MOBILE BANKING ADOPTION: APPLICATION OF DIFFUSION OF INNOVATION THEORY

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ABSTRACT

Many banks in Saudi Arabia are starting to offer banking services through mobile phones. However, not many studies investigate the factors that may help the bankers to design mobile services, which are suitable for and adoptable by bank customers. This study fills this gap and examines a number of factors affecting the mobile banking adoption. Using Diffusion of Innovation as a baseline theory, data are obtained from 330 actual mobile banking users. It is found that relative advantage, compatibility, and observability have positive impact on adoption. Contrary to the findings in extant literature, trialability and complexity have no significant effect on adoption. Perceived risk has a negative impact on adoption. The findings of this study will have practical implications for banking industry in Saudi Arabia.

Keywords: Mobile Banking, IT Adoption, IT Satisfaction, Diffusion Innovation Theory, Saudi Arabia.

1. Introduction

Technological advancements in the area of telecommunications and information technology have continued to revolutionize the banking industry. The delivery of financial services has experienced major changes during the past few years. A feature of the banking industry across the globe has been that it is increasingly becoming turbulent and competitive. Banks, aided by technological developments, have responded to the challenges by adopting a new strategy, which emphasizes on attempting to build customer satisfaction through offering better products and services and at the same time to minimize operation costs [Sohail & Shanmugham 2003]. Provision of mobile banking services has been broadly used, and an understanding of the customer adoption process will have important implications for bankers and customers alike.

Electronic banking is one of the most successful business-to-consumer applications in electronic commerce [Pousttchi & Schurig 2004]. Research in the area of electronic banking has spanned over a gamut of delivery options, from measuring consumers' attitudes toward automated teller machines [Filotto et al. 1997; Moutinho & Smith 2000] to issues on adoption and quality of services of internet banking [Barnes & Corbitt 2003; Black et al. 2002; Enders et al. 2006; Gerrard & Cunningham 2003; Karjaluoto et al. 2002; Lichtenstein & Williamson 2006; Mattila et al. 2003; Polatoglu & Ekin 2001; Sathye 1999; Yu 2012]. More recent studies have analyzed the adoption and use of internet/online banking in Saudi Arabia [Al-Somali et al. 2009; Sohail & Shaikh 2008]. However, with a rapid increase in usage of smart mobile phones in Saudi Arabia and diffusion of WAP-enabled phones, the transformation of banking applications to mobile devices has been a logical development in electronic banking. Mobile banking is emerging as a wireless service delivery channel providing increased value for customers' banking transaction [Pousttchi & Schurig 2004].

The objective of this study is to investigate a set of technical attributes and how they influence mobile banking adoption in a developing nation, like Saudi Arabia. The study uses diffusion of innovation as a base-line theory to investigate factors that may influence mobile banking adoption and use. More specifically, the objective of this research is to examine the potential facilitators and inhibitors of mobile banking adoption. Rogers [2003] identified five attributes of innovations in his seminal book "Diffusion of Innovations". These attributes that are viewed to

determine rate of innovation adoption are relative advantage, compatibility, complexity, trialability, and observability. These five attributes, in addition to perceived risk, are investigated in relation to mobile banking adoption and use in Saudi Arabia. This study appears to be the first attempt to use diffusion of innovation theory, in mobile banking context, in a developing country like Saudi Arabia. This paper is organized as follows: the next section sheds some light on mobile telecommunications and banking in Saudi Arabia, followed by the literature review and hypotheses formulation. Then the research methodology, analyses and results are presented. Finally, the discussions, conclusions and further research directions are suggested.

2. Mobile Telecom and Banking in Saudi Arabia

The long-term vision for information and telecommunication technology (ICT) in the Kingdom of Saudi Arabia is, "The transformation into an information society and digital economy so as to increase productivity and provide communications and IT services for all sectors of the society in all parts of the country and build a solid information industry that becomes a major source of income." [NCIT Plan 2007]. In Saudi Arabia, mobile phones services were first offered in 1995. By the end of third quarter of 2011, the total number of mobile subscribers was 56.1 million, comprising a 198% penetration rate [ICT Indicators Report 2011]. The number of Internet users increased from approximately one million in 2001 to 13 million at the end of third quarter 2011; this corresponds to a cumulative average growth rate (CAGR) of around 21% over the nine-year period (2001-2010). Internet penetration increased from 5% in 2001 to 46% of the population by the end of third quarter 2011 [ICT Indicators Report 2011].

Telecom services revenues in Saudi Arabia have been gradually growing at a cumulative average growth rate (CAGR) of around 13%, increasing from about Saudi Arabia Riyal (SAR) 20 billion (US $5.3 billion) in 2001 to SAR 61 billion (US $16.2) in 2010. Mobile services revenues increased from SAR 8 billion in 2001 to SAR 45.11 in 2010. In addition to revenue from the local market, investment by Saudi licensed telecom companies in international telecom markets have led to a fast growth of revenue for the sector from foreign operations, from SAR 9.5 billion in 2008, to SAR 14.5 billion in 2010, (US $3.9 billion). Local revenues, however, still stand for around 80% of the total telecom sector revenues of SAR 75.5 billion (US $20.1 billion) in 2010 [ICT Indicators Report 2010].

Most large banks in Saudi Arabia like Riyadh, Rajhi, Alahali, SAMBA, and SABB have made substantial investments in mobile banking capabilities and smaller banks are not far behind. Mobile banking services include full access to the details and transactions of personal bank accounts, as well as making credit installment and utility bill payments and transferring funds instantly. Customers intending to use mobile banking must register for the service through the bank website and download the mobile banking application to their phones. Once they install the application, customers are free to use the mobile banking services at their own convenience, wherever and whenever they are, completely free of charge. The only cost is the normal communication cost by the mobile operators.

Riyad Bank, for example, offers mobile banking services that allows their customers to take full advantage of the latest technology whereby they can:
- Check account details
- View mini-statement
- Pay bills for government service and public utilities
- Transfer funds between bank accounts
- Pay credit cards and loan installments
- Place remittances to beneficiaries in local banks or abroad.

SAMBA, another bank in Saudi Arabia, recently has announced the formal launch of their mobile banking applications for the Apple iPhone and Blackberry handheld mobile phones. It is a fully transactional service that allows customers of SAMBA to check their accounts, make payments and transfer funds through their mobile phones at anytime, and from anywhere using the same user name and login password as on PC-based Internet Banking.

The increasing number of mobile subscribers and fierce competition amongst mobile operators has caused continuous improvement in quality of service as well as in reduction of prices. This motivated banks and other commercial and private establishments to offer their services using mobile phones. Therefore; it is important to study the factors that facilitate and/or inhibit the use of mobile banking from customer's perspective.

3. Literature Review and Hypotheses

Past research on understanding individuals' adoption of mobile banking mainly relies on considering mobile banking as a technological innovation. The diffusion of innovation theory (DIT) could be considered as one of the most popular theories that have attempted to explore factors that affect an individual to adopt an innovation or a new technology. DIT is a theory that seeks to explain how, why, and at what rate new ideas and technology spread

through cultures. Rogers defines diffusion as the adoption of an innovation "over time by the given social system", as a consequence diffusion processes result in the acceptance or penetration of a new idea, behavior, or physical innovation. Rogers identified several attributes of an innovation that are key influences on adoption behavior. According to Rogers, these attributes are *relative advantage, complexity, compatibility, trialability, and observability*. A number of previous studies have examined these factors in adoption and diffusion of Internet-based technologies and have consistently concluded these attributes, particularly those of relative advantage, ease of use, and compatibility, as the most frequently salient factors for adoption of Internet and mobile technologies [for example, Koenig-Lewis et al. 2010; Liu & Li 2010; Papies & Clement 2008; Park & Chen 2007; Vijayasarathy 2004]. Following is brief summary of Rogers' five attributes and their relationship with innovation adoption.

3.1.   Relative advantage

Relative advantage refers to the degree to which an innovation is perceived as providing more benefits than its predecessor [More & Benbasat 1991]. Relative advantage results in increased efficiency, economic benefits and enhanced status [Rogers 2003]. Past research has found that relative advantage of an innovation is positively related to the rate of adoption [Moore & Benbasat 1991]. Research suggests that when user perceives relative advantage or usefulness of a new technology over an old one, they tend to adopt it [McCloskey 2006; Rogers 2003]. In the context of mobile banking adoption, benefits such as immediacy, convenience and affordability to customers have been reported [Lin 2011]. Therefore, it is hypothesized that, when customers perceive distinct advantages offered by mobile banking, they are more likely to adopt it.

H1. Relative advantage will have a positive effect on mobile banking adoption.

3.2.   Complexity

Cheung et al. [2000] defined complexity as the extent to which an innovation can be considered relatively difficult to understand and use. They found that complexity negatively influences the adoption of internet usage. Complexity is the opposite of ease of use. Ease of use refers to the extent to which mobile banking is perceived as easy to understand and operate. A vast body of research suggests that there is a strong impact of perceived ease of use of new technology on its adoption [Gu et al. 2009; Luarn & Lin 2005; Venkatesh & Davis 2000; Wang et al. 2006]. As mobile banking services have very user friendly interfaces, users see them as easy to use, and hence to form positive attitudes towards them [Lin 2011].

Complexity in use is a major factor in adoption of mobile banking. There is considerable amount of empirical research on the mobile technology to suggest that users' intention to adopt mobile banking is inhibited by the perceived complexity of the innovation [Au & Kauffman 2008; Mallat 2007; Ondrus & Pigneur 2006]. Much of the extant literature on barriers of mobile banking adoption is predominantly related to technical complexity. Complexity in use, technical infrastructure, and design of technology are reported as individual barriers in a number of studies [Vrechoupoulos et al. 2003]. Users will be inhibited to use mobile banking if they find it requires more mental effort, is time-consuming or frustrating. Therefore, it is hypothesized that perceived complexity inhibits adoption of mobile banking.

H2. Complexity will have a negative effect on mobile banking adoption.

3.3.   Compatibility

Compatibility refers to the degree to which a service is perceived as consistent with users' existing values, beliefs, habits and present and previous experiences [Chen et al. 2004]. Compatibility is a vital feature of innovation as conformance with user's lifestyle can propel a rapid rate of adoption [Rogers 2003]. Research has shown that compatibility is a significant antecedent in determining consumers' attitude towards internet banking adoption in Malaysia [Ndubisi & Sinti 2006]. Compatibility has further been found influential in the adoption of virtual store [Chen et al. 2004], m-payment [Chen 2008], and mobile banking [Koenig-Lewis 2010; Lin 2011]. Al-Gahtani [2003] found that compatibility had significant correlation with computer adoption and use in Saudi Arabia. Thus, it is also likely that the relation between compatibility and adoption will hold in the context of mobile banking.

H3. Compatibility will have a positive effect on mobile banking adoption.

3.4.   Observability

Observability of an innovation describes the extent to which an innovation is visible to the members of a social system, and the benefits can be easily observed and communicated [Rogers 2003]. Moore & Benbasat [1991] simplified the original construct by redefining observability into two constructs: visibility and result demonstrability. In the context of mobile banking, observability is defined as the ability to access the banking services at any time and from any location without any delay or queue, and seeing the effect of mobile banking transactions immediately, and conveying the accessibility benefits to others. Through such exposure, customers gain knowledge about mobile banking and its benefits, thereby facilitating adoption.

H4. Observability will have a positive effect on mobile banking adoption.

3.5.   Trialability

Trialability refers to the capacity to experiment with new technology before adoption. Potential adopters who are allowed to experiment with an innovation will feel more comfortable with it and are more likely to adopt it [Agarwal & Prasad 1998; Rogers 2003]. Further support is given by Tan & Teo [2000] who argue that if customers are given a chance to try the innovation, it will minimize certain unknown fears, and lead to adoption. With banks providing assistance and demonstrations on mobile banking usage while in the trial period, fears about mobile banking can be minimized and this will also motivate potential adopters to use mobile banking.

H5. Trialability will have a positive effect on mobile banking adoption.

3.6.   Perceived risk

This attribute refers to the degree of risks in using an innovation [Ram & Sheth 1989]. Risk perception by customers usually arises due to the doubt related to the degree of inconsistency between customers' judgment and real behaviour, and technology failing to deliver its anticipated outcome and its consequent loss [Chen 2008; Koenig-Lewis 2010; Lee et al. 2007]. In technology adoption, there is research evidence of the importance of the perception of risk in deploying new technology or services [Gewald et al. 2006; Ndubisi & Sinti 2006].

In the context of mobile banking, the perception of risk is even more important due to the threat of privacy and security concerns [Luarn & Lin 2005]. Secondly, fear of loss of PIN codes may also pose security threats [Kuisma et al. 2007]. Thirdly, some users also fear that hackers may access their bank accounts via stolen PIN codes (Poon 2008). Finally, some users may also have a fear of loss or theft of a mobile device with stored data [Coursaris et al. 2003]. Therefore, perceived risk is more likely to negatively affect the mobile banking adoption.

H6. Perceived risk will have a negative effect on mobile banking adoption.

3.7.   Mobile banking adoption

Rogers [2003] defined adoption as a decision to make full use of an innovation. In this study, we are investigating the factors that influence the adoption of mobile banking. While there are many studies that define adoption in terms of implementation, usage, utilization, or satisfaction; this study uses satisfaction as it is the most widely used single measure of adoption. Satisfaction has often been used as the dependent variable for IT success [DeLone & McLean 1992, 2003; Montazemi 1988; Raymond 1990]. The reason for selecting satisfaction as surrogate measure for adoption is twofold. First, "satisfaction" has a high degree of face validity. It is hard to deny the success of a system where users say that they like it. Second, the satisfaction is widely used as a success measure [DeLone & McLean, 1992 2003; Liu & Guo 2008; Mahmood et al. 2000; Zviran & Ehrlich 2003] and post-adoption measure of m-services [Park et al. 2011]. The study hypotheses are depicted in Figure 1.
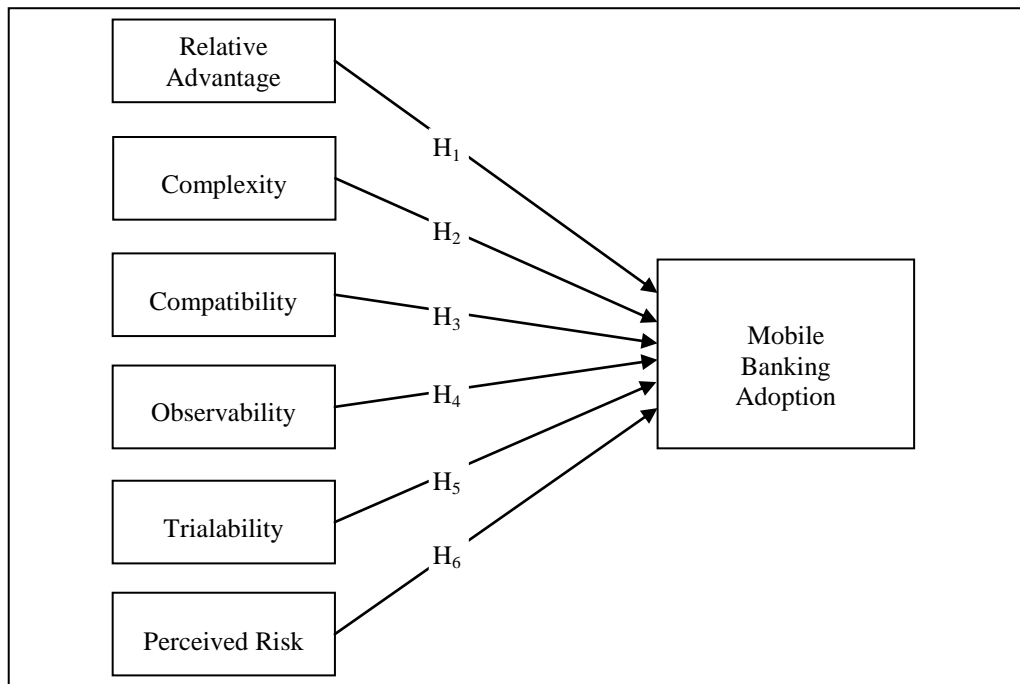

Figure 1: The Research Model

4. Research Methodology

4.1. Focus group discussion

A group of eight graduate students having an exposure to mobile banking was invited to participate in the focus group. They were briefed about the purpose of the meeting and the guidelines developed by Morgan [1988], and were used in managing the focus group discussion. The list of variables relating to the adoption of mobile banking identified through a review of the literature was revealed to the participants. They were then asked to select and assess the variables they felt were relevant when undertaking mobile banking. The discussion, moderated by one of the authors lasted nearly two hours and the findings were used to refine the survey instrument design.

4.2. Development of survey instrument

Based on the review of literature and input from the focus group discussion, a survey instrument was specifically developed for this study. The survey instrument consisted of a two part self–administered questionnaire. The first part of the questionnaire was designed to capture demographic characteristics of respondents and usage patterns in mobile banking. The second part was designed to capture information on constructs affecting the mobile banking adoption, namely relative advantage, complexity, compatibility, observability, trialability, and perceived risk. The measurement items of these constructs are adopted from prior research on internet and mobile banking [e.g. Kuisma et al. 2007; Lee & Chung 2009; Lin 2011; Ndubisi & Sinti 2006; Poon 2008; Rogers 2003; Tan & Teo 2000] and adapted for this study.

After developing the instrument, a pilot test was conducted on 20 randomly selected mobile banking users with diverse backgrounds studying in the university campus. This was done to ensure clarity and validity of the survey instrument. After obtaining feedback, it was decided to modify the wordings of some questions as they were found to be lacking clarity in meaning. The final items and their corresponding sources are listed in ''Appendix''. All items were measured with a five-Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

4.3. Sample and procedure

The target population of this study was all adult individuals residing in Saudi Arabia. Because of difficulties in obtaining probabilistic samples in Saudi Arabia, a convenience sampling technique was used. In the first stage of data collection, initial recruits were randomly selected by the authors from university students in three major cities in Saudi Arabia. The chosen cities are spread across three different regions: Jeddah in the western province, Riyadh in the central province, and the tricities of Dhahran-Khobar-Dammam in the eastern province. After refinement, questionnaires are distributed to 1500 participants. All these efforts resulted in obtaining 496 usable responses.

All collected questionnaires were checked for completeness. To increase accuracy and precision, an editing process was undertaken by reviewing the questionnaire and screen out illegible, inconsistent and ambiguous responses. A code sheet was then prepared. After this process, data cleaning was undertaken for a more thorough and extensive treatment of responses. All data was inputted using the SPSS v16 package for the next step of analyses. After this round of elimination due to incompleteness, we were finally left with 466 usable questionnaires, of which 330 mobile banking users and 136 potential mobile banking users. This gives a response rate of 31% which compares favorably with results of previous studies in Saudi Arabia [Sohail & Sahin 2010].

5. Results

Table 1 shows the demographic characteristics of 330 respondents who actually used mobile banking services. About 58% are male; and almost 93% are Saudi nationals. Mobile banking users are relatively young in the sample; more than two-thirds of the mobile banking users (72.7%) are between 18 and 25 years old. Approximately 41% earn SAR 5000 or more per month; 54.5% are students; 75.8% visit their banks 1-4 times monthly; 35.8% make deposits when visiting their banks; and 43.7% used mobile banking for one year or more.

5.1. Factor Analysis

Based on the review of literature discussed earlier, the items identified as measure for the six independent variables (i.e. relative advantage, compatibility, observability, complexity, trialability, and perceived risk) were subjected to a factor analysis in order to group them into meaningful clusters and verify their unidimensionality. Specifying six factors, factor analysis was conducted via principal component analysis with orthogonal varimax rotation. The Bartlett Test of Sphericity and Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy were used to validate the use of factor analysis. Table 2 indicates that the value of KMO is meritorious (i.e. between 0.80 to 0.89) and Bartlett's Test of Sphericity is significant ($P<0.05$) suggesting that factor analysis can be conducted [Kaiser 1974]. Various authors have given different cutoff values for the retention of items based on the value of factor loadings, varying from 0.35 to 0.50 [Hair et al. 1998]. In this study, loadings of 0.50 or more are considered practically significant. However; the authors, as an exception, retained two items. The first one "*I can see the effect of a transaction immediately*", having factor loading equal to 0.482, was retained on the basis that it does load on its own construct, namely "Observability"; and its factor loading is close to 0.50. The second item "*MB fits well with*

the way I like to manage my finances", having cross loadings greater than 0.50 was retained because it loads on its own construct, namely "Compatibility". The remaining items are grouped into six factors. These factors are relative advantage, compatibility, observability, complexity, trialability, and perceived risk, explaining 74.86% of the total variance. The results of the factor analysis are summarized in Table 3.

Table 1: Demographic characteristics of the respondents

Variable		N	%
Gender	Male	191	57.9
	Female	139	42.1
Age (years)	18-25	240	72.7
	26-30	45	13.6
	31-35	23	7.0
	36-40	10	3.0
	Above 41	12	3.6
Nationality	Saudi	306	92.7
	Non-Saudi	24	7.3
Education	High School	74	22.4
	Diploma	35	10.6
	Bachelor	179	54.2
	Master Degree	36	10.9
	Ph.D	4	1.2
	Others	2	0.6
Monthly Income (SAR)*	Under 1,000	105	31.8
	1,000 - 4,999	90	27.3
	5,000 - 9,999	46	13.9
	10,000 - 14,999	51	15.5
	15,000 - 20,000	23	7.0
	Over 20,000	15	4.5
Occupation	Student	180	54.5
	Executive	26	7.9
	Worker	49	14.8
	Not-Employed	13	3.9
	Self-Employed	24	7.3
	Others	38	11.5
Name of Bank have an Account	Riyad Bank	75	22.7
	Alahli Bank	98	29.7
	SAMBA	45	13.6
	Rajhi Bank	46	13.9
	SABB	24	7.3
	Others	42	12.7
No. of Bank Visits per Month	1 to 4 times	250	75.8
	5 to 8 times	45	13.6
	9 to 12 times	15	4.5
	Over 12 times	20	6.1
Experience in Using Mobile Banking	Less than 6 months	34	10.3
	6 months to < 1 year	152	46.1
	1 to 3 years	84	25.5
	More than 3 years	60	18.2

Reason for Bank Visit	Make a deposit	118	35.8
	Investment advice	19	5.8
	Balance inquiry	28	8.5
	Cash withdrawal	71	21.5
	Money transfers	33	10.0
	Others	61	18.5

*3.75 SAR = 1 USD

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.848
Bartlett's Test of Sphericity	Approx. Chi-Square	4653
	Degrees of Freedom	231
	Significance	0.000

Factor 1 contains five items measuring the Relative Advantage with a variance of 18.87%. Factor 2 has five items measuring Compatibility with variance of 14.49%. Factor 3 has four items measuring Observability with variance of 11.07%. Factor 4 has three items measuring Complexity with variance of 10.99%. Factor 5 has three items measuring Perceived Risk with variance of 10.80%. Finally, two items of Trialability loaded on the sixth factor with variance of 8.64%.

Table 3: Exploratory factor analysis

Constructs	Factor Loadings					
	1	2	3	4	5	6
Relative Advantage						
MB is a convenient way to manage finance	**.859**	.105	.197	.135	.067	.063
MB allows to manage finance efficiently	**.840**	.135	.115	.085	.013	.058
MB allows me to manage my finance effectively	**.798**	.204	.235	-.055	.085	.181
MB gives greater control over finances	**.779**	.250	.104	-.028	.068	.061
MB is useful for managing financial resources	**.748**	.139	.333	.138	.143	.149
Compatibility						
MB fits well with the way I like to manage my finances	.532	**.529**	.142	.075	-.111	.240
I like to try new technology	.136	**.897**	.105	-.097	.009	.077
I like to adopt new innovation	.142	**.871**	.065	-.107	.048	.087
MB is compatible with my lifestyle	.296	**.656**	.261	-.002	-.010	.272
Using MB fits into my working style	.321	**.643**	.270	.020	-.109	.306
Observability						
MB can be accessed anytime & anywhere when in Saudi Arabia	.151	.117	**.855**	-.014	.007	.257
MB have no queue	.302	.106	**.716**	.095	.057	.033
MB can be accessed when abroad	.347	.219	**.682**	.145	.047	-.074
I can see the effect of a transaction immediately	.231	.332	**.482**	-.133	.171	.299
Complexity						
MB requires a lot of mental effort	.083	-.027	.076	**.842**	.278	-.039
MB requires technical skills	.049	-.106	-.005	**.832**	.157	.163
MB can be frustrating	.066	-.037	.062	**.828**	.229	.012

Perceived Risk						
Information about my transactions may be tampered by others	.037	-.073	.140	.252	**.847**	.098
I fear that the PIN codes get lost & end up in wrong hands	.029	.011	.071	.152	**.828**	.159
Information about my transactions may be known to others	.162	.042	-.065	.317	**.823**	-.002
Trialability						
I want to try for at least one month	.207	.189	.182	.148	.118	**.834**
I want to use MB on a trial basis to see what it can do for me	.135	.330	.078	.017	.169	**.822**
Eigen value	**4.15**	**3.19**	**2.44**	**2.42**	**2.38**	**1.90**
Variance explained (%)	**18.87**	**14.49**	**11.07**	**10.99**	**10.80**	**8.64**
Cumulative variance explained (%)	**18.87**	**33.36**	**44.42**	**55.42**	**66.22**	**74.86**

5.2. Cronbach's coefficient of reliability

The items in the study constructs were then tested for reliability. To check the reliability of each factor, internal consistency using Cronbach's Alpha analysis was computed. The coefficients ranged between 0.922 (factor Satisfaction) and 0.783 (factor Observability) which are all above the value of 0.6 [Nunnally & Bernstein 1994]. This indicates that all items in the factorial groups in this study are sufficient reliable measures, Descriptive statistics and Cronbach's Alpha reliability coefficients are presented in Table 4.

Table 4: Mean, Standard Deviation, and Cronbach's Alpha Reliability

Dimension	No. of Item	Mean	Standard Deviation	Alpha
Relative Advantage	5	3.625	0.751	0.908
Compatibility	5	3.831	0.749	0.883
Complexity	3	2.956	0.935	0.843
Observability	4	3.697	0.747	0.783
Perceived Risk	3	3.336	0.958	0.858
Trialability	2	3.768	0.925	0.839
Satisfaction	5	3.515	0.820	0.922

Notes: Mean scores based on a five point scale , where 1= Strongly Disagree and 5= Strongly Agree

5.3. Regression analysis

Table 5 reports the result of the multiple regression model. The dependent variable is satisfaction of mobile banking use as a surrogate measure for mobile banking adoption. The *F* statistic for the regression model is 40.222 (with a *p* value of 0.000). The results of the regression analysis show that four factors, that are relative advantage, compatibility, and observability have positive significant effect and perceived risk has negative significant effect on mobile banking adoption. However, complexity and trialability are found to have no significant effect on mobile banking adoption. Further, R^2 which is 0.428 indicates that 42.8% of mobile banking adoption is explained by the model. The variance inflation factor (VIF), which indicates the degree to which each predictor (i.e. independent) variable is correlated with other predictor variables, showed that there is no evidence of multicollinearity. A threshold VIF that is less than or equal to 10 (i.e. tolerance > 0.1) suggests that multicollineariy is almost absent.

Table 5: Regression Model of mobile banking adoption

Independent Variables	B	Standard Error	T	p-value	Collinearity Statistics	
					Tolerances	VIF
Relative Advantage	.270	0.062	4.363	.000	0.554	1.806
Compatibility	.320	0.065	4.956	.000	0.509	1.964
Observability	.294	0.061	4.817	.000	0.573	1.745
Complexity	.057	0.043	1.304	.193	0.726	1.378
Trialability	-.045	0.046	-0.987	.324	0.658	1.521
Perceived Risk	-.141	0.043	-3.333	.001	0.710	1.408

Dependent Variable = Satisfaction; R^2 = 0.428; Adjusted R^2 = 0.418; F = 40.222; P-value <0.05

6. Discussions

Hypothesis H1, that is relative advantage will have a positive effect on mobile banking adoption is supported (t=4.363, p ≤ 0.001). This result is consistent with and supports prior research related to mobile commerce [Khalifa & Shen 2008; Lu et al. 2003; Luarn & Lin 2005; Nor & Pearson 2007]. Relative advantage is almost similar to perceived usefulness in the technology acceptance model. This implies that those customers who find mobile banking useful and convenient way in managing their finances efficiently and effectively will tend to adopt it.

Compatibility is found to be the most significant determinant to predict mobile banking adoption. The support for H2 (t=4.956, p ≤ 0.001) is similar to findings of previous studies [Koenig-Lewis 2010; Lin 2011]. These studies have shown that perceived compatibility of an innovation has a positive influence on the adoption of mobile banking. This implies that mobile banking service fits well in the manner customers manage their finances, is suitable to their working and lifestyle, and therefore, they like to adopt new innovations. When customers or prospective customers perceive that using mobile banking is completely compatible with their current ways of banking and it fits well with the way they like to do banking, they tend to adopt it.

Observability is found to have a significant effect on mobile banking adoption, supporting H3 (t=4.817, p ≤ 0.001). Observability, in the mobile banking context, is the ability to see the beneficial results like immediate access to transactions anytime and anywhere. From the customers' perspective, mobile banking offers a very convenient and effective way to manage one's financial transactions as it is easily accessible around the clock.

Complexity is found to have an insignificant effect on mobile banking adoption, thus not supporting H4. This result is unexpected and contradictory to findings of some prior studies [Jahangir & Begum 2008; Luarn & Lin 2005]. However, it is consistent with Wang et al.,'s [2003] findings, which suggested that there was no significant impact of ease of use on behavioral intention to use the internet banking. It can be inferred that since majority, 72.7%, of the sample respondents of this study are young (between ages of 18 and 25), it is possible that they can learn mobile banking easily; and thus the complexity has no impact on their decision whether they adopt mobile banking or not. Since youth are more aware of new innovation, they may have experienced various technologies and therefore have a good foundation of knowledge on how to use and interact with mobile banking.

Trialability is also found to have an insignificant effect on mobile banking adoption, not supporting H5. This supports other research finding in the context of PC and phone banking [Kolodinsky et al. 2004]. However, the reasons for not supporting H5 are not clear. Normally, in the trial period, customers are expected to have full support and awareness about the mobile banking services. Perhaps, banks do not give much attention to the potential customers who are willing to use mobile banking on trial bases. Therefore, such customers are not likely to be convinced with mobile banking as they do not see its benefits in the trial period. Another contrasting explanation is that consumers may have trust in mobile banking, find it useful, and consider it safe and less risky. Hence; they think that there is no need to try it out.

Perceived risk is found to have a negative significant effect on mobile banking adoption, supporting H6 (t=-3.333, p ≤ 0.001). This is in line with most of the previous research findings [Chen 2008; Tan & Teo 2000], which means that bank customers perceive risk as a major impediment to the adoption of mobile banking. They fear that their PIN codes may get lost and end up in wrong hands and the information about their transactions could be known and tampered by others. This customers' concern must be addressed by banks have by providing assurances that their banking transactions are safe; and the whole mobile banking system is trustworthy.

7. Conclusions, Limitations and Further Research

Our findings suggest that banks, in Saudi Arabia, should offer mobile banking services that are compatible with various current user requirements, past experiences, lifestyle and beliefs in order to fulfill customer expectations. With better mobile banking support and provision of variety of services, the more useful customers perceive mobile banking to be and to increase their level of adoption. Hence, bank's attention should focus on understanding customer behavior and designing reliable mobile banking systems that will meet their needs and provide useful and quality services. In addition, banks should focus on communicating information that emphasizes the relative advantage and usefulness of mobile banking compared to other banking channels like physical presence to the bank or using ATM machines. Banks must seek to reduce risk perceived by their customers by offering specific guarantees protecting them and taking their complaints seriously and urgently.

This study used convenience sampling technique for data collection. Thus the findings cannot be generalized because the majority of the sample size is young respondents, between 18 and 25 years old. The mobile banking services are still relatively new in Saudi Arabia, and probably immature, therefore, further research is needed to identify additional factors that facilitate adoption of mobile banking in this country. Searching for additional variables that will improve our ability to understand actual use and predict usage intention more accurately is necessary. Since the research model explained less than half of the variance of the dependent variable, it would be

reasonable to add social influence and facilitating conditions, such as self-efficacy and technical support, to the research model. Moderating variables like age, education, and experience may also add more insight to the findings of future studies.

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Appendix: *Measurement items*
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Relative Advantage
Mobile Banking is a convenient way to manage finances [Tan & Teo 2000]
Mobile Banking allows to manage finance efficiently [Tan & Teo 2000]
Mobile Banking allows me to manage my finance effectively [Tan & Teo 2000]
Mobile Banking gives greater control over finances [Tan & Teo 2000]
Mobile Banking is useful for managing financial resources [Tan & Teo 2000]

Compatibility
Mobile Banking fits well with the way I like to manage my finances [Lin 2011]
I like to try new technology [Gerrard & Cunningham 2003]
I like to adopt new innovation [Gerrard & Cunningham 2003]
Mobile Banking is compatible with my lifestyle [Lin 2011]
Using Mobile Banking fits into my working style [Lin 2011]

Observability
Mobile Banking can be accessed anytime and anywhere when in Saudi Arabia [Poon 2008]
Mobile Banking have no queue [Poon 2008]
Mobile Banking can be accessed when abroad [Poon 2008]
I can see the effect of a transaction immediately [Fain & Roberts 1997]

Complexity
Mobile Banking requires a lot of mental effort [Tan & Teo 2000]
Mobile Banking requires technical skills [Laukkanen & Cruz 2009]
Mobile Banking can be frustrating [Tan & Teo 2000]

Perceived Risk
Information about my transactions may be tampered by others [Ndubisi & Sinti 2006]
I fear that the PIN codes get lost and end up in wrong hands [Laukkanen & Cruz 2009]
Information about my transactions may be known to others [Ndubisi & Sinti 2006]

Trialability
I want to try for at least one month [Tan & Teo 2000]
I want to use Mobile Banking on a trial basis to see what it can do for me [Tan & Teo 2000)

Satisfaction
I strongly recommend Mobile Banking to others [Lee & Chung 2009]
I think that I made the correct decision to use Mobile Banking [Lee & Chung 2009]
I am satisfied with the way that Mobile Banking has carried out transactions [Lee & Chung 2009]
I am satisfied with the service I have received from Mobile Banking [Lee & Chung 2009]
Overall, I was satisfied with Mobile Banking [Lee & Chung 2009]

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