



Factors Influencing the Adoption of Mobile Banking Applications in Yemen Using an Extended Technology Acceptance Model

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ABSTRACT

In the Yemeni environment, the adoption rate of Mobile Banking Applications (MBA) is lower than expected by banks, and there is a lack of studies that have examined MBA adoption in Yemen. The rapid development in wireless technology and the widespread use of cell phones have motivated banks to invest their budget in building Mobile Banking Applications (MBA). However, the adoption rate of MBA in Yemen falls short of banks' expectations, and there is a scarcity of studies investigating the factors related to MBA adoption. Therefore, this study aims to extend the current understanding of MBA adoption by proposing a theoretical model to investigate the factors influencing Yemeni customers' adoption of MBA. The proposed model extends the Technology Acceptance Model (TAM). Data were collected through a survey questionnaire completed by 473 participants. This study empirically concludes that individuals' intention to adopt MBA is significantly and positively influenced by perceived usefulness, perceived ease of use, perceived value-added services, perceived self-efficacy, social influence, financial cost, perceived system non-availability risk, perceived privacy risk, and perceived security risk.

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1. INTRODUCTION

Over the past years, Mobile Banking (MB) has played an important role in our daily life [1]. Having the ability to use mobile banking to cover daily transactions has gone through several steps. For example, in the past, when customers needed to perform any banking transaction, they would go by themselves to the bank, and then ask the bank employer to perform their transactions after that, they should wait until they have assurance that the operation has been done[2]. As time goes on, new technologies have emerged continually to facilitate daily business processes and user needs One of these technologies is web-based applications, which provide

significant effortless services. Through the adoption of web applications, customers were able to perform some banking transactions such as transferring money and paying utility bills, etc.[3]. Nevertheless, smartphones have spread across all over the world, which opened an opportunity for banks to offer their services as mobile applications. Therefore, Mobile banking applications are considered another kind of banking services, which allow customers to perform banking transactions in an easy and fast manner[2, 4, 5]. Currently, some additional values are given to customers through the adoption of mobile communications, which offers virtual banking transactions at any time[2, 4–7]. Millions of individuals



are frequently using their mobile devices to manage their accounts besides performing other activities such as contacting friends, playing games, and more [8]. Consequently, it is worth mentioning that, the emergence of new information technologies plays a vital role in the advancement of financial industries. Although the growth of international trading has increased, the problem of transferring money has also increased which formed a gap that motivate researchers to propose new solutions and one of these solutions suggested to facilitate service to customers is mobile banking applications. Thus, some researchers have attempted to propose frameworks, models, and strategies. Whereas other solutions have suggested mitigating risks[7, 9, 10], meanwhile others have tried to make systems easy to use even with the presence of some challenges by reducing system complexity to some extent [7], or suggested studying the understanding and improving users' trust, and potential risks of adapting MB applications[11]. Consequently, it is worth pointing out that, there is a widely understanding of the importance of the external factors that would increase the intention of customers toward mobile banking applications that facilitate their daily life transactions. Knowing that, several banks have applied Mobile banking applications in their business transactions for the same reason such as the USA, UK, China, India, Finland, Singapore, Thailand, Malesia, Saudi Arabia[2, 5, 10, 12, 13], and Qatar[14] whereas in Yemen, MBA is still in its initial stage, therefore this study has concentrated on that affection of MBA on Yemeni environment, in this study there is no special tool that used to include factors affected on Yemeni environment; all the selected factors were carefully chosen based on the most affected factors in the developed and developing countries. In addition, several meetings with some marketing employees in Yemeni banks such as Corporation Agriculture Credit (CAC) Bank, and International Bank of Yemen (IBY) have been done to gain the most important factors that affected on customer's satisfaction ratio. Moreover, education, income, risk, and lack of trust factors play a main role in the adoption of electronic services in[2, 5] studies. This study has concentrated on measuring the degree of acceptance toward MBA and how it will be adopted in the Yemeni environment via studying a set of factors. These factors were divided into two sections, the first was benefits which means opportunities and the second was sacrifices which means challenges. The proposed model which depends on these factors for implementing MBA in Yemen's banks, has been built based on a theoretical model that has been implemented and used in multiple studies such as[2, 4, 5, 7, 10]. To the best of our knowledge, there is no such study that has mentioned factors that could influence the behavior intention toward MBA in Yemen. Therefore, the aim of this study is to propose an extended theoretical model to analyze customer's behavior intentions toward the adap-

tion of MBA. Furthermore, this study attempts to fill the gap by understanding the most influential and important factors that could affect customer's behavior intention to use MBA in Yemen. The remainder of this paper is organized as follows. Section 2 presents the related works. Section 3 presents the theoretical model. Section 4 introduces the research method. Section 5 presents data analysis. Section 6 presents the Results Discussion. Section 7 presents the conclusion and implications of this study. Section 8 presents the recommendations and future work.

2. RELATED WORK

According to[4], this study proposed possible benefits and sacrifices MB factors in China, and it identified four Perceived Benefits(PB): (universal, value-added services, social value, and perceived enjoyment) and two Perceived Sacrifices(PS): (fee, perceived risk). The results showed that the two dependents constructs (perceived value, and Trust(T)) has a significant influence on consumers' adoption intention toward MB. A study conducted by[13] identified five factors that influence consumers' behavioral intention to adopt MB: perceived usefulness, perceived ease of use, perceived credibility, perceived self-efficacy, and perceived financial cost. The results indicated that all factors except for perceived financial cost have a positive significant impact on behavioral intention towards MB usage. The comprehensive study of[10] surveyed 1434 participants Chief Information Security Officers of banks, MB Channel Managers and smartphone users, working women and men from Information Technology (IT) and Non-IT companies, homemakers, retired staff of public sector firms, etc. This study was conducted using WhatsApp, Facebook, LinkedIn, emails, and face-to-face interactions to understand the usability-related challenges of MB. From this survey and user comments analysis, there was a clear correlation between usability issues and reliability. The study of [2] has done a deep analysis of different articles on MB adoption from (January 2005–March 2014). This study was done in some developed countries such as the USA, UK, Scandinavian, Central Europe, South Asia, and some other developing countries such as South East Asia, and East Asia. The respondent average for all those studies was 365. This study recommended future researchers focus on cultural and social factors that would increase a positive user attitude and trust toward MB services in developing countries. This study provided an understanding of constructs that influence students' intention to adopt MB, by extending TAM to TAM for mobile services which incorporate additional constructs such as perceived value, perceived ease of adoption, social influence, and perceived trust. Their result showed that the independent constructs trust, perceived value, perceived ease of adoption, and social influence may account for

42% of the explanatory power for the dependent variable in MB use. In addition, strong predictors (perceived value and trust) influenced students' intention to use MB. This study also found that the attitude of students towards MB was positive which motivates them to adopt or continue using MB [15]. The study of [7] supposed five adoption barriers, namely usage, value, risk, tradition, and image. The results showed that uncertainty avoidance has a highly significant effect on innovation resistance, and the strongest influence related to image and risk barriers. The two moderating roles age and gender were taken; age appeared not to moderate the effects while gender was found to be a highly significant moderator in customer adoption intention. The rule of having customer satisfaction and loyalty was found in [16] when they think of having loyalty and satisfaction via employed performance expectancy, price value, facilitating conditions, hedonic motivation, habit, system quality, and service quality factors via building a new model that integrated between two models (UTAUT2 and D&M IS Success Model). The results of this study were tested on six big cities in KSA and noticed that performance expectancy has the highest level of influence over MBA usage among Saudis. A strong relationship was found between actual usage behavior and customer satisfaction. Customer loyalty was observed to be strongly expected by both usage behavior and satisfaction. The factors suggested by [17] were performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, perceived risk, and perceived trust. This study proved that there is a significant association between the behavioral intention to adopt m-commerce and the intention to recommend it to others. In [18], a comparative study of three ways of payment via mobile to analyze the adaptation and use of mobile via buying. They proved the adaptation and use of mobile via practical practice in Spain. Most of Brazil's population are farmers, therefore the main target of [19] study was concerned with how mobile banking was adopted by this class. TAM model was used to prove if it is acceptable by farmers or not and what are the factors that affected them. The result of this study showed that perceived ease of use, perceived usefulness, and trust were the main factors that were interrelated to the usage of mobile banking by the farmers who responded to the survey. The relationship between social influence and the use of mobile banking was negative. This study also raised the level of understanding about the benefits of information technology to the financial routine of farmers. Adoption and usage of mobile payment were the aim of the [20] study. This study was done in the second-largest mobile market in the world with 616 million subscribers. The result of this study may not be fully generalized due to covering a limited geographical area in India. Whereas it exposed three newly added factors -personal innovativeness, anxiety, and trust- as important unintended

determinants of consumer use behavior through attitude and behavioral intention. Having a strategy via TAM to accelerate user acceptance of mobile banking technology is a highlight sign for helping countries to be developed. It also helps academics and practitioners to understand, and recognize the status of mobile banking. For example, India is one of these countries that trusts in having a strategy to encourage consumers to use mobile banking [21]. This study had the benefit of interleaving two models and they are the TAM model and its main constructs (Perceive Usefulness, perceive Ease of Use, Attitude) and the theory of planned behavior (TPB) and its main factors (Trust (TR), Perceived Risk (PR), Behavior Intention (BI), Facilitating conditions (FC), Subjective Norms (SN), Website Usability (WU)). This study presented that 77.4 percent of Palestine bank customers have the idea of using mobile banking to complete their work and it also indicated that perceived risk has a negative effect on consumers' attitude to use mobile banking services [22]. In the [23] study they depended on the Digikala app mobile users (shopping application) to understand the adoption in Iranian users. They used the TAM model as their main model in addition to other factors that were taken from social factors (social influence and peer influence). The result of this study showed that perceived usefulness does not have a significant effect on attitude towards mobile app use. Age was an important factor that affected the path from perceived usefulness to attitude toward mobile app use. In [24] study was done in Jabodetabek city. This city has the highest number of internet users in Indonesia. It used the UTAUT2 model. A survey was taken online from 205 customers who used mobile banking. This study proved that performance expectancy, effort expectancy, and social influence have a significant effect on behavior toward mobile banking. Moreover, Jabodetabek citizen feels that a degree of productivity and fast access was achieved via using mobile banking. Banking clients of five South African retail banks (Absa, Capitec, First National Bank, Nedbank, and Standard Bank) were the sample which taken in [25] study. This study used the UTAUT2 model and additional factors to measure how users could foster the concept of mobile banking. The findings of this study identified that banking clients are more excited about the adoption of mobile banking apps. According to [26] trust is the key factor that helps Indonesians to continue using m-banking or not. Banks in Indonesia should prove the degree of trust in their mobile banking services to attract customers to deal with m-banking services. Using of extended UTAUT model which is interrelated with trust is suitable for Indonesian people. In their finding, they understand that trust is an important factor in accepting this service and showed that trust, PE, EE, and SI have significantly influenced the intention to use m-banking. In the [27] study personality traits were taken as five factors extended with the TAM model to depict users' intention to adopt mobile bank-

ing. This study was done in Ghana via mobile banking users (customers). It proved that agreeableness, conscientiousness, and openness to new experiences have a significant impact on user intention to adopt mobile banking toward perceptions of usefulness and ease of use meanwhile perceived usefulness and perceived ease of use are significant forecasters of users' intention to adopt mobile banking. Innovation Diffusion Theory (IDT) and TAM were merged in the [28] study to have the full benefits of both models. This study includes 517 responses from Business students from a large public university in Ghana. The findings of this study were that perceived ease of use, perceived usefulness, relative advantage, and complexity are the main interpreters of intentions to adopt mobile banking in Ghana. Furthermore, it proved that complexity has a positive effect on perceived ease of use. In addition, it showed that relative advantage has a positive impact on perceived usefulness. In [29] they concentrated on the most important factors that affect Chilean thinking to have m-banking loyalty. These factors are Perceived usefulness, Ease of use, Perceived risk, usage, trust, satisfaction, Loyalty, and Quality. The result of this study proved that the selected variables had the greatest influence on mobile users' loyalty and they were satisfaction, usage, and trust. In addition, perceived quality and risk have a significant effect on loyalty. Moreover, satisfaction has a straight, positive effect on Loyalty. Based on all previous studies and the meeting that had done with the marketing section in banks this study concentrates on understanding the factors that influence customer intention to adopt MBA in Yemen, by extending the TAM model, which incorporates five factors that refer to Perceived Benefits(PB): Perceived Ease Of Use(PEOU), Perceived Usefulness(PU), Perceived Value-Added Services(PVAS), Perceived Self-Efficacy Services(PSES), Social influence(SI), and more additional four factors that referring to Perceived Sacrifices(PS): Perceived Financial Cost(PFC), System Non-Availability Risk(SNAR), Privacy Risk(PR), and Security Risk(SR). The chosen factors have been taken based on the most used factors in different environments and countries. The suggested hypotheses justified why these factors were used. The analysis part proved whether this study is adapted to the Yemeni environment or not.

3. RESEARCH MODEL AND HYPOTHESES

According to [2, 30] TAM is considered to be the most popular model that has been used since 1986 (originally proposed by Davis in 1986). It is a theoretical model that helps to explain and predict user behavior of information technology. Besides, it is used to explain why a user would accept or reject a new emerging information technology [2, 30]. The implementation of TAM was based on the influential extension of the Theory of Reasoned

Action (TRA), which consists of two cognitive beliefs factors perceived usefulness and perceived ease of use [15, 31]. However, unlike most of the reviewed studies, the selected factors in this study were grouped into two groups, which are perceived benefits factors and perceived sacrifices factors. Researchers intended to know what factors could encourage or discourage Yemeni customers' intention to adopt MBA. Fig. (1) illustrates the research model of this study.

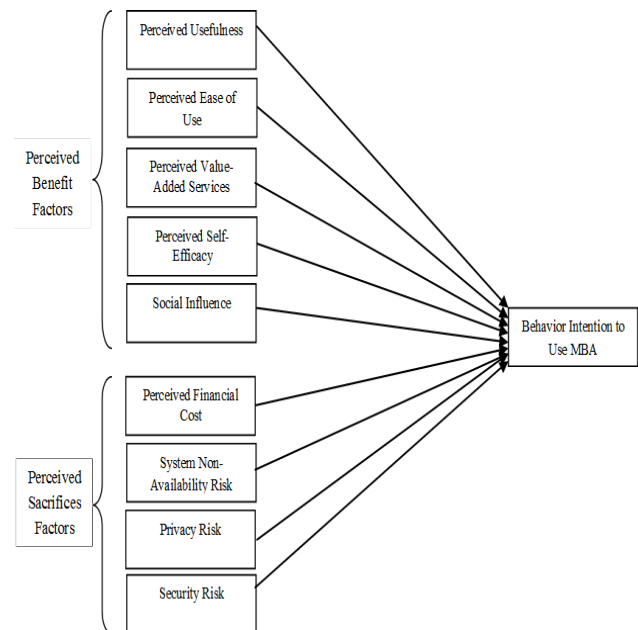


Figure 1. The research model of this study

3.1. PERCEIVED BENEFITS FACTORS

Factors that are related to the perceived benefits of MBA in this research were used to extend the original TAM. This study adapted the perceived usefulness and perceived ease of use factors that were originally introduced by TAM. Besides that, the research model of this study proposes three external factors namely perceived value-added services, perceived self-efficacy, and social influence to the extent TAM. Some researchers believe that these suggested external factors could have a strong influence on customers towards the adoption of MBA in both developed and developing countries [2].

3.1.1. Perceived Usefulness

Perceived usefulness (PU) is defined as an individual belief that he/she would benefit from using MB [13]. Shaikh and Karjaluo [2] argued that individuals often evaluate the consequences of their behavior and make a choice based on the desirability of PU. Therefore, PU will influence the intention to accept and adopt a system [13]. In the context of MBA, one of the reasons that would encourage people to use MBA is that they find the system

useful and trustable for their transactions and saves their time as well [30]. According to [12] PU is considered to be a very important factor for predicting information technology usage. Thus, the following hypothesis related to PU is formed as follows: H1: Perceived usefulness will positively influence Yemeni customers' intention to adopt MBA.

3.1.2. Perceived Ease of Use

Perceived ease of use (PEOU) is defined as an individual who believes that using MB would be free of effort [13]. Some previous studies showed that PEOU has a significant effect on usage intention, either directly or indirectly through its effect on PU in TAM [12, 13, 15]. A system which perceived to be easy to use will facilitate more system use and be more likely to be accepted and trusted by users [2]. In addition, information such as details of products or services, their benefits, and usage guidelines need to be added to make the service via mobile banking easy to use [4]. Moreover, the PEOU helps in building customer satisfaction and trust with banks as it may send a signal that banks have put in thought about end users [13]. In this research, the PEOU for study that, do customers feel comfortable and whether is it easy to use mobile applications for business transactions. This factor will play the main role in behavior intention toward using MBA [2, 15]. Therefore, the hypothesis is formed as follows: H 2: Perceived ease of use will positively influence Yemeni customers' intention to adopt MBA.

3.1.3. Perceived Value-Added Services

Perceived value-added services (PVAD) is defined as the belief that when using the new mobile services, will add valuable value to the user [15]. According to [4, 15] PVAD refers to the availability of additional services over and above basic banking services. According to [4], some studies pointed out that the map of banking branches, self-help payment, and market information are the most populated value-added services on the iPhone MB client. In this research, we argued that value-added services are an important factor that might help in convincing customer to use mobile banking applications and may reflect their intention toward MBA. Hence, the following hypothesis is formed: H 3: Perceived value-added services will positively influence Yemeni customers' intention to adopt MBA.

3.1.4. Perceived Self-Efficacy

Perceived self-efficacy (PSE) is defined as the judgment of one's ability, knowledge, or skills to use MB services [13]. Social cognitive theory states that self-efficacy is the belief that one can perform a specific behavior [12]. An individual with a high experience may have a higher positive trust and intention to use a system than an individual with lower experience [7]. Besides, an individual with a high experience may rate a system as easier to

use than an individual who has a relatively lower level of experience [7]. There are numerous studies supporting the influence of self-efficacy on behavioral intentions [2]. For instance, [13] indicated that persons perceive low self-efficacy with a new technology and it will be more resistant than persons perceiving high self-efficacy. Some studies argued that high self-efficacy has a positive influence on PB, PEOU, and BIU [12, 13, 15, 31]. In this regard, the following hypothesis is formed as follows: H4: Perceived self-efficacy will positively influence Yemeni customers' intention to adopt MBA.

3.1.5. Social Influence

Social influence (SI) is another factor that could influence customers towards the adoption of MBA. Most people are amenable to technological innovations and tend to be influenced by their peers regarding the use of phones with the numerous applications that are available on their phones [13, 15, 31]. According to [12], SI is a degree to which an individual perceives that it is important to implant believing that he/she should use the technology. This fact has been confirmed by researchers, for instance, Yu [12] conducted an empirical study in Malaysia and the researcher concluded that an individual trust and intention to use MBA were significantly affected by the people surrounding them. Furthermore, [12] discovered that individual decisions to adopt mobile commerce services were influenced by friends and family members. According to [4], SI reflects on social recognition and identification. Consumers would accept MB services perhaps if the people around them are using these services; therefore, he/she wants to join the same services as a member. In addition, individuals who like pleasure and joy when they use technology are more likely to adopt the technology [4]. As a result, SI is a significant factor that motivates people to adopt MBA like others around them under any circumstances [4]. In this regard, the following hypothesis is formed as follows: H5: Social influence will positively influence Yemeni customers' intention to adopt MBA.

3.2. PERCEIVED SACRIFICES FACTORS

Factors related to perceived sacrifices of MBA also proposed to extend the original TAM. According to [4], the sacrifices include monetary costs and non-monetary costs. The perceived sacrifices factors include perceived financial cost, perceived system non-availability risk, perceived privacy risk, and perceived security risk. The first factor is considered as monetary cost while the rest are considered as non-monetary cost. Some researchers such as [11, 32] argued that these factors will influence customers' intention to use MBA.



3.2.1. Perceived Financial Cost

By using MBA transactions, customers should pay some costs including communication fees, banking service fees, mobile phone costs, and other fees [7]. The cost of accessing mobile and wireless based access has traditionally been higher than that of accessing via wire based access [7]. Studies [4, 12] found that perceived financial cost (PFC) has a significant negative effect on customers perceiving trust and intention to use MBA. According to [4], the fee factor negatively affects perceived customers' intentions toward the adoption of MBA. Accordingly, the following hypothesis is formed as follows: H 6: Perceived financial cost will negatively influence Yemeni customers' intention to adopt MBA.

3.2.2. Perceived System Non-Availability Risk

Perceived System Non-Availability Risk (PSNR) is one of the most affected factors that could reduce the adoption of MBA. Customers may not adopt MBA if the system is unavailable to carry out his/her banking transactions over the clock [31]. Some studies showed that individuals negatively behave using such techniques because a system or application doesn't work directly upon their requests [2]. For example, if customers don't think the application would work directly upon request, their trust and behavioral intention to adopt MBA may decrease [4]. Furthermore, customers may be afraid of using mobile bank applications due to hanging or losing transactions [4]. A study [7] observed that individuals resisted MBA adoption because of delaying and suspending when implementing banking transactions. Moreover, the study of [7] observed that customers are worried that other people may access their accounts when they perform their MB transactions. In addition, there are many reasons regarding SR which may affect customer's behavior and intention to use MBA in a negative way such as information security, usability, network connectivity, network security, reliability of electronic signature, liability for loss, damages, and so on [7]. With this regard, the following hypothesis is formed as follows: H 7: Perceived system non-availability risk will negatively influence Yemeni customers' intention to adopt MBA.

3.2.3. Perceived Privacy Risk

Perceived Privacy Risk (PR) is defined as customers worried other people may access their accounts or the perception of customers that the bank may harm users' data entered in the MBA [13]. Perceived Privacy Risk (PR) may increase if customers are not confident that the MBA could protect their privacy when implementing banking transactions [7]. A study conducted by [7] showed that customers fear that banks don't have the ability in MBA to protect their privacy. As a result, privacy issues are an important concern for consumers in using MBA. In this respect, the following hypothesis is formed as follows: H8: Perceived privacy risk will negatively

influence Yemeni customers' intention to adopt MBA.

3.2.4. Perceived Security Risk

Perceived Security Risk (SR) means that customers believe that using MBA is financially not secure. This may increase from the perception of customer fear that while making MBA transactions the mobile battery would run out [5]. Furthermore, customers may resist adopting MBA because they are afraid of the inherent fraud and hacking associated with new technology [4]. Therefore, their satisfaction with dealing with bank employees may decrease. Besides that, customers may not adapt and use MBA if there are no high encryption systems and authentication processes within MBA transactions. In addition, some customers believe that wrong data entry in the MBA may expose them a financial loss [7]. Compared with Internet banking, the security risks of MBA could be lower but the susceptibility of the device to be lost or stolen is very high [13]. Accordingly, the following hypothesis is formed as follows: H9: Perceived security risk will negatively influence Yemeni customers' intention to adopt MBA.

3.3. SELECTION FACTORS

According to previous studies and because ease of use and usefulness factors may not be adequate in TAM, therefore other factors or variables could be included [2, 4, 12, 13, 15, 31]. Therefore, in this research, two kinds of factors were chosen. The first refers to perceived benefits and the second refers to perceived sacrifices. Different studies have focused on these factors and recommended using these factors to enhance and increase customer behavior intention toward using MBA services [2, 4].

3.3.1. Behavior Intension to Use

In general Behavior Intension to Use (BIU) means a person's readiness to adopt such a technique as MB adoption [33, 34]. In this research, the behavior intention to use is built on comparing benefits and costs (based on the calculation of the benefits and sacrifices. In this research, we evaluated the ratio of customer behavior intention to use MBA by taking two dominations perceived benefits and perceived sacrifices factors as the study of [35] had conducted. Perceived benefits and perceived sacrifice factors would affect customer perception of serviceability, honesty, and kindness, as a result, they may influence customer behavior intention to use MBA as mentioned in Figure 1 which illustrates the proposed theoretical model of this study.

4. RESEARCH METHOD

This study was conducted through the combination of qualitative and quantitative approaches to have the valu-

able results of this research as demonstrated in [36]. For initial research, this research used unstructured interviews with some Yemeni bank employees. After that, researchers have gotten a review for a set of relevant studies. Then, the researchers selected the most used external factors that could influence the behavior intention to use MBA. For the quantitative approach, researchers used a questionnaire and employed online surveys and offline surveys for data collection. While online surveys provide researchers with various benefits [31], saving researchers time and expenses by overcoming geographic distance, the offline survey provides the responders with an explanation of the indistinct items which makes answers certain and valid [37]. In the online survey, the interaction of the respondents reached 76 responses whereas in an offline survey, the interaction of the respondents reached 397 responses. The online survey and offline survey were developed to examine the relationship and impact of factors toward using MBA or not using it.

4.1. VARIABLE SELECTION

This research contains nine variables as independent and one variable as dependent. The independent variables have been divided into two groups: five variables referring to perceived benefit factors (perceived usefulness, perceived ease of use, perceived value added services, perceived self-efficacy, social influence) and four variables referring to perceived sacrifices factors (perceived financial cost, system non-availability risk, privacy risk, and security risk). The dependent variable was the factor of behavior intention to use MBA.

4.2. SAMPLE AND DATA COLLECTION

To validate a conceptual model and examine the research hypotheses, a sample of 473 responses from higher education students and experts was allocated. The survey was developed in English and Arabic languages to be familiar with the concepts used in this survey and the nature of the study population. All participants in this study were students and teachers studying in the Faculty of Computer and Information Technology, who fit well with the aim and context of this study. The questions in the survey were evaluated using the Likert scale. Likert scale requires respondents to specify a degree of agreement or disagreement in each statement in the survey using a five-point format where 1 = strongly disagree to 5 = strongly agree. A five-point Likert-type scale was used to specify the degree of acceptance in each statement of this survey.

4.3. MEASURES

In general, the survey consists of two main sections. The first section incorporates a nominal scale to identify respondents' demographic information. The second section uses a 5-point Likert scale where 1: Strongly disagree to 5: Strongly agree. This section includes the proposed factors that have been used in this study. The second section of the survey measures the variables (factors) used in this study. Firstly, for measuring the independent variables, there were 38 questions (Qs) in this survey which were measured by the current study's research model. The measured Qs include 9 Qs used to evaluate the fundamental factors of TAM: 5 for PU and 4 for PEOU. The rest 29 Qs for other external factors of the theoretical model that have been added to the original theoretical framework TAM as well as previous studies have been conducted [13, 15, 31]. Hence, the first 5 Qs have been for PVAS and the next 4 Qs for PSE, then 5 Qs for SI, 3 Qs for PFC, 4 Qs for SNAR, 4 Qs for PR, and 4 Qs for SR. Secondly, to measure the dependent variable 2 Qs were for the factor of Behavioral Intention to Use MBA. To develop a model that represents the relationship between the proposed factors, a structured equation modeling (SEM) was applied to test hypotheses and predict dependent variables (factors) from independent variables [38]. The SEM method is more concerned with the model predictability [38]. SEM allowed testing of the research model, especially with normal distribution data [39]. In other words, to examine the model two-step methods were used, first testing the reliability and validity of the instrument and second analyzing the structural model [40].

4.4. ETHICAL ISSUES

This study has no prejudice in any section. Respondents in this study were voluntary and data was collected based on standards. Respondents were aware of the objective, the significance of this study, and the type of information being collected. Respondents answered with no obligation to participate. To increase the content validity, respondents were clarified with the services provided in mobile banking and caution was taken to make certain that respondents are familiar with m-banking concepts. The research is not funded by any public or private institution. The ethical measures of this study followed the guidelines of [35].

5. DATA ANALYSIS

5.1. DESCRIPTIVE ANALYSIS

The data analysis was carried out through SPSS software with a sample size of $N = 473$ as shown in Table 1. The profile of the sample is about 57.93% of the respondents were male and 42.07% were female. The

majority of participants were between 18 and 21 years at 43.55%, then from 22 to 25 at 49.47%, and 26 and above at 6.98%. The content of the survey's basic demographic characteristics consisted of four important parts: gender age, schooling, and specialist.

Table 1: Distribution of Survey Respondents

Variable	Frequency total:473	Total percentage of sample (%)
<i>Gender</i>		
Male	274	57.93
Female	199	42.07
<i>Age</i>		
18-21	206	43.55
21-25	234	49.47
>=26	33	6.98
<i>Schooling</i>		
BSc	452	95.56
Higher	21	04.44
<i>Specialist</i>		
Computer science	118	24.95
Information Technology	155	32.77
Information System	179	37.84
Other	21	04.44

5.2. ASSESSMENT OF NORMALITY

To determine which statistical test should be used to check the hypotheses of MBA attention, checking of normality test is the first step. This step is represented in Table 2. As noticed all of the values of a given survey were supported by the normality distribution box all values of skewness were distinguished to be below 3 and not more than 8 in kurtosis measure[41, 42].

5.3. RELIABILITY AND VALIDITY ANALYSIS

The sample data was checked and examined to understand the degree of user attention to MBA service or not. Cronbach's alpha and composite reliabilities were used as tools to determine whether this survey was reliable or not. Cronbach's alpha was used to determine a scale's consistency between items for each factor. Normally, during reliability analysis, the consistency of the factor is gained when the Cronbach's alpha coefficient is at 0.5 or higher and it reflects acceptable [43–45] and the composite reliabilities are accepted when they are over the minimum acceptable limit of 0.70 [43, 46, 47]. Table 3 illustrates the instruments' reliability. To assess the validity of the research instrument, three types of validity were estimated; i.e. convergent validity, content validity, and discriminant validity. The purpose of the survey was to test the suitability and relevance of questions related to each factor. The respondents were to choose between two selections "Is it useful or not" and "Is it sacrificed or not". Then, the calculation of each question is based on the Average Variance Extracted (AVE), which is used to test convergent validity. AVE should be higher than 0.50, therefore, the latent variables (items) clarify more than

Table 2: Normality Assessment

Belongs	Constructs	Items	Skewness	Kurtosis
<i>Perceived Benefit Factors</i>	PU	PU1	-1.043	1.408
		PU2	-0.955	0.873
		PU3	-0.940	0.441
		PU4	-0.900	0.543
		PU5	-1.064	1.497
	PEOU	PEOU1	-0.835	1.000
		PEOU2	-0.497	0.283
		PEOU3	-0.700	0.912
		PEOU4	-0.988	0.830
	PVAS	PVAS1	-0.732	0.764
		PVAS2	-0.189	-0.706
		PVAS3	-1.068	1.492
		PVAS4	-1.206	1.977
		PVAS5	-0.934	0.933
	PSE	PSE1	-0.834	0.244
		PSE2	-0.627	0.514
		PSE3	-0.833	0.461
		PSE4	-0.653	0.291
	SI	SI1	-0.150	-0.781
		SI2	-0.791	0.2000
SI3		-0.285	-0.785	
SI4		-0.597	-0.032	
SI5		-0.300	-0.500	
<i>Perceived Sacrifices Factors</i>	PFC	PFC1	.077	-0.638
		PFC2	0.228	-0.709
		PFC3	0.234	-0.460
		SNAR	SNAR1	-0.141
	SNAR2	0.021	-0.608	
	SNAR3	-0.574	0.454	
	SNAR4	-1.010	0.735	
	PR	PR1	-1.155	0.749
		PR2	-0.683	-0.027
		PR3	-0.320	-0.283
PR4		-0.326	-0.395	
SR	SR1	-0.409	-0.193	
	SR2	-0.259	-0.454	
	SR3	-0.372	-0.152	
	SR4	-0.437	0.148	
<i>Behavior intention to use MBA</i>	BIU	BIU1	-0.740	0.578
		BIU2	-0.547	0.622

that value [48–51]. To ensure the model's convergent validity, three items were eliminated (PVAS2, PVAS5, and SI1) because of their low loadings. Content validity indicated that the survey should be filled out by a respondent who is aware of the MB concept. Respondents were given details about the services delivered by mobile banking to make certain that respondents were familiar with mobile banking concepts to increase content validity. Moreover, items loading should be above 0.70 [48–51]. Table 3 illustrates the results of content validity. Finally, discriminant validity was tested based on the loadings, which were larger than cross-loading, and the square root of AVE for each construct that should be greater than the correlations with all factors [48–51]. Table 4 shows the results of discriminant validity and the square root of AVE (in bold).

6. RESULTS DISCUSSION

Once the validity and reliability of the survey were established and proven, hypotheses had been tested and the extended model had been examined. In order to test

Table 3: Instrument Reliability and Content Validity N=473

Constructs	Items	Mean	Loading factors	Cronbach's Alpha	AVE	CR
PU	PU1	4.03	0.797	0.890	0.70	0.92
	PU2	4.06	0.848			
	PU3	4.07	0.844			
	PU4	4.02	0.812			
	PU5	3.93	0.867			
PEOU	PEOU1	3.76	0.729	0.738	0.57	0.842
	PEOU2	4.00	0.764			
	PEOU3	3.89	0.777			
	PEOU4	3.88	0.745			
PVAS	PVAS1	3.74	0.839	0.825	0.50	0.716
	PVAS3	4.10	0.882			
	PVAS4	4.32	0.868			
PSC	PSC1	3.71	0.756	0.764	0.60	0.854
	PSC2	3.91	0.758			
	PSC3	3.67	0.831			
	PSC4	3.65	0.732			
SI	SI2	3.66	0.70	0.782	0.52	0.789
	SI3	2.92	0.809			
	SI4	3.32	0.812			
	SI5	3.13	0.796			
PFC	PFC1	2.73	0.734	0.721	0.64	0.843
	PFC2	2.84	0.845			
	PFC3	2.79	0.821			
SNAR	SNAR1	2.93	0.678	0.699	0.53	0.816
	SNAR2	2.87	0.791			
	SNAR3	3.46	0.745			
	SNAR4	4.06	0.684			
PR	PR1	3.99	0.737	0.748	0.57	0.843
	PR2	3.80	0.813			
	PR3	3.48	0.778			
	PR4	3.41	0.695			
SR	SR1	3.38	0.855	0.841	0.68	0.894
	SR2	3.57	0.783			
	SR3	3.29	0.837			
	SR4	3.59	0.817			
BIU	BIU1	3.68	0.920	0.800	0.70	0.821
	BIU2	3.74	0.907			

hypotheses from H1 to H9, a structured equation modeling (SEM) analysis was performed. The testing method followed SME using SPSS as a testing and analysis tool. This testing was used to recognize the fitness of the suggestion model. Structured Equation Modelling (SEM) was followed to evaluate the t-value, R-square, and p-value. T-value can generalize the results. R-square represents the satisfaction of the model. It should be higher than 0.10. The P-value or probability of a value is to determine the significance of our results that are related to our hypotheses and the p-value should be less than 0.05, which is represented in Table 4. From a theoretical point of view, and according to the results represented in Table 5, it is clear that the Technology Acceptance Model (TAM) proved the ability to use MBA. In this study, all suggested relationships for interacting with TAM were tested. The theory of TAM suggests that there is a significant positive relationship and influence between PEOU, PU, PVAD, PSC, and SI behavior intention toward using MBA and that is found in (H1, H2, H3, H4, and H5). According to this study, there is a significant and positive relationship between perceived usefulness and behavior intention toward MBA (H1), and PEOU has

a higher and direct effect on attitude toward using MBA on Yemeni customers' (H2). H3 was also supported; the result indicates that perceived value-added services significantly affect Yemeni customers' intention to adopt MBA. H4 and H5 which represented the influence of perceived self-efficacy and social influence on Yemeni customers' intention to adopt MBA also supported. In this study, the perceived financial cost, perceived system non-availability risk, perceived security risk, and perceived privacy risk have a positive influence on Yemeni customers' intentions. Therefore, these four hypotheses (H6, H7, H8, and H9) are not supported as a negative influence but as a positive influence on Yemeni customers' intentions. Even H6 and H7 are significant but they are not acceptable because their values of R-squares are less than 0.10.

6.1. FOR PERCEIVED BENEFITS FROM ADAPTING TO MOBILE BANKING APPLICATION (MBA)

According to the survey results, it indicates that social influence, perceived self-efficacy perceived value added services, perceived ease of use, and perceived usefulness have a positive influence on behavioral intention to adopt MBA for students in the Faculty of Computer and Information Technology in their order of influencing strength. Social influence is found to be the most significant factor influencing the intention to use MBA. This finding suggested that the decision of students to adopt MBA could strongly be influenced by the media and by their friends. Our finding is consistent with the finding of [12] which empirically concluded that individual intention to adopt MB was significantly influenced by social influence in Taiwan. Their study noticed that social influence was the most salient factor in predicting human intention to adopt MB [12]. It is interesting to note that our findings are extremely different from other studies. For instance, the study of [13] found that social influence was not a stronger influence on behavioral intention than traditional TAM variables (perceived usefulness and ease of use). However, our findings showed that social influence was the most significant factor that positively affected students' behavior and intention to use MBA. In addition, our finding contrasts the finding of [13] which analyzed that the perceived usefulness and ease of use had a super influence on the adoption of MB which is against our finding that evidence the two perceived usefulness and ease of use have a minimum effect toward MBA adoption from the five proposed factors (PU, PEOU, PVAS, PSE, SI) that related to perceived benefits in our study. For perceived self-efficacy, our finding observed that the perceived self-efficacy factor was the second most important factor affecting customer intention to use MBA. This supported the suggestions made by [13] that the perceived self-efficacy of customers to-



Table 4: Result of Discriminant Validity

Constructs	PU	PEOU	PVAS	PSC	SI	PFC	SNAR	PR	SR	BIU
PU	0.834									
PEOU	0.483	0.755								
PVAS	0.530	0.494	0.707							
PSC	0.472	0.408	0.450	0.771						
SI	0.240	0.213	0.289	0.361	0.721					
PFC	0.133	-0.004	0.118	0.195	0.146	0.801				
SNAR	0.144	-0.008	-0.007	0.282	0.182	0.327	0.726			
PR	0.132	-0.025	0.085	0.264	0.131	0.195	0.526	0.757		
SR	0.128	-0.053	-0.032	0.213	0.125	0.178	0.456	0.586	0.823	
BIU	0.249	0.225	0.303	0.242	0.298	0.102	0.105	0.033	-0.032	0.834

Note: in bold the square route of AVE

Table 5: Hypotheses Testing

Hypothesis	Hypothesized path	T-value	R-square	P-Value	Remarks
H1	PU → BIU	5.579	0.10	0.000	Supported
H2	PEOU → BIU	5.016	0.10	0.000	Supported
H3	PVAS → BIU	6.902	0.10	0.000	Supported
H4	PSC → BIU	5.410	0.10	0.000	Supported
H5	SI → BIU	6.769	0.10	0.000	Supported
H6	PFC → BIU	2.228	0.04	0.026	No supported
H7	SNAR → BIU	2.293	0.04	0.022	No supported
H8	PR → BIU	0.715	0.10	0.475	No supported
H9	SR → BIU	-0.692	0.22	0.489	No supported

wards the adoption of MB is the second most important construct influencing the decision to adopt MB service. Contrary to a study of [12] which indicated that, in the current Electronic-life (E-life) context, people are more experienced in using technology products/services than they were several years ago. According to [12] this explains why the effects of perceived self-efficacy were decreased and could not play salient roles in affecting consumers to adopt MB in their study. Our finding also showed that perceived value added services were the third most important factor affecting student intention to use MBA According to students' responses the biggest value added service for them for adopting to MBA, and the convenient MBA use, because they don't have to go to a branch to do their transaction, moreover they believe that MBA will contain a new value for them such as saving their time and cost. Our study is consistent with the finding of [15] which reminded us that students will adopt or continue using MB if there are some advantages or new added values. For example, improves their banking performance, and enhances their banking needs. A big positive impact of MBA in our study is the inconvenience of traveling to a bank or branch and the avoidance of long queues. Our study findings also support the finding of [15] which reminded that most respondents believe that MB will be valuable and will give them greater control over their banking transactions. For perceived ease of use and perceived usefulness factors, our findings show that these two factors perceived ease of use and perceived usefulness have a significant influence on stu-

dent's adoption intention in their order of importance. That means if students perceive ease of use with MBA such as easy dealing and clear interaction they will adopt MBA. According to customer responses, they think It would be easy for them to remember how to conduct banking on a phone, consequently, they don't feel that MBA would be too difficult to perform their transaction via using their phone. Their opinions for perceived ease of use its ok and important but it doesn't rich to a high level of significance because their lifestyle is related to different new techniques. The same thing to perceived usefulness according to their responses they think it's really important to perceive the usefulness of using MBA like using MBA in my job would enable me to accomplish tasks more quickly, using MBA would improve my job performance, using MBA I can perform my banking transaction anywhere and anytime, but this importance doesn't rich to the high level to consider it very important. These findings support the previous finding of [12] which indicates that, in the current E-life context, people are more experienced in using technology products/services than they were in several years ago. This explains why the effects of effort ease to use and perceived usefulness were decreased and would not play salient roles in affecting customers to adopt MBA.

6.2. FOR PERCEIVED SACRIFICES FROM ADAPTING TO MOBILE BANKING APPLICATION (MBA)

After analyzing students' responses, the result indicated that the four factors (PFC, SNAR, PR, SR) that describe the level of perceived sacrifices for customers toward MBA don't have a negative significance toward behavior intention to use MBA, because these factors were too weak to reach the level to the resistant customer to use MBA in a near future, to their knowledge that there are some sacrifices or risks to any technique, but these sacrifices or risks do not reach a level that prevents them to use the modern technology (meaning that the benefits of MBA are greater than sacrifices (potential risks)). This means the Behavior Intention to Use (BIU) has not been affected by perceived sacrifice factors because the whole weakness of sacrifices toward adopting MBA in general. This contrasts with the study of [12] which given that perceived financial cost was the second most important factor affecting customer intention to use MB. Their study performed a drill-down analysis and found that the cost of using services via cell phones was perceived as a critical factor in hindering people from using MB, and compared to women, men were more concerned with Perceived Financial Cost (PFC) [12]. Our study findings showed that the factor of SNAR doesn't play a main role in resistant customer adoption intention to use MBA. Contrary to the finding of [31] which found that the Lack of Learning Management System (LMS) availability negatively affects the Behavior Intention to Use LMS. Therefore, the two factors of security and privacy risk were not important concerns for customers adopting MBA in Yemen. This finding is contrary to study [13] which found that security and privacy issues are important concerns for consumers using MB services compared with Internet banking, security risks for MB could be lower but the susceptibility of the device to be lost or stolen is very high.

7. CONCLUSION AND IMPLICATIONS OF THIS STUDY

This study examines factors influencing the adoption of Mobile Banking Applications (MBA) in Yemen based on the extended TAM model. Nine factors were identified: perceived usefulness, perceived ease of use, perceived value added services, perceived self-efficacy, social influence, perceived financial cost, system non-availability risk, privacy risk, and security risk. The first five factors have been taken as perceived benefits from adapting to a Mobile Banking Application (MBA) and the rest four factors have been taken as perceived sacrifices from adapting to MBA. This study specifically validates the relationship between all factors that are related to perceived benefits and PSE, SI) that refer to perceived benefits and behavior intention to use MBA. On the other

hand, findings were found regarding the negative relationship between the four factors (PFC, SNAR, PR, SR) that refer to perceived sacrifices and behavior intention to use MBA. The analysis results certain that there is no negative influence or resistance to adopting MBA for students in specifications. This means even if the students and experts perceived that there are some challenges or sacrifices they believe that the advantages of MBA are more than the disadvantages and the value that they will gain by adapting or using it will be very high. This finding is extremely opposite to our first hypothesis belonging to perceived sacrifices in general and its four factors in more specific which have assumed firstly in the theoretical model. The implication of this study can be summarized as follows. First, this study proposed a theoretical model based on a robust acceptance model TAM. This model can be used to predict the behavioral intention to use MBA services before the actual implementation. Moreover, this study contributes to the efforts to empirically validate TAM in the Arab world, specifically in Yemeni banks. Most significantly, this study could benefit Yemeni citizen in their plans to adopt MBA services.

7.1. ACADEMIC CONTRIBUTION OF STUDY

- This study provides valuable insights for MBA providers in terms of identifying the factors or constructs that would influence customers (who may be the prospective users of MBA).
- This research will contribute to building a new model that may help mobile banking managers improve the trust between the users and their MBAs. As a result, by adopting the proposed model, we expect its contribution to advancing the banking industry shortly.

7.2. LIMITATIONS OF STUDY

This study is not free of limitations which create a scope for future research. Further multiple correlations analysis, only evaluates the effect of individual independent factors on the dependent factor. This creates a fairly simple path model and does not allow for the estimation of mediation, indirect effects, and other complex relationships among factors. Another limitation of this study is the relatively small sample size (473). For this reason, caution must be applied as these findings may not be generalized to the broader MB adoption based on this study alone. In addition, the findings and implications were derived from specific students in just three specifications customers at the Faculty of Computer and Information Technology in the Republic of Yemen. Therefore, future research is needed to generalize our findings and discussion by including other groups of students in different specifications, as a different sample specification would help to make the conclusion more general. Furthermore, the focus on customers was the main theme of this study.



Lastly, the perception of individuals changes over time as they gain experience.

8. RECOMMENDATIONS AND FUTURE WORK

- Our recommendations for banking institutions, they should emphasize interpersonal word-of-mouth and put more advertising on emerging social media (such as Facebook, MSN, Twitter, and Blog) than traditional mass media (i.e., televisions, radios, and newspapers) to increase the diffusion and penetration of MBA.
- Therefore, managerial attention should be focused more on developing perceived self-efficacy. When new technologies emerge, people may not utilize them because they perceive them to be difficult to learn. To enhance self-efficacy, banks may initiate training sessions and awareness campaigns on MB to help users get familiar with mobile technologies. Even if these training sessions and campaigns are not directly related to MB services, they can still help develop more positive usefulness, ease of use, and trust which in turn can influence to use of MB. Banks should offer enough related information that would help their customers adapt and use MB services.
- Banks should also explain the advantages of the new values services for adapting to MBA like customers don't have to go to a branch to do their transaction and explain a new value for them such as saving their time and cost, inconvenience of traveling to a bank or branch, and the avoidance of long queues. Banks can investigate the concept of MB is valuable and it will give them greater control over their banking transactions.
- Our external recommendation for banking industries is to efficiently reduce the cost for customers for using a cell phone-based service and to differentiate service/price packages for males and females, even if the barrier of cost is found to be a little bit significant on MBA adoption in this study.
- In particular, MBA service providers need to enhance authentication mechanisms to avert fraudulent activity and allay fears of privacy issues so that trust may be increased and hence MB adoption rates increase. Even though we have found that the level of perceived sacrifices was low for customers in this study. In general, the providers of MBA should do their best to deliver new opportunities through offering new kinds of services that can be beneficial for their customers. The same things on the other hand, the providers of MB services should do their best and try to minimize the challenges or risks that can affront MBA adoption.
- Our suggestion for future work is to choose different populations and samples that would be beneficial for them to understand and predict customer's intention to use MBA.

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