Composite Analysis of Mobile Banking Usage: Dimension and Construct Effect

Chanta Jhantasana

Faculty of Management Science, Valaya Alongkorn Rajabhat University, Klong Nueng, Klong Luang, Pathum thani 13180, Thailand

Corresponding author's e-mail: Zhandhak3@gmail.com

Received: *November 6, 2021* ***Revised:*** *December 27, 2021* ***Accepted:*** *December 28, 2021*

Abstract

This study explores the dimension and construct effect of mobile banking usage on customer satisfaction and loyalty. The research done in previous studies only considered a dimensional or constructive effect. But the construct model cannot be expressed as a dimensional effect. Furthermore, the dimension connection cannot be defined as a construct effect. As a result, both levels should be subjected to hypothesis testing. Mobile banking usage model is measured using a composite model and a formative-formative type for second-order constructs, while customer satisfaction and loyalty are measured using a consistent partial least squares method (PLSc). The data were obtained from 400 students at Valaya Alongkorn Rajabhat University. The consequence of the dimensional effect shows that the influence of promotions, perceived usefulness, and perceived security has a substantial impact on customer satisfaction and loyalty. For the construct effect, the 7Ps organize the mobile banking usage model well, which significantly impacts customer satisfaction and loyalty.

Keywords: Dimension effect, Construct effect, Mobile banking, Composite model, Technology acceptance model

Introduction

The impressive growth of Internet technology influences new industries, including mobile banking (M-banking) with smartphones and tablets being the primary tools affecting service demand (Shaikh & Karjaluoto, 2015; Verissimo, 2016). Approximately 27.7 billion cashless transactions, reported by E.U. member states in 2018, are now expanding globally based on credit cards, online banking, and M-banking. Global M-banking revenues have increased from $450 billion in 2015 to over $1 trillion in 2019 (Statista, 2020). In 2018, Thailand's M-banking went from 13.92 million accounts, or 2,800 million baht, to 41.18 million accounts, or 16,321 million baht (BOT, 2020). Improving customer service would improve consumer loyalty, relying on banking productivity to allow customers to embrace technology and sustain long-term financial performance (Aksoy et al., 2013). M-banking seeks

to increase bank profitability by targeting complete areas and reducing the bank's operational and overhead costs (Chiu et al., 2017). It will also boost banking competitiveness and quality of life for customers (Siyal et al., 2019). It will allow them to track account balances, make payment bills and money transfers and access swift and reliable financial services anytime, anywhere and with safe connectivity (Gu et al., 2009; Shaikh & Karjaluoto, 2015; Tam & Oliveira, 2016). M-banking also lowers the risk of virus infection. As Cocheo (2020) says, the conventional payment network exposes countless people to COVID-19, which has forever changed society's view of money (Bambrough, 2020; Brown & Whittle, 2020). M-banking is a platform where the consumer interacts with the bank for financial transactions through a mobile phone or personal digital assistant (PDA) (Baabdullaha et al., 2019). This is the merging of financial services and IT called financial technology (Fintech) which provides innovative services (Riskinanto et al., 2017). Many scholars use M-banking to study market loyalty, acceptance, effects, protection, customer experience, and increased technology-intensive usage (e.g., Baabdullaha et al., 2019; Kelly & Palaniappan, 2019). The Technology Acceptance Model (TAM) is widely used for M-banking, and consists of perceived usefulness and ease of use, but lacks a security variable (Kelly & Palaniappan, 2019). Several scholars found that TAM could indicate an individual's intention to use M-banking by only about 40-60% (e.g., Ong et al., 2004; Pikkarainen et al., 2004). Thus, the current work incorporates a security element to better explain consumer behaviour. The M-banking component describes three TAM dimensions but lacks understanding of user attitudes and M-banking behavioural intent (Venkatesh & Davis, 2000). Adopting electronic banking is necessary to reduce costs and boost profitability and allow banks to retain their current customer base and attract new customers (Guriting & Ndubisi, 2006). The 4Ps market mixes are incorporated in the M-banking usage model in the present analysis. A successful marketing mix will help banks achieve better customer service and support, improve efficiency, and reduce costs (Krasnikov et al., 2009). Thus, the current study proposes 7Ps to determine the M-banking usage model: perceived ease of use, perceived usefulness, perceived security, product, price, place, and promotion.

In addition, to our knowledge, this is the first study to propose a dimension and construct effect on lower and higher-order constructs, respectively, and hypothesizes both levels. Each level assesses the overall model fit, as well as the structure and measurement model. Typically, if scholars decide to learn the impact of aspects, they can only research the dimension effect. Scholars should always study the construct effect if they want to learn about the effects of the construct. However, the rationale is that the effect of dimension and construct only explores the aspect and latent variables, respectively, which may differ for both models because not all dimensional results support the hypothesis. The simultaneous study of dimensions and constructs may produce discrepancies in the results that may indicate to researchers that the study as a whole differs from what is currently found in the literature.

This study aims to examine the relationship between the M-banking usage model, satisfaction, and loyalty with the dimension and construct effects. The M-banking usage model consists of three critical variables of technology convergences (extended TAM) and non-technology aspects (4Ps marketing mix). It is created with composite and mode B algorithms

using a formative-formative type and a disjointed two-stage approach (Becker et al., 2012). We used the composite model to examine M-banking usage because many scholars recommend abandoning the causal-formative model since it can lead to confounding interpretations if the R^2 is less than one. Furthermore, the M-banking usage model's elements are man-made or artifacts (Aguirre-Urreta et al., 2016; Henseler, 2017).

Literature review

The M-banking usage model

Marketing academics recently grew increasingly involved in M-banking (Tam & Oliveira, 2017), but they needed additional support at the early stage of adoption (Mullan et al., 2017). Most of the M-banking studies relate to consumer acceptance or customer behavioural intent to implement M-banking services (Shaikh & Karjaluoto, 2015; Tam & Oliveira, 2017). Most scholars recognize a distinction between the M-bank acceptance models. Almost all of the research using the covariance-based structural equation model (CB-SEM) and direct analysis of the M-banking acceptance mechanism focuses on the dimensional effects. Practically, none of the studies include a second-order adoption, usage of M-banking or direct measurements of indicators (e.g., Baabdullah et al., 2019; Humbani & Wiese, 2019). Some models are less parsimonious, with numerous assumptions and powerless statistics leading to type I and type II errors. The M-banking usage model must be constructed using a hierarchical component model (HCM) due to its two-level dimension.

The HCM is robust and parsimonious (Hair et al., 2017), requiring that it be constructed using an approach and type that are both composed of fours. The four approaches include repeated (Wold, 1982), two-stage (Ringle et al., 2012), three-stage and hybrid (van Riel et al., 2017). The approach describes how to include indicators into lower- and higher-order constructs. The repeated indicator strategy puts all the same indicators both into lower and higher constructs. The two-stage approach involves developing the repeated indicator approach in the first stage and then using the standard construct score from the first stage to build higher-order constructs in the second stage. The hybrid approach divides the indicators into two components: 50% of the indicators are devoted to the lower construct while the other 50% are devoted to the higher construct. Nobody has ever employed the three-stage model, which is a related composite model that has been the subject of few studies. Each type has limitations, but in my experience, the most effective approach is a disjointed two-stage approach that employs an improved repeated indicator approach in the first step (Becker et al., 2012; Henseler et al., 2007; van Riel et al., 2017). The type of construct used in the HCM is a method in which the indicator and construct are related to lower and higher constructs. For example, a reflecting-formative type response indicates that the link between the indicator and the construct is reflective in lower constructs but formative in higher constructs. Four types of HCM were identified: reflective-formative, reflective-formative, formative-reflective, and formative-formative. Prior to Henseler's (2017), Henseler et al. (2018), Henseler and Schuberth's (2020) emphasis on confirmatory composite analyses, the majority of studies employed the reflective-reflective model, with no one utilizing the formative-formative model. Numerous

authors have explored how to use reflective or formative evaluations in lower and higher constructs using the confusing PLS-SEM theory for establishing the measurement model. The difficulty arises when composite variables are used in both reflective and causal formative models. The reflective model indicates that there is a measurement error in the indicator, the path and arrow point go from the construct to the indicator, but the correct thing to do is to employ latent variables. Additionally, they use composite variables in their formative causal model, which include measurement errors at the construct variable and a route and arrow point connecting the indicator and the construct variable. Numerous scholars conclude that it is not a good idea to utilize causal formative models and that MIMIC should be used instead (Rigdon, 2012). There are difficulties with using reflective and causal formative assessments with composite variables in an old-fashioned manner (Rönkkö & Evermann, 2013). Thus, a reflective or formative implementation in lower-order and higher-order constructs may be less efficient. Dijkstra and Henseler (2015ab) recommend using PLSc to measure latent variables, when use this way PLS-SEM offers a clear view of reflective measurements. On the other hand, Henseler (2017), Henseler et al. (2018), Henseler and Schuberth (2020) argue for the usage of a composite model. The use of this model clearly indicates the formative measurement though the use of emergent or composite variables. Thus, whereas reflective measurement models are appropriate for latent variables or PLSc, the formative measurement models are appropriate for composite or emergent variables.

Thus, in HCM, lower- or higher-order constructs must be used as formative or reflective variables, depending on whether they are latent or emergent variable. Thus, confirmatory factor analysis should be performed using reflective-reflective types. The confirmatory composite analysis should be performed using formative-formative types (Schuberth et al., 2020). The M-Banking usage model assumes a composite design construction model. A composite model may have some drawbacks: the sum of the constructed correlations entered and the respective indicator loads between the indicators can all be perceived as correlations (Henseler, 2017). Nevertheless, the composite measurement model needs no assumptions about the relationships that may have some meaning between its indicators. Thus, in this research, the formative-formative type and disjointed two-stage approach must be used to create the HCM of M-banking usage. That is the M-banking usage model core principle of this study, the components of which address the following.

Technology Acceptance Model (TAM) & perceived security

Many researchers used multiple theories to approach mobile research, such as the theory of reasoned action (TRA), Innovation Diffusion Theory (IDT), Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), Task Technology Fit (TTF), Unified Technology Acceptance and Usage Theory (UTAUT), and Initial Trust Model (ITM) (Ajzen, 1991; Davis, 1986,1989; Fishbein & Ajzen, 1975; Goodhue & Thompson, 1995; Kim et al., 2009; Rogers, 1995; Venkatesh et al., 2003). Kelly and Palaniappan (2019) divided the models and hypotheses into four categories based on findings that include customer satisfaction,

adoption and impact, consumer perception, security and encryption, and consumer behaviour. TAM is the most commonly used model for innovation adoption, describing customer decision-making processes related to technology acceptance behaviour (Mohammadi, 2015). TAM examines the factors influencing the use of new technology by a person (Venkatesh & Davis, 2000). TAM is also the most commonly used model for M-banking (Kelly & Palaniappan, 2019). TAM is a stable, productive, and parsimonious model to predict consumer IT, and is more straightforward to understand than the other models (Gu et al., 2009; Mehrad & Mohammadi, 2017). The primary problem with previous TAM research was twofold (Gu et al., 2009). It referred to the primary construct determinants (Venkatesh & Davis, 2000) and behavioural intent (Gefen, 2000). This study aims to examine constructs M-banking usage to determine perceived usefulness (PUS), perceived ease of use (PEU), perceived security (PSE), product, price, place, and promotion.

Perceived Usefulness (PUS): Perceived usefulness is defined as the degree to which an individual believes their success is related to using a particular program (Davis, 1989). It refers to planned performance (Venkatesh et al., 2003), efficiency, effectiveness, and productivity, including accessibility, sociability, reassurance, and instrumentality (Nysveen et al., 2005). PUS positively relates to both attitude and intended use (Hanafizadeh et al., 2014). Szajna (1996) identified PUS as a critical influence on the intended use. For this report, PUS refers to how M-banking incorporates itself in the customers' day-to-day activities as his or her confidence grows, making the M-banking model more accurate. When customers recognize the benefits of M-banking, the user model will lead to increased M-banking satisfaction and loyalty.

Perceived Ease of Use (PEU): Perceived ease of use is the degree to which a person believes that using a particular method will be easy (Davis, 1989). A function will come to an end in a less complicated manner (Venkatesh & Morris, 2000). Perceived ease of use is positively related to the intention to use M-banking (Wu & Wang, 2005). Perceived usefulness and ease of use relate positively to mobile banking behavioural intent, which refers to a customer's belief that the application is easy to understand and use. Perceived ease of use is undoubtedly linked to a consumer's willingness to use the service (Singh et al., 2010). PUS is productivity-related, while PEU is effort-related. Therefore, this study will follow the classic TAM, or perceived usefulness construct and perceived ease of use, in the M-banking model.

Perceived Security (PSE): M-banks are based on wireless networks which can be vulnerable to security attacks; therefore, M-banks may be riskier than traditional banking services. Classic TAM approaches, however, consist of perceived usefulness and perceived ease of use, and have no protection or risk constructs. Some scholars expanded the classic TAM by adding some recognized risk components (Kibicho & Mungai, 2019) such as perceived risk and social influence, perceived risk, and trust (Munoz-Leiva et al., 2016). Nevertheless, many customers remain uncertain (Munoz-Leiva et al., 2016). M-banking can use wireless encryption technology to enhance its security and provide customers with reliable, safe, and real-time services (Lafraxo et al., 2018). Perceived risk refers to security or privacy risks, financial risks, social risks, or time risks and refers to the customer's fear of failure while

dealing with M-banking (Cocosila & Trabelsi, 2016). High perceived risk is a barrier to mobile banking. As a result, this study will take security into consideration in the M-banking usage model to enhance superior TAM efficiency.

Four Ps marketing mixes

Studies done using TAM have omitted economics, demographics, and external variables which limited the understanding of consumer expectations and behavioural intent for M-banking adoption, and marketing mixes could address this shortcoming (Venkatesh & Davis, 2000). Marketing mix refers to marketing strategies that will help a company achieve profitability, market share, customer satisfaction, and sustainability (Pour et al., 2013; Zeithaml et al., 2006)). Marketing mixes come from twelve components of Borden's original marketing mix definition (Grönroos, 1994), which are product planning, pricing, branding, distribution channels, personal sales, advertising, promotion, packaging, display, service, physical handling, fact-finding, and research. Goi (2009), McCarthy (1964) divided Borden's definition into four categories: product, price, promotion, and place. Many marketing analysts opposed the 4Ps marketing mix using different perspectives (Zeithaml et al., 2006). For example, Bitner (1990) recommended an additional P for People, Process, and Physical in the 4Ps, making service marketing mixes be 7Ps. The product marketing mix can impact consumer satisfaction and retention, helping banks succeed (Kushwaha & Agrawal, 2015). Nevertheless, Alnaser et al. (2017) used the 7Ps to examine customer satisfaction with Islamic banking services: product, place, price, promotion, people, process, and physical. Berry (1995) noted that working with the 7Ps for banking service marketing combinations is negligible, inconsistent, and confounding. Thus, this study does not use Bitner's 7Ps (1990) for M-banking but rather suggests an alternative 7Ps. The first traditional 4Ps is the specified non-ICT aspect that can be effective for studying behaviour-intensive M-banking and adopts PUS, PEU, and PSE to explain M-banking's effectiveness, commitment, and security issues related to ICT. Therefore, the present research will follow the 4Ps marketing mix and use it in the model of M-banking, the 4Ps are defined as follows.

Product (PRD): Product is something on the market for sale or that customers are thinking of bidding on, and offers tangible and intangible benefits, often called goods and services. Products are applied to activities, interests, or satisfaction (Kotler & Armstrong, 2010), and have a bundle of market-specific features and benefits (Taherdoost et al., 2014). Banks need innovative ways to tailor their products/services, and react to customer needs. The product is the central element of a marketing mix since pricing, promotion, and distribution are impossible without it (Ferrell & Hartline, 2005). In banking, organizational objectives contribute primarily to product productivity (Coviello et al., 1997). Thus, the product is the primary determinant in the M-banking model usage, and is also the antecedent of customer satisfaction and loyalty (Pourdehghan, 2015).

Price (PRI): Price is the monetary value of the direct and indirect costs of profit or loss. It is a significant variable of a consumer's purchasing decision among other factors. They must consider prior value-for-money experiences before they repurchase something, such as

necessary financial and non-financial sacrifices, including time, energy, and effort, including opportunity costs (Kotler et al., 2010). For, M-banking, the price factor in the market mix relates to fees, bank charges, and interest rates, and may be cheaper than traditional bank transactions (Gerrard & Cunningham, 2004). When rates are unfair or uncompetitive, consumers turn to other banks (Colgate & Hedge, 2001). Therefore, price expectations directly affect consumer satisfaction and loyalty. Price is an important marketing mix variable that several scholars consider to be a key variable among many customer-related variables such as attraction, satisfaction, retention, and loyalty (e.g., Gupta & Dev, 2012; Shanker, 2002). Therefore, price is the primary determinant in the usage M-banking model.

Place/Distribution Place (PLA): The traditional meaning of place is where a company distributes its products or services, giving customers convenient access. To date, ICT has altered the way consumers access banking services (Brodie et al., 2013). Automated teller machines (ATMs) is one of the banking sector's most well-known technology applications that can increase cost efficiency (Beccalli, 2007). The large number of branches and ATMs make it more customer-friendly (Gupta & Dev, 2012). For the current study on M-banking, place refers to a customer's ability to access banking services that are less time-consuming and available 24-hours a day anywhere in the world. Therefore, adopting "place" in the present study on the usage M-banking model is very significant.

Service Promotion (PRO): If a company's new service or product is unsuccessful, service promotion refers to how important it is to them. Customers will purchase what they know, and companies will influence the decision through successful, persuasive communication. Marketing communication affects consumer behavioural intentions: satisfaction, loyalty, retention, and others (Hoffmann & Birnbrich, 2012). Promotion is also essential for M-banking, so the current study added it to the M-banking model of usage.

M-banking loyalty

Loyalty is referred to as a deep commitment to repurchase products or services in the future (Oliver, 1999). It may motivate repeated usage over time of the same service or product from the same companies (Dwivedi et al., 2019). In the mobile services sector, loyalty is characterized as the continuation of a business relationship between a service provider and a customer, meaning that customers expect to purchase more from the service provider (Gerpott et al., 2001). The bank can also play a significant role in developing customer loyalty, which is much cheaper than searching for new potential consumers. Thus, in the current analysis, we assume customer loyalty to be the individual's behavioural intent to continually use the current bank's M-banking service. Loyalty's antecedent is customer satisfaction and M-banking model usage. Figure 1 shows the first-order construct constructed using the improved repeated indicator approach that does not include second-order construct variables in the process (Becker et al., 2012; Sarstedt et al., 2019). The analysis will draw on the dimension effect of the marketing mix and TAM to evaluate loyalty of M-banking as follows;

Hypothesis 1a: Product is positively related to loyalty.
Hypothesis 1b: Price is positively associated with loyalty.
Hypothesis 1c: Place is positively associated with loyalty.
Hypothesis 1d: Promotion is positively associated with loyalty.
Hypothesis 1e: Perceived security is positively associated with loyalty.
Hypothesis 1f: Perceived usefulness is positively related to loyalty.
Hypothesis 1g: Perceived ease of use is positively associated with loyalty.

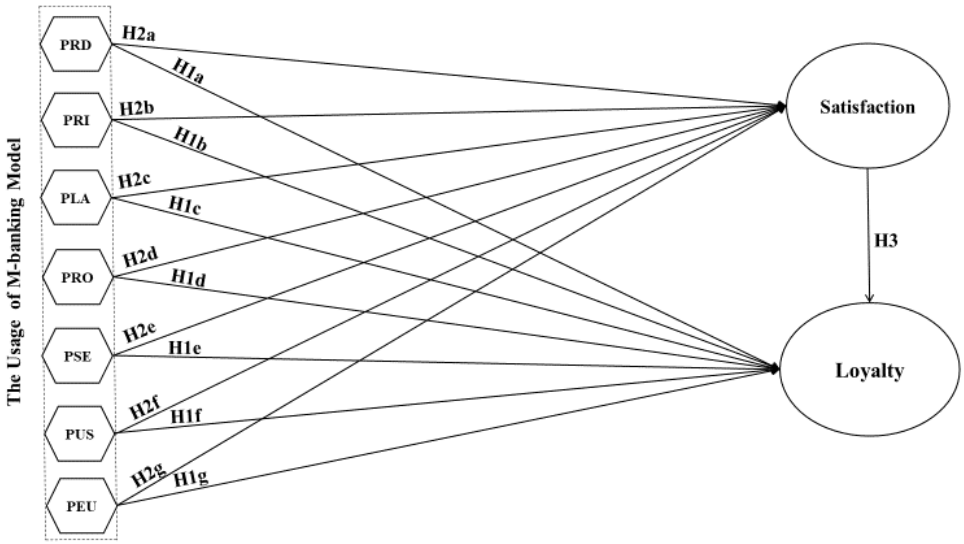

Figure 1 Dimension effect conceptual framework

Satisfaction of M-banking

Satisfaction is a fundamental concept in marketing literature for decision-making by direct marketers and customers (Preko et al., 2019). It is a primary element in optimizing profitability (Keshavarz & Jamshidi, 2018). M-banking services provide a wide variety of applications and value-added services to fulfil consumer needs, and customer satisfaction (Calvo-Porral & Nieto-Mengotti, 2019). In the literature, customer satisfaction refers either to the overall evaluation of performance based on the perceptions of service delivery achieved, or to assessments based on the value of the consumption experience (Eshghi et al., 2007). In M-banking, customer satisfaction refers to the degree of positive feelings felt for the bank depending on the experience. Therefore, customer satisfaction for M-banking can be related to the quality of communication, high value for money, the customer services provided, and convenient procedures that fulfil customer needs (Calvo-Porral & Nieto-Mengotti, 2019). Loyal customers will experience improved satisfaction. They will not respond adequately to product or service price changes and will also pay less attention to alternative products on the market (Jaakkola et al., 2015). Therefore, customer satisfaction is crucial for separating M-banking from rivals and shaping customer loyalty (Deng et al., 2010). Customer satisfaction

can affect the marketing mix, including TAM and perceived risk. In most of the literature, consumer satisfaction leads to higher retention rates, allowing corporations to achieve greater profitability due to improved customer loyalty (Wicks & Roethlein, 2009). Therefore, M-banking usage models should positively contribute to customer satisfaction and loyalty. Further, customer satisfaction is positively related to consumer loyalty. The analysis will draw on the dimension effect of the marketing mix and TAM to evaluate satisfaction of M-banking as follows;

Hypothesis 2a: Product is positively associated with satisfaction.
Hypothesis 2b: Price is positively associated with satisfaction.
Hypothesis 2c: Place is positively related to satisfaction.
Hypothesis 2d: Promotion is positively associated with satisfaction.
Hypothesis 2e: Perceived security is positively associated with satisfaction.
Hypothesis 2f: Perceived usefulness is positively associated with satisfaction.
Hypothesis 2g: Perceived ease of use is positively related to satisfaction.

Construct effect

The HCM usually consists of lower and higher-order constructs. Based on the reflective or formative model, the lower-order construct reports with measurement model criteria while higher-order model tests use structural rules hypothesized higher-order tests (Sarstedt et al., 2019). The current study needs to make assumptions for both the lower and higher-level constructs. Lower-order analysis hypothesizes that this is the dimension effect, which is the relationship between the 7Ps dimension and satisfaction and loyalty. For higher-order construct, this study hypothesizes a relationship between M-banking usage and satisfaction and loyalty, which is the construct effect. This does not appear to be a typical type of HCM, since there are two hypotheses in the lower-order and higher-order levels. The M-banking usage model is constructed with a composite and mode-B algorithm. The HCM is constructed with a formative-formative weighting scheme, which Schuberth et al. (2020) referred to as composite of composite. The variables satisfaction and loyalty are designed using a consistent partial least square that uses a consistent mode A algorithm. The model aims to illustrate how M-banking usage affects satisfaction and loyalty. The hypothesis of the construct effect was defined as follows in the current research literature.

Hypothesis 1: M-bank usage model is related positively to loyalty.
Hypothesis 2: M-banking usage model is related positively to satisfaction.
Hypothesis 3: Satisfaction is positively associated with loyalty.

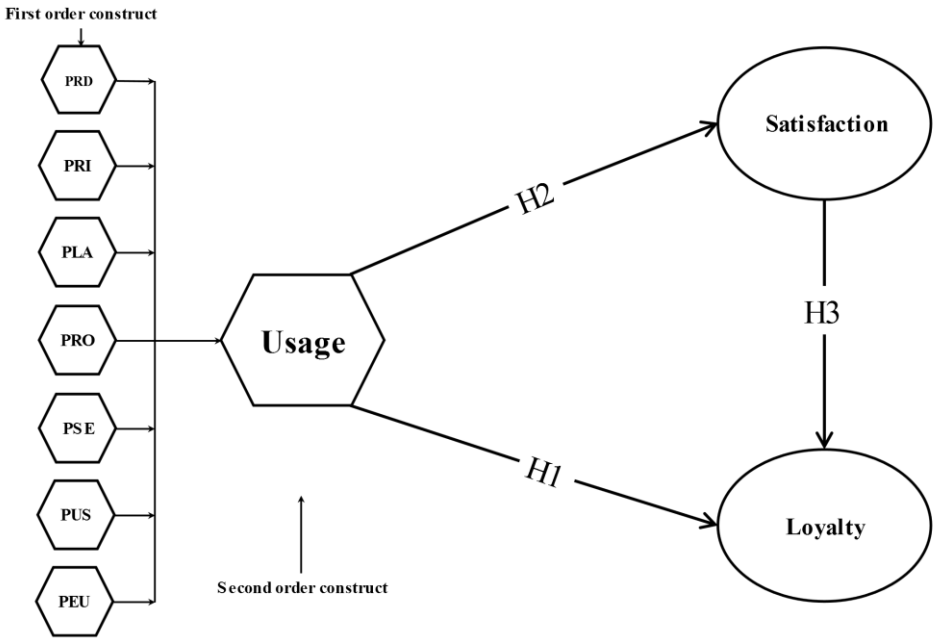

Figure 2 The construct effect conceptual framework

The conceptual framework contains two main models as shown in Figure 1 and 2. Figure 1 aims to investigate the influence of the dimensions of M-banking usage on satisfaction and loyalty. Figure 2 shows the M-banking usage model's relationship with satisfaction and loyalty. The model consists of three main assumptions (1, 2 and 3), all of which affect the first seven assumptions (H1a to H1g) give how differences in the usage component of M-banking relate to loyalty. Concurrently, the second seven assumptions (H2a to H2g) concerns satisfaction. The H3 set of assumptions states the relationship suggestion between satisfaction and loyalty. The hexagons represent emergent variables while the ovals represent latent variables

Methods

Measurement

Table 1 shows the questionnaire developed using various previous studies. Kushwaha and Agrawal (2015) established the marketing mix and found that product is based on the concept of innovation and value-added. In contrast, price is based on the idea of low cost. Place is based on the concept of convenience and ease of access. Promotion is based on the concept of bank advertising, social and cultural events, and promotional impact strategies. Puriwat and Tripopsakul (2017) sought to improve perceived security. Sripalawat et al. (2011) supported the use of perceived usefulness and ease of use. Baabdullah et al. (2019) adapted satisfaction and loyalty within the model.

Questionnaire design

The present study investigates the behaviour of M-banking customers in Thailand, and proposes to use the M-banking model based on the classic marketing mix, the traditional TAM, and perceived security. The 4Ps marketing mix explains consumer intentions or non-ICT behaviour, while the conventional TAM, including perceived risk, represents the consumer's ICT attitude towards M-banking. The questionnaire was developed from previous research but was carefully rewritten to suit the M-banking adoption background found in Thailand. It was translated into Thai given the target population. Two translators translated the original English instrument into Thai. They were native academics fluent in English. The Thai version was then back-translated to English. The researcher evaluated whether the words and terms reflected the same ideas or concepts in both English and Thai to ensure effective conceptual translation, and that the instrument's content was correct in Thai. The translated tool was tested for reliability. The questionnaire consisted of 32 questions divided into two parts. The first section consisted of 5 items, while the second section consisted of 27 questions. The second part used a 5-point Likert scale ranging from "strongly disagree" to "strongly accept".

Data collection

The data were collected from student at Valaya Alongkorn Rajabhat University. The survey was conducted in June 2019. The sample consisted of 400 individuals who had been using various banks' M-banking applications). The data showed that 49.2% of the respondents were male, while 50.8% were female. By age, 50% were 19-20 years old, and 45% were 21-22 years old. They were in their 1st, 2nd, 3rd or 4th year of study at 20, 25, 30, and 25% of the total, respectively. The data were gathered from two faculties, Management Science and Science and Technology, accounting for about 60% and 40% of the total, respectively. Considering their monthly income, 5% were below 5,000 baht, 25% were between 5001 and 7,000 baht, 30% were between 7,001 and 9,000 baht, 20 % were between 9,000 and 11,000 baht, and 20 percent were at more than 11,000 bath.

Table 1 Questionnaire

Product	
PRD1	M-bank transactions provide correct and protected information.
PRD2	M-banking's services are more flexible.
PRD3	M-banking is very fast.
Price	
PRI1	M-banking transaction fees are lower than regular bank transactions.
PRI2	M-bank transactions have no annual charges.
PRI3	M-banking transaction fees are fair.
Place	
PLA1	24-hour M-banking transactions are available.
PLA2	M-bank transactions can be completed from anywhere.
PLA3	M-bank transactions save time.

Product	
Promotion	
PRO1	I receive my bank information via SMS, MMS or email.
PRO2	I get a bank gift on New Year's Day and other special occasions.
PRO3	M-bank transaction information is easily understood and followed.
Perceived security	
PSE1	My confidential M-banking transaction information is well-protected.
PSE2	My M-banking information is safe.
PSE3	My M-banking transaction details are private and secure.
Perceived usefulness	
PUS1	M-banking transactions offer more advantages than other networks.
PUS2	Transactions through M-banking can be undertaken immediately without queuing
PUS3	M-banking makes transactions simpler to execute.
Perceived ease of use	
PEU1	Knowledge of how to use M-banking is simple.
PEU2	M-banking is not complicated.
PEU3	Learning how to use M-banking is quick.
Satisfaction	
SATIS1	I am feeling that M-bank transactions meet my needs and expectations.
SATIS2	I am satisfied with M-banking transactions.
SATIS3	I am satisfied after I complete M-banking transactions.
Loyalty	
LOYAL1	I plan to keep using M-banking.
LOYAL2	I prefer my bank's M-bank to other banking networks.
LOYAL3	I will recommend M-banking to others.

Data analysis

The current study used partial least square structural equation modelling. In terms of the dimensional effect, an emergent variable algorithm and improved repeat indicator approaches were used for M-banking usage, satisfaction, and loyalty. The construct effect used an emergent variable algorithm with a two-stage approach for the M-banking usage model-current study calculations were done using ADANCO 2.2 bootstrapping, 4,999 rounds (Henseler & Dijktra, 2015).

Quality of PLS-SEM

Model consistency parameters include a fit index, measurements, and a structural model. Thus, each dimension and construct effect must report these three components. For the model fit parameters, the algorithm used was bootstrapping. It was used to identify the uncertainty between the results and the algorithm-inferred correlation matrix (Henseler & Dijkstra, 2015). It involved three statistics: standardized root means square residual (SRMR), unweighted minimum square discrepancy (d_{ULS}), and geodesic discrepancy (d_G). The model was made up of two criteria: First, the results should be less than 95% (HI95) and 99% (HI99)

of bootstrapping. Second, if the first condition cannot be fulfilled, the SRMR value must be below 0.08 (Hu & Bentler, 1999).

In the latent variable model, the reflective criteria were internal consistency, indicator reliability, convergent validity, and discriminant validity. Internal consistency, using Dijkstra-Henseler's rho, Jöreskog's rho and Cronbach alpha should reach 0.70, while indicator reliability that loading items must exceed 0.708 (Henseler et al., 2015). The convergence validity test with an average extracted variance (AVE) score exceeding 0.50 indicates an appropriate indicator variance (Hair et al., 2017). Hetrotrait Monotrait correlations (HTMT) which discriminate the validity measure should be distinct and below 0.85 (Henseler et al., 2015).

In the emergent variable model, the composite criteria were: the nomological network, multicollinearity, loading significance, weight, and loading relevance (Henseler, 2017). That is like for the formative criterion (Hair et al., 2020). Nomological validity and confirmation of the formative variable must meet the requirements, including the design variable's essential dimension. Variance inflation factor (VIF) levels must not exceed 5 (Hair et al., 2011). The weight should be significant enough as the t-statistic must be higher than 1.96. Loading must be substantial, not less than 0.50, to keep the model's indicator.

The structural model can find the path coefficient, R-square (R^2), effect size (f^2), and predictable indicator (Q^2). R^2 can be broken into three amounts of social science research, representing small, moderate, and sufficient or 0.25, 0.35, and 0.75 respectively (Hair, Black, Babin, Anderson, 2010). It should reach the medium-scale (Chin, 1998). Effect sizes (f^2) are divided as 0.02, 0.15, and 0.35, for low, medium, and large respectively (Cohen, 1992). The medium size is the bare minimum that is acceptable for this study.

Results

Dimension effect

Model Fit: Table 2 shows the model fit parameters SRMR, $d_{ULS,}$ and d_G. The d_{ULS} values are slightly higher than HI99, while the d_G ones are lower than HI99 but are equal in the Saturated and Estimated models. The SRMR, on the other hand, is 0.037, less than 0.08, indicating that the empirical correlation matrix is identical to the model-implied correlation matrix.

Table 2 Test of model fit of dimension effects

	Saturated Model			Estimated Model		
Parameters	**Value**	**HI95**	**HI99**	**Value**	**HI95**	**HI99**
SRMR	0.037	0.033	0.036	0.037	0.033	0.036
d_{ULS}	0.525	0.401	0.478	0.525	0.401	0.478
d_G	0.248	0.227	0.249	0.248	0.227	0.249

Measurement Model: The M-banking usage model is a composite model criterion which has the following assessment criteria are nomological validity, variance inflation factor (VIF) and weight significance. Table 3 shows that the nomological validity is validated because all of the network's relations are supported in a single, omnibus model assessment (Hagger et al., 2017). The VIF of the M-banking usage aspects is less than 5, with the lowest value being 1.511 for PROD2 and the highest value being 2.071 for PLA2. The M-banking usage model's weights are all significant, with the lowest t statistic being 2.519 for PSE2 and the highest being 7.173 for PRD2. For satisfaction and loyalty, the internal consistency as well as Dijkstra-Henseler's rho, Jöreskog's rho and Cronbach alpha, are all very close to the two parameters: Satisfaction has the lowest value at about 0.833 while loyalty has the highest at about 0.857. Indicator reliability shows that all loading values are higher than 0.708, ranging between 0.746 (SATIS1) and 0.836 (LOYAL2). Convergent validity is confirmed by AVE values ranging from 0.627 (Satisfaction) to 0.644 (Loyalty). The HTMT value for satisfaction and loyalty is 0.759, which is less than 0.85, indicating that the discriminating validity is appropriate.

Table 3 Measurement model of dimension effects

Indicators	Weighting	Loading	VIF	Weighted t-value
Product				
PRD1	0.312	0.795	1.671	3.479
PRD2	0.594	0.924	1.757	7.173
PRD3	0.259	0.784	1.732	2.710
Price				
PRI1	0.484	0.877	1.672	4.665
PRI2	0.368	0.846	1.878	3.283
PRI3	0.318	0.833	1.916	2.934
Place				
PLA1	0.387	0.856	1.840	3.551
PLA2	0.325	0.857	2.071	3.104
PLA3	0.439	0.888	1.993	3.973
Promotion				
PRO1	0.448	0.852	1.598	4.216
PRO2	0.257	0.739	1.511	2.154
PRO3	0.488	0.878	1.674	5.007
Perceived security				
PSE1	0.445	0.862	1.803	5.092
PSE2	0.227	0.812	2.011	2.519
PSE3	0.492	0.878	1.735	6.431
Perceived usefulness				
PUS1	0.331	0.792	1.607	4.447

Indicators	Weighting	Loading	VIF	Weighted t-value
PUS2	0.263	0.799	1.797	3.220
PUS3	0.575	0.917	1.777	8.323
Perceived ease of use				
PEU1	0.414	0.847	1.670	6.395
PEU2	0.336	0.835	1.831	4.526
PEU3	0.426	0.867	1.811	6.381
Loading	**Dijkstra-Henseler's rho (ρ_A)**	**Jöreskog's rho (ρ_c)**	**Cronbach's alpha(α)**	**The average variance extracted (AVE)**
Satisfaction	0.836	0.834	0.833	0.627
SATIS1 0.746				
SATIS2 0.825				
SATIS3 0.803				
Loyalty	0.857	0.855	0.855	0.644
LOYAL1 0.772				
LOYAL2 0.836				
LOYAL3 0.834				

Structural Model: Table 4 and Figure 3 display the dimension effect of the fifteen-way relationship between the usage M-banking aspects, satisfaction, and loyalty. However, there are only four significant directions PRO->Loyalty, PSE->Satisfaction, PUS->Satisfaction, and Satisfaction->Loyalty.

Table 4 Structural model criteria of dimension effects

Effect	Beta	T. Value	P. Value	Cohen's f^2	R^2	Hypothesis test
PRD -> Satisfaction	0.089	0.728	0.467	0.007	0.669	No support
PRD -> Loyalty	0.208	1.471	0.141	0.042	0.690	No support
PRI -> Satisfaction	0.157	1.522	0.128	0.028	0.669	No support
PRI -> Loyalty	-0.037	-0.351	0.725	0.002	0.690	No support
PLA -> Satisfaction	-0.034	-0.354	0.724	0.001	0.669	No support
PLA -> Loyalty	-0.179	-1.672	0.095	0.040	0.690	No support
PRO -> Satisfaction	-0.101	-0.899	0.369	0.013	0.669	No support
PRO -> Loyalty	0.233	2.113	0.035	0.072	0.690	support
PSE -> Satisfaction	0.322	2.740	0.006	0.123	0.669	support
PSE -> Loyalty	-0.037	-0.305	0.760	0.002	0.690	No support

Effect	Beta	T. Value	P. Value	Cohen's f^2	R^2	Hypothesis test
PUS -> Satisfaction	0.275	2.302	0.021	0.082	0.669	support
PUS -> Loyalty	0.116	0.935	0.350	0.014	0.690	No support
PEU -> Satisfaction	0.232	1.866	0.062	0.053	0.669	No support
PEU -> Loyalty	0.206	1.671	0.095	0.043	0.690	No support
Satisfaction -> Loyalty	0.420	3.098	0.002	0.188	0.690	support

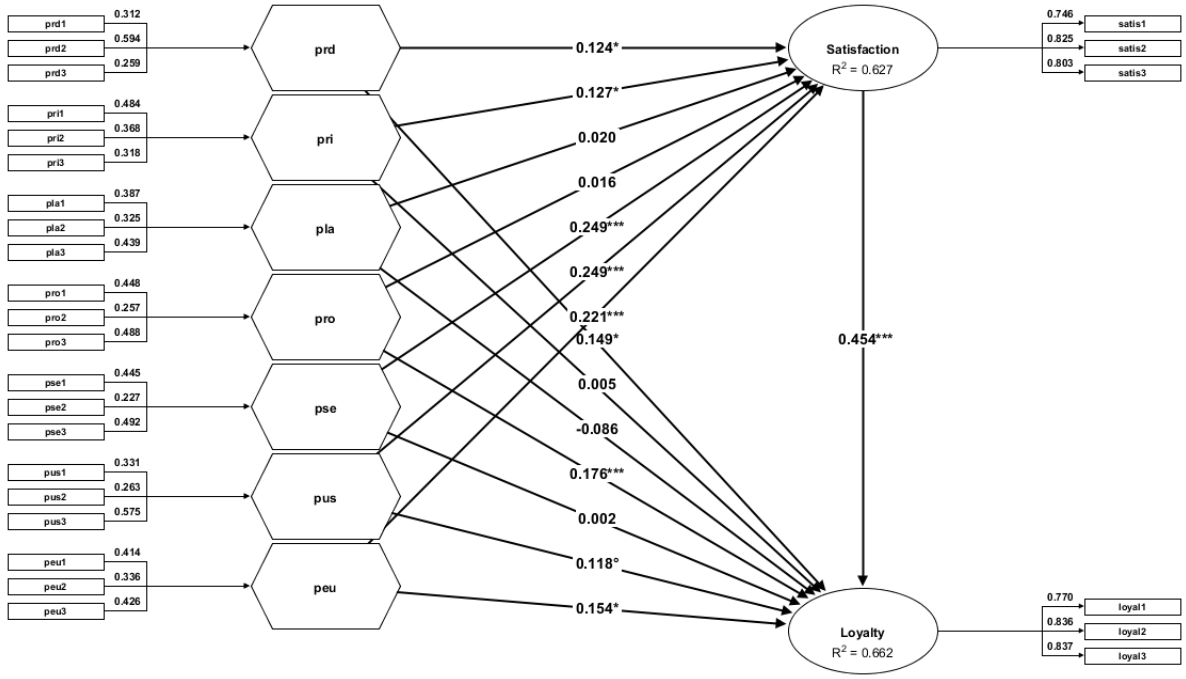

Figure 3 The dimension effects

Construct effect

Model Fit: Table 5 shows that the saturate, and estimated model parameters are equal and below HI95. ADANCO provides model fit tests that rely on bootstrapping to determine the probability of discrepancies between the empirical matrix and the model-implemented correlation matrix. The results show that they are as high as the ones obtained for the sample at hand, and that the hypothesized model was indeed correct (Henseler & Dijkstra, 2015).

Table 5 Test of model fit of construct effects

Parameters	Saturated Model			Estimated Model		
	Value	HI95	HI99	Value	HI95	HI99
SRMR	0.021	0.024	0.028	0.021	0.024	0.028
d_{ULS}	0.041	0.054	0.070	0.041	0.054	0.070
d_G	0.033	0.040	0.048	0.033	0.040	0.048

Measurement Model: Table 6 shows the composite model parameters which are the nomological network, multicollinearity, loading significance, including weight, and loading relevance. Almost all of the aspects of the M-banking usage model are based on the nomological net and the context except for places (PLA) which has a loading of more than 0.5. None of the dimensions has any issues with a multicollinearity problem due to a VIF value less than 5. As a result, the composite model can establish an M-banking usage model where PLA needs to describe more.

Table 6 The measurement model of construct effects

Indicators	Weight	Loading	VIF	Weighted t-value	AVE	Dijkstra-Henseler's rho (ρ_A)	Cronbach's alpha(α)
Satisfaction					0.628	0.838	0.833
SATIS1	0.354	0.729	1.732	22.723			
SATIS2	0.397	0.817	2.167	32.074			
SATIS3	0.402	0.828	2.033	29.701			
Loyalty					0.664	0.857	0.855
LOYAL1	0.356	0.765	1.982	26.708			
LOYAL2	0.389	0.836	2.350	29.155			
LOYAL3	0.391	0.841	2.122	29.199			
Usage M-banking							
PRD	0.191	0.766	2.122	2.874			
PRI	0.121	0.683	1.865	2.114			
PLA	-0.029	0.655	1.916	-0.408			
PRO	0.132	0.650	1.597	2.105			
PSE	0.241	0.774	1.852	3.451			
PUS	0.315	0.819	1.869	4.861			
PEU	0.313	0.830	1.977	4.834			

Structural Model: Table 7 and figure 4 show the structural model parameters which are the path coefficient, the R-square (R^2), the impact size (f^2), and the predictable (Q^2) predictor, but ADANCO did not generate Q^2. The results show that all three routes are significant, while

R^2 value are higher than moderate. The effect sizes reveal that usage M-Banking- > Loyalty and Usage M-Banking- > Satisfaction are large while Satisfaction- > Loyalty is medium. The results indicate that the constructs and indicators have healthy relationships.

Table 7 The structural model criteria of the construct effects

Direct Effect	Beta	t-value	P-value	Cohen's f^2	R^2	Hypothesis test
Usage M-banking -> Loyalty	0.427	4.070	0.000	0.760	0.649	Support
Usage M-banking -> Satisfaction	0.782	28.599	0.000	0.782	0.611	Support
Satisfaction -> Loyalty	0.427	4.298	0.000	0.202	0.649	Support

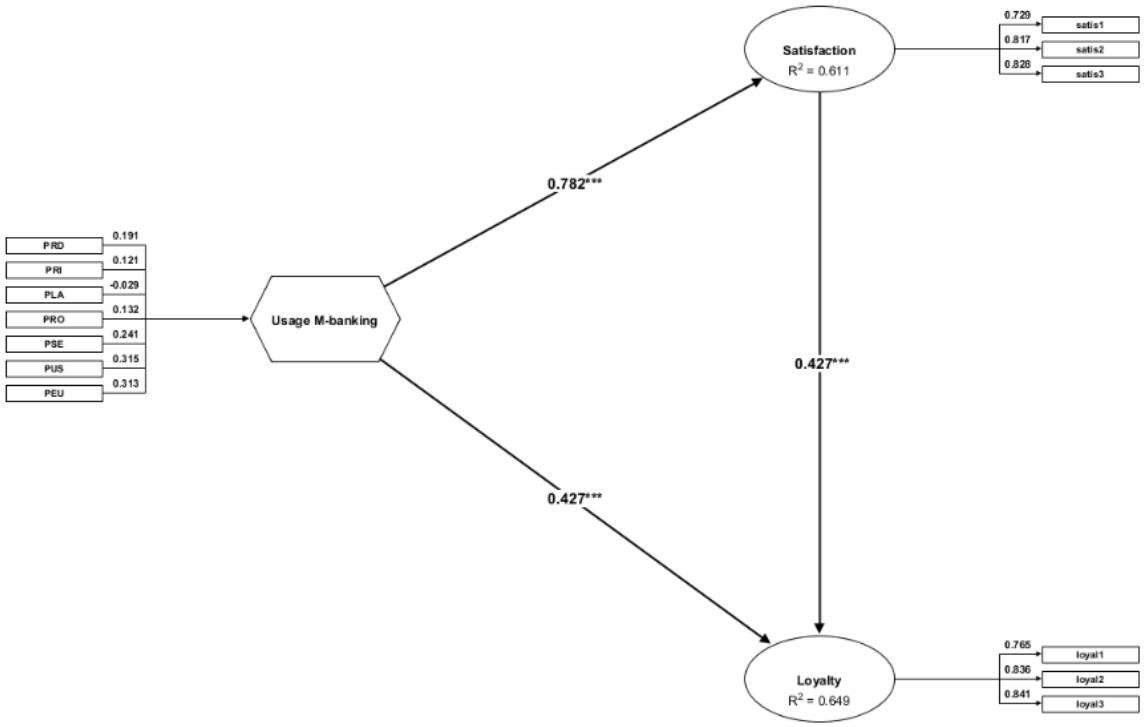

Figure 4 The construct effects

Discussion

Summary results

The present study examined the dimension and construct effects of the M-banking usage model on customer satisfaction and loyalty. The dimension effect used an improved repeat indicators approach, while the construct effect used a disjointed two-stage approach to avoid discriminatory validity (Becker et al., 2012). In our experience, this might first suggest the need to explore dimension and construct effects that hypothesize both levels, while HCM hypothesizes higher-order constructs. In such cases, the dimension and construct effects would show the power of the aspects and of the latent variables, respectively.

Theoretical implications

For the dimension effect, security and usefulness significantly impacted customer satisfaction. In particular, concerning security, customers were satisfied that their confidential M-banking transaction information was well protected, secure, and private. In terms of usefulness, the customers were satisfied that the M-banking transactions offered more advantages than other networks, immediately ending the need to wait in queues and making purchases easier to execute. The results also showed that promotion and satisfaction are essential to customer loyalty. Customers remain loyal because they have already received bank information, through SMS, MMS or email, which was easily understood and followed. M-bank transactions that are completed smoothly and successfully also affect customer loyalty. The results confirmed that the usefulness, security, and promotion of the M-banking usage model are well organized and in line with Hanafizadeh et al. (2014). Perceived usefulness and perceived security significantly impact customer satisfaction, creating a positive feeling toward the bank (Deng et al., 2010). Promotion and customer satisfaction had a significant impact on the M-banking usage model's customer loyalty. Deng et al. (2010) found that customer satisfaction in M-banking is crucial to customer loyalty. These findings are consistent with the assumption that promotion, usefulness, and security are essential to influence customer satisfaction and loyalty in M-banking. The aspects of product, price, place, and ease of use were insignificant, which is not consistent with the assumption of customer satisfaction and loyalty. It differs significantly from the primary literature, which claims that the 7Ps of service M-banking positively influence consumer perception (Kushwaha & Agrawal, 2015).

Appendix can be consulted to check the relationship between each dimension, and consider that all aspects significantly affected customer satisfaction and loyalty, with the exception of place and price for loyalty. However, putting all seven aspects into the M-banking usage model revealed that only promotion, perceived usefulness and perceived security had an impact on customer satisfaction and loyalty. Thus, M-banking usage means that M-banking transactions are easier to execute and do not require any queuing. Thus, they have more advantages than other networks. The information is easily understood, and followed, and the banks offer well-protected, private, and secure transactions.

For the construct effect, usage M-banking had a significant impact on customer satisfaction and loyalty, conforming to the assumption and in line with Baabdullaha et al. (2019). Except for place, the 6Ps were clearly organized for M-banking usage. Place had a weight that may be insignificant, but the loading was more significant than 0.5, and so it could remain within the model. The results showed that location may be less critical for M-banking. Moreover, the 7Ps of the usage M-banking model also impacted customers who plan to continue using M-banking and prefer it to other banking networks and also plan on recommending M-banking to others. Customers were happy when M-banking transactions met their goals both during and after the transaction. The 7Ps elements were well-developed components of a composite model for mobile banking usage. Thus, the 7Ps influenced customer satisfaction and loyalty in this context. As a result, it confirms that M-banking usage elements are significant for customer satisfaction and loyalty.

The dimension and the construct effects can be distinguished by the fact that the dimension effect clearly shows which aspect is relevant to customer satisfaction and loyalty

whereas the construct effect shows that the relationship between the M-banking, satisfaction and loyalty are well organized. The dimension effect can show the relationship between the individual aspects while the construct effect can show how well the construct is organized. Therefore, studies would benefit from including both the dimension and construct effect, as they produce different results. The results showed that the M-banking usage model is appropriate for the construction of a composite model that may vary from what is reported in other literature such as Baabdullaha et al. (2019), Shaikh and Karjaluoto (2015).

Practical implications

The dimension effect showed that the aspects promotion, perceived usefulness, and perceived security are the indicators that had the most significant impact on customer satisfaction and loyalty. Thus, if any bank wants to concentrate more on M-banking, they should spend more time and effort to increase the promotion, usefulness, and security of their M-banking. According to theory, every dimension has the propensity to be significant, but when all dimensions are included in construct variable, only a few dimensions is meaningful. However, the construct effect is still significant, and no insignificant dimension can be removed from the model. Additionally, the response to all of the dimensions is the primary organization of the construct. Thus, the construct variable, according to theory, must include all of the dimensions, including the insignificant ones.

Limitations and directions for further research

The research had some weaknesses that should be acknowledged before generalizing the results to Thailand and beyond. This research was based on data collected from student at Valaya Alongkorn Rajabhat University. A future broad-based data analysis across various provinces would help generalize national findings. This is the first research done that hypothesized both the lower-order and higher-order constructs in order to investigate dimension and construct relationships with other construct variables. The dimension effect showed each aspect's relationship of the M-banking usage model to satisfaction and loyalty. The construct effect showed how well organized they were between the constructs. That may be a shortcoming of this method. Future research should further examine the dimension and construct effect in other industries that are more likely to result in a difference. As a result of this study’s construction of M-banking usage, a future study could aim to establish the emergent of latent variables. That could have a beneficial effect on the satisfaction-loyalty relationship, which is typically difficult to achieve when using latent variables with an indirect effect. While emergent variables are generally appropriate for data with capabilities, indices, and values, Hubona et al. (2021) propose constructing emergent variables from latent variables, referring to attitudes and characteristics as emergent variables or formative composite variables.

Conclusions

This study could perhaps, in our experience, first propose a dimension and construct effect that hypothesizes both a lower-order and a higher-order design for both investigation levels. The results showed that the 7Ps were well organized in the M-banking usage model and that there was a significant impact on customer satisfaction and loyalty as shown by the construct effect. The dimension effect showed the relationship between the aspects, or 7Ps and customer satisfaction and loyalty. Using the dimension and construct effect in the same study revealed the development of a new theory.

References

Adam, M. A., & Akber, S. N. (2016). The impact of brand equity on consumer purchase decisions of cell phones. *European Journal of Business and Innovation Research, 4*(4), 60-133.

Aguirre-Urreta, M. I., Rönkkö, M., & Marakas, G. M. (2016). Omission of causal indicators: consequences and implications for measurement. *Measurement: Interdisciplinary Research and Perspectives, 14*(3), 75-97.

Ajzen, I (1991) The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.

Aksoy, L., Buoye, A., Aksoy, P., Larivière, B., & Keiningham, T. L. (2013). A cross-national investigation of the satisfaction and loyalty linkage for mobile telecommunications services across eight countries. *Journal of Interactive Marketing, 27*(1), 74-82.

Alnaser, F. M. I, Ghani, M. A., Rahi, S., Mansour, M., & Abed, H. (2017). The Influence of Services Marketing Mix (7Ps.) and Subjective Norms on Customer's Satisfaction in Islamic Banks of Palestine. *European Journal of Business and Management, 9*(27), 20-25.

Baabdullaha, A. M., Alalwanb, A. A., Ranac, C. P., Kizgin, H., & Patil, P. (2019). Consumer use of mobile banking (M-Banking) in Saudi Arabia: Towards an integrated model. *International Journal of Information Management, 44*, 38-52.

Bambrough, B. (2020). *The coronavirus crisis has changed money forever*. Retrieved from http://www.Forbes.com.

Bank of Thailand. (2020). *PS_PT_009 use of mobile banking and internet banking.* Retrieved from https://www.bot.or.th/App/BTWS_STAT/statistics/BOTWEBSTAT.aspx?reportID=688&language=eng.

Beccalli, E. (2007). Does I.T. investment improve bank performance? Evidence from Europe. *Journal of Banking & Finance,* 31(7), 2205-2230.

Becker, J. M., Klein, K., & Wetzels, M. (2012). Hierarchical latent variable models in PLS-SEM: Guidelines for using reflective-formative type models. *Long Range Planning, 45*(5-6), 359-394.

Berry, L. L. (1995). Relationship marketing of services-growing interest, emerging perspectives. *Journal of the Academy of Marketing Science, 23*, 236-245.

Bitner, M. J (1990) Evaluating service encounters: the effects of personal surroundings and employee responses, *Journal of Marketing, 54*(2), 69-82.

Boonsiritomachai, W., & Pitchayadejanant, K. (2017). Determinants affecting mobile banking adoption by generation Y based on the unified theory of acceptance and use of technology model modified by the technology acceptance model concept. *Kasetsart Journal of Social Sciences, 40* (2019), 349-358.

Brodie, R. J., Ilic, A., Juric, B., & Hollebeek, L. (2013). Consumer engagement in a virtual brand community: An exploratory analysis. *Journal of Business Research, 66*, 105-114.

Brown, G., & Whittle, R. (2020). *Money, money, money: Has COVID-19 changed society's view of money forever? Opinion.* Retrieved from https://www.hertford.ox.ac.uk/alumni/publications/hertford-blogs/money-money-money.

Calvo-Porral, C., & Nieto-Mengotti, M. (2019). The moderating influence of involvement with ICTs in mobile services. *Spanish Journal of Marketing-ESIC, 23*(1), 25-43.

Cheah, J., Tang, H., Ramayah, T., Menon, M. A., Cham, T. H., & Ciavolono, E. (2019). A comparison of five reflective–formative estimation approaches: Reconsideration and recommendations for tourism research. *Qual Quant, 53*, 1421-1458.

Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In G. A. Marcoulides (Ed.), Modern methods for business research. New Jersey: Lawrence Erlbaum Associates Publishers.

Chiu, J. L., Bool, N. C., & Chiu, C. L. (2017). Challenges and factors influencing initial trust and behavioral intention to use mobile banking services in the Philippines. *Asia Pacific Journal of Innovation and Entrepreneurship, 11*(2), 246-278.

Cocheo, S. (2020). *Coronavirus crisis: The future of cash, checks, credit cards & crypto*. Retrieved from http://www.thefinancialbrand.com.

Cocosila, M., & Trabelsi, H. (2016). An integrated value-risk investigation of contactless mobile payments adoption. *Electronic Commerce Research and Applications, 20*(1), 159-170.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*(1), 155-159.

Colgate, M., & Hedge, R (2001). An investigation into the switching process in retail banking services. *The International Journal of Bank Marketing, 19*(5), 201-212.

Coviello, N. E., Brodie, R. J., & Munro, H. J (1997). Understanding contemporary marketing: development of a classification scheme. *Journal of Marketing Management, 13*(6), 501-522.

Davis, F. D (1986). *A technology acceptance model for empirically testing new end-user information system theory and results* (Doctoral dissertations). USA: Massachusetts Institute of Technology.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 318-339.

Deng, Z., Lu, Y., Wei, K. K., & Zhang, J. (2010). Understanding customer satisfaction and loyalty: an empirical study of mobile instant messages in China? *International Journal of Information Management, 30*(4), 289-300.

Dijkstra, T. K., & Henseler, J. (2015). Consistent and asymptotically normal PLS estimators for linear structural equations. *Computational statistics & data analysis, 81*, 10-23.

Dijkstra, T. K., & Henseler, J. (2015). Consistent partial least squares path modeling. *MIS quarterly, 39*(2), 297-316.

Dwivedi, Y. K., Rana, N. P., & Jeyaraj, A. (2019). Re-examining the Unified Theory of Acceptance and Use of Technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers, 21*, 719-734.

Eshghi, A., Haughton, D., & Topi, H. (2007). Determinants of customer loyalty in the wireless telecommunications industry. *Telecommunications Policy, 31*(2), 93-106.

Farrell, A. M., & Rudd, J. M. (2009). *Factor analysis and discriminant validity: A brief review of some practical issues*. In D. Tojib (Ed.). Australia-New Zealand marketing academy conference. Australia: Australia-New Zealand Marketing Academy.

Ferrell, O. C., & Hartline, M. D. (2005). *Marketing strategies.* USA: Soth-western.

Fishbein, M., & Ajzen, I. (1975). Belief attitude, intention, and behavior: An introduction to theory and research. MA, USA: Addison-Wesley.

Gefen, D. (2000). E-commerce: The role of familiarity and trust. *Omega-International Journal of Management Science, 28*, 725-737.

Gerpott, T. J., Rams, W., & Schindler, A. (2001). Customer retention, loyalty, and satisfaction in the German mobile cellular telecommunications market. *Telecommunications Policy, 25*(4), 249-269.

Gerrard, P., & Cunningham, J. B. (2004). Consumer switching behavior in the Asian banking market. *Journal of Services Marketing, 18*(3), 215-223.

Goi, C. L. (2009). A review of the marketing mix: 4Ps or more? *International Journal of Marketing Studies*, *1*(1), 2.

Goodhue, D. L., & Thompson, R. L. (1995). Task-technology fit and individual performance. *MIS Quarterly, 19*(2), 213-236.

Grönroos, C. (1994). Quo Vadis, marketing? Toward a relationship marketing paradigm. *Journal of Marketing Management, 10*(5), 347-360.

Gu, J. C., Lee, S. C., & Suh, Y. H. (2009). Determinants of behavioral intention to mobile banking. *Expert Systems with Applications,* 36(9), 11605-11616.

Gupta, A., & Dev, S. (2012). Client satisfaction in Indian banks: An empirical study. *Management Research Review, 35*(7), 617-636.

Guriting, P., & Ndubisi, N. (2006). Borneo online banking: Evaluating customer perceptions and behavioral intention. *Management Research News. 29*, 6-15.

Hagger, M. S., Gucciardi, D. F., & Chatzisarantis, N. L. D. (2017). On nomological validity and auxiliary assumptions: The importance of simultaneously testing effects in social cognitive theories applied to health behavior and some guidelines. *Frontiers in Psychology, 8*, 1-14.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis: A global perspective.* (7th eds.). Upper Saddle River, USA: Pearson Education.

Hair, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research, 109,* 101-110.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., & Thiele, K. O. (2017). Mirror, mirror on the wall: A comparative evaluation of composite-based structural equation modeling methods. *Journal of the Academy of Marketing Science, 45*(5), 616-632.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed, a silver bullet. *Journal of Marketing Theory and Practice, 19*(2), 139-152.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2013). Partial least squares structural equation modeling: Rigorous applications, better results, and higher acceptance. *Long Range Planning, 46,* 1-12.

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2017). *Advanced issues in partial least squares structural equation modeling.* Thousand Oaks, CA: Sage Publications.

Hanafizadeh, P., Behboudi, M., Koshksaray, A. A., & Tabar, M. J. S. (2014). Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics, 31*(1), 62-78.

Henseler, J. (2017). Bridging design and behavioral research with variance-based structural equation modeling. *Journal of advertising, 46*(1), 178-192.

Henseler, J., & Dijkstra, T. K. (2015). *ADANCO 2.0. Kleve: Composite modeling.* Retrieved from http://www. compositemodeling.com

Henseler, J., & Schuberth, F. (2020). Using confirmatory composite analysis to assess emergent variables in business research. *Journal of Business Research, 120,* 147-156.

Henseler, J., Müller, T., & Schuberth, F. (2018). New guidelines for the use of PLS path modeling in hospitality, travel, and tourism research. *Journal of Hospitality and Tourism Technology, 9*(3), 249-266

Henseler, J., Ringle, C.M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115-135.

Henseler, J., Wilson, B., Götz, O., & Hautvast, C. (2007). Investigating the moderating role of fit on sports sponsorship and brand equity. *International Journal of Sports Marketing and Sponsorship. 8*(4), 321-329.

Hoffmann, A. O. I. & Birnbrich, C. (2012). The impact of fraud prevention on bank-customer relationships: An empirical investigation in retail banking. *International Journal of Bank Marketing, 30*(5), 390-407.

Hu, L., & Bentler, P. (1999). Cutoff criteria for fit indices in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1-55.

Hubona, G. S., Schuberth, F., & Henseler, J. (2021). A clarification of Confirmatory Composite Analysis (CCA). *International Journal of Information Management, 61,* 102399.

Humbani, M., & Wiese, M. (2019). An integrated framework for the adoption and continuance intention to use mobile payment apps. *International Journal of Bank Marketing, 37*(2), 646-664.

Jaakkola, E., Helkkula, A., & Aarikka-Stenroos, L. (2015). Service experience co-creation: Conceptualization, implications, and future research directions. *Journal of Service Management, 26*(2), 182-205.

Kelly, A. E., & Palaniappan, S. (2019). Survey on customer satisfaction, adoption, perception, behavior, and security on mobile banking. *Journal of Information Technology & Software Engineering, 9*(2), 1-15.

Keshavarz, Y., & Jamshidi, D. (2018). Service quality evaluation and the mediating role of perceived value and customer satisfaction in customer loyalty. *International Journal of Tourism Cities, 4*(2), 220-244.

Kibicho, N. K., & Mungai, J. (2019). Mobile banking adoption and financial credit accessibility in wote sub-county, Makueni county, Kenya. *International Journal of Current Aspects, 3*(IV), 65-79.

Kim, G., Shin, B., & Lee, H. G. (2009). Understanding dynamics between initial trust and usage intentions of mobile banking. *Information Systems Journal, 19*, 283-311.

Kotler, P., & Armstrong, G. (2010). *Principles of marketing*. New Jersey: Pearson education.

Kotler, P., Kartajaya, H., & Setiawan, I. (2010). *Marketing 3.0: From products to customers to the human spirit*. U.S.: John Wiley & Sons.

Krasnikov, A., Jayachandran, S., & Kumar, V. (2009). The impact of customer relationship management implementation on cost and profit efficiencies: evidence from the U.S. commercial banking industry. *Journal of Marketing, 73*(6), 61-76.

Kushwaha, G. S., & Agrawal, S. R. (2015). An Indian customer surrounding 7P' s of service marketing. *Journal of Retailing and consumer services, 22*, 85-95.

Lafraxo, Y., Hadri, F., Amhal, H., & Rossafi, A. (2018). *The effect of trust, perceived risk, and security on the adoption of mobile banking in Morocco* (pp. 497-502). In Proceedings of *the 20th International Conference on Enterprise Information Systems.* Portugal: Institute for Systems and Technologies of Information, Control and Communication.

McCarthy, E. J. (1964). *Basic marketing: A managerial approach*. IL: Richard D. Irwin.

Mehrad, D., & Mohammadi, S. (2017). Word of mouth impact on the adoption of mobile banking in Iran. *Telematics and Informatics, 34*(7), 1351-1363.

Mohammadi, H. (2015). Investigating users' perspectives on e-learning: An integration of TAM and I.S. success model. *Computers in human behavior, 45*, 359-374.

Mullan, J., Bradley, L., & Loane, S. (2017). Bank adoption of mobile banking: a stakeholder perspective. *International Journal of Bank Marketing, 35*(7), 1154-1174.

Munoz-Leiva, F., Climent-Climent, S., & Liébana-Cabanillas, F. (2016). Determinants of intention to use the mobile banking apps: An extension of the classic TAM model. *Spanish Journal of Marketing, 21*, 25-38.

Nysveen, H., Pedersen, P. E., & Thorbjernsen, H. (2005). Explaining intention to use mobile chat services: Moderating effects of gender. *The Journal of Consumer Marketing, 22*(4). 247-256.

Oliver, R. L (1999) Whence Customer Loyalty? *Journal of Marketing, 63*(Special Issue), 33-44.

Ong, C. S., Laia, J. Y., & Wang, Y. S. (2004). Factors affecting engineers' acceptance of asynchronous e-learning systems in high-tech companies. *Information & Management, 41*, 795-804.

Pikkarainen, T., Pikkarainen, K., Karjaluoto, H., & Pahnila, S. (2004). Consumer acceptance of online banking: An extension of the technology acceptance model. *Internet Research, 14(*3), 224-235.

Pour, B. S., Nazari, K., & Emani, M. (2013). The effect of marketing mix in attracting customers: Case study of Sederat Bank in Kermanshah province. *African Journal of Business Management, 7*(34), 3272-3276.

Pourdehghan, A. (2015). The impact of marketing mix elements on brand loyalty: A case study of mobile phone industry. *Marketing and Branding Research, 2*(1), 44-63.

Preko, A., Doe, F., & Dadzie, S. A. (2019). The future of youth tourism in Ghana: motives, satisfaction, and behavioral intentions. *Journal of Tourism Futures, 5*(1), 5-21.

Puriwat, W., & Tripopsakul, S. (2017). Mobile banking adoption in Thailand: an integration of technology acceptance model and mobile service quality. *European Research Studies Journal, xx*(4A), 200-210.

Rigdon, E. E. (2012). Rethinking partial least squares path modeling: In praise of simple methods. *Long range planning, 45*(5-6), 341-358.

Ringle, C. M., Sarstedt, M., & Straub, D. W. (2012). Editor's comments: A critical look at the use of PLS-SEM in MIS Quarterly. *MIS quarterly*, iii-xiv.

Riskinanto, A., Kelana, B., & Hilmawan, D. R. (2017). The moderation effect of age on adopting e-payment technology. *Procedia Computer Science, 124*, 536-543.

Rogers, E. M. (1995). *The diffusion of innovation* (4th eds.). New York: Free Press.

Rönkkö, M., & Evermann, J. (2013). A critical examination of common beliefs about partial least squares path modeling. *Organizational Research Methods, 16*(3), 425-448.

Sarstedt, M., Hair Jr, J. F., Cheah, J. H., Becker, J. M., & Ringle, C. M. (2019). How to specify, estimate, and validate higher-order constructs in PLS-SEM. *Australasian Marketing Journal, 27*(3), 197-211.

Schuberth, F., Rademaker, M., & Henseler, J. (2020). Estimating and assessing second- order constructs using PLS-PM: the case of composites of composites. *Industrial Management & Data Systems, 120*(12), 2211-2241.

Shaikh, A. A., & Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and informatics, 32*(1), 129-142.

Shanker, R. (2002). *Services marketing*. India: Excel Books.

Singh, S., Srivastava, V., & Srivastava, R. K. (2010). Customer acceptance of mobile banking: A conceptual framework. *SIES Journal of Management, 7*(1), 55-64.

Siyal, A. W., Ding, D., & Siyal, S. (2019). M-banking barriers in Pakistan: a customer perspective of adoption and continuity intention. *Data Technologies and Applications, 53*, 58-84.

Sripalawat, J., Thongmak, M., & Ngramyarn, A. (2011). M-banking in metropolitan Bangkok and a comparison with other countries. *Journal of Computer Information Systems, 51*(3), 67-76.

Statista (2020). *E.U. member states with the most cashless payment transactions in 2018.* Retrieved from https://www.statista.com/statistics/276233/eu-member-states-with-the-most-cashless-payment-transactions/.

Szajna, B. (1996). Empirical evaluation of the revised technology acceptance model. *Management Science, 42*(1), 85-92.

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2014). Features' evaluation of goods, services, and e-services; electronic service characteristics exploration. *Procedia Technology, 12*, 204-211.

Tam, C., & Oliveira, T. (2016). Understanding the impact of m-banking on individual performance: DeLone & McLean and TTF perspective. *Computers in Human Behavior, 61*, 233-244.

Tam, C., & Oliveira, T. (2017). Literature review of mobile banking and individual performance. *International Journal of Bank Marketing, 35*, 1044-1067.

Van Riel, A. C., Henseler, J., Kemény, I., & Sasovova, Z (2017) Estimating hierarchical constructs using consistent partial least squares. *Industrial Management & Data Systems, 117*(3), 459-477.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186-204.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their roles in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115-139.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly, 27*(3), 425-478.

Veríssimo, J. M. C. (2016). Enablers and restrictors of mobile banking app use: A fuzzy set qualitative comparative analysis (fsQCA). *Journal of Business Research, 69*(11), 5456-5460.

Wicks, A. M., & Roethlein, C. J. (2009). A satisfaction-based definition of quality. *Journal of Business & Economic Studies, 15*(1), 82-97.

Wold, H. (1982). *Soft modeling: The basic design and some extensions* (pp. 1-54). In Jöreskog, K. G., & Wold, H. (Eds.). In systems under indirect observation: Causality, structure, prediction (Volume 2). Amsterdam: North-Holland.

Wu, J. H., & Wang, S. C. (2005). What drives mobile commerce? An empirical evaluation of the revised technology acceptance model. *Information & Management, 42*(5), 719-729.

Zeithaml, V., Bitner, M., & Gremler, D. (2006). *Services marketing: Integrating customer focus across the firm* (4th ed.). USA: McGraw-Hill.

APPENDIX

Table 9 Relationship to customer satisfaction and loyalty of each dimension

		Beta	T statistics	p-value	R^2
Product	Product →Satisfaction	0.650	13.509	0.000	0.422
	Product →Loyalty	0.293	3.297	0.000	0.628
	Satisfaction →Loyalty	0.570	6.932	0.000	0.628
Price	Price →Satisfaction	0.604	11.711	0.000	0.365
	Price →Loyalty	0.160	1.908	0.560	0.594
	Satisfaction →Loyalty	0.663	8.808	0.000	0.594
Place	Place →Satisfaction	0.588	12.697	0.000	0.345
	Place →Loyalty	0.160	1.272	0.203	0.584
	Satisfaction →Loyalty	0.698	9.616	0.000	0.584
Promotion	Promotion →Satisfaction	0.528	9.545	0.000	0.279
	Promotion →Loyalty	0.285	4.097	0.000	0.635
	Satisfaction →Loyalty	0.609	9.541	0.000	0.635
Perceived	Security →Satisfaction	0.696	15.741	0.000	0.485
Security	Security →Loyalty	0.179	2.014	0.044	0.595
	Satisfaction →Loyalty	0.636	7.321	0.000	0.595
Perceived	Usefulness →Satisfaction	0.717	15.492	0.000	0.514
Usefulness	Usefulness →Loyalty	0.296	2.939	0.003	0.620
	Satisfaction →Loyalty	0.548	5.591	0.000	0.620
Perceived	Ease of use →Satisfaction	0.720	16.720	0.000	0.518
ease of use	Ease of use →Loyalty	0.325	3.191	0.001	0.628
	Satisfaction →Loyalty	0.526	5.307	0.000	0.628

The seven experiments were used to assess the relationship between each aspect of M-banking usage and satisfaction and loyalty, and almost all of the hypotheses that were accepted excluded place and price for loyalty.