Critical Factors Influencing the Behavioral Intention of Consumers towards Mobile Banking in Malaysia

Zahoor Ur Rehman
Faculty of Technology Management and Business
Universiti Tun Hussein Onn Malaysia
Parit Raja, Malaysia
zahoorrehman715@gmail.com

Fazal Ali Shaikh
Department of Economics
University of Sindh
Jamshoro, Pakistan
fazal_110_shaikh@hotmail.com

Abstract—**Mobile banking services are widely adopted in developed and developing countries, while their adoption by Malaysian consumers is relatively low. The effective adoption of mobile banking mostly depends on consumers. This study's objective was to examine the factors that influence Malaysian customers' behavioral intention toward mobile banking. A detailed literature review was conducted in order to identify the critical factors that affect mobile banking users. The research model was based on the Technology Acceptance Model, investigating additionally perceived risk. Primary data were collected from 384 generation Y bank customers. Structure equation modeling through Smart-PLS was used for data analysis. Results revealed that consumers' behavioral intention was significantly and positively influenced by perceived usefulness and ease of use, while a significant negative relationship was found between consumers' behavioral intention and perceived risk. The findings also revealed a mediating relationship of attitude between perceived usefulness, ease of use and risk, and behavioral intention to use mobile banking. The study provides appropriate guidelines to Malaysian banks and mobile banking application developers for the effective implementation and design of mobile banking services.**

Keywords-mobile banking adoption; technology acceptance model; perceived risk; generation Y; Malaysia

I. INTRODUCTION

Mobile banking is defined as any form of banking transaction that is carried out through a mobile device [1]. According to [2], mobile banking got underway at the end of the 1990s. Mobile banking is widespread in developed and developing countries, such as the US [3], the UK [4], China [5], India [6], Pakistan [7, 8], Malaysia [9] and Iran [10]. Juniper research estimated that more than 2 billion mobile users would use their devices for banking by the end of 2021, compared to 1.2 billion people in 2016 [11]. Malaysia is among the fastest growing mobile and telecommunications technology countries in Asia, and the proportion of smartphone users continues to rise from 68.7% in 2016 to 75.9% in 2017, indicating a sharp increase in their penetration rate [12]. Malaysian central bank officially permitted mobile banking services in 2005 [13], and 17 commercial banks announced mobile banking services [14]. Developments in technology and mobile banking applications attracted gradually more users by time, but Malaysian customers show less attention and

enthusiasm towards mobile banking services [15, 16]. Moreover, there is a lack in the awareness of Malaysian customers' acceptance, behavioral intention, and in the investigation of factors affecting their intention to adopt mobile banking. Furthermore, people born between 1980 and 1994, called generation Y [17, 18], are the majority of subscribers of mobile phones in Malaysia. They are the first generation to have spent all their life in the digital environment and information technology fundamentally influences how they live and work [19]. The purpose of this study was to examine the Malaysian generation Y consumers' behavioral intention towards mobile banking adoption.

II. LITERATURE REVIEW

Investigating customers' intention and mobile banking adoption has attracted the focus of many researchers, while this issue has experienced a spectacular increase in the related literature of online and internet banking channels [20–22]. Researchers used different methodologies to describe how consumers articulate their opinions, attitudes, intentions, and behaviors towards mobile banking [21, 23–25]. Despite these studies provided a better understanding of the critical factors for predicting consumers' intention and use of mobile banking, there are further essential aspects to study.

A. Technology Acceptance Model (TAM)

TAM explains technology acceptance from the customer's point of view. It is a model that covers almost all the constructs that determine customers' intentions in adopting mobile banking, and it was selected as the theoretical basis of this study's conceptual model. Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) were proposed as direct determinants of customers' attitude, affecting indirectly the behavioral intention to adopt it. Both factors, Behavioral Intention (BI) and Attitude (ATT), have been identified as important predictors of adoption behavior in mobile banking [26]. Many studies adapted TAM to examine the influence of various factors to the adaptation of technology, concluding that TAM itself is inadequate in explaining the user's decision to adopt technologies [6, 7, 9, 12, 24, 27-31]. According to [9], Perceived Risk (PR) is a decisive factor for customers' perceptions and their intentions in adopting such a technology.

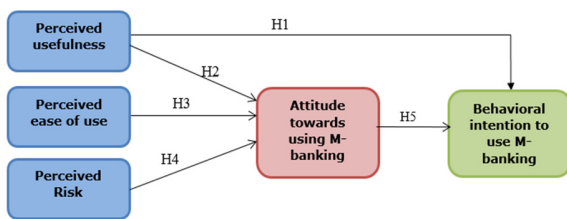Corresponding author: Zahoor Ur Rehman

Fig. 1.   Research framework

B. Perceived Usefulness (PU)

PU is the degree to which a person believes that using a particular system would enhance his job performance [26]. In general, individuals seem interested to adopt new technologies when they believe that technology is more beneficial and suitable for their daily lives [26, 32, 33]. Consumers' attitudes and their intentions to adopt mobile banking are predicted by PU [32, 34-37]. As a result, the following hypotheses were proposed:

H1: PU has a significant relationship with the behavioral intention to use mobile banking

H2: PU has a significant relationship with the attitude towards using mobile banking

C. Perceived Ease of Use (PEOU)

PEOU is the degree to which a person believes that using a particular system would be free of effort [26]. Although individuals may believe that an application is beneficial, they may also think that it is difficult to use [26]. The easier the use of a technology is, the more beneficial it could be, increasing its adoption and usage [38]. Due to the mobile banking applications' features, which require a certain amount of knowledge and skills, perceived ease of use plays an essential role in affecting individuals' attitudes to accept such a system [39]. Several empirical studies have shown that PEOU plays a crucial role in predicting consumers' intentions to use mobile banking, confirming its impact on individuals' attitudes [16, 26, 36, 37]. Thus, the following hypothesis was developed:

H3: PEOU has a significant relationship with the attitude towards using mobile banking.

D. Perceived Risk (PR)

PR is the uncertainty about the outcome of the use of the innovation or the level of uncertainty on its security [40]. Authors in [18] stated that individuals were reluctant to accept mobile banking when the fear of insecurity existed, and increasing uncertainty increased the awareness of risk. PR is recognized as a dynamic factor in predicting an individual's attitude and intention to use mobile banking [19, 21, 41]. In particular, perceived risk was negatively related to the consumers' attitudes towards mobile banking in [6, 34, 42]. An increase in the perception level of risk would decrease consumers' attitudes and intentions towards mobile banking. Hence, the following hypothesis was proposed:

H4: PR has a significant relationship with the attitude towards using mobile banking.

E. Mediating Effect of Attitude and Behavioral Intention to the Use Mobile Banking

Attitude refers to an individual's positive or negative evaluative effect about performing a particular behavior [9], whereas behavioral intention is the measure of the likelihood of a person employing the application [43]. In [44], it was hinted that individuals' attitudes predicted their behavioral intention to use a technology, which sequentially predicted their actual usage behavior. Previous studies examined the relation between individuals' attitudes and their behavioral intentions [7, 16, 43-45]. This study assumes that mobile banking adoption can be predicted by the users' attitudes to the adoption of mobile banking. Furthermore, attitude was hypothesized as a mediator to the relation between PU, PEOU, PR and behavioral intention, as:

H5: Attitude has a significant relationship with the behavioral intention to use mobile banking.

III. METHODOLOGY

Data were collected from 550 respondents, using self-administered questionnaires that investigated their perceptions on the characteristics of their behavior towards mobile banking and usage acceptance. The questionnaire consisted of 38 scale items that measured the constructs of the conceptual model. PR covered nineteen items adapted from [26, 46, 47]. PU and PEOU were determined by nine items each, adapted from [35, 48]. A seven-point Likert scale, from strongly disagree to strongly agree, was used to measure the respondents' responses. Partial Least Squares Equation Model (PLS-SEM) was utilized for the data analysis. PLS-SEM was chosen because of the type of the relationships, the data characteristics, and its convenience.

IV. DATA ANALYSIS

A. Respondent's Profile and Characteristics

Three hundred eighty-four (384) usable questionnaires were collected from generation Y respondents, where 51.4% were male and 48.6% female. The age group of 24-34 years represented the largest part of the total valid samples (76%), the largest group of the respondents (38.2%) had a monthly income between 2000 and 3500 Malaysian Ringgit (MYR), while their vast majority (88.3%) had more than ten years of experience on mobile phones and internet. Moreover, 55.5% of the respondents had already adopted mobile banking services.

B. Construct Reliability

Table I indicates the reliability of the constructs, displaying Cronbach's alpha, Compound Reliability (CR) and Average Extraction Variance (AVE). Results show that Cronbach's alpha for each one of the five variables exceeded the minimum 0.70 threshold [49]. CR values for all the variables are within the range of 0.70, as suggested by [50, 51]. The highest value of CR was 0.96 for PR and attitude, while its lowest was 0.83 for PEOU. As shown in Table I, AVE values for all the variables are above the suggested limit of 0.50 [49], while these values started from 0.52 for PU, reaching 0.86 for attitude.

TABLE I.   CONSTRUCT RELIABILITY AND CONVERGENT VALIDITY

Constructs	Items	Factor loadings	AVE	Composite reliability	Cronbach's alpha
Attitude (ATT)	ATT1	0.944	0.863	0.969	0.960
	ATT2	0.937			
	ATT3	0.904			
	ATT4	0.918			
	ATT5	0.941			
Behavioral intention (BI)	BI1	0.907	0.792	0.950	0.934
	BI2	0.897			
	BI3	0.862			
	BI4	0.900			
	BI5	0.885			
Perceived ease of use (PEOU)	PEOU1	0.776	0.565	0.838	0.744
	PEOU2	0.653			
	PEOU3	0.756			
	PEOU4	0.813			
Perceived risk (PR)	FR1	0.808	0.628	0.966	0.963
	FR2	0.817			
	FR3	0.837			
	FR4	0.831			
	FR5	0.811			
	PERR2	0.594			
	PERR3	0.809			
	PR1	0.847			
	PR2	0.850			
	PR3	0.841			
	PR4	0.892			
	SR1	0.803			
	SR3	0.766			
	SR4	0.805			
	TR1	0.661			
	TR2	0.536			
	TR3	0.867			
Perceived usefulness (PU)	PU1	0.649	0.522	0.844	0.801
	PU2	0.674			
	PU3	0.828			
	PU4	0.811			
	PU5	0.627			

C. Construct Validity

A discriminant validity test was used to indicate that all constructs have not any relationship. Based on the suggested criterion, discriminant validity is acceptable when the square root of the AVE of the variable of interest is higher than any correlation between this and the other variables in the model [52]. As shown in Table II, the diagonal values, which represent each variable's square root, are higher than the inter-correlations between the model's variables, satisfying the discriminant validity criterion. In addition, as shown in Table I, all item loadings meet the recommended 0.5 threshold except of two: security risk (item2) and performance risk (item1), which were excluded.

TABLE II.   DISCRIMINANT VALIDITY

Constructs	ATT	BI	PEOU	PR	PU
ATT	0.929				
BI	0.767	0.890			
PEOU	0.225	0.271	0.752		
PR	-0.135	-0.134	0.481	0.792	
PU	0.173	0.434	0.123	0.042	0.723

D. Structural Model

The path coefficient is the appraisal of the proposed hypotheses and the relationship between the dependent and the independent variables in the structural model. Path coefficient close to 1 is considered as a strong positive correlation, while close to -1 represents a strong negative correlation [53, 54]. As the coefficient approaches zero, the relationship is weaker, while very low values close to zero are generally negligible.

TABLE III.   RESEARCH MODEL EVALUATION

Paths	Beta	t-statistic	p-value	R^2
PU→BI	0.137	4.027	0.000	0.258
PEOU→ATT	0.310	6.104	0.000	
PU→ATT	0.366	8.902	0.000	0.624
PR→ATT	-0.269	3.912	0.000	
ATT→BI	0.658	19.393	0.000	

As shown in Table III, all path coefficients have significant relationships. The highest significant positive path relationship was found between ATT and BI (β=0.658, t=19.393, p=0.000). The second most significant positive relationship was found between PU and ATT (β=0.366, t=8.902, p=0.000). Among significant positive relationships, the lower correlation was found between PEOU and ATT (β=0.310, t=6.104, p=0.000), while the least but significant positive relationship was between PU and BI (β=0.137, t=4.027, p=0.000). On the other hand, the most negative significant relationship was found between PR and ATT (β=-.269, t=3.912, p=0.000). In summary, all positive and negative paths show significant relationships. The results shown in Table III indicate that PU, PEOU, and PR have a direct relationship with the attitude towards the use of mobile banking (R^2=0.258), explaining approximately 26% of its variance. Moreover the combined influence of PU, PEOU, and PR have a moderate effect on behavioral intention (R^2=0.624) explaining about 62% of the variance.

E. Mediating Effect of Attitude towards the Use of Mobile Banking

The variable "attitude towards using mobile banking" was hypothesized to mediate the relationship between PU, PEOU, PR, and behavioral intention to use mobile banking. Results show that all hypotheses are supported, indicating a partial mediation, following the mediation criteria recommended by [51, 54].

V.   DISCUSSION

Results showed that the proposed model was able to reach an acceptable level of predictive power for all factors, as all the criteria related to the measurement model, i.e. construct reliability and validity, were met. Further, R^2 shows the combined effect of the exogenous latent constructs, explaining about 62% of the variance in the endogenous latent construct, suggesting that PU, PEOU, PR and attitude predict the consumers' intention towards mobile banking. According to the path coefficient analysis, attitude was proved as key factor in predicting an individual's intention to adopt mobile banking. Results also made available significant evidence on the causal path between behavioral intention and PU, suggesting that Malaysian consumers' perception of usefulness is fundamental to their intention to adopt mobile banking. Results also showed

the significant relationship between PEOU and attitude towards the use of mobile banking. This means that Malaysians tend to worry about the degree of easiness, or struggle in the use of mobile banking. This relationship is traced back to the fact that clients need some basic knowledge and abilities, due to the special characteristics of mobile banking [10, 42]. In particular, when individuals realize that the use of a technology requires minimum effort, they realize that they can take advantage of it [26]. Regarding the role of PR, results showed that it significantly influenced negatively the behavioral intention through attitude. It is deduced that PR plays a crucial role in shaping the individuals' beliefs and perceptions, affecting their behavior and intention to use mobile banking.

VI. RESEARCH CONTRIBUTION

This study examined the key factors that predict the Malaysian customers' intentions towards mobile banking adoption and its usage, contributing to the literature of online banking channels and technology acceptance in general. Moreover, this study provides useful guidelines towards mobile banking, which has not been evaluated thoroughly in the context of Malaysia. Therefore, this study considerably expands the knowledge and literature in Malaysia, by focusing more thoroughly on mobile banking as a new technology that requires greater understanding. It is also noteworthy that researchers [9, 23, 34, 55] have empirically investigated the validity of TAM in explaining mobile internet services and other technology acceptance in developed and developing countries. Accordingly, this study is amongst the studies that have extended TAM by monitoring a new technology (mobile banking) in a modern context (banking sector) in Malaysia. Furthermore, as the adoption level of mobile banking in Malaysia is considered low, banks should struggle in building trust with users, make mobile banking operating services easier, and customers more aware of mobile banking's usefulness. Banks should minimize the perceived risk factors as a core of their strategic objectives.

VII. RESEARCH LIMITATIONS AND FUTURE DIRECTIONS

Although this study was a successful attempt in exploring the area of mobile banking adoption, however, it has certain limits. Data were collected from a convenient sample of generation Y bank customers in a single state of Malaysia (Johor), which sequentially could negatively affect the generalization of results in other states of the country. This fact increases issues about the results' applicability to other population groups with different demographic characteristics and experience in technology. Moreover, findings were based on cross-sectional data. A future study can deliver more in-depth insight into the mobile banking acceptance and usage in a different context, examining the degree to which the influential factors could stabilize or improve by time.

VIII. CONCLUSION

Mobile banking is an attractive area of interest that should be explored in the light of the challenges related to its adoption. Considering the lower acceptance of mobile banking among customers in Malaysia, this study identified the need to investigate the factors influencing its adoption in Malaysia's

generation Y. Technology acceptance model was extended by including perceived risk as an external construct, which was cited amongst the key factors to predict consumers' intention and adoption of mobile banking. Results proved the predictive validity of the suggested conceptual model, representing approximately the 62% of its deviation. Perceived usefulness, perceived ease of use, perceived risk and attitude were found to be significant predictors of Malaysian consumers' behavioral intentions towards the adoption and use of mobile banking.

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