Empirical validation of the decomposed theory of planned behaviour model within the mobile banking adoption context

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Abstract: The study utilises the decomposed of theory of planned behaviour (DTPB), to understand the consumer behaviour in relation to the applications of mobile banking. The model is empirically tested using an online survey from a convenience sample of 404 respondents, and analysed using structural equation modelling. The study concluded that consumer attitude towards using m-banking is impacted by relative advantage and compatibility. Complexity however does not play a significant role in influencing attitudes. Subjective norms are significantly influenced by social influences. The findings show that behavioural intention can be explained through attitude and perceived control. Moreover, subjective norms do not influence behavioural intention for adoption. The findings extend our understanding of the most important antecedents of consumer adoption of m-banking by synthesising theories from the related literature.

Keywords: mobile banking; theory of planned behaviour; TPB; decomposed theory of planned behaviour model.

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1 Introduction

It is visible that information technology is on constant rise. The mobile industry is contributing immensely to the growth of information technology in various aspects. Due to its sophistication, short messaging system (SMS) is being utilised in different business conducts including the banking industry worldwide; hence the term mobile banking (Zainol, 2011). The banking services have witnessed an archetype move in the last decade. As a result, the banking industry is dedicating the organisational intelligence and resources to respond to existing and forthcoming needs (Malhotra, 2011).

Rapid growth of mobile banking entitles the user to handle most banking transactions via smart phones, sparing customers physical visits to bank’s branches, thereby saving time and effort (Zainol, 2011). The very basic functions of mobile banking began in simple SMS embodying simple transactional and promotional alerts. This later expanded to encompass balance inquiries, fund transfers, reloads, and bill payments, among other transactions (Witeepanich et al., 2013; Zainol, 2011).

Nevertheless, despite of its constant growth, mobile banking face controversial debates regarding potential risks embedded in transactions (Chandran, 2014; Chitungo and Munongo, 2013). Some argue however that the virtual environment and technology in general lack security, placing the issue of funds in a critical position when electronic transactions are concerned, and in turn negatively influences adoption (Kabir, 2013; Govender and Sihlali, 2014; Akturan and Tezcan, 2012; Alsamyda et al., 2014; Chitungo and Munongo, 2013).

Nonetheless, it is evident that the phenomenon of mobile banking is escalating worldwide. This indicates positive tendencies toward mobile banking in the international arena. In line with Sayid and Echchabi’s (2013) assertions, the point of difference concerns the factors that influence the purchasing behaviour and in turn the adoption of mobile banking, which vary amongst countries. For instance, it is argued that perceived usefulness, perceived credibility, and awareness are dominant factors leading to mobile adoption in Malaysia. Whereas, usefulness, social norms, and social risk, are factors that influence the intention to adopt mobile banking services in Singapore. On the other hand, culture is the most important factor influencing mobile banking adoption behaviour in Nigeria. In Finland however, relative advantage, compatibility, communication, and trialability are the most important factors in explaining consumers’ behaviour in the context of mobile banking (Sayid and Echchabi, 2013). In Jordan, mobile telecommunication is witnessing a vast progress over the past years, as this progress is in constant growth. It is concluded that comfort, and ease of access are major factors for the adoption of mobile banking in the Jordanian market (Shammot and Al-Shaikh, 2008).

In light of the above, the authors observe that the features of mobile banking fit perfectly within the context of universality, since standardisation is applied in technology (Keegan and Green, 2015). Thus, the purpose of the study is to apply a comprehensive model to the global industry of mobile banking, in order to conclude general factors that positively influence the adoption of mobile banking globally, disregarding in this sense countries or regions.

Consequently, the objective is to apply the decomposed theory of planned behaviour (DTPB) to the applications of mobile banking and to conclude a thorough understanding to consumer behaviour as far as this service is concerned. One of the major strengths of the theory of planned behaviour (TPB) is that it is widely applicable to a variety of
behaviours in different context, health communications, environmental concerns, risk communication, mass transit use, and, more recently, technology adoption (Knabe, 2012).

Therefore, the reason behind choosing this particular model lies in the fact that it has excelled itself in predicting the performance of behaviour and intentions toward products’ trials (Barahani, 2007). Hence, while the groundwork of DTPB is theory of reasoned action (TRA), the first operates in predicting deliberative and planned behaviour. To elaborate, the theory includes the construct perceived behaviour control (PBC) as an addition to TRA components. This addition considers the more common conditions in which consumers suffer from a particular hesitancy toward the product, and in turn do not possess total voluntary control on their behaviour (Truong, 2009). This absence of full control on the purchasing behaviour is another reason behind the employment of DTPB in the study. As mentioned earlier, the literature highlights the lack of risk and privacy issues in the mobile banking industry, which form an impediment to adoption in some cases (Govender and Sihlali, 2014). Therefore, DTPB comes in handy as far as the lack of security aspect is concerned, as it might operate as an impediment to adoption in certain cases.

2 Theoretical framework and hypotheses development

Figure 1 Research model (see online version for colours)

2.1 Decomposed theory of planned behaviour

According to Knabe (2012), the application of the TPB to technological innovations has been utilised in various studies using quantitative research methods. TPB includes attitudes, subjective norms, and PBC, in order to foresee intentions with a respectable margin of astuteness.

Subsequently, attitudes in this context is a learned orientation to respond in a constant manner to a given object or entity. PBC refers to individual’s perception toward the ability to perform this particular behaviour. Subjective Norms refers to a person’s volitional behaviour based on one’s prediction of how people would view him/her if such
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behaviour is performed. Thus, attitude coupled with subjective norms, form behavioural intention (Ajzen, 1988; Knabe, 2012).

Consequently, the TPB is decomposed via the DTPB model into multidimensional belief constructs. DTPB “specifies that the attitudinal belief has three innovation characteristics that influence behavioural intentions: relative advantage, complexity, and computability” [Lin, (2007), pp.434–435]. Previous studies generally took personal influence (normative influence) as a determinant of subjective norms. Whereas the decomposition of PBC consists of: self-efficacy (SE) and facilitating conditions (FC) (ibid, 2007).

2.1.1 Relative advantage and attitude

Relative advantage is:

“The degree to which an innovation provides benefits which supersede those of its precursor and may incorporate factors such as economic benefits, image, enhancement, convenience, and satisfaction.” [Barahani, (2007), p.40]

Thus, relative advantage refers to a perceived betterment (Siddik et al., 2014). Mobile banking allows users to use mobile devices to conduct various financial transactions without having to visit the branch. This brings forth a relative advantage in comparison to traditional banking, embodied in accessibility and time saving for both customers and employees (Zainol, 2011). 3G network facilitated adaptation to functionality for the current age smart phones, and are observed to make mobile banking more attractive for future users. The fourth generation (4G) is presumed to tolerate larger bandwidth of data and advanced security features in mobile phones (Malhotra, 2011). Moreover, another two advantages are constant availability of the service, and fraud reduction (Chandran, 2014). Thus, the following hypothesis is formulated:

H1 Relative advantage of mobile banking has a significant positive influence on attitude towards mobile banking.

2.1.2 Compatibility and attitude

Compatibility is the “degree to which the innovation fits with the potential adopter’s existing values, previous experiences and current needs” [Lin, (2007), p.435].

In light of a technology driven lifestyle, the adoption of smart phones is constantly escalating in the modern world, while such adoption is becoming an obvious phenomenon today and a direct manifestation to customers’ needs. Therefore, and considering that compatibility is consistency with current values, experiences, and needs (Shih and Fang, 2004), it is safe to say that the advancements of mobile banking fall in alignment with the two elements in the definition of compatibility: existing values and current needs. Thus, such alignment operates as a driver to positive attitudes towards mobile banking.

The financial transactions do not differ from those conducted in traditional banking; the only difference between traditional and mobile banking lies in the heart of the process. In line with Engwanda (2014), compared to traditional financial, mobile banking added ‘ubiquity, mobility, and flexibility’ [ibid, (2014), p.5]. Consequently, the authors believe that the element of ‘previous experience’ in the definition of compatibility apply on mobile banking, hence the following hypothesis:
H2 Compatibility of m-banking has a significant positive influence on attitudes toward m-banking.

2.1.3 Complexity and attitude

Complexity refers to “the degree to which an innovation is perceived to be difficult to understand, learn, or operate” [Barahani, (2007), p.40].

The literature highlights that the use of mobiles in various industries is on constant rise (Wessels and Drennan, 2010). Coupled with the acknowledged advantages of mobile banking that include convince, easy access, and increased efficiency (Gupta et al., 2013) the factor of complexity can be defied. This negation takes place in light of an observation that complexity is a difficulty in comprehending an innovation (Shih and Fang, 2004). To the contrary, in line with Tobbin (2012), many studies indicate that perceived ease of use (PEOU) is a main determinant of positive attitudes, and in turn behavioural intentions, towards technology including mobile banking.

Although previous studies were not found concerning direct contentions of complexity concerning using mobile banking, nevertheless, it is argued that mobile banking is problematic in rural areas. Most mobile banking applications need an internet connection to function. Therefore, residents of rural areas cannot activate mobile banking services (Chandran, 2014).

However, the researchers observe that such limitation does not earn utter generalisation in the context of global mobile banking, for two reasons. Firstly, lack of internet connection in rural areas is a concern of people residing in rural areas and their attitudes towards mobile banking. Secondly, generalisation of complexity in such condition is not validated due to the fact of intensive usage of mobile phones in international markets, including developing countries and rural areas (Tobbin, 2012).

Subsequently, the literature concludes a weak relationship between complexity and negative attitudes towards the adoption of mobile banking. The following hypothesis is formulated:

H3 Complexity of m-banking has a significant negative influence on attitude towards m-banking.

2.1.4 Normative influence and subjective norms

Normative influence generates subjective norms. The latter is a person’s voluntary behaviour in light of one’s own of people’s judgments (Knabe, 2012). Lin (2007) believes that subjective norms include interpersonal influence such as word-of-mouth communication, and external influence such as media reports.

Subjective norms refer to individual’s perception of the opinion of key influencers in the society, and in turn committing the behaviour or not (Kazemi et al., 2013). In the context of subjective norms, using technological innovations is considered a symptom of progress. It is admitted mobile banking is becoming an accepted practice of the daily modern life with acknowledged advantages (Asfour and Haddad, 2014).

Furthermore, the literature did reveal concerns regarding security of applications, and as concluded above such limitation contributed to negative perceptions and adoption. However, specialised and official reports have acknowledged the procedures banks have adopted in this regard. In response to these concerns, it is accredited that a number of mobile applications provide a fair measure of both convenience and security.
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for users. Mobile applications today offer a direct link between the device used and the bank’s internal network, which allows banks to control the security measures governing user interactions. Since these apps are custom-tailored solutions, banks can make use of a variety of security tools that best meet their individual requirements, including SSL encryption, two-factor authentication, and others (Asfour and Haddad, 2014).

In light of the above, the literature draws a potential correlation between normative beliefs and subjective norms in the context of mobile banking. As a result, the following hypothesis is formulated:

H4  Normative influence has a significant positive influence on subjective norms of the acceptance of using m-banking.

2.1.5 SE and PBC

SE is defined as “individual judgment of individual capabilities to use IT” [Lin, (2007), p.435]. Consequently, in the context of mobile banking, SE refers to the customer’s evaluation of one’s abilities capabilities to use its services.

The literature points to the ease of use as far as mobile banking is concerned. According to Govender and Sihlali (2014), mobile technologies, such as smart phones, PDAs, cell phones, and iPads have not only become universal, but also trendy among young adults.

PBC refers to one’s perception about ease or difficulty about a particular behaviour, thus embodies one’s perceptions about required skills and resources necessary for committing the behaviour (Kazemi et al., 2013) As a result, it is safe to conclude a simulation between the perceived ease of use of mobile phones and mobile banking.

Some argue that SE is the strongest originator of perceived ease of use, as this directly influence behavioural intentions in mobile banking (Sayid and Echchabi, 2013). The literature conforms that one of the advantages of mobile banking happens to be the ease of use (Chandran, 2014); while SE is believed to be a main driver behind the adoption of mobile banking (Kabir, 2013; Witeepanich et al., 2013). Therefore, the following hypothesis is formulated:

H5  SE has a significant positive influence on PBC.

2.1.6 FC and PBC

In reference to Barahani (2007, p.41), FC refer to: “the availability of resources needed to perform a particular behavior. This might include access to time, money, and other specialised resources”.

In light of the above-mentioned resources for FC (time, money, and specialised resources, it is concluded earlier that mobile banking is highly efficient and considered a time saving sources, as the service exempts the user from physically visiting the bank to conduct transactions (Alsoufi and Ali, 2014; Chandran, 2014). Rationally, such time convince should lead to a higher PBC.

Secondly, technology resulted in service quality revolution, thereby encouraging customers to endorse the technology-based-self-service, and believed to have resulted in cost reduction for customers and staffs (Alsamya et al., 2014; Engwanda, 2014; Gupta et al., 2013; Wessels and Drennan, 2010). Thus, there is an obvious correlation between lower costs and a higher PBC. The following relationship is formulated:
H6 FC has a significant positive influence on PBC.

2.1.7 Attitude and behavioural intentions

Attitude is defined as “a learned tendency to respond in a consistent way to a given object or entity” [Keegan and Green, (2015), p.126]. In the context of m-banking, word-of-mouth plays a vital role in shaping attitudes and in turn behaviour. The literature confirms that there is an association between adopting m-banking and modernity; in addition to high accessibility, efficiency, and ease (Asfour and Haddad, 2014).

Subsequently, the literature concludes a correlation between attitudes and behavioural intention. The following hypothesis is formulated:

H7 Consumers’ attitudes towards m-banking have a significant positive influence on behavioural intention.

2.1.8 Subjective norms and behavioural intentions

“Subjective norms are one’s perceptions or assumptions about others’ expectations of certain behaviors that one will or will not perform” [Huda et al., (2012), p.272]. The authors argue however, that subjective norms hold no impact on intentions. Nevertheless, considering that subjective norms refer to social expectations and judgment (Lin, 2007), the literature highlights the association between m-banking users and advancement (Asfour and Haddad, 2014). As a result, the literature concludes potential correlations between subjective norms and behavioural intentions. The following hypothesis is formulated:

H8 Subjective norms have a significant positive influence on behavioural intentions towards m-banking.

2.1.9 PBC and behavioural intentions

“Perceived behavioral control or simply behavioral control is one’s perceived ease or difficulty in performing one particular behavior” [Ajzen, 2005 cited in Huda et al., (2012), p.273]. It is observed that PBC holds a major role in strengthening behavioural intentions. Referring to the advantages of m-banking, Govender and Sihlali (2014) argue that using smart phones is a universal phenomenon. This is because smart phones contributed to the ease of conducting various types of communication, including m-banking transactions. Thus, the literature draws a linear relationship between PBC and Behavioural intentions. The following hypothesis is formulated:

H9 PBC has a significant positive influence on behavioural intention towards m-banking.

3 Research method

3.1 Data

A quantitative approach was used in this research. In order to empirically test the hypotheses developed in the previous section, data were collected using a convenience
sampling approach via an online self-administered survey. The first reason for using this sampling technique is because it offers an easy way to collect the raw data for further analysis. Secondly, it saves time and costs as the respondents are randomly selected. M-banking was described to participants as a mobile commerce application that gives the user the opportunity to make the everyday bank transactions (such as balance inquiries, checkbook requests, make money transfers, etc.), mobile brokerage (trading financial instruments), and financial inquiries (bank balance, statement requests, ATM locations, foreign exchange rates, etc.) using a mobile phone or other portable devices. The participation in the study was voluntary. To increase content validity, it was indicated that the survey should be filled out by a respondent who is familiar with m-banking concept. To encourage participation and reduce self-reporting bias, all participants were given the opportunity to receive the findings of the study. To test the instrument, a pilot study was conducted among a group of 50 college students who were not included in the main survey. Consequently, the wording of some questions was modified. Preliminary evidence showed that the scales were reliable and valid.

Following the pre-test, the survey was sent to a user base of people with one or more mobile phones. The survey was mainly promoted and hosted online by survey monkey website; a provider of web-based survey solutions (Surveymonkey.com). Respondents were invited to take the questionnaire by sending them the link of the survey webpage on their e-mail addresses, Facebook pages, and via a popular mobile-device application called Whatsapp. A total of 835 e-mails were sent using personal hyperlinks that could be used only once, thus preventing repeated responses. A follow-up reminder was sent to non-respondents after four weeks. A total of 432 responses were collected. Twenty eight responses were discarded due duplicate submissions or incompletion, a net sample of 404 usable questionnaires remained. The common method bias was examined using Harman’s one-factor test (Podsakoff et al., 2003). No significant common method bias was found in the dataset.

3.2 Measurement and scaling

A typical seven-point Likert scale was used to measure the constructs presented in the proposed model (scores were ranged from 1 = ‘strongly agree’ to 7 = ‘strongly disagree’ ‘with neutral’ score = 4). The conceptualisation and development of the questionnaire was based on the existing literature, resulted in total of 31 items. The questionnaire instrument was developed based on the constructs of relative advantage, compatibility, complexity, social influence, SE, FC, attitude towards use m-banking, subjective norms, PBC, and behavioural intention to use m-banking. Social influence, FC, and behavioural intention were all adapted from the measurements used by Venkatesh et al. (2003) and Venkatesh et al. (2012), containing three items for the first construct, two items for the second construct and three items for the third construct. Relative advantage, attitude towards use m-banking, PBC, compatibility, SE, subjective norms, and complexity, were all adapted from the measurements used by Taylor and Todd (1995) and Shih and Fang (2004), containing four items for the first three constructs and three items for the next three constructs and two items for the remaining construct. Additional four items were included for capturing demographic information (gender, age, educational level, and marital status).
Data analysis was conducted using SPSS version 19.0. Part of it was descriptive, while the inferential part of the statistical analysis examined the antecedents of behavioural intention to adopt m-banking. Analysis is shown in the scenario below.

3.3 Demographic profile of the respondents

Data were gathered from a convenience sample of 404 respondents via an online survey. The data relating to respondents’ profiles were tabulated to obtain a better feel of the data, as recommended by Sekaran (2003). Therefore, the respondents’ demographic profiles were tabulated for gender, age, education level and marital status (Table 1).

Table 1 Demographic profile of the sample

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Response information N = 404</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>63%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>37%</td>
</tr>
<tr>
<td>Age</td>
<td>Less than 20</td>
<td>27%</td>
</tr>
<tr>
<td></td>
<td>21–29</td>
<td>47%</td>
</tr>
<tr>
<td></td>
<td>30–30</td>
<td>13%</td>
</tr>
<tr>
<td></td>
<td>40–49</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>50–59</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>Above 60</td>
<td>1%</td>
</tr>
<tr>
<td>Education</td>
<td>High school</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>University degree</td>
<td>82%</td>
</tr>
<tr>
<td></td>
<td>Higher education</td>
<td>13%</td>
</tr>
<tr>
<td>Marital status</td>
<td>Single</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>Married</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>Divorced</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Developed for the current research

3.3.1 Demographic profile of the sample

As shown in Table 1, male respondents accounted for the majority of the sample (63%) and the majority of the respondents’ ages were less than 29 (74%). In relation to educational level, 13% of the respondents reported completing higher education, while 82% reported achieving a university degree. For marital status, single respondents accounted for the majority of the sample (54%).

4 Results

To test the model, a two-step method was used, beginning with the measurement model to examine the reliability and validity of the instrument and then analysing the structural model (Anderson and Gerbing, 1988). PLS estimation requires ten times the largest number of structural paths directed at a particular construct in the model (Chin, 1998; Gefen et al., 2003). The sample in our study met the necessary conditions for using PLS.
4.1 Measurement model

Tables 2 and 3 present the measurement model results. Composite reliability (CR) is above 0.65 indicating that the scales have internal consistency (Table 2). To evaluate the indicator reliability, we opted to consider the loadings above 0.70. Hence one item, FC03 was eliminated. As seen in Table 2, the instrument presents good indicator reliability as the loadings are above 0.65. Average variance extracted (AVE) was used to test convergent validity. AVE should be higher than 0.50 so that the latent variables explain more than half of the variance of its indicators (Fornell and Larcker, 1981; Hair et al., 2012; Henseler et al., 2009). As seen in Table 2, all constructs meet these criteria. The AVE, CR, and alpha values are higher than the recommended thresholds of 0.500, 0.700, and 0.770 respectively (Bagozzi and Yi, 1988; Gefen et al., 2003; Nunnally, 1978). This demonstrates convergent validity and validity indicating that the constructs can be used to test the conceptual model.

Table 2  Individual item reliability and construct validity

<table>
<thead>
<tr>
<th>Construct</th>
<th>Factor</th>
<th>Loadings</th>
<th>AVE</th>
<th>Composite reliability</th>
<th>Cronbach’s alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>RA01</td>
<td>.863</td>
<td>.59</td>
<td>.848</td>
<td>.764</td>
</tr>
<tr>
<td></td>
<td>RA02</td>
<td>.856</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RA03</td>
<td>.721</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>RA04</td>
<td>.592</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Compatibility</td>
<td>C01</td>
<td>.902</td>
<td>.708</td>
<td>.882</td>
<td>.789</td>
</tr>
<tr>
<td></td>
<td>C02</td>
<td>.891</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>C03</td>
<td>.721</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complexity</td>
<td>Com01</td>
<td>.956</td>
<td>.907</td>
<td>.951</td>
<td>.907</td>
</tr>
<tr>
<td></td>
<td>Com02</td>
<td>.948</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social influence</td>
<td>Socl01</td>
<td>.770</td>
<td>.676</td>
<td>.861</td>
<td>.762</td>
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<tr>
<td></td>
<td>Socl02</td>
<td>.897</td>
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<td>SE</td>
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<td>.787</td>
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<td></td>
<td>SE02</td>
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<td></td>
<td>SE03</td>
<td>.905</td>
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<tr>
<td>FC</td>
<td>FC01</td>
<td>.988</td>
<td>.619</td>
<td>.655</td>
<td>.637</td>
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<tr>
<td></td>
<td>FC02</td>
<td>.609</td>
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<tr>
<td>Attitude towards m-banking</td>
<td>ATTO1</td>
<td>.925</td>
<td>.783</td>
<td>.935</td>
<td>.908</td>
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<tr>
<td></td>
<td>ATTO2</td>
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<td></td>
<td>ATTO3</td>
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<td></td>
<td>ATTO4</td>
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<td>Subjective norms</td>
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<td>.882</td>
<td>.807</td>
<td>.926</td>
<td>.881</td>
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<td>SN02</td>
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<td></td>
<td>SN03</td>
<td>.916</td>
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</table>

Source:  Developed for the current research
Table 2  Individual item reliability and construct validity (continued)

<table>
<thead>
<tr>
<th>Construct</th>
<th>Factor</th>
<th>Loadings</th>
<th>AVE</th>
<th>Composite reliability</th>
<th>Cronbach's alpha</th>
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<tr>
<td>PBC</td>
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<td></td>
<td>PBC01</td>
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<td>.703</td>
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<td></td>
<td>PBC02</td>
<td>.795</td>
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<td></td>
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<td>PBC03</td>
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<td>PBC04</td>
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<td></td>
<td></td>
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<tr>
<td>Behavioural intention to adopt</td>
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<td>.905</td>
<td>.779</td>
<td>.914</td>
<td>.858</td>
</tr>
<tr>
<td></td>
<td>INT02</td>
<td>.836</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>INT03</td>
<td>.904</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Developed for the current research

Finally, discriminant validity was tested based on the square root of AVE for each construct should be greater than the correlations with all constructs (Boudreau et al., 2001; Fornell and Larcker, 1981). In Table 3, we can see that the square root of AVE (in bold) is higher than the correlation between constructs.

Table 3  Latent variable correlations

| RA  | .769 |
| C   | .590 | .841 |
| COMPL | .522 | .429 | .952 |
| SOCI | .581 | .301 | .257 | .822 |
| SE  | .505 | .272 | .347 | .379 | .887 |
| FC  | .534 | .547 | .564 | .303 | .325 | .575 |
| ATT | .796 | .609 | .523 | .511 | .466 | .581 | .885 |
| SN  | .644 | .386 | .469 | .489 | .430 | .505 | .636 | .898 |
| PBC | .622 | .555 | .703 | .363 | .440 | .619 | .662 | .527 | .927 |
| Intention | .739 | .649 | .580 | .345 | .379 | .434 | .713 | .483 | .717 | .887 |

Source: Developed for the current research

The measurement model results indicate that the model has good internal consistency, indicator reliability, convergent validity and discriminant validity. Hence, the constructs from our model are statistically distinct and can be used to test the structural model.

4.2 Structural model

The PLS results, as shown in Table 4, indicate that relative advantage of using m-banking has a significant positive effect on users (consumers) attitude towards m-banking adoption ($\beta = 0.633$, $t = 7.914$, $p < 0.01$), indicating that users who perceived m-banking as relatively advantageous compared to other methods of banking transactions, tend to have positive attitude towards using m-banking, thereby, supporting H1. As proposed in H2, a significant positive relationship between compatibility and consumer attitude towards m-banking was found ($\beta = 0.206$, $t = 2.438$, $p < 0.01$), suggesting that those consumers who perceive m-banking as compatible to their values, current needs and lifestyles, are more likely to have positive attitude towards m-banking. This finding
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supports H2. Inconsistent with H3, complexity of using m-banking did not significantly affect consumers’ attitude towards m-banking ($\beta = 0.072, t = 0.966, p < 0.01$), implying that complexity is not a concern when using m-banking services, thereby rejecting H3. As proposed in H4, a significant positive relationship between social influence and subjective norms was found ($\beta = 0.490, t = 5.331, p < 0.01$), providing support for H4. Further, SE ($\beta = 0.268, t = 3.107, p < 0.01$) and FC ($\beta = -0.533, t = 7.55, p < 0.01$) are statistically significant in explaining PBC of m-banking, thus, supporting H5 and H6. In addition, consumer attitude towards using m-banking ($\beta = 0.439, t = 4.324, p < 0.01$) and PBC ($\beta = 0.441, t = 5.258, p < 0.01$) are statistically significant in explaining behavioural intention of using m-banking, therefore, confirming H7 and H9. Where as, subjective norms did not significantly affect behavioural intention to use m-Banking. Consequently, H8 is not confirmed. Overall, within the nine hypotheses formulated, only one hypothesis is disconfirmed by the data. Table 4 summarises the empirical results of the research hypotheses.

Table 4 Partial least squares results for the theoretical model

<table>
<thead>
<tr>
<th>Predicted variable</th>
<th>Predictor variable</th>
<th>Hypotheses</th>
<th>Path</th>
<th>$R^2$ squared</th>
<th>Critical ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitude towards m-banking</td>
<td>Relative advantage</td>
<td>H1</td>
<td>.633</td>
<td>0.667</td>
<td>7.914</td>
</tr>
<tr>
<td></td>
<td>Compatibility</td>
<td>H2</td>
<td>.206</td>
<td></td>
<td>2.483</td>
</tr>
<tr>
<td></td>
<td>Complexity</td>
<td>H3</td>
<td>.072</td>
<td></td>
<td>.966</td>
</tr>
<tr>
<td>Subjective norms</td>
<td>Social influence</td>
<td>H4</td>
<td>0.490</td>
<td>0.239</td>
<td>5.331</td>
</tr>
<tr>
<td>Perceived</td>
<td>SE</td>
<td>H5</td>
<td>0.268</td>
<td>0.448</td>
<td>3.107</td>
</tr>
<tr>
<td>behavioural control</td>
<td>FC</td>
<td>H6</td>
<td>0.533</td>
<td></td>
<td>7.55</td>
</tr>
<tr>
<td>Behavioural</td>
<td>Attitude</td>
<td>H7</td>
<td>0.439</td>
<td>0.616</td>
<td>4.324</td>
</tr>
<tr>
<td>intention</td>
<td>Subjective norms</td>
<td>H8</td>
<td>-0.029</td>
<td></td>
<td>0.350</td>
</tr>
<tr>
<td></td>
<td>PBC</td>
<td>H9</td>
<td>0.441</td>
<td></td>
<td>5.258</td>
</tr>
</tbody>
</table>

Source: Developed for the current research

As shown in Table 4, 67% of the variance in consumer attitude towards m-banking is explained by relative advantage of using m-banking and compatibility of m-banking. Social influence explained 24% of the variance in subjective norms. Furthermore, SE and FC explained 45% of the variance in PBC. Both attitude and PBC significantly influence behavioural intention and jointly explained 62% of the total variance in behavioural intention to adopt m-banking.

5 Discussions

The study demonstrates the applicability of the DTPB to a mobile setting, and the empirical results strongly support the model in predicting consumers’ behavioural intentions to use and adopt m-banking. Particularly, the overall explanatory power of the current research model had an $R$-square of 62% for consumer behavioural intention to use m-banking, indicating that the DTPB model had the capability of explaining a relatively high percentage of variation of consumer behavioural intention to adopt m-banking. In addition, the current study found that consumer attitude towards using m-banking was significantly impacted by relative advantage and compatibility in their
order of influencing strength. Whereas, complexity did not play a significant role in affecting consumer attitude towards using m-banking.

Furthermore, the current study found that subjective norms were significantly influenced by social influence. PBC was significantly impacted by FC and SE in their order of influencing strength. The findings show that behavioural intention to adopt m-banking can be explained by attitude and PBC. The results obtained regarding the impact of attitude on intention to use are consistent with the results of studies conducted by Al Khasawneh (2012), Al Khasawneh and Shuhiaber (2013), Cheung et al. (2000), Hung et al. (2006), Kim et al. (2008) and Suh and Han (2002).

The findings also reveal that subjective norms did not significantly influence behavioural intention to adopt m-banking services, providing further support to previous research findings conducted by Kazemi et al. (2013). Also, the results obtained from the impact of PBC’s on intention to use are consistent with the results of studies conducted by Bhattacherjee (2000), Cheung et al. (2000), Lau (2002), Venkatesh et al. (2003), Wu and Chen (2005) and Kim et al. (2008).

5.1 Practical implications

The value of research in the area of marketing lies in its ability to be applied in practice. In this sense, the value of this research is that it expands our understanding of m-banking by identifying and synthesising the most important antecedents of m-banking adoption. The practical implications of these findings are that they add to the understanding of m-banking from a consumer’s behaviour perspective and, therefore, act as a valuable base for banks.

First, the findings highlight the need for practitioners to understand that customer attitude towards m-banking and PBC represent both important aspects of the consumer behavioural intention to adopt such service. In particular, relative advantage and compatibility have emerged as significant positive factors influencing consumers attitude towards m-banking and consequently their overall behavioural intention to adopt m-banking. First, the empirical evidence of the current research indicates that the relative advantage is the most important and powerful factor in positively influencing customers’ attitudes towards using m-banking. This result is expected as most of the previous related literature has consistently revealed that relative advantage of an innovation is significantly and positively related to the adoption of new innovation (Chitungo and Munongo, 2013; Crabbe et al., 2009; Tan and Teo, 2000; Jaruwachirathanakul and Fink, 2005; Pikkarainen et al., 2004; Shih and Fang, 2004; Venkatesh and Davis, 2000). It is therefore essential for banks to educate potential customers about benefits of using m-banking having in mind that potential adopters are found to rely more on their own efforts to search for information. Information relating to the advantageous nature of using m-banking (such as cost savings, ubiquity, flexibility and mobility) should be emphasised by bank tellers and customer services assistants at the physical branches.

Second, compatibility was found to have a significant positive impact on consumer attitude towards using m-banking which is consistent with previous findings by Lee (2009) and Koenig-Lewis et al. (2010) and inconsistent with a previous research conducted in relation to the internet banking context by Al-Majali and Mat (2010) and Shih and Fang (2004). This result implies that the better the m-banking services fit their lifestyle, the more they will adopt m-banking. More specifically, it demonstrates that if consumers perceive m-banking as consistent with their existing beliefs, values, lifestyle
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and past experience, they are more likely to use these services. In particular, companies have to emphasise that m-banking fits with customers’ lifestyles. Thus, banks should design their products in such a way so that it suits best to the people’s lifestyle.

However, complexity was found to be insignificant implying that people have confidence on themselves over mobile banking transaction procedure. This finding is consistent with Tan and Teo’s (2000) study and inconsistent with other previous studies (Cooper and Zmud, 1990; Shih and Fang, 2004) in other contexts of technological platforms.

The data findings also indicated that social influence has a significant positive influence on customers’ subjective norms regarding the use of m-banking services. That is, respondents of the current study contended that the nature of beliefs held by others, regarding the use of m-banking services as a result of its advantages or good experiences in using such services, was strongly and positively related to customers subjective norms regarding the use of m-banking. This finding is consistent with previous studies within the internet banking context (Al-Majali and Mat, 2010; Shih and Fang, 2004; Tan and Teo, 2000).

With regard to PBC, both SE and FC were found to be important. The SE hypothesis has provided a positive support and implied the importance of educating consumers regarding using m-banking services. Also, according to the results of path analysis and the values of path coefficients, FC in comparison to SE has higher impact on customers’ PBC’s regarding the use of m-banking services; in other words, conditions such as access to help when choosing m-banking system, access to professionals when facing with problems in using these services, the availability of an information network for rapid exchange of information, and the possibility of installing necessary software by banks have higher impact on customers’ PBC’s in comparison to having manuals and becoming familiar with others’ method of use. Therefore, banks should seek to increase the availability of necessary hardware and software for m-banking service use and an enhancement for the access to technological facilities and resources, and training is needed.

The subjective norms construct was also found to have no significant relationship with intention to adopt m-banking. The results were inconsistent with the findings from previous studies conducted by Puschel et al. (2010), Riquelme and Rios (2010), Schepers and Wetzel (2007) and Chitungo and Munongo (2013). This indicates that family, friends, colleagues and media does not significantly affect customers’ behavioural intention to adopt m-banking. A possible explanation to the results is that respondents or mobile users are not convinced that their referent groups may not have tried the mobile banking services themselves to enable them provide useful and knowledgeable recommendations on m-banking services to them. Another possible interpretation could be that because banks operate under strict privacy and security, their m-banking platforms are very much diverse and information relating to them cannot be generalised. Thus family, friends, colleagues and media may not use all m-banking platforms and therefore may not also have the information to assist potential adopters make the relevant decisions.

5.2 Theoretical implications

The current study contributes to theory within the areas of m-banking and consumer adoption behaviour. From a theoretical perspective, the results of the study provide new...
information related to behavioural intention to adopt m-banking that have not been previously examined, to a large extent, in the existing related literature. This study uses DTPB model to provide a comprehensive model to understand the antecedents of m-banking adoption. Therefore, it contributes to marketing research by providing the logical companion-in a consumer use setting-to DTPB (Venkatesh et al., 2003) that was developed for an employee acceptance and use setting. By doing so, the generalisability of UTAUT from an organisational to a consumer context was extended.

It is noteworthy also to mention that there is little prior research that uses a DTPB model based on diffusion of innovations theory to discuss the intention to adopt m-banking. The current research adds to not only the appropriateness of using DTPB model to study adoption of new technology but also using Roger’s innovation attributes in measuring the different dimensions of attitude toward adoption of m-banking. This, it is showed that UTAUT is a powerful framework (Goodhue, 2007) and when it is validated with relevant constructs (Bagozzi, 2007), it can contribute to the understanding of important phenomena, here consumer adoption of m-banking. By combining elements of two theories, namely innovation diffusion theory and DTPB, this research added an important contribution to the theoretical perspectives to identify and examine factors influencing adoption of m-banking.

Thus, the study adds to and expands our knowledge of the most important factors influencing consumer behavioural intention towards adopting m-banking services. In doing so, the current research has applied proven theory and constructs in traditional banking, online banking and m-banking research, and has extended and validated the theoretical relationships between the focal constructs in the research model. In particular, this model has extended our understanding of the most important antecedents of consumer adoption of m-banking by synthesising theories from the related literature.

In examining the simultaneous relationships among the set of variables within the research model, a more accurate representation of the topic being investigated has been obtained. Moreover, the study has provided a further confirmation of the relationships discussed in previous online banking and consumer behaviour literature via an examination within the m-banking context. Such relationships include a direct link between relative advantage and attitude towards m-banking (Chitungo and Munongo, 2013; Crabbe et al., 2009), the positive influence of compatibility of using m-banking on attitude (Lee, 2009; Koenig-Lewis et al., 2010; Chitungo and Munongo, 2013), the (positive) relationship between social influence and subjective norms (Al-Majali and Mat, 2010; Shih and Fang, 2004), the positive impact of SE and FC on PBC (Kim et al., 2008; Wu and Chen, 2005). In addition, it is shown that attitude and PBC can satisfactory explain the primary construct behavioural intention (Ajzen, 2002, 2005; Smith et al., 2007).

6 Conclusions

The purpose of this study was to identify factors that could influence the adoption of mobile banking using the DTPB model. The study examined attitudinal, subjective norms and PBC dimensions of the DTPB. The findings from this study have significant implications for the research community. The findings of our study showed, primarily, a good fit of the model and that the tested model has a strong explanatory power. The complexity construct is the only attribute not supported out of the three innovation
attributes used for this study. As explained earlier, this may be due more to the inherent characteristics of the sample of individual consumers used for the study rather than any inappropriateness of the measure for the study.

Notwithstanding the above findings, this research has some limitations which should be dealt with in future studies. As the current research is applying the survey-based method, it could be argued that this method is prone to the inherent limitation of measurement errors. However, the measurement errors were reduced, as indicated by the study’s good reliability and validity results reported in Tables 2 and 3. The current study emphasised on examining consumers’ intentions rather than their actual behaviour. The results by no means are conclusive towards users’ actual behaviour for adopting m-banking services. Research findings can be substantiated to a rational extent using the causal relationship that exists between intentions and behaviour (Taylor and Todd, 1995). Nonetheless, more accurate outcomes may be obtained by assessing the actual behaviour of m-banking uses.

In future research, it is necessary to verify the results through investigations in other developed and developing countries in order to be able to generalise the findings. This is because the adoption and usage of m-banking are highly varied across countries with different adoption levels and perceptions (Yang and Jolly, 2009). In addition, the current study used cross-sectional survey to examine customers’ adoption of m-banking where the data were collected at the same point of time. It was indicated that customers’ perceptions may change over time when consumers have gained more experience (Mathieson, 1991; Venkatesh and Davis, 2000). Thus, future research is needed to replicate and validate the findings using a longitudinal research which would allow for further examination of m-banking adoption at multiple points of time, thus, allowing for tracking customer decision adoption process which may change and fluctuate over time. Another opportunity for future research is to extend the model to include other variables such as culture in order to examine their impact on customer adoption of m-banking.

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