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Does culture influence m-banking use and individual performance?

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Highlights

- Task and technology characteristics impact task-technology fit (TTF)
- TTF and use are important precedents of individual performance
- The moderating effect of individualism over TTF to use
- The moderating effect of uncertainty avoidance over TTF to individual performance

Abstract

We show evidence on the influence of culture on m-banking use and individual performance, by using a combination of the task-technology fit (TTF) model and two of Hofstede's cross-cultural dimension scales: uncertainty avoidance and individualism. On the basis of a sample of 204 m-banking users, we show that individualism moderates the relationship between TTF and use, and uncertainty avoidance moderates the relationship between TTF and individual performance. The remaining constructs, which represent the core of the TTF model, can still empirically explain TTF, use, and

individual performance of m-banking. Strategies grounded in these factors are suggested for m-banking service providers to better attract and retain users.

Keywords: M-banking; task-technology fit (TTF); individualism; uncertainty avoidance.

1. Introduction

In the last decade, the use of mobile devices and their applications have seen exponential growth in popularity. The vastness of products, services, and functionalities carried out on mobile devices cannot be strategically ignored [1–3]. The use of mobile banking (m-banking) in retail banking has become one of the most strategic channels to be used by bank customers. In the end of 2016, there were 7.4 billion mobile-cellular user subscriptions, and there are almost as many user subscriptions as people in the world [4]. The number of services and products offered for mobile platforms can go from a simple account balance inquiry to a more complex stock exchange transaction, available at anytime from anywhere [5]. The percentage of population using m-banking in Spain is 51%, which is comparable with 47% in the Eurozone, and 63% in the Netherlands, which is the highest value [6]. To enhance usage and retain m-banking users, this research intends to study the cultural usage behavior and its strategic implications to service providers.

Culture plays an important role in information technology (IT) adoption and use. Many authors have sought to explain the culture influence of IT use (e.g., [7,8]), which may affect the use and successful implementation of IT [9]. Therefore, m-banking system features appropriate for one culture may not be suitable for others of a different culture. Cultural characteristics going far beyond country differences can exist within a country or a city [10], or even two people may have different cultural characteristics though living in the same place [11]. This paper studies the influence of culture on m-banking use by individuals. We focus on a Southern European country using an online survey to collect the data. It may be revealing to include the culture dimension with other models. Indeed, the culture dimension has important moderating effects for behavioral intention to adopt m-banking [12]. Hofstede's (1980) uncertainty avoidance and individualism dimensions were successfully adopted to study the effect of customer postadoption of mobile internet in three different countries [13] and help designers of mobile data services to develop strategies for new services [14]. On the basis of these examples, we apply Hofstede's model, specifically in the uncertainty avoidance and individualism dimensions. The main reason for choosing two dimensions is to deal with the issues of system design and user behavior for specific applications of mobile devices such as m-banking, and the relationship with postadoption stage such as individual performance. In this paper, we analyze the m-banking individual performance, considering the consequence of use and task-technology fit (TTF)

and how different national characteristics of the users reflect on the development of m-banking services.

The motivation for this study is to gain a better understanding of the drivers of m-banking individual performance as a benefit for the user. While the most common demand-side determinants of m-banking are addressed in adoption models, this research focuses on the postadoption phase, more specifically the individual performance. In their recent literature review of m-banking research, Shaikh and Karjaluoto [15] report 55 studies (between 2005 and 2014) associated with different kinds of motivations that influence potential adopters of m-banking. One of the major factors that influences the growing popularity of ways of living and working that are facilitated by m-banking is the convenience and availability of the service [16]. Understanding the convenience and availability as a benefit for the user may offer more efficient and effective ways of performing banking transactions. Sink and Tuttle [17] relate performance to the combination of effectiveness and efficiency. For them, effectiveness is "doing the right things", whereas efficiency is "doing things right." Performing banking tasks at a high level of proficiency or ease can be a source of performance. Poor accomplishment and outright failure in achieving one's goals might be a source of dissatisfaction or even general feelings of shame [18].

Understanding postadoption may help to increase retention of m-banking users and decrease attrition effects [19,20]. Our main goals are to (a) retain m-banking users and to link use and individual performance and (b) provide some specific strategic measures for service providers to retain users. In this paper, we study the relationship between TTF and use of m-banking and test the effect of culture on m-banking use and individual performance. The theoretical support for this study is based on the TTF theory [21] and Hofstede's (1980) cultural dimensions of uncertainty avoidance and individualism.

The contributions of this work are threefold. First, we identify how fit of task and technology influence m-banking use. Extensive research has been undertaken to understand the determinants of m-banking adoption. This study helps us to characterize the development of this research stream and shows where it is today. On the basis of that, we provide further insights on the drivers of effective use of m-banking. Second, we show the importance of individual performance in the m-banking context. Performing banking tasks at a high level could enhance time saving and reduce effort and can be a source of individual performance. Finally, but perhaps most importantly, we investigate the cultural characteristics that moderate m-banking use and individual performance. Studying the cultural relationship with use and m-banking users may explain their beliefs and behaviors toward m-banking.

Section 2 presents the m-banking concept, explains the TTF model and cultural theory, and formulates the study hypotheses. Thereafter, we describe the methodology and results and present the analysis. Finally, the last section discusses conclusions, limitations, and possible further research directions.

2. Literature Review and Hypotheses

2.1 M-banking concept

Today, one of the most widely accepted mode of performing banking activities by customers is by using a mobile device. M-banking is a service or product offered by financial institutions that makes use of portable technologies [15]. Accessing account information, paying bills, transferring funds, and other services by mobile devices are not exclusive to progressive financial institutions [22]. Accessing and interacting with banking accounts at any time, from anywhere, have become the most common actions in m-banking. Mobile applications become more and more user friendly, and the number of available m-banking functions is expanded further (e.g., recently, interactions with smartwatch).

There are several features that highlight m-banking service. For financial institutions that develop and promote this service, it allows cost savings compared to the traditional storefront banking [23]. M-banking enables cross-selling and up-selling products in wide-ranging market coverage. Different products can be offered to different customer segments, thus enabling customer relationships and bringing multiple benefits to financial institutions. For customers who habitually carry a mobile device for accessing bank accounts anywhere, 24 hours per day, and 7 days a week, m-banking has a tremendous advantage over other channels such as internet banking, automated teller machines, telephone contact, and branch banking.

2.2 Task-technology fit model and Hypotheses

Adoption models have dominated m-banking research in recent years. Several literature reviews of m-banking studies (e.g., Shaikh and Karjaluoto [15], Hoehle *et al.* [24], and Dewan [25]) report motivations, attitudes, behavioral intention, social systems, and associations that have influenced potential m-banking adopters. On the basis of that and to the best of our knowledge, there are no m-banking studies that focus on the postadoption stage. Motivated by this research gap, we provide further insights on individual performance at the postadoption phase. Furthermore, the growing body of research on m-banking shows that there is no sign of research saturation [26]. On the basis of that,

instead of presenting another investigation analyzing other drivers of m-banking adoption, we believe that it may be more valuable to focus on retaining users instead of thinking about potential adopters.

Figure 1 illustrates our proposed model for this study. We focus this research on use and individual performance, investigating the individual performance as a source of efficiency and effectiveness in performing banking tasks. Performing banking tasks more quickly and avoiding mistakes could be a source of individual performance [27]. To enhance the current understanding of m-banking use and individual performance, we apply the TTF theory, defined as *"the degree to which a technology assists an individual in performing his or her portfolio of tasks"* [21]. Goodhue and Thompson [21] suggest that individual performance is a consequence of the use and the better fit between the technology and task it supports, which is an essential subject in the m-banking service. The following list summarizes the meaning of TTF model dimensions:

- Task characteristics – are broadly defined as the actions carried out by individuals in turning inputs into outputs. These characteristics can vary in several dimensions, such as task nonroutineness, task interdependence, and time criticality. Furthermore, it seems reasonable to assume that the better the match between m-banking and the portfolio of banking tasks, the greater will be the use of the service.
- Technology characteristics – are viewed as tools used by individuals in carrying out their tasks. M-banking technology characteristics make the technology attractive to users and allow performing tasks such as accessing account balances, paying bills, transferring funds, and other financial services.
- Task technology fit – is the degree to which a technology assists an individual in performing his or her tasks. A high degree of TTF will promote the use of m-banking, while a low degree of fit will decrease user intention to adopt m-banking. When the users feel that technology can support the task at hand, they show good individual performance.
- Use – is the behavior of employing the technology in completing tasks. There are several applications, solutions, and products available for mobile devices that make this a valuable platform for users who expect benefits of anywhere-at-anytime connectivity.
- Performance impact – relates to the accomplishment of a portfolio of tasks by an individual. In the m-banking context, it is the ability to carry out banking transactions with the least expenditure of time and effort, thereby enhancing the well-being of users.

Many studies have used and supported the validity of the TTF model, such as knowledge management systems use [28], location-based services [29], use of IT [30], use of mobile commerce in the insurance industry [31], mobile work support [32], and performance impact using learning

management systems [33]. The TTF model can combine with other models such as the technology acceptance model (TAM) to explain users' intentions to use wireless technology in organizations [34], the unified theory of acceptance and use of technology (UTAUT) to explain user adoption of m-banking [35], and UTAUT combined with the initial trust model (ITM) to explain m-banking adoption [36].

Several studies applying TTF models are related to technology adoption, technology evaluation, impact on learning, and task performance and not to individual performance as initially suggested by Goodhue and Thompson [21], in postadoption phase. In this study, the individual performance refers to the consequences or a result of using m-banking. By carrying the mobile device everywhere, the customer using this channel will enjoy the availability of this service anytime/anywhere faster than any other channel. Taking this background into account, we propose to test the following hypotheses:

H1: Task characteristics of m-banking positively affect TTF.

H2: Technology characteristics of m-banking positively affect TTF.

H3: TTF positively affects the use of m-banking.

H4: TTF positively improves individual performance.

H5: Use of m-banking positively affects individual performance.

2.3 Cultural models

The word *"culture"* is derived from the Latin word *"cultura,"* from the verb *"colere,"* which means tending or cultivation. Culture is wide and multifaceted, and this may justify the abundance of definitions it has been given. For example, Kroeber and Kluckhohn [37] report 164 definitions of culture. Kluckhohn and Strodtbeck [38] list more than 300 definitions of culture. Despite the vastness of definitions of culture, the central idea is "the sum total of values, beliefs, perceptions, and customs that are shared by a society." Leidner and Kayworth [9] examine culture in the IS/IT context and compile a long list of value dimensions and levels including individual, group, organizational, and national, and the potential influence of the successful implementation and use of IS/IT.

Because understanding individual-difference cultural characteristics is a bona fide issue to study, we propose the investigation of the moderating effect of culture over use and individual performance. One of the most well-grounded theories applied to the IS/IT field was developed by Hofstede. Leidner and Kayworth [9] report that over 60% of IS/IT research examined utilized one or more of Hofstede's culture dimensions. Table 1 presents the description of five of Hofstede's national culture dimensions. On the basis of the successful application of Hofstede's culture dimensions, we adopt two of them: uncertainty avoidance and individualism. There are four main reasons why we

select these. First, the dimension proposed by Hofstede is a well-established theory. Second, many researchers have empirically tested the validity (e.g., [12,13]). Hofstede's culture dimensions have been applied to the m-banking adoption context [12], and in this research, we test the culture influence on the postadoption phase of m-banking, which has not yet been tested. Third, in their literature review of application of Hofstede's culture dimensions in IT adoption and use, Leidner and Kayworth [9] find that the most applied dimensions were uncertainty avoidance and individualism-collectivism. The main reason is that uncertainty avoidance plays a strong role in how people will use or not use the IT, which means the adoption of IT includes some stress and risk. At the same time, for people with high propensity to individualism, the social behavior addresses their personal interest, whereas for people with high propensity to collectivist culture, the main influence of social behavior addresses the group or collective interest [39]. Finally, there are some studies that have successfully applied these two Hofstede's culture dimensions (e.g., [13]).

The selection of the most appropriate and relevant cultural dimensions to answer the research questions is undoubtedly the most important challenge. For example, a scholar may be interested only in issues that affect personal behavior and may wish to exclude dimensions related to the workplace behavior. The selection of relevant dimensions that distinguish culture/personality is quite a difficult task. On the other hand, a single model will hardly explain all the complex phenomena of culture [40]. The model presented here differs from traditional m-banking adoption research in that it focuses on use and individual performance combining individual culture differences. We posit that individual culture differences influence and moderate use and individual performance.

2.3.1 Individualism

Individualism is defined as *"ties between individuals are loose: everyone is expected to look after himself or herself and his or her immediate family"* [41]. This means that individuals do things in their own best interests. People with a greater propensity for individualism may tend to use mobile Internet services that will showcase their personality and are more likely to focus on personalized objectives [42]. Collectivism is a cultural value that indicates a preference for a tightly knit social framework in which people view the group as the primary entity. It sees the group as the important element and individuals as just members of the group. From this, we believe that m-banking users with high individualistic propensity will negatively influence the use of m-banking and that this will consequently impact the individual performance. Therefore, we propose the following:

H3a: Individualism moderates the effects of TTF on use, such that the effects are weaker among users with greater individualism.

H4a: Individualism moderates the effects of TTF on individual performance, such that the effects are weaker among users with greater individualism.

H5a: Individualism moderates the effects of use on individual performance, such that the effects are weaker among users with greater individualism.

2.3.2 Uncertainty avoidance

Uncertainty avoidance is defined as *"the extent to which the members of a culture feel threatened by uncertain or unknown situations"* [41]. People with high uncertainty avoidance perceive novel or ambiguous phenomena as threats. According to Hofstede [43], high uncertainty avoidance culture is characterized by treating unstructured situations as novel, and in which people dislike the unknown situations and seek security. Uncertainty avoidance affects the usage of mobile Internet services [42]. New technologies and IT innovations bring with them some level of risk (uncertainty) that may be less acceptable to these types of cultures. They try to avoid ambiguous situations by feeling that a new technology is more difficult to use, because of the uncertainty related to making mistakes, etc. In contrast, people who exhibit low uncertainty avoidance and deal well with uncertainty are more likely to consider taking some risks. On the basis of that, users with high uncertainty avoidance play an important role in m-banking use and individual performance. Thus, we hypothesize the following:

H3b: Uncertainty avoidance moderates the effects of TTF on use, such that the effects are weaker among users with greater uncertainty avoidance.

H4b: Uncertainty avoidance moderates the effects of TTF on individual performance, such that the effects are weaker among users with greater uncertainty avoidance.

H5b: Uncertainty avoidance moderates the effects of use on individual performance, such that the effects are weaker among users with greater uncertainty avoidance.

3. Methodology

We collected data using a questionnaire directed to m-banking users on a popular survey website. The questionnaire was first developed in English and reviewed for content validity. We translated the English questionnaire to Portuguese and then back to English to ensure translation consistency [44]. All measurement items (see Table 2) were adapted from Zhou *et al.* [35], Lin and Huang [28], Goodhue and Thompson [21], and Lee *et al.* [13], with slight modifications. Most items were measured using a numerical scale ranging from strongly disagree (1) to strongly agree (7). The data were collected in a Southern European country between November 2014 and February 2015. A total of 720 e-mails were sent in November 2014 to m-banking users with an introduction letter, which

explains the purpose and procedures of the study. The survey was accessed 315 times. Because of incompleteness, 111 responses were removed, thus leaving 204 valid and complete responses.

Our demographic analysis indicated that of the 204 respondents, 58% are men. Regarding age, 51 (25%) of the respondents are below 30 years, 90 (44%) of the respondents are between 30 and 40 years, and the rest (63 respondents) are above 40 years. Concerning m-banking usage frequency in a month, 63% use it over 10 times a month, and 15% of the users use it 6–10 times a month, and the rest use it fewer than 6 times a month.

To test for common method bias, we applied Harman's one factor test [45]. No significant common method bias was found in our dataset. We also used the marker variable technique [46,47] to test for common method bias. We asked the m-banking users about their "knowledge level with the topic of this study" as marker variable, which is not theoretically associated with other variables in our study, obtaining 0.0034 (0.34%) as the maximum shared variance with other variables. On the basis of that, we found low and nonsignificant correlations between the marker variable (i.e., the knowledge level with the topic of this study) and other individual-level and group-level variables with potential common method bias. These results support the discriminant validity between the study variables and the marker variable.

4. Data analysis and results

The data analysis was carried out using partial least squares structural equation modeling (PLS-SEM) [48] supported on the software SmartPLS 2.0 M3 [49]. The measurement model's strength is revealed in the evaluation of (i) convergent and (ii) discriminant validity [48]. (i) The convergent validity refers to three factors: reliability of questions, composite reliability (CR) of constructs, and average variance extracted (AVE) by constructs [50]. (ii) 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) [50]. Second, to ensure the discriminant validity, the loadings should be greater than cross loadings [51–53].

Tables 3 and 4 present the measurement model results. The CR values were greater than 0.8, thus indicating that the model has a satisfactory internal consistency. Factor loadings should be at least 0.6 and preferably greater than 0.7 [51]. For this reason and to meet cross loading criteria, item USE4 was excluded from our PLS model estimation. After the exclusion, we found that no indicator has loadings (in bold) with values lower than their cross loadings (please see Table 4). The AVE was used to test convergent validity, and it was above the cut-off of 0.50 [48,54]. Additionally, the square

root of AVE (in bold) was higher than the correlation between constructs. In short, the measurement model measures were met, and consequently, the constructs developed can be used to assess the conceptual model and its hypotheses.

Figure 2 shows the path coefficients and t-statistics derived from bootstrapping with 5,000 resamples and the R^2 values. 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 [48].

The model explains 61.4% of the variation in TTF. The task characteristics ($\hat{\beta}$ = .196, p<.01) and technology characteristics ($\hat{\beta}$ = .676, p<.01) are statistically significant in explaining TTF, thus confirming hypotheses H1 and H2. The model explains 54.5% of the variation in m-banking use, which is explained by TTF ($\hat{\beta}$=.808, p<.01), providing support for H3. Finally, 71.9% of the variation in individual performance is explained by TTF ($\hat{\beta}$=.148, p<.05) and m-banking use ($\hat{\beta}$=.613, p<.01), providing support for H4 and H5, respectively. Regarding the cultural moderators, our results show that of the six hypotheses, only two (H3a and H4b) are supported, and the paths are negative. For hypothesis H3a, because $\hat{\beta}$= -.844 and p<.01, the high value of individualism traits weakens the effect of TTF on m-banking use. For hypothesis H4b, because of the negative beta value ($\hat{\beta}$= -.142, p<.10), the high value of uncertainty avoidance will be weaker in the relationship between TTF and individual performance.

5. Discussion

The main objective of the present study is to provide an explanation of the influence of culture in m-banking use and individual performance. To the best of our knowledge, this is the first empirical research that investigates TTF considering the moderating effect of individualism and uncertainty avoidance over m-banking use and individual performance. As indicated in Figure 2, our research model accounts for 61.4% of the variation in TTF, thus supporting H1 and H2. These results demonstrate that both task characteristics and technology characteristics strongly affect TTF. This is in line with earlier research on the impact of TTF [55]. The research model explains 54.4% of the variation in use, supporting H3. Our results suggest that TTF has the strongest direct and positive impact on m-banking usage. This finding is consistent with earlier findings from similar studies [35]. The research model explains 71.9% of the variation in individual performance, which presents a stronger predictive power [51]. The use of m-banking and TTF was found to significantly and

positively affect individual performance, thus supporting H4 and H5. The results show that TTF and usage positively influence the individual performance and are also consistent with the literature [33,56].

We decided to test individualism because of its negative association with the use of mobile Internet services [42]. Our results show that high individualism scores (and based on the negative value) decrease the effect of TTF on m-banking use. This means that for individuals with low individualism, the importance of TTF is greater; for individuals with high individualism, the importance of TTF in explaining m-banking use is lower (see Figure 3). The uncertainty avoidance moderator is statistically significant between the path TTF and individual performance. Because of the negative beta value for m-banking users with high uncertainty avoidance propensity, the effects of TTF and individual performance will be weaker than for users with low uncertainty avoidance propensity (see Figure 3).

Figure 3 shows the impact of statistically significant moderators, the individualism over TTF to m-banking use, and uncertainty avoidance over TTF to individual performance. The individualism moderator suggests the major impact of TTF over use among people with low individualism. For users with high individualism, the TFF is not important in explaining the m-banking use. The uncertainty avoidance moderator suggests a major impact of high TTF on individual performance when the user has low uncertainty avoidance.

When the moderating effect of individualism and uncertainty avoidance is included in the model to predict use and individual performance, the variation of use is 54.5%, and the variation of individual performance is 71.9%. Without this moderating effect, the variation of use decreases to 46.4%, and the variation of individual performance decreases to 69.4%. Inclusion of the moderating effect in the model to predict use improves the variation of use by 8.1% and the variation of individual performance by 2.5%.

5.1 Theoretical Implications

Most empirical studies of m-banking seek to understand the factors and motivations that influence the adoption or behavior intention. In their m-banking literature review, Shaikh and Karjaluoto [15] report this fact. In this research, we focus on individual performance as a consequence of using IT/IS. Larsen's [57] taxonomy of information systems success antecedent (ISSA) identifies three main steps of dependent variable in ISSA research. These steps are implementation process, behavior and perceptions, and performance. According to this, and adapted to m-banking, step 1, known as (a)

adoption, corresponds to an initial stage of implementation of m-banking system — m-banking users tend to either adopt or not adopt the system; step 2 (b) intention to use, use, user satisfaction, acceptance, and continuance intention deal with perceptions and behavior related to the implemented system — after adopting the m-banking system, the user may tend to use it; and finally, step 3 (c) individual impact, dealing with technology performance. The term "performance" usually relates to effectiveness and productivity. We adopted this terminology to express in the m-banking context the efficiency and effectiveness in performing banking tasks. This paper contributes to the body of literature by understanding the drivers of individual performance in the m-banking context.

The TTF model was applied in combination with other models such as UTAUT [35] and UTAUT with ITM [36] to evaluate m-banking adoption. On the basis of this and despite its limitations, our research makes several contributions to the theory and practice of information systems. First, we applied the TTF model to evaluate use and individual performance, as sources of retention and reduction of attrition effects [19,20]. Understanding how to retain users and attract potential adopters has become a critical strategic issue to service providers [58,59]. Second, we combine cultural characteristics as a moderator of the path between TTF on use and on individual performance. We also test the cultural characteristics as a moderator of the path between use on individual performance. By combining the TTF model and culture dimensions, a new concept of culture TTF is formulated. This approach may provide other insights to m-banking developers and managers. Third, cultural differences go far across national borders or may be enclosed in the same region. Our model reveals that individualism had a negative statistically significant moderating effect on TTF over use of m-banking. The uncertainty avoidance inclination is a statistically significant moderator and had a negative effect on TTF over individual performance.

5.2 Practical Implications

There are practical implications of this study that are key for building solid relationships with m-banking users and service providers. These key strategies may engage customer loyalty and attract potential adopters to this channel. First, while the majority of m-banking studies focus on the adoption and behavior intention phase, this study focuses on postadoption and retention of m-banking users. Understanding the postadoption usage stage could help service providers to design strategies to deal with this group of m-banking users. Second, we find that TTF and use explain individual performance, which indicates that there are possible benefits associated with the banking tasks accomplished by using this channel. Understanding how m-banking enables users to conduct financial services in a more efficient and effective way, thereby offering many advantages for individuals, such as time savings and ease of performing banking transactions, may retain more m-banking users. Third,

understanding cultural characteristics could be significant in developing and managing the m-banking solutions. For instance, for people with a high tendency to individualism, service providers should offer personalized services such as bookmarks. For those with a high tendency to uncertainty avoidance, service providers should offer solutions that mitigate the risk of using m-banking, which could positively influence customers' sense of security and their willingness to adopt this service. From the Deloitte survey in January 2014 conducted in the US, 64% of respondents said that they were either extremely or very concerned about data security when using m-banking [60]. In addition, in the same report, 72% of consumers would appreciate the use of biometric identification (such as fingerprints or iris recognition) as a means of device authentication during financial services transactions, which would help to mitigate the uncertainty risk. Finally, considering these changes, and how they affect the fit of task and technology characteristics and the implications to m-banking use and individual performance, changing the strategies can make increase the appeal of this banking channel and boost the performance of its users.

6. Conclusion

To better understand the use and individual performance of m-banking, we propose a research model that combines the TTF model with two Hofstede's cross-cultural dimension scales (individualism and uncertainty avoidance). We tested the research model in a Southern European country. We find that individualism moderates the path between TTF and use, and uncertainty avoidance moderates the path between TTF and individual performance. The cultural relationship with usage and individual performance influences users' beliefs and behaviors. This presents a new challenge to any researcher who seeks to explain culture's impact on use and individual performance in the IS/IT field. Our results are confirmed with evidence that TTF explains the use of m-banking, and TTF and use explain approximately 72% of the variation in individual performance.

For any business that provides services or products to customers, attracting customers and retaining them are among the top priorities. M-banking has been one of the most strategic channel launches in retail banking in the last decade. Understanding the customer needs would help to retain and attract more m-banking users; for example, by mitigating the risk and offering more functionalities such as personalized services.

Our research has several limitations. One is the use of data from a Southern European country. Although this limits the generalizability, our findings can be the basis for future studies. Most empirical studies involving national culture focus on a comparison of data collected from more than one country, but this research is based on data collected from one country. The second limitation is that this study applied only two Hofstede's cultural dimensions, individualism and uncertainty

avoidance. Including other cultural dimensions could be interesting in future studies and could provide further insights on m-banking and its users. Despite this limitation of studying only two Hofstede's dimensions, we believe that the results of this study are valuable for other researchers and practitioners who are interested to study some of Hofstede's other dimensions.

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Biography

Brief biographical statements

Carlos Tam is Invited Assistant Professor at the NOVA Information Management School (NOVA IMS) and Senior Technician of Management Information with over 20 years' banking experience, 15 of which at a mobile and internet division. He holds a Ph.D. from NOVA IMS, Universidade Nova de Lisboa, in Information Management. His research interests include business intelligence, knowledge management, performance management, management information, and technology adoption.

Tiago Oliveira is Associate Professor at the NOVA Information Management School (NOVA IMS) and Coordinator of the degree in Information Management. His research interests include technology adoption, digital divide and privacy. He has published papers in several academic journals and conferences, including the *Information & Management, Decision Support Systems, Government Information Quarterly, Computers in Human Behavior, Journal of Business Research, Information Technology & People, Information Systems Frontiers, International Journal of Information Management, Journal of Global Information Management, Industrial Management & Data Systems, Computers in Industry, International Journal of Accounting Information Systems*, among others. Tiago has authored more than 100 scientific articles in Journals and conference proceedings. Tiago has more than 3500 citations (https://scholar.google.com/citations?user=RXwZPpoAAAAJ).

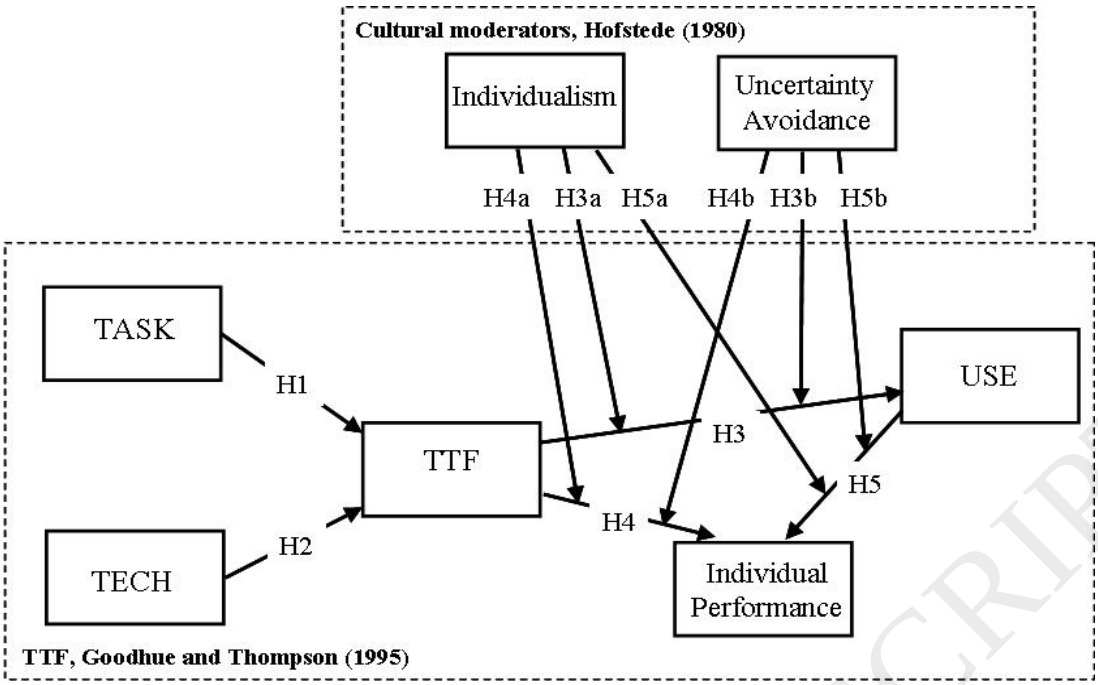

Figure 1. Research model

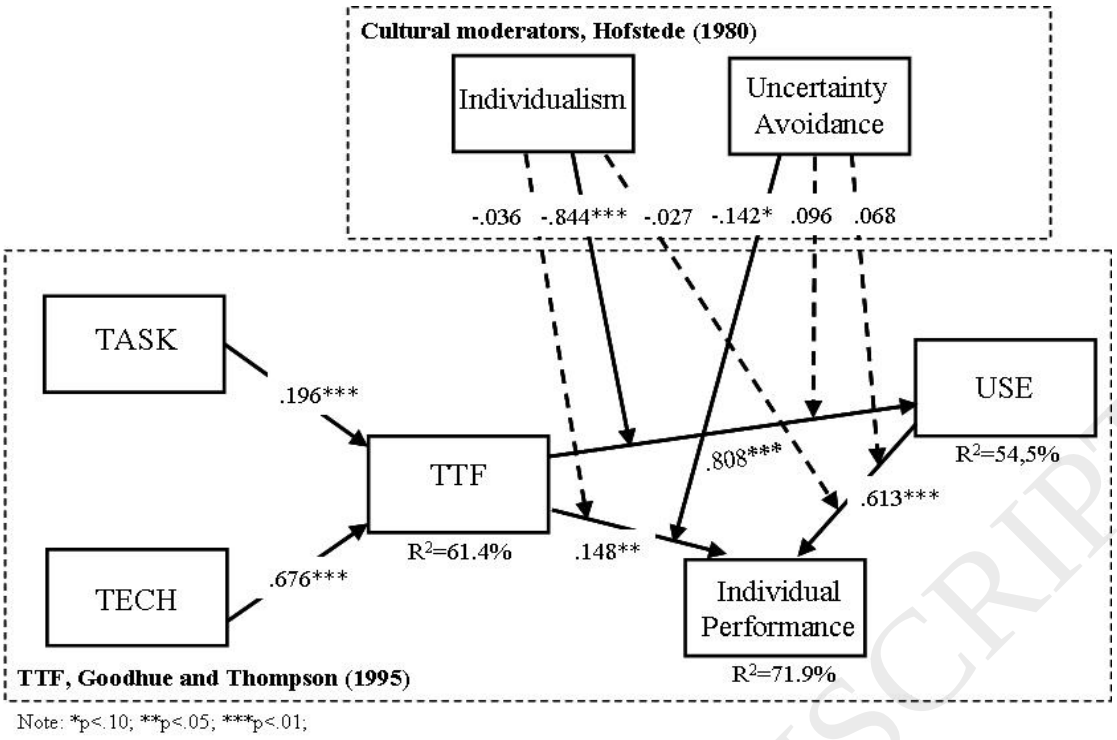

Figure 2. Structural model results

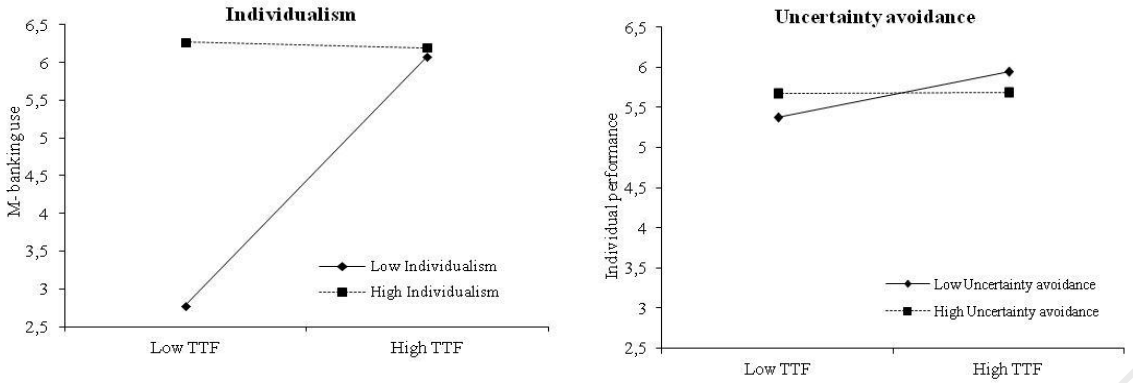

Figure 3. Moderator effects

Table 1. Hofstede's national culture dimension

Dimension	**Description**
Uncertainty Avoidance	The degree to which novel phenomena or ambiguities are perceived as threats.
Power Distance	The degree to which differences in power, status, and privileges are accepted in society and considered a "natural order."
Masculinity–Femininity	The distinction could be related to what motivates people, wanting to be the best (Masculine) or liking what one does (Feminine). It is related to gender roles.
Individualism/Collectivism	This is the degree to which people derive their identity primarily from being an individual ("I") versus being a member of social groups ("We").
Time orientation	Degree of how society prioritizes and deals with its own past with the challenges of the present and the future.

Table 2. Items

Constructs	**Items**	**Adapted from**
Task characteristics	TASK1 - I need to manage my accounts anytime anywhere TASK2 - I need to do transfer anytime anywhere TASK3 - I need to have a real time control in my accounts TASK4 - The financial instructions I give can't wait	[35]
Technology characteristics	TECH1 – M-banking provides ubiquitous services TECH2 – M-banking provides real time services TECH3 – M-banking provides a quick service TECH4 – M-banking provides secure services	[35]
Task technology fit	TTF1 – M-banking payment services are appropriate TTF2 – M-banking account management services are appropriate TTF3 - Real-time m-banking services are appropriate TTF4 - In general, m-banking services are enough	[28]
Use	USE1 - I often use m-banking USE2 - I use m-banking to manage my accounts USE3 - I use m-banking to make transfers USE4 - I subscribe to financial products that are exclusive to m-banking	[35]
Individual performance	IP1: The m-banking enables me to accomplish tasks more quickly IP2: The m-banking makes it easier to accomplish tasks	[21]
Individualism	ID1: I frequently use m-banking services that express my personality. ID2: I do not want to feel like an anonymous member of a group that uses an m-banking service. ID3: I frequently use m-banking services that can differentiate me from other people.	[13]
Uncertainty avoidance	UA1: I do not use m-banking content when I am unsure of its quality. UA2: I am bothered when an m-banking service does something strange. UA3: I am reluctant to use an m-banking service if the security of operations is compromised in any way.	[13]

Table 3. PLS Loadings and Cross Loadings

Constructs		**TASK**	**TECH**	**TTF**	**USE**	**IP**	**ID**	**UA**
Task characteristics (TASK)	TASK1	**.87**	.37	.39	.52	.46	.30	.06
	TASK2	**.91**	.44	.48	.58	.55	.30	.10
	TASK3	**.85**	.39	.45	.48	.45	.25	.13
	TASK4	**.80**	.32	.38	.44	.38	.22	.21
Technology characteristics (TECH)	TECH1	.40	**.90**	.70	.57	.60	.34	.06
	TECH2	.33	**.87**	.63	.42	.44	.25	.06
	TECH3	.37	**.91**	.67	.53	.60	.34	.09
	TECH4	.44	**.78**	.64	.57	.55	.36	-.02
Task technology fit (TTF)	TTF1	.49	.72	**.90**	.68	.68	.34	.14
	TTF2	.50	.71	**.94**	.66	.62	.39	.07
	TTF3	.47	.67	**.88**	.53	.52	.28	.14
	TTF4	.24	.54	**.76**	.49	.48	.24	.10
USE	USE1	.57	.60	.68	**.97**	.80	.41	.09
	USE2	.59	.59	.64	**.96**	.79	.40	.03
	USE3	.54	.56	.65	**.95**	.78	.40	.05
Individual performance (IP)	IP1	.55	.66	.64	.82	**.97**	.45	.07
	IP2	.49	.56	.65	.76	**.96**	.43	.09
Individualism (ID)	ID1	.35	.41	.41	.46	.50	**.94**	.14
	ID2	.02	.04	.05	.01	.05	**.60**	.07
	ID3	.16	.20	.17	.22	.24	**.76**	-.03
Uncertainty avoidance (UA)	UA1	.17	.02	.13	.02	.03	.13	**.71**
	UA2	.12	.06	.13	.07	.10	.11	**.95**
	UA3	.09	.05	.05	.02	.04	.00	**.77**

Table 4. Means, standard deviations, correlations, and reliability and validity measures of latent variables.

Constructs	**Mean**	**SD**	**CR**	**CA**	**TASK**	**TECH**	**TTF**	**USE**	**IP**	**ID**	**UA**
Task characteristics (TASK)	5.79	1.29	.92	.88	**.86**						
Technology characteristics (TECH)	5.73	1.09	.92	.89	.45	**.87**					
Task technology fit (TTF)	5.50	1.15	.93	.89	.50	.76	**.87**				
Use	5.33	1.96	.97	.96	.59	.61	.68	**.96**			
Individual performance (IP)	5.67	1.54	.96	.93	.54	.63	.67	.82	**.96**		
Individualism (ID)	3.69	1.58	.82	.75	.32	.38	.37	.43	.47	**.78**	
Uncertainty avoidance (UA)	5.16	1.62	.86	.78	.14	.06	.13	.06	.08	.10	**.82**