Understanding mobile banking individual performance: The DeLone & McLean model and the moderating effects of individual culture

Carlos Tam (NOVA IMS, Universidade Nova de Lisboa, Lisbon, Portugal)

Tiago Oliveira (NOVA IMS, Universidade Nova de Lisboa, Lisbon, Portugal)

This is the author accepted manuscript version of the article published by EMERALD as:


This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.
Understanding mobile banking individual performance: The DeLone & McLean model and the moderating effects of individual culture

Abstract

**Purpose** – This paper investigates the effects of Hall’s cultural dimension on m-banking individual performance in the m-banking post-adoption stage.

**Design/methodology/approach** – This article proposes using the DeLone and McLean IS success model moderated by Hall’s cross-cultural dimensions of high-low context and monochronic-polychronic time perception to evaluate the m-banking individual performance in the post-adoption stage.

**Findings** – The results reveal that usage and user satisfaction are important precedents of individual performance, and the importance of the moderating effects of monochronic inclination between the usage and user satisfaction to individual performance. The system, information, and service quality affect user satisfaction positively.

**Originality/value** – While the majority of earlier research focuses on potential adopters, this study seeks to understand the significance of cultural effects on m-banking individual performance in the post-adoption stage, as these are important to explain use and attract potential adopters of m-banking.

**Keywords**: Culture, DeLone & McLean model, individual performance, m-banking, post-adoption
Understanding mobile banking individual performance: The DeLone & McLean model and the moderating effects of individual culture

1. Introduction

Mobile banking (m-banking) is one of the most important strategic changes in retail banking in more than a decade. It has rapidly progressed from being merely online banking via a smartphone to a position at the very centre of customer relationships, where it now serves as a differentiating feature and revenue generator for forward-looking banks (Ensor & Wannemacher, 2015). M-banking allows customers to conduct a vast number of banking transactions at anytime from anywhere. The effects of “anytime and anywhere” play an important role in efficiency and effectiveness of performing banking tasks, and their relationship with individual performance.

M-banking makes use of portable technologies, which face several constraints such as small keyboards, display size, data transmission, and several others (Chae & Kim, 2004; Zwass, 2003; Wang & Li, 2012). The small amount of data that can fit on a small device plays an important role in developing m-banking applications (Poustchi & Schurig, 2004; Carter & Yeo, 2016). Also, the acceptance or rejection of the m-banking service is still in doubt. As m-banking continues to struggle to find widespread customer adoption, m-banking users confront several challenges such as accepting to do banking transactions in a small device with summarized information. We believe that knowing how customers react with less detailed information may influence their acceptance of m-banking service.

We further suppose that the literature associated with information systems (IS) may offer insights into innovative technology acceptance because the use of e-commerce systems is associated with culture. Based on that motivation, it is important to include cultural characteristics that bear directly on issues of system design and customer behaviour in IS research, because a user’s cultural profile shapes his/her perceptions of a system’s usage and features (Garfield & Watson, 1997). Users with a certain cultural profile could focus their attention on certain information while ignoring other (Overby et al., 2004). For Leidner & Kayworth (2006), culture can positively or negatively influence the successful implementation of information technology (IT). Therefore, m-banking system features appropriate for one culture may not be suitable for others of a different culture. Despite the importance of this subject, there is little empirical evidence on the cultural influence in the IS/IT field (e.g. Lee et al., 2013; Al-Smadi, 2012). The user’s cultural profile may thus result in different post-adoption beliefs about the IT (Lee et al., 2007). Hall’s (1976) context and time perception dimensions were successfully adopted to study the effect of customer
behaviour in e-commerce adoption (Gong, 2009), and helping designers of mobile data services to
develop strategies for new services (Choi et al., 2005). Based on these examples, we apply Hall’s
model, specifically in the context and time perception dimensions. The main reason that two
dimensions were chosen is to deal with the issues of system design and user behaviour for specific
applications of mobile device such as m-banking, and the relationship with post-adoption stage such
as individual performance. In this paper we analyse the m-banking individual performance,
considering the consequence of use and user satisfaction, and how different national characteristics
of the users reflect on the development of m-banking service.

Several authors relate “performance” to effectiveness and productivity (e.g. Manzoor, 2012;
Adler & Benbunan-Fich, 2012; Mahdi et al., 2014). On the other hand, other authors relate
“performance” to effectiveness and efficiency (Sink & Tuttle, 1989; Slack & Lewis, 2011). In this
research we adopt the term “performance” to express the idea of efficiency and effectiveness at
performing m-banking tasks. M-banking enables users to conduct financial services in a more
efficient and effective way, and thus offers many advantages for individuals, such as time savings
and ease of performing banking transactions (Kim et al., 2009; Tan & Teo, 2000). For example,
some operations related to the task time criticality and task importance in performing financial
transactions, such as stock market operations, are highly sensitive to market volatility and to their
just-in-time nature. Examples include checking an account balance and verifying a salary deposit or
urgent-payments processing. These are m-banking transactions that aim to meet market and
customer demands of high level of individual performance.

This paper draws on m-banking individual performance and cultural influence to link the
use, continued use, and user satisfaction, and makes three contributions. Firstly, we focus on system
quality, information quality, and service quality, with the appropriate level (e.g. functionality of the
service, quality of the information that m-banking provides, and overall support related to the
service), and the ability to convince and influence use and user satisfaction. The importance of
continually measuring the general quality of the service and the alignment of those three dimensions
could reduce potential problems of m-banking service.

Secondly, we identify the importance of leveraging the individual performance that links the
use and continued use of the service: (1) individual performance, efficiency and effectiveness of
performing banking tasks, and its implications of time saving and less effort; (2) user satisfaction,
which mediates the quality of the overall system and the continued use of the service; and (3) use,
which satisfies all of the users’ needs. A higher correlation amongst those three drivers could reduce
the attrition effect or even leverage the number of potential adopters of the service. During the post-
adoption stage, after users start using m-banking and responding to their expectations, they may
engage more m-banking functional features (Hsieh et al., 2011).
Thirdly, which cultural characteristics moderate the use and user satisfaction effect on individual performance? Studying the cultural relationship with usage and users’ satisfaction at the individual level may explain their beliefs and behaviours. Toward this end, connecting those constructs between use and user satisfaction to individual performance may obtain insights to m-banking. The globalization of mobile device use and consumer’s changing attitudes press the need to understand the impact of culture on m-banking use and user satisfaction.

The structure of the paper is as follows. We next examine earlier approaches in the literature for m-banking and explain cultural theory and its model. We then present the research design, methodology, and results. Finally, the results are discussed, including the implications for m-banking theory and practice, and possible further research directions are suggested.

2. Literature Review

Adoption drivers dominate as the focus of most research about m-banking, and there is an overload of m-banking adoption models. Recently, in their literature review of m-banking research, Shaikh & Karjaluoto (2015) report 55 studies (between 2005 to 2014) associated with different kinds of motivations that influenced m-banking potential adopters. Hoehle et al. (2012) identified 56 m-banking adoption research sources published between 2001 and 2010. Another m-banking literature review carried out by Dewan (2010) emphasized the need for more theory-based empirical research from a non-traditional perspective. The constantly growing number of m-banking papers is a sign that m-commerce research shows no signs of saturation (Kourouthanassis & Giaglis, 2012). Based on that, instead of presenting another research analysing other determinants of m-banking adoption, we believe it may be more valuable to centre on retaining users in the post-adoption phase, instead of thinking about potential adopters.

We focus on individual performance as a source of efficiency and effectiveness in performing banking tasks. The challenge is to provide m-banking service with a high level of individual performance. The individual performance refers to the consequences or results of using IS/IT. Grounded on the individual performance literature, the information system research discipline has been taking a greater interest in seeking to explain the individual performance in the use of technological innovations. For example, a student using a calculator to do a homework assignment will probably have a better result than another student who does not use it. Sonnentag & Frese (2002) link the research on individual performance to the research on work-related well-being. For them accomplishing tasks and performing at a high level can be a source of satisfaction, with feelings of mastery and pride. Low performance and not achieving the goals might be experienced as dissatisfying or even as a personal failure. They also discuss if and how well-being
and performance are empirically related, and argue, especially, that self-regulation might account
for such a relationship. In the performance measurement literature, job performance comprises two
dimensions: task performance and contextual performance (Sonnentag & Frese, 2002). Task
performance consists of behaviours carried out to complete a job; contextual performance consists
of behaviours that contribute to the social/psychological climate in which a job is performed
(Sonnentag & Frese, 2002). According to Wu et al. (2016), when individuals become familiar with
the online store they perceive performance more positively. For Burton-Jones & Grange (2012) to
achieve maximum performance of using IS, the system must be used effectively. Based on that, we
propose to analyse the framework that points to the interconnections amongst use, user satisfaction,
and individual performance, as critical enablers of m-banking continued use and possible attraction
of potential adopters. Other arguments in the performance impact literature suggest that the initial
effects should occur at the quality of the overall IT framework assets and resources (Mithas et al.,
2011; Kannan & Tan, 2005), which is very consistent with the DeLone & McLean’s (D&M) IS
success model.

On the other hand, there are models that apply the terminology “performance expectancy”,”
outcome expectation”, and “perceived usefulness” as main independent construct(s)/factor(s) or
predictor variable to explain behaviour intention to use or adopt IS/IT. These include perceived
usefulness in the technology acceptance model (TAM) (Davis, 1989), job fit in the Model of PC
Utilization (MPCU) (Thompson et al., 1991), outcome expectations in the Social Cognitive Theory
(SCT) (Compeau & Higgins, 1995), and performance expectancy in the unified theory of
acceptance and use of technology (UTAUT) (Venkatesh et al., 2003).

2.1 Original and Updated DeLone and McLean’s IS success model

The main theory that explains the individual performance as a dependent construct in a post-
adoptive context (i.e., by using an IS/IT) is DeLone & McLean’s IS Success model (DeLone &
McLean, 1992). Our study is based on DeLone & McLean’s IS Success model (original and
updated version) (DeLone & McLean, 1992; DeLone & McLean, 2003). The original version of the
D&M model revised IS success measures and conceived a model of the interrelationships between
six information systems’ success factors: system quality, information quality, use, user satisfaction,
individual impact, and organizational impact. Later, in the updated version DeLone & McLean
(2003) added the “service quality” measure. For D&M, to measure the success of a single system,
information quality or system quality may be the most significant quality component. For
measuring the overall success of the IS department, as opposed to individual systems, ‘service
quality’ may become the most important variable”. M-banking users may face several problems and

http://mc.manuscriptcentral.com/intr
usage troubles that should be mitigated. Providing adequate support for the end user could encourage continued use and end user satisfaction.

Many studies have used and supported the validity of the D&M framework in different applications, such as knowledge management systems (KMS) (Wu & Wang, 2006), learning success systems (Lin, 2007), website success goals (Schaupp et al., 2006), implementation success of enterprise resource planning (ERP) (Tsai et al., 2012), evaluation of the electronic health record (Bossen et al., 2013), and employee portal success (Urbach et al., 2010); or in combination with other theories, such as trust to explain satisfaction in m-banking (Lee & Chung, 2009; Chung & Kwon, 2009), continuance intention of mobile payment service (Zhou, 2013), and unified theory of acceptance and usage of technology (UTAUT) to explain electronic patient records (Mailliet et al., 2015). The variety of applications of the D&M model, alone or in combination with other theories, provides a basis and support for our investigation in the m-banking context. The purpose of this study is to make both theoretical and empirical advances concerning the relationships among the perceptions of system quality, information quality, service quality, use, user satisfaction, and the influence on individual performance in m-banking.

2.2 Culture

There are many definitions of culture. For example, Leidner & Kayworth (2006), quoting Kroeber & Kluckhohn (1952), report 164 definitions of culture. According to Hall (1976), beliefs and values determine the way that people think, behave, solve problems, make decisions, plan and lay out their homes and cities, and even organize their economic, political, and transportation systems. Hofstede (1980) explained culture as “the collective programming of the mind that distinguishes the members of one group or category of people from another” (Hofstede, 1980). As such, it is a set of shared and enduring meanings, values, attitudes, opinions, and beliefs that characterize ethnic, national, or other groups, and guide their behaviour (Triandis, 1995).

Although several definitions may adequately express the meaning of culture, the literature has been trying to provide theoretical explanations for the lack of applications with the several culture levels and dimensions. Leidner & Kayworth (2006) examine culture in the IS/IT context and compile a long list of value dimensions and levels including national, organizational, and group, and the possible influence of the successful implementation and use of information technology. Cultural characteristics going far beyond country differences could be enclosed within a country (Baskerville, 2003), or even two people may have different cultural characteristics though living in the same country (Straub et al., 2002).
In order to test the application of different dimensions and levels of culture, several empirical studies published in the IT/IS field have applied culture in different contexts, such as: technology acceptance in national cultures (Srite & Karahanna, 2006), comparison of post-adoptions of mobile internet in three different countries (Lee et al., 2007), communication values in high-low context amongst Norwegian middle managers (Warner-Söderholm, 2013), differences between employees in two countries in the process of knowledge sharing (Li, 2010), cultural differences among customers of a single bank in the use of electronic channels (Al-Smadi, 2012), cultural responses to the download time of websites (Rose et al., 2003), nature of Internet adoption in Arab cultures (Loch et al., 2003), factors influencing the adoption of m-banking in Australia and Thailand, cross-cultural comparison (Mortimer et al., 2015), m-banking adoption in Africa combining the extended unified theory of acceptance and use of technology model and cultural moderators (Baptista & Oliveira, 2015), internet portals (Zahir et al., 2002), impact on e-government development (Zhao, 2011), e-retailing ethics (Elbeltagi & Agag, 2016), and many others.

To date, the most popular conceptualization of national culture has been Hofstede’s (Constantinides et al., 2010). Leidner & Kayworth (2006) reviewed national culture studies and found that over 60 percent utilized one or more of Hofstede's culture dimensions, and very few focused on Hall’s dimensions of culture. Even fewer studies apply other national culture dimensions.

Although information systems researchers have conceptualized several dimensions of culture value, and based on a lack of contribution applying Hall’s culture dimension, we adopted two dimensions proposed by Hall (1969): context, and time perception. These two dimensions have been tested in a variety of ways and contexts. Kittler et al. (2011) reviewed the literature related to Hall’s context model and reports a significant theoretical framework within intercultural studies during the last five decades. Also, in one of few applications of time perception, Rose et al. (2003) investigated time perception as a culture value. Holtbrügge et al. (2013) apply the context and time perception dimensions to study the email communication style. Alkhaldi et al. (2013) explore the context style on video conferencing for knowledge sharing.

Hall’s time context perception dimension deals with issue of system design and user temporality behaviour for specific applications of mobile device such as m-banking, and the relationship with post-adoption stage such as individual performance. Choi et al. (2005) applied high vs. low context culture to investigate the design for mobile services to help in developing strategies for new services. Mohamed et al. (2013) applied it to study automobile interior design. Chung & Lim (2005) investigate the temporality of the use of mobile devices. They found that temporality of mobile users are becoming hybrid, which means that it is a merger of monochronic
time use (linear time use wherein one strictly holds to certain schedules) and polychronic time use (cyclical time use wherein plans change rapidly). Polychronic people are more likely to change plans and focus on relationships rather than task (Rose et al., 2003). However, dealing with banking transactions with a mobile device, it is quite difficult to perform multitasking operations, meaning that people will tend to be monochronic, performing one task at the time.

The context is operationalized by Hall to deal in terms of explicitly written textual information vs. implicitly drawn pictorial information. The small size of the portable device to run applications underlies several specific restrictions and characteristics. Such characteristics have greatly influenced the design of m-banking applications and the relationship to the usage. Based on that, our approach examines the influence of national culture on individual behaviour. We posit that national culture influences the cultural values that an individual holds which in turn influence and moderate the use and user satisfaction affecting the individual performance. In this sense, values can be as a set of social norms that define the rules or context for social interaction through which people act and communicate.

2.2.1 Time Perception

Time perception (the perceived duration of the unfolding of indefinite and continuous events) is subjective, and therefore varies from person to person. Time perception and the way it is handled have much to do with the structuring of space, and different cultures perceive time differently (Nonis et al., 2005; Hall, 1969). Hall (1976) differentiates two notions of time: monochronic (M-time) and polychronic (P-time), which are attitudes toward use of time in performing tasks focusing either on issues one at a time (monochronic) or performing more than one activity in parallel (polychronic). People characterized with monochronic culture tend to view time as a series of segments, for which they plan carefully and perform sequentially according to strict schedules. People of polychronic societies tend to be engaged in several actions at the same time.

2.2.2 Context

The context usually tells the hearer which level of discourse is being used. Hall (1976) defines context as “the amount of information that is in a given communication as a function of the context in which it occurs”. High context cultures prefer a communication style in which individuals prefer to draw inferences from non-explicit or implicit information; the verbal part of a message carries less information, and people perceive the rules as they are embedded in and extracted from context. Individuals in low context cultures prefer information to be stated directly and exhibit a preference.
for quantifiable detail. In other words, low context cultures are characterized by explicit messages in which words carry most of the information. There is evidence that the users in high-context cultures may prefer symbolic and indirect expressions in their communications that are based on mobile data services (e.g. Lee et al., 2007).

3. Research Model

Figure 1 presents the proposed model of this study. The dependent variable is individual performance, referring to the efficiency and effectiveness at performing m-banking tasks. The IS/IT adoption literature has been influential in providing guidance for achieving excellence in technological use and adoption by individuals. While the overall quality of IT/IS infrastructure provides the basis or the foundation for m-banking success, this paper draws its influence from the usage and user satisfaction and its influences on the individual performance. In other words, although the D&M model allows for evaluating the organizational impact level, we adopt the model to study individual performance, because it is reasonably compatible with prior conceptualization in the IS literature. Several investigations show that the D&M model can be partially applied or combined with other models. For example, for Igbaria & Tan (1997), individual performance becomes an important issue in IT acceptance, usage, and user satisfaction in the organizational context. They concluded that user satisfaction is an important factor affecting system use and that it has the strongest direct effect on individual performance. In an empirical study of m-banking, Lee & Chung (2009) found that system quality and information quality significantly influence customers’ trust and satisfaction. Ali & Younes (2013) studied the relationship between information systems and users by examining individual performance on several factors, including system quality and information quality. They combined the D&M, task-technology fit (TTF), and technology acceptance model (TAM) to study the impact of information systems on user performance. The main hypothesis advanced herein is that a high level of the overall quality of the system in an m-banking context will influence the use and user satisfaction, and consequently that both of these lead to individual performance. The hypotheses are presented below.
DeLone & McLean (1992) investigated the reliability of the system, system accuracy, flexibility, online response time, and ease of use as a part of the system quality dimension. More specifically, they incorporated four scales from Bailey & Pearson (1983) into the system quality: (1) convenience of access, (2) flexibility of system, (3) integration of systems, and (4) response time. There are several negative effects associated with m-banking services, such as small screen, uncooperative keypad, communication bandwidth, and other constraints (Chae & Kim, 2004; Zwass, 2003; Zhou, 2011). Such challenges could be turned into strengths by increasing system quality, concern with user interface, ease of use, usefulness, performance, and quality of documents (Seddon, 1997; Liao et al., 2011). System quality of m-banking can be regarded as the degree to which a system assists an individual in performing his or her portfolio of tasks. Poor system quality can frustrate the users' experience as it increases their difficulty of using m-banking and cannot lead to users' satisfaction over m-banking services. Thus, two hypotheses are tested in this study:

**H1a**: System quality has a positive influence on use of m-banking.

**H1b**: System quality has a positive influence on user satisfaction of m-banking.

There are many definitions of information quality. Some consider the user’s information (Lee et al., 2002), and others assess the degree to which it is helpful in completing a particular task (Fisher & Kingma, 2001). Fisher & Kingma (2001) divide information quality into five categories: accuracy, completeness, consistency, relevance, and fitness for use. DeLone & McLean (1992) consider information quality from Bailey & Pearson (1983) research as a “good example of this
cross linkage” – showing the “desirable characteristics of the system outputs”. For m-banking usage, the experience of using the service during the adoption or post-adoption phase could be affected by information quality, such as overall product and usage description. If the information is irrelevant, inaccurate, or out-of-date, users may doubt service providers’ integrity and ability to present quality services (Zhou, 2013; Zhou, 2011; Cheung et al., 2008). At the same time, due to the screen size of mobile devices, information improperly designed can cause unnecessary work for users and can negatively affect their usage (Lee & Chung, 2009). It is expected that information quality of m-banking should contain useful and updated information for the user. Weak information quality can frustrate the users’ experience as the need to spend much effort in the search for information would affect the level of users' satisfaction. Therefore, we propose the following:

H2a: Information quality has a positive influence on use of m-banking.

H2b: Information quality has a positive influence on user satisfaction of m-banking.

One decade after of the original D&M IS success model, in the “Ten-Year Update” research the service quality dimension was added to the DeLone & McLean (2003) model. For D&M, “service quality is the overall support delivered by the service provider”, and quoting Petter et al. (2008), it is “the quality of the support that system users receive from the IS department and IT support personnel” (e.g. responsiveness, reliability, conciseness, technical competence, and empathy of the personnel staff). Providing high quality service and ensuring user satisfaction are widely recognized as important dimensions that lead to the continued use and success of the service. In an empirical study of the banking industry, Marinkovic & Obradovic (2015) found that service quality significantly influences users’ satisfaction and its influence on customers’ emotional reactions. Poor service quality can frustrate the users' trust and decrease users' perceived satisfaction over m-banking services. Based on that, it is expected that the m-banking service provider should offer overall quality support related to the youngest channel in the financial industry, which will positively influence the use and user satisfaction. Therefore,

H3a: Service quality has a positive influence on use of m-banking.

H3b: Service quality has a positive influence on user satisfaction of m-banking.

After analysing the overall quality of the framework, we propose to focus our attention on the usage and user satisfaction, and particularly on the factors that cause individual performance and the resistance to the technology, continued use. While the system usage and user satisfaction may not ensure the enhancement of individual performance, it is critical to ensure that quality has been taken into consideration (Guimaraes & Igbaria, 1997). Although several m-banking studies focus on m-banking adoption, as reported by Shaikh & Karjaluoto (2015), the literature lacks an
examination of the consequences of the usage. User satisfaction is also found to be significant in
affecting users to use (e.g. Agag & El-Masry, 2016), and in turn the use of m-banking could affect
user satisfaction. Therefore,

\textbf{H4}: The use affects the user satisfaction of m-banking.

\textbf{H5}: The user satisfaction affects the use of m-banking.

One of the drivers of this study is the individual performance, which has been associated
with efficiency and effectiveness in performing banking tasks with less time and effort. One of the
most important advantages of this channel over other traditional banking channels (e.g. automated
teller machines (ATM), internet banking (IB), telephone banking, or branch) is the availability from
everywhere and anywhere, 24 hours per day and 7 days a week. We propose that with the m-
banking service, users can carry out banking transactions with the least time and effort, thereby
enhancing the well-being of the user. Sonnentag & Frese (2002) link their research on individual
performance to the research on work-related well-being. They discuss if and how well-being and
performance are empirically related. An important rationale behind this interest is the belief that
happy users tend to be more productive than other users (Taris & Schaufeli, 2015). User satisfaction
is considered as a key factor affecting continued use and individual performance. Thakur (2014)
found empirical evidence in the m-banking context that user satisfaction and loyalty are correlated.
User satisfaction is an emotional reaction to a transaction experience that meets user expectations
(Kim et al., 2004). Based on that, user satisfaction is evaluated based on evidence of the m-banking
service’s ability to meet user expectations, such as service quality, information quality, and system
quality. The use and continued use of m-banking is based on prior experience that leads to repeated
action. Igbaria & Tan (1997) reported that system use and user satisfaction have a direct positive
effect on individual perceived performance impacts (i.e., perceived impact of computer systems on
decision-making quality, performance, productivity, and effectiveness of the job). Based on that,
user satisfaction and m-banking use could positively affect the individual performance. Hence, the
following hypotheses are proposed:

\textbf{H6}: The use of m-banking influences individual performance.

\textbf{H7}: The user satisfaction of m-banking influences individual performance.

It is difficult to perform multi-task operations such banking transactions and other
operations at the same time on a mobile device because of the small screen and awkward input
mechanisms, and other constraints (Chae & Kim, 2004; Zwass, 2003). Mobile users are able to talk
while walking, driving, or watching TV, but they do not seem to be able to perform other tasks
while performing banking operations via mobile device. We believe m-banking users focus on one
task at a time, and that it will enhance individual performance, and that the tendency will be to complete the banking task more quickly. People who like to perform multi-tasking will feel less satisfied because m-banking applications are far from offering this facility. Therefore, we propose the following:

**H8a**: A monochronic inclination will moderate the effects of use on individual performance such that the effects will be stronger among users with higher monochronic inclination.

**H8b**: A monochronic inclination will moderate the effects of user satisfaction on individual performance such that it will be weaker among users with high monochromic inclination.

Hall defines high-context as the “feature pre-programmed information that is in the receiver and in the setting, with only minimal information in the transmitted message” and low-context “is the reverse” (Hall, 1976). People in low-context cultures tend to prefer information that is communicated primarily through language and rules are explicitly spelled out. High-context culture is generally characterized by people who prefer face-to-face meetings because it is easier to identify the contextual aspects than with written communication. The small size of the mobile device limits the quantity of information that it can show. At the same time, the low bandwidth and packet-based pricing of mobile communication encourages abbreviation of the information presented (Chae & Kim, 2004). Lee et al. (2007) compared Korea, Hong Kong, and Taiwan and found that high-context mobile internet users preferred implicit information, such as abbreviated menu style information and pictorial or symbolic expressions. High-context users found implicit information easy to use, and they think it is an effective way to convey information. Context seems to play a significant role in how an IS is received. Based on that, we believe that in an m-banking context non-verbal communication plays an important part in high context cultures and that it will enhance individual performance. On the other hand, people who are willing to perform certain complex banking transactions on mobile devices will feel less satisfied due to the hardware limitations. Thus, we hypothesize the following:

**H9a**: A high-context inclination will moderate the effects of use on individual performance such that the effects will be stronger amongst users with high-context inclination.

**H9b**: A high-context inclination will moderate the effects of user satisfaction on individual performance such that it will be weaker amongst users with high-context inclination.
4. Methods

4.1 Measurement

All measurement items (Appendix A) were adapted from Urbach et al. (2010), Zhou et al. (2010), Wu & Wang (2006), and Lee et al. (2007), with slight modifications. From the literature, system quality (SYSQ), information quality (INFQ), service quality (SERQ), and individual performance (IP) were adopted from Urbach et al. (2010); use from Zhou et al. (2010), and user satisfaction (US) from Wu & Wang (2006); and context (CT) and time perception (TP) from Lee et al. (2007).

4.2 Data collection

The questionnaire was primarily developed in English, based on the literature, and the final version was independently translated into Portuguese by a professional translator, and then back into English by a different translator to ensure translation equivalence (Brislin, 1970). First, we conducted field interviews with managers of a banking company and made modifications accordingly. They were asked to assess the terminology, clarity of instructions, and response format. Most items were measured using a numerical scale ranging from strongly disagree (1) to strongly agree (7). The questionnaire was modified and pretested among 30 m-banking users so that further problems with the measures and response format could be detected. These were not included in the main survey. Preliminary results of the pilot survey showed that the scales were reliable and valid with the exception of four items (SYSQ6, INFQ3, INFQ5, and USE4), which had a loading higher than 0.70 but did not meet the cross-loadings criterion. However, at that stage, we decided not to apply the cross-loading criterion exclusion, due to the fact that it is the pilot study stage and because of the importance of measuring those items in the m-banking context.

Second, the data were collected in a Southern European country using an online survey conducted via a popular survey website between November 2014 and February 2015. A total of 1,400 e-mails were sent in November 2014. A follow-up reminder was sent in January 2015 to non-respondents. 354 responses were received by the end of February 2015, which corresponds to a 25.3 percent response rate. 49 responses were removed due to incompleteness, leaving 305 (21.8 percent) valid and complete responses. To test for non-response bias, we compared the sample distribution of the first and second respondent groups. We used the Kolmogorov–Smirnov (K–S) test to compare the sample distributions of the two groups (Ryans, 1974). The K–S test suggests that the sample distributions of the two independent groups do not differ statistically (Ryans, 1974), meaning that non-response bias is not present. Further, we examined the common method bias by using Harman’s one factor test (Podsakoff et al., 2003). This test found no significant common method bias in our dataset. Additionally, to test for common method bias, the marker variable
technique was employed (Malhotra et al., 2006; Lindell & Whitney, 2001). No significant common method bias was found in the data set.

Third, the study results are based upon m-banking users. A total of 181 respondents (59%) are men. Regarding age, 180 (60 percent) of the respondents are 35 years old or younger. Concerning m-banking usage frequency in a month, 55 percent use over 10 times in a month, and 19 percent of the users between six to ten times per month. Detailed descriptive statistics relating to the respondents’ characteristics are in Table 1.

Table 1 - Sample characteristics

<table>
<thead>
<tr>
<th>Distribution (n=305)</th>
<th>Education</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>84</td>
<td>28%</td>
</tr>
<tr>
<td>25-30</td>
<td>48</td>
<td>16%</td>
</tr>
<tr>
<td>31-35</td>
<td>48</td>
<td>16%</td>
</tr>
<tr>
<td>36-40</td>
<td>40</td>
<td>13%</td>
</tr>
<tr>
<td>41-50</td>
<td>59</td>
<td>19%</td>
</tr>
<tr>
<td>&gt;50</td>
<td>26</td>
<td>8%</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>181</td>
<td>59%</td>
</tr>
<tr>
<td>Female</td>
<td>124</td>
<td>41%</td>
</tr>
<tr>
<td>M-banking usage frequency in a month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One time per month</td>
<td>31</td>
<td>10%</td>
</tr>
<tr>
<td>2-5 times</td>
<td>49</td>
<td>16%</td>
</tr>
<tr>
<td>6-10 times</td>
<td>57</td>
<td>19%</td>
</tr>
<tr>
<td>11-20 times</td>
<td>67</td>
<td>22%</td>
</tr>
<tr>
<td>Over 20 times</td>
<td>101</td>
<td>33%</td>
</tr>
</tbody>
</table>

5. Results

Our analysis focused on measurement validation and hypothesis testing. Validation efforts assessed the absence of common method bias and the reliability and validity of the measures, while hypothesis testing analysed the hypotheses. The structural equation modeling, known as SEM with partial least squares (PLS) was used to perform a simultaneous evaluation of both measurement quality (measurement model) and construct interrelationship (structural model). PLS provides the ability to model latent constructs even under conditions of non-normality and small- to medium-size samples (Chin, 1998b). By using ordinary least squares as the estimation technique, PLS performs an iterative set of factor analyses and a bootstrap procedure to estimate the significance of the paths. In this study we used Smart PLS 2.0 M3 to evaluate the measurement properties and test hypotheses (Ringle et al., 2005).
5.1 Measurement model

The measurement model’s strength is revealed in the assessment of convergent and discriminant validity (Hair et al., 2014). Convergent validity is normally measured with three tests: reliability of questions, composite reliability of constructs, and variance extracted by constructs (Fornell & Larcker, 1981).

Tables 2 and 3 present the measurement model results. The results for composite reliability (CR) are greater than 0.9, indicating that the model has good internal consistency. The good indicator reliability was evaluated based on the criterion that the loadings should be greater than 0.70. As seen in Table 2, the loadings are above 0.70. 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 their indicators (Henseler et al., 2009; Hair et al., 2014). As is also seen in Table 3, AVE for each construct is above the threshold of 0.5, ensuring convergence.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>SYSQ</th>
<th>INFQ</th>
<th>SERQ</th>
<th>USE</th>
<th>US</th>
<th>IP</th>
<th>TP</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>System quality</td>
<td>SYSQ1</td>
<td>.95</td>
<td>.80</td>
<td>.58</td>
<td>.67</td>
<td>.74</td>
<td>.73</td>
<td>.37</td>
</tr>
<tr>
<td></td>
<td>SYSQ2</td>
<td>.95</td>
<td>.79</td>
<td>.55</td>
<td>.61</td>
<td>.70</td>
<td>.68</td>
<td>.27</td>
</tr>
<tr>
<td></td>
<td>SYSQ3</td>
<td>.95</td>
<td>.81</td>
<td>.59</td>
<td>.61</td>
<td>.72</td>
<td>.68</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>SYSQ4</td>
<td>.95</td>
<td>.81</td>
<td>.56</td>
<td>.63</td>
<td>.71</td>
<td>.71</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>SYSQ5</td>
<td>.91</td>
<td>.81</td>
<td>.56</td>
<td>.64</td>
<td>.75</td>
<td>.67</td>
<td>.32</td>
</tr>
<tr>
<td>Information</td>
<td>INFQ1</td>
<td>.82</td>
<td>.94</td>
<td>.57</td>
<td>.65</td>
<td>.73</td>
<td>.73</td>
<td>.37</td>
</tr>
<tr>
<td>quality (INFQ)</td>
<td>INFQ2</td>
<td>.81</td>
<td>.93</td>
<td>.57</td>
<td>.64</td>
<td>.73</td>
<td>.72</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>INFQ3</td>
<td>.74</td>
<td>.87</td>
<td>.55</td>
<td>.63</td>
<td>.62</td>
<td>.62</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td>INFQ4</td>
<td>.78</td>
<td>.91</td>
<td>.61</td>
<td>.62</td>
<td>.71</td>
<td>.68</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>INFQ5</td>
<td>.73</td>
<td>.89</td>
<td>.55</td>
<td>.56</td>
<td>.69</td>
<td>.62</td>
<td>.32</td>
</tr>
<tr>
<td></td>
<td>INFQ6</td>
<td>.76</td>
<td>.90</td>
<td>.49</td>
<td>.63</td>
<td>.70</td>
<td>.65</td>
<td>.30</td>
</tr>
<tr>
<td>Service quality</td>
<td>SERQ1</td>
<td>.59</td>
<td>.59</td>
<td>.95</td>
<td>.48</td>
<td>.57</td>
<td>.56</td>
<td>.33</td>
</tr>
<tr>
<td>(SERQ)</td>
<td>SERQ2</td>
<td>.59</td>
<td>.58</td>
<td>.97</td>
<td>.48</td>
<td>.57</td>
<td>.56</td>
<td>.34</td>
</tr>
<tr>
<td></td>
<td>SERQ3</td>
<td>.56</td>
<td>.57</td>
<td>.96</td>
<td>.43</td>
<td>.53</td>
<td>.53</td>
<td>.29</td>
</tr>
<tr>
<td></td>
<td>SERQ4</td>
<td>.57</td>
<td>.58</td>
<td>.92</td>
<td>.44</td>
<td>.54</td>
<td>.54</td>
<td>.29</td>
</tr>
<tr>
<td>Use (USE)</td>
<td>USE1</td>
<td>.67</td>
<td>.67</td>
<td>.49</td>
<td>.98</td>
<td>.82</td>
<td>.75</td>
<td>.40</td>
</tr>
<tr>
<td></td>
<td>USE2</td>
<td>.65</td>
<td>.64</td>
<td>.48</td>
<td>.97</td>
<td>.81</td>
<td>.75</td>
<td>.38</td>
</tr>
<tr>
<td></td>
<td>USE3</td>
<td>.64</td>
<td>.66</td>
<td>.44</td>
<td>.96</td>
<td>.80</td>
<td>.73</td>
<td>.39</td>
</tr>
<tr>
<td>User satisfaction</td>
<td>US1</td>
<td>.74</td>
<td>.73</td>
<td>.57</td>
<td>.79</td>
<td>.96</td>
<td>.80</td>
<td>.40</td>
</tr>
<tr>
<td>(US)</td>
<td>US2</td>
<td>.78</td>
<td>.77</td>
<td>.56</td>
<td>.82</td>
<td>.98</td>
<td>.82</td>
<td>.41</td>
</tr>
<tr>
<td></td>
<td>US3</td>
<td>.76</td>
<td>.77</td>
<td>.58</td>
<td>.83</td>
<td>.98</td>
<td>.82</td>
<td>.40</td>
</tr>
<tr>
<td></td>
<td>US4</td>
<td>.75</td>
<td>.75</td>
<td>.57</td>
<td>.83</td>
<td>.98</td>
<td>.83</td>
<td>.41</td>
</tr>
<tr>
<td>Individual</td>
<td>IP1</td>
<td>.71</td>
<td>.71</td>
<td>.55</td>
<td>.77</td>
<td>.83</td>
<td>.94</td>
<td>.38</td>
</tr>
</tbody>
</table>
The discriminant validity refers to two factors. First, the square roots of AVEs (diagonal elements) are greater than the correlation between each pair of constructs (off-diagonal elements) (Fornell & Larcker, 1981). Second, to ensure the discriminant validity, the loadings should be greater than cross loadings (Chin, 1998a; Götz et al., 2010; Grégoire & Fisher, 2006). In Table 3 we see that the square root of AVE (in bold) is greater than the correlation between constructs. In order to meet cross-loading criteria, we excluded two items (SYSQ 6, and USE4). After the exclusion, we found that no indicator has loadings (in bold) with lower values than their cross loadings (Table 2). Therefore, both measures are met.

Table 3 – Means, standard deviations, correlations, and reliability and validity measures (CR, CA, and AVE) of latent variables.

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Mean</th>
<th>SD</th>
<th>CR</th>
<th>CA</th>
<th>SYSQ</th>
<th>INFQ</th>
<th>SERQ</th>
<th>USE</th>
<th>US</th>
<th>IP</th>
<th>TP</th>
<th>CT</th>
</tr>
</thead>
<tbody>
<tr>
<td>System quality (SYSQ)</td>
<td>5.25</td>
<td>1.19</td>
<td>.97</td>
<td>.97</td>
<td>.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information quality (INFQ)</td>
<td>5.32</td>
<td>1.18</td>
<td>.97</td>
<td>.96</td>
<td>.85</td>
<td>.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service quality (SERQ)</td>
<td>4.94</td>
<td>1.35</td>
<td>.97</td>
<td>.96</td>
<td>.61</td>
<td>.61</td>
<td>.95</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use (USE)</td>
<td>4.91</td>
<td>2.17</td>
<td>.98</td>
<td>.97</td>
<td>.67</td>
<td>.68</td>
<td>.48</td>
<td>.97</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User satisfaction (US)</td>
<td>5.11</td>
<td>1.62</td>
<td>.99</td>
<td>.98</td>
<td>.77</td>
<td>.78</td>
<td>.58</td>
<td>.84</td>
<td>.98</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual performance (IP)</td>
<td>5.47</td>
<td>1.52</td>
<td>.96</td>
<td>.93</td>
<td>.74</td>
<td>.74</td>
<td>.58</td>
<td>.77</td>
<td>.84</td>
<td>.94</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time perception (TP)</td>
<td>4.61</td>
<td>1.45</td>
<td>.92</td>
<td>.87</td>
<td>.27</td>
<td>.29</td>
<td>.26</td>
<td>.23</td>
<td>.25</td>
<td>.27</td>
<td>.89</td>
<td></td>
</tr>
<tr>
<td>Context (CT)</td>
<td>4.12</td>
<td>1.41</td>
<td>.87</td>
<td>.80</td>
<td>.34</td>
<td>.36</td>
<td>.33</td>
<td>.40</td>
<td>.41</td>
<td>.38</td>
<td>.26</td>
<td>.84</td>
</tr>
</tbody>
</table>

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.
5.2 Structural model

After determining that the measurement model and the results meet all conditions, the research model was evaluated by examining the significance of paths in the structural model. Figure 2 shows the path coefficient with bootstrapping t-statistics derived from standard error with 5,000 iterations. The estimates of the coefficients from a bootstrap distribution can be viewed as an approximation of the sampling distribution and its standard deviation, and can be used as a proxy for the parameter’s standard error in the population. Therefore, t values are calculated to assess each indicator weight’s significance (Hair et al., 2014).

The hypotheses were tested using the significance of the path coefficients as determined by t-values. Since hypotheses H4 and H5 include a mutual influence between use and user satisfaction that cannot be simultaneously tested, we tested two different models. Model 1 assumes the influence to be from use to user satisfaction (H4), whereas model 2 flows from user satisfaction to use (H5). The outcomes of the tests applied to the two structural models are depicted in Figure 2. The upper path coefficients show the results of model 1 and the lower ones of model 2.

![Figure 2. Research model](http://mc.manuscriptcentral.com/intr)

The model explains 49.3% (in model 1) and 70.4% (in model 2) of the variation in m-banking use. The system quality ($\beta = .337$, $p < .01$) and information quality ($\beta = .346$, $p < .01$) are statistically significant in explaining use in model 1, but in model 2 are not statistically significant, thus partially confirming hypotheses H1a and H2a. The service quality is not statistically significant.
in explaining the use, and consequently H3a is not confirmed. The user satisfaction ($\beta = .783, p < .01$) is statistically significant in explaining the use, thus confirming hypothesis H5.

The model explains 79.9% (in model 1) and 65.7% (in model 2) of the variation in user satisfaction of m-banking. The system quality ($\beta = .337, p < .01$ in model 1 and $\beta = .380, p < .01$ in model 2), information quality ($\beta = .191, p < .05$ in model 1 and $\beta = .375, p < .01$ in model 2), service quality ($\beta = .087, p < .01$ in model 1 and $\beta = .123, p < .05$ in model 2), and use ($\beta = .531, p < .01$ in model 1) are statistically significant in explaining user satisfaction, thus confirming hypotheses H1b, H2b, H3b, and H4.

The model explains 73.1% of the variation in individual performance of m-banking. The use ($\beta = .250, p < .01$), and user satisfaction ($\beta = .588, p < .01$) are statistically significant in explaining individual performance, thus confirming hypotheses H6 and H7. The time perception was assessed as a moderating variable in the relationship between use and individual performance (hypothesis H8a). The high value of time perception will be stronger in the relationship between use and individual performance ($\beta = .177, p < .10$). For hypothesis H8b, due to the ($\beta = -.237, p < .05$), the high value of time perception will be weaker in the relationship between user satisfaction and individual performance. Thus hypotheses H8a and H8b are confirmed. The context was assessed as a moderating variable in the relationship between use and individual performance (hypothesis H9a), and between user satisfaction and individual performance (hypothesis H9b). The hypotheses H9a and H9b are not confirmed.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>$\beta$</th>
<th>Support</th>
<th>$f^2$</th>
<th>Effect size</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1a: System quality $\rightarrow$ Use</td>
<td>.337***/.039</td>
<td>Partial</td>
<td>.057/.000</td>
<td>Small/</td>
<td>.493 / .704</td>
</tr>
<tr>
<td>H2a: Information quality $\rightarrow$ Use</td>
<td>.346***/.052</td>
<td>Partial</td>
<td>.059/.003</td>
<td>Small/</td>
<td></td>
</tr>
<tr>
<td>H3a: Service quality $\rightarrow$ Use</td>
<td>.068-.028</td>
<td>No</td>
<td>.004/.000</td>
<td>-/-</td>
<td></td>
</tr>
<tr>
<td>H5: User satisfaction $\rightarrow$ Use</td>
<td>-.783***</td>
<td>Yes</td>
<td>-.713</td>
<td>/Large</td>
<td></td>
</tr>
<tr>
<td>User satisfaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H1b: System quality $\rightarrow$ User satisfaction</td>
<td>.201***/.380***</td>
<td>Yes</td>
<td>.045/.111</td>
<td>Small/Small</td>
<td>.799 / .657</td>
</tr>
<tr>
<td>H2b: Information quality $\rightarrow$ User satisfaction</td>
<td>.191***/.375***</td>
<td>Yes</td>
<td>.04/.105</td>
<td>Small/Small</td>
<td></td>
</tr>
<tr>
<td>H3b: Service quality $\rightarrow$ User satisfaction</td>
<td>.087***/.123**</td>
<td>Yes</td>
<td>.02/.026</td>
<td>-/-Small</td>
<td></td>
</tr>
<tr>
<td>H4: Use $\rightarrow$ User satisfaction</td>
<td>.531***/-</td>
<td>Yes</td>
<td>.706/-</td>
<td>Large/-</td>
<td></td>
</tr>
<tr>
<td>Individual performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.731 / .731</td>
</tr>
<tr>
<td>H6: Use $\rightarrow$ Individual performance</td>
<td>.250***/.250***</td>
<td>Yes</td>
<td>.074/.074</td>
<td>Small/Small</td>
<td></td>
</tr>
<tr>
<td>H7: User satisfaction $\rightarrow$ Individual performance</td>
<td>.588***/.588***</td>
<td>Yes</td>
<td>.465/.465</td>
<td>Large/Large</td>
<td></td>
</tr>
<tr>
<td>H8a: Use x Time perception $\rightarrow$ Individual performance</td>
<td>.177*/.177*</td>
<td>Yes</td>
<td>.030/.019</td>
<td>Small/-</td>
<td></td>
</tr>
<tr>
<td>H8b: User satisfaction x Time perception $\rightarrow$ Individual performance</td>
<td>-.237**/-237**</td>
<td>Yes</td>
<td>.019/.030</td>
<td>-/Small</td>
<td></td>
</tr>
</tbody>
</table>

Table 4 – Results of hypotheses tests
Table 4 reports the evaluation of $f^2$ of both structural models. The $f^2$ effect size captures the influence of one construct on another, by evaluating $R^2$ values of all endogenous constructs. In our model all significant structural paths to the individual performance ranging from small to large affect size. For assessing the predictive value, we apply a blindfolding procedure ($Q^2$ value) of the path model. The $Q^2$ values greater than zero suggest that the model has predictive power for a certain endogenous construct. In contrast, values of zero and below indicate a lack of predictive power (Hair et al., 2014). In both models, all of the $Q^2$ values are considerably greater than zero, suggesting the model’s predictive quality.

Table 5 reports the evaluation of the mediating effects. The central part of mediation analysis occurs when a third variable (mediator variable) plays an intermediate role between two other related constructs. Quoting Hair et al. (2017), three decades after Baron & Kenny (1986) presented an approach to mediation analysis, Zhao et al. (2010) offer a synthesis of prior research on mediation analysis. In model 1, the use construct as mediator variable, the results show that system quality and information quality have a complementary (partial) mediation with user satisfaction, which means both the indirect effect and direct effect are significant and point in the same (positive or negative) direction. No mediation effects were found between service quality and user satisfaction. In model 2, the user satisfaction construct as mediator variable, the indirect-only mediation (full mediation) was found between overall quality and use, which means the indirect effect, is significant but not the direct effect.

<table>
<thead>
<tr>
<th>Table 5 – Significance analysis of the direct and indirect effects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Effect of</strong></td>
</tr>
<tr>
<td>System quality → User satisfaction</td>
</tr>
<tr>
<td>Information quality → User satisfaction</td>
</tr>
<tr>
<td>Service quality → User satisfaction</td>
</tr>
<tr>
<td>System quality → Use</td>
</tr>
<tr>
<td>Information quality → Use</td>
</tr>
<tr>
<td>Service quality → Use</td>
</tr>
</tbody>
</table>
6. Discussion

The scope of this research is to increase the understanding of the cultural influence on m-banking individual performance. To do so, we conduct an empirical investigation that focuses on culture variables and individual performance. Since there is an extensive array of literature on the concept of culture and several dimensions, the greatest challenge is in defining exactly what culture is and how to measure it. Straub et al. (2002) report the deficiency in clear concepts, and measures of culture may help to explain why cultural research has been so difficult to conduct. We adopted two dimensions proposed by Hall (1976): context (high-context inclination), and time perception (monochronic inclination). To measure individual performance, we adopted the D&M IS Success model (original and updated versions). Our results show that except for H3a, H9a, and H9b, our hypotheses are totally or partially supported.

The use of m-banking in our model is explained by system quality, information quality, and service quality. The model explains 49.3% in model 1 (in which the use explains user satisfaction) and 70.4% in model 2 (in which the user satisfaction explains the use) of the variation in m-banking use. Our hypotheses derived from system quality (H1a) and information quality (H2a) to explain use are partially supported, i.e. only supported in model 1, and service quality (H3a) is not supported (in either model). Considering only the results of overall quality of m-banking to explain use, the results are consistent with those reported in similar studies (e.g. Urbach et al., 2010). This may be explained by assuming that there are banking tasks that can be done in alternative channels.

The research model explains 79.9% in model 1 and 65.7% in model 2 of the variation in user satisfaction. The overall quality of m-banking and use was found to significantly and positively affect user satisfaction, supporting H1b, H2b, H3b, and H4. Similar results found in other studies point to the positive influence of the overall quality of the system increasing user satisfaction (e.g. Lin & Lee, 2006; Hollmann et al., 2013; Lin, 2007). The findings demonstrate how important it is to enhance the system quality, information quality, and service quality and the influence of these on the user satisfaction, and can therefore be considered to promote success factors. Finally, in support of H5, user satisfaction had a strong impact on m-banking use.

We also found support for H6 and H7. The research model explains 73.1% of the variance in the individual performance of m-banking compared to 67% indicated by Guimaraes & Igbaria (1997) in impact on end-user jobs. Based on our results, we argue that use and user satisfaction lead to m-banking individual performance. On the other hand, the significant impact of user satisfaction...
on m-banking individual performance may suggest that user satisfaction is a valid alternate for individual performance (Urbach et al., 2010).

The monochronic time perception was found to have a significant moderating effect on use and user satisfaction, supporting H8a, and H8b. Our results suggest that having a high value of time perception (monochronic inclination) means that the effect of use on individual performance will be stronger (based on positive beta value), but on the other hand, the moderating effect of user satisfaction on the individual performance will be weaker (based on the negative beta value) (see Figure 3). In other words, the use of m-banking will gain power and user satisfaction will lose power in explaining the individual performance. If the m-banking users feel that service will enhance individual performance, the users will focus on task completion time. On the other hand, there are challenges associated with the corresponding device, such as small screen, uncooperative keypad, which will lead the user to focus on one task at a time, and to complete the banking task more quickly. While they perceive that focusing on one task at the time will complete the task more quickly, the results show that monochronic inclination scores (and based on the negative value) decrease the effect of user satisfaction on individual performance. This means that for individuals with high monochronic inclination, the importance of user satisfaction for explaining the individual performance is lower (see Figure 3). Finally, the context was not found to have a moderating effect on the relationship between use and user satisfaction to individual performance, and thus hypotheses H9a and H9b are not confirmed. These results suggest that the low significance of the relationship of implicit information is probably because the m-banking users do not consider it as an important feature for m-banking. The implications of the study to theory and practice are summarized below.

![Figure 3](http://mc.manuscriptcentral.com/intr)
6.1 Theoretical Implications

This research makes several contributions to the theory and practice of information systems. The theoretical contribution to the body of knowledge on IS-Culture research properties and individual performance are the following: First, the individual performance (efficiency and effectiveness of performing banking tasks) becomes a source of retention and attraction of potential adopters of m-banking service. While the majority of m-banking research focuses on potential adopters, we focus on the post-adoption stage, by testing the use, user satisfaction, and individual performance as sources of retention and reduction of attrition effects (Singh & Kumar, 2014; Campbell & Frei, 2010). We believe that by maintaining the overall quality of the m-banking service and enhancing individual performance, potential problems could be mitigated along with (possibly) customer complaints (Kumar & Telang, 2012). System quality, information quality, and service quality are important determinants for m-banking users’ trust in conducting financial transactions (Lee & Chung, 2009). Understanding how the quality of m-banking service affects usage and user satisfaction becomes an important issue. As mentioned earlier, by testing mutual influence between use and user satisfaction, the matching point between the two models is that this study finds that three quality factors have significant effects on user satisfaction, and that this is the main enabler for customers to use m-banking.

Second, we test monochronic and high-context inclination, which moderate the use and user satisfaction to the individual performance. We decided to test high-context inclination because (a) there is evidence in mobile contexts that users prefer pictorial or symbolic expressions to detailed information from a system (Lee et al., 2007), and (b) there are negative effects associated with the user interface, such as small screen and other constraints (Chae & Kim, 2004), which limit the amount of information that can be displayed. Our results show that the high-context inclination (H9a and H9b) is not statistically significant, and thus, that construct plays no role in individual performance.

Third, the monochronic inclination moderators are statistically significant. According to Hall (1969), Northern European and American cultures tend to be monochronic cultures (e.g. arrive on time; keep to agendas, schedules, and deadlines; deal with one project or task at a time before moving on to the next). On the other hand, when dealing with polychronic culture, such as in Southern European, Latin, or African cultures, the people answer the phone, drink coffee, transmit sign language to their colleagues, listen to a presentation, and think about lunch all at the same time. Focusing on individual performance in the m-banking context, we decided to test monochronic inclination in a Southern European country. Our results reveal that it is statistically significant in a
Southern country in Europe, indicating that in terms of individual performance, customers focus on one task at a time, which is different in this case from the literature.

Finally, based on our findings and given the fact that the system quality, information quality, and service quality all together play an important role on user satisfaction, and then enhance continued use of m-banking, it is important to periodically monitor the overall quality. Therefore, effective management of overall quality can enable the service providers to increase the number of potential adopters and reduce attrition effects.

6.2 Managerial Implications

From a practical perspective, our research shows that the overall quality of the m-banking system has a significant effect on user satisfaction, which influences the usage and individual performance. We have included the cultural dimension in this research because it could trigger other insights that improve the individual performance of using m-banking. Although it may not be possible to provide all user segments with differentiated services, service developers and banking managers could devise differentiation strategies for some cluster of target users, providing them with culturally specific m-banking services. The results of this study sustain the importance of continually improving the quality of the overall service, which will lead to greater user satisfaction and encourage continued use and individual performance of m-banking. In terms of system quality, there are several enhancements that could be made, such as ease of use, ease of learning, response time, etc. Customers and stakeholders of the financial industry are increasingly reliant on information produced by regulated entities. Reliable and comprehensive information is crucial. Continually updating all information that supports m-banking users could enhance the information quality. Irrelevant, inaccurate, or out-of-date information could affect user satisfaction. Bank customers have more possibilities in how, when, and where they can do their banking today. Changing banks is easy and engagement with one specific bank is no longer a lifetime arrangement.

One of the major challenges in providing excellence in service quality is keeping the competence, courtesy, helpfulness, and empathy of the personnel staff, and their behaviour affects a generation of positive customer word-of-mouth (Choudhury, 2014). Due to lower labour costs, several firms have made strategic decisions to outsource their call centres. A knowledgeable agent can quickly resolve a customer’s technical problems, while an incompetent agent will likely exacerbate the customer’s problem, leading to frustration, dissatisfaction, complaint(s), and almost certainly reduce the likelihood of the customer’s future use of the system (Ren & Zhou, 2008; Ye et al., 2014).
7. Conclusion

Retaining users and attracting potential adopters of m-banking becomes important for service providers. Combining the DeLone and McLean information systems success model and two cultural dimensions from Hall (1969), this research identified the drivers that affect use and user satisfaction with the moderating effects of culture and its influence on individual performance.

System quality, information quality, and user satisfaction play important roles in m-banking use. Our results reveal the considerable effect of system quality, information quality, service quality, and use on m-banking user satisfaction. The results point to a significant effect of use and users’ satisfaction on m-banking individual performance, and the importance of the moderating effect of time perception over use and user satisfaction to individual performance. In addition, this research empirically demonstrates the importance of including a culture dimension, which may help service providers to segment m-banking users and develop different strategies.

This study has several limitations that should be taken into consideration when generalizing its findings. First, we focused on m-banking users from a Southern European country. In order to enhance generalization, future research can examine other regions or countries. Second, we applied this study to the m-banking context. Other technologies or services could produce different results. Third, we applied two cultural dimensions in our model. There are several cultural dimensions, such as masculinity–femininity, uncertainty avoidance, individualism–collectivism, and many others that may provide other insights on m-banking users. Fourth, by measuring different quality parameters we would have been able to explore other unique features of m-banking. It would be difficult to extend the results of this study to all of m-banking services without additional empirical studies. Finally, the study focused on the m-banking individual performance, but some items of cultural dimensions cover specific situation (e.g. e-mail and searching behaviour). Measurement of other specific situations may affect users' beliefs about m-banking.
References


http://mc.manuscriptcentral.com/intr


Hall, E. T. (1976), Beyond culture, Anchor Books, Garden City, CA.


**Appendix**

**Appendix A – Items**

<table>
<thead>
<tr>
<th>Constructs</th>
<th>Items</th>
<th>Adapted from</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System quality</strong></td>
<td>SYSQ1 – M-banking is easy to navigate</td>
<td>(Urbach et al., 2010)</td>
</tr>
<tr>
<td></td>
<td>SYSQ2 – M-banking allows me to easily find the information I am looking for</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSQ3 – M-banking is well structured</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSQ4 – M-banking is easy to use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSQ5 – M-banking offers appropriate functionality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SYSQ6 – M-banking offers comfortable access to all the business applications</td>
<td></td>
</tr>
<tr>
<td><strong>Information quality</strong></td>
<td>INFOQ1 - The information provided by m-banking is useful</td>
<td>(Urbach et al., 2010)</td>
</tr>
<tr>
<td></td>
<td>INFOQ2 - The information provided by m-banking is understandable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INFOQ3 - The information provided by m-banking is interesting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INFOQ4 - The information provided by m-banking is reliable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INFOQ5 - The information provided by m-banking is complete</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INFOQ6 - The information provided by m-banking is up-to-date</td>
<td></td>
</tr>
<tr>
<td><strong>Service quality</strong></td>
<td>SERQ1 - The responsible service personnel are always highly willing to help whenever I need support with the m-banking</td>
<td>(Urbach et al., 2010)</td>
</tr>
<tr>
<td></td>
<td>SERQ2 - The responsible service personnel provide personal attention when I experience problems with the m-banking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERQ3 - The responsible service personnel provide services related to the m-banking at the promised time</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SERQ4 - The responsible service personnel have sufficient knowledge to answer my questions regarding the m-banking</td>
<td></td>
</tr>
<tr>
<td><strong>Use</strong></td>
<td>USE1 - I use m-banking</td>
<td>(Zhou et al., 2010)</td>
</tr>
<tr>
<td></td>
<td>USE2 - I use m-banking to manage my accounts</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USE3 - I use m-banking to make transfers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>USE4 - I subscribe to financial products that are exclusive to m-banking</td>
<td></td>
</tr>
<tr>
<td><strong>User satisfaction</strong></td>
<td>US1 - I am satisfied that m-banking meets my knowledge or information processing needs</td>
<td>(Wu &amp; Wang, 2006)</td>
</tr>
<tr>
<td></td>
<td>US2 - I am satisfied with m-banking efficiency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>US3 - I am satisfied with m-banking effectiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>US4 - Overall, I am satisfied with m-banking</td>
<td></td>
</tr>
<tr>
<td><strong>Individual performance</strong></td>
<td>IP1: The m-banking enables me to accomplish tasks more quickly</td>
<td>(Urbach et al., 2010)</td>
</tr>
<tr>
<td></td>
<td>IP2: The m-banking makes it easier to accomplish tasks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IP3: The m-banking is useful for my job</td>
<td></td>
</tr>
<tr>
<td><strong>Time perception</strong></td>
<td>TP1: When I use the m-banking, I only use the services I planned to use beforehand.</td>
<td>(Lee et al., 2007)</td>
</tr>
<tr>
<td></td>
<td>TP2: Before connecting to the m-banking, I usually decide which service I am going to use.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TP3: When I search for information on the m-banking, I search for one piece at a time.</td>
<td></td>
</tr>
<tr>
<td><strong>Context</strong></td>
<td>CT1: When using m-banking, I prefer to see symbolic information in the form of pictures or drawings, instead of detailed information in text form.</td>
<td>(Lee et al., 2007)</td>
</tr>
<tr>
<td></td>
<td>CT2: When I use e-mail or a chat room, I prefer indirect expressions (e.g., emoticons) to direct expressions (e.g., text).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CT3: When I am searching for information, symbolic iconic representation is more convenient than detailed textual information.</td>
<td></td>
</tr>
</tbody>
</table>
Understanding mobile banking individual performance: The DeLone & McLean model and the moderating effects of individual culture

We thank the reviewers for the constructive and insightful comments and suggestions to improve the quality of our paper. The paper has been significantly revised to address the concerns. We detail the revisions below.

Reviewer 1

Comments: I treat the revised version as a significant improvement compared with the initial submission. The authors have taken both reviewers' comments/queries seriously when revising this paper. They have addressed nearly all perspectives raised from the reviewer. However, there are still some problems as listed below:

Authors: Thank you. Your comments have helped us enormously in improving the paper. We provide details of the changes for each of the suggestions below.

Comments: 1. The reviewer is still not satisfied with the author's feedback on my comment 4: the D&M model has been tested in so many different contexts in IS research, and it is still necessary to test the independent variables in the current model. The point is that the research model should be based on the theoretical needs, instead of testing the whole set of the variables verified by prior researchers. More justifications are needed for this part.

Authors: Thank you. We agree with the reviewer that additional justifications are needed based on theoretical needs that were not provided. To address this concern, quoting DeLone & McLean (2003) from 1993 to mid-2002, nearly 300 articles had referenced and cited the DeLone and McLean model in refereed journals and research from past literature on information system success. However, as DeLone & McLean (1992, p. 88) argued ‘this success model clearly needs further development and validation before it could serve as a basis for the selection of appropriate IS measures’. In order to address our research models needs, we added the following sentence before hypotheses H1a/H1b in Section 3 (Research Model):

“System quality of m-banking can be regarded as the degree to which a system assists an individual in performing his or her portfolio of tasks. Poor system quality can frustrate the users' experience as it increases their difficulty of using m-banking and cannot lead to users' satisfaction over m-banking services.”

The following sentence was added before of hypotheses H2a/H2b in Section 3 (Research Model):

“It is expected that information quality of m-banking should contain useful and updated information for the user. Weak information quality can frustrate the users' experience as the need to spend much effort in the search for information would affect the level of users' satisfaction.”

The following sentence was added before of hypotheses H3a/H3b in Section 3 (Research Model):

“Providing high quality service and ensuring user satisfaction are widely recognized as important dimensions that lead to the continued use and success of the service. In an empirical study of the banking industry, Marinkovic & Obrodovic (2015) found that service quality significantly influences users’ satisfaction and its influence on customers’ emotional reactions. Poor service quality can frustrate the users' trust and decrease users' perceived satisfaction over m-banking services. Based on that, it is expected that the m-banking service provider should offer overall quality support related to
the youngest channel in the financial industry, which will positively influence the use and user satisfaction."

We added the following sentence at the end of the 1st paragraph of Section 6.1 (Theoretical Implications):

“System quality, information quality, and service quality are important determinants for m-banking users’ trust in conducting financial transactions (Lee & Chung, 2009). Understanding how the quality of m-banking service affects usage and user satisfaction becomes an important issue. As mentioned earlier, by testing mutual influence between use and user satisfaction, the matching point between the two models is that this study finds that three quality factors have significant effects on user satisfaction, and that this is the main enabler for customers to use m-banking.”

Comments: 2. In my comment 9, though the authors have explained why m-banking is related to high context culture, however, they didn’t clearly define what is a "high-context" in this part. Please further explain in this section.

Authors: Thank you. In order to address your suggestion to define “high-context”, we added the following sentences in the beginning of the last paragraph of Section 3 (Research Model):

“Hall defines high-context as the “feature pre-programmed information that is in the receiver and in the setting, with only minimal information in the transmitted message” and low-context “is the reverse” (Hall, 1976). People in low-context cultures tend to prefer information that is communicated primarily through language and rules are explicitly spelled out. High-context culture is generally characterized by people who prefer face-to-face meetings because it is easier to identify the contextual aspects than with written communication.”

Comments: 3. Some grammar issues still exist in this version. For example, on page 3, first line: Hall (1976) context and time perception dimension was successfully applied to...; page 13, High-context users found implicit information easy to use, and they think it an effective way to...

Authors: Thank you for your correction, we rewrote the following sentences in the new version of the manuscript to:

“Hall’s (1976) context and time perception dimensions were successfully adopted to study the effect of customer behaviour in e-commerce adoption (Gong, 2009), and helping designers of mobile data services to develop strategies for new services (Choi et al., 2005).”

“High-context users found implicit information easy to use, and they think it is an effective way to convey information.”

Additional Questions:

Comments: 1. Originality: Yes. The authors have changed a large portion of the content based on the reviewer's comments.

Authors: We are thankful that you considered the authors’ changes significant. The reviewer’s comments strengthened our justifications.

Comments: 2. Relationship to Literature: Yes, adequate now.

Authors: We appreciate knowing that the relationship to literature section is adequate.

Comments: 3. Methodology: The methodology is appropriate.
**Authors:** Thank you for finding that our methodology section is appropriate.

*Comments:* 4. Results: Clearly presented.

**Authors:** We appreciate knowing that the results section is clearly presented.

*Comments:* 5. Implications for research, practice and/or society: Adequately addressed.

**Authors:** Thank you for finding our study implications to be adequate.

*Comments:* 6. Quality of Communication: Still have area for improvement.

**Authors:** Thank you. Recommendation followed.

---

**Reviewer 2**

*Comments:* I think the authors have justified majority of my previous concerns in this revision. The paper has improved a lot in the argument of theoretical contribution. The authors have leveraged the features of m-banking to develop their research motivation as well as the hypotheses. I appreciate their effort in making the revision. I only have few remaining comments for their reference.

**Authors:** Thank you. The feedback was very useful in improving the overall quality of the paper. Detailed responses for each of the concerns are given below.

*Comments:* First, as for H8b and H9b, it predicts the negative moderation of monochromic inclination/high-context on the relationships between user satisfaction and individual performance. However, I can only find the explanation about the positive moderation in the related paragraphs. It is reasonable that people who prefer focusing on one task at a time will be more comfortable with m-banking service so that they can complete the task more quickly. Similarly, people who like implicit information might perform better in m-banking context due to the feature of symbolic expressions. But why the effect of user satisfaction on individual performance will be negatively moderated by the culture factors? The authors need to further justify the reason, and moreover, try to explain the rationale clearly in the discussion part.

**Authors:** Thank you. In order to answer your question, we added the following sentences before of hypotheses H8a/H8b in Section 3 (Research Model):

> “People who like to perform multi-tasking will feel less satisfied because m-banking applications are far from offering this facility.”

We added the following sentences before the hypotheses H9a/H9b.

> “On the other hand, people who are willing to perform certain complex banking transactions on mobile devices will feel less satisfied due to the hardware limitations.”

Additionally, we added the following sentences in the last paragraph of Section 6 (Discussion).

> “The monochronic time perception was found to have a significant moderating effect on use and user satisfaction, supporting H8a, and H8b. Our results suggest that having a high value of time perception (monochronic inclination) means that the effect of use on individual performance will be stronger (based on
positive beta value), but on the other hand, the moderating effect of user satisfaction on the individual performance will be weaker (based on the negative beta value) (see Figure 3). In other words, the use of m-banking will gain power and user satisfaction will lose power in explaining the individual performance. If the m-banking users feel that service will enhance individual performance, the users will focus on task completion time. On the other hand, there are challenges associated with the corresponding device, such as small screen, uncooperative keypad, which will lead the user to focus on one task at a time, and to complete the banking task more quickly. While they perceive that focusing on one task at the time will complete the task more quickly, the results show that monochronic inclination scores (and based on the negative value) decrease the effect of user satisfaction on individual performance. This means that for individuals with high monochronic inclination, the importance of user satisfaction for explaining the individual performance is lower (see Figure 3). Finally, the context was not found to have a moderating effect on the relationship between use and user satisfaction to individual performance, and thus hypotheses H9a and H9b are not confirmed. These results suggest that the low significance of the relationship of implicit information is probably because the m-banking users do not consider it as an important feature for m-banking. The implications of the study to theory and practice are summarized below.

Figure 3. Moderators effects

Comments: Second, while I proposed the concern of the measurements in the previous review, it seems less possible to conduct another survey to modify the measures. I would suggest the authors to acknowledge the issue as one limitation. While the authors adopted the measures of system/information/service quality from previous literature, they did not develop or include any unique features of m-banking in the measurements so that they would not be able to evaluate the specific effects directly. In addition, the two culture factors were measured very differently. The items of context cover different situations (m-banking, e-mail, and searching behavior). This construct was treated more like a trait for each person, while the items of time perception are designed specific to m-banking context.

Authors: Thank you. In order to address your suggestion to include limitations of the study, we added the following sentences at the end of the last paragraph in Section 7 (Conclusion):

“Fourth, by measuring different quality parameters we would have been able to explore other unique features of m-banking. It would be difficult to extend the results of this study to all of m-banking services without additional empirical studies. Finally, the study focused on the m-banking individual performance, but some items of cultural dimensions cover specific situation (e.g. e-mail and searching behaviour). Measurement of other specific situations may affect users’ beliefs about m-banking.”

All in all, I believe this paper is qualified to be published on Internet Research.
Authors: Thank you for the constructive feedback, and recognizing that the paper is qualified to be published in Internet Research.

Additional Questions:
Comments: 1. Originality: Yes. The paper has improved in its theoretical arguments by highlighting the features of m-banking and culture issues.

Authors: We are grateful for your kind consideration.

Comments: 2. Relationship to Literature: The authors conducted good literature review.

Authors: We are thankful that you considered the relationship to literature section good.

Comments: 3. Methodology: Yes. The methods are appropriate.

Authors: Thank you for finding our study methodology to be appropriate.

Comments: 4. Results: Yes. The results are well presented.

Authors: We appreciate knowing that the results section is appropriate and clearly presented.

Comments: 5. Implications for research, practice and/or society: Yes. The discussion and implications are well justified.

Authors: We are grateful for your kind consideration.

Comments: 6. Quality of Communication: Yes

Authors: We are grateful for your kind consideration.

=================================================================================================
References
=================================================================================================


Hall, E. T. (1976), Beyond culture, Anchor Books, Garden City, CA.
