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Past, Present and Future of M-Banking Research: A Literature Review

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Abstract

Mobile banking (m-banking) is an emerging topic with a growing number of publications over recent years. In this paper, we present a literature review and classification framework for existing m-banking research. The literature review consists of 65 articles published between January 2000 and May 2010 in Information Systems (IS) and IS-related journals, and major IS conferences. The articles are classified into five main categories: m-banking overview and conceptual issues, m-banking applications and cases, m-banking behavioural issues, infrastructures of mobile users and networks, and strategic, legal and ethical issues. We hope that the comprehensive list of references and the findings presented in this paper will provide useful insights into the anatomy of young m-banking literature to anyone who is interested in this field and help stimulate further interest.

Keywords

Mobile banking (m-banking), Literature review, Future research

INTRODUCTION

Conventional telecommunication technologies, characterized by wires and fixed locations, are rapidly giving way to mobile data services (MDSs) (Lee and Chung 2009). Among various MDSs, m-banking can add more value than other services (Economist 2007; Kim et al. 2009). M-banking has the potential to transform banking and telecom sectors (GSMA 2010; Kim et al. 2009). It increases revenue for banks and mobile service providers and cuts cost for banks by offering self-services to users (Kim et al. 2009). M-banking is defined as provision and availability of banking services with the help of mobile telecommunication devices such as mobile phones (Mallat et al. 2004). Typical functions include viewing account balances, transferring funds from one account to another, receiving alerts and paying bills. However, m-banking cannot support all banking functions. For instance, cash can only be withdrawn at physical branches or at automated teller machines (ATMs). Special functions, such as applications for loans or investment funds, may require face-to-face meetings between users and the bank. Thus, m-banking cannot fully replace physical branches or ATMs. M-banking is generally viewed as a channel that is more flexible and ubiquitous than the existing banking channels (Barnes and Corbitt 2003). One may consider m-banking to be complementary and, sometimes, competing with the existing channels (Meuter et al. 2000; Morrison and Roberts 1998). It can provide “anytime and anywhere” banking services, unlike branch offices, where banks have traditionally delivered services through face-to-face interactions with users.

Interest in m-banking is growing among practitioners and researchers alike. In an increasingly competitive banking market, managers are interested in improving understanding of user acceptance of technology-mediated m-banking (Constantiou et al. 2007; Lyytinen and Youngjin 2002). In academia, more IS researchers are expected to respond to the calls by senior scholars to conduct research in the services and choice space, specifically in the emerging self-service electronic banking channels (Curran and Meuter 2007; Nickerson 2008; Venkatesh 2006). Unfortunately though, to the best of our knowledge no review article on m-banking exists. Thus, we embark on writing this review article to answer the following research question: what do we know and do not know about m-banking, with special interest in behavioural issues?

This review article is expected to contribute in three ways. First, it will survey and synthesize articles in the area of m-banking published between January 2000 and May 2010. Second, the research on m-banking so far seems fragmented and lacks a roadmap or an agenda. This review article will not only lead to a better understanding of the current state of m-banking, but will also discern patterns in the development of the area itself. Third, a synthesis of existing findings will allow researchers not to repeat similar work and discover important gaps.

The remainder of this article is organised in a number of sections. In section 2, we describe the methodology used in the study. Section 3 presents the criteria used for classifying the literature on m-banking. The results of the analysis follow in section 4. Section 5 concludes the article and discusses future research directions.

RESEARCH METHODOLOGY

To determine the state-of-art and future directions in m-banking research we conducted an extensive literature review. Since m-banking is an interdisciplinary topic, relevant articles are published in a wide variety of journals. Furthermore, many contemporary m-banking studies are emerging in conference proceedings because of their relative novelty. Hence, we have included academic journals from various disciplines, such as marketing, information technology (IT), management, and information systems (IS), and IS conference proceedings in our literature search.

We conducted a systematic literature search based on the descriptors, “mobile banking” and “m-banking”. Table 1 lists online databases and conferences which were searched to provide a comprehensive bibliography on m-banking literature. We reviewed the full text of each article to eliminate those articles which were not actually related to m-banking. From the articles, identified as “intensely” m-banking articles, we conducted backward and forward search for more articles by looking at the bibliography of each of those articles. We excluded articles where m-banking was only a minor section of a study on mobile commerce or mobile payments. To ensure the quality of the conference papers we searched six IS conferences and one major mobile business conference (see Table 1). A number of articles were also excluded because they did not meet the following selection criteria:

- Considering the relative novelty of m-banking research and the importance of being current in the field, we have only considered research papers published between January 2000 and May 2010.
- Textbooks, doctoral dissertations, book chapters, unpublished working papers and news reports were excluded because academics most often use journals and conference proceedings to disseminate and obtain research findings.
- Some highly technical papers addressing mostly engineering and computer science topics were excluded from the review.

Table 1. Selected online databases and conferences for the m-banking literature search

Online databases	ABI/INFORM database, ACM Digital Library, AIS eLibrary, Google Scholar, IEEE Xplore, ScienceDirect, Web of Science, Wiley InterScience
Conferences	Americas Conference on IS (AMCIS), Australasian Conference on IS (ACIS), European Conference on IS (ECIS), Hawaii International Conference on System Sciences (HICSS), International Conference on IS (ICIS), International Conference on Mobile Business (ICMB), Pacific Asia Conference on IS (PACIS)

CLASSIFICATION METHOD

The reviewed articles were classified using eight methods. The first classification is by research topic, and it identified five main categories of work with those divided into further sub-categories. This classification framework is developed based on the work of Ngai and Gunasekaran (2007) on m-commerce framework. Each m-banking article was reviewed and assigned to one sub-category based on its core topic.

The first category, *m-banking overview and conceptual issues*, covers articles that deal with general introduction and foundational concepts of m-banking. We divided this category into three sub-categories: m-banking overview, market, and conceptual framework. The second category, *m-banking applications and cases*, covers a range of m-banking applications, such as SMS banking, stock brokerage service, mobile money transfer service and information service. It also covers cases about companies, industries and countries. We divided this category into two broad sub-categories: planning for IS application, and mobile services for financial market. The third category, *m-banking behavioural issues*, contains articles that describe perceptions, decisions, acceptance and diffusion of m-banking applications. Studies from both users’ and service providers’ perspectives are included here. We divided this category into seven related sub-categories: intention, adoption, decision, resistance, channel comparison, consumer profiling, and trust and satisfaction. The fourth category, *infrastructures of mobile users and networks*, includes articles that discuss mobile software interfaces or mobile hardware interfaces, such as interfaces of mobile phones, personal digital assistants (PDAs) and iPhones. Network infrastructure is about wireless networks and network standards such as global system for mobile communication (GSM), Bluetooth, wireless local area network (WLAN), radio frequency identification (RFID), third generation (3G) network etc (Ngai and Gunasekaran 2007). Our reviewed articles in this category predominantly address security issues. The fifth and final category, *strategic, legal and ethical issues*, covers a range of articles on legal and ethical issues, such as privacy, regulations and legal environment. M-banking economics, strategy and business model articles are also included here. We divided this category into three sub-categories: strategy, convergence, and legal and ethical issues. The classification framework of the topic categories and sub-categories is shown in Figure 1.

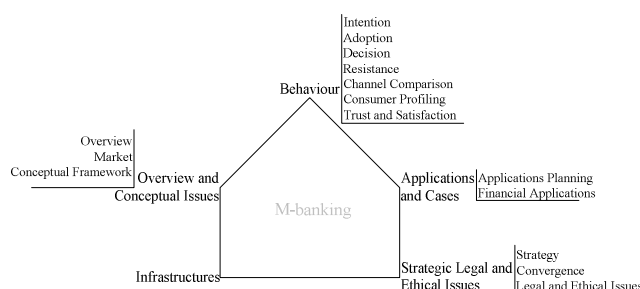


Figure 1. Classification of topics on m-banking

The second, third and fourth form of classification of the reviewed articles are based on research method, data analysis method and theory used respectively. It should be noted here that although conceptual papers do not use empirical research methods, we included them in our analysis and tabulation to gain an overall view. The remaining four classifications are based on distribution by year of publication, country of study, journal and conference of the reviewed articles.

RESULTS OF THE ANALYSIS

We reviewed and classified a total of 65 articles according to the aforementioned classifications. The results of tabulation and classification of the reviewed articles are presented in this section. It is noteworthy that total number of articles in any classification is unlikely to reach the total number of articles we reviewed (65 articles) because of irrelevance of some articles to any given classification.

Distribution of articles by topic

The majority of articles (38 out of 65 or 58% of the total) were related to m-banking behavioural issues (consumer behaviour, adoption and diffusion), whilst the least were on mobile user and network infrastructures (3 articles or 5% of the total). As expected, intention and adoption issues made up a large proportion of reviewed articles. The second-largest number of articles is related to m-banking overview and conceptual issues (13 articles or 20% of the total). The domination of conceptual and behavioural categories reflects that m-banking is a relatively young area of research. It is conceivable that more researchers may/would attempt to understand user acceptance and conceptual issues in the early stages of m-banking adoption life cycle. Articles on applications and cases made up 11% of the total (7 articles) and articles on legal, ethical and strategic issues made up 6% of the total (4 articles). Table 2 shows a summary of the reviewed articles that correspond to the classification of topics. Table 3 summarises findings of major m-banking related empirical studies. Table 2 and Table 3 are expected to be a helpful resource for anyone interested in m-banking studies and their findings.

Distribution of articles by research design, data analysis method and theory used

The purpose of classifications by research design and data analysis is to develop an understanding of what methodologies and data analysis methods are used for m-banking research. Most of the empirical research on m-banking has been done through the use of field surveys (see Figure 2). A qualitative research method was used in about half as many articles as was a field survey for data collection. An online survey method was used less than a qualitative research method in the reviewed articles. It is noteworthy that none of the reviewed articles used experiments for data collection. Also, only a small proportion of reviewed articles used an archival database or design science approach. It should be noted here that the total number of conceptual articles in our review almost matches the total number of field survey-based studies, however, “conceptual” is by no means a research method. We have included them in Figure 2 simply to indicate that a substantial number of conceptual articles exist in m-banking literature which do not use any empirical research method.

The type of data analysis method, used to perform empirical research, is an important indication of the sophistication of the research design that is used in an article. As expected, structural equation (i.e., path) modelling was the most widely used quantitative data analysis method, used in 16 reviewed articles, followed by descriptive statistics (5 articles), regression analysis (4 articles), t-tests (3 articles) and conjoint analysis (2 articles). (M)ANOVA, cluster, Rasch and ZMET analysis – each was used in one reviewed article.

IS researchers often turn to existing theories on which to base their research. As expected, a technology acceptance model is widely used (6 articles) given its popularity for over a decade. This is followed by an IS success model (3 articles) and a task-technology fit model (3 articles). Among other models included are theory of planned behaviour (2 articles), actor-network theory (2 articles), Rasch model (1 article) and unified theory of acceptance and use of technology (1 article). It is noteworthy that many empirical studies did not use a theory. Table 3 identifies theories used by empirical studies.

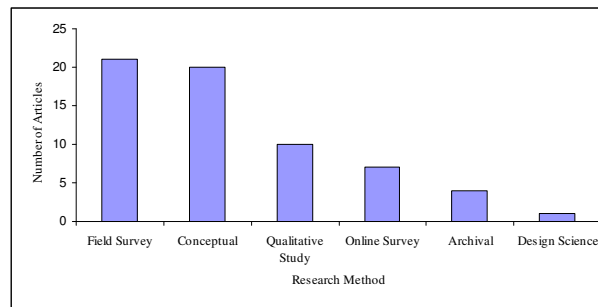


Figure 2. Distribution of articles by research method

Table 2. Classification of the reviewed m-banking literature

Classification criteria	References
<i>M-banking overview and conceptual issues</i>	
M-banking overview	Barnes and Corbitt (2003), Herzberg (2003), Mallat et al. (2004), Xiangpei et al. (2008)
Market	Karjaluoto (2002), Pousttchi and Schurig (2004), Riivari (2005)
Conceptual framework	Chen et al. (2001), Jarvenpaa and Lang (2005), Kemper and Wolf (2002)
<i>M-banking applications and cases</i>	
Planning for IS application	Al-Taitoon and Sorensen (2004), Peffers and Tuunanen (2005)
Mobile services for financial market	Muntermann (2009), Muntermann and Janssen (2005), Muntermann et al. (2004)
<i>M-banking behavioural issues</i>	
Intention	Amin et al. (2008), Anckar and D'Incau (2002), Hoehle and Huff (2009), Joubert and Van Belle (2009), Kim et al. (2009), Kleijnen et al. (2004), Lou et al. (2010), Luarn and Lin (2005), Suoranta and Mattila (2004), Tang et al. (2004), Wang et al. (2006)
Adoption	Brown et al. (2003), Crabbe et al. (2009), Lee et al. (2003), Yang (2009), Zhou et al. (2010)
Decision	Brown et al. (2005), Chang and Melbourne (2008), Dewan et al. (2009)
Compare channels	Laforet and Li (2005), Laukkanen (2007a), Laukkanen (2007b), Laukkanen (2007c), Laukkanen and Lauronen (2005)
Categories of adopters	Laukkanen and Pasanen (2008)
Resistance	Laukkanen et al. (2007), Laukkanen et al. (2008), Lee et al. (2007)
Trust and satisfaction	Chu and Yao-bin (2009), Lee and Chung (2009), Wati et al. (2009)
<i>Infrastructures of mobile users and networks</i>	Claessens et al. (2002), Muntermann et al. (2005), Ngo et al. (2008), Singh Ghotra et al. (2007)
<i>Strategic, legal and ethical issues</i>	
Strategy	Bonina and Illa (2008), Scornavacca Jr and Barnes (2004), Stamoulis (2000), Yang (2008)
Convergence	Oh and Lee (2005)
Legal and ethical issues	Anderson (2010), Weber and Darbellay (2010)

Distribution by year of publication and country of data collection

The distribution of articles from January 2000 to May 2010 is presented in Figure 3. Research output on m-banking increased steadily from 2001 to 2005. However, in 2006 the research output fell. However, from 2007 onwards research output has again been steadily increasing. It is interesting that the curve is representative of m-banking hypes and promises. In early 2000, there was major hype about m-banking that lasted until mid-decade.

Table 3. Empirical Studies Related to Mobile Banking¹

Authors ²	Theoretical Foundation	Context and Method	Independent Variables	Dependent Variables	Results ³
Brown et al. (2003)	Technology acceptance model (TAM)	11 semi-structured interviews with mobile phone and bank users in South Africa.	Cost, resistance to change, exposure, relative advantage, ease of use, perceived risk	Adoption	Resistance to change, exposure, relative advantage, perceived ease of use, perceived risk and cost influence adoption decision.
Chang and Melbourne (2008)	TAM	Survey of 249 general mobile phone users in Australia	Perceived usefulness, perceived ease of use, perceived enjoyment, perceived risk, phone type service plan, demographics, PC ownership	Intention	Perceived enjoyment has more influence than usefulness and ease of use on intention to use mobile phones for personal information management. Perceived risk is salient for commercial transactions. Gender and PC ownership are important moderators.
Chu and Yao-bin (2009)	None	Online survey of 313 college students who used online banking in China.	Personal factors (trust propensity), cognition-based factors (relative advantage, compatibility), institutional factors (structural assurance, firm reputation)	Initial trust of m-banking, usage intention	Online trust influences initial trust and perceived structural assurance. Previous satisfaction with online banking influences on initial trust, perceived relative advantage and perceived compatibility.
Crabbe et al. (2009)	TAM	Survey of 271 bank users in Ghana	Usefulness, ease of use, perceived elitisation, credibility, facilitating conditions, sustained usefulness, demographics	Attitude, intention, usage, sustained usage	Elitisation positively influences adopters and negatively influences non-adopters. Perceived credibility and facilitating conditions influence attitude. Demographics, social and cultural features influence adoption.
Hoehle and Huff (2009)	Task technology fit model (TTF)	9 interviews with bank managers of 3 banks in Germany	Task channel fit, social norms, facilitating conditions. Moderators: age, gender, experience	Intention to use channel	Task channel fit is perceived relevant for electronic channels.
Hong et al. (2008)	Theory of planned behaviour (TPB)	Online survey of 811 mobile data services consumers in Hong Kong	Usefulness, ease of use, enjoyment, social influence, media influence, mobility, monetary value	Attitude and intention to continued usage	Attitude, social influence, media influence, perceived mobility, perceived monetary value and individual usage context (i.e., mobile data service categories) influence intention. Perceived ease of use, perceived usefulness, and perceived enjoyment influence attitude.
Kim et al. (2009)	None	Online and mail survey of 206 mobile phone and bank users in Korea	Relative benefits, Personal propensity of trust, Structural assurances, Firm reputation, Initial trust in mobile banking	Intention to use	Relative benefits, propensity to trust and structural assurances influence initial trust. Initial trust and relative benefits influence intention. Firm reputation does not influence intention.

Table 3. Empirical Studies Related to Mobile Banking (*continued*)¹

Authors ²	Theoretical Foundation	Context and Method	Independent Variables	Dependent Variables	Results ³
Kleijnen et al. (2004)	TAM	Field survey of 105 mobile banking users (who used at least once)	Usefulness, ease of use, cost, system quality, social influence, user characteristics: age, computer skills, mobile technology readiness	Attitude, intention	Perceived usefulness and systems quality influence attitude. Social influence and attitude influence intention. User characteristics have moderating effects.
Lee et al. (2007)	None	20 semi-structured interviews with non-mobile banking users	Risk, lack of knowledge	Resistance	Well developed traditional electronic banking services (e.g., internet banking), perceived risk and lack of knowledge contribute to resistance.
Luarn and Lin (2005)	TAM and TPB	Field survey of 180 bank users in Taiwan	Usefulness, ease of use, credibility, self-efficacy, financial cost	Intention	Usefulness, ease of use, credibility, self-efficacy influence intention. Financial cost negatively influences intention.
Luo et al. (2010)	None	Survey of 122 students in USA	Performance expectancy, trust, risk, structural assurance, disposition of trust, self-efficacy	Intention	Risk, personal trait factors (self-efficacy, disposition to trust) and performance expectancy influence intention.
Tang et al. (2004)	TAM	Survey of 267 mobile phone and bank users in Taiwan	Computer self-efficacy, perceived usefulness, perceived ease of use, perceived credibility	Intention	Computer self-efficacy affects intention through perceived ease of use, perceived usefulness and perceived credibility.
Wang et al. (2006)	TAM and TPB	Field survey of 258 visitors to an e-commerce exposition in Taiwan	Self-efficacy, Financial resource, Usefulness, Ease of use, Credibility	Intention to use	Self-efficacy, financial resource, usefulness, ease of use and credibility influence intention.
Wu et al. (2005)	TAM and diffusion of innovation theory (DOI)	Survey of 373 online bank, mobile and securities investment company customers	Risk, cost, compatibility, usefulness, ease of use	Intention, actual use	Risk, cost, compatibility, usefulness influence intention which in turn influence actual use. Ease of use does not influence intention.
Yang (2009)	Rasch measurement model	Survey of 178 students in Taiwan	Speed of transaction, transaction fees, practical banking services, safety, system basic fees	Adoption	Speed of transactions and special reduction in transaction fees, practical banking services, and reduced banking transaction fees influence adoption. System configuration safety and system basic fees inhibit adoption.
Zhou et al. (2010)	TTF and unified theory of acceptance and use of technology	Field survey of 250 m-banking users in China	Task characteristics, technology characteristics, performance expectancy, effort expectancy, social influence, facilitating conditions	Task technology fit, user adoption	Performance expectancy, task technology fit, social influence and facilitating conditions influence adoption. Task technology fit influences performance expectancy.

Note: ¹ Some selectivity was employed in choosing references. ² Sorted in alphabetical order by author's name. ³ Only primary and significant results reported.

Recently the promise of m-banking has resurfaced and research output in this area is again on the rise. It is noteworthy that we are in the middle of 2010 and perhaps, more than half of the yearly research output is yet to be published, given that many publications come out in the last half of the year.

It is not surprising that Finland tops the list with 11 reviewed articles, followed by Korea (6 articles), because both countries are pioneers in m-banking innovations. Germany and Taiwan had 4 articles each, followed by China and South Africa (3 articles each). While Malaysia had 2 articles, Australia, Ghana, Hong Kong, Indonesia, Japan, Kenya each had 1 article.

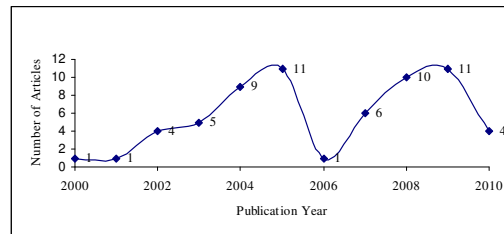


Figure 3. Distribution of articles by year

Distribution of articles by journal and conference

In our results list, there were a total of 21 different journals from various disciplines, such as IS/IT, marketing, management and business that published m-banking articles. Most of the articles were published in IS/IT journals. Interacting with Computers and International Journal of Mobile Communications had the highest number of articles, 6 each, on m-banking. It is encouraging that top-tier IS journals, such as Decision Support Systems (3 articles), Information Systems Journal (2 articles), Communications of the ACM (2 articles) Information and Management (1 article) and Information Systems Frontiers (1 article) are increasingly accepting articles on m-banking and the majority of these articles have been published since 2009. In terms of conferences, AMCIS, HICSS, ICIS, PACIS, ICMB, ACIS and ECIS published 8, 5, 5, 5, 4, 3 and 1 article(s) respectively.

CONCLUSIONS AND FUTURE RESEARCH DIRECTIONS

Mobile banking has been attracting the attention of both practitioners and academics. Specifically, empirical research activities on m-banking have increased since 2007 and we believe that m-banking will become increasingly pervasive. In this review article, we identified 65 articles on m-banking published between 2000 and 2010. Although we do not claim it to be exhaustive, it does provide a reasonable amount of insight into m-banking research. The results presented in this review article have several important implications:

- There is no doubt that m-banking research will prosper in the future given that m-banking is a relatively young research area and many issues, including the potential and pitfalls of m-banking, are still unresolved.
- It is not surprising that a large proportion of the reviewed articles in this study were related to m-banking behavioural issues given that acceptance of technology is a popular topic in IS literature. We understand that different factors are important at different stages in the development of an IT artefact. Since m-banking, in general, is in the development and early adoption stage, we expect that both technology/infrastructure and user experience/adoption related research will continue to grow.
- The capabilities of user infrastructure should be considered when we embark on developing new m-banking applications. Various mobile devices (e.g., the iPhone and iPad) are available with faster processing time, large storage capacity, touch pad and reasonably sized display screens. Attempts to improve and modify m-banking interfaces should continue correspondingly to suit the requirements of new business models.
- We believe that the number of published articles in some of our categories and sub-categories mentioned earlier, such as infrastructures, is more than what we have found and documented in this review article. Because the descriptors were limited to “m-banking” or “mobile banking” during the literature search, some articles, which had none of the descriptors in the title, keyword or abstract, may have failed to be included in our review. Nonetheless, this is a good indicative review given that it is the first review article on m-banking.

Further to the above implications, we would like to offer the following suggestions for future research on m-banking:

- Researchers should conduct more qualitative and quantitative empirical studies, perhaps, backed by guiding theories to improve understanding of underlying characteristics of m-banking (such as mobility)

and help improve the quality and relevance of m-banking research. In other words, more theory based empirical research is needed to enhance the current understanding of m-banking services and markets.

- There has not been much research on m-banking from a cultural perspective. Cultural differences in adopting m-banking could be an interesting area of investigation. It would also be interesting to carry out comparative studies between cultures and countries. Specifically, it would be interesting to study differential influences of hedonics, demographics, personality traits, extrinsic motivations etc. in adopting m-banking between predominantly cash culture and electronic banking culture.
- More research is needed to address regulatory (i.e., public policy) and technical issues for m-banking. New standards and methods should be developed and old policies should be adapted to address regulatory lacking or policy problems for m-banking. Similarly, technical standards to handle specifics of information publishing tools, user interfaces, and transport are essential to ensure compatibility across the entire network involving, for example, banks and mobile service providers.
- M-banking should be further studied as to its impact in various business sectors, such as supply chain, retail, finance and brokerage. For example, m-banking can facilitate support and collaboration among players in the supply chain.
- This review article shows that there is a lack of empirical study that uses experiments. Researchers should consider using experiments for their m-banking studies in the future.

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