The relationships between electronic banking adoption and its antecedents: A meta-analytic study of the role of national culture

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\textbf{A B S T R A C T}

Prior studies fail to provide a clear understanding of the role that national culture plays in electronic banking acceptance. Therefore, we conduct a meta-analysis involving 62 samples from 27 countries or regions to explore how national cultural dimensions moderate the relationships between consumer behavioral intentions to use electronic banking and the constructs of performance expectancy, effort expectancy, social influence, perceived risk, and trust. The results showed that each of Hofstede’s national cultural dimensions has a moderating effect on some of the relationships. In particular, when considering using electronic banking, people pay more attention to social influence and trust in high power distance countries; focus more on performance expectancy, effort expectancy, and perceived risk in countries with high individualism; and care more about performance expectancy and trust in high uncertainty avoidance countries. We also discuss how to improve the strategies for boosting user adoption by incorporating cultural differences.

\textbf{1. Introduction}

Electronic banking reduces financial operating costs and offers consumers more convenience and easier accessibility (Hoehle, Scornavacca, & Huff, 2012; Montazemi & Qahri-Saremi, 2015). Despite these benefits, its rate of adoption varies considerably between countries (Takieddine & Sun, 2015). The varying rates of acceptance may be due to the diverse cultural values found in different countries (Warkentin, Charles-Pauvers, & Chau, 2015; Yuen, Yeow, & Lim, 2015; Zhao, Shen, & Collier, 2014). If this conjecture is true, cross-cultural differences may constitute a major impediment to banks seeking to expand their international markets (Khan, Hameed, & Khan, 2017). Recent studies have suggested the necessity of incorporating cultural dimensions to the technology adoption model (Chen, Hsieh, Van de Vliert, & Huang, 2015; Nistor, Lerche, Weinberger, Ceobanu, & Heymann, 2014; Zhang, Zhu, & Liu, 2012). Doing so would not only assist in investigating how national culture influences consumer behavior toward electronic banking adoption but also enable banks to provide efficient global services (Mortimer, Neale, Hasan, & Dunphy, 2015).

National culture plays a key role in technology adoption (Ashraf, Thongpapanl, & Auh, 2014; Lee, Trimi, & Kim, 2013), but only a few studies have explored the direct or moderating effects of culture on the constructs of electronic banking acceptance. Most of them included no more than three countries in their samples (e.g., Im, Hong, & Kang, 2011; Mortimer et al., 2015) and did not consider the specific effects of different cultural dimensions. Therefore, the results of previous studies have limited generalizability (Takieddine & Sun, 2015; Yuen et al., 2015). This limitation in the literature suggests that if banks want to improve the diffusion rate of electronic banking across countries, more research is warranted on the impact of national culture on electronic banking acceptance.

To address the limitations of the current literature, we conduct a meta-analysis of the relationships between consumer behavioral intentions to use electronic banking and its antecedents, and more importantly, test the moderating effects of national cultural dimensions on such relationships. By doing so, this study contributes to the literature in two ways. First, we extend the UTAUT model by providing a comprehensive theoretical explanation for the role of cultural values in determining consumer behavioral intentions toward using electronic banking. Prior studies simply used the monolithic concept of national culture to explain the differing results in electronic banking adoption across countries without explaining why. Our study outlines how each cultural dimension can moderate the relationships within the electronic banking acceptance model. Second, this is the first meta-analysis, to the best of our knowledge, which examines the moderating effects of...
national culture on the relationships between electronic banking adoption and its antecedents by using secondary data. Based on the data collected from 62 samples across 27 different countries or regions, the findings of our study add important and unique empirical evidence to the current literature.

2. Theoretical background

Several theoretical models have been used to explain technology adoption. These models include the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Theory of Planned Behavior (TPB), Innovation Diffusion Theory (IDT), Social Cognitive Theory (SCT), and the Unified Theory of Acceptance and Use of Technology Model (UTAUT).

Among these models, TAM has been one of the most widely used models (Dauda & Lee, 2015; Shaikh & Karjaluoto, 2015). However, it only incorporates two factors of technology adoption, namely perceived usefulness (PU) and perceived ease of use (PEOU), and not including any other external factors, which limits its ability to explain consumer behavior (Venkatesh, Morris, Davis, & Davis, 2003).

To address the limitations, Venkatesh et al. (2003) integrated eight prominent theories into one model – the Unified Theory of Acceptance and Use of Technology Model (UTAUT). The UTAUT model includes four key constructs: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC). The UTAUT model successfully explains 70% of the variance in behavioral intentions and is considered as the most comprehensive research model for predicting consumer behavior regarding information system acceptance such as electronic banking (Alwanan, Dwivedi, & Rana, 2017; Martins, Oliveira, & Popović, 2014).

Following Martins et al.’s (2014) suggestion, we use the UTAUT model as our overarching theoretical framework. Given that facilitating conditions (one of the four key constructs in the model) can predict only actual use of technology (Venkatesh et al., 2003), in our model we utilize the other three constructs – performance expectancy, effort expectancy, and social influence predictors. Moreover, we incorporate perceived risk and trust, two important antecedents of electronic banking adoption in the literature (Hoehle et al., 2012; Shaikh & Karjaluoto, 2015), into the UTAUT model in our study.

National culture was introduced to the literature to explain the variance of internet banking adoption across countries (see the recent internet banking diffusion percentage in Fig. 1). Building on UTAUT model, Yuen et al. (2015) examined the cross-cultural differences of Internet banking adoption in the United States and Malaysia, and found that global consumers have different internet banking adoption patterns. They further suggested that the UTAUT model should incorporate cultural dimensions.

Previous studies argued that culture played a key role in electronic banking adoption or resistance (Baptista & Oliveira, 2015; Elbadrawy & Aziz, 2011). However, the relevant literature is scarce (as shown in Table 1) and fails to provide clear hypotheses about how each of culture dimensions impacts the key constructs in electronic banking adoption.

3. Research model and hypotheses

In this study, we incorporate Hofstede’s cultural dimensions (i.e., individualism/collectivism, power distance, uncertainty avoidance, masculinity/femininity, and long-term orientation) into the extended UTAUT model, as shown in Fig. 2.

3.1. Power distance

Power distance (PDI) refers to the degree to which people in a society accept inequities in power distribution (Hofstede, 2011). In high power distance cultures, individuals often show respect for authority, which may affect their decision-making (Hofstede, 2011). Specifically, people from such cultures prefer to be told what to do, and rely more on opinions from reference groups (Daniels & Greguras, 2014). As such, people in these cultures are more likely to care about salient others’ comments before adopting new technologies (Lai, Wang, Li, & Hu, 2016; Lu, Yu, Liu, & Wei, 2017; Tarhini, Hone, Liu, & Tarhini, 2017). Therefore, it can be inferred that where there is high power distance, social influence has a stronger impact on consumer behavioral intentions to use electronic banking. Additionally, the incidence of opportunism is relatively high in such countries, implying that trust has a critical role in consumers’ decision-making, as it can reduce the possible opportunistic behavior of providers, especially in electronic markets (Hallikainen & Laukkanen, 2018). Regarding electronic banking, consumers do financial transactions in a virtual environment, leading to the importance of individuals’ trust in bank managers to protect their personal property and privacy (Alalwan et al., 2017; Hanafizadeh, Behboudi, Koshkarsay, & Tabar, 2014). Capece et al. (2013) reported in high power distance cultures, trust is a more important determinant of consumer behavioral intentions to use e-commerce, as people are less open to adopting innovation. Accordingly, we expect that the effect of trust on electronic banking adoption would become stronger in these cultures. Thus, we propose that:

H1a. The SI-BI relationship is stronger in cultures higher in power distance.
The TR-BI relationship is stronger in cultures higher in power distance. Contrarily, in low power distance cultures, individuals have more autonomy and are less worried about status (Hofstede, 2011). As such, in this context, individuals could exhibit innovative behaviors and adopt new ideas more freely than in high power distance cultures (Capece, Calabrese, Di Pillo, Costa, & Crisciotti, 2013). In particular, low power distance cultures would encourage individuals to be more curious about new technologies (Im et al., 2011). If they consider the new technology to be useful and easy, they will be more likely to accept it (Tarhini et al., 2017). Accordingly, we propose that people in low power distance cultures may give more weight to performance expectancy and effort expectancy of electronic banking. Moreover, people would be more concerned about the safety of electronic banking in low power distance cultures, because they often freely make decisions by themselves and may not recognize all of the potential threats (Yuen et al., 2015). We therefore expect that perceived risk would have more effect on hindering people from adopting electronic banking in low power distance cultures. Thus, we posit that:

**H1b.** The TR-BI relationship is stronger in cultures higher in power distance.

Contrarily, in low power distance cultures, individuals have more autonomy and are less worried about status (Hofstede, 2011). As such, in this context, individuals could exhibit innovative behaviors and adopt new ideas more freely than in high power distance cultures (Capece, Calabrese, Di Pillo, Costa, & Crisciotti, 2013). In particular, low power distance cultures would encourage individuals to be more curious about new technologies (Im et al., 2011). If they consider the new technology to be useful and easy, they will be more likely to accept it (Tarhini et al., 2017). Accordingly, we propose that people in low power distance cultures may give more weight to performance expectancy and effort expectancy of electronic banking. Moreover, people would be more concerned about the safety of electronic banking in low power distance cultures, because they often freely make decisions by themselves and may not recognize all of the potential threats (Yuen et al., 2015). We therefore expect that perceived risk would have more effect on hindering people from adopting electronic banking in low power distance cultures. Thus, we posit that:

**H1c.** The PE-BI relationship is stronger in cultures lower in power distance.

**H1d.** The EE-BI relationship is stronger in cultures lower in power distance.

**H1e.** The PR-BI relationship is stronger in cultures lower in power distance.

### 3.2. Individualism/collectivism

Individualism/collectivism (IDV) reflects the extent to which people prefer to take care of only themselves and their families. In highly individualistic cultures, individuals often make decisions independently and are more innovative (Hofstede, Hofstede, & Minkov, 2010; Park,
Jun, & Lee, 2015). They prefer to focus on the innovative characteristics (e.g., usefulness and ease of use) of new technologies rather than word of mouth and subjective norm when adopting new technology (Abbasi, Tarhini, Elyas, & Shah, 2015; Lee et al., 2013). As noted by Zheng et al. (2013), in individualistic countries, product or service quality, prices, and rates play crucial roles in driving consumers’ financial decision-making. Accordingly, we argue that people from countries with highly individualistic cultural would place more emphasis on the usefulness and easiness of electronic banking. Moreover, people from individualistic countries would be more worried about potential threats of new technologies, because they should bear the possible adverse consequences from their own decisions (Ashraf et al., 2014). Therefore, it can be inferred that individualistic people will be more influenced by perceived risk when making decisions on electronic banking adoption. Accordingly, we expect that the negative effect of perceived risk on electronic banking adoption would be stronger in cultures with high individualism. Based on the above, we expect that:

H2a. The PE-BI relationship is stronger in cultures higher in individualism.

H2b. The EE-BI relationship is stronger in cultures higher in individualism.

H2c. The PR-BI relationship is stronger in cultures higher in individualism.

Further, in collectivistic cultures, people often seek information from social networks due to their strong herd behavior preference (Luo, Wu, Shi, & Xu, 2014; Ng, 2013). Specifically, they give more consideration to views of others such as feedback from early adopters (Lee et al., 2013; Lu et al., 2017; Shiu, Walsh, Hassan, & Parry, 2015). For example, such consumers would be more likely to adopt electronic banking if familiar bank employees recommend it to them (Zheng, Ghoul, Guedhami, & Kwok, 2013). Lin’s (2014) study showed that subjective norms have a greater influence on behavioral intentions to adopt new technology in collectivistic cultures. Therefore, we posit that the positive relationship between social influence and electronic banking adoption would be stronger in more collectivistic cultures.

Relationship building is more important for people in collectivistic cultures (Magnusson, Peterson, & Westjohn, 2014; Zhou, Jin, Fang, & Vogel, 2015). People from collectivistic cultures prefer to establish long-term relationships with bank personnel to avoid switching costs (Farah, 2017). Because trust plays a critical role in building and maintaining relationships (Altinay, Saunders, & Wang, 2014; Hoorn, 2015), it should have a greater impact on people’s decision-making in collectivistic cultures (Lowry, Zhang, Zhou, & Fu, 2010; Shiu et al., 2015). Thus, we expect that trust has a greater effect on electronic banking adoption in more collectivistic cultures. Accordingly, we propose that:

H2d. The SI-BI relationship is stronger in cultures lower in individualism.

H2e. The TR-BI relationship is stronger in cultures lower in individualism.

3.3. Masculinity/femininity

Masculinity (MAS) represents a preference for achievement, heroism, assertiveness, and material rewards for success; femininity, on the other hand, stands for cooperation, modesty, and quality of life (Hofstede, 2011). Concerning the effect of masculinity/femininity on electronic banking adoption, performance expectancy is a key construct in the extended UTAUT model and is close to performance improvement and achievement, which are consistent with the masculine values (Tarhini et al., 2017). Prior research suggested perceived usefulness played a more important role in people’s decisions on adopting new technology in highly masculine cultures (Kaba & Osei-Bryson, 2013; Lin, 2014). As such, we expect that people from higher masculinity cultures would focus more on the performance expectancy of electronic banking. Thus, we posit that:

H3a. The PE-BI relationship is stronger in cultures higher in masculinity.

Conversely, effort expectancy reflects how much effort is required to use the technology, which is related to concerns about the quality of life (Srite & Karahanna, 2006). People from countries high in femininity might pay more attention to the availability of technologies as it influences the quality of their lives (Tarhini et al., 2017). In an e-commerce adoption study, Yoon (2009) suggested that perceived ease of use was a more crucial factor in decisions in feminine cultures than in masculine cultures. We, therefore, posit that the positive effect of effort expectancy on electronic banking adoption would be stronger in cultures low in masculinity.

In feminine cultures, people pursue stability and comfort of life (Hofstede, 2011), which drives them to be more sensitive to the uncertainty in new technology adoption (Lin, 2014). In contrast, individuals with more masculine attributes (e.g., assertiveness and competitiveness) would like to take more risks in their financial decision-making behaviors (Meier-Pesti & Penz, 2008). Therefore, we expect that people in highly feminine countries would be less likely to adopt electronic banking if they perceive a high risk of such behavior. Based on the above arguments, we propose that:

H3b. The EE-BI relationship is stronger in cultures lower in masculinity.

H3c. The PR-BI relationship is stronger in cultures lower in masculinity.

Individuals from feminine cultures often pay more attention to maintaining personal relationships (Hoehle, Zhang, & Venkatesh, 2015; Magnusson et al., 2014), so they are more likely rely on the advice from reference groups when making decisions on accepting technologies (Lin, 2014; Lu et al., 2017). Tarhini et al. (2017) found subjective norms have a greater effect on behavioral intentions of using e-learning tools in highly feminine cultures. Thus, we propose that social influence would have more impact on electronic banking adoption in cultures low in masculinity.

Moreover, individuals from feminine cultures prefer to build long-term commercial relationships with providers, in order to save time and energy thereby improving the quality of their lives (Schumann et al., 2010). Considering the critical role of trust in building interpersonal and commercial relationships (Hallikainen & Laukkanen, 2018), we expect that in highly feminine cultures trust has a greater impact on consumers’ new technology adoption in general, and electronic banking adoption in particular. Accordingly, we expect that:

H3d. The SI-BI relationship is stronger in cultures lower in masculinity.

H3e. The TR-BI relationship is stronger in cultures lower in masculinity.

3.4. Uncertainty avoidance

Uncertainty avoidance (UAI) captures the degree to which people in a society feel uncomfortable with uncertainty and ambiguity (Hofstede, 2011), which is associated with people’s risk perceptions regarding financial decisions (Frijns, Gilbert, Lehert, & Tourani-Rad, 2013; Kim, Schroeder, & Pennington-Gray, 2016). People from high uncertainty avoidance cultures often value security more than people with low uncertainty avoidance (Al Kailani & Kumar, 2011; Cyr, 2013). Specifically, consumers in high uncertainty avoidance cultures would be more concerned about the risks such as hacking, fraud, and privacy issues, which involve in using electronic baking (Khan et al., 2017; Lim, Yeow, & Yuen, 2010; Sampaio et al., 2017). Further, Laukkanen (2015) reported that people with high uncertainty avoidance are more
sensitive to the perceived risks in mobile banking, which in turn increase their resistance to mobile banking. Accordingly, we infer that perceived risk is likely to be a barrier to electronic banking adoption in such cultures. Thus, we propose that:

H4a. The PR-BI relationship is stronger in cultures higher in uncertainty avoidance.

The concerns people in higher uncertainty avoidance cultures have about unknown situations can be alleviated by listening to others’ usage experience or comments (Hwang & Lee, 2012). This informational influence from reference groups can offer evidence encouraging them to accept new technologies (Alhmir & Sajeev, 2015; Tarhini et al., 2017). Lai et al. (2016) found the relationship between social influence and behavioral intentions to use new technology is stronger in high uncertainty avoidance cultures. Therefore, we propose that social influence will act as a more powerful determinant of consumer behavioral intentions to use electronic banking in high uncertainty avoidance cultures.

Ng (2013) suggested that people from countries high in uncertainty avoidance would not adopt a new technology if they do not trust it. Stated differently, they are resistant to change, and their loyalty is primarily determined by trust (Ndubisi, Malhotra, Ulas, & Ndubisi, 2012). However, when they trust the bank provider, they prefer to build a long-term relationship and obtain high loyalty (Hallikainen & Laukkana, 2018; Ndubisi et al., 2012; Wang, Shi, & Barnes, 2015). Consistently, previous studies showed that the role of trust in people’s decision-making of adopting new technology is more dominant in high uncertainty cultures (Hwang & Lee, 2012; Shiu et al., 2015; Xin, Techatasamasannoorn, & Tan, 2015). Consequently, we expect that trust has a stronger impact on electronic banking adoption in higher avoidance uncertainty cultures. Accordingly, we posit that:

H4b. The SI-BI relationship is stronger in cultures higher in uncertainty avoidance.

H4c. The TR-BI relationship is stronger in cultures higher in uncertainty avoidance.

New IT technologies, especially electronic banking, are inherently high in risk (Roy, Balaji, Kesharwani, & Sekhon, 2017). To mitigate unknown situations, individuals from high uncertainty avoidance cultures would focus more on the quality of products such as the usefulness and ease of use (Hung & Chou, 2014; Kaba & Osei-Bryson, 2013; Sabio, Frias, & Castaneda, 2012). Ladhari et al. (2011) argued that people put an increased emphasis on the quality (e.g., reliability, responsiveness, and assurance) of bank services in the presence of high uncertainty avoidance. Consistent with this argument, Al-Smadi (2012) suggested that people in higher uncertainty avoidance cultures care more about the usefulness and ease of use of electronic banking. Thus, we expect both the effects of performance expectancy and effort expectancy on electronic banking adoption would become stronger in such countries. In sum, we propose that:

H4d. The PE-BI relationship is stronger in cultures higher in uncertainty avoidance.

H4e. The EE-BI relationship is stronger in cultures higher in uncertainty avoidance.

3.5. Long/short-term orientation

Long-term orientation (LTO) is related to the extent to which people are encouraged by thrift or persistence to prepare for the future; on the contrary, people with short-term orientation often show respect for the norms while being suspicious of societal change (Hofstede & Minkov, 2010). In more long-term orientation cultures, people tend to focus more on the future rewards (Lu et al., 2017; Zhao, 2013). Wang and Bansal (2012) proposed that long-term orientation has a positive impact on financial performance, as it facilitates long-term investments which can achieve greater benefits. However, achieving future success requires investing more time and resources, thus this long-term process may involve additional potential threats (Krishnan, 2017; Lai et al., 2016). As such, in this context, people would be more sensitive to risks so we expect that perceived risk may have greater effects on electronic banking adoption in long-term orientation cultures than in short-term orientation cultures. Additionally, since people are more concerned about risks in long-term orientation cultures, trust, persistence, and trust are encouraged to reduce uncertainty and secure future rewards (Yoon, 2009). Particularly, in long-term orientation cultures, trust as a long-lasting basis plays a crucial role in building business relationships by decreasing the possibility of opportunistic behavior (Hallikainen & Laukkanen, 2018; Wang et al., 2015). Hence, we infer that the positive effect of trust on electronic banking adoption would be stronger in countries with more long-term orientation. Based on the above, we posit that:

H5a. The PR-BI relationship is stronger in cultures with more long-term orientation.

H5b. The TR-BI relationship is stronger in cultures with more long-term orientation.

In contrast, since short-term orientation refers to the past and present, people in this context often place great emphasis on achieving quick results (Hofstede, 2011). Accordingly, they would pay more attention to usefulness and ease of use of new technologies as ways to improve their performance quickly (Lu et al., 2017). We, therefore, believe that in short-term orientation cultures, performance expectancy and effort expectancy would have more influence on electronic banking adoption, as compared to long-term orientation cultures. Furthermore, individuals from cultures with short-term orientation are sensitive to social trends (Hofstede & Minkov, 2010). As a result, they are willing to identify the emerging technology and communicate with people who have already used it. This implies that usage experience and judgment from reference groups about innovations are important for them to keep up with modern times. Hence, it can be inferred that social influence would have a greater impact on electronic banking adoption in such cultures. Accordingly, we propose that:

H5c. The PE-BI relationship is stronger in cultures with more short-term orientation.

H5d. The EE-BI relationship is stronger in cultures with more short-term orientation.

H5e. The SI-BI relationship is stronger in cultures with more short-term orientation.

4. Methodology

4.1. Data collection

4.1.1. Literature search

We searched for studies by using relevant keywords in databases including EBSCO, Springer, Taylor & Francis, Science Direct, IEEE Xplore, Web of Science, ABI/Information Database, and Google Scholar. The keywords we used includes adoption; acceptance; use; Internet banking; online banking; electronic banking; e-banking; mobile banking; and m-banking. To avoid publication bias; conference proceedings and dissertations were also included in our search. Moreover; we retrived papers from journals such as Information & Management; Expert Systems with Applications; Technovation; and International Journal of Information Management; published in the time period 2001–2016. Several Chinese studies written in Mandarin were identified and included in this search; which added cross-cultural depth to the sample. These initial searches resulted in the identification of 373 papers.
4.1.2. Criteria for inclusion
To be included in the meta-analysis, studies needed to meet three criteria. First, the studies should provide empirical evidence on the behavioral intentions of using electronic banking (e.g., Internet banking or mobile banking) and measure at least one construct in the proposed adoption model (see Fig. 2). Second, studies were included only if they reported a Pearson correlation coefficient (or another effect from which a correlation could be computed) between effect factors and behavioral intentions to use electronic banking. Finally, studies needed to report sample sizes and the participants in any given sample should all be from the same country. In our sample, two papers analyzed two countries but for sample sizes and effect sizes treated the two independently, and thus we considered each of these papers as an independent study in our sample. However, to avoid overlapping data, some studies using the same samples and conducted by the same authors were excluded in our work.

4.1.3. Coding procedure
After identifying relevant prior research, we conducted a coding procedure to collect valuable information. We coded the basic information about the paper (e.g., year, author(s), and publication), research objective (Internet banking or mobile banking), research method, theoretical model, sample size, all the variables and related effect sizes (correlation coefficients between key constructs), and investigated country or region. To enhance the effectiveness of the meta-analysis, we included some constructs with definitions similar to the variables in our model.

4.1.4. Dataset
Using the above criteria, we identified 66 studies among the 373 initial papers, which cumulatively covered 31 countries or regions. Unfortunately, 4 countries had no corresponding culture data source in Hofstede’s work and so they had to be excluded. As a result, the search yielded 60 relevant publications, involving 62 datasets and 19604 respondents covering 27 countries or regions (see Appendix A). Of these publications, 54 were journal articles, 2 were conference papers, and 4 were dissertations. We obtained the data on national cultural dimensions from Hofstede’s official website (http://geert-hofstede.com). Furthermore, this study explored five pairs of relationships in the extended UTAUT model. Among them, the relationships between performance expectancy and behavioral intentions (PE-BI) and between effort expectancy and behavioral intentions (EE-BI) were tested 57 times and 55 times, respectively, which ranked first and second among the five pair relationships. We also collected a good number of studies that reported the relationships between social influence and behavioral intentions (SI-BI, k = 29), between perceived risk and behavioral intentions (PR-BI, k = 20), and between trust and behavioral intentions (TR-BI, k = 17).

4.2. Meta-analytic procedures
We first estimated the true population correlations between consumer behavioral intentions to use electronic banking and its antecedents, based on a well-used meta-analysis method proposed by Hunter and Schmidt (2004). We sample-weighted correlations from primary studies and corrected sampling and measurement error in the dependent variables. Specifically, we first calculated the sample mean correlation of each relationship. After that, we divided the correlation by the square root of the reliability of two corresponding constructs to obtain reliability-adjusted correlations (Lipsey & Wilson, 2001). Missing reliabilities in some research were estimated by inserting mean values from the rest of studies. Then, we weighted the reliability-adjusted correlations by the product of sample size and the reliability of two related constructs to address the sampling error to gain the corrected correlations (Schmidt & Hunter, 2015).

In addition, 95% confidence intervals of the sample-weighted effect sizes and 80% credibility intervals of corrected correlations were determined. The confidence interval (CI) is used to estimate how much on single value is influenced by sampling error, while the credibility interval (CV) reflects the distribution of parameter values after removing the artifacts. According to Hunter and Schmidt (2004), moderators are likely to exist if artifacts account for less than 75% of the variance across primary studies. We reported the percentage of variance in effect size estimates due to sampling and measurement error (% s.e.).

After that, we conducted weighted least squares (WLS regression as a meta-analytic moderator estimation technique (Steel & Kammeyer-Mueller, 2002) to examine the moderating effect of national culture. It is appropriate to use WLS regression method in this study as it provides the most accurate results compared to other meta-analytic estimation techniques such as bivariate correlation, ordinary least squares (OLS) multiple regression, and hierarchical subgroup (HS) analysis (Steel & Kammeyer-Mueller, 2002). For the WLS regression analysis, each cultural dimension score was entered as the independent variable, and each uncorrected correlation coefficient between behavioral intentions and its antecedents was entered as the dependent variable (Jones, Woods, & Guillaume, 2016). Moreover, each study was weighted by the inverse square root of the sampling error for each correlation in WLS regression (Jones et al., 2016; Steel & Kammeyer-Mueller, 2002). Additionally, if the regression coefficient of a certain cultural dimension on the examined correlation is positive, the correlation is positively moderated by the given cultural dimension, and vice versa.

5. Results

5.1. Main effect size estimates
Table 2 presents the corrected correlation (ρ) between behavioral intentions (BI) to engage in electronic banking and its antecedents, along with the sample-weighted mean uncorrected (bare bones) γ, standard deviations of corrected and uncorrected correlations, and the percentage of variance attributable to artifacts using 95% confidence intervals and 80% credibility intervals.

Specifically, we listed effect sizes for five relationships: PE-BI, EE-BI, SI-BI, PR-BI, and TR-BI. Consistent with previous research, PE and EE

<table>
<thead>
<tr>
<th>Relationship</th>
<th>( k )</th>
<th>( N )</th>
<th>( \gamma )</th>
<th>( SD_\gamma )</th>
<th>95% CI</th>
<th>( \rho )</th>
<th>( SD_\rho )</th>
<th>% s.e.</th>
<th>80% CV</th>
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<tbody>
<tr>
<td></td>
<td>Lower</td>
<td>Upper</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>PE-BI</td>
<td>57</td>
<td>18170</td>
<td>0.545</td>
<td>0.303</td>
<td>0.500</td>
<td>0.591</td>
<td>0.634</td>
<td>0.185</td>
<td>5.745</td>
</tr>
<tr>
<td>EE-BI</td>
<td>55</td>
<td>17573</td>
<td>0.460</td>
<td>0.152</td>
<td>0.420</td>
<td>0.500</td>
<td>0.536</td>
<td>0.169</td>
<td>8.524</td>
</tr>
<tr>
<td>SI-BI</td>
<td>29</td>
<td>10418</td>
<td>0.425</td>
<td>0.177</td>
<td>0.360</td>
<td>0.489</td>
<td>0.507</td>
<td>0.201</td>
<td>6.162</td>
</tr>
<tr>
<td>PR-BI</td>
<td>20</td>
<td>6420</td>
<td>–0.338</td>
<td>0.164</td>
<td>–0.411</td>
<td>–0.267</td>
<td>–0.377</td>
<td>0.177</td>
<td>8.912</td>
</tr>
<tr>
<td>TR-BI</td>
<td>17</td>
<td>6624</td>
<td>0.489</td>
<td>0.166</td>
<td>0.410</td>
<td>0.568</td>
<td>0.556</td>
<td>0.188</td>
<td>5.205</td>
</tr>
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</table>

Note: \( k \) = number of studies; \( N \) = total number of participants; \( \gamma \) = sample-weighted mean correlation; \( SD_\gamma \) = standard deviation for uncorrected correlation; \( CI \) = confidence interval; \( \rho \) = corrected correlation; \( SD_\rho \) = standard deviation for corrected correlation; % s.e. = percentage of variance attributable to artifacts; CV = credibility interval.
were found to be positively related to BI. The mean corrected correlations were $\rho = 0.634$ ($N = 18170$, $k = 57$) and $\rho = 0.536$ ($N = 17573$, $k = 55$), respectively. Both the 95% confidence and 80% credibility intervals excluded zero, indicating that the mean true-score correlations were nonzero and generalizable. Regarding the remaining relationships, the mean corrected correlations were $\rho = 0.507$ ($N = 10418$, $k = 29$) for SI-BI, $\rho = -0.377$ ($N = 6420$, $k = 20$) for PR-BI, and $\rho = 0.556$ ($N = 6624$, $k = 17$) for TR-BI, with the 95% confidence intervals and 80% credibility intervals excluding zero. In addition, the percentage of variance attributable to artifacts (% s.e.) in each of the five relationships was less than 75%, showing that moderators may exist.

5.2. Moderating effects of national cultural dimensions

To test our hypotheses, we conducted a WLS regression analysis using Stata 14.0 software. For each regression, we entered each correlation coefficient as the dependent variable and each cultural dimension as the independent variable. The results are shown in Table 3.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>k</th>
<th>Region</th>
<th>Beta</th>
<th>SE</th>
<th>Beta</th>
<th>SE</th>
<th>Beta</th>
<th>SE</th>
<th>Beta</th>
<th>SE</th>
<th>Beta</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE-BI</td>
<td>57</td>
<td>27</td>
<td>-0.316</td>
<td>**</td>
<td>0.127</td>
<td>0.218</td>
<td>0.124</td>
<td></td>
<td>-0.480</td>
<td>**</td>
<td>0.101</td>
<td>0.551</td>
</tr>
<tr>
<td>EE-BI</td>
<td>55</td>
<td>26</td>
<td>-0.024</td>
<td></td>
<td>0.079</td>
<td>0.256</td>
<td>0.114</td>
<td></td>
<td>-0.029</td>
<td>0.081</td>
<td>-0.053</td>
<td>0.069</td>
</tr>
<tr>
<td>SI-BI</td>
<td>29</td>
<td>19</td>
<td>0.552</td>
<td>**</td>
<td>0.200</td>
<td>0.243</td>
<td>0.266</td>
<td>0.156</td>
<td>-0.353</td>
<td>**</td>
<td>0.155</td>
<td>0.193</td>
</tr>
<tr>
<td>PR-BI</td>
<td>20</td>
<td>13</td>
<td>-0.154</td>
<td></td>
<td>0.227</td>
<td>0.391</td>
<td>0.191</td>
<td>0.316</td>
<td>0.308</td>
<td>0.319</td>
<td>0.274</td>
<td>0.207</td>
</tr>
<tr>
<td>TR-BI</td>
<td>17</td>
<td>11</td>
<td>0.500</td>
<td>**</td>
<td>0.204</td>
<td>0.312</td>
<td>0.287</td>
<td></td>
<td>-0.078</td>
<td>0.327</td>
<td>0.638</td>
<td>***</td>
</tr>
</tbody>
</table>

Note: *, **, *** Correlation is significant at the 0.1, 0.05, and 0.01 levels (2-tailed). BI-behavioral intentions, PE-performance expectancy, EE-effort expectancy, SI-social influence, PR-perceived risk, TR-trust.

We found that power distance moderates the associations of performance expectancy, social influence, and trust with behavioral intentions. In lower power distance cultures, consumers are more likely to make decisions independently and, as a result, performance expectancy plays a prominent role in their decisions about adopting electronic banking. Meanwhile, consistent with the previous findings (Lin, 2014; Tarhini et al., 2017), our results showed that social influence acts as a more important determinant of behavioral intentions to use electronic banking in higher power distance cultures. We also showed that the relationship between trust and behavioral intentions is stronger in higher power distance cultures.

However, the moderating effects of power distance on the associations of effort expectancy, and perceived risk with behavioral intentions were not significant. These nonsignificant findings accord with Yuen et al.’s (2015) findings, which found no difference between the USA (low PDI) and Malaysia (high PDI) when exploring the impact of effort expectancy on electronic banking adoption. The results indicate that ease of use and security are important determinants of the decision to adopt electronic banking, independent of cultural power distance.

6.2. Individualism/collectivism

Individualism was found to moderate the associations of performance expectancy, effort expectancy, and perceived risk with behavioral intentions, such that these relationships were stronger in individualistic cultures. These are in agreement with Hung and Chou’s (2014) findings, which showed that perceived usefulness and perceived ease of use had stronger effects on behavioral intentions in highly individualistic cultures. People in such cultures are innovative and tend to make decisions independently; making usefulness, ease of use, and security of electronic banking more salient in their decision-making on technology adoption.

The hypothesized moderating effect of individualism on the relationship between social influence and behavioral intentions was not evident in our study. This finding, however, is consistent with previous studies (Faqih & Jaradat, 2015; Im et al., 2011). Meanwhile, individualism had no moderating effect on the relationship between trust and behavioral intentions. The findings suggest that social influence and trust play equally important roles in electronic banking adoption in both individualist and collectivist cultures. However, the lack of associations of performance expectancy and trust with behavioral intentions are moderated by power distance and uncertainty avoidance. The relationship between perceived risk and behavioral intentions can only be moderated by individualism/collectivism. Moreover, long/short-term orientation has negative moderating effects on the links of performance expectancy and effort expectancy to behavioral intentions. However, the moderating effects of masculinity/femininity on the associations of performance expectancy and social influence with behavioral intentions were contrary to our hypotheses.

6. Discussion

Our study examines how national cultural dimensions moderate the effects of the key constructs in the extended UTAUT model. The findings supported most of our predictions that the effects of performance expectancy, effort expectancy, social influence, perceived risk, and trust on behavioral intentions to accept electronic banking partially depend on culture dimensions. In particular, we showed that both the relationships, which supports H5c and H5d.
support in our study may be because of the small number of studies for SI-BI and TR-BI relationships included in our meta-analysis (k = 29 of SI-BI, k = 17 of TR-BI). We encourage future research to replicate these findings.

6.3. Masculinity/femininity

Our results showed that masculinity moderate the links of performance expectancy and social influence to behavioral intentions, but both in the opposite directions. The result that performance expectancy has a greater effect on behavioral intentions in highly feminine cultures is counterintuitive, as one would think that usefulness would be linked to achievement and performance, which are characteristic of highly masculine cultures. One possible explanation for this lies in the work of Bagchi et al. (2004), who suggested that the effect of masculinity/femininity on new technology adoption depended on the type of the technology, to be specific, whether it is for work use or personal use. The adoption of new technology will be greater in masculine cultures when it is for work use, but it will be lower in the same cultures when it is for personal use. The fact that most consumers use electronic banking for personal purposes may help explain why the relationship between performance expectancy and behavioral intentions would be stronger in feminine cultures. Our results also contained the contrary finding that the relationship between social influence and behavioral intentions is stronger in more masculine cultures, a result that we also find counterintuitive. Generally, people are more likely to be influenced by others in feminine cultures, as collaboration and helping behaviors are among the values of feminine cultures. The reason for this contradictory result may be that the increasing uncertainty and pressure in the pursuit of success drive people to consider all of the situations near them, including the social influence of relations or friends.

In our study, masculinity did not moderate the effects of effort expectancy on behavioral intentions to use electronic banking, nor did the effects of perceived risk or trust. These findings are consistent with the work of Sriwindono and Yahya (2012), who found that masculinity has no effect on any construct in the technology adoption model. The authors explained that this lack of significance might result from the fact that the masculinity score of the countries in their study was 46, which is close to the median value. The masculinity value in our study was with low variance (i.e., between 40 and 60), and in light of this, the nonsignificant results regarding masculinity are more understandable.

6.4. Uncertainty avoidance

The results showed that uncertainty avoidance has a positive moderating effect on the relationship between performance expectancy and behavioral intentions, supporting the findings in Tarhini et al. (2017). We also found that uncertainty avoidance positively moderates the relationship between trust and behavioral intentions. These findings suggest that individuals from high uncertainty avoidance cultures will put more emphasis on performance expectancy (usefulness) and trust in their decisions about electronic banking adoption. It seems possible that these findings are due to that both usefulness and trust serve to minimize uncertainty. Surprisingly, the effect of social influence on consumer behavioral intentions to adopt electronic banking is stronger in the presence of low uncertainty avoidance. One possible explanation for this is that the unexpected finding may simply reflect the fact that social influence from multiple others muddies the water and increases one’s level of uncertainty, particularly when faced with multiple opinions.

In addition, the relationship between effort expectancy and behavioral intentions was not significantly moderated by uncertainty avoidance. The nonsignificant result may imply that in both high and low uncertainty avoidance cultures, individuals perceive that the easier something is to use, the less the uncertainty involved in using it. Moreover, uncertainty avoidance failed to moderate the relationship between perceived risk and behavioral intentions, which may also be due to the small number of studies (k = 20) for the relationship between perceived risk and behavioral intentions included in our meta-analysis, limiting our ability to detect a significant effect.

6.5. Long/short-term orientation

Our results showed that long-term orientation negatively moderates the associations of performance expectancy and effort expectancy with behavioral intentions, such that these association are stronger in short-term orientation cultures. Individuals from short-term orientation cultures focus on achieving quick success and therefore they often put more emphasis on the usefulness and the ease with which new technologies help them reach their goals. In this case, they are more likely to adopt electronic banking when they find that it can improve their performance and save time.

Finally, long-term orientation had a nonsignificant effect on the relationship between social influence and behavioral intentions, the relationship between perceived risk and behavioral intentions, and the relationship between trust and behavioral intentions. Similarly, Capece et al. (2013) found the moderating effect of long-term orientation on the relationship between trust and intention to use e-commerce was nonsignificant. These findings suggest that long-term orientation may not influence the effects of social influence, perceived risk, and trust on electronic banking adoption.

7. Implications for research and practice

7.1. Theoretical implications

Since previous studies mainly added age, gender, education, and experience as moderators into the technology adoption models (Giovanis, Biniosis, & Polychronopoulos, 2012; Oliveira, Pari, Thomas, & Popovic, 2014), we highlight that cultural values play a key role in consumer behavior regarding electronic banking acceptance. We contribute to cross-culture research by incorporating national cultural dimensions rather than the monolithic concept of national culture, and our results provide an understanding of the “why” behind the different adoption rates among countries. Moreover, by advancing our understanding of the relationship between culture and technology adoption, this work will stimulate additional future research and theory development in areas concerned with national culture, new technology adoption, and global business. This study also shows the appropriateness of the extended UTAUT model in electronic banking adoption research and the value of incorporating cultural dimensions in it, which provides a basis for further refinement of the technology adoption model. Further, this study indicates that Hofstede’s cultural dimensions are suitable for exploring cultural diversity in the context of information technology. With the quick development of information technology, there is a need to conduct more cross-cultural research to meet the challenges of globalization.

7.2. Practical implications

We analyzed how each cultural dimension affects electronic banking adoption, which can guide provider innovation to more attractive and effective IT products based on cultural values of the target country. Primary studies proposed that individuals are more inclined to accept a new technology when its embedded values are in line with their own values (Leidner & Kayworth, 2006; Reinecke & Bernstein, 2013). We, therefore, suggest that providers should add cultural factors into their design of new technologies (such as the interface) to yield higher consumer adoption rates. Further, our results can help bank managers make and adapt global market strategies. Electronic banking needs to provide personalized banking services based on the characteristics of the culture in which the potential consumers reside. For example, in high power distance countries such as China and Malaysia,
the influences of social influence and trust on electronic banking adoption are stronger. With this knowledge, banks should concentrate on building a favorable image and reputation to make consumers trust them, and on using word of mouth to boost user adoption. On the other hand, in highly individualist countries such as Australia and the USA, bank managers would be better served by putting more emphasis on advertising the usefulness of electronic banking, making it easy to access, and ensuring the security of their products in order to increase consumers’ intentions to adopt electronic banking. In addition, raising consumer acceptance of electronic banking and reinforcing consumer usage can leverage the benefits of banks, which in turn can promote economic growth. Hence, based on our results, policymakers can design more reasonable and effective principles which match their countries’ cultural roots to encourage people to adopt electronic banking.

8. Limitations and future research

We must view our findings in light of its limitations. First, due to increased globalization, cultural values may change over time, and some argue it is not appropriate to use national cultural dimensions to measure individual behavior (Srite & Karahanna, 2006). Therefore, future research needs to propose a more appropriate scale to measure cultural values at the individual level as well as explore the effects of other culture dimensions (e.g., GLOBE’s or Hall’s culture dimensions) on IT adoption. Meanwhile, cultural dimensions may have both direct and moderating effects on consumers’ behavioral intentions related to the adoption of new technologies, and there may exist interaction effects among different cultural dimensions, which provide avenues for future research on technology adoption across diverse cultures.

Second, the sample sizes used to investigate some constructs or relationships were small, such as PR-BI (k = 20) and TR-BI (k = 17), and this may cause second-order sampling error (Hunter & Schmidt, 2004), which is related to biased estimates due to insufficient sampling. As a result, the reliability and validity of data in a meta-analysis may be reduced and thus the results based on a small number of studies should be interpreted and generalized with caution. Although the small sample size in a meta-analysis may cause variability issues in effect sizes, it is still superior to the technique of giving narrative reviews of prior research using subjective and inexplicit ways. The second-order sampling error could be diminished to some extent by the low level of credibility intervals in the analysis (Kabins, Xu, Bergman, Berry, & Willson, 2016).

Another shortage of our sampling is that there are only 27 countries or regions covered in the analysis, and data from China (including Hong Kong and Taiwan) count for about 35% of the total sample size, which may limit the validity and generalization of our results. We, therefore, encourage future research to replicate our findings with a larger and wider variety of geographical samples.

Third, since our data were collected from previous studies, which often used different scales and measurement items in their analyses, the lack of uniformity in the measurement of constructs may cause potential bias in estimation. However, some researchers believe that meta-analysis can enhance the generalizability of current results by synthesizing quantitative outcomes across various subjects and measurements (Hunter & Schmidt, 2004). To promote the accuracy and consistency of our technique, we precisely identified the definitions of constructs in the extended UTAUT model.

Finally, we did not control other factors which may affect consumer behavior, such as economic, political, social, religious, or even personal (e.g., personality) factors (Galang, 2014). We hope that future studies will incorporate these and other relevant factors to provide more accurate results. Moreover, the influence of cultural dimensions may vary across the different stages of the acceptance process (Srite & Karahanna, 2006) such as initial adoption versus continued use, which is also a direction for future research.

9. Conclusion

To better understand what drives different levels of electronic banking adoption across cultures, we did a meta-analysis to explore how national cultural dimensions affect consumer behavioral intentions using the extended UTAUT model. Our study provides theoretical explanations for the different Internet banking diffusion percentages across countries to some extent. Most of the countries (as shown in Fig. 1) with the lowest adoption percentages are countries in Eastern Europe (e.g., Bulgaria and Greece), which are high uncertainty avoidance cultures, denoting low levels of trust in internet banking in these countries. While most of those with high adoption rates are Scandinavian countries (e.g., Denmark and Finland), which are characterized as highly individualistic, reflecting people in these countries are more open to innovation. Direct comparison is difficult, however, because each country has multiple cultural values which in many cases vary in the direction of their moderating effects on the adoption variables in the UTAUT model. This points to the need to consider cultural values rather than simply country of origin when trying to understand and enhance new technology adoption rates.

Acknowledgements

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Appendix A. Studies involved in the meta-analysis

<table>
<thead>
<tr>
<th>Study</th>
<th>Country/Region</th>
<th>Sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortimer et al. (2015)</td>
<td>Australia</td>
<td>173</td>
</tr>
<tr>
<td>Wessels and Drennan (2010)</td>
<td>Australia</td>
<td>314</td>
</tr>
<tr>
<td>Püschel, Mazzon, and Hernandez (2010)</td>
<td>Brazil</td>
<td>666</td>
</tr>
<tr>
<td>Jahangir and Begum (2008)</td>
<td>Bangladesh</td>
<td>227</td>
</tr>
<tr>
<td>Tian (2014)</td>
<td>China</td>
<td>201</td>
</tr>
<tr>
<td>Zhang (2014)</td>
<td>China</td>
<td>325</td>
</tr>
<tr>
<td>Wei, Hu, and Carley (2013)</td>
<td>China</td>
<td>224</td>
</tr>
<tr>
<td>Wang, Wei, and Li (2013)</td>
<td>China</td>
<td>534</td>
</tr>
<tr>
<td>Xu (2013)</td>
<td>China</td>
<td>311</td>
</tr>
<tr>
<td>Zhou (2012)</td>
<td>China</td>
<td>200</td>
</tr>
<tr>
<td>Chen and Wu (2012)</td>
<td>China</td>
<td>260</td>
</tr>
<tr>
<td>Zhou (2011)</td>
<td>China</td>
<td>210</td>
</tr>
</tbody>
</table>
Bai, Zhao, Zhu, and Li (2010) China 222
Lee (2009) China 368
Xie, Lin, and Guo (2009) China 94
Wu and Jiao (2008) China 672
Mangin, Bourgault, Guerrero, and Egea (2011) Canada 225
Giovanis et al. (2012) Germany 212
Chau and Lai (2003) Hong Kong 167
Chan (2001) Hong Kong 147
Mohammadi (2015) Iran 128
Kesharwani and Bisht (2012) India 619
Alalwan, Dwivedi, Rana, and Williams (2016) Jordan 500
Al Qeisi and Al-Abdallah (2013) Jordan 224
Yuen et al. (2015) Malaysia 333
Foon and Fah (2011) Malaysia 200
Daud, Kassim, Said, and Noor (2011) Malaysia 300
Tat et al. (2008) Malaysia 204
Tran and Corner (2016) New Zealand 183
Afshan and Sharif (2016) Pakistan 151
Zahid, Mujtaba, and Riaz (2010) Pakistan 317
Martins et al. (2014) Portugal 249
Oliveira et al. (2014) Portugal 194
Gu, Lee, and Suh (2009) South Korea 910
Riquelme and Rios (2010) Singapore 600
Mortimer et al. (2015) Thailand 175
Bidar, Fard, Salman, Tunga, and Cheng (2014) Turkey 128
Celić (2008) Turkey 161
Yu (2012) Taiwan 441
Lin (2011) Taiwan 177
Shib and Fang (2006) Taiwan 425
Luarn and Lin (2005) Taiwan 180
Yuen et al. (2015) USA 333
Luo, Li, Zhang, and Shim (2010) USA 122
Al Qeisi and Al-Abdallah (2014) UK 316
Yousafzai and Yani-de-Soriano (2012) UK 435
Yousafzai, Foxall, and Pallister (2010) UK 441
Chau and Ngi (2010) UK 164
Yousafzai, Pallister, and Foxall (2009) UK 441
Aboelmaged and Gebba (2013) United Arab Emirates 119
Chong, Ooi, Lin, and Tan (2010) Vietnam 156

References
