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Examining the Intention to Use Mobile Banking Services in Yemen: An Integrated Perspective of Technology Acceptance Model (TAM) with Perceived Risk and Self-Efficacy

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Abstract: While there are a wide range of business opportunities available via mobile technologies and allied services along with technologically advanced mobile devices, mobile banking services have not been widely accepted by bank clients in Yemen. Therefore, this study aims to study the major factors that contribute towards client intention to accept and use mobile banking as one of the e-Financial services available from Yemeni banks using the Technology Acceptance Model (TAM), integrated with perceived risk and self-efficacy. A survey questionnaire was used to collect primary data from individuals who are non-users of mobile banking services and 482 valid responses were received. Structural Equation Modelling (SEM) via AMOS Software was utilised to determine the importance levels of association and interaction between the factors tested. The proposed model for this research was developed with five core constructs, namely perceived risk, Perceived Ease Of Use (PEOU), Perceived Usefulness (PU) and Self-Efficacy (SE) as independent variables with intention as the dependent variable. The model as evidenced by the goodness of fit of the model to the data explained 80% of the variance in intention to use mobile banking services, while the findings of the multivariate analysis demonstrated that PR, PU, PEOU and SE are significant predictors of the intention to use mobile banking services. The results of this current study will provide insights into the factors that affect the successful uptake of mobile banking services among clients of Yemeni banks.

Key words: Mobile banking, Yemen, perceived risk, self-efficacy, Technology Acceptance Model TAM, intention to use

INTRODUCTION

The advancement of digital technology within the field of information and telecommunications has driven market growth throughout the world and businesses are now accelerating its impact by rebuilding operations to to take even greater advantage of this online potential by developing new and more innovative mobile applications. Mobile banking was a major information technology investment priority in 2013 across all digital banking channels, resulting in some countries making momentous leaps forward in its adoption. However, it is a technological innovation that may be more obvious and certainly more significant in developing countries than in those less developed. Now a days, users are capable of conducting banking services anywhere and at any time easily and quickly (Anderson, 2010; Gu *et al*., 2009; Hanafizadeh *et al*., 2014; Lin, 2011; Zhou *et al*., 2010).

Mobile banking refers to the ability to use a mobile devices (like cell phones, smartphones, PDAs and tablets) to conduct financial transactions such as account balance inquiries, transfers, bill payments and other financial management without temporal and spatial constraints (Elbadrawy and Aziz, 2012; Koenig-Lewis *et al*., 2010; Lin, 2011; Zhou, 2012). Yet, despite the benefits of mobile banking (such as cost savings, efficiency, conceptuality, ubiquity, convenience and interactivity), its ability to supplement traditional banking channels such as ATMs (Kim *et al*., 2009; Lin, 2013) and requiring little or no infrastructure (Khraim *et al*., 2011), empirical studies conducted around the world (Elbadrawy and Aziz, 2012; Yang, 2009; Yu, 2012) have revealed a certain amount of adoption resistance among a significant number of consumers.

Although, mobile phone subscription in Yemen (Fig. 1) has shown a rapid increase from 2012 (49%) to

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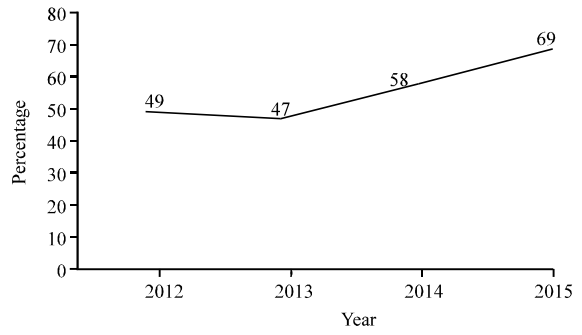


Fig. 1: Yemen mobile phones subscriptions (Per 100 people) 2012-2015; Last update: March 30th, 2016

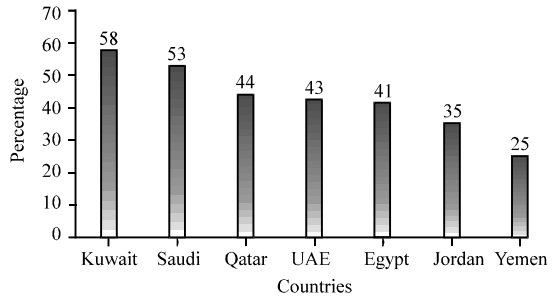


Fig.2: Mobile banking usage (Yemen vs. Arab countries)

2015 (69%), mobile banking services adoption is still lagging behind the world and neighbouring Arab countries. A recent worldwide survey on first quarter of 2012, conducted by ACI (2012) indicated that 76% of Indian mobile respondents used their mobiles for banking transactions in the last 6 months, the highest percentage in the world. Comparatively in the same period, the US recorded only 38% and the UK 31%. China followed India with 70%, next was South Africa at 61%. Germany (24%) and Canada (18%) were among the least of the 14 countries surveyed. The global average for mobile banking adoption rate stands at 45%. Another study of e-Commerce in the Middle East (in 2013), showed that in Saudi Arabia, 53% of users conducted banking transactions on their mobile phones, compared with Kuwait (58%), Qatar (44%) and the United Arab of Emarits (43%), Egypt recorded around 41% while in Jordan the figure was 35%. By comparison with the Arab world countries (Fig. 2), Yemen is one of the poorest in mobile banking usage with only 25%. As noted by Goodhue and Thompson (1995), Norzaidi (2008) and Norzaidi *et al.* (2007), low usage will lead to low performance, low productivity, less return on investment, etc. The mobile banking adoption rate differed from one country to another because of differing client mindset. Therefore, it is crucial to identify what factors promote or hinder the adoption of mobile banking services in Yemen. The banking industry in this country has an obvious opportunity to increase mobile phone subscription and turn it as an effective and efficient delivery channel for their clients.

Although, many researchers such as Amin *et al.* (2012), Khraim *et al.* (2011), Wessels and Drennan (2010), Daud *et al.* (2011) and Shen *et al.* (2010) have conducted studies in various countries throughout the world, none have focused on the factors affecting mobile banking adoption among Yemeni bank clients (Zolait, 2010). Several theories and models have been developed to examine and understand the factors affecting technology acceptance and usage (Shroff *et al.*, 2011). The Technology Acceptance Model (TAM) seems to be the most broadly accepted and used theory among IS researchers for studying system usage and acceptance behaviour (Liu *et al.*, 2008; Oliveira and Martins, 2011). This research employs the TAM as an underpinning theory but as the TAM focuses only on perceived usefulness and perceived ease of use (Al-Qeisi, 2009; Davis, 1989; Taylor and Todd, 1995) and fails to assess barriers to using an information system device, it is unlikely to accurately reflect the adoption of mobile banking (Luarn and Lin, 2005). In this study, the TAM will be extended and variables will be added to PU and PEOU, one of which is self-efficacy. As Yemen ranks number 145 out of 148 countries in the Global Competitiveness Report 2014 indicating that Yemeni citizens lack skills in using technology (for reasons such as lack of education or training or the economic state of the country), mobile banking self-efficacy is one of the important variables to be studied. Another variable, imported from other theories and models in order to overcome the weaknesses of the TAM is perceived risk. This second order variable has five dimensions, namely privacy risk, financial risk, performance risk, time risk and psychological risk. And this extension is justified because uncertainty avoidance is considered high in the Middle East and Arab countries like Yemen (Hofstede *et al.*, 2010) where Arab societies avoid taking risks or chances because Yemeni citizens have this tendency, perceived risk may play a major role in changing the behaviour of clients in determining the use and acceptance of mobile banking in their country. To date, limited empirical research has been carried out in developing countries, especially not in the Middle East (Al-Qeisi, 2009), although many studies have restated calls for examining the factors that predict intention to adopt behaviour of mobile phone banking (Liu *et al.*, 2008; Venkatesh *et al.*, 2003). Thus, this study examines factors affecting behavioural intention to use mobile banking services and attempts to achieve the following research objectives:

- To examine the effect of PEOU on PU
- To examine the effect of PU on intention to use mobile banking services
- To examine the effect of PEOU on intention to use mobile banking services
- To examine the effect of self-efficacy on intention to use mobile banking services
- To examine the effect of perceived risk on intention to use mobile banking services
- If the main constructs of this study are found to have important relationships with the intention to use mobile banking, suggestions will be made on how to draw more clients to use mobile banking services

Literature review

Perceived Ease of Use (PEOU): As defined by Davis (1989), PEOU is "The degree to which a person believes that using a system would be free of effort". A number of studies on different technology applications and contexts have reported the significant influence of ease of use on PU as the TAM suggests. One example is how mobile banking is applied in Turkey, Korea and Malaysia (Akturan and Tezcan, 2012; Amin *et al*., 2008; Gu *et al*., 2009). In Saudi Arabia, Al-somali *et al.* (2009) in examining online banking, found also that PEOU significantly affects the PU. This is consistent with the research of Haderi and Saleh (2012) who studied IT usage in the public sector in Yemen. Moreover, the PEOU construct has been studied and found to positively influence PU (Isaac *et al*., 2016; Ramayah *et al*., 2005; Ramayah and Suki, 2006; Tan and Leby, 2016).

A study was done by Ramayah and Lo (2007) found that ease of use positively predicts the intention to use. A study by Ramayah and Lo (2007) found that ease of use positively predicts intention to use. Another study conducted by Chiu *et al.* (2005) in Taiwan reported the significant effect of PEOU on intention to use e-Tail. Their structural equation modelling analysed a quantitative study and the results were consistent with the findings of a Wang *et al.* (2003) study on Internet banking in Taiwan, examining data collected from 123 Taiwanese adults and analysed using SEM LISREL. Fuksa (2013) studied the mobile internet in Latvia and also found that PEOU has a notable effect on intention to use mobile internet, after analysing 2000 questionnaires collected from internet users using structural equation modelling AMOS. Several other researches while on different applications have also confirmed the importance of PEOU including mobile financial services, Chinese e-Bay internet banking, mobile payments, e-Booking, online auction, e-Book services, mobile learning, library application, higher education and social networking learning; these studies were conducted in different countries: Korea, China, Taiwan, Thailand, Nigeria, Tanzania, Lebanon, Yemen and Uganda (Alrajawy *et al*., 2016; Bhatiasevi and Yoopetch, 2015; Chang, 2008; Gao *et al*., 2012; Koksal, 2016; Lee *et al*., 2012; Lwoga, 2013; Kocaleva, 2014; Maleko *et al*., 2013; Pahnila *et al*., 2011; Zhong *et al*., 2013). Consequently, the following two hypotheses are proposed:

- H_1: perceived ease of use has a positive effect on perceived usefulness
- H_2: perceived ease of use has a positive effect on the intention to use mobile banking services

Perceived Usefulness (PU): Davis (1989) defined PU as "The degree to which a person believes that using a particular system would enhance his or her job performance". Researchers have argued that PU plays a major role in the context of technology (Ramayah, 2006), especially in mobile banking technology (Mutahar *et al*., 2016; Norzaidi *et al*., 2007) and many studies have been conducted on it. For example, using multiple regression analysis on a sample of 878 bank clients, AbuShanab and Pearson (2007) reported that performance expectancy, defined by Venkatesh *et al.* (2003) as perceived usefulness, significantly influenced the intention of customers to use internet banking in Jordan. A similar study conducted by Al-Somali *et al.* (2009) found that PU notably influenced the intention to use internet banking services in Saudi Arabia. Other scholars had the same results for the intention to use internet banking (Faqih, 2016; Guriting and Ndubisi, 2006) for Oman; Marcus for Australia (Riffai *et al*., 2012) for Jordan (Sathye, 2010) for Denmark and Zolait for Yemen. Consequently, the following hypothesis is proposed:

- H_3: perceived usefulness has a positive effect on the Intention to use mobile banking services

Self-Efficacy (SE): This is defined as "the judgment of one's ability to use mobile banking" (Luarn and Lin, 2005; Wang *et al*., 2006). Its influence on the intention to accept and use technology is reported in many studies in a variety of applications and contexts. In Taiwan, using the structural equation modelling analytical tool LISREL, Hsu and Chiu (2004) reported the significant influence of SE on the intention to use e-Services. In Hong Kong, Khalifa and Shen (2008) confirmed the significance of SE on the intention to use mobile commerce after using SEM PLS to analyse data collected from 202 mobile service subscribers. SEM LISREL was used by Wang *et al.* (2006) to analyse 285 questionnaires collected from mobile services users and conclude there is a significance effect

of SE on the intention to use mobile services in Taiwan, Kocaleva (2014) revealed the significance of SE in higher education in Serbia. Lee (2009) reported in his Singapore study that SE notably affects the intention to use internet banking while in Yemen Zolait (2010) affirmed the results of the same application but in a different context. Both of these studies used SPSS to analyse data collected from 454 business students and 369 bank clients. Luarn and Lin (2005) noted that SE was significantly a predictor of behavioural intention to use mobile banking in Taiwan. Consequently, the following hypothesis is proposed:

- H_4: self-efficacy has a positive effect on the intention to use mobile banking services

Perceived Risk (PR): Perceived risk is defined as "the potential for loss in the pursuit of a desired outcome of using an e-Service" (Featherman and Pavlou, 2003). Many types of risk were identified that is performance risk, psychological risk, financial risk, privacy risk, time risk, social risk, security risk and overall risk. Chen (2013) studied the perceived risk as a predictor of intention to use mobile banking services in Taiwan and from LISREL analysis on 610 bank clients confirmed that PR is considerable hindrance to the intention to use mobile banking services. This study is consistent with Hanafizadeh *et al.* (2014) who studied the factors affecting Iranian behavioural intention to use mobile banking services, using a different SEM tool (AMOS) to analyse a sample of 361 university students. In Germany (Koenig-Lewis *et al*., 2010) and Portugal (Martins *et al*., 2014), both used SEM for analysis of perceived risk on the intention to use mobile banking services and confirmed the significance of PR as a negative predictor of using mobile banking. In other words, clients perceived the risk as a deterrent to using mobile banking as they feared to lose (e.g., money, time, comfort or information).

In general, customer perception of risk or doubt arises from the degree of contradiction between customer judgment and real behaviour as well as loss arising from the failure of technology to deliver an expected outcome (Koenig-Lewis *et al*., 2010; Lee *et al*., 2012; Sun *et al*., 2008). The risk may be perceived as greater hindrance for transactions via mobile devices (Ndubisi and Sinti, 2006) although, it is been associated with internet transactions for quite some time now. As for mobile banking, PR is even more of a concern because of the threat of privacy and security concerns (Luarn and Lin, 2005). Mobility increases the threat of security violations, arising from the infrastructure required for wireless applications. Users of mobile banking services are concerned about this since there are more points in the telecommunication process between mobile phones than between fixed devices (Corradi *et al*., 2001). There is also user concern that hackers may access bank accounts via stolen PIN codes (Poon, 2008). PR is thus more likely to adversely impact the adoption of mobile banking services. Consequently, the following hypothesis is proposed:

- H_5: perceived risk has a negative effect on the intention to use mobile banking services

MATERIALS AND METHODS

Overview of the proposed research model: The proposed model of this research is based on the Technology Acceptance Model (TAM) (Davis, 1989; Davis *et al*., 1989) to explain intention to use mobile banking as the dependent variable in the context of mobile banking services in Yemen. The independent variables are Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Self-Efficacy (SE) and Perceived Risk (PR). Relationships among the variables and the whole model are represented in Fig. 3. PEOU would lead to the usefulness perception (H_1) and subsequently improve the intention of clients to use mobile banking services. Moreover, the intention of using mobile banking is improved when users perceive the usefulness of the system (H_2). In addition when the system is easy to use, this will lead to an increase in the intention to use mobile banking services (H_3). A higher SE will improve the intention to use mobile banking (H_4). On the other hand, when there is high perception of risk among clients, the clients may prefer not to use mobile banking services and become resistant to accept and use them, leading to reduced intention to use mobile banking (H_5).

Development of instrument: A specially designed questionnaires are was used to collect data for this study and measure all the main constructs of the research model. It was divided into two sections containing close-ended questions that were tested and translated into Arabic since the respondents were from Yemen. The first section measured five core constructs using a seven-point Likert scale ranging from 1-7 (strongly disagree) (strongly agree) while the second section covered the demographic profile of the respondents, measured using a nominal or ordinal scale (Appendix A).

Data collection: In this study, the respondents were individuals who currently had a bank account at any bank that provides mobile banking services in Yemen had a mobile phone and were not users of mobile banking services. In this current study, snowball sampling (a

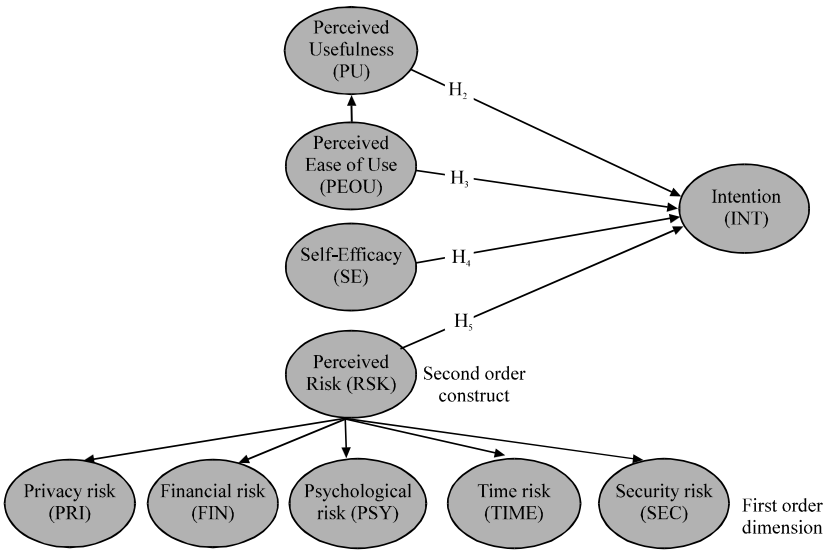


Fig. 3: The integrated research model

non-probability sampling technique) was adopted to reach potential subjects among Yemeni bank clients in the capital city Sana'a which is appropriate when the a target population is difficult to reach (Al-Qeisi, 2009). Total 482 valid usable responses were received and analysed, the first part via multivariate analysis process using Structural Equation Modelling (SEM) through Analysis of Moment Structures (AMOS) Software Version 21.0. AMOS is used because of its simplicity and technically advanced nature (Miles, 2000). Moreover, it offers a more precise assessment of the discriminant validity of an instrument than exploratory analysis (Bagozzi and Phillips, 1982). Meanwhile, the second part was analysed using the Statistical Package for the Social Sciences (SPSS) Version 22.0.

RESULTS

Data analysis and results

Respondents demographics profile: Frequencies and percentages for respondent demographics in this study are shown in Table 1. About 342 (71.0%) of respondents were male the remaining 140 (29.0%) female. The majority of respondents (62%) were married while 35.7% still single and 2.1% from other categories (divorced and widowed). Regarding age groups, 2.7% were <20 years old, 93.1% were aged from 20 and 49 years and 4.1% were aged 50 years and above. In term of education, 133 (27.6%) had high school certificate and diploma, 315 (65.4%) had a bachelor degree and 34 (6.7%) had finished their postgraduate studies. By occupation, 23.7% of respondents were students, government and private sector employees represented almost 68.4 and 7.9% were from other categories (business owner, unemployed,

Table 1: Respondents demographics profile

Demographic items/Categories	Frequencies	Percentage
Gender		
Male	342	71.0
Female	140	29.0
Marital status		
Single	127	35.7
Married	300	62.2
Divorced	9	1.9
Widowed	0	0.0
Others	1	0.2
Age (year)		
<20	13	2.7
20-29	184	38.2
30-39	167	34.6
40-49	98	20.3
50-59	18	3.7
60<	2	0.4
Education background		
High school	69	14.3
Diploma	64	13.3
Bachelor degree	315	65.4
Master degree	24	5.0
PhD/DBA degree	8	1.7
Others	2	0.4
Occupation		
Student	114	23.7
Government employee	257	53.3
Private sector employee	73	15.1
Business owner	15	3.1
Unemployed	9	1.9
Others	14	2.9
Gross monthly income		
Less than YER20,000	74	15.4
YER 20,000-YER 39,000	62	12.9
YER 40,000-YER 59,000	87	18.0
YER 60,000-YER 79,000	65	13.5
YER 80,000-YER99,000	95	19.7
YER 100,000 and above	99	20.5
When did you open your first account? (Years)		
1	98	20.3
2	93	19.3
3-5	124	25.7
5-7	58	12.0
≥7	109	22.6

Table 2: Mean and standard deviation

Construct/ Dimension Item	Loading (above 0.5)	M (above 0.7)	SD	α (above 0.5)	CR (0.7)	AVE
PU						
PU1	0.95	4.72	1.80	0.963	0.963	0.867
PU2	0.95					
PU3	0.90					
PU4	0.92					
PEOU						
PEOU1	0.84	4.94	1.76	0.876	0.887	0.723
PEOU2	0.87					
PEOU3	0.78					
SE						
SE1	0.83	4.32	1.55	0.900	0.901	0.752
SE2	0.90					
SE3	0.87					
RSK						
PRI						
PRI1	0.87	4.01	1.98	0.966	0.966	0.852
PRI2	0.89					
PRI3	0.92					
FIN						
FIN1	0.89	4.06	1.85			
FIN2	0.91					
PSY						
PSY1	0.95	3.67	1.89			
PSY2	0.95					
TIME						
TIME1	0.79	3.63	1.53			
TIME2	0.81					
TIME3	0.84					
SEC						
SEC1	0.90	3.98	1.80			
SEC2	0.89					
SEC3	0.89					
INT						
INT1	0.92	4.77	1.88	0.964	0.964	0.899
INT2	0.96					
INT3	0.93					
0						

M = Mean; SD = Standard Deviation; The measurement used is seven-point scale ranging from 1 (strongly disagree) to 7 (strongly agree); PU: Perceived Usefulness, PEOU: Percieved Ease of Use, SE: Self-Efficacy, RSK: Perceived Risk, PRI: Privacy Risk, FIN: Financial Risk, PSY: Psychological risk, TIME: Time Risk, SEC: Security Risk, INT: Intention to use mobile banking services

others). Based on gross household monthly income, 15.4% received <20,000 YER per month, 12.9% ranged between (20,000 and 39000 YER), the majority 51.2% between 40,000 and 99,000 YER and 20.5% or 99 respondents had a monthly income of more than YER 100,000 and above. For the banking experience, 20.3% had only used banking services for up to a year while 57.0% had been bank clients for 2-7 years and 22.6% (109 respondents) had used banking services for >7 years.

Descriptive analysis and measurement model assessment: Table 2 presents the mean and standard deviation for each core variable in the current study. The findings indicate that the level of both PEOU and PU is high among respondents in the current study and show that the respondents expect ease, flexibility and usefulness when using mobile banking. The results also show that the level of both SE and PR is moderate among respondents. The indication is that respondents have the ability to use mobile banking services which may have come as a result of using other technologies and services such as phones and internet banking. However, they also think that using the mobile banking service is risky compared to other banking channels although, the intention to use mobile banking services in the future is good (4.77 out of 7).

Absolute fit indices determine how well a priori model fits the sample data (Mcdonald and Ho, 2002). Based on the results of Confirmatory Factor Analyses (CFA), the Absolute fit indices show that the chi-square is not significant and this is justifiable because of the high sample size (Byrne, 2010). Model fit as reported in RMSEA coefficient is 0.076 indicating a good fit. However, other indicators are not fit with GFI 0.851, Sharma *et al*. (2005) recommended that this index should not be used because of the sensitivity of the index and the fact it has become less popular in recent years. Meanwhile, Adjusted Goodness of Fit Index AGFI 0.819 is fit and incremental fit indices indicate that both tests are fit since the NFI and CFI obtained were 0.924 and 0.943, respectively. As Parsimony fit indices also indicate fit, since the PGFI is 0.699 and PNFI is 0.819, the model fits well. In addition as Incremental fit indices indicate that both tests are fit since the CFI obtained was 0.943, the model fits well (Byrne, 2010; Kline, 2011). The CFA Model in the current study, tested all variables simultaneously, rather than individually because the hypothesised model integrated a small number of items for each of the latent variables. Generally, the goodness-of-fit statistics (Table 3) support the integrity of the overall model. The overall model fit reported in Table 3 shows that the overall fit indices for the CFA Model are acceptable (Byrne, 2010; Hair *et al*., 2014; Kline, 2011), since Incremental fit indices and Parsimony fit indices are fulfilled.

Convergent validity was tested on the CFA Model before testing the hypotheses by examining the factor loading, composite reliability and Average Variance Extracted (AVE). High loadings (at least 0.50) on a factor indicate that the items converge on the same common point (Hair *et al*., 2014). The composite reliability is the same acceptable cut-off for the Cronbach's alpha (at least 0.70). High AVE values (>0.5) show that the latent variables have high convergent validity (Hair *et al*., 2014). In Table 2, the results of composite reliability show values >0.7 and AVE values >0.5, so all variables have convergent validity (Hair *et al*., 2010).

The Fornell-Larcker criterion is a more conservative approach for assessing discriminant validity and compares the value of the AVE with the latent variable correlations. Specifically, AVE should exceed the correlation with any other construct (Hair *et al*., 2014).

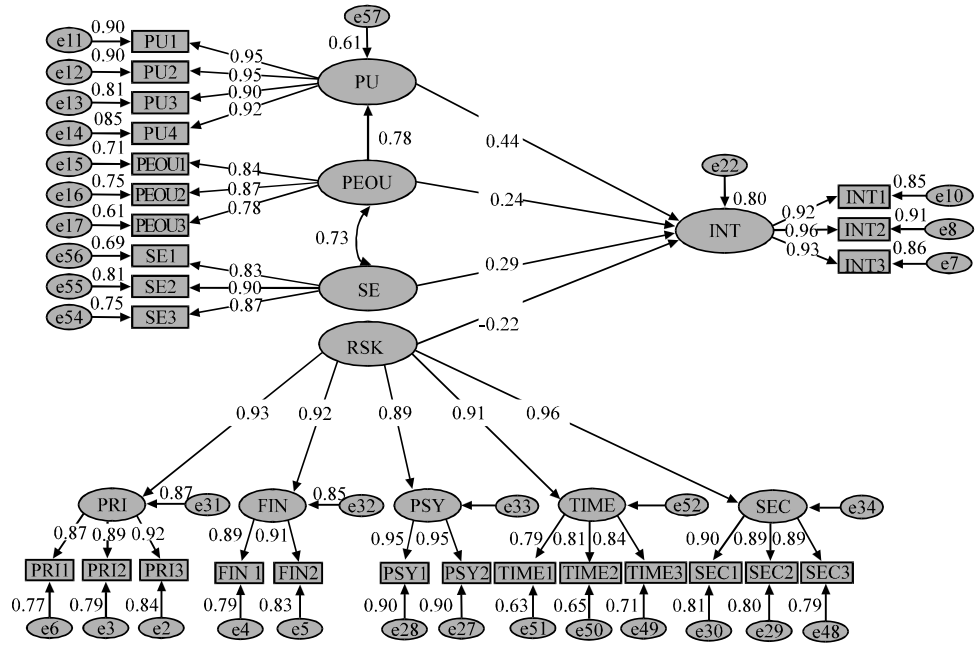


Fig. 4: Research structural model results; PU = Perceived Usefulness, PEOU = Perceived Ease of Use, SE = Self-Efficacy of mobile banking services, RSK = Perceived Risk, INT = Intention to use mobile banking services

Table 3: Goodness-of-fit indices for the measurement model

Fit index	Cited	Admissibility	Result	Fit (Yes/No)
χ^2			1096.064	
DF			288.000	
p-value		>0.05	0.000	No
χ^2/df	Kline (2010)	1.00-5.00	3.806	Yes
RMSEA	Steiger (1990)	<0.08	0.076	Yes
SRMR	Hu and Bentler (1999)	<0.08	0.0450	yes
GFI	Joreskog and Sorbom (1993)	>0.90	0.851	no
AGFI	Joreskog and Sorbom (1993)	>0.80	0.819	Yes
NFI	Bentler and Bonnet (1980)	>0.80	0.924	Yes
PNFI	Bentler and Bonnet (1980)	>0.05	0.819	Yes
IFI	Bollen (1990)	>0.90	0.943	Yes
TLI	Tucker and Lewis (1973)	>0.90	0.936	Yes
CFI	Byrne (2010)	>0.90	0.943	Yes
PGFI	James *et al.* (1982)	>0.50	0.699	Yes

χ2 = Chi-square, df = Degree of freedom, GFI = Goodness-of-fit, NFI = Normed fit index, IFI = the increment fit index, TLI = Tucker-Lewis coefficient Index, CFI = Comparative-fit-index, RMSEA = Root Mean Square Error of Approximation, PNFI = Parsimony Normed Fit Index, AGFI =Adjusted goodness of fit index, SRMR = Standardized Root Mean Square Residual. ***The indexes in bold are recommended since they are frequently reported in literature (Awang, 2014)

Table 4 represents the Fornell-Larcker criterion for this study and shows that AVE exceeds the correlation with any other construct.

Structural model and hypotheses testing: The goodness-of-fit of the structural model was comparable to the CFA measurement model. In this structural model, the χ^2/df = 3.806, CFI = 0.943 and RMSEA = 0.076. These fit indices provide evidence of adequate fit between the hypothesised model and the observed data (Byrne, 2010). The entire hypotheses were tested using structural equation modelling via AMOS Software Version 21.0 as presented in Fig. 4. The structural model fit as shown in Table 5, provides the indication of the hypothese's tests.

Table 4: Results of discriminant validity by Fornell-Larcker criterion

	1	2	3	4	5
Factors	PU	PEOU	SE	RSK	INT
PU	0.931	-	-	-	-
PEOU	0.714	0.850	-	-	-
SE	0.775	0.652	0.867	-	-
RSK	-0.593	-0.517	-0.494	0.923	-
INT	0.862	0.752	0.807	-0.660	0.948

Diagonals represent the square root of the average variance extracted while the other entries represent the correlations. Key: PU: Perceived Usefulness, PEOU: Percieved Ease of Use, SE: Self-Efficacy, RSK: Perceived Risk, INT: Intention to Use Mobile Banking Services

The p-values associated with each standardised path estimate are used to determine significance at an alpha level of 0.05.

Table 5: Structural path analysis result

Hypothesis	Dependent variables/Independent variables	Path coefficients-beta values	SE	CR (t-values)	Findings
H_1	PU<---PEOU	0.779	0.061	16.904***	Supported
H_2	INT<---PU	0.442	0.041	9.855***	Supported
H_3	INT<---PEOU	0.235	0.072	3.963***	Supported
H_4	INT<---SE	0.294	0.051	6.954***	Supported
H_5	INT<---RSK	-0.219	0.025	-8.555***	Supported

PU = Perceived Usefulness, PEOU = Perceived Ease Of Use, SE = Self-Efficacy of mobile banking services, RSK = Perceived Risk, INT = intention to use mobile banking services; ***p<.001; **p<.01; *p<.05; S.E = Standard Error; C.R = Critical Ratio

The results of the five hypotheses constructed are shown in Table 5. The Structural Equation Modelling (SEM) analysis indicates that PEOU significantly predicts PU hence H1 is accepted ($p<0.001$). PU also significantly predicts intention to use mobile banking, so H_2 is supported ($\beta = 0.442$, $p<0.001$). Likewise, H_3 is supported as PEOU significantly predicts behavioural intention ($\beta = 0.235$, $p<0.001$). H_4 is also supported as SE significantly predicts intention to use mobile banking ($\beta = 0.294$, $p<0.001$). PR significantly predicts the intention to use mobile banking services ($\beta = -0.219$, $p<0.001$) and hence, H_5 is supported.

For the coefficient of determination, PEOU is able to explain 61% of the variance in PU while PEOU, SE and PR explain 80% of the variance in intention to use mobile banking services. According to Chin (1998), the R^2 of the intention to use mobile banking in this study is considered substantial.

DISCUSSION

The results show that, PEOU has a highly significant positive effect on PU with 0.781. Therefore, objective H_1 is supported. The original TAM proposed by Davis (1989) suggests that the higher the effort-free of using a system, the higher the perception of the usefulness of that system by users. This is in line with previous studies (Akturan and Tezcan, 2012; Haderi and Saleh, 2012; Amin *et al*., 2008; Gu *et al*., 2009) in different contexts and applications in which was reported a significant positive influence of PEOU on PU (PU is 61% explained by the PEOU). In the current study, potential users of the mobile banking system in Yemeni bank's perceive that if the mobile banking services system is easy to use, their perception of the usefulness of the same system will be heightened and consequently increase their intention to use mobile banking services.

This finding of this study is consistent with studies by Kim *et al*. (2008), Krogstie (2012), Amin *et al*. (2008) and Luarn and Lin (2005) whose empirical evidence shows that PU and PEOU have positively influenced the intention to use mobile banking services. Thus hypotheses H_2 and H_3 are supported. In a related study, Riquelme and Rios (2010) found that PU (performance expectancy) has the most effect on the intention to use mobile banking services among current users of internet banking. Therefore, the findings clearly show that ease of use and usefulness are important predictors of intention to use in the initial adoption stage of mobile banking services (Guriting and Ndubisi, 2006; Riffai *et al*., 2012; Sathye, 1999; Zolait, 2010). The findings also indicate that PEOU and PU are regarded by bank clients in Yemen as core determinants of intention to adopt technology, supporting conclusions reached by prior technology adoption studies (Davis, 1989; Venkatesh *et al*., 2003).

H_4 is supported in consistency with related and previous studies by Cudjoe *et al*. (2015), Khalifa and Shen (2008), Luarn and Lin (2005) and Zolait (2010) who affirmed the significance of positive influence of SE on the intention to adopt a technology. The higher the ability to use and confidence in using similar technology and mobile phones will most probably lead to a higher intention to adopt mobile banking services among Yemeni bank clients.

Perceived risk findings are consistent with former studies (Brown *et al*., 2003; Chen, 2013; Cruz *et al*., 2010; Featherman and Pavlou, 2003; Koenig-Lewis *et al*., 2010; Lian, 2015; Martins *et al*., 2014; Rana *et al*., 2015; Wessels and Drennan, 2010) which have reported the significant negative influence of PR on intention to adopt mobile banking services. The results of all this research, demonstrated that bank client's perceived risk on mobile phone banking is a core predictor of intention to use mobile banking services indicating that the higher the perception of potential risk as a result of using mobile banking services, the lower the predictability that mobile phones will be used for banking purposes in the near future. Among the risk types incorporated in this study, security risk appears to be the greatest concern about the intention to use mobile banking among Yemeni banks clients, followed by privacy risk, financial risk and time risk with the least concern being the psychological risk.

CONCLUSION

The main objective of this study was to determine factors influencing the intention to use mobile banking

services among Yemeni bank clients. While the study has some limitations, the findings have been encouraging, shedding some light on new variables of behavioural intention. In brief, perceived risk can be a significant hindrance to the take-up of mobile banking, since it negatively influences intention to use it. To the bank customer, mobile banking services have to offer something newer than competing services in the same category (such as e-Banking services). As illustrated by this study when bank clients evaluate mobile banking services based on ease of use, usefulness and risk perception, they will decide to use mobile banking services or not. Experience from using mobile phones and similar technologies may also reinforce self-efficacy and ability perception to use mobile banking. The study results clearly show that PU, PEOU, SE and PR are significant predictors of intention to use mobile banking at the initial stage of adoption.

LIMITATIONS

Mobile banking services are still relatively new and somewhat immature in Yemen. Therefore, further research is needed to identify other factors that may facilitate the uptake of mobile banking in Yemen. As this research only studied the acceptance of mobile banking among clients of Yemeni banks, further studies may shed more light on actual usage. Moreover, adding moderating factors like education, age and experience could also add to the findings of future studies. While data collection was geographically limited to Yemen, mobile banking acceptance and adoption is occurring worldwide and a retest and comparison of the proposed model across different cultural and geographical contexts as a future study will increase the generalisability of the results of the proposed model.

IMPLICATIONS

This study revealed that in line with the previous studies, bank customers are more likely to use mobile banking services if the service is easy to use and useful. There is a robust correlation between the mobile banking platform and technological aspects with respect to acceptance and usage of the service offered. Developers of mobile banking platforms must work together with banks to allocate resources and invest effort to create effective mobile banking applications that are easy and useful. Ease of use and direct usefulness both increase the chance of customer uptake of mobile banking services and are significant considerations in the decision whether to use mobile banking services or not, together with service efficiency, convenience and quality.

The current study has also established that in congruence with the foregoing, bank's clients are more willing to use mobile banking services when they have self-confidence and the ability to use technology. In addition, through the experience they have in using other technology, their perception of the value of mobile banking services increases with a consequent uptake of such services. Moreover, if opportunities for bank clients to try and test mobile phone banking services are given by banks, alongside practical demonstrations, there will be a corresponding increase in their acceptance and adoption.

Finally, PR is analysed based on privacy, financial, time, psychological and security risks of mobile banking services. The higher the perception of breaches of privacy, financial disclosures, time wasting, psychological concerns and security risks, the lower the acceptance and usage levels of the service. Clients are less likely to use a service that they do not trust to protect their privacy, money or interest and are less willing to use a service that will make them feel uncomfortable and waste their time. It is suggested that high-security features be incorporated to protect information such as personal identification or details such as account numbers and transactions. To ensure a higher level of uptake of the service among the bank clients, practical adoption of mobile banking will depend on the ability of the service to operate with a similar level of trust and efficiency as other channels of banking.

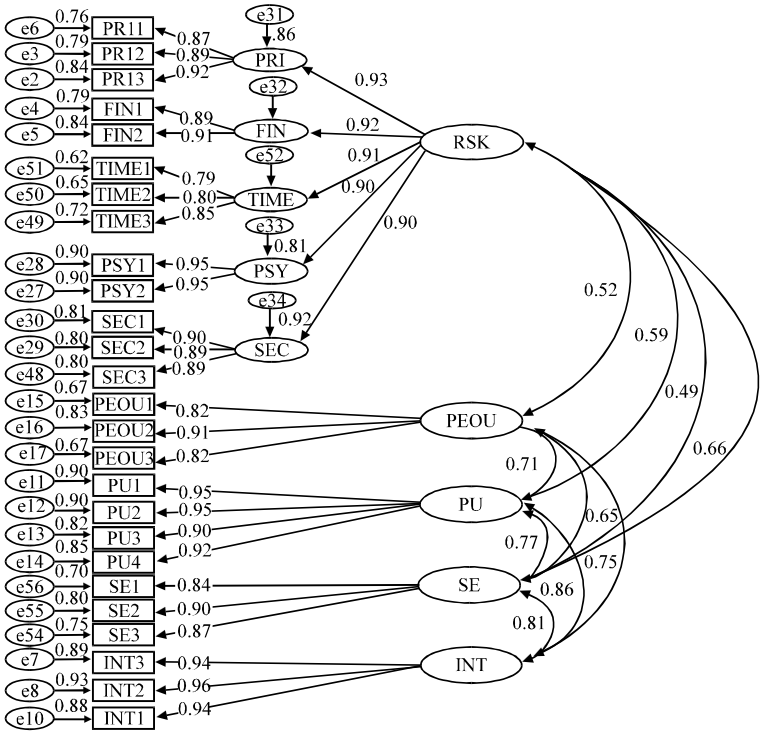
APPENDIX

Appendix A: Instrument for construct

Construct	Dimensions	Items	Sources
Perceived Usefulness (PU)		I think using mobile banking would enable me to accomplish more banking activities	Akturan and Tezcan (2012)
		I think mobile banking would enable me to improve performance of utilizing banking services	Al-somali *et al.* (2009)
		In general, I would find mobile banking useful.	Akturan and Tezcan (2012)
		I think that using mobile banking services will enhances my effectiveness in conducting my banking tasks	Lee *et al.* (2012)
Perceived Ease of Use (PEOU)		I would find mobile banking easy to use	Yu (2012)
		Learning to use mobile phone banking would be easy	Hanafizadeh *et al.* (2014)
		I would find mobile banking services to be flexible to interact with	Liu *et al.* (2008)

Appendix A: Continue

Construct	Dimensions	Items	Source
Self-Efficacy (SE)		I could use mobile banking if I could call someone for help if I got stuck	Yu (2012)
		I could conduct my banking transactions using the mobile banking systems if I had just the built-in help facility for assistance	Luarn and Lin (2005)
		I could conduct my banking transactions using the mobile banking systems if someone showed me how to do it first	Luarn and Lin (2005)
Perceived Risk (RSK)	Privacy risk (PRI)	I think mobile banking endanger my privacy by using my personal information without my permission	Thakur and Srivastava (2013)
		When using mobile banking, my personal data can't be kept private	Chen (2013)
		When using mobile banking, personal information may be stolen by others	Chen (2013)
	Financial risk (FIN)	When using mobile banking, I may lose money because my account information is hacked	Akturan and Tezcan (2012)
		When using mobile banking services, financial risk exists	Chen (2013)
	TIME risk (TIME)	I think I would spend too much time learning how to use mobile banking	Akturan and Tezcan (2012)
		I think that mobile banking would not run fast and cause time loss, Because of some problems in the operating system	Chen (2013)
		I think using mobile banking service would lead to a loss of convenience for me because I would have to waste a lot of time fixing payments errors	Lee (2009)
	Psychological risk (PSY)	Using mobile banking system makes me feel anxiety	Chen (2013)
		Using mobile banking system makes me feel nervous	Chen (2013)
	Security risk(SEC)	I would not feel totally safe providing personal privacy information over the mobile banking	Lee (2009)
		I am worried to use mobile banking because other people may be able to access my account	Luo *et al.* (2010)
		I would not find mobile banking secure in conducting my transactions	Koenig-Lewis *et al.* (2010)
Intention (INT)		Assuming I have access to the mobile banking system, I intend to use it	Venkatesh And Davis (2000)
		I would use the mobile banking for my banking needs	Nasri and Charfeddine (2012)
		If I have access to the mobile banking system, I want to use it as much as possible	Haderi and Saleh (2012)



Appendix B: Confirmatory Factor Analysis (CFA): χ^2 = 77.212; df = 284; p = 0.000; relative χ^2 = 2.723; CFI = 0.966; RMCEA = 0.060; GFI = 0.885; AGFI = 0.858; NFI = 0.947; PNFI = 0.827; IFI = 0.966; TLI = 0.961; PGFI = 0.716

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