Customer usage intention of mobile commerce in India: an empirical study

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Abstract

Purpose – Mobile commerce is a broad term used for mobile banking, mobile ticketing, mobile coupons, purchasing of goods and services using mobile phones. Considering mobile penetration and changing lifestyles of the Indian population, it has huge potential. The purpose of this paper is to investigate the factors influencing the adoption intention of mobile commerce.

Design/methodology/approach – For the study, a research model was developed based on constructs from the technology acceptance model and innovation resistance theory and a literature review on research related to usage intention of similar technologies which was then empirically tested using second generation statistical technique of SEM.

Findings – Perceived usefulness, perceived ease of use and social influence are found to be significant dimensions of technology adoption readiness to use mobile commerce while facilitating conditions were not found to be significant. The results also indicate perceived credibility risk defined by security risk and privacy risk is significantly associated with behavioural intention in negative relation, which indicates that security and privacy concerns are important in deterring customers from using mobile commerce.

Research limitations/implications – This study proposed and validated a new construct – technology adoption readiness. The study developed an integrated model for behavioural intention towards financial innovations.

Practical implications – Knowing the factors affecting customers’ behaviour towards mobile commerce and the relationship between these factors, various banks, merchants and mobile service providers can develop their marketing strategies to ensure that people use this new service. This in turn will influence the behavioural intention and change these intentions to actual adoption of this new technology.

Originality/value – This study is one of the few empirical studies which have investigated the adoption of mobile commerce in India, which is considered one of the fastest growing countries in terms of mobile usage. The study relates to inclusion of both utilitarian and credibility aspect of adoption intention. It gives an empirical basis on which mobile and banking companies can base their mobile payments marketing strategy.

Keywords Mobile commerce, Technology acceptance, Innovation, Customer adoption, India, Mobile communication systems, Consumer behaviour

Paper type Research paper

1. Introduction

Mobile device usage is witnessing a new paradigm by enhancing its application from mere connectivity to a lifestyle device. Customers are increasingly using their mobile devices to find stores, research about products, make purchases, and manage their accounts.
Mobile phones are omnipresent with nearly 70 percent of Indian population owning mobile phones (tele-density of 69 percent, TRAI Data, April 2011). India is the world’s second largest mobile market and fourth largest internet market. Mobile value added services (VAS) are services that are not part of the basic voice service offering and are availed separately by the end-user. They are used as a tool for differentiation and allow mobile operators to develop an additional stream of revenue. Mobile VAS includes caller ring back tunes, radio, web browsing, social media, mobile applications, download of digital content, etc. Indian population has amazing appetite for digital content on mobile phones making it the fastest growing business for telecom companies. Indian mobile VAS industry has evolved from person to person SMS to mobile TV and mobile commerce over the past decade. While mobile commerce had limited success in developed countries, it has seen significant success in emerging economies like Kenya and Philippines where penetration of formal banking system is low. Considering low banking penetration, there is strong potential for mobile commerce in India however actual adoption is less than 1 percent (World Economic Forum, 2011). The data on usage of mobile commerce is evidence of the fact that in spite of inherent advantages of the channel, there is some reluctance among customers to adopt this technology. The present study seeks to develop and test a conceptual model for factors affecting adoption intention of mobile commerce in India.

This paper conceptualizes and empirically validates a new construct “technology adoption readiness” (TAR) measured through four dimensions – Perceived usefulness (PU), perceived ease of use (PEOU), social influence (SI) and facilitating conditions (FC). The paper also provides insights about consumer perception on risk as a useful predictor of intention to adopt mobile commerce. The main contribution of this research lies in development of TAR as a new construct and development of an integrated model on usage intention of mobile commerce. The model can be further used for similar financial technological innovations.

The present study is laid out in five sections. Section 2 provides analysis of the research problem. Section 3 builds theoretical background of the study and develops hypothesis for conceptual model on adoption intention of mobile – commerce. Section 3 provides discussion on research design and methodology used in the study. Section 4, analysis and results of empirical testing of the model are offered. The paper is concluded with the discussion on findings and implications of the research for academia and practice.

2. Research problem
Mobile commerce is a broad term used for mobile banking, mobile ticketing, mobile coupons as well as for purchase of goods and services using mobile phone. Mobile commerce can be defined as “all activities related to a (potential) commercial transaction conducted through communication networks that interface with wireless devices” (Tarasewich et al., 2002).

Mobile commerce has seen significant success in emerging economies like Kenya and Philippines where penetration of formal banking system is low. Considering low banking penetration in India, there is strong potential for mobile commerce. Recognizing the importance of mobile commerce, Indian banking regulator The Reserve Bank of India issued the guidelines for mobile banking transactions in October 2008 to support mobile commerce in the country. To enable easy, safe and fraud-free transactions a common mobile banking platform was created by the National Payments Corporation of
India (NPCI) under the guidance of RBI. However, at the time of writing this paper only 12 million bank customers had registered for mobile banking services (Chakrabarty, 2012) which form backbone of mobile commerce. Further, as per industry estimates, less than 10 percent of users registered for mobile banking are active users of mobile commerce while the rest are passive receivers of SMS updates from the banks (Prasad, 2009). The mobile’s “magical characteristics” of any-where, any-time, easy to use personal device makes it one of the strongest channel for payments and banking services. Mobile commerce offers much higher level of security and privacy as compared to fixed internet based channel in a shared environment or at a cybercafé. Despite of all the inherent advantages of mobile commerce, the urban mobile subscriber base has made little attempts to make monetary transactions over the mobile phone. The numbers of mobile commerce usage are evidence of the fact that despite inherent advantages of the channel, there is reluctance among customers to adopt this technology. There is, thus a need to study the factors that are inhibiting customer adoption of mobile commerce in India.

3. Theoretical background and hypotheses
The objective of this study is to evaluate mobile commerce adoption intention from the perspective of Indian mobile phone users. The term “mobile commerce” encompasses a whole range of financial and other services indicated in the previous section, which can be accessed remotely with the use of a mobile phone. Given the large number of applications available via mobile phones and the ongoing development of the platform, the ability to transact using mobile phones can be perceived as a significant technological innovation. It is difficult to reconcile the general academic literature on behavioral intention (BI) and usage specific to mobile commerce. This study therefore reviews the factors related to customers’ usage and intention towards various technological innovations of similar nature like e-commerce, online shopping, internet banking, mobile banking and usage of internet.

3.1 Technology acceptance
Researchers in different parts of the world have viewed internet banking, e-commerce and similar technologies through the prism of innovative technology adoption (Barczak et al., 1997; Black et al., 2001; Howcroft et al., 2002; Liao et al., 1999; Sathy, 1999; Tan and Teo, 2000). Technology acceptance model (TAM) (Davis, 1989) and its subsequent versions are the most commonly used models for research on usage intention towards a new technology.

Based on review of literature as below, four key dimensions of technology acceptance were identified – PU, PEOU, SI and perceived FC.

**PU and PEOU.** The pre-requisite for consumers to consider usage or trial of any product or service is that the new product should be useful and easy to use for consumers to intend to use the product. PU is defined as the degree to which a person believes that using a particular system would enhance his or her job performance (Davis, 1989). PEOU refers to the degree to which a person believes that using a particular system would be free of effort (Davis, 1989).

Evidence has shown that PU and PEOU have an influence on user attitude towards acceptance of a new technological innovation (Agarwal and Prasad, 1998; Davis et al., 1989; Davis and Venkatesh, 1996; Venkatesh and Morris, 2000). A large number of researchers have focused on the constructs of PU and PEOU in adoption of
online banking and e-commerce in different parts of the world (Chan and Lu, 2004; Eriksson et al., 2004; Karjaluoto, 2002; Kolodinsky et al., 2004; Lee et al., 2011; Pikkarainen et al., 2004; Wang et al., 2003; Yiu et al., 2007).

Prior studies have extensively documented the importance of PU in information system (IS) adoption. Chang (2008) applied the TAM to identify consumers’ acceptance of intelligent agent (IA) technology for the automation of auction websites and found that PU was the most influential in promoting intention to use an auction website. Chiu et al. (2005) found that PU positively influences online purchase intentions. The result indicates that consumers are likely to consider the online purchase useful for making purchases. Pikkarainen et al. (2004) found that PU was positively correlated with online banking use. Cheong and Park (2005) found PU and PEOU to be significant factors on intention to use M-internet. Hence, this study deduces that:

Perceived Usefulness will have positive significant effect on customer intention to use mobile commerce.

Perceived ease of use will have significant effect on customer intention to use mobile commerce.

Social influence. SI is defined as the degree to which an individual perceives how important others believe he or she should use the new system (Venkatesh et al., 2003). SI as a direct determinant of BI is represented as subjective norm in theory of reasoned action (TRA), social factors in the model of PC utilization (MPCU) and image in innovation diffusion theory (IDT). While they have different labels, each of these constructs contains the explicit or implicit notion that the individuals’ behavior is influenced by the way in which they believe others will view them as a result of having used the technology.

The construct of SI has been widely used by researchers to investigate customers’ usage intention of technologies related to internet, online purchases, online banking, mobile chat and mobile banking (Amin, 2008; Kleijnen et al., 2004; Nysveen, 2005; Venkatesh et al., 2012). Indeed, the literature shows that reason why people exploit online banking is that they are encouraged by people surrounding them to accept and utilize online banking. As observed by, Amin (2007) the normative pressure has significant impact in the development of initial willingness to use SMS banking. This result is consistent with the study of Venkatesh and Morris (2000). In the study of Nysveen, 2005, normative pressure was found to be important construct that bring the success of IS acceptance.

In a study by Kleijnen et al. (2004) about wireless finance in The Netherland, normative pressure was found to be significant in the development of people’s intention to use wireless finance. The work of Venkatesh and Morris (2000) which was conducted in the context of technology usage in a workplace found strong role of SI in adoption of enterprise technologies. Online banking is often used as a new mean of banking transactions where social pressure may be prominent among bank customers to distinguish themselves from the others (Pikkarainen et al., 2004; Wang et al., 2003; Karjaluoto, 2002). Social norm offers an improvement beyond the general constructs offered by Davis (1989) notably PU and PEOU. Hence, this study deduces that:

Social influence will have positive significant effect on customer intention to use mobile payments services.

Perceived FC. FC are defined as the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system.
(Venkatesh et al., 2003). Ajzen (1991) suggested that the FC construct can be viewed as an external influence of the environment on one’s perceived controllability (perceived FC).

In mobile commerce context and from the customer view, we propose the construct is not under customers’ control but they would perceive it to affect their performance or utilization of mobile commerce. Hence, this study deduces that:

Perceived facilitating conditions will have positive significant effect on customer intention to use mobile commerce.

Bagozzi and Yi (2012) noted that TAM, is one of the most highly cited models in the literature with two papers (Davis et al., 1989; Davis, 1989) alone having over 15,000 Google citations. Based on the analysis of various studies using TAM and its subsequent versions, it was found that all the components of TAM had very high degree of correlation. Studies discussed in the earlier sections experimented with various determinants of BIs in developed countries where the evolution of mobile commerce has evolved over various stages allowing sufficient time to people to move from one technology to another. However, emerging economies like India are leapfrogging; hence the model for adoption in Indian context may be significantly different from the developed countries. The study proposes that with reference to Indian context, dimensions of technology acceptance as discussed in this section are highly correlated and occur simultaneously rather than having a cause and effect relationship proposed by many researchers. This new construct TAR would be a pre-requisite for adoption intention and PU, PEOU, FC and SI would form dimensions of TAR.

This study, proposes TAR as a latent variable defined by the above dimensions. This study proposes to establish the convergent and discriminant validity and reliability of technology acceptance readiness as a key construct in usage intention of mobile commerce in India. Hence we hypothesize:

**H1.** TAR is a multidimensional construct and includes PU, PEOU, SI and facilitating condition.

Correspondingly:

**H1a.** PU is a sub-construct of multidimensional construct TAR.

**H1b.** Perceived ease of use is a sub-construct of multidimensional construct TAR.

**H1c.** Social influence is a sub-construct of multidimensional construct TAR.

**H1d.** Perceived facilitating condition is a sub-construct of multidimensional construct TAR.

### 3.2 Perceived credibility risk

Credibility has been drawing a lot of importance in technologies involving financial transaction owing to the risk perception of users. Based on Wang et al. (2003), perceived credibility (PC) is defined as the extent to which a person believes that using mobile-service will be free of security and privacy threats. PC was also found to have a significant positive influence on the BIs to use online banking (Wang et al., 2003), electronic tax filing (Wang et al., 2003), electronic learning (Ong et al., 2004) and m-banking (Luarn and Lin, 2005). As observed by Wang et al. (2003), PC that people have
in the ability of the m-service system to conclude their transactions securely and to maintain the privacy of their personal information, affects their acceptance of m-service.

PC risk refers to two important dimensions – security and privacy – that are identified across many studies as effecting intention by users to adopt the online-based transaction systems.

Security risk. Many researchers have found that security is a key dimension in studying user attitude towards online banking (Hernandez et al., 2008; Polatoglu and Ekin, 2001; Suh and Han, 2002). Consumers associate security risk (SR) with loss of money (in cash or through the credit card). Previous research in countries with different levels of e-commerce adoption shows that perceived SR is an important predictor of internet banking adoption. Sathye (1999) investigated internet banking adoption by Australian consumers and identified security concerns and lack of awareness as the main obstacles to adoption. Gerrard and Cunningham (2003) found security concerns over internet banking high in both adopters and non-adopters in Singapore. Research by Lee, Kwon, and Schumann on USA consumers showed greater concern among prospective adopters than current adopters over transaction security and monetary benefits when choosing an internet based banking service. Cheng et al. (2006) found perceived web security to be a significant determinant of customer’s acceptance of online banking. Customers tend to increase purchases only if they perceive that credit card number and other sensitive information is safe. Hence, this study deduces that:

Perceived security risk will have negative significant effect on customer intention to use commerce.

Privacy risk. Another important barrier to electronic transactions is consumer disappointment and frustration at violations of consumer privacy (i.e. privacy risk (PR)). Some research results indicated that people are concerned about unwanted disclosure of private information or simply its misuse of their information by the company collecting it (Kesh et al., 2002; Sathye, 1999). This dimension of risk included undisclosed capture of information such as consumers’ shopping habits. Thus, PR was particularly salient for e-payments. Perceived PR is defined as the possibility that online businesses might use personal information inappropriately hence invading a consumer’s privacy (Nyshadham, 2000). Gerrard and Cunningham (2003) found that consumers worry that the bank may share customer profiles with other companies in the banking group and, thus, use the information to try and sell additional products. E-banking users want to control all aspects of their personal data collection (Pikkarainen et al., 2004). Aladwani (2001) found that potential online banking customers ranked internet security and customers’ privacy as the most important future challenges facing banks. Therefore, perceived fears of divulging personal information and feelings of insecurity have a negative influence on internet banking services use (Howcroft et al., 2002). Hence, this study deduces that:

Perceived privacy risk will have negative significant effect on customer intention to use mobile commerce.

In summary, PC risk is about consumer perception towards the risk of losing money and personal information which can be used in opportunistic manner by third parties in mobile commerce transactions. Based on the above review, it is considered that PC
risk mainly constitutes two aspects namely, SR and PR. Based on the analysis of various studies about perceived risk especially the works of Flavián and Guinalíu (2006), Featherman and Pavlou (2003) and Cheung and Lee (2002), it was found that SR, and PR have very high degree of correlation and they form the dimensions of a single construct which has been referred as perceived risk or PC risk. The study proposes that with reference to Indian context, SR and PR form dimensions of PC risk. This study proposes to establish the convergent and discriminant validity and reliability of the individual scales of the dimensions of PC risk. This study further proposes to establish the relationships between the individual dimensions of PC. Hence we hypothesize:

\[ H2. \] PC is a multidimensional construct and its underlying dimension are PR and SR.

Correspondingly:

\[ H2a. \] SR is a sub-construct of multidimensional construct PC.

\[ H2b. \] PR is a sub-construct of multidimensional construct PC.

3.3 Behavioral intention
BI is defined as a person’s intentions to perform various behaviors (Fishbein and Ajzen, 1975). BI s are motivational factors that capture how much effort a person is willing to dedicate to perform a behavior (Ajzen, 1991). The construct originally developed in theory of planned behavior (TPB) and TRA (Fishbein and Ajzen, 1975) is widely used in subsequent models related to technology acceptance. TPB suggests that BI is the most influential predictor of behavior. Intention has been widely advocated in literature as predictor of behavior (Engel et al., 1986; Howard and Sheth, 1969; Nicosia, 1966). Sheppard et al. (1988) used meta-analysis to indicate that there is an average correlation of 0.53 between intentions and behavior.

Based on literature, this study defines “BI to use mobile commerce” as “the degree of conscious effort that a consumer will exert in order to conduct a monetary transaction using a mobile device”.

The above mentioned research conducted by researchers in various markets laid the foundations of our conceptual research model, which is presented below.

Figure 1 delineates the model which forms the basis for further empirical analysis. It divides the factors which are hypothesized to influence the individual’s intention to adopt mobile commerce into three main constructs:

1. TAR having four dimensions – PU, PEOU, SI and FC.
2. PC risk having two dimensions perceived SR and perceived PR.

3.4 Technology adoption, PC risk and BI
TAM (Davis, 1989) and its subsequent avatars have proposed that dimensions of technology acceptance significantly impact BI to use a new technology. Researchers in different parts of the world have dimension of technology acceptance in internet banking, e-commerce and similar technologies positively impacting usage intention (Barczak et al., 1997; Sathye, 1999; Liao et al., 1999; Tan and Teo, 2000; Black et al., 2001; Howcroft et al., 2002; Flavián and Guinalíu, 2006).
Another aspect associated with online environment which is has been drawing a lot of importance in technologies involving financial transactions is credibility risk perception of users. PC risk has been found to be negatively impacting usage intention of online banking (Pikkarainen et al., 2004; Howcroft et al., 2002; Polatoglu and Ekin, 2001). Researchers have found credibility risk to be significant obstacle to the adoption of online banking in Australia (Sathye, 1999) and in Singapore (Tan and Teo, 2000). Mobile commerce is a technological innovation with similar characteristics. Based on review of existing literature, we hypothesize:

H3. TAR positively influences BI towards usage of mobile commerce.

H4. PC risk negatively influences BI towards usage of mobile commerce.

4. Research methodology

4.1 Instrument design
The research instrument developed for the study was based on tools from previous research modified to the subject of mobile commerce. The tool was developed using...
standard procedure for development of a research instrument. The items used in this survey were adapted from previous studies (Davis, 1989; Moore and Benbasat, 1991; Thompson et al., 1991; Compeau and Higgins, 1995; Ajzen, 1991; Taylor and Todd, 1995; Agarwal and Prasad, 1998). Since this study is using borrowed scale for each of the constructs, it is important to first establish the validity and reliability of the scale. In other words, the items must reflect what they are intended to measure (face validity) and represent a proper sample of the domain of each construct (content validity) and pass the test of validity (discriminant, convergent and nomological) in order for a measure to have construct validity (Fornell and Larcker, 1981). To establish the face validity, a group of five experts was identified who were exposed to the objectives of the research, overall scope, definition of each construct and items under each construct. Post incorporation of the feedback/suggestions of experts, the instrument was finalized. The final instrument had a brief write-up on the purpose of the study as well as explicit statement of assurance about confidentiality of their responses and that responses would be used only for academic purposes. This was followed by two sections of questions – first section had items for beliefs and intention related constructs and second section had items related to demographic and usage patterns. Respondents were also asked if they were aware about mobile commerce and its presence in India. All the beliefs and intention related items were rated on a scale of 1-7 (strongly disagree to neutral to strongly agree).

4.2 Data collection and sampling
Primary data for the study was collected through structured questionnaires (Appendix) administered to respondents. Questionnaires were administered through online data collection link mailed to respondents as per the convenience of the respondents. The respondents were requested to spare a few minutes to provide responses to items in the questionnaire. Participation in this study was purely voluntary. A total of 450 questionnaires were mailed to the respondents. 292 questionnaires were found to be complete in all respects which were taken for further analysis.

Respondents for this study were working professionals. This respondent profile is appropriate in this study for several reasons. First, they are current banking customers, are mobile phone customers, have experience with traditional banking services and are most likely to be familiar with mobile banking. Second, working professionals have lifestyle needs which can be fulfilled using mobile payments in an effective manner. Also, since mobile payments are essentially offered in English, the chosen sample profile ensures basic literacy level to conveniently transact using mobile payments. Table I gives a snapshot of respondent profiles.

To understand the usage patterns relevant to mobile commerce, data was collected from respondents regarding their mobile phone non-voice usage and mobile commerce usage. Usage pattern of respondents is presented in Table II.

5. Data analysis and results
Structural equation modeling (SEM) was chosen for research model testing. SEM provides techniques for estimation of multiple interrelated dependent relationships (Hair et al., 2006) that are either limited or not available in other multivariate analysis techniques. SEM also has the capability to represent concepts that are not directly observable or measurable, such as latent variables contained in this research model.
5.1 Measurement model
The study employed both first and second order confirmatory factor analysis (CFA) to confirm the fitness of the measurement model. To assess measurement reliability and validity of the final measurement model, CFA containing the multi-item constructs of technology acceptance readiness and PC risk was conducted. CFA was not performed
for BI as it is a uni-dimensional construct. Factor loadings for all three indicators of BI were higher than 0.7 and Cronbach’s $\alpha$ was 0.89 establishing reliability of the measure. Statistical software AMOS is used in this study to develop and test structural models.

The initial CFA led to the deletion of three items (PE1, EE1, SI4) and the second order CFA led to complete elimination of the construct FC based on high cross-loadings with indicator items of PC (Anderson and Gerbing, 1988). The results of the final CFA are reported in Tables III-VI and suggest that our final measurement model provides a good fit to the data on the basis of a number of fit statistics. The critical ratio (CR) values of all the items reached the significant level ($p < 0.001$) with standardized loadings higher than 0.60 (Bagozzi and Yi, 1988) and the average of the item-to-factor loadings are higher than 0.70 (Hair et al., 2006) confirming the convergent validity of each of the items measuring the constructs of the study. Cronbach’s $\alpha$ exceeded Nunnally’s (1978) recommendation of 0.70 demonstrating high internal consistency of the constructs. Composite reliability represents the shared variance among a set of observed variables measuring an underlying construct (Fornell and Larcker, 1981). Composite reliability of each of the factors was

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicator</th>
<th>Factor loading</th>
<th>CR value</th>
<th>LA</th>
<th>CA</th>
<th>Composite reliability</th>
<th>AVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived usefulness</td>
<td>PE4</td>
<td>0.77</td>
<td>0.80</td>
<td>0.87</td>
<td>0.77</td>
<td>0.63</td>
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<tr>
<td></td>
<td>PE3</td>
<td>0.80</td>
<td>29.93</td>
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<td></td>
<td>PE2</td>
<td>0.82</td>
<td>20.75</td>
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<tr>
<td>Perceived ease of use</td>
<td>EE4</td>
<td>0.78</td>
<td>0.81</td>
<td>0.85</td>
<td>0.79</td>
<td>0.66</td>
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<tr>
<td></td>
<td>EE3</td>
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<td>23.24</td>
<td></td>
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<tr>
<td></td>
<td>EE2</td>
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<td>19.13</td>
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<tr>
<td>Social influence</td>
<td>SI3</td>
<td>0.76</td>
<td></td>
<td>0.81</td>
<td>0.84</td>
<td>0.77</td>
<td>0.59</td>
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<td></td>
<td>SI2</td>
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<td>23.58</td>
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<td></td>
<td>SI1</td>
<td>0.80</td>
<td>22.15</td>
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</table>

**Table III.**  
Validations of the measurements – reliability and convergent validity (technology acceptance readiness)

**Notes:** Significant at: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; LA – loadings average; CA – Cronbach’s $\alpha$; CR – critical ratio; AVE – average variance extracted; CMIN (df = 50) = 167; NFI = 0.98; CFI = 0.98; GFI = 0.97; RMSEA = 0.055

<table>
<thead>
<tr>
<th>Variable</th>
<th>Indicator</th>
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<th>CR value</th>
<th>LA</th>
<th>CA</th>
<th>Composite reliability</th>
<th>AVE</th>
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<tr>
<td>Security risk</td>
<td>SR4</td>
<td>0.779</td>
<td>0.75</td>
<td>0.831</td>
<td>0.74</td>
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<td>SR3</td>
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<td>SR2</td>
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<td>SR1</td>
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<td>Privacy risk</td>
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<td>PR2</td>
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<td></td>
<td>PR1</td>
<td>0.621</td>
<td>23.58</td>
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</table>

**Table IV.**  
Validations of the measurement model – reliability and convergent validity (PC risk)

**Notes:** Significant at: *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$; LA – loadings average; CA – Cronbach’s $\alpha$; CR – critical ratio; AVE – average variance extracted; CMIN (df = 13) = 12.7; NFI = 0.995; CFI = 1; GFI = 0.996; RMSEA = 0.0
above 0.7 implying good internal consistence of the scale (Bagozzi and Yi, 1988). Variance extracted estimates (AVE) for each of the factors were greater than 0.5 providing adequate evidence of convergent validity (Fornell and Larcker, 1981).

All the constructs have positive significant correlation establishing nomological validity. The shared variance between pairs of constructs was always less than the corresponding AVE (Fornell and Larcker, 1981) establishing discriminant validity. On the basis of these criteria, we concluded that the measures in the study provided sufficient evidence of reliability and validity.

5.2 Results of research hypotheses
The items retained after CFA were used to test the measurement model shown in Figure 1 using path analysis. The empirical estimates for the main-effects model are shown in Table VII and Figure 2. The results indicate that the data fit our conceptual model acceptably $CMIN (df) = 3.2 (113); NFI = 0.869; CFI = 0.904; GFI = 0.993; RMSEA = 0.07.$

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Hypothesized path</th>
<th>Standardized estimate</th>
<th>SE</th>
<th>CR</th>
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<td>PEOU ← TAR</td>
<td>0.98</td>
<td>0.111</td>
<td>10.935**</td>
</tr>
<tr>
<td></td>
<td>PU ← TAR</td>
<td>0.844</td>
<td>0.085</td>
<td>12.177**</td>
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<tr>
<td></td>
<td>SI ← TAR</td>
<td>0.607</td>
<td>0.084</td>
<td>8.118**</td>
</tr>
<tr>
<td>H2</td>
<td>PR ← PC</td>
<td>0.512</td>
<td>0.15</td>
<td>4.838**</td>
</tr>
<tr>
<td></td>
<td>SR ← PC</td>
<td>1.188</td>
<td>0.247</td>
<td>5.346**</td>
</tr>
<tr>
<td>H3</td>
<td>BI ← TAR</td>
<td>0.735</td>
<td>0.23</td>
<td>14.058**</td>
</tr>
<tr>
<td>H4</td>
<td>BI ← PC</td>
<td>−0.21</td>
<td>0.241</td>
<td>−3.838**</td>
</tr>
</tbody>
</table>

Notes: Significant at: * $p < 0.05$, ** $p < 0.001$; SE – standard error; CR – critical ratio; $CMIN (df) = 370 (113); NFI = 0.869; CFI = 0.904; GFI = 0.993; RMSEA = 0.07.$
Technology acceptance readiness. H1 tested whether TAR towards usage intention of mobile commerce is explained through PU, PEOU, SI and FC. As per the results of path analysis, PU (H1a: $\beta = 0.98, p < 0.001$), PEOU (H1b: $\beta = 0.844, p < 0.001$) and SI (H1c: $\beta = 0.607, p < 0.001$) are significantly predicting technology acceptance readiness. This hypothesis was partially supported because FC were not found to be contributing to TAR in second order CFA.

Further, H3 tested whether TAR had significant impact on BI to use mobile commerce. As hypothesized, technology acceptance readiness positively influences BI towards usage of mobile commerce (H3: $\beta = 0.735, p < 0.001$) supporting H3. Thus, H3 was supported at 99 percent level of significance.
PC risk. H2 tested whether PC risk towards usage intention of mobile commerce is explained through SR and PR. As clearly evident from path analysis, SR (H2a: $\beta = 1.118, p < 0.001$) and PR (H2b: $\beta = 0.512, p < 0.001$) are significantly predicting PC. This hypothesis was thus fully supported by the data.

H4 tested whether PC risk had significant impact on BI to use mobile commerce. Results evidence the key role of PC risk as a deterrent of intention to use mobile commerce. As we expected, this perception act as deterrent in intention of using mobile commerce ($H4: \beta = -0.21; p < 0.001$) and thus supporting $H4$.

6. Discussion and implications

6.1 Discussion on findings

This paper provides new insights about consumer perception on risk as a useful predictor of mobile commerce adoption intention. The main contribution of this research lies in providing a model that integrates PC risk with the influence of consumer technology acceptance readiness which has been widely studied by researchers in investigating adoption intention of various technologies. The role of credibility risk is very crucial, as using mobile phones, in this case, consumers are making monetary transaction.

As indicated in the results, PC risk is significantly associated with BI in negative relation, which indicates that security concern is important in deterring customer from using mobile commerce. Clearly, customers have a tendency to use mobile commerce if the system is fully protected. This result is consistent with the previous research (Luarn and Lin, 2005; Wang et al., 2003). As per findings of this study, security and PR have been found to be significantly affecting the perception of credibility of mobile payments and hence the adoption intention. Based on these findings, credibility can be improved through uncertainty and risk reduction strategies.

The findings show that FC do not have a significant impact on usage intention. This is contrary to most of the existing research on similar technologies (Bhattacherjee, 2000; Taylor and Todd, 1995) and requires further investigation. This could be because of availability of basic infrastructure (mobile phone) with consumer and high degree of comfort with usage of the channel.

SI which has significant impact on usage intention highlights the role of peer group in the adoption of mobile commerce which is consistent with previous studies. This finding can be attributed to the fact that the users of mobile commerce will influence peers into using this innovation, so increase in users will have strong influence on the peer group leading to increased usage.

In line with existing research, PU and PEOU have significant impact on usage intention which signifies that customers would use the mobile commerce for the convenience and simplicity or ease factor.

6.2 Implications

This study has revealed meaningful insights which provide implications to academia as well as the industry. While for academia, the findings of this study contribute to existing body of knowledge; it provides meaningful insights for organizations associated with online business and mobile financial services.

As part of this study, a structural model was developed and validated with technology acceptance readiness (defined by PU, PEOU, SI and facilitating condition)
and PC risk (defined by security and PR) of mobile commerce. The context was specifically among the mobile users of India and investigated the factors affecting intentions to use mobile commerce in India as an emerging technology to support alternate payment channels.

Despite its large population and huge potential, India has gained little attention from researchers in the field of online buying behavior and adoption of mobile based applications. In India and other emerging economies with high adoption of mobile phones and limited penetration of banks, mobile payments have huge potential socio-economic impact. This study represents an initial attempt to explore the perceptual and behavioral factors that impact the adoption intention towards mobile payments.

The integrative model of consumer usage intention of mobile commerce proposed by this study was largely confirmed by the empirical test. Accordingly, this study makes important contributions to mobile commerce practices.

First, since adoption readiness was confirmed to impact a customer’s intention to use mobile commerce, service providers may consider to position dimensions of adoption readiness as a part of their marketing initiatives.

Similar to the finding in earlier research (Burton-Jones and Hubona, 2006; Deng et al., 2007; Gefen et al., 2000, 2003; Koufaris and Hampton-sosa, 2002; Pavlou, 2003), the factors of PU and PEOU were found to be playing significant role in adoption intention. Service providers should focus on simplifying the user interface of mobile payments to make it more user-friendly for small screen usage and work on customer communication towards awareness of benefits and ease of using mobile payments. Service providers may also consider promoting anywhere, anytime instantaneous payment benefits of the channel which is unique to mobile commerce.

Second, a consumer’s perception toward the two key components of credibility (privacy and security) of mobile commerce was confirmed to be deterrent in usage intention. Issues of security and privacy are major concerns in online environment and the impact gets multiplied where there is a financial transaction involved as the customer may be at the risk of losing money by opportunistic vendors and hackers (Gupta and Xu, 2010; Scott, 2004). The findings of this study indicate significant negative impact of security and PR on customer adoption readiness as well as intention to adopt mobile payments in Indian context. This is consistent with previous research in countries with different levels of e-commerce adoption where perceived SR was found to be important factor restraining internet banking adoption (Cheng et al., 2006; Gerrard and Cunningham, 2003; Lee et al., 2005; Sathye, 1999). These results show findings similar to existing research on PR (Gerrard and Cunningham, 2003; Kesh et al., 2002; Mukherjee and Nath, 2003; Pikkarainen et al., 2004; Sathye, 1999) where researchers have found that people are concerned about unwanted disclosure of private information or simply its misuse of their information by the company collecting it. This finding has valuable insights for the industry.

To reduce perceived risk among consumers, banks and service providers may consider adopting strategies that reduce uncertainty. These may include embracing certified encryption, multi-tier authentication, real-time PIN generation, adopting privacy and security policies and policies to indemnify consumers in case of fraud though need further investigation. Service providers may also consider providing demonstrations and trials to potential users thereby giving them opportunity to try the service and develop comfort.
6.3 Limitations and future research direction
This study begins the work necessary to build a reasonable model for explaining the factors affecting individual acceptance of mobile payments. The SEM provided support for most of the proposed hypotheses, however, as with any study, this research has certain limitations which should be addressed in future research. Some of the main limitation are discussed below which can be taken up as future research.

First, studies on mobile commerce are developing in India. The findings discussed in this paper are based on a single study targeted at a specific group in two Indian Metros. Hence, this study suffers from the limitation of size and geography of the population. Second, we used BI as a surrogate for actual usage in our model. This is in sync with previous research which supports the causal link between intention and usage (Taylor and Todd, 1995; Venkatesh and Davis, 2000; Venkatesh et al., 2003). However, intentions are only partially useful as their correlation with actual behavior is low and mediated by many other variables. Third, only risk related constructs and innovativeness have been used as constructs for predicting customer intention, where other models with more constructs related to enjoyment, value or customer loyalty may be able to explain the usage intention mobile commerce better.

Further empirical research may be conducted to test the effect of other exogenous factors, such as enjoyment, customer loyalty, and culture on customer’s attitude towards mobile commerce. Findings of this study indicated FC do not play very significant role in determining technology acceptance. In emerging economies like India, FC are likely to play a significant role in acceptance of any new financial technology. Thus, there is a need to further investigate the role of FC. Also, further research is needed to empirically test the validity of the proposed model and its conclusions. Research on moderating effects of demographic factors may be undertaken to get better prediction model of the usage.

References


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(The Appendix follows overleaf.)

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## Appendix

**Perceived usefulness (PU)**

<table>
<thead>
<tr>
<th>PE1</th>
<th>I expect mobile payment services will be useful in my life</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE2</td>
<td>Using mobile payment services will enable me to accomplish transactions more quickly</td>
</tr>
<tr>
<td>PE3</td>
<td>Using mobile payment services will increase my productivity</td>
</tr>
<tr>
<td>PE4</td>
<td>Using mobile payment services will enhance my effectiveness</td>
</tr>
</tbody>
</table>

**Perceived ease of use (PEOU)**

<table>
<thead>
<tr>
<th>EE1</th>
<th>I expect that my interactions with the mobile payment services would be clear and understandable</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE2</td>
<td>I expect it would be easy for me to become skillful at mobile payment services</td>
</tr>
<tr>
<td>EE3</td>
<td>Learning to operate mobile payment services will be easy for me</td>
</tr>
<tr>
<td>EE4</td>
<td>Working with mobile payment services is not complicated; it is easy to understand what is going on</td>
</tr>
</tbody>
</table>

**Social influence (SI)**

<table>
<thead>
<tr>
<th>SI1</th>
<th>People who influence my behavior think that I should use mobile payment services</th>
</tr>
</thead>
<tbody>
<tr>
<td>SI2</td>
<td>People who are important to me think that I should use mobile payment services</td>
</tr>
<tr>
<td>SI3</td>
<td>In general the bank has supported the use of mobile payment services</td>
</tr>
<tr>
<td>SI4</td>
<td>People in my environment who use mobile payment services have more prestige than those who do not</td>
</tr>
</tbody>
</table>

**Facilitating conditions**

<table>
<thead>
<tr>
<th>FC1</th>
<th>I have resources to use mobile payment services</th>
</tr>
</thead>
<tbody>
<tr>
<td>FC2</td>
<td>I have the knowledge necessary to use mobile payment services</td>
</tr>
<tr>
<td>FC3</td>
<td>Mobile payment services is compatible with other systems I use</td>
</tr>
<tr>
<td>FC4</td>
<td>Online assistance is available for issues/queries related to mobile payment services</td>
</tr>
</tbody>
</table>

**Behavioral intentions (BI)**

<table>
<thead>
<tr>
<th>BI1</th>
<th>I will use/continue using mobile payment services in the future</th>
</tr>
</thead>
<tbody>
<tr>
<td>BI2</td>
<td>Given the chance, I predict I will use/continue using mobile payment services in the future</td>
</tr>
<tr>
<td>BI3</td>
<td>It is likely that I will use/continue using mobile payment services in the future</td>
</tr>
</tbody>
</table>

**Security risk (SR)**

<table>
<thead>
<tr>
<th>SR1</th>
<th>I fear that while I am paying a bill by mobile phone, I might make mistakes since the correctness of the inputted information is difficult to check from the screen</th>
</tr>
</thead>
<tbody>
<tr>
<td>SR2</td>
<td>I fear that while I am using mobile payment services, the battery of the mobile phone will run out or the connection will otherwise be lost</td>
</tr>
<tr>
<td>SR3</td>
<td>I fear that while I am using a mobile payment service, I might tap out the information of the bill wrongly</td>
</tr>
<tr>
<td>SR4</td>
<td>I fear that the list of PIN codes may be lost and end up in the wrong hands</td>
</tr>
</tbody>
</table>

**Privacy risk (PR)**

<table>
<thead>
<tr>
<th>PR1</th>
<th>I think banking websites could provide my personal information to other companies without my consent</th>
</tr>
</thead>
<tbody>
<tr>
<td>PR2</td>
<td>It increases the likelihood of receiving spam</td>
</tr>
<tr>
<td>PR3</td>
<td>I think banking web sites endanger my privacy by using my personal information without my permission</td>
</tr>
<tr>
<td>PR4</td>
<td>It increases the likelihood of receiving unsolicited calls</td>
</tr>
</tbody>
</table>

### Table A1.
Measure items for the study