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Predicting Customer Loyalty in the Mobile Banking Setting: An Integrated Approach

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ABSTRACT

This study uses a novel theoretical approach that combines two multidimensional service quality models that focus on customer satisfaction, perceived value, and customer loyalty as outcomes of service quality in the context of mobile banking. Additionally, the study assesses the potential moderating effects of switching costs between mobile banking service quality and customer loyalty. The study found a strong direct effect between service quality, perceived value, customer satisfaction, and loyalty. The moderating effect of switching costs was found to be inconsequential to customer loyalty. The study demonstrates that financial institutions should focus on building and maintaining functional, secure mobile banking applications to enhance customer loyalty and retention.

KEYWORDS

Customer Loyalty, Customer Satisfaction, Mobile Banking

1. INTRODUCTION

Creating and fostering customer loyalty is one of the most important goals of businesses (Pham et al., 2020). Many studies have examined the factors that influence customer loyalty in traditional and online commerce settings, for example, brick-mortar banking and online banking (Van et al., 2020b). However, as mobile commerce becomes more and more commonplace and mobile banking is one of its most vivid forms of manifestation (Pham et al., 2019c), concern focuses on the question: How can a bank effectively maintain its clients and enhance its competitive edge in the mobile banking environment?

Evaluating previous studies in the traditional commerce setting provides the theoretical foundations for investigating factors influencing customer loyalty in the mobile banking environment. Specifically, Parasuraman and Grewal (2000) proposed a chain model showing the relationships among service quality, value, and loyalty in their conceptual research. In this chain model, service

quality has a positive effect on perceived value, and in turn, perceived value has a positive effect on customer loyalty.

Many studies have been conducted in traditional banking and online banking environments, indicating that this model is reliable and valid (Jian et al., 2015). This means that if the quality of online or traditional banking services is good, customers will appreciate the value created, which in turn will lead to increased customer loyalty. In addition to empirical evidence supporting the relationships among service quality, perceived value, and loyalty, another theoretical foundation has been established, which is a model indicating the relationships among service quality, satisfaction, and loyalty in the traditional and online banking environments (Long & Vy, 2016). Specifically, good quality of service leads to satisfaction, and in turn, satisfaction leads to loyalty.

Surprisingly, no research has been conducted combining two chain models, (1) service quality ® satisfaction ® loyalty, and (2) service quality ® perceived value ® loyalty, into an integrated model to consider its predictive power for the final construct—loyalty. Furthermore, switching costs are seen as a factor affecting loyalty (Lee et al., 2001). However, no studies have examined switching costs' moderating role in the relationships between perceived value and loyalty, between satisfaction and loyalty, and between service quality and loyalty. Therefore, it is necessary to put the two chain models and switching costs into an integrated model to examine its predictive power for customer loyalty in the new banking environment—the mobile banking setting.

We believe that, as in traditional and online banking settings, dimensions of service quality play different roles in shaping overall service quality in mobile banking, and mobile banking service quality not only directly affects loyalty but also indirectly affects loyalty through perceived value and satisfaction. This study aims to fill the research gaps. Combining two chain models and switching costs (including bank and platform) into the integrated model, we look at the relationships among mobile banking service quality, perceived value, satisfaction, switching costs, and loyalty in the mobile banking context. The specific objectives are as follows:

- (1) Examine the relationship between mobile banking service quality and customer loyalty.
- (2) Examine the relationship between mobile banking service quality and customer satisfaction.
- (3) Investigate the relationship between perceived value, customer satisfaction, and customer loyalty.
- (4) Consider whether bank switching costs and platform switching costs have moderating effects on the relationships between customer satisfaction and customer loyalty, between mobile banking service quality and customer loyalty, and between perceived value and customer loyalty.

To assess these relationships, the authors employed Partial Least Squares Structural Equation Modeling. This modeling technique is preferred due to our desire to predict customer loyalty and the investigation of a moderated model (Moore, 2020). The results of the study clearly demonstrate that customer loyalty is impacted by service quality. These results demonstrate that managers involved with mobile banking should consider that entirety of their mobile banking services when making managerial decisions.

2. CONCEPTUAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

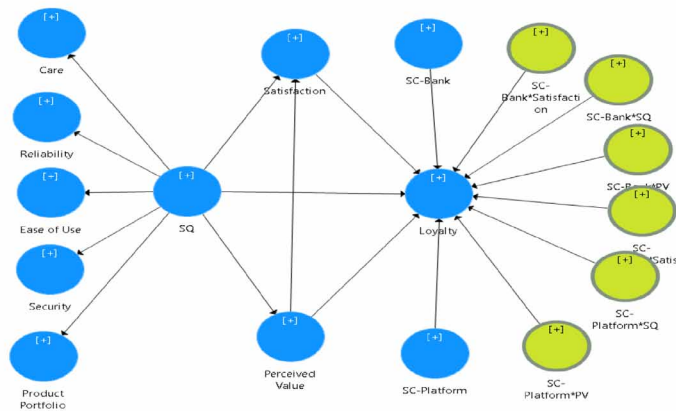
The underlying theory for this research is the chain model of service quality ® perceived value ® loyalty built by Parasuraman and Grewal (2000). This chain model has been confirmed in both traditional and online commercial environments (Jiang et al., 2015). Besides, the second chain model on the relationships of service quality ® satisfaction ® loyalty is also confirmed in traditional and online commercial settings (Long & Vy, 2016). Because of the empirical evidence supporting the role of switching costs in determining loyalty (Lee et al., 2001), in this study, the two chain models and switching costs are combined to form an integrated research model in the context of mobile banking

in Figure 1. Based on a review of previous studies, 14 hypotheses are generated. These hypotheses revolve around the relationships among mobile banking service quality, perceived value, satisfaction, switching costs, and loyalty. Furthermore, the moderating role of switching costs (both bank and platform) is proposed in the relationships between satisfaction and loyalty, between mobile banking service quality and loyalty, and between perceived value and loyalty.

2.1. Mobile Banking Service Quality and Perceived Value

Customer perceived value is considered based on the theory of equity (Yang & Peterson, 2004). Equity refers to the degree to which a customer perceives whether the value received is fair, correct, and worthwhile in comparison to costs (Bolton & Lemon, 1999). In the traditional commercial environment with goods and services trading, perceived value is created on the basis of comparing the customer’s output to input ratio with the service provider’s output to input ratio (Oliver & DeSarbo, 1988). Note that the output is related to benefits, while the input is related to costs.

Figure 1. Research model



Perceived costs consist of two parts, which are monetary costs and non-monetary costs (Yang & Peterson, 2004). Non-monetary costs are related to the time a customer has to spend searching for information about products or services of interest. This information will assist the customer in making purchasing decisions of favorite products or services. In addition, non-monetary costs are also associated with the stress and frustration of participating in the process of buying and selling goods or services with different transactions or exchanges.

Perceived value is not only studied in the traditional commercial environment but also in the e-commerce environment (Jiang et al., 2015). The traditional commercial environment is characterized by the interactions between the customers and the service provider’s employees, while the e-commerce environment is characterized by the interactions between the customers and the service provider’s website. Both these environments emphasize perceived value as a determinant of the service provider’s long-term success and profitability (Pham et al., 2019a; Pham et al., 2019b).

In today’s era, with the rapid development of mobile devices connected to wireless Internet, traditional commerce and e-commerce have evolved into mobile commerce (Bui et al., 2020). In the mobile commerce environment, the level of competition increases as searching for information and comparing output, input, and output to input ratios among service providers are easily carried out

by customers. It can be said that mobile banking is one of the most vivid manifestations of mobile commerce (Gu et al., 2009). Mobile banking is considered an evolutionary form of online banking. With just a mobile device connected to wireless Internet, customers can check account balances, transfer money, pay bills, or engage in financial investments without being limited by space or time (Yuan et al., 2016).

Perceived value is influenced by service quality (Parasuraman & Grewal, 2000). Although there is much debate about what constitutes service quality, there is a tendency to assume that service quality is considered on the basis of the difference between customer service expectations and experiences (Jiang et al., 2015). The SERVQUAL scale is commonly used to evaluate service quality in the traditional service environment. In the online service environment, many studies show that service quality attributes have different importance in shaping the overall online service quality. For example, Liu and Arnett (2000) contended that system design quality, information quality, system use, and playfulness influence the success of a website in the e-commerce setting. Sohn (2000) argued that interactivity, ease of use, trust, contents of web pages, speed of delivery, and reliability impact the overall quality of online services. Jun and Cai (2001) indicated that reliability, access, and responsiveness are the most important factors influencing the quality of e-banking services.

Empirical evidence shows that service quality is positively related to perceived value in traditional and online banking environments (Jiang et al., 2015). Some studies also show that in the mobile banking environment, service quality has a positive impact on perceived value. Therefore, the following hypothesis is proposed:

H1: Mobile banking service quality has a positive relationship with perceived value.

2.2. Mobile Banking Service Quality and Loyalty

Customer loyalty is one of the most important goals that companies/organizations always aim for (Nguyen et al., 2020; Pham et al., 2019a; Pham et al., 2019b; Pham et al., 2018a; Pham et al., 2018b). Customer loyalty is seen as a long-term commitment to the acquisition of one or more preferred products or services (Neal, 1999). Customer loyalty is established and accumulated when a customer feels that buying and consuming a product or service can bring value to him or her (Oliver, 1999). In the traditional commercial environment, evidence from empirical studies points to a positive relationship between service quality and customer loyalty (Zeithaml, 2000). This result is also confirmed in the online commerce environment. Heim and Sinha (2001) indicated that product information, website navigation, price, timeliness of delivery, product availability, and ease of return have a positive impact on customer loyalty. Yen and Gwinner (2003) mentioned that convenience, efficiency, perceived control, and performance of technology are positively correlated to customer loyalty. Furthermore, Srinivasan et al. (2002) found that choice, care, customization, community, customer cultivation, and positively perceived character of the e-tailer have positive relationships with customer loyalty.

Studies also show that in traditional and online banking environments, service quality has a positive relationship with customer loyalty (Long & Vy, 2016). Therefore, the following hypothesis is proposed:

H2: Mobile banking service quality has a positive relationship with loyalty.

2.3. Mobile Banking Service Quality and Satisfaction

Customer satisfaction refers to the customer's emotional response to experiences related to transactions with a service provider (Oliver, 1999). As information and communication technology and e-commerce evolve widely, online customer satisfaction is formed on the basis of customers' overall assessment of online experiences related to transactions, interactions, and buying products or services (Huy et al.,

2019; Jun & Cai, 2001). Studies have shown the relationship between service quality and customer satisfaction (Pham & Doan, 2014).

The SERVQUAL scale is commonly used to evaluate the quality of service in the traditional commercial environment. SERVQUAL includes five factors (Parasuraman et al., 1988): Responsiveness (the willingness to help customers and provide fast services); Tangibles (the appearance of facilities, equipment, and personnel); Assurance (the knowledge and courtesy of staff and their ability to bring about trust and confidence); Reliability (the ability to perform the committed services correctly and trustfully); and Empathy (the accessibility, reachability, and ability to understand the customers and their needs).

When e-commerce was born and developed, SERVQUAL was no longer suitable to measure the quality of service characterized by the interactions between the service provider's website and the customer. As a result, several online service quality measurement scales have been developed. Jun and Cai (2001) constructed a measurement scale consisting of 17 factors, which were grouped into three categories, namely, online system quality, product service quality, and customer service quality. Zeithaml, Parasuraman, and Malhotra (2002) developed a foundation consisting of 11 factors to measure online service quality: security/privacy, assurance/trust, responsiveness, personalization, efficiency, reliability, flexibility, access, ease of navigation, site aesthetics, and price knowledge. Yang, Jun, and Peterson (2004) believed that attentiveness, reliability, access, credibility, security, and ease of use served as important factors that could be used to measure online service quality. Parasuraman, Zeithaml, and Malhotra (2005) built a framework to measure online service quality. This framework includes E-S-Qual as a core online service quality scale (fulfillment, efficiency, privacy, and system availability) and E-RescS-Qual as an online recovery service quality scale (compensation, responsiveness, and contact).

Mobile commerce is an evolutionary form of online commerce and traditional commerce (Kalinic & Marinkovic, 2016). Mobile banking is one of mobile commerce's specific manifestations (Luo et al., 2010). In the mobile banking environment, with just one mobile device connected to wireless Internet, customers can enjoy a variety of banking services, such as checking account balance, transferring money, paying bills, or participating in financial investments (Hanafizadeh et al., 2014; Van et al., 2020). Studies in traditional and online commerce settings have shown that service quality has a positive relationship with satisfaction (Long & Vy, 2016). Therefore, the following hypothesis is proposed:

H3: Mobile banking service quality has a positive relationship with satisfaction.

2.4. Perceived Value and Customer Satisfaction

Customer satisfaction can be analyzed through the context of a particular transaction or the context of accumulation (Cronin & Taylor, 1992). In a transaction-specific context, customer satisfaction is seen as an assessment of the customer's buying experience (Boulding et al., 1993). Contrary to the context of a particular transaction, in the context of accumulation, customer satisfaction stems from an overall and comprehensive assessment, which means that such an evaluation is based on all relevant experiences relating to the customer's transactions and interactions (Zeithaml et al., 2009).

Studies in both traditional and online commercial environments show that perceived value is one of the most important factors influencing satisfaction (Yang & Peterson, 2004). Consistent with these studies, in the mobile banking environment (one of mobile commerce's key embodiments), the following hypothesis is proposed:

H4: Perceived value has a positive relationship with satisfaction.

2.5. Perceived Value and Customer Loyalty

Customer loyalty refers to the customer's intention to continue or increase the customer's transactions or interactions with the company (Oliver, 1999). Furthermore, customer loyalty indicates a tendency to recommend the company to others (Jun et al., 2004). Previous studies have shown that perceived value is a factor that positively affects customer loyalty (Yang & Peterson, 2004). In the e-commerce environment, perceived value is one of the most important factors driving customer loyalty (Pham et al., 2020). In the context of both traditional and online banking environments, empirical evidence shows that perceived value influences the loyalty of customers (Pham & Doan, 2014). Note that a bank may offer a high price or fee for a product when it attaches useful services to that product. Customers may perceive a high value of this product in comparison to the same product offered by the bank's competitors. Consistent with this point of view, in the mobile banking environment, the following hypothesis is proposed:

H5: Perceived value has a positive relationship with loyalty.

2.6. Satisfaction and Loyalty

In this study, customer loyalty is measured through the customer's intention to continue or increase the conduct of purchases of goods or services with the customer's current company (Anderson & Srinivansan, 2003). Furthermore, customer loyalty is also measured through the tendency to recommend the company to others (Jun & Cai, 2001). This measurement has been shown to be useful in previous studies (Huy et al., 2019). Satisfied customers tend to have a higher level of consumption for a product or service than unsatisfied customers. Satisfied customers tend to have stronger acquisition intentions and recommend products or services to their acquaintances (Pikkarainen et al., 2006). Studies show that in both traditional and online banking environments, customer satisfaction leads to customer loyalty (Long & Vy, 2016). This relationship seems to be applicable in the mobile banking environment. Therefore, the following hypothesis is proposed:

H6: Customer satisfaction has a positive relationship with loyalty.

2.7. Effects of Switching Costs

Switching costs can be considered from an economic, psychological, or emotional point of view (Yang & Peterson, 2004). Switching costs are influenced by different factors depending on the characteristics of customers, products, or businesses. In the eyes of customers, switching costs include costs related to money, behavior, searching, and learning (Marinosa, 2001).

In the traditional and online commerce settings, evidence from empirical studies has shown that switching costs affect not only loyalty but also the relationship between satisfaction and loyalty and the relationship between perceived value and loyalty (Yang & Peterson, 2004). Note that when switching costs are significant, customers who are unsatisfied or do not perceive a high value in transactions or interactions with an existing service provider still may not turn to the company's competitors' transactions or interactions (Lee et al., 2001).

Studies show that switching costs can have a moderating effect on the relationship between satisfaction and loyalty. For example, Lee et al. (2001) pointed out that switching costs affect the relationship between satisfaction and loyalty in the mobile phone service environment. Similar results are found in the study of Sharma and Patterson (2000) in the personal financial planning service environment.

The mobile banking environment is increasingly competitive. Banks can offer new customers monetary incentives to motivate them to change their banks. Some banks also offer free training to help new customers familiarize themselves with their products or services. Consequently, the ultimate net impact of switching costs depends on the relationship between benefits and costs not only in the customer's relationship with the current bank but also on the actions that the bank's competitors deploy.

So far, there have been few studies examining the role of switching costs in the relationship between perceived value and loyalty in the mobile banking environment. However, there is a high correlation between perceived value and customer satisfaction (Yang & Peterson, 2004), so it makes sense to consider the moderating effects of switching costs on the relationship between perceived value and loyalty. Consistent with previous studies, in the mobile banking environment, the following hypothesis is proposed:

H7: Bank switching costs have a positive relationship with customer loyalty.

H8: Platform switching costs have a positive relationship with customer loyalty.

H9: Bank switching costs have a moderating effect on the relationship between customer satisfaction and customer loyalty.

H10: Platform switching costs have a moderating effect on the relationship between mobile banking service quality and customer loyalty.

H11: Banking switching costs have a moderating effect on the relationship between perceived value and customer loyalty.

H12: Platform switching costs have a moderating effect on the relationship between customer satisfaction and customer loyalty.

H13: Platform switching costs have a moderating effect on the relationship between mobile banking service quality and customer loyalty.

H14: Platform switching costs have a moderating effect on the relationship between perceived value and customer loyalty.

3. RESEARCH METHOD

Measure

Survey tools require content validity. Content validity is assessed by whether items accurately measure what is expected to measure. To ensure content validity, the measurement scales were borrowed and adapted from previous studies. These measurement scales have been confirmed in terms of reliability and validity.

In the research model, the relationships among service quality, satisfaction, perceived value, loyalty, banking switching costs, and platform switching cost are considered. Mobile banking service quality is a second-order construct, consisting of five first-order constructs, namely, care, reliability, ease of use, security, and product portfolio. This measurement scale was adapted from a scale previously published by Jiang et al. (2015) to suit the mobile banking environment. Specifically, care includes six items; reliability and ease of use are measured with four items, security and product portfolio are measured with three items.

The second construct is satisfaction, which is measured with five items. The third construct, perceived value, is measured with five items adapted from two previously published scales, Yang and Peterson (2004) and Jiang et al. (2015). The fourth construct is loyalty. The measures for this variable were adapted from Yang and Peterson (2004) and Jiang et al. (2015), and the measure includes six items. The bank switching cost construct is borrowed from Yang and Peterson (2004) and consists of three items. The platform switching cost construct is built based on the

bank switching cost construct and consists of three items. In addition, demographic information is also included in the questionnaire.

The preliminary questionnaire was sent to a group of three academics and two managers who were knowledgeable in the mobile banking field for their evaluating content and semantics. Based on their feedback, some modifications were made to improve the questionnaire. The revised questionnaires were pretested by ten students who were using mobile banking. These students indicated that the questionnaire was completely understandable.

Sample and Data Collection

Questionnaires were emailed to students at the School of Business of a national university in the southeastern United States. Specifically, the school's lecturers were approached about the purposes and contents of the survey. The lecturers who were interested helped the data collection by emailing the survey link to their students. The student participation in this survey was completely voluntary; however, some students were offered bonus credit for completing the survey. Participants answered items on a 5-point Likert scale, ranging from 1 'totally disagree' to 5 'strongly agree.'

A total of 283 responses were collected. Of these 283 responses, 25 questionnaires were substantially incomplete; thus, they were removed from the analysis. In total, 258 questionnaires were used for statistical analysis. Demographic characteristics are shown in Table 1.

Male respondents accounted for 46.1%. By age, 21.7% are under 20, 68.6% between 21 and 29, 5.4% between 30 and 39, and 4.3% over 39 years old. In terms of the highest education level achieved, 51.2% have a high school diploma; 44.6%, 2-years degree; and 4.3%, 4-years degree. Regarding income before monthly tax, 26.5% are below \$300; 17.1% between \$300 - \$499; 26.1% between \$500 - \$999; 14% between \$1000 and \$1999; and 16.3%, \$2000 or more. In terms of student classification, 19% are sophomores; 20.2%, juniors; and 60.8%, seniors. For years of using mobile banking, 12.5% are under one year, 49.6% between 1 and 3 years and 37.9% are 4 years or more. Of the respondents, 67% had problems using mobile banking.

In research using surveys, one of the issues of concern is non-response bias. As suggested by Armstrong and Overton (1977), non-response bias was examined through t-tests, and the results of these tests showed no statistically significant differences at the 5% significance level between the early and late respondents for all measures, implying that, in this study, no-response bias is not a major problem.

Statistical Techniques Used for Data Analysis

Statistical techniques, for example, descriptive statistics, correlation coefficients, factor analysis, and structural equation modeling, were used to analyze the data in this study. Specifically, structural equation modeling techniques were utilized to estimate the path coefficients between constructs. Note that both measurement and structural models must be statistically valid and reliable to ensure that the full model is as well. Therefore, Bollen's (1989) 2-step analytical process to evaluate measurement models and structural models is conducted. The measurement model is analyzed in Step 1, while the structural model is considered with the aim of testing the statistical hypotheses in Step 2. The two main statistical software packages utilized for the statistical analyses are SPSS 25 and SmartPLS 3.

4. RESULTS

Before analyzing the structural and measurement qualities of the model, descriptive statistics were reviewed. The results showed that there were no outliers. With the sample size of 258, measurement

Table 1. Characteristics of respondents

Characteristics		Count and Proportion	
Gender	Male	119	46.1
	Female	139	53.9
	Total	258	100.0
Age	Less than 20 years old	56	21.7
	21 - 29	177	68.6
	30 - 39	14	5.4
	Over 39	11	4.3
	Total	258	100.0
Education	High school	132	51.2
	2-years degree	115	44.6
	4-years degree	11	4.3
	Total	258	100.0
Pre-tax income per month	Less than \$300	68	26.5
	300 - 499	44	17.1
	500 - 999	67	26.1
	1000 - 1999	36	14.0
	2000 or more	42	16.3
	Total	257	100.0
Student classification	Sophomore	49	19.0
	Junior	52	20.2
	Senior	157	60.8
	Total	258	100.0
Years with current primary bank	Less than one year	18	7.0
	1 - 3	85	33.1
	4 or more	154	59.9
	Total	257	100.0
Frequency of using mobile banking per month	One time	22	8.6
	2 - 3	39	15.2
	4 or more	196	76.2
	Total	257	100.0
Number of years using mobile banking	Less than one year	32	12.5
	1 - 3	127	49.6
	4 or more	97	37.9
	Total	256	100.0
Issues occurred while using mobile banking	Yes	67	26.1
	No	190	73.9
	Total	257	100.0

and structural models were analyzed with an acceptable level of accuracy. For observed variables with missing values, their means were used as alternatives—a common method for statistical analysis.

Because there was only one method of data collection, that is, the questionnaire was sent to students via email. It is, therefore, necessary to consider whether common method bias is present (Podsakoff et al., 2003). Using Harmon's one-factor method, all observed variables were loaded into just one factor, and the results showed that less than 50% of the variability was explained by that single factor. In addition, VIF values were considered to see if multicollinearity was an issue in the model. All VIF values were less than 5, which indicates that multicollinearity does not pose an issue in the model. Combining Harmon's one-factor approach and analysis of VIF values, it can be concluded that common method bias is not a matter of concern.

To assess whether mobile banking service quality includes care, reliability, ease of use, security, and product portfolio, an exploratory factor analysis was conducted for mobile banking quality factors. The results showed that there are five factors of mobile banking service quality. The loading of each observed variable for its respective factor is high and for other factors is low. The loadings are in the range between 0.645 and 0.877; this indicates that all measured items loaded appropriately to their respective constructs (Moore, 2020). In addition, Cronbach's alpha coefficients of mobile banking service quality factors are in the range of 0.866 and 0.885.

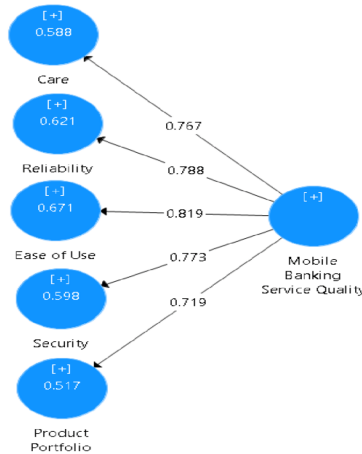
To further examine the structure of mobile banking service quality, confirmatory composite analysis was conducted (Hair et al., 2020). Mobile banking service quality is a higher-order construct that includes first-order abstract variables (component mobile banking service quality factors). Figure 2 shows the path coefficients of mobile banking service quality to component mobile banking service quality factors and R^2 coefficients. Specifically, the regression coefficient of mobile banking service quality on care is 0.767 ($R^2 = 0.588$); on reliability, 0.788 ($R^2 = 0.621$); on ease of use, 0.819 ($R^2 = 0.671$); on security, 0.773 ($R^2 = 0.598$); and on product portfolio, 0.719 ($R^2 = 0.517$). All the regression coefficients of mobile banking service quality on component mobile banking service quality factors are statistically significant at the 1% significance level. Moreover, the loading values of observed variables on respective component mobile banking service quality factors are all greater than 0.8. All loading values are statistically significant at the 1% significance level. Composite reliability values for care, reliability, ease of use, security, and product portfolio are 0.911, 0.920, 0.927, 0.926, and 0.918, respectively. The AVE (average variances extracted) values for care, reliability, ease of use, security, and product portfolio are 0.720, 0.743, 0.809, 0.806, and 0.790, respectively.

The square root of AVE for each component mobile banking service quality factor is greater than the correlation coefficient between that factor and the other factors. The HTMT value for each of the component mobile banking quality factors are all less than 0.85. All these statistics show that the mobile banking service quality measurement scale has high reliability and high convergent and discriminant validity.

After confirming the mobile banking service quality measurement scale's reliability and validity, the overall measurement model, including all unobserved variables and their observed variables, were analyzed at the same time. The overall measurement model was evaluated based on three criteria: reliability, convergent validity, and discriminant validity. The abstract variable's reliability was examined through Cronbach's alpha coefficients, composite reliability coefficients, and AVE values. Table 2 shows that Cronbach's alpha and composite reliability coefficients are both greater than 0.7, and AVE values are greater than 0.5. This demonstrates the overall measurement model's reliability. Convergent validity is considered based on factor loadings. Table 2 shows that all factor loadings are greater than 0.6, demonstrating the overall measurement model's convergent validity.

Discriminant validity is considered based on comparing the square root of each abstract variable's AVE and correlation coefficients between that abstract variable and other abstract variables. Table 3 shows this comparison. The square root values of AVEs are on the diagonal, and the square root of AVE for each factor is greater than the correlation coefficients between that factor and other factors.

Figure 2. Dimensions of service quality



In addition, discriminant validity is also considered based on the HTMT values. Table 4 shows that the HTMT values are all less than 0.85. Discriminant validity is confirmed because the square root of each factor’s AVE is greater than the correlation coefficients between that factor and other factors, and the HTMT values are less than 0.85.

After confirming the overall measurement model’s reliability and validity, the structural model was analyzed to test statistical hypotheses. Note moderating effects were analyzed based on the fact that loyalty is the dependent variable, switching cost (bank), and switching cost (platform) as moderator variables, satisfaction, service quality, and perceived value as independent variables. The estimated values of path coefficients between constructs are shown in Figure 3.

The path coefficients of mobile banking service quality to component mobile banking service quality factors are positive. The path coefficients of mobile banking service quality to satisfaction, perceived value, and loyalty are positive. The path coefficients of satisfaction and perceived value to loyalty are positive. Furthermore, the path coefficients of bank and platform switching costs to loyalty are positive. The impacts of bank switching costs on the relationship between satisfaction and loyalty and the relationship between mobile banking service quality and loyalty are positive; meanwhile, the relationship between perceived value and loyalty is negative. The impacts of platform switching costs on the relationship between satisfaction and loyalty and the relationship between perceived value and loyalty are positive, while the relationship between mobile banking service quality and loyalty is negative. The whole model explains 72% of the variability of loyalty.

Figure 4 shows estimates of t-values. These values are all greater than 2, except for t-values of path coefficients of bank switching costs, platform switching costs, and moderating effects on loyalty.

Based on Figure 3 and Figure 4, the testing of statistical hypotheses is summarized in Table 5. Specifically, hypotheses H1, H2, H3, H4, and H5 are all statistically supported, while hypotheses H6, H7, H8, H9, H10, H11, H12, H13, and H14 are not statistically supported.

5. DISCUSSIONS AND IMPLICATIONS

The objectives of this study are to integrate two chain models (service quality ® perceived value ® loyalty and service quality ® satisfaction ® loyalty) and switching costs into an overall model to predict customer loyalty in the mobile banking environment. Furthermore, the moderating role of

Table 2. Values of loadings, composite reliability, Cronbach's alpha, and average variance extracted

Construct	Item	CAR	EAS	CUSL	PER	PRO	REL	BAN	PLA	CUSS	SEC
1. BAN	BAN1							0.607			
CR = 0.802	BAN2							0.673			
CA = 0.731	BAN3							0.966			
AVE = 0.585											
2. CAR	CAR1	0.843									
CR = 0.911	CAR2	0.848									
CA = 0.870	CAR5	0.858									
AVE = 0.720	CAR6	0.845									
3. CUSL	CUSL1			0.882							
CR = 0.926	CUSL3			0.896							
CA = 0.899	CUSL4			0.716							
AVE = 0.715	CUSL5			0.872							
	CUSL6			0.848							
4. CUSS	CUSS1									0.883	
CR = 0.948	CUSS3									0.91	
CA = 0.927	CUSS4									0.9	
AVE = 0.821	CUSS5									0.93	
5. EAS											
CR = 0.927	EAS2		0.899								
CA = 0.882	EAS3		0.887								
AVE = 0.809	EAS4		0.912								
6. PER	PER1				0.805						
CR = 0.928	PER2				0.812						
CA = 0.903	PER3				0.82						
AVE = 0.721	PER4				0.906						
	PER5				0.898						
7. PLA	PLA2								0.749		
CR = 0.856	PLA3								0.97		
CA = 0.722											
AVE = 0.751											
8. PRO	PRO1					0.909					
CR = 0.919	PRO3					0.935					
CA = 0.825											
AVE = 0.850											
9. REL	REL1						0.847				
CR = 0.920	REL2						0.881				
CA = 0.884	REL3						0.893				
AVE = 0.743	REL4						0.823				
10. SEC	SEC1										0.838
CR = 0.926	SEC2										0.927

continued on next page

Table 2. Continued

Construct	Item	CAR	EAS	CUSL	PER	PRO	REL	BAN	PLA	CUSS	SEC
CA = 0.879	SEC3										0.925
AVE = 0.806											

Note: BAN – SC-Bank; CAR – Care; CUSL – Loyalty; CUSS – Satisfaction; EAS – Ease of Use; PER – Perceived Value; PLA – SC-Platform; PRO – Product Portfolio; REL – Reliability; SEC – Security; CR – Composite Reliability; CA – Cronbach’s Alpha; AVE – Average Variance Extracted. All loading values are statistically significant at p-value < 1%.

Table 3. Discriminant validity

	CAR	EAS	CUSL	PER	PRO	REL	BAN	PLA	CUSS	SEC
CAR	0.848									
EAS	0.539	0.899								
CUSL	0.556	0.644	0.845							
PER	0.43	0.418	0.656	0.849						
PRO	0.493	0.536	0.518	0.538	0.922					
REL	0.446	0.582	0.556	0.492	0.45	0.862				
BAN	0.055	0.025	0.159	0.173	0.07	0.048	0.765			
PLA	0.036	0.059	0.169	0.224	0.081	0.116	0.76	0.867		
CUSS	0.504	0.667	0.79	0.648	0.563	0.529	0.137	0.111	0.906	
SEC	0.474	0.541	0.563	0.476	0.496	0.532	0.031	0.078	0.603	0.898

Note: BAN – SC-Bank; CAR – Care; CUSL – Loyalty; CUSS – Satisfaction; EAS – Ease of Use; PER – Perceived Value; PLA – SC-Platform; PRO – Product Portfolio; REL – Reliability; SEC – Security. Square root of AVE values are on the diagonal.

Table 4. HTMT values

Construct	CAR	EAS	CUSL	PER	PRO	REL	BAN	PLA	CUSS	SEC
CAR	-									
EAS	0.613	-								
CUSL	0.629	0.711	-							
PER	0.484	0.463	0.714	-						
PRO	0.579	0.616	0.591	0.622	-					
REL	0.505	0.654	0.61	0.549	0.523	-				
BAN	0.093	0.142	0.148	0.172	0.089	0.104	-			
PLA	0.06	0.073	0.188	0.258	0.094	0.113	1.012	-		
CUSS	0.56	0.733	0.85	0.705	0.64	0.583	0.123	0.132	-	
SEC	0.539	0.603	0.62	0.528	0.574	0.599	0.044	0.089	0.661	-

Note: BAN – SC-Bank; CAR – Care; CUSL – Loyalty; CUSS – Satisfaction; EAS – Ease of Use; PER – Perceived Value; PLA – SC-Platform; PRO – Product Portfolio; REL – Reliability; SEC – Security; HTMT – Heterotrait-Monotrait.

Figure 3. Path coefficient estimates

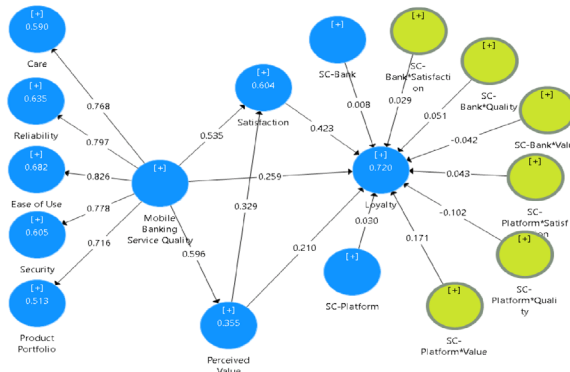
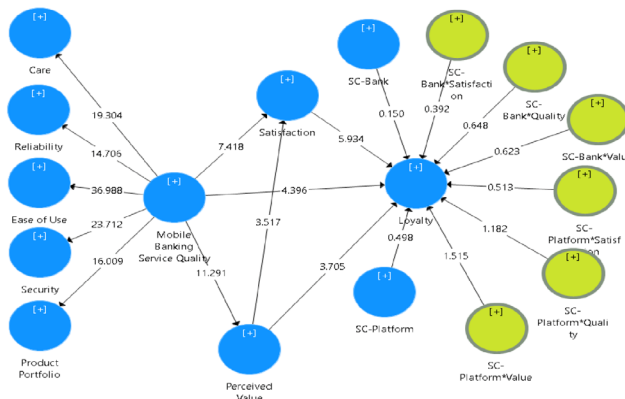


Figure 4. Estimates of t-values



switching costs (bank and platform) is considered in the relationships between perceived value and loyalty, between service quality and loyalty, and between satisfaction and loyalty.

Summary of Results

The first result in this study is that mobile banking service quality is a second-order abstract variable, including component mobile banking service quality factors. The path coefficient of mobile banking service quality to perceived value is 0.596 (t-value, 11,291; p-value < 0.001; R^2 , 0.355; f^2 , 0.550; Q^2 , 0.252). This indicates that H1, mobile banking service quality has a positive relationship with perceived value, which is statistically supported.

The path coefficient of mobile banking service quality to loyalty is 0.259 (t-value, 4,396; p-value < 0.001; f^2 , 0.101). This indicates that H2 (mobile banking service quality has a positive relationship with customer loyalty) is statistically supported. The path coefficient of mobile banking service quality

to satisfaction is 0.535 (t-value, 7.418; p-value < 0.001; f^2 , 0.466). This indicates that H3 (mobile banking service quality has a positive relationship with customer satisfaction) is statistically supported.

The path coefficient of perceived value to satisfaction is 0.329 (t-value, 3.517; p-value < 0.001; f^2 , 0.177). This implies that H4, perceived value has a positive relationship with customer satisfaction, is statistically supported. The path coefficient of perceived value to loyalty is 0.210 (t-value, 3.705; p-value < 0.001; f^2 , 0.076). This implies that H5, perceived value has a positive relationship with customer loyalty, is statistically supported. The path coefficient of satisfaction to loyalty is 0.423 (t-value, 5.934; p-value < 0.001; f^2 , 0.239). This implies that H6, satisfaction has a positive relationship with customer loyalty, is statistically supported.

The path coefficient of switching cost (bank) to loyalty is 0.008 (t-value, 0.150; p-value, 0.881; f^2 , 0.000). The path coefficient of switching cost (platform) to loyalty is 0.030 (t-value, 0.498; p-value, 0.595; f^2 , 0.001). This implies that H7, switching cost (bank) has a positive relationship with customer loyalty, is not statistically supported, and H8, switching cost (platform) has a positive relationship with customer loyalty, is not statistically supported. The moderating effects are positive, except for SC-Bank * Perceived Value and SC-Platform * Satisfaction. The t-values' coefficients of moderating effects are all less than 1.6, meaning that these moderating effects are not statistically supported (Hypotheses H9 - H14 are rejected).

The model explains 60.4% of the variability is satisfaction, 35.5% of the variability is perceived value, and 72% of the variability is loyalty. The Q^2 values for satisfaction, perceived value, and loyalty are 48.7%, 25.2%, and 48.5%, respectively.

Table 5. Results of hypotheses testing

Relationship	Hypothesis	Path Coefficient	t-Value	p-Value	Result
SQ – PER	H1	0.596	10.273	0.000	Accepted
SQ – CUSL	H2	0.259	4.410	0.000	Accepted
SQ – CUSS	H3	0.535	7.174	0.000	Accepted
PER – CUSS	H4	0.329	3.463	0.000	Accepted
PER – CUSL	H5	0.210	3.559	0.000	Accepted
CUSS – CUSL	H6	0.423	5.745	0.000	Accepted
SC-Bank – CUSL	H7	0.008	0.149	0.881	Rejected
SC-Platform – CUSL	H8	0.030	0.531	0.595	Rejected
SC-Bank*CUSS - CUSL	H9	0.029	0.382	0.702	Rejected
SC-Bank*SQ – CUSL	H10	0.051	0.686	0.493	Rejected
SC-Bank*PER - CUSL	H11	-0.042	0.597	0.551	Rejected
SC-Platform*CUSS - CUSL	H12	0.043	0.535	0.593	Rejected
SC-Platform*SQ - CUSL	H13	-0.102	1.199	0.231	Rejected
SC-Platform*PER - CUSL	H14	0.171	1.539	0.124	Rejected

Note: SQ – Mobile Banking Service Quality; PER – Perceived Value; CUSL – Loyalty; CUSS – Satisfaction; SC-Bank – Switching Cost (Bank); SC-Platform – Switching Cost (Platform).

Discussion

The results of this study are consistent with those of previous studies. Specifically, mobile banking service quality includes five factors: care, reliability, ease of use, security, and product portfolio. These five factors are identified in Jiang et al. (2015). However, the study by Jiang et al. (2015) took place in the e-commerce environment, while this study is conducted in the mobile banking environment. Mobile banking service quality is a higher-order construct consisting of five first-order constructs. The importance of these first-order constructs in their contribution to overall mobile banking service quality (the second-order constructs) are different, with rankings of importance from highest to lowest: ease of use, reliability, security, care, and product portfolio.

The second result of this study is that mobile banking service quality is positively related to perceived value, loyalty, and satisfaction. Furthermore, perceived value has a positive relationship with satisfaction. This result is consistent with that of other prior studies, such as Jiang et al. (2015), Yang and Peterson (2004), and Parasuraman and Grewal (2000). The prior studies were carried out in the e-commerce environment. The third result is that perceived value and satisfaction are positively related to loyalty, which is consistent with most studies in traditional commerce and e-commerce environments, such as Jiang et al. (2015), Yang and Peterson (2004), and Parasuraman and Grewal (2000). This again confirms that the two chain models (service quality @ perceived value @ loyalty and service quality @ satisfaction @ loyalty) are not only reliable and valid in the traditional commerce and e-commerce environments, but also in the mobile commerce environment, in particular the mobile banking environment—one of mobile commerce's most vivid manifestations.

This study differs from previous studies that took place in traditional, electronic, and mobile commerce environments in the way that bank and platform switching costs are considered. However, both these types of costs do not have direct effects on loyalty. Furthermore, they do not play moderating roles in the relationships between perceived value and loyalty, between service quality and loyalty, and between satisfaction and loyalty.

Implications for Research

This research provides the necessary foundations for more in-depth and comprehensive studies in the future. This study shows that service quality has a positive relationship with perceived value, loyalty, and satisfaction. Subsequent studies should focus on looking at these relationships during different stages of mobile banking to see how the magnitude of these relationships change as mobile banking continues to develop.

The relationships between perceived value, loyalty, and satisfaction are also positive, so future studies should also consider these relationships in different development stages of mobile banking.

Another important point is that perceived value is analyzed on the basis of the output to input ratio under the customer's perspective. Outputs refer to benefits, while inputs refer to costs. Future studies may examine the relationships between service quality and constituent parts of perceived value and the relationships between constituent parts of perceived value, satisfaction, and loyalty.

Last but not least, the relationships among service quality, perceived value, loyalty, and satisfaction in the mobile banking environment may differ from country to country, such as among developed countries, among developing countries, or between developed countries and developing countries, so future studies need to clarify these relationships.

Implications for Practice

This study provides insight for managers of banks providing mobile banking services to customers. The learned knowledge is that in the mobile banking environment, mobile banking service quality has a positive relationship with perceived value, satisfaction, and loyalty. Therefore, bank managers need to develop strategies and action plans to increase the quality of mobile banking services. Increasing the quality of mobile banking will lead to increased perceived value, satisfaction, and loyalty. Mobile

banking service quality includes factors ranging from most important to least important: ease of use, reliability, security, care, and product portfolio. All of these factors must be taken into account in the efforts towards the overall increased quality of mobile banking.

The most important contributor to the overall quality of mobile banking is ease of use. This factor refers to the minimum efforts required to navigate mobile banking applications installed on customers' mobile devices, well organized and structured information on products/services, and, in particular, easily completed mobile banking transactions. The ease of use factor is also one of the most important factors in the technology acceptance model (TAM) and is confirmed as the determinant of the adoption of technologies in the e-commerce environment. Therefore, bank managers must build a mobile banking system where information about mobile banking products/services is well structured and organized, content is concise with terms and conditions being clearly explained, and steps to complete mobile banking transactions are completed simply. Mobile banking applications must be built to suit the configuration of different mobile devices so that customers with different mobile devices can access the bank's mobile banking system conveniently, not limited by space and time.

The second most important factor contributing to mobile banking service quality is reliability. This factor is considered as the degree to which commitments and promises are followed. Furthermore, mobile banking transactions and receipts must be accurately maintained. In fact, in many cases, customers get frustrated when experiencing erroneous mobile banking transactions and interactions, leading to not perceiving values created by mobile banking. Therefore, bank managers providing mobile banking services must have an investment policy or regularly upgrade mobile banking technologies used in meeting their customers' needs in the most reliable way in an effort towards increasing overall mobile banking service quality.

The third most important factor contributing to mobile banking service quality is security. Security deals with potential risks in mobile banking. Note that mobile banking is characterized by interactions between customers and the bank's mobile banking application and is not limited by space and time constraints, so the degree of risk in the mobile banking environment is higher than that in both online and traditional banking environments. Mobile banking managers must develop policies and solutions (technology and people) to ensure that customers perceive low risks in their mobile banking transactions and interactions. There are still customers who are afraid of using mobile banking because they are concerned that their financial and personal information could be leaked or stolen for illegal profit purposes. Responding best to customers' needs and making customers trust in risk minimization solutions in the mobile banking environment is always one of the most important goals that banks offering mobile banking services pay attention to.

The fourth most important factor contributing to mobile banking service quality is care. Care refers to the extent to which a bank providing mobile banking services cares about its customers. This interest is demonstrated through the provision of personalized services in an effort to meet the diverse needs of customers. The unique feature of mobile banking that sets itself apart from online and traditional banking is that banking transactions can happen anytime, anywhere, or in other words, unrestricted by space and time. The basic products and services are generally similar, so in order to differentiate the bank from its competitors, the provision of customized products and services based on the support of mobile banking technologies and applications is essential. In other words, to be able to maintain customer loyalty and profitability in the long term, customer-centric solutions and policies are more important than ever.

The final factor contributing to the quality of mobile banking services is the product portfolio. This factor deals with situations in which a bank's mobile banking products and services are viewed and evaluated in both breadth and depth dimensions. Clients tend to prefer banks that offer a wide variety of products and services. They will be more satisfied if they find the full range of products and services they want when conducting transactions or interactions through mobile banking applications. In order to bring good customer experiences, besides providing main products and services, banks

should also provide free services to customers. The main services and free services are both aiming to create added value for customers in an effort to make customers more satisfied and loyal to the bank.

In this study, perceived value has a positive relationship with satisfaction and loyalty, and satisfaction has a positive relationship with loyalty. Perceived value, therefore, plays a very important role in a bank's mobile banking management strategy. It is worth noting that mobile banking transactions and interactions are not limited by space and time or with just a mobile device with a wireless Internet connection. Customers can enjoy mobile banking products and services anytime, anywhere, and that is also the main reason customers move from traditional and online banking to mobile banking. Bank managers must focus on applying new technology and constantly update existent mobile banking technology to bring more benefits and reduce costs for customers. Doing so will make customers feel valued when participating in mobile banking. In turn, increased perceived value will lead to increased customer satisfaction and loyalty.

6. CONCLUSIONS, LIMITATIONS, AND FUTURE RESEARCH

This study integrates two chain models (service quality ® perceived value ® loyalty and service quality ® satisfaction ® loyalty) and switching costs into an extended research model for predicting customer loyalty in the mobile banking environment. The results show that mobile banking service quality is a second-order construct that includes first-order abstract variables in order of importance: ease of use, reliability, security, care, and product portfolio. Furthermore, mobile banking service quality is found to have a positive effect on perceived value, loyalty, and satisfaction. Perceived value has a positive relationship with satisfaction and loyalty, and satisfaction has a positive relationship with loyalty. The two chain models not only have reliability and validity in the traditional and online commercial environments but also in the mobile commerce environment, specifically in the mobile banking environment. The results also indicate that in the mobile banking environment, bank and platform switching costs have no effect on customer loyalty. Bank and platform switching costs also have no moderating effect on the relationships between satisfaction and loyalty, between service quality and loyalty, and between perceived value and loyalty. Implications have been drawn in efforts to increase mobile banking service quality, perceived value, satisfaction, and loyalty.

Although this is the first study integrating two common chain models to examine the factors that make up the quality of mobile banking services and the relationships among mobile banking service quality, perceived value, satisfaction, and loyalty in the mobile banking environment, there are limitations. One of the limitations is that data was collected from students from the School of Business and Social Sciences of a nationally ranked university in the U.S. Thus, generalizing the results to clients using mobile banking services should be considered with caution. In other words, the convenient sample in this study might not be representative of customers using mobile banking services.

Future studies should be conducted on a representative sample. Furthermore, future studies need to consider the relationships among mobile banking service quality, perceived value, satisfaction, and loyalty according to mobile banking's different levels of development. Specifically, these relationships need to be compared between two developed countries, between two developing countries, and between a developing country and a developed country.

Last but not least, perceived value is constituted by two important components of cost and benefit: future studies should focus on the relationship between mobile banking service quality and each part of perceived value and between each part of perceived value, satisfaction, and loyalty in settings with varying degrees of mobile banking development.

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