basha *et al*., 2022; Venkatesh *et al*., 2000), implying the possibility that men evaluate mobile payment technology based on utilitarian performance while women are driven more by hedonistic aspects.

The study contributes methodologically to the literature by employing a new perspective from deep learning. Unlike past research that assumes a linear relationship, this study includes a dual SEM-ANN analysis to capture both linear and compensatory PLS models, as well as non-linear and non-compensatory ANN models. The novelty of ANN as an artificial intelligence technique lies on the ground that the approach facilitates the reduction of over-simplification of decision-making processes. The combination of both SEM and ANN offers a complementary understanding of the variable importance ranking. For instance, the linear model informs brand

awareness as the most important predictor for the affective response, but the non-linear model suggests otherwise, where brand awareness is the least important predictor, and layout is the most important predictor for the affective response.

6.2 Practical implications

In light of the prominent role of loyalty and satisfaction, our finding suggests that mobile payment service providers should emphasize creating enjoyable platform experiences. Hence, service providers and developers are to pay attention to joy-related aspects in engineering their mobile payment platforms. Further, a gender-based targeting and segmentation approach should be deployed to better cater to the hedonic needs of female mobile payment users. To this end, mobile payment service providers need to allocate more effort to the presentation of the system layout, of which the system interface needs to be enhanced beyond facilitating the ease of use but also the aesthetic appearance. Enabling the customization of the interface (e.g., fonts and colors) might be a viable alternative. In terms of value, mobile payment service providers can consider diversifying the available payment services that include more basic payment services such as energy, water, internet, and phone card recharges within the app. More importantly, consumers' affective response (i.e., enjoyment) can be stimulated by offering more cash discounts and rewards for the usage of mobile payment services. Mobile payment service providers should incorporate the element of gamification, such as ladders, badges, and medals. With the implementation of the above, users are expected to perceive more value and obtain a better experience, given that their monetary and time-saving needs are being met.

In addition, in terms of the significance of perceived quality and perceived value, mobile payment service providers should ensure smoothness and minimal errors in the operating system and inform consumers beforehand of any expected maintenance and system outage to avoid any possible jeopardization of perceived quality. On top of that, mobile payment service providers should never overlook the significance of customer service, with the helpdesk always available and aided by well-trained personnel. Apart from that, mobile payment service providers should allocate resources to boost consumers' brand awareness and brand image to foster optimal affective/emotional experiences with mobile payment services (Chang, 2006; Han *et al.*, 2018). mobile payment service providers need to regularly interact with and approach consumers through various promotional initiatives, such as advertising on social media to spread awareness. On the one hand, mobile payment service providers need to carefully curate their image for a successful positioning in which they can inject brand personality and highlight their point of difference through a series of integrated marketing communication.

7. Limitations and Future Research Directions

First, since the data was collected from a particular country, the generalization of the findings to other countries may be limited. It would be interesting to compare the model between an emerging country and a developed country to determine the variations in user perception and behavior, as users from this market may exhibit varying perceptions and expectations towards mobile payment

services. Second, future research can consider enhancing the existing model by incorporating some potential variables from the marketing (e.g., co-creation and engagement), information system (e.g., privacy and security), and psychology (e.g., time orientation and self-concept) realms to enhance the comprehensiveness of the understanding. Thirdly, as mobile payment systems grow, there is a possibility that voice assistants and chatbots will be integrated to enhance user experience, indicating a fruitful avenue for future research (Aw *et al*., 2022).

8. Conclusion

The switch from web-based to mobile payments has become a global trend in the payment ecosystem. The lucrative opportunities presented have enticed new entrants to the mobile payment market, and thus mobile payment service vendors must spend effort in persuading consumers to adopt mobile payment, more importantly, to retain existing customers in order to step up the game. This study proposed a complete paradigm for understanding how cognitive drives work can stimulate affective responses and lead to downstream key outcomes, namely satisfaction and loyalty. Notably, the proposed model is tested using both linear (PLS-SEM) and non-linear (ANN) approaches, which provides a more nuanced insight into the underlying relationships between the variables. We believe that the study's findings provide a theoretical foundation for understanding the formation of loyalty in the context of mobile payments, and practitioners can draw on the study to fine-tune strategies for building loyalty and driving better business performance.

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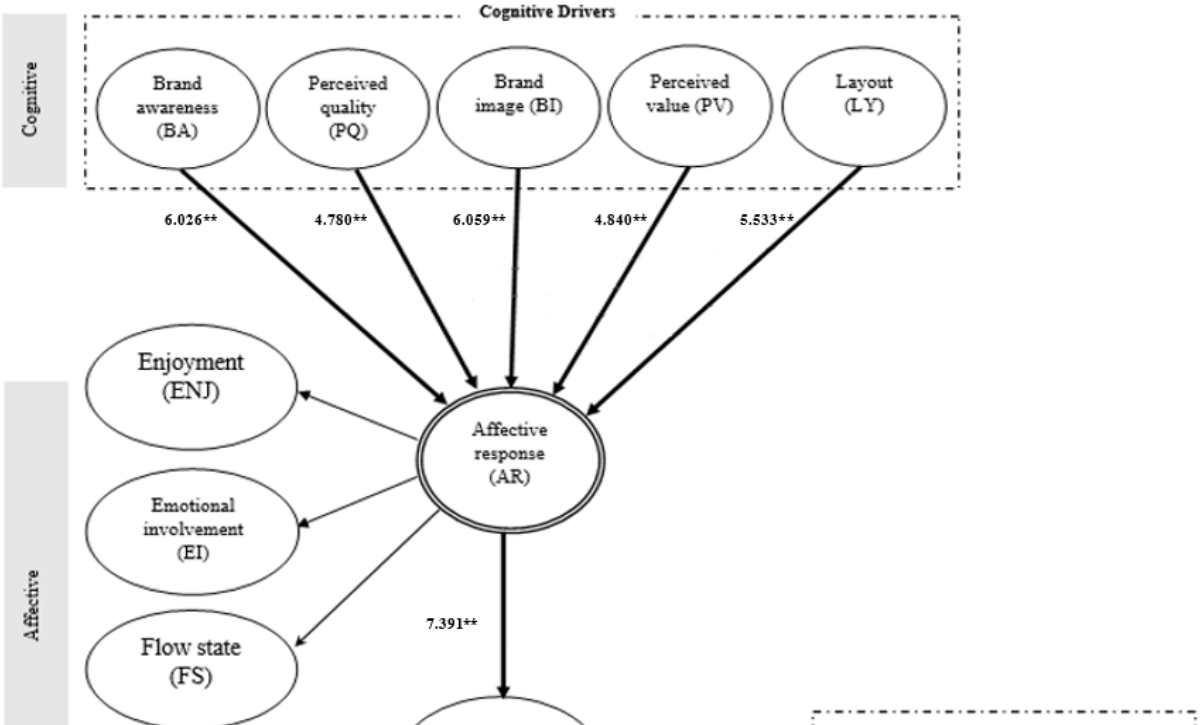
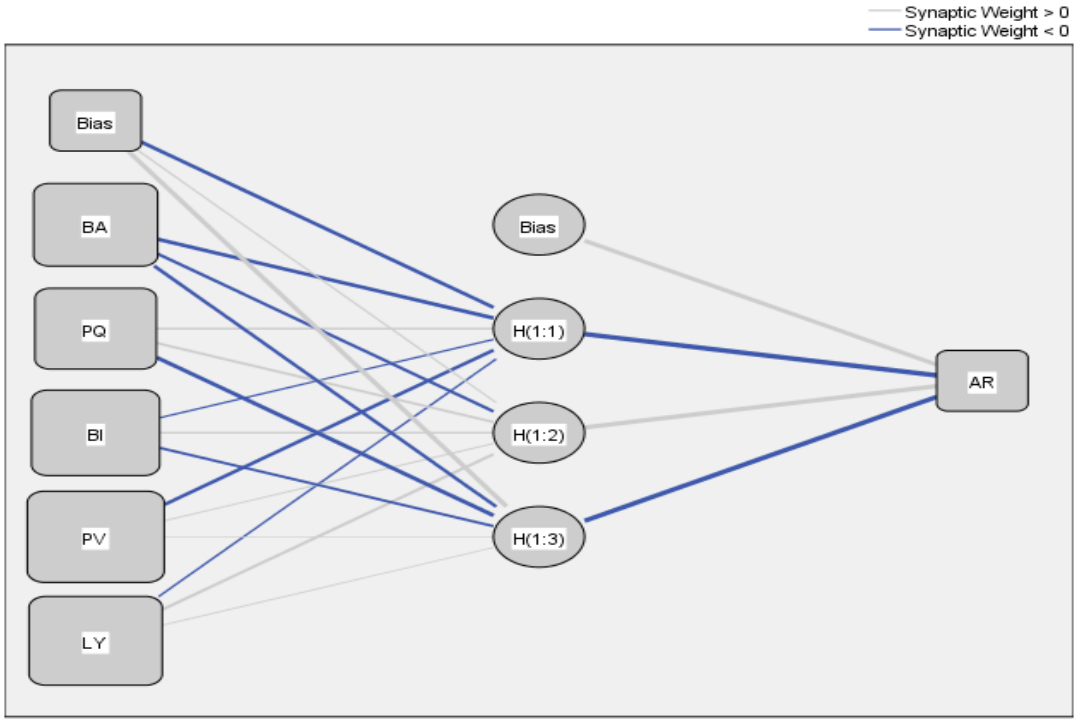


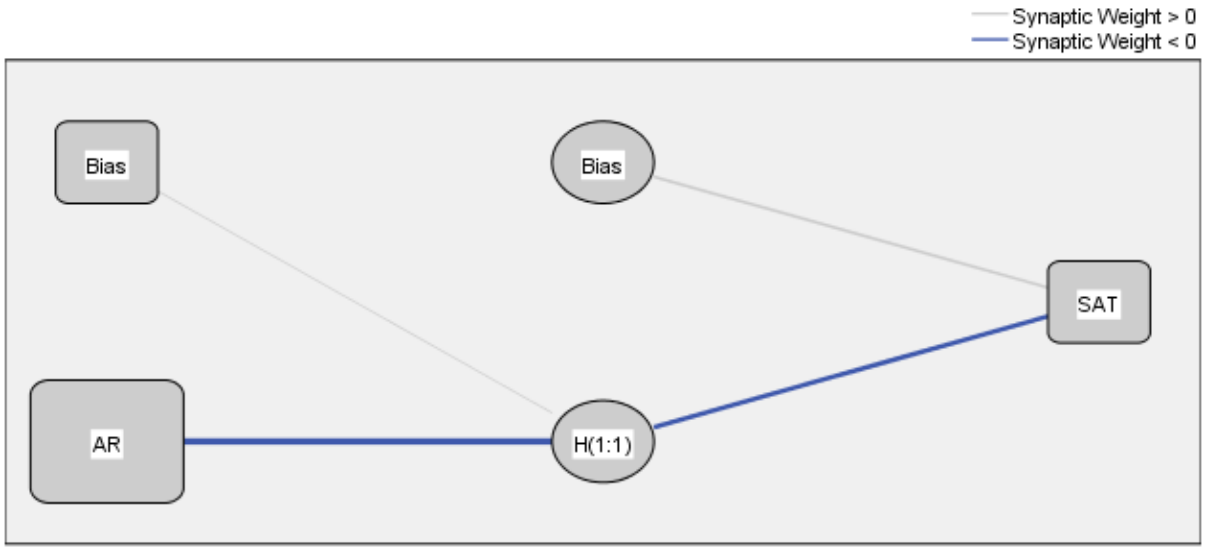
Figure 1: Structural model



Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid

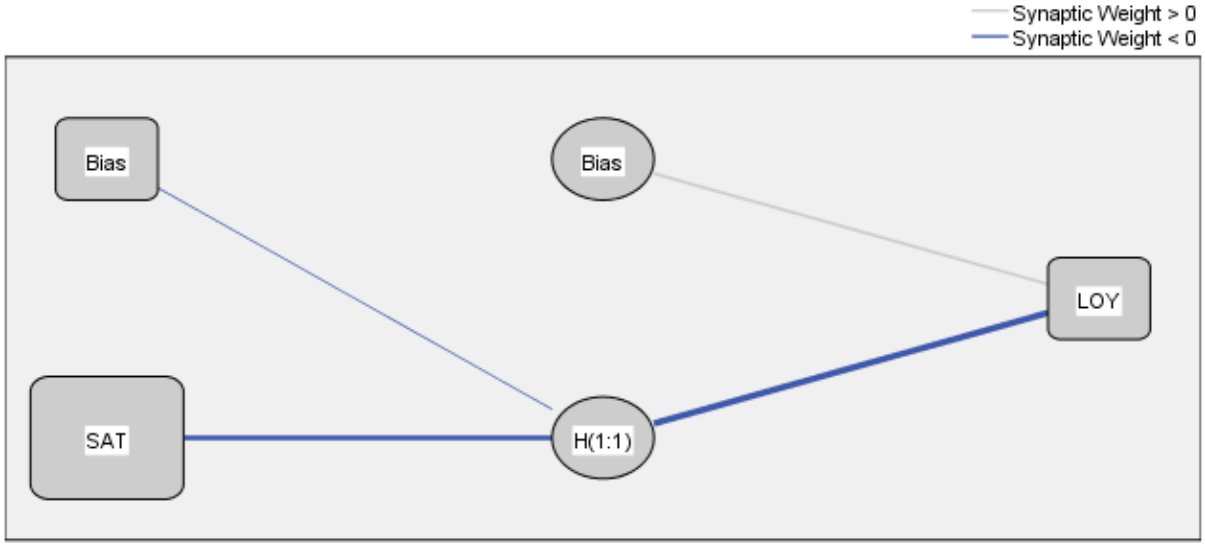
Figure 2: ANN Model A



Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid

Figure 3: ANN Model B



Hidden layer activation function: Sigmoid

Output layer activation function: Sigmoid

Figure 4: ANN Model C

Table 1. Demographic Profile

Demographic Characteristics		*Frequency*	*Percentage*
Gender	Male	152	41.08%
	Female	218	58.92%
Age	Below 18	8	2.16%
	19-35	229	61.89%
	36-50	74	20.00%
	51 and above	59	15.95%
Education	High school graduate	46	12.43%
	Bachelor's degree	255	68.92%
	Master degree	62	16.76%
	Doctorate degree	7	1.89%
Occupations	Students	154	41.62%
	Self-employment	46	12.43%
	Paid employment	139	37.57%
	Professionals	31	8.38%
Income per month	Below USD 200	123	33.24%
	USD 201 to 400	139	37.57%
	USD 401 to 1200	104	28.11%
	Above USD 1200	4	1.08%
Mobile payment service platform usage experience	< 0.5 year	46	12.43%
	0.5-1 year	31	8.38%
	1-2 years	154	41.62%

	>2 years	139	37.57%
Average mobile payment platform usage frequency	1-5 times	62	16.76%
	6-15 times	185	50.00%
	Almost everyday	123	33.24%
The most price range paid via a mobile payment service platform	Below USD 20	47	12.70%
	USD 20-100	80	21.62%
	USD 101 – 400	212	57.30%
	Above 400 USD	31	8.38%
Brand of mobile payment services used the most in Vietnam.	Momo	249	67.3%
	Zalopay	42	11.4%
	Moca	25	6.8%
	Viettel pay	14	3.8%
	Shoppee pay	38	10.3%
	Other	2	0.5%

Table 2: Reliability and Convergent validity

Latent Constructs	Items	Loadings	Dijkstra-Henseler's (rho_A)	Composite Reliability (CR)	Average Variance Extracted (AVE)
			First Order		
Brand awareness	BA1	0.859	0.903	0.925	0.756
	BA2	0.853			
	BA3	0.883			
	BA4	0.882			
Perceived quality	PQ1	0.816	0.856	0.902	0.698
	PQ2	0.880			
	PQ3	0.859			
	PQ4	0.783			
Brand image	BI1	0.878	0.833	0.875	0.637
	BI2	0.816			
	BI3	0.775			
	BI4	0.716			
Perceived value	PV1	0.887	0.856	0.901	0.696
	PV2	0.829			
	PV3	0.833			
	PV4	0.783			

Layout	LY1	0.813	0.848	0.891	0.671
	LY2	0.828			
	LY3	0.784			
	LY4	0.849			
Enjoyment	ENJ1	0.819	0.866	0.900	0.693
	ENJ2	0.873			
	ENJ3	0.766			
	ENJ4	0.868			
Emotional involvement	EI1	0.891	0.882	0.927	0.809
	EI2	0.901			
	EI3	0.907			
Flow state	FS1	0.871	0.880	0.912	0.777
	FS2	0.906			
	FS3	0.866			
Satisfaction	SAT1	0.785	0.759	0.860	0.671
	SAT2	0.848			
	SAT3	0.824			
Loyalty	LOY1	0.880	0.830	0.895	0.739
	LOY2	0.856			
	LOY3	0.843			
			Second-order		

Affective Response			**0.905**	**0.911**	**0.514**
	Enjoyment	0.931			
	Emotional involvement	0.869			
	Flow state	0.627			

Table 3: HTMT Assessment

Variables	1	2	3	4	5	6	7	8	9	10
1. Brand awareness										
2. Brand image	0.246									
3. Emotional involvement	0.440	0.349								
4. Enjoyment	0.594	0.513	0.813							
5. Flow state	0.263	0.273	0.392	0.494						
6. Layout	0.322	0.118	0.401	0.512	0.192					
7. Loyalty	0.572	0.359	0.533	0.800	0.264	0.428				
8. Perceived quality	0.288	0.357	0.411	0.540	0.283	0.129	0.298			
9. Perceived value	0.358	0.315	0.448	0.630	0.270	0.360	0.555	0.370		
10. Satisfaction	0.356	0.314	0.277	0.437	0.212	0.204	0.391	0.070	0.157	

Table 4: Structural Model

Hypothesis	PLS Path	Path Coefficient	T Statistics	P Values	0.5%	99.5%	Remarks
H1	Brand awareness -> Affective response	0.256	6.026	0.000	0.147	0.360	Supported
H2	Brand image -> Affective response	0.207	4.780	0.000	0.094	0.317	Supported
H3	Perceived quality -> Affective response	0.231	6.059	0.000	0.130	0.323	Supported
H4	Perceived value -> Affective response	0.235	4.840	0.000	0.108	0.355	Supported
H5	Layout -> Affective response	0.221	5.533	0.000	0.114	0.322	Supported
H6	Affective response -> Satisfaction	0.321	7.391	0.000	0.199	0.427	Supported
H7	Satisfaction -> Loyalty	0.310	6.593	0.000	0.186	0.426	Supported

Table 5. Measurement invariance testing

Constructs	Configural Invariance	Compositional Invariance (Correlation=1)		Equal Mean		Equal Variances		FMI
		C=1	5% quantile	Dif	CI	Dif.	CI	
Brand awareness	Yes	1.000	0.998	-0.192	[-0.199, 0.203]	0.237	[-0.245, 0.267]	Yes
Brand image	Yes	0.993	0.990	-0.177	[-0.188, 0.201]	-0.146	[-0.349, 0.299]	Yes
Layout	Yes	0.994	0.993	0.058	[-0.209, 0.223]	0.132	[-0.343, 0.365]	Yes
Loyalty	Yes	0.993	0.989	-0.102	[-0.207, 0.238]	0.016	[-0.156, 0.166]	Yes
Perceived quality	Yes	0.999	0.993	-0.032	[-0.217, 0.200]	0.149	[-0.264, 0.279]	Yes
Perceived value	Yes	0.999	0.996	-0.011	[-0.212, 0.209]	-0.318	[-0.262, 0.261]	No
Affective response	Yes	0.998	0.989	-0.006	[-0.213, 0.216]	-0.058	[-0.266, 0.268]	Yes
Satisfaction	Yes	0.992	0.983	-0.104	[-0.236, 0.205]	0.172	[-0.225, 0.190]	Yes

Notes: CI= Confidence Interval; Dif= Differences; FMI= Full measurement invariance

Table 6. PLS-MGA (male vs. female)

Hypothesis	Relationships	Path Coefficient (Female)	Path Coefficient (Male)	CIs (Bias corrected) Female	CIs (Bias corrected) Male	Path coefficient differences
H1	Brand awareness -> Affective response	0.270	0.209	[0.170, 0.361]	[0.069, 0.329]	0.061$^{n.s.}$
H2	Brand image -> Affective response	0.195	0.227	[0.096, 0.277]	[0.091, 0.356]	-0.033$^{n.s.}$
H3	Perceived quality -> Affective response	0.258	0.199	[0.158, 0.348]	[0.073, 0.310]	0.060$^{n.s.}$
H4	Perceived value -> Affective response	0.219	0.256	[0.129, 0.312]	[0.119, 0.376]	-0.037$^{n.s.}$
H5	Layout -> Affective response	0.245	0.205	[0.115, 0.363]	[0.078, 0.375]	0.040$^{n.s.}$
H6	Affective response -> Satisfaction	0.397	0.225	[0.302, 0.491]	[0.042, 0.320]	0.171*
H7	Satisfaction -> Loyalty	0.344	0.283	[0.225, 0.446]	[0.125, 0.386]	0.062$^{n.s.}$

Notes: p< 0.05*, n.s.= not significant

Table 7. RMSE Values

	Model A		**Model B**		**Model C**	
	Input: BA, PQ, BI, PV, LY		Input: AR		Input: SAT	
	Output: AR		Output: SAT		Output: LOY	
Neural network	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE	Training RMSE	Testing RMSE
ANN1	0.117	0.094	0.168	0.159	0.193	0.179
ANN2	0.113	0.112	0.166	0.170	0.188	0.193
ANN3	0.117	0.112	0.169	0.157	0.187	0.203
ANN4	0.118	0.114	0.167	0.172	0.193	0.189
ANN5	0.120	0.099	0.174	0.184	0.192	0.151
ANN6	0.109	0.113	0.167	0.178	0.191	0.168
ANN7	0.119	0.092	0.165	0.177	0.191	0.170
ANN8	0.109	0.124	0.169	0.165	0.192	0.174
ANN9	0.115	0.114	0.171	0.151	0.192	0.164
ANN10	0.109	0.121	0.166	0.169	0.189	0.187
Mean	0.115	0.109	0.168	0.168	0.191	0.178
SD	0.004	0.011	0.003	0.010	0.002	0.015

Table 8. Sensitivity Analysis

	Model A (Output: AR)					Model B (Output: AT)	Model C (Output: LOY)
Neural network	**BA**	**PQ**	**BI**	**PV**	**LY**	**AR**	**SAT**
ANN1	0.176	0.177	0.192	0.217	0.238	1.000	1.000
ANN2	0.160	0.263	0.185	0.169	0.224	1.000	1.000
ANN3	0.162	0.167	0.182	0.22	0.269	1.000	1.000
ANN4	0.207	0.165	0.106	0.26	0.262	1.000	1.000
ANN5	0.221	0.163	0.128	0.245	0.243	1.000	1.000
ANN6	0.163	0.205	0.185	0.218	0.228	1.000	1.000
ANN7	0.121	0.200	0.198	0.216	0.265	1.000	1.000
ANN8	0.188	0.221	0.150	0.194	0.246	1.000	1.000
ANN9	0.185	0.210	0.210	0.18	0.214	1.000	1.000
ANN10	0.139	0.231	0.152	0.216	0.262	1.000	1.000
Average relative importance	0.172	0.200	0.169	0.214	0.245	1.000	1.000
Normalized relative importance (%)	70.257	81.681	68.870	87.107	100.000	100.000	100.000

Table 9. Comparison between PLS-SEM and ANN results

PLS Path	Path Coefficient	ANN results: Normalised relative importance (%)	Ranking (PLS-SEM) [based on Path Coefficient]	Ranking (ANN) [based on Normalised relative importance	Remark
Model A (Output: Affective response)					
Perceived quality -> Affective response	0.231	81.681	3	3	Match
Perceived value -> Affective response	0.235	87.107	2	2	Match
Brand awareness -> Affective response	0.256	70.257	1	4	Not Match
Brand image -> Affective response	0.207	68.870	5	5	Match
Layout -> Affective response	0.221	100.000	4	1	Not Match
Model B (Output: Satisfaction)					
Affective response -> Satisfaction	0.321	100.000	1	1	Match
Model C (Output: Loyalty)					
Satisfaction -> Loyalty	0.310	100.000	1	1	Match

Appendices

Table A1: Measurement items

Measurement items	Sources
Brand Awareness (BA)	
BA1. I have heard about the [brand of mobile payment service]. BA2. I can recall [brand of mobile payment service] immediately when I think of mobile payment services. BA3. The brand of mobile payment is often at the top of my minds when I think about mobile payment services. BA4. I can clearly relate [brand of mobile payment service] to mobile payment services.	(Aaker, 1996)
Perceived quality (PQ)	
PQ1.The performance of [brand of mobile payment service] is very good. PQ2. The overall quality of [brand of mobile payment service] is very high. PQ3. [Brand of mobile payment service] have a wide range of individual functions and settings. PQ4. [Brand of mobile payment service] have an acceptable standard of quality.	(Pisnik Korda & Snoj, 2007) (Le et al., 2013)
Brand Image (BI)	
BI1. My overall image for services of [brand of mobile payment service] is positive. BI2. The overall image I have about [brand of mobile payment service] is favorable. BI3. The overall image of [brand of mobile payment service] will affect my prediction toward its effectiveness. BI4. Overall, I have a good image perception about [brand of mobile payment service].	(Han & Ryu, 2012)

Perceived Value (PV)	
PV1. I think [brand of mobile payment service] bring a lot of benefits. PV2. For me, the overall value of [brand of mobile payment service] is worth using PV3. [Brand of mobile payment service] have a lot of conveniences PV4. I think using [brand of mobile payment service] can actually meet my needs.	(Parasuraman & Grewal, 2000)
Layout (LY)	
LY1. The layout of [brand of mobile payment service] looks attractive. LY2. The layout of [brand of mobile payment service] is easy to read and use. LY3. The layout of [brand of mobile payment service] uses appropriate colors. LY4. The layout of [brand of mobile payment service]'s multimedia features properly.	(Al-Qeisi et al., 2014)
Enjoyment (ENJ)	
ENJ1. Using [brand of mobile payment service] is enjoyable for me. ENJ2. Using [brand of mobile payment service] is rather pleasant. ENJ3. Using [brand of mobile payment service] is fun for me. ENJ4. Using [brand of mobile payment service] keeps me comfortable.	(Kim et al., 2020)
Emotional Involvement (EI)	
EI1. I am completely involved in the [brand of mobile payment service].	(Kim et al., 2020)

EI2. I am deeply impressed by the [brand of mobile payment service]. EI3. I feel good with [brand of mobile payment service].	
Flow State (FS)	
FS1. When I am using [brand of mobile payment service], I feel totally captivated. FS2. When I am using [brand of mobile payment service], time seems to pass very quickly. FS3. When I am using [brand of mobile payment service], I forget all concerns.	(Kim et al., 2020)
Satisfaction (SAT)	
SAT1: My overall experience of [brand of mobile payment service]is satisfying. SAT2: My overall experience of [brand of mobile payment service]is delightful. SAT3: Satisfaction is higher after using [brand of mobile payment service] than other service providers.	(Bhattacherjee, 2001c)
10. Loyalty (LOY)	
LOY1: I will use [brand of mobile payment service] in the future. LOY2: I will say positive things about [brand of mobile payment service] to others. LOY3: I would recommend other people to use [brand of mobile payment service].	(Chang & Yeh, 2017)

Table A2: Prior research on mobile payment satisfaction and loyalty

Articles	Research objective(s)	Independent/ moderating variables	Outcome variables	Research methodology
Kar, A. K. (2021).	• Identify antecedents of mobile payment usage satisfaction	• Cost • Usefulness • Trust • Information risk • Security • Social influence • Ease of use • Performance • Credibility • Reliability • Information privacy • Responsiveness • Customer attitude • Confidentiality • Assurance	• Usage satisfaction	Mixed method (e.g., text analysis and multiple regression analysis)
Chang et al. (2021)	• Understand the role of perceived risks in	• Financial risk • Privacy risk	• Usage satisfaction • Intention	Questionnaire survey

	determining mobile payment intention and satisfaction within a Japanese sample.	• Performance risk • Psychological risk • Security risk • Time risk		
Raman and Aashish (2021)	• Determine antecedents of Indian mobile payment users' continuance intention	• Service quality • Convenience • Social value • Perceived risk	• Satisfaction • Attitude • Effort expectancy • Continuance intention • Perceived trust	Questionnaire survey
Gong et al. (2020)	• Identify mechanisms to foster brand equity and consumer loyalty toward mobile payment	• Cross-side network effect	• Loyalty • Brand equity	Questionnaire survey
Talwar et al. (2020)	• Analyze the pre-adoption factor and post-adoption factors of mobile payments	• Perceived information quality • Perceived service quality • Perceived uncertainty	• Initial trust • Perceived usefulness • Confirmation • Dissatisfaction • Continuance intention	Questionnaire survey

		• Perceived asset specificity		
Yuan et al. (2020)	• Identify antecedents of mobile payment loyalty	• Information quality • System quality • Service quality	• Satisfaction • Loyalty • Trust • Intimacy	Questionnaire survey
Sun et al. (2020)	• Investigate the role of mobile payment for hotel reservations	• Functionality • Usability	• Attitude • Subjective norms • Perceived behavior control • Customer satisfaction • Repurchase intention	Questionnaire survey
Lim et al. (2019)	• Understand the role of perceived security in mobile fintech payment service	• Fintech service knowledge	• Perceived security • Confirmation • Perceived usefulness • Satisfaction • Continuous intention	Questionnaire survey
Liébana-Cabanillas et al. (2019)	• Identify the determinants of continuance intention	• Convenience • Social value • Service quality	• Perceived trust • Satisfaction • Continuance intention	Questionnaire survey

	toward NFC mobile payments	• Perceived risk		
Humbani and Wiese (2019)	• Validate the integration of the technology readiness index (TRI) and the extended expectation-confirmation model in explaining continuance intention on mobile payment	• Technology readiness factors Optimism Innovativeness Convenience Compatibility Discomfort Insecurity • Perceived cost Perceived risk	• Perceived ease of use • Perceived usefulness • Adoption of mobile payment • Satisfaction • Continuance intention	Questionnaire survey
Ramadan and Aita (2018)	• Examine the drivers of mobile payment application(s) use intention and loyalty among Arab consumers	• Satisfaction toward system quality • Satisfaction toward system security	• Purchase intention • Loyalty • Customer experience • Customer expectation	Mixed method (e.g., focus group and questionnaire survey)