



A Survey on Mobile Banking Applications and the Adopted Models

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DOI: [10.23956/ijarcsse/V7I2/01220](https://doi.org/10.23956/ijarcsse/V7I2/01220)

Abstract— Many banks around the world are starting to offer banking services through mobile phones. Therefore, many studies have been proposed to help bankers to increase the number of customers. Despite the effort that has been founded in the state of the art, the adoption rate of mobile banking application has not reached the expected amount yet. Therefore, the aim of this study is to analyse the most well-known and accepted models to provide a comprehensive understanding of their impacts toward the adoption of mobile banking applications. Furthermore, this study aims also at exploring the most effected factors that have been used to influence the adoption behaviour intention of mobile banking applications. As a result of this survey study, some critical recommendations were stated clearly.

Keywords— Mobile Banking Applications, Adoption, Intention to use, TAM, IDT, UTAUT

I. INTRODUCTION

In the new era, the information and communications technology have undergone through rapid development. Besides, the revolution of wireless technology and the intensive penetration of cell phones have encouraged banking industries around the world, to invest considerably large budget on building Mobile Banking (MB) systems, through the adaptation of different kinds of strategies with the aim of attracting customer intention to use this new technology [1-2]. Consequently, the most popular banking systems that can be offered to customers are internet banking and MB systems, which allow customers to perform their banking transactions [3-5].

Internet banking, sometimes called online banking, is an outgrowth of Personal Computer (PC) banking that enables customers to execute bank transactions from their PC [6-7]. The realization of internet banking systems is relying on the internet infrastructure as the main delivery channel, which allows customers to conduct most banking activities such as transferring funds, checking account balances, paying bills, and more [8]. Internet banking system is not limited to a physical site; some internet banks exist without physical branches. One of the most interesting features that are brought by internet banking is the ability for individuals to perform their banking transactions anywhere and anytime [5, 9]. Therefore, individuals can easily checking and monitoring their account balance as long as they have internet access [5-6]. However, most of the research that has been done on electronic banking has focused on internet banking [1].

One of the first commercial applications of the mobile commerce is mobile banking system. MB system is a further development upon earlier customer channel extensions such as phone banking and online banking. In fact, MB has emerged at the end of 1990s when the first service is launched by company Paybox in collaboration with Deutsche bank. Initially, it was deployed and tested mostly in European countries including Sweden, Austria, Germany, Spain, and the United Kingdom. Among developing countries, Kenya was the first to introduce a text-based MB service, M-Pesa, in 2007. By 2012, there were more than seven million registered M-Pesa users in Kenya.

However, researchers have proposed some models that would help people to adapt the new emerged technology. Meanwhile, banks have adapted these models to be able to deliver an acceptable Mobile Banking Application (MBA) as a new technology. These models are various somehow, in which they only included the most general factors that would affect people intention toward the adoption of MBA. Therefore, the aim of this study is to analyse the most well-known and accepted models to provide a comprehensive understanding of their impacts toward the adoption of mobile banking applications. Furthermore, this study aims also at exploring the most effected factors that have been used to influence the adoption behaviour intention of mobile banking applications.

II. LITIRATURE REVIWE

Generally, many researchers have come across many different kinds of models and frameworks to increase customer's behaviour intention to use MB services by proposing some factors or constructs that could affect an individual's decisions to adopt MB services [4, 7, 10]. These models and frameworks like Technology Acceptance Model (TAM), Theory of Panned Behaviour (TPB), Innovation Diffusion Theory (IDT), Information System Success Model (ISSM), Elaboration likelihood Model (ELM), Theory of Planned Behaviour (TPB), Ubiquitous Computing Framework

(UCF), Benefit Cost Framework (BCF), Rasch Measurement Model (RMM), Self-Developed Model (SDM), Uncertainty Avoidance (AU), Mobile App Usability Index (MAUI). All of these models and frameworks are very helpful in determining the adoption intention of customers toward MB services [11].

However, with all the benefits that are brought by MBA, customer adoption is still low. Hence, it is very important to investigate factors that positively or negatively would affect customers toward the adoption or rejection of MBA. Despite the fact that previous studies on MBA adoption have provided sufficient background information on the adoption behaviour with regard to MBA, studies that focus on the constructs or factors that influence youth markets to adopt MBA are limited [9, 12]. Therefore, understanding the effects such factors will certainly play a critical role in increasing the opportunities and reducing the challenges associated with the use of MBA. On the other hand, [3] proposed potential perceived benefits and perceived sacrifices of MBA in China. The perceived benefits were social value, universal, perceived enjoyment, and value-added services. On the other hand, the perceived sacrifices were perceived risk and fee. The results showed that perceived value significant influence consumers' adoption intention toward MB.

From another perspective, [7] identified five adoption barriers, namely usage, value, risk, tradition and image. The results showed that uncertainty avoidance has a highly significant effect on innovation resistance, the strongest influence related to image and risk barriers. The two moderating role age and gender were taken, age appear not to moderate the effects while gender found to be a highly significant moderator in customer adoption intention.

From the mobile application usability, the research reported in [4] has focused on the usability to improve mobile banking adoption. They chose a sample size of 1434 participants with diverse backgrounds. All participants communicated by using WhatsApp, Facebook, LinkedIn, emails and face-to-face interactions to understand the usability related challenges of MBA. From the survey and user comments analysis, there was a clear correlation perceived by the users between usability issues and reliability. For example, if the application had difficult activation process, customers lost interest in the application and stated that the MBA was not reliable.

III. MOBILE BANKING APPLICATION

In general, MBA is a service provided by a bank or other financial institution that allows customers to carry out a range of financial transactions remotely using a mobile device such as a mobile phone or tablet [1-2]. MBA is usually a software program downloaded to a Smartphone which will be available 24-hour for performing basic banking transactions as long as the device is connected to the internet. Some financial institutions have imposed some restrictions on the accounts to be accessed through MBA, and on the amount to be transferred which is limited [2-3]. MBA offers some essential services to customers including paying bills, transferring money from account to another, checking account balance, history of latest transactions, and more [1]. Besides, some MBA also able to generate a downloadable account statement to be printed by customers or mailed as hardcopy to customers, in the later case, come banks impose mailing fee.

From the bank's point of view, MBA certainly reduces the cost of handling transactions by reducing the need for customers to visit a bank branch for non-cash withdrawal and deposit transactions [4]. Transactions involving cash aren't handled using MBA, and a customer needs to visit an ATM or bank branch for cash withdrawals or deposits. Some recent MBAs have a mobile cheque deposit option; using the device's camera to digitally transmit cheques to their financial institution [5-6]. In fact, MBA has brought many benefits for banks and customers, which are discussed in some details in following subsections.

A. Benefits for Banks

The most important benefit for banks that can be obtained by MBA is the competitive advantage, in which banks that would offer such services would be perceived as leaders in technology implementation. As a result, many customers will deal with such banks to enjoy performing banking transactions using MBA, which is in turn will increase customer's ratio. According to work reported in [3], the loyalty for customer will be increased toward dealing with such bank that deliver MB services through mobile phone devices. In addition, new customers will choose that bank because it offers different ways to access multiple banking services through mobile phone. Therefore, banks that offer MBA are declining some branches which is in turn reduces the cost of carrying out bank transactions [2]. Table 1 summarizes some popular benefits of using MBA for banks.

B. Benefits for Customers

In fact, MBA does not bring benefits to banks only, it also bring some benefits to customers. The most benefit that customers would perceived is saving a significant time, in which customer can perform some banking transactions without the need of presenting to any branch [7-9]. The common benefits that customers can be perceived are illustrated in Table 1. According to [10], the main advantages of MB for corporate customers are as follows:

- Reduced costs in accessing and using the banking services and better cash management.
- Increased comfort and time saving in which transactions can be made 24-hour a day, without requiring the physical interaction with the bank.
- Quick and continuous access to information.
- Corporations will have easier access to information as, they can check on multiple accounts at the click of a button.

Table 1 The popular benefits of MBA for customers and banks

No	Benefits for customers	Benefits for banks
1	Time saving	More efficient
2	Cost saving	Reducing costs
3	Fast	Borderless(scalable)
4	Accessible	Dependence on IT
5	Available	Various services

IV. THE ADOPTED MODELS FROM MBA

Based on the survey that has been conducted in this study, the most popular and frequent models that are mostly used to improve the adoption of MBA are Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), and Unified Theory of Acceptance and Use of Technology (UTAUT) [1] [11-13]. Therefore, this study analyses these models in sufficient details in the following subsections.

A. Technology Acceptance Model (TAM)

It is worthy to point out that, TAM is the most popular theoretical model which has been used since 1986 (originally proposed by Davis in 1986) [1, 10]. It has proven to be a theoretical model in helping to explain and predict user behaviour of information technology. In fact, TAM is considered an influential extension of Theory of Reasoned Action (TRA). The predominant usage of TMA is the explanation of why users would accept or reject any new emerged information technology [1, 10]. TAM provides a basis with which one traces how external variables influence belief, attitude, and intention to use [11]. The main fundamental factors (some studies call them constructs) that are included in TAM are perceived usefulness and perceived ease of use [11-12].

One of the main reasons for the wide acceptance of TAM is its specific approach to address the factors that influence the usage of information system while TRA is a general theory of human behaviour. TAM has been validated through examining various types of technologies pertinent to the adoption of individual and organization such as electronic commerce, intranet, World Wide Web, and online shopping [2, 14].

Despite the surrounding success stories around TAM, it suffers from an obvious limitation which is the omission of other important factors that could affect user acceptance [1, 10]. Therefore, as it has been observed from the literature, researchers did not use the original TAM as it is, instead, they extended it by adding some other factors to facilitate the understanding of the information system adoption [1, 14].

TAM fundamental Factors

TAM model suggests that the user adoption of a new information system is determined by two fundamental factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The former factor is defined as the extent to which an individual believes that he or she would benefit from using MB [14] [4]. A study reported in [1] argued that individuals often evaluate the consequences of their behaviours and make a choice based on the desirability of PU. Therefore, PU will influence their intention to accept and adopt a system [14]. In the context of MBA, one of the reasons people would use MBA is that, they find it useful and trustable to their transactions and saves their time as well [10]. Numerous studies have shown that PU is the primary predictor of information technology usage [13].

The latter factor PEOU is defined as the extent to which an individual believes that using MBA would be free of effort [14] [4]. Previous studies have shown that PEOU is significantly affecting the usage intention, either directly or indirectly through its effect on PU in TAM [12-14]. A system perceived to be easier to use will facilitate more system use and is more likely to be accepted by users and therefore, will be more trustable [1]. In the context of MBA, customers may find MBA services uneasy when the system is not easy to learn and easy to use, and this could affect user trust and confident. In addition, information such as details of products or services, their benefits, and usage guidelines needs to be provided as it will make easier for user to adopt MBA [15]. Furthermore, the PEOU helps in building trust with banks as it may send a signal that banks have really put in thought about their end users [1, 12, 14]. However, these two factors PU, PEOU form the attitude and attitudes develop into intention which in turn drives the actual system usage [1, 10-12]. Fig. 1 shows the original TAM model.

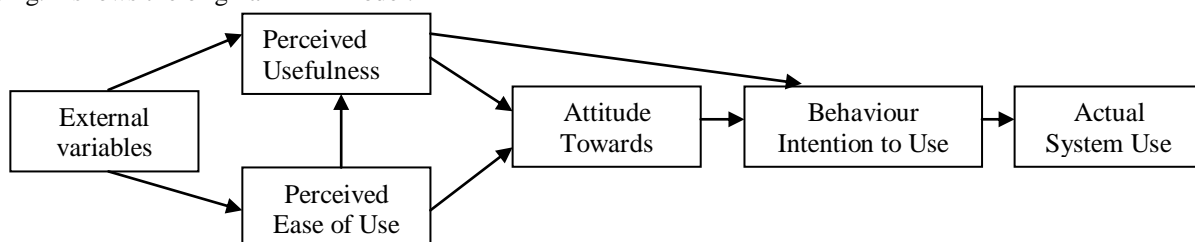


Fig. 1 The Original Technology Acceptance Model (TAM) , source [10]

TAM Extended factors

TAM has been used and extended to attract customers' adoption of MBA by offering divers advantages and services that customers would gain from the adoption of new technology, such as perceived usability, perceived trust, perceived enjoyment, and more [1, 10, 15]. For example, study reported in [15] chose factors such as universal ,value

added services, social value, and perceived enjoyment to predict customer behaviour intention to use MBA services by the extension of TAM to TAM for MBA services. Some of TAM extended factors are shown in the survey study conducted in [1].

B. Innovation Diffusion Theory (IDT)

IDT is the second most widely used model as a theoretical model [1], which is developed by [16]. According to [17], the innovation-diffusion process is described as “an uncertainty reduction process” and he proposes attributes of innovations that help to decrease uncertainty about the innovation.

IDT fundamental Factors

The fundamental factors (sometimes called attributes of innovations) that form the IDT are relative advantage, compatibility, complexity, observability, and trainability. According to this theory model, the adoption rate of a new technology depends on those five factors. However, Rogers and Everett M stated in their study [17] that “individual’s perceptions of these characteristics predict the rate of adoption of innovations”. Furthermore, they defined the rate of adoption as “the relative speed with which an innovation is adopted by members of a social system” [17]. On the other hand, the definition of those five factors are clearly given and introduced in [18]. Fig. 2 illustrates how we can employ IDT model with mobile banking adoption.

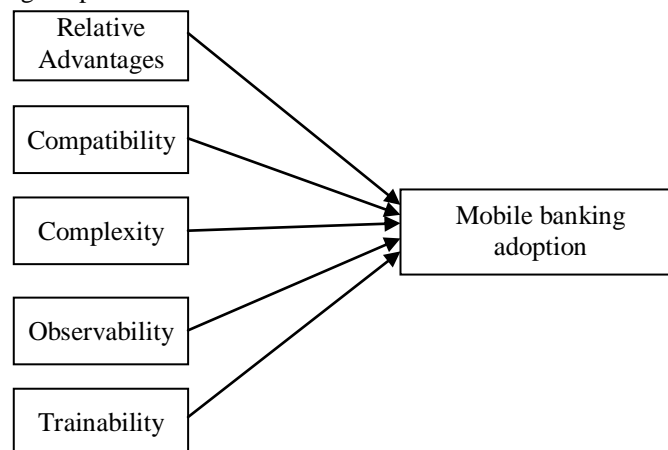


Fig. 2 Innovation Diffusion Theory with Mobile banking adoption (obtained from [19])

IDT Extended factors

Many studies have extended IDT to suit their needs. For example, study reported in [19] has taken some innovation characteristics of IDT such as relative advantage, compatibility, trainability, complexity, observability, and one external factor perceived risk. The result of [19] found that, these characteristics or factors have a major influence on customer intention to adopt MBA services. According to the analysis that have been conducted in [1, 18], which covered the published works within the period of time from 2005 to 2014, it found that IDT model had been extended by adding some different factors such as trust, perceived risk, self efficacy, perceived benefits, ease of use, perceived risk, credibility, demographic factors, and more.

C. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT is developed by Venkatesh et al. in 2003 [1]. This model is based on the theories of individual acceptance that are synthesized by [20], which is inspired from TRA, TAM, IDT, motivational model, theory of planned behaviour, model combining the technology acceptance model and theory of planned behaviour, model of PC utilization, and social cognitive theory [18]. This theory focuses on the motivations for user behaviour, such as perceived usefulness or relative advantages [18].

UTAUT fundamental Factors

UTAUT is involved around four fundamental factors namely, performance expectancy, effort expectancy, social influence, and facilitating conditions [13]. According to [20], performance expectancy refers to the degree to which an individual believes that using the system will help him/her to attain gains in job performance; While the effort expectancy refers to the degree of ease associated with the use of the system. Furthermore, [20] defines the social influence as the degree to which an individual perceives that important others believe he or she should use the new system. In addition, facilitating conditions refers to the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system [20].

UTAUT Extended factors

Similarly, researchers have extended UTAUT model to suit their needs. According to the results of a deep analysis conducted by [1], many studies had extended UTAUT model by adding variant factors such as trust, social influence /subject norm, perceived risk, facilitation condition, cost, credibility, demographic factors, accessibility, convenience, and more. However, [13] employed UTAUT to investigate what impacts people to adopt MB. The study empirically concluded that individual intention to adopt MB was significantly influenced by social influence, perceived financial cost, performance expectancy, and perceived credibility, in their order of influencing strength. Furthermore, [13]

also used the moderating effects of gender and age to discover do these factors have impact on behavioural intention to use MB services or not. The result was true there was a certain impact of both gender and age to respondents. Fig. 3 demonstrates UTAUT model.

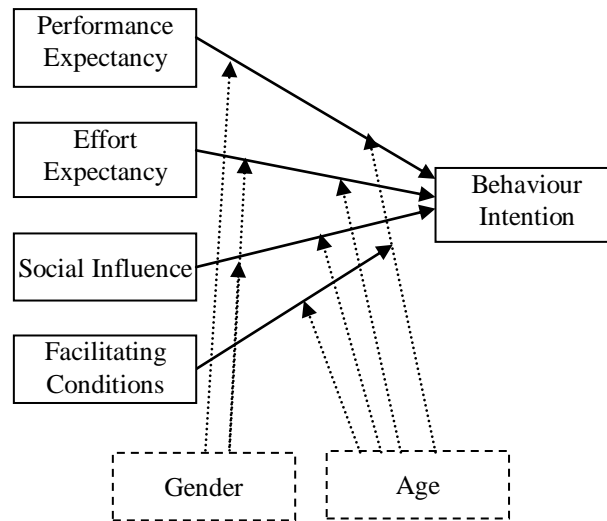


Fig. 3 Unified Theory of Acceptance and Use of Technology Model Source: [20]

V. RECOMMENDATIONS AND CONCLUSIONS

Based on the conducted review, it can be clearly seen that the adoption of MB services in both developed and developing countries has not reached to the expected amount of intention and usage toward customers. Hence it becomes an important goal for banks and service providers to increase the rate of adoption of MB users. Thus, some important recommendations are pointed out as follow:

- Banking institutions should emphasize interpersonal word-of mouth and put more advertising on emerging social media (such as Facebook, MSN, Twitter, and Blog) than traditional mass media (i.e., televisions, radios and newspapers) to increase the diffusion and penetration of MB.
- Banks should create awareness about the MB services through advertisements, pamphlets, demo fares, campaigning etc. Therefore, the customer feel informed and it may create interest among them. A very interesting claim was made in [21], that the footfalls at ATM centres is likely to be very high, the campaigns may be carried out at these locations to attract more customers towards these services.
- Managerial attention should be focused more on developing perceived self-efficacy. When new technologies emerge, people may not utilize them because they perceive it to be difficult to learn. In order to enhance self-efficacy, banks may initiate training sessions and awareness campaigns on MB to help users to get familiar with mobile technologies. Even if these training session and campaigns are not directly related to MB services, they can still be helpful to develop more positive attitude, which in turn can influence to use MB. Banks also should offer enough related information that would help their customers adapting and using MB services.
- Banks should also explain the advantages of the new values added services for adapting to MB, such as customers don't have to go to a branch to do their transaction, and explain a new value for them such as saving their time and cost, inconvenience of travelling to a bank or branch, and the avoidance of long queues. Banks can investigate the concept of MB is valuable and it will give them greater control over their banking transactions.
- Perceived ease of use and perceived usefulness are found to be the most important factors to influence the consumer intention to adopt mobile banking. Hence, the main attention of management should be focused on the development of ease of use and usefulness of system because it found that customers will adopt mobile banking if they find it easy to use, clear, and useful to them.
- Our external recommendation for banking industries is to efficiently reduce the cost for customer to using cell phone-based service and to differentiate service/price packages for male and female. Perceived cost is an important factor; therefore, this study suggests that the creative promotional and pricing strategies, including cost reduction should be implemented to attract more price-conscious customers.
- Trust is also an important point of concern. Thus, trust between customers and services providers is very important, without security and privacy users will not use mobile for financial transactions. In particular, MB services providers need to enhance authentication mechanisms to avoid fraudulent activity and allay fears of privacy issues in order to increase trust and hence increasing MB adoption rates.
- In general the providers of MB services should do the best to deliver a new opportunities throw offering new kinds of services that can be beneficial for their customers. Similarly, providers of MB services should do the best and try to minimize the challenges or risks that can stand affront MB adoption.
- To achieve the expectations of the consumers and to increase the MB users, MB services provider needs to increase the awareness level about the MB services. Banks and the mobile service providers need to come together to bring a revolution in the field of MB.

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