Studying and developing a model for mobile banking adoption in Iran banking system

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Abstract

With huge investment made in information technology, there are some challenges to the adoption of the technologies including mobile banking for some reasons. The aim of the paper is to investigate factors affecting mobile banking adoption with the instrumental factor framework “Technology Adoption Model” (TAM), as well as investigating the potential performance of the model in Iran’s banking system. Furthermore, in this research, considering certain features of mobile banking, an attempt was made to add some variables of “Innovation Diffusion Theory” (IDT) to the model. In this research, type of research is applied-developmental, and method of implementing it is survey method. Data collection was performed via library studies and field observations (questionnaire). The study population consisted of Melli banks’, Pasargad banks’, Mellat banks, and Saderat Banks’ clients in Tehran, in that a sample consisting 300 individuals was finally obtained using a stratified random sampling. The validity of the questionnaire was confirmed by professors’ and experts’ opinions, and its reliability was estimated to be 89% by means of Cronbach’s alpha coefficient. In the end, the findings of the research indicated that among factors affecting mobile banking adoption credibility (security and privacy) and Perceived ease-of-use had stronger effect than other factors namely compatibility, perceived trust and Perceived usefulness; additionally, the proposed theoretical model could interpret behavioral intention of use variance better at a considerable rate of about 55%, while TAM has just 40% predictability.

Keywords: mobile commerce, mobile banking, technology acceptance model (TAM), innovation diffusion model (IDT), trust.
1. Introduction

The modern age is largely different from the past. One of the characteristics of the modern age is the fast pace of changes. It has been said that no technology but information and communication technology could ever serve as a catalyst for political, social and economic changes since the invention of printing machine in the 15th century by “Gutenberg (Commonwealth center for Electronic Governance, 2002). Over the past decade, the world has witnessed the rapid development of communicative mobile devices and wireless technologies, which has resulted in a new kind of business called m-commerce as part of e-commerce. M-commerce is a process during which commercial transactions conducted by mobile communicative networks using mobile payment tools such as mobile phone or other mobile devices (Yang C et al, 2011).

Statistical studies indicate that electronic banking has grown non-linearly and made unprecedented jump in recent years. E-commerce conducted in 1998 via the internet was about $40 billion; the rate has rose to about $110 billion by the end of 2000. In this regard, available predictions suggest an increase in the use of the internet in banking from 6.6 million in 1998 to 32 million in 2003, suggesting continuation of explosive growth in this technology (Meshkini et al, 2011: 18). Despite countless advantages of mobile banking, the use of mobile phone or tablet has not been expected a lot for conducting banking operation or getting access to financial information (Dineshwar R, Steven M, 2013). However, reports of public media have announced that it is expected that one billion people in the world will use mobile banking services by 2017 (Shaikh A, Karjaluoto H, 2015: 130).

Mobile banking systems consist of WAP1, GPRS2 and STK3. Despite the obvious advantages of mobile banking for both customers and banks, the service has received little acceptance in many societies including Iran (Hanafizadeh P. et al., 2014; 63). In Iran, due to lack of infrastructures and high costs of the wireless internet and low-speed internet of mobile phone and lack of permanent connection to the internet, mobile banking has been facing substantial problems. At the same time, there are people who cause challenges to the adoption of new technologies due to some reasons such as lack of familiarity, uncertainty, and lack of security and costs relating to banking transportation. Unfortunately, in Iran the speed of electronic service adoption is less than that in other countries.

In research conducted into the adoption of new technologies, a variety of models such as Theory of Reasoned Action (TRA), Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), and Innovation Diffusion Theory (IDT) were utilized. In domestic studies, we can refer to master’s thesis by Hemmati (2010) and Shamsi YazdaniFard (2003), which were conducted into the acceptance of mobile banking and factors contributing to mobile banking adoption, while mobile banking was not addressed in the research by Yazdanifard and mobile banking and its features were dealt with just as introduction and an overall account in the research by Hemmati. In other countries, concerning the acceptance of financial services of e-banking, McKechnie et al. (2006), using TAM model, came to the conclusion that customers who had experience of online shopping earlier accepted e-banking services easier; in this paper, emphasis

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1 Wireless application protocol
2 General Packet Radio Service
3 Sim Tool Kit
was largely placed on earlier experiences of the service users, rather than on mobile banking in particular. Sun et al (2009) introduced the matter of trust in TAM model and found the importance of studying the important role of trust in the acceptance of e-banking and mobile banking. However, they didn't point to important factors such as compatibility or acceptability of mobile banking. Roca et al. (2008) found perceived trust, Perceived usefulness, and Perceived ease of use to be basic factors in the discussion of online commerce systems. Wessels and Drennan (2010) referred to the importance of perception of risk, Perceived usefulness, compatibility and Perceived costs of mobile banking adoption, though subjective perception of costs doesn't appear to be a determining factor in mobile banking, because rate of mobile influence is high to such an extent that clients are charged a little for using such services. Koening-Lewis et al (2010) studied a synthetic model composed of IDT and TAM model, and concluded that the proposed model interpreted intention of use variance and behavior better at a considerable rate (about 65%) and can explain variations in mobile banking adoption, while TAM model could just interpret about 40% of intention of use variance. Moreover, subjective perceptions of compatibility, usefulness, and risk are believed to be determining indicators in the discussion of mobile banking. However, in this article, the topic of trust has been emphasized a little, and perceived trust was considered a separate factor, as other factors affecting perceived trust were not taken into consideration.

Given the above and previous research conducted into mobile banking, in this research, considering change of environmental conditions and test of the proposed model according to particular circumstances of Iran, an attempt was made to explore the situation of mobile banking and factors affecting it (such as Perceived usefulness, Perceived ease-of-use, Perceived trust, and also matter of security and privacy and compatibility, and creditability).

Innovation, the main characteristic of this research, i.e. the synthesis of the two models TAM and IDT, which were conducted in similar studies, has proved that it can predict the acceptance of mobile banking better. Considering the key role of trust in the acceptance of new technologies, particularly mobile banking, perceived trust has taken on a central role, and effort was made to explore the role of trust in the acceptance of mobile banking in a particular manner.

In this regard, the research endeavors to develop a model of technology acceptance and use Innovation Diffusion Theory in the field of mobile banking. In other words, it comes up with a model for mobile banking field among young Iranian people according to models of acceptance and innovation diffusion.

The present research aims at measuring the effect of the five variables “Perceived usefulness”, “Perceived ease of use”, “Perceived trust”, and “compatibility” and “trust” on the dependent variable, i.e. “behavioral tendency to the adoption of mobile banking”, by proposing the following hypotheses:

H1: subjective perception of usefulness (perceived usefulness) results in higher behavioral tendency toward using mobile banking, and it is positively related to the tendency toward the acceptance of mobile banking.

H2: subjective perception of ease of use (Perceived ease-of-use) results in higher behavioral tendency toward using mobile banking, and it is positively related to the tendency toward the acceptance of mobile banking.

H3: compatibility results in higher behavioral tendency toward using mobile banking, and it is positively related to the tendency toward the acceptance of mobile banking.
H4: perceived trust results in higher behavioral tendency toward using mobile banking, and it is positively related to the tendency toward the acceptance of mobile banking.

H5: creditability results in higher behavioral tendency toward using mobile banking, and it is positively related to the tendency toward the acceptance of mobile banking.

2. Introduction to the research model
Over the past two decades, acceptance of information technology has been the topic of many studies, and various models have been proposed for technology acceptance at personal level. Among the theories, “technology acceptance model” has gained more attentions (Ploufee. C et al., 2001). The model was introduced by Davis in 1985, based on “Theory of Reasoned Action” at MIT University. The overall framework of TAM model in which Davis made some changes in 1989 is as follows;

*Figure 1. Technology acceptance model (TAM). Source: Davis FD (1989)*

In this model, it is assumed that tendency toward the use of a technology by means of users’ perception of usefulness and ease of use, in that tendency toward use ends up with application of that system. As a matter of fact, according to the model, application and use of new products and services are influenced by tendency and desire for that product; this is also shaped by usefulness and ease of use. External variables have an impact on users’ acceptance by affecting key variables.

Davis asserted that further research is needed to explore the effect of other factors on usefulness and ease of use (Davis FD, 1989). On the contrary, many studies have shown that basic constructs ‘theme’ cannot totally explain the effects of technological and applied factors that can change the adoption of information system (Moon JW, Kim YG, 2001).

In this research, considering certain features of mobile banking, an attempt was made to add variable of IDT theory to TAM model and, in consequence, we aim to test a model that can best predict users’ tendency toward acceptance of mobile banking in Iran banking system. The hypothetical model of the research is shown in figure 2 in order to be tested in Iran banking system; in what follows, the constructs of the model are reviewed and the hypotheses of the model are illustrated.

*Figure 2. Initial conceptual model proposed in the present research for testing model fitting in Iran Banking system (source: authors)*
Table 1. Model variables and research measures

<table>
<thead>
<tr>
<th>measures</th>
<th>Variables of interest</th>
<th>measures</th>
<th>Variables of interest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulfilling obligations</td>
<td>Perceived trust (PTRUST)</td>
<td>Efficiency of banking</td>
<td>Perceived usefulness (PU)</td>
</tr>
<tr>
<td>Reliability</td>
<td>(PTRUST)</td>
<td>operation usefulness</td>
<td></td>
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<tr>
<td>Trust in manufacturer of</td>
<td>Tendency for adoption and</td>
<td>Acceleration in doing</td>
<td></td>
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<tr>
<td>mobile device</td>
<td>(BI)</td>
<td>tasks</td>
<td></td>
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<tr>
<td>Trust in communicative</td>
<td>Ease of doing bank</td>
<td>Supporting banking</td>
<td></td>
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<tr>
<td>service operator</td>
<td>transactions</td>
<td>activities</td>
<td></td>
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<tr>
<td>Interest and desire for</td>
<td>Ease of learning</td>
<td></td>
<td></td>
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<tr>
<td>use</td>
<td>Increased use if available</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Encouraging people to use</td>
<td></td>
<td></td>
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<tr>
<td>Belief in ability to learn and use</td>
<td>Compatibility (COMP)</td>
<td>System reliability</td>
<td>Credit (security and privacy) (CRED)</td>
</tr>
<tr>
<td>Adaptation to young</td>
<td>Safe transaction and</td>
<td></td>
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<tr>
<td>people’s lifestyle</td>
<td>transfer of information</td>
<td></td>
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<tr>
<td>Adaptation to individuals’</td>
<td>Security of mobile banking</td>
<td></td>
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<td>abilities</td>
<td>application</td>
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<tr>
<td>Adaptation of mobile phone</td>
<td>Privacy of individuals’</td>
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</table>
3. Research method

The research method is an applied and developmental, and it is a survey study in terms of conducting it. Data collection was performed by a library study and field study (questionnaire). The study population consisted of clients of Melli, Pasargad, Mellat and Saderat banks in Tehran, in that a sample of 300 individuals was finally obtained using stratified random sampling method. The validity of the questionnaire was confirmed by professors and experts and its reliability was estimated to be 89% through Cronbach’s alpha coefficient. The main model of the research and its foundation is TAM model, and the final model was obtained by being integrated with IDT model and the questionnaire was developed. In addition, for testing hypotheses and internal relations between variables and predicting the rate and degree of internal relations of variables, structure equation modeling (SEM) approach and path analysis method were used. As mentioned earlier, in the analysis of data, LISREL 8.53 was used, as well as SPSS 19 for presenting descriptive and analytical tables.

4. Research findings

For data analysis, personal and demographic characteristics of respondents were addressed in the first place, and then statistical tests and significance levels were used to reject or confirm the hypotheses of the research. Of 300 respondents, 222 individuals (74 percent) were male and 78 individuals (26 percent) were female, which shows that men have greater desire for using mobile banking services. Moreover, out of the total number of respondents, 54.3 percent were married and 45.7 percent were single. Considering the young age range of the study sample and exclusion of respondents older than this range, among valid responses total respondents were between 18 and 35 years of age, among which 7.7 percent were between 19 and 25 years of age, and 58.7 percent were between 25 and 30 years of age (most frequency), and 36.3 percent were between 30 and 35 years of age. In regard to level of education, the most frequency is attributed to bachelor degree, which constitutes 51 percent of total respondents. In regard to occupational situation, 57 percent worked in private sector. Likewise, considering the statistic obtained from users of mobile banking services, the highest rates of use among types of services provided were attributed to knowing account balance (93.7 percent), bill payment and money transfer (76.1), last transactions and cash flow (67.6 percent), respectively.

4.1. Inferential findings

In this part, having examined and confirmed the model, the hypotheses of the research model are evaluated; in other words, the process of confirming or rejecting the research hypotheses is addressed.

The first stage of the statistical analysis of the model hypotheses is to quantitatively determine correlation between variables based on available data. In table 2, it is evident that variables are correlated, but we aim to test them because we are not certain about the causal relationship between variables. Using correlation values, path coefficients (path weight), i.e. standard coefficient of regression (beta), were determined. The variance-covariance matrix entails the variance of each of latent variable and covariance among them. Average extracted variance for
each latent variable should be greater than the amount of its correlation with other latent variables. Numbers in the main diameter represents average extracted variance for each latent variable (table 2).

Table 2. Correlation between model variables (source: authors)

<table>
<thead>
<tr>
<th></th>
<th>PU</th>
<th>PEU</th>
<th>CRED</th>
<th>PTRUST</th>
<th>COMP</th>
<th>EI</th>
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<tbody>
<tr>
<td>PU</td>
<td>1</td>
<td></td>
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<td></td>
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<tr>
<td>N</td>
<td>309</td>
<td></td>
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<td></td>
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<tr>
<td>PEU</td>
<td>.637*</td>
<td>1</td>
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<tr>
<td>Sig (2-tailed)</td>
<td>.009</td>
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<tr>
<td>N</td>
<td>294</td>
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<tr>
<td>CRED</td>
<td>.537**</td>
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<td>Sig (2-tailed)</td>
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<td>294</td>
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<tr>
<td>PTRUST</td>
<td>.492**</td>
<td>.492**</td>
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<td>1</td>
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<tr>
<td>Sig (2-tailed)</td>
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<td>.000</td>
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<td>N</td>
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<td></td>
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<tr>
<td>COMP</td>
<td>.600**</td>
<td>.572**</td>
<td>.595**</td>
<td></td>
<td>1</td>
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<tr>
<td>Sig (2-tailed)</td>
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<td>N</td>
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<tr>
<td>EI</td>
<td>.519*</td>
<td>.846*</td>
<td>.846*</td>
<td>.520**</td>
<td>.591**</td>
<td>1</td>
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<tr>
<td>Sig (2-tailed)</td>
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<tr>
<td>N</td>
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</table>

* Correlation is significant at the 0.01 level (2-tailed).

Initial developed model
In diagram 2, the initial developed model can be seen. The conceptual model is comprised of independent variables affecting dependent variable and internal model relations. The model demands revision, because its fit indexes represent the lack of fit, so we attempt to revise it.

In what follows, the final fitted conceptual model in the initial phase is presented. As can be seen, given the revised diagram of the path analysis model, we conclude that all hypothetical paths except for H6 (effect of Perceived ease of use on Perceived trust) have remained. However, given that model fit indexes represent the lack of model fit to data at this stage, we need to revise the model, in that some other paths will be eliminated during revision process.

Figure 3. Final fitted conceptual model (source: authors)
In the theoretical model proposed, which a synthetic model of IDT and TAM models, intention of use variable and acceptance behavior of mobile banking services are better interpreted at a substantial rate of about 55%, while TAM model could just explain 40% of variations in the acceptance of mobile banking services (Venkatesh et al., 2003). Therefore, total coefficient of determination ($R^2$) of the model is roughly equal to 55% as can be seen.

$$BI = 0.131*PU + 0.257*PEU + 0.263*CRED + 0.139*PTRUST + 0.141*COMP, Errorvar. = 0.179, \quad R^2 = 0.545$$

(0.0587) (0.0688) (0.0566) (0.0684) (0.0572) (0.0147)
2.23 3.73 4.650 2.030 2.467 12.207

$$PU = 0.505*PEU + 0.223*COMP, Errorvar. = 0.176, \quad R^2 = 0.429$$

(0.0590) (0.0499) (0.0144)
8.561 4.467 12.207

$$PEU = 0.517*COMP, Errorvar. = 0.170, \quad R^2 = 0.374$$

(0.0387) (0.0139)
13.345 12.207

$$CRED = 0.414*PEU + 0.457*COMP, Errorvar. = 0.316, \quad R^2 = 0.387$$

(0.0791) (0.0668) (0.0259)
5.234 6.835 12.207

$$PTRUST = 0.0866*PU + 0.529*CRED + 0.198*COMP, Errorvar. = 0.129, \quad R^2 = 0.647$$

(0.0447) (0.0356) (0.0452) (0.0105)
1.938 14.842 4.373 12.207

Diagram with standardized estimations

In the following diagram, standardized estimation of factor load coefficients is plotted; they are standardized estimations of previous diagram. In doing so, all test statistics are subtracted from expected value and then divided by the squared root of the variance (i.e. standard deviation). Thus, all estimates stand between 0 and 1 and are comparable. In structural equation modeling, numbers written on the line, beta coefficients are obtained from regression among variables, which are also called path coefficients.
The results of regression coefficients indicate that all indicators are not equally determine “adoption”. As for the rate of the effect on the prediction of the research response variable, i.e. behavioral desire for mobile banking adoption, it can be said that credit priority (security and privacy), Perceived ease of use, compatibility, Perceived trust, and Perceived usefulness are of importance in the adoption of mobile banking.

Diagram of partial T-student coefficient for displaying the lack of eliminating existing paths

Given the diagram, the remaining diagram take on a significant path coefficient, so just one path is eliminated from paths they shouldn’t have been and they are, and one path does not show a significant relationship. Therefore, the model is not recognized as a valid and good model. As a matter of fact, the following figure shows the structural equation model of the research along with significant numbers\(^1\) (t-value). Testing hypotheses are conducted based on t values.

\[ \text{Figure 6. Diagram of partial T values (blue represents significance and red represents non-significance) (source: authors)} \]

As a matter of fact, having confirmed the model, the hypotheses of the model were evaluated. For testing the hypotheses, the index of the test is critical value (CR), which is obtained by

\[ \text{In order for a coefficient to be significant, its significant number should be greater than 1.96 or less than -1.96.} \]
dividing “regression weight estimate\(^1\)” by its standard error (S.E). According to the significance level 0.05, critical value should be greater than 1.96; values less than it cause relevant parameter to considered significant in model (Chau PY, 1997). However, if the value is less than -1.96, it suggests an inverse relationship between variables.

In the end, considering the process of model revision and values, regression weight estimate (path coefficients), standard error, critical value, and significance level were obtained. As for rejection or acceptance of research hypothesizes, it can be said that H2 is rejected among the proposed hypotheses. As for H2 hypothesis (Perceived usefulness has a positive impact on Perceived trust), given the results obtained from data and that the path in question is eliminated from paths during the process of path analysis, it can be said that Perceived usefulness has an effect on perceived trust according to data obtained from Persian clients, and they have no significance relationship. Furthermore, as for the hypothesis (Perceived ease of use has made a positive difference to Perceived trust). Given that its coefficient is 1.94 and less than 1.96 (though it makes little difference from reaching significance level), it has no significant relationship, and the hypothesis is also rejected.

**Conclusion and suggestions**

The research aimed at using a synthetic model, TAM and IDT model, for one of the new banking technologies (mobile banking). Using the model of technology acceptance as theoretical framework of the research, the research added the construct “compatibility” from innovation diffusion and also the construct “Perceived trust” and “creditability” to the model. As a matter of fact, we decided to examine the effect of five variables namely “Perceived usefulness”, “Perceived ease of use”, “Perceived trust”, “compatibility”, and “creditability’ on the response variable, i.e. “behavioral tendency for adoption of mobile banking”.

The findings of the research confirm the application of the developed TAM model in the adoption of mobile banking. The significant effects of perceived usefulness, perceived ease of use, perceived trust, compatibility, and creditability on behavioral tendency for mobile banking adoption have become evident. In this regard, creditability (security and privacy, and perceived ease of use had stronger effects respectively than other three factors, i.e. compatibility, perceived trust and perceived usefulness. In fact, it can be concluded that, given that creditability (security and privacy) is the most important factor in the discussion of mobile banking adoption, banks are required to increase their exchange of information and banking software and inculcate it in clients that securing users’ privacy concerns banks and their personal and financial information will not be disclosed. Once their concern about privacy and security as a presumption is fixed, they show more intention for using mobile banking. In what follows, we need to point out that according to the research results Perceived ease of use is the second important factor in the discussion of mobile banking adoption, and even more important than Perceived usefulness; according to this, we can claim that the matter of user-friendly takes on greater importance and priority in the discussion of mobile banking.

The findings the research indicated that the developed TAM model can be used for young Iranian users’ acceptance. For this reason, the model, though it is simple, can offer a good

\(^{1}\) Parameter estimate
understanding of mobile banking adoption to policy makers in banking sector, and as well as the following suggestions:

1. The main constructs of the model, perceived usefulness, Perceived ease of use, creditability, compatibility, and Perceived trust, are considered important factors in using mobile banking. Thus, bank managers and developers of systems should pay great attention to these concepts.

2. Increase in the creditability of the system in clients’ minds and making clients certain about the lack of any security problem in mobile banking system are considered vital matters in the success of mobile banking technology. Moreover, instilling the fact that private and financial information of clients are not made available to any third person and cannot be changed is essential.

3. Designing a simple software program with easy learning feature takes on the greatest importance, following credit.

4. Customization feature of mobile banking services should be taken into consideration in order to increase ease of use.

5. Banks, mobile operators, and telecommunication should offer further cooperation in order to present more efficient services favored by clients.

6. Services should be in accordance with mobile banking clients’ growing and varying expectations, rather than restricting rules, so that insufficient infrastructures of some services provided can be reduced.

7. Waiving extra charge from clients, because banks lower many expenditures by providing new services and clients gain more capitals; it is likely that they reduce the influence of new technologies and lose huge capitals even by imposing little charge.
References

