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A meta-analysis of antecedents and consequences of trust in mobile commerce

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ABSTRACT

Awareness of antecedents and consequences of trust in m-commerce can enable m-commerce service providers to design suitable marketing strategies. Present study conducted a meta-analysis of 118 related empirical studies. The results indicate that antecedents namely perceived usefulness, perceived ease of use, system quality, information quality, service quality, user interface, perceived risk, perceived security, structural assurance, ubiquity, and disposition to trust, while consequences namely attitude, user satisfaction, behavioral intention, and loyalty have significant relationship with trust in m-commerce. Further, all the relationships were found to be moderated by culture except perceived ease of use, disposition to trust, and attitude.

1. Introduction

The growing popularity of mobile devices and the proliferation of mobile technologies, has led to the emergence of mobile commerce (m-commerce) as a new business phenomenon (Zheng, Men, Yang, & Gong, 2019). M-commerce refers to the business activities conducted through Internet-enabled mobile devices (Ko, Kim, & Lee, 2009). Compared to electronic commerce, m-commerce offers a unique set of advantages such as instantaneity, ubiquity, localization, personalization, and identification (Wang, Ngamsiriudom, & Hsieh, 2015). However, the apparent benefits of Internet-enabled transactions are sometimes countered by fear and anxiety, which could result in potential buyers' unwillingness and reluctance to engage in online transactions (Jaradat, Moustafa, & Al-Mashaqba, 2018).

Consumer trust has been observed as one of the most significant predictors to m-commerce adoption as it strongly determines its success (Koksal, 2016; Rana, Barnard, Baabdullah, Rees, & Roderick, 2019). Liébana-Cabanillas, Marinkovic, and Kalinic (2017) argued that the lack of trust is one of the key reasons behind buyers' reluctance to purchase online. Therefore, m-commerce providers need to understand the factors influencing consumers' trust in m-commerce as it would enable them to design suitable marketing strategies leading to higher m-commerce adoption rates (Liébana-Cabanillas et al., 2017; Wang et al., 2015). M-commerce differs from traditional e-commerce in terms of its user interface and its associated risk, interactivity, ubiquity, localization services, and usage patterns (Wang, Ou, & Chen, 2019). M-commerce suffers from inherent limitations of small screen size, display of information, and security of transactions; nevertheless, it also provides opportunities for making transactions on the go (Rana et al., 2019). Ozok and Wei (2010) posits that the m-commerce comes with usability issues and restrictions. Therefore, the factors influencing trust and the consequences of trust might differ across these platforms.

Many scholars have examined the antecedents and consequences of trust in m-commerce (Al-Jabri, 2015; Chin, Harris, & Brookshire, 2018; Hajiheydari & Ashkani, 2018; Nel & Boshoff, 2017; Ofori, Boakye, & Narteh, 2018; Silic & Ruf, 2018; Zhou, 2011e). Antecedents of trust determine the extent to which various factors influence trust in m-commerce, while consequences of trust determine the extent to which trust in m-commerce influences consumers' intention to use, or continue to use the service (Pavlou, 2003).

Empirical research involving trust in m-commerce has produced inconsistent results. For example, Koenig-Lewis, Palmer, and Moll (2010) suggested that there is an indirect relationship between trust and customers' behavioral intention to use mobile banking, Hanafizadeh, Behboudi, Abedini, Jalilvand, and Tabar (2014) found evidence for the direct effect of trust on mobile banking adoption. In the context of mobile wallets, Kumar, Adlakaha, and Mukherjee (2018) found that perceived usefulness has an insignificant effect on trust. However, many scholars found a significant effect of perceived usefulness on trust (Afshan & Sharif, 2016; Oliveira, Faria, & Abraham, 2014). Mixed findings were reported on the relationship between perceived ease of use and trust (Afshan & Sharif, 2016; Gu, Lee, & Suh,

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2009; Zhou, 2018). Prior research on m-commerce posits behavioral intention as an important consequence of trust (Almaiah, 2018; Gao & Waechter, 2017; Verkijika, 2018). Contrarily, several researchers failed to find support for the relationship between trust and behavioral intention (Farah, Hasni, & Abbas, 2018; Hajiheydari & Ashkani, 2018; Koksal, 2016). Further, scholars have reported inconsistent results for the relationship between trust and other behavioral outcomes, such as satisfaction and continuance intention (Cao, Yu, Liu, Gong, & Adeel, 2018; Groß, 2016; Marinkovic & Kalinic, 2017; Ting, 2018; Wu, Zhao, Zhu, Tan, & Zheng, 2011).

The inconsistent results create confusions among academicians, practitioners, and m-commerce researchers and may be attributed to infrastructural and technological differences. Nevertheless, it is common to have mixed findings in the field of social and behavioral sciences. A single research study is often constrained by its research context. Meta-analysis helps in finding the common truth by statistically combining all the conceptually similar studies (King & He, 2005; Rana, Dwivedi, & Williams, 2015; Tamilmani, Rana, Prakasam, & Dwivedi, 2019). Meta-analysis has been applied in the past to study trust in m-commerce. For example, Min and Ji (2008) categorized the existing m-commerce literature specific to China into several categories and provided a descriptive analysis of studies falling under those categories. However, the study was qualitative and did not examine any causal relationship. The meta-analysis conducted by Zhang, Zhu, and Liu (2012) examined several causal relationships between factors affecting adoption of m-commerce. However, only a single relationship between trust and behavioral intention was estimated. Kim and Peterson (2017) conducted a meta-analysis of 150 empirical studies to determine the online trust relationships in e-commerce. However, this study did not focus specifically on m-commerce. Our study differs from the previous studies as it specifically focuses on the meta-analysis of m-commerce studies. Thus, previous meta-analyses failed to comprehensively study the antecedents and consequences of trust in m-commerce, though there is a growing interest of researchers in this field. Furthermore, many of the previous studies focused on m-commerce in a single country and thus no comprehensive conclusions could be drawn. Also, different variables have different effects in different cultures, and therefore, organizations in multiple countries should have dissimilar managing strategies (Zhang et al., 2012).

With the background mentioned above, this study aims to: 1) conduct a meta-analytic review of research studies published during 2008–2018 and examine all major antecedents and consequences of trust in m-commerce, and 2) investigate the moderating impact of culture on all the factors influencing m-commerce adoption. The study contributes to the existing literature by analysing the findings of 118 research papers to identify the antecedents and consequences of trust that have been previously explored by researchers. Nevertheless, many other important factors responsible for developing trust in m-commerce have received limited attention by the academicians. The study also makes an important contribution by categorising the antecedents and consequences under broader heads. Further, examining the moderating effect of culture enhances our understanding of which factors are more important in a specific culture.

The rest of this study is organized as follows. Section 2 provides a review of literature on trust in m-commerce and highlights the antecedents and consequences of trust to develop the hypotheses. Section 3 describes the detailed research methodology. The results of the meta-analysis and sub-group analysis are discussed in Section 4. Section 5 discusses the findings, implications, and limitations and future research directions. Section 6 presents the conclusion of the study.

2. Literature review and hypotheses development

M-commerce is currently in its initial phase of development, and potential consumers are still wary and unfamiliar with the majority of its features, which further aggravates feeling of uncertainty (Liébana-Cabanillas et al., 2017). Trust in m-commerce is a prerequisite to its adoption and usage. Morgan and Hunt (1994) articulated that trust exists when one party has confidence in other party's integrity and reliability. The trusting party believes that the party being trusted will not turn opportunistic (Teo, Srivastava, & Jiang, 2008). M-commerce consumers represent the trusting party, and m-commerce providers act as the trusted party. If m-commerce providers deceive the consumers, it can negatively impact the m-commerce adoption.

Yeh and Li (2009) in their research on consumers' trust towards m-commerce vendors, posited that brand image, customization, and satisfaction affect trust. Building trust on a mobile platform is a challenging task as it is subject to problems regarding interface design, communication and network speed, and physical constraints. These factors make consumers sceptical about m-commerce. In another research, Li and Yeh (2010) discussed the importance of website aesthetics in improving the hedonic value of m-commerce and trust. The design elements improve perceived usefulness, customization, and ease of use, thereby strengthening customers' trust in m-commerce. Nilashi, Ibrahim, Reza, and Ebrahimi (2015) argued that website design, content, and security dimensions are critical in facilitating trust and can help in improving website quality and consumers' decision to use m-commerce websites.

The ubiquity of mobile devices encourages consumers' spontaneous purchase behavior which leads to enhanced sales for the seller (Marriott & Williams, 2018). However, the nature of mobile technology inherently increases the risks and uncertainty of making purchases online as it distances the user from the service provider (Gao & Waechter, 2017). Consumers experience high privacy and security risks due to the transmission of transaction data in a wireless environment (Ismagilova, Slade, Rana, & Dwivedi, 2019; Wei, Marthandan, Chong, Ooi, & Arumugam, 2009). Trust plays an important role in diminishing the adverse effects of risk perceptions in m-commerce transactions (Marriott & Williams, 2018; Zhang et al., 2012). Furthermore, researchers posited that trust is associated with perceived privacy and security (Ozturk, Nusair, Okumus, & Singh, 2017; Zoghlami, Yahia, & Berraies, 2018).

In m-commerce, the mobile devices act as a platform on which users perform various businesses or monetary transactions. Consequently, the initial interaction of the users with service providers plays a critical role in developing users' trust. In the context of m-commerce, several studies have highlighted that trust in the service provider facilitates consumers' attitudes and intentions to make additional purchases (Hanafizadeh et al., 2014; Koksal, 2016; Oliveira et al., 2014; Zhou, 2011e). Consumers' evaluation of service outcomes, such as satisfaction and loyalty, is greatly influenced by users' trust in the service provider (Akter, Ray, & D'Ambra, 2013; Berraies, Ben, & Hannachi, 2017; Jimenez, San-Martin, & Azuela, 2016; Marinkovic & Kalinic, 2017). Pi, Liao, and Chen (2012) posited that the financial performance of an organization is positively influenced by trust and is a prerequisite for customer satisfaction and commitment. Thus, various scholars emphasized the relevance of trust over the years in predicting consumers' intention to use and adopt m-commerce (Blaise, Halloran, & Muchnick, 2018; Chong, 2013).

The following sub-sections provides an overview of the constructs which have been studied as antecedent or consequence of trust in m-commerce. Several studies across different cultures on technology adoption have indicated the importance of technology related attributes in facilitating exchange and customer satisfaction. However, the current study is an attempt to focus on the factors that enhance consumers' trust in m-commerce and are its consequences. More than 90 constructs were identified with which relationship of trust in m-commerce has been studied. However, since many of these relationships have not been studied considerably, they were not included in this meta-analysis. Kirca, Jayachandran, and Bearden, 2005) and Hong, Xu, Wang, and Fan (2017) suggested that meta-analysis can be carried out with at least three studies. Thus, the relationship of 16 constructs with trust in m-

commerce has been considered for current meta-analysis. Appendix A provides a summary of the studies used for each construct. The description of each construct is provided below:

2.1. Technology acceptance factors

Several theories such as technology adoption model (TAM), theory of reasoned action (TRA), theory of planned behaviour (TPB), and unified theory of acceptance and use of technology (UTAUT) and their derivatives have been used to study trust in m-commerce in past. Previous scholars have examined technology acceptance factors such as perceived usefulness, perceived ease of use, perceived behavioural control, perceived risk, subjective norms, and perceived enjoyment as antecedents of trust in m-commerce (Chang & Shen, 2018; Farah et al., 2018; Hajiheydari & Ashkani, 2018; Al Khasawneh, Hujran, & Abdrabbo, 2018; Kumar, Israel, & Malik, 2018). However, every derivative except perceived usefulness and perceived ease of use have been studied scarcely, i.e., less than three times. Therefore, we only considered perceived usefulness and perceived ease of use in this meta-analysis study.

2.1.1. Perceived usefulness

Perceived usefulness refers to the degree to which a system enhances or facilitates job performance (Hajiheydari & Ashkani, 2018; Qu, Rong, Chen, Ouyang, & Xiong, 2018). The Unified Theory of Acceptance and Use of Technology (UTAUT) model operationalizes the perceived usefulness construct as performance expectancy (Venkatesh, Morris, Davis, & Davis, 2003). Thus, some studies refer to perceived usefulness as performance expectancy (Khalilzadeh, Ozturk, & Bilgihan, 2017; Luo, Li, Zhang, & Shim, 2010; Shaw & Sergueeva, 2019; Zhou, 2014). M-commerce is useful in saving time, customization, and flexibility which further enhances the job performance (Farah et al., 2018). With the perception of such benefits offered by m-commerce, users tend to develop trust in various mobile services (Kumar, Israel et al., 2018). Previous studies posit that users' judgment of usefulness positively influences trust in a mobile information system (Afshan & Sharif, 2016; Kumar, Israel et al., 2018). Thus, we hypothesize that:

H1. There is a significant, positive relationship between perceived usefulness and trust in m-commerce.

2.1.2. Perceived ease of use

Perceived ease of use refers to the extent to which using a system is free from the additional effort at the users' level of skill and knowledge (Ismagilova, Slade, Rana, & Dwivedi, 2019; Chang, Shen, & Yeh, 2017; Hajiheydari & Ashkani, 2018; Liébana-Cabanillas et al., 2017). Effort expectancy, as defined by the UTAUT model, is similar to perceived ease of use and hence some studies have adopted effort expectancy as the study variable (Khalilzadeh et al., 2017; Shaw & Sergueeva, 2019). Zhou (2018) posits that the challenges offered by any mobile system can be mitigated by enhancing the perceived ease of use. Previous studies have found perceived ease of use of the mobile system as an antecedent to trust (Kumar, Israel et al., 2018; Nel & Boshoff, 2017; Zhou, 2018). Thus, the following hypothesis is posed:

H2. There is a significant, positive relationship between perceived ease of use and trust in m-commerce.

2.2. Quality factors

2.2.1. System quality

System quality is defined as the perceived quality exhibited in a system's overall performance (Delone & Mclean, 2004; Zhou, 2013a). Due to the facelessness of mobile platforms, the access speed, navigation and visual appeal influence the users' first impression (Silic & Ruf, 2018). Multiple m-commerce studies found that users tend to develop the high level of trust on a system when they perceive the system to be of high quality, which encourages them to spend more on that particular system (Gao & Waechter, 2017; Silic & Ruf, 2018; Zhou, 2011d, 2012b). Thus, we hypothesize that:

H3. There is a significant, positive relationship between system quality and trust in m-commerce.

2.2.2. Information quality

Information quality reflects the relevance, sufficiency, accuracy, and timeliness of the information provided by m-commerce systems (Gao & Waechter, 2017). Users search for various information while using any m-commerce services (Zhou, 2014). Inaccurate or out-of-date information undermines users' experience and signals that the system is incapable of providing timely and quality services, which further affects their trust in the system (Gao, Waechter, & Bai, 2015). Extant research has highlighted the importance of information quality on trust in e-commerce, mobile banking, and financial services (Kim, Oh, & McNiel, 2008; Silic & Ruf, 2018). Across different studies in m-commerce, researchers have found that trust is significantly influenced by the information quality (Gao et al., 2015; Silic & Ruf, 2018; Zhou, 2014). Thus, the following hypothesis is proposed:

H4. There is a significant, positive relationship between information quality and trust in m-commerce.

2.2.3. Service quality

Service quality reflects the ability of a system to provide reliable, responsive, assured and personalized offerings to the users (Gao & Waechter, 2017). Reliable and efficient service provides a sense of high quality which enables the users to build trust in the system (Apostolos, 2016; Wang et al., 2019). Extant literature has found service quality as a determinant of users' trust (Ofori et al., 2018; Silic & Ruf, 2018). When service quality experienced by the users exceeds a certain level, users form trust as they perceive the service provider to be competent (Puriwat & Tripopsakul, 2017). However, untimely and unreliable services build distrust in the users about the system (Apostolos, 2016; Gao & Waechter, 2017; Ofori et al., 2018; Puriwat & Tripopsakul, 2017; Silic & Ruf, 2018). Hence, we hypothesize that:

H5. There is a significant, positive relationship between service quality and trust in m-commerce.

2.2.4. User interface

User interface in m-commerce refers to the user environment (such as menus, options, and various functions) for controlling the mobile devices (Stewart & Jürjens, 2018). Previous studies on trust formation in m-commerce revealed that user interface is an important determinant of users' trust in the system (Li & Yeh, 2010; Vaithilingam, Nair, & Guru, 2013). Well-designed user interface reduces the perceived system complexity, facilitates navigation and interactivity, and makes the users trust the system (Lee & Chung, 2009; Stewart & Jürjens, 2018; Vaithilingam et al., 2013). Hence, the following hypothesis is put forward:

H6. There is a significant, positive relationship between the user interface and trust in m-commerce.

2.3. Risk factors

2.3.1. Perceived risk

Perceived risk is defined as the users' subjective evaluation of incurring losses while using a particular system (Chen & Li, 2017; Marriott & Williams, 2018). Gao and Waechter (2017) used perceived uncertainty as their study variable to examine the perceived risk associated with loss of privacy and security. In a mobile environment, users

are affected by a sense of insecurity due to potential undesirable behavior related to unauthorized access to their personal or financial data (Chin et al., 2018; Gao & Waechter, 2017). Lack of information concerning data security makes the users hesitant of using mobile technologies as it is perceived to be risky (Liébana-cabanillas et al., 2015). Research suggests that trust is affected by perceived risk (Chin et al., 2018; Gao & Waechter, 2017; Khalilzadeh et al., 2017; Liébana-cabanillas et al., 2015; F.F. Malaquias & Hwang, 2016). Thus, the following hypothesis is proposed:

H7. There is a significant, negative relationship between perceived risk and trust in m-commerce.

2.3.2. Perceived security

Security refers to the consumers' ethical perception regarding financial transactions carried over the internet (Matemba & Li, 2018; Sharma & Lijuan, 2014). It also refers to the risks associated with stealing financial information by unauthorized personnel, viruses, and malicious software (Agag, El-masry, Alharbi, & Almamy, 2016; Sarel & Marmorstein, 2006). Security during storing and transferring financial information throughout the purchasing process is one of the major concerns of online shoppers (Roman, 2007). In the context of m-commerce, consumers expect the mobile applications or websites to be secured against potential malware and viruses, such that the financial details of the transaction are not shared or stored in any form. Negligence in handling customers' financial data would lead to negative ethical perceptions (Limbu, Wolf, & Lunsford, 2011), which would influence trust in m-commerce. Thus, we propose the following hypothesis:

H8. There is a significant, positive relationship between perceived security and trust in m-commerce.

2.3.3. Structural assurance

Structural assurance refers to the existence of technological and legal structures that safeguard security (McKnight, Choudhury, & Kacmar, 2002). It represents an institution-based mechanism and provides assurances related to confidentiality and protection of information (Oliveira et al., 2014). In the context of m-commerce, structural assurance in the form of promises, guarantees, regulations, insurances, and contractual terms and conditions signals credibility of the vendor and helps in building trust in the system (Afshan & Sharif, 2016; Silic & Ruf, 2018; Wang et al., 2015). Many prior researchers found that structural assurance leads to trust among users (Afshan & Sharif, 2016; Oliveira et al., 2014; Silic & Ruf, 2018; Wang et al., 2015; Xin, Techatassanasoontorn, & Tan, 2015). Hence, the following hypothesis is proposed:

H9. There is a significant, positive relationship between structural assurance and trust in m-commerce.

2.3.4. Perceived privacy

Privacy refers to consumers' perceptions related to unauthorized sharing of personal information, unsolicited contacts from online retailers and tracking of shopping behavior over the internet (Limbu et al., 2011). Consumers share their personal and financial details while making any purchases online (Roman, 2007; Roman & Cuestas, 2008). In the context of m-commerce, consumers expect that the service provider must keep their personal information confidential and do not share/sell it to third-party applications (Miyazaki & Femandez, 2001). Previous studies have found perceived privacy as a determinant of customers' willingness to use and trust the technology for purchase or consumption purposes (Arpaci, 2016; Khasawneh et al., 2018; Ozturk et al., 2017; Zhang, Lu, & Kizildag, 2018). Thus, the following hypothesis is put forward:

H10. There is a significant, positive relationship between perceived privacy and trust in m-commerce.

2.4. Mobile factor: ubiquity

Ubiquity refers to the ability of users to conduct business activities or transactions using their mobile devices at anytime from anywhere (Nikou & Economides, 2017; Zhou, 2012a). Mobile technology enables users to minimize the temporal and spatial constraints by providing an opportunity to conduct ubiquitous transactions (Liébana-Cabanillas et al., 2017). However, ubiquitous connectivity may be hindered as a result of poor connectivity and service failures (Lin, 2011). Such service interruptions lead to users' frustration and dissatisfaction which ultimately impact the user experience (Zhou, 2012a). Contrary to that, ubiquitous connectivity signals vendors' ability to providing efficient service which further fosters users' trust in the system (Lin, 2011; Zhou, 2012a). Prior research posits that ubiquity influences users' trust in the system (Lin, 2011; Zhou, 2011e, 2012a). Thus, the following hypothesis is proposed:

H11. There is a significant, positive relationship between ubiquity and trust in m-commerce.

2.5. Individual factor: disposition to trust

Disposition to trust remains stable over time in an individual and refers to the ability of an individual to form trust in general (Wang et al., 2015; Xin et al., 2015). Due to differences in disposition to trust, individuals tend to develop trust differently under the same circumstances (Deng et al., 2010). Disposition to trust is a personal trait which varies across individuals based on their tendency to have faith in humanity (Xin et al., 2015). This tendency is also known as propensity to trust. Individuals across different cultures with different life experiences differ in their disposition to trust. It is shaped as a result of personality types, experiences, and background (Lin, 2011). Several researchers in the domain of m-commerce found that an individual's disposition to trust has a direct effect on the formation of trust (Deng, Lu, Wei, & Zhang, 2010; Lin, 2011; Wang et al., 2015; Xin et al., 2015; Zhang & Mao, 2008). Thus, the following hypothesis is proposed:

H12. There is a significant, positive relationship between disposition to trust and trust in m-commerce.

2.6. Behavioural outcomes

2.6.1. Attitude

The theory of reasoned action defines attitude as a favorable or unfavorable evaluative reaction toward action or behavior which is influenced by the belief on the consequence of that behavior (Arpaci, 2016; Fishbein & Ajzen, 1975). Users' positive attitude toward a system leads to favorable behavioral intentions in the context of technology acceptance and continuance (Zhang, Lu et al., 2018). In the context of mobile applications, greater trust increases the level of positive attitude (Hajiheydari & Ashkani, 2018). Previous studies have found that trust in m-commerce has a positive effect on users' attitude (Arpaci, 2016; Chauhan, 2015; Cheung & To, 2017; Fan, Shao, Li, & Huang, 2018; Hajiheydari & Ashkani, 2018; Jang & Lee, 2018; Zhang, Lu et al., 2018). Hence, the following hypothesis is put forward:

H13. There is a significant, positive relationship between trust in m-commerce and attitude.

2.6.2. User satisfaction

Satisfaction refers to the users' perceived difference between actual and expected benefits (Hajiheydari & Ashkani, 2018). It reflects the

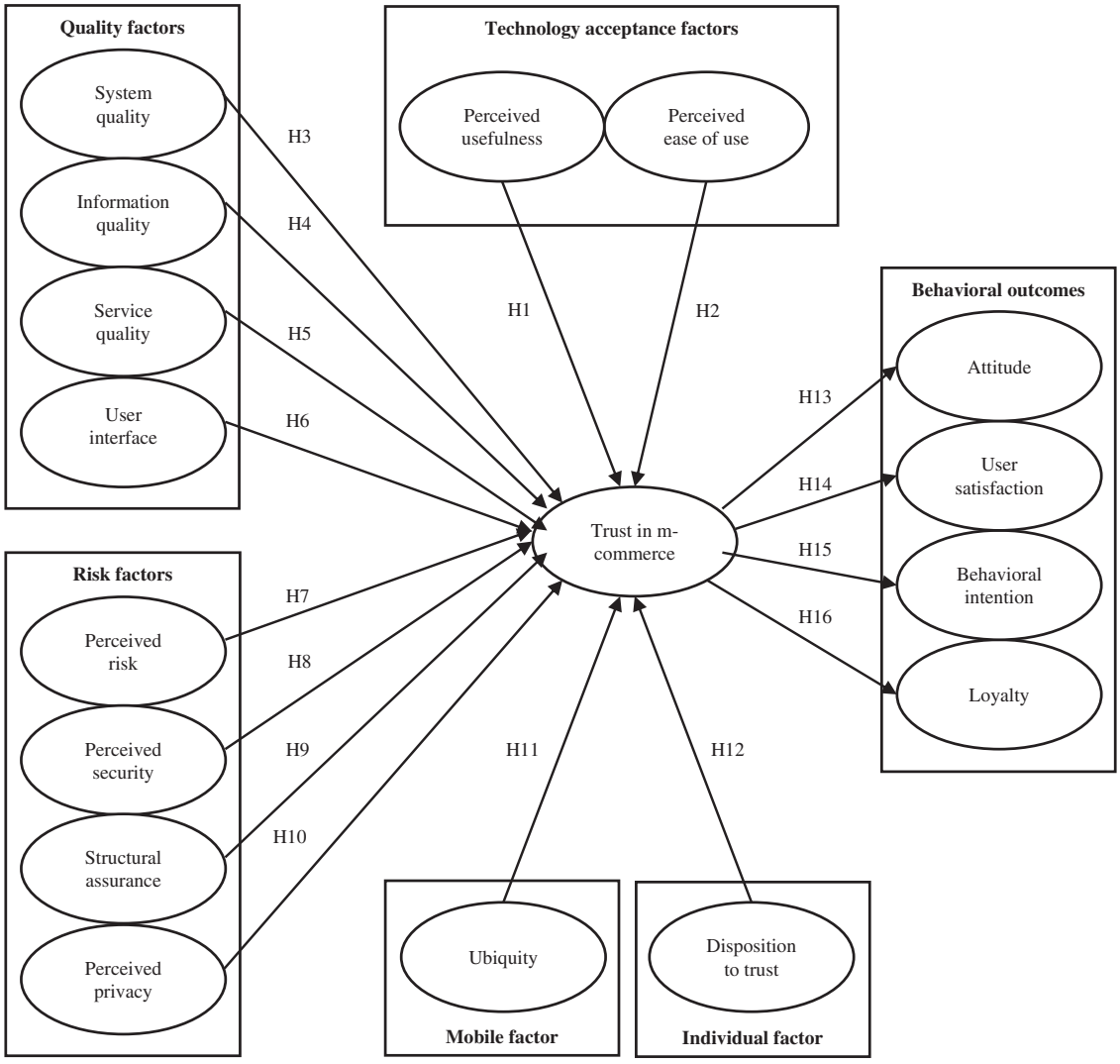

Fig. 1. Hypothesized relationships.

overall user experience while using a service or product (Berraies et al., 2017; Ofori et al., 2018). Satisfaction is shaped as a result of multiple interactions with the system (Ofori et al., 2018; Wang et al., 2019). If users are not satisfied with their experience, they may discontinue their usage (Akter et al., 2013). Trust on the service provider acts favorably while evaluating the level of satisfaction among the users (Ting, 2018). Extant research on m-commerce posits that trust has a significant positive influence on user satisfaction (Akter et al., 2013; Berraies et al., 2017; Kumar, Israel et al., 2018; Marinkovic & Kalinic, 2017; Ofori et al., 2018; Ting, 2018). Thus, we hypothesize that:

H14. There is a significant, positive relationship between trust in m-commerce and user satisfaction.

2.6.3. Behavioural intention

Theory of reasoned action (TRA) defines behavioral intention as an individual's tendency to perform some behavior (Fishbein & Ajzen, 1975). Behavioral intention predicts users' actual adoption of an IS and its usage (Agrebi & Jallais, 2015; Davis, 1989). Research posits that a major deterrent to adoption of online shopping is the absence of online purchase intention (He, Lu, & Zhou, 2008). When users trust the m-commerce, they tend to continue using it as they believe that the service provider would not exhibit any opportunistic behavior (Gao et al., 2015; Matute, Polo-Redondo, & Utrillas, 2016). Prior studies on e-commerce and m-commerce adoption have found users' trust to be a significant predictor of adoption intention, repurchase intention and continuance intention (Alazzam, Al-Sharo, & Al-azzam, 2018; Almarashdeh & Alsmadi, 2017; Beza, Reidsma, Poortvliet, Misker, & Sjors, 2018; Cao et al., 2018; Kim, Shin, & Lee, 2009; Kumar, Israel et al., 2018; Lu, Liu, Yu, & Wang, 2008; Phonthanukitithaworn, Sellitto, & Fong, 2016; Yang, Chen, & Wei, 2015; Zhao, Ni, & Zhou, 2018). Thus, we hypothesize that:

H15. There is a significant, positive relationship between trust in m-commerce and behavioral intention.

2.6.4. Loyalty

Building customers' loyalty represents one of the most important managerial challenges. Numerous researchers have emphasized that trust has a positive impact on customers' loyalty (Berraies et al., 2017; Ozturk et al., 2017). As the environment of m-commerce is inherently riskier, users' trust in a system affects their loyalty towards the system (Jimenez et al., 2016). The extant literature on m-commerce has found that trust significantly influences loyalty (Akroush, Al-Mohammad, Zuriekat, & Abu-Lail, 2011; Berraies et al., 2017; Dahiyat & Akroush, 2011; Jimenez et al., 2016; Ofori et al., 2018; Ozturk et al., 2017; Thakur, 2014). Hence, the following hypothesis is proposed:

H16. There is a significant, positive relationship between trust in m-commerce and loyalty.

2.7. Moderating variable: culture

Culture plays an important role in information systems research, especially in trust formation and adoption/reuse intention of web-based products/applications (Ganguly, Dash, Cyr, & Head, 2010; Hossain & Quaddus, 2012; Jarvenpaa, Tractinsky, & Saarinen, 1999; Weber & Hsee, 1998). Individuals across different cultures vary in their propensity to trust based on different life experiences. The expectation of users varies across cultures and hence the factors accepted in a particular society for gaining trust might get rejected in a different society/culture (Chung, Holdsworth, Chung, & Holdsworth, 2012; Straub, 1994). People have significantly dissimilar behavior in eastern culture and western culture (Zhang, Weng, & Zhu, 2018, 2012). For example, western culture is inclined towards individualism, while eastern culture has inclination for collectivism (Anderson et al., 2010).

Moreover, users' skill, expertise, and knowledge about m-commerce may differ across cultures, hence, specific factors might have more relevance in one culture than the other (Hossain & Quaddus, 2012). Following Zhang et al. (2012), the present study segregates the primary studies into the eastern and western culture to examine the moderating effect of culture on the different hypothesized relationships. Zhang et al. (2012) posit that different factors have different effects on attitude, behavioral intention, and actual use across eastern and western culture. Therefore, the examination of trust in m-commerce in both the cultures may facilitate in understanding its moderating effect. Thus, it is hypothesized that:

H17. Culture moderates the relationship of antecedents and consequences with trust in m-commerce.

Fig. 1 presents the proposed research model.

3. Research methodology

3.1. Data collection

Following previous studies, research articles were searched comprehensively from prominent electronic databases such as ScienceDirect, Emerald, EBSCO, SAGE, Taylor & Francis, Google Scholar, Web of Science, and Scopus (Tamilmani et al., 2019; Zhang, Weng et al., 2018). Additionally, conference proceedings from established Information Systems conferences such as International Conference on Information Systems (ICIS), Americas Conference on Information Systems (AMCIS), Australasian Conference on Information Systems (ACIS), Pacific Asia Conference on Information Systems (PACIS), and Hawaii International Conference on Systems Sciences (HICSS) were considered as suggested by Webster and Watson (2002). The search terms used for extraction of the articles were "mobile" and "trust." The Boolean operator "AND" was used to combine these search terms which resulted in the extraction of articles containing both of these terms. The articles published over the last decade, i.e., from 2008 to 2018 were extracted for the present review. The initial database search resulted in a total of 1319 articles.

The next step involved the manual screening of title and keywords of the extracted articles from the above search protocol to remove the irrelevant ones. Review articles, commentary, news, prefaces, editorials, non-English, and duplicate articles were also filtered out in this step. Thus, a total of 370 articles qualified this filtration stage.

The abstracts of the filtered articles were read independently by two researchers. This resulted in exclusion of experimental studies, qualitative studies, and studies which did not particularly focus on trust in a mobile environment. A third researcher validated the reasons for exclusion and ensured the removal of only irrelevant articles. Thus, a total of 244 peer-reviewed articles qualified this round of selection.

Next, the full text of all the shortlisted articles was read two researchers to make sure: 1) the article must have quantitatively assessed at least one relationship with trust in m-commerce, 2) the article must have mentioned either correlation coefficient or other statistic (e.g., F-ratio and Student's t) that could be converted to correlation coefficient, 3) the article must have mentioned the sample size. Again, the third researcher validated the reasons for exclusion and ensured the removal of only irrelevant articles. Thus, a total of 161 articles were shortlisted.

3.2. Coding procedure

The descriptive information such as authors, title, paper source, publication year, country, sample size, and correlation coefficients were recorded for each shortlisted article. Empirical studies having multiple samples were treated as separate studies. The antecedents and consequences of trust in m-commerce were identified from each study. As suggested by Kirca et al. (2005), meta-analysis can be carried out with at least three studies. Thus, the antecedents and consequences with less than three studies were discarded for the current meta-analysis. Further, some of the antecedents were grouped into a single construct as existing articles had used different terminologies for the same construct. For example, performance expectancy was combined with perceived usefulness, effort expectancy and usability were combined with perceived ease of use, disposition to trust was combined with propensity to trust, mobility was combined with ubiquity, and design quality was combined with user interface. Finally, the dataset included 118 articles. Appendix B provides the profile of the studies used in the meta-analysis.

To conduct moderator analysis, each article was categorized into eastern culture and western culture subgroups. The studies conducted in North America, United Kingdom, Europe, Australia and New Zealand were classified as western culture and others as eastern culture (Anderson et al., 2010; Schepers & Wetzels, 2007). Previous researchers have also used this method and achieved reliable findings (Schepers & Wetzels, 2007; Zhang et al., 2012).

Additionally, reliability values were also collected during the coding procedure. The values of Cronbach's alpha coefficients of the constructs were found higher than the recommended value of 0.7.

3.3. Statistical analysis

The correlation coefficient was used as the effect size metric in this study (Ismagilova, Dwivedi, & Slade, 2019; Dwivedi, Rana, Jeyaraj, Clement, & Williams, 2019; Hamari & Keronen, 2017; Ismagilova, Slade, Slade et al., 2019; Rana et al., 2015; Zhao et al., 2018). Effect size provides an estimation of the magnitude of a phenomenon present in the population (Cohen, Cohen, West, & Aiken, 1983). The larger value of effect size represents the higher degree of presence of a subject phenomenon. Following steps were carried out to conduct meta-analysis (Hedges & Vevea, 1998; Lipsey & Wilson, 2001):

Step 1: Calculation of the Fisher transformation of correlation coefficients:

$$\text{Fisher transformation (Ti)} = 0.5 * \log\frac{1 + r_i}{1 - r_i}$$

Step 2: Homogeneity among the studies is tested by Q-statistic which is calculated as the weighted variance of the effect size metric. Q-statistic indicates the variability in the effect size estimate due to sample heterogeneity instead of sampling error. Following are the formulas used for the analysis:

$$Q = \sum_{i=1}^{n} W_i * (T_i - \bar{T})^2$$

where,

Q = Heterogeneity statistic,
W_i = Sample size for the i^{th} study
T_i = Effect size for the i^{th} study

$$\bar{T} = \sum (W_i * T_i) / \sum W_i$$

Step 3: Calculation of overall effect size:

$$T\ (\text{consolidated}) = \sum_{i=1}^{n} W'_i * T_i$$

where,

$$1/W'_i = 1/W_i + \tau^2$$

$$\tau^2 = \text{Max}\ [0, (Q\text{-}df)/C]$$

$$C = \sum W_i - \frac{\sum W_i^2}{\sum W_i}$$

df = Degrees of Freedom

$$\text{Overall effect size}\ (\bar{r}) = \frac{e^{2T\,(consolidated)} - 1}{e^{2T\,(consolidated)} + 1}$$

Step 4: Assessing the significance level of the overall effect size: The p-value linked to the overall effect size specifies its statistical significance.

4. Results

4.1. Effect-size calculation

The objective of the present study was to find the combined effect of multiple studies using meta-analysis. Fixed effect and random effect models are two bases on which meta-analysis can be conducted. The fixed effect model assumes that a single effect exists across the population from which the samples were drawn. However, the random effect model assumes that varying effect size exists across the population from which the samples were drawn (Borenstein, Hedges, & Rothstein, 2007). Owing to the varying nature of studies in this research, the random effect model was used to calculate the combined effect size (Rana et al., 2015; Tamilmani et al., 2019).

The meta-analysis was carried out using correlation coefficients as the metric to estimate the combined effect size for the relationships between technology acceptance factors, risk factors, quality factors, mobile factors, individual factors, behavioral outcomes, and trust in m-commerce. Table 1 summarizes the results of the meta-analysis. The findings reveal that both the technology acceptance factors (perceived usefulness and perceived ease of use) have a significantly positive relationship with trust in m-commerce, providing support to H1 and H2. The perceived usefulness has a stronger relationship with trust as compared to perceived ease of use. All quality factors (system quality, information quality, service quality, and user interface) are significantly and positively related to trust with system quality and information quality was having the strongest effects, supporting H3 – H6. Risk factors namely, structural assurance and perceived security have a significant positive relationship, and perceived risk has a significant negative relationship with trust, supporting H7 – H9. However, perceived privacy is not significantly related to trust in m-commerce. Thus, H10 was not supported. Among the risk factors, the relationship of structural assurance with trust in m-commerce is the strongest. Ubiquity and disposition to trust have a significant positive relationship with trust, providing support to H11 and H12. Concerning the consequences of trust, trust is significantly related with all the behavioral outcomes with the relationship being strongest with user satisfaction followed by loyalty, supporting H13 – H16. According to Cohen et al. (1983) and Hamari and Keronen (2017), the effect sizes can be categorized into strong (0.5), moderate (0.3) or weak (0.1) based on its magnitude. The effect sizes of most of the relationships examined were either moderate or strong.

The heterogeneity of the effect sizes was estimated using the Q statistic. The significant values of Q statistic for all the paths led to the rejection of the null hypothesis of homogeneity in this study. It further supported the selection of the random-effects model for the present study. Subgroup analysis was conducted using culture as a moderator to explain the variability in the findings.

4.2. Sub-group analysis

To explain the heterogeneity in the sample, the moderating effect of culture was examined. Table 2 summarizes the findings of moderator analysis. The significant Q-statistic value for all the antecedents and consequences of trust except perceived ease of use, disposition to trust, and attitude posits that culture moderates these relationships. Thus, H17 was partially supported. The relationship of perceived usefulness with trust was significant irrespective of the culture with the relationship being stronger in western culture. All the quality related factors have a significant relationship with trust across both the cultures with the relationships being stronger in eastern cultures. The risk related factors, perceived security, and structural assurance are significantly related to trust in eastern and western cultures. Further, the relationships of perceived security and structural assurances with trust are stronger in western culture. Perceived risk has a significant negative relationship with trust in western cultures, however, the relationship becomes insignificant in eastern culture. Perceived privacy is not

Table 1
Meta-analytic effect sizes of antecedents and consequences of trust in m-commerce.

Factor Category	Factor	Significant Study Number	Sample Size	Combined Effect Size	p-Value	Q-Value (Homogeneity Test)	Strength
Technology acceptance factors	Perceived Usefulness	74	24351	0.498***	0.000	2112.483***	Moderate
	Perceive Ease of Use	68	23442	0.472***	0.000	2376.366***	Moderate
Quality factors	System quality	15	7817	0.555***	0.000	700.445***	Strong
	Information quality	18	7744	0.554***	0.000	634.671***	Strong
	Service quality	15	7757	0.551***	0.000	714.524***	Strong
	User interface	6	1414	0.384***	0.000	77.353***	Moderate
Risk factors	Perceived risk	25	14374	−0.186**	0.015	1698.749***	Weak
	Perceived security	22	7180	0.438***	0.000	2163.826***	Moderate
	Structural assurance	13	3083	0.504***	0.000	192.564***	Strong
	Perceived privacy	9	3250	0.193^{ns}	0.131	700.660***	Weak
Mobile factors	Ubiquity	9	2745	0.478***	0.000	67.333***	Moderate
Individual factors	Disposition to trust	12	3452	0.317***	0.000	326.349***	Moderate
Behavioural outcomes	Attitude	19	6765	0.519***	0.000	358.451***	Strong
	User Satisfaction	27	10689	0.594***	0.000	842.590***	Strong
	Behavioural intention	80	28776	0.504***	0.000	2707.228***	Strong
	Loyalty	11	4862	0.535***	0.000	302.411***	Strong

Notes: According to Kirca et al. (2005), meta-analysis was conducted on factors which had a significant study number of at least three.
ns: non-significant relationship; $p > 0.10$.
*: $p < 0.10$.
**: $p < 0.050$.
***: $p < 0.010$.

Table 2
The moderating effect of culture.

Moderator	Factor	Significant Study Number	Combined Effect Size	p-Value	Q-Value of two groups (Homogeneity Test)
Eastern	Perceived	60	0.490***	0.000	6.801***
Western	Usefulness	14	0.535***	0.000	
Eastern	Perceive	56	0.468***	0.000	2.027^{ns}
Western	Ease of Use	12	0.493***	0.000	
Eastern	System	11	0.672***	0.000	297.833***
Western	quality	4	0.260***	0.001	
Eastern	Information	12	0.582***	0.000	68.636***
Western	quality	6	0.389***	0.000	
Eastern	Service	11	0.567***	0.000	27.871***
Western	quality	4	0.441***	0.000	
Eastern	User	3	0.465**	0.014	9.392***
Western	interface	3	0.302*	0.055	
Eastern	Perceived	14	−0.047^{ns}	0.347	304.358***
Western	risk	11	−0.355***	0.001	
Eastern	Perceived	15	0.355**	0.021	84.903***
Western	security	7	0.605***	0.000	
Eastern	Structural	8	0.473***	0.009	5.067**
Western	assurance	5	0.559***	0.000	
Eastern	Perceived	6	0.022^{ns}	0.909	165.861***
Western	privacy	3	0.496^{ns}	0.132	
Eastern	Disposition	9	0.354***	0.000	1.832^{ns}
Western	to trust	3	0.298^{ns}	0.526	
Eastern	Attitude	15	0.526***	0.000	1.422^{ns}
Western		4	0.566***	0.000	
Eastern	User	23	0.581***	0.000	6.428**
Western	Satisfaction	4	0.654***	0.000	
Eastern	Behavioural	59	0.498***	0.000	2.850*
Western	intention	21	0.521	0.000	

Notes: According to Kirca et al. (2005), meta-analysis was conducted on factors which had a significant study number of at least three.
ns: non-significant relationship; $p > 0.10$.
*: $p < 0.10$.
**: $p < 0.050$.
***: $p < 0.010$.

significantly related to trust across both the cultures. Culture moderates the relationship of trust with user satisfaction and behavioral intention with the relationships being stronger in western cultures. The moderating effect of culture could not be examined for ubiquity and loyalty due to the insufficient number of studies.

5. Discussion

Previous studies on antecedents and consequences of trust in m-commerce have reported mixed findings (Kumar, Adlakaha et al., 2018; Cao et al., 2018; Koenig-Lewis, Palmer, & Moll, 2010; Kumar, Israel et al., 2018; Marinkovic & Kalinic, 2017). The present study collates the findings of 118 published empirical papers using meta-analysis to provide some useful and interesting insights. The review of articles highlighted the most frequently studied antecedents and consequences of trust in m-commerce. The findings reveal that all the hypothesized antecedents except perceived privacy and all the behavioral outcomes have significant relationship with trust in m-commerce (See Table 1). The effect sizes for all the relationships were found to vary from moderate to strong except perceived risk for which effect size strength was found weak.

Hypotheses H1 and H2 were supported as technology acceptance factors, namely perceived usefulness and perceived ease of use were found to have a significant positive relationship with trust in m-commerce. This is consistent with the findings of the previous studies (Kumar, Adlakaha et al., 2018; Afshan & Sharif, 2016; Kumar, Israel et al., 2018; Nel & Boshoff, 2017). For example, Afshan and Sharif (2016) found that perceived usefulness and perceived ease of use significantly influence trust in the context of mobile banking in Pakistan.

Hypotheses H3-H6 proposed that quality factors, namely system quality, information quality, service quality, and user interface have a significant positive relationship with trust in m-commerce. The results indicated that all the quality factors have a significant positive relationship with trust in m-commerce, which is consistent with the previous studies (Gao & Waechter, 2017; Ofori et al., 2018; Silic & Ruf, 2018; Stewart & Jürjens, 2018). For example, system quality positively influences trust in mobile payment systems (Gao & Waechter, 2017). Information quality and service quality are positively related to the trust in mobile financial advisory systems (Silic & Ruf, 2018). Similarly, Stewart and Jürjens (2018) found that user interface influences consumer trust in FinTech innovation in Germany.

Hypotheses H7-H10 proposed that risk factors have a significant relationship with trust in m-commerce. The results indicated that perceived risk has a significant negative relationship with trust, supporting H7. Perceived security and structural assurance were found to have a significant positive relationship with trust in m-commerce, supporting H8 and H9. Perceived privacy did not have a significant relationship with trust, thus, H10 was not supported. The results are consistent with the findings of the previous studies (Arpaci, 2016; Khalilzadeh et al., 2017; Oliveira et al., 2014; Silic & Ruf, 2018; Xin et al., 2015). For example, Khalilzadeh et al. (2017) found that perceived risk and security significantly influence trust in near-field communication based mobile payment systems in the restaurant industry. Similarly, trust was found to be significantly influenced by structural assurances in financial advisory services (Silic & Ruf, 2018).

Hypothesis H11 proposed that mobile factor, i.e., ubiquity is significantly related to trust in m-commerce. Ubiquity was found to have a significant positive relationship with trust in m-commerce, supporting H11. The result is consistent with the findings of the previous studies (Lin, 2011; Zhou, 2011e, 2012a). For example, ubiquity was found to have a significant positive influence on trust in mobile payment systems (Zhou, 2011e). Hypothesis H12 proposed that individual factor, i.e., disposition to trust has a significant positive relationship with trust in m-commerce. Consistent with previous studies, disposition to trust was found to have a significant positive relationship with trust, providing support to H12 (Deng, Lu, Zhang, & Wei, 2010; Lin, 2011; Wang et al., 2015; Xin et al., 2015). For example, Xin et al. (2015) found that disposition to trust has a significant positive influence on trust in mobile payments.

Hypotheses H13-H16 proposed that trust has a significant positive relationship with behavioral outcomes. The findings revealed that trust has a significant positive relationship with satisfaction, loyalty, behavioral intention, and attitude, supporting H13-H16. The findings are consistent with the previous studies (Beza et al., 2018; Hajiheydari & Ashkani, 2018; Marinkovic & Kalinic, 2017; Ofori et al., 2018). For example, in the context of Iranian mobile application users, trust significantly influences attitude (Hajiheydari & Ashkani, 2018). Similarly, Ofori et al. (2018) found that trust has a significant positive influence on user satisfaction and loyalty in the context of mobile data service providers in Ghana.

Hypothesis H17 proposed that culture moderates the relationship of antecedents and consequences with trust in m-commerce. The results indicated the high heterogeneity across all the paths. Sub-group analysis was conducted to explain the heterogeneity in the antecedents and consequences of trust in m-commerce by taking culture as the moderating variable. Culture significantly moderated the hypothesized relationships except in the cases of perceived ease of use, disposition to trust, and attitude, partially supporting H17. The results are consistent with the previous studies which propose culture as an important moderator in trust formation (Anderson et al., 2010; Zhang et al., 2012). Summary of the results of meta-analysis and sub-group analysis is presented in Table 3.

Table 3
Summary of results.

Factor	Expected relationship	Meta-analysis result	Sub-group analysis		
			Moderator	Subgroup	Result
Perceived usefulness	Positive	0.498***	Culture	Eastern	0.490***
			(Q-value: 6.801***)	Western	0.535***
Perceive ease of use	Positive	0.472***	Culture	Eastern	0.468***
			(Q-value: 2.027^{ns})	Western	0.493***
System quality	Positive	0.555***	Culture	Eastern	0.672***
			(Q-value: 297.833***)	Western	0.260***
Information quality	Positive	0.554***	Culture	Eastern	0.582***
			(Q-value: 68.636***)	Western	0.389***
Service quality	Positive	0.551***	Culture	Eastern	0.567***
			(Q-value: 27.871***)	Western	0.441***
User interface	Positive	0.384***	Culture	Eastern	0.465**
			(Q-value: 9.392***)	Western	0.302*
Perceived risk	Negative	−0.186**	Culture	Eastern	−0.047^{ns}
			(Q-value: 304.358***)	Western	−0.355***
Perceived security	Positive	0.438***	Culture	Eastern	0.355**
			(Q-value: 84.903***)	Western	0.605***
Structural assurance	Positive	0.504***	Culture	Eastern	0.473***
			(Q-value: 5.067**)	Western	0.559***
Perceived privacy	Positive	0.193^{ns}	Culture	Eastern	0.022^{ns}
			(Q-value: 165.861***)	Western	0.496^{ns}
Disposition to trust	Positive	0.317***	Culture	Eastern	0.354***
			(Q-value: 1.832^{ns})	Western	0.298^{ns}
Attitude	Positive	0.519***	Culture	Eastern	0.526***
			(Q-value: 1.422^{ns})	Western	0.566***
User Satisfaction	Positive	0.594**	Culture	Eastern	0.581***
			(Q-value: 6.428**)	Western	0.654***
Behavioural intention	Positive	0.504***	Culture	Eastern	0.498***
			(Q-value: 2.850*)	Western	0.494***

ns: non-significant relationship; $p > 0.10$.
*: $p < 0.10$.
**: $p < 0.050$.
***: $p < 0.010$.

5.1. Theoretical contributions

The study had several theoretical and managerial implications. Firstly, the research integrates the findings of 118 studies to propose an overarching model that supports the proposition that technology acceptance factors, quality factors, risk factors, mobile factors, and individual factors are significantly related to trust in m-commerce. Whilst most studies have examined the relevance of these factors concerning trust and behavioral intention, there is limited research on integrating them to understand their applicability in m-commerce adoption and use. This study proposes that technology acceptance factors, quality factors, risk factors, mobile factors, and individual factors infuse trust in m-commerce that leads to attitude formation, satisfaction, loyalty, continued use and behavioral intention to use m-commerce. Since m-commerce is understood as a new technological interface that improves transaction and helps in building long term relationship with customers, these factors can help companies enhance the customers' trust in m-commerce. Trust can be related with customers' expectations about performance of the m-commerce. M-commerce service attributes may also play a critical role in improving the trust perception by enhancing the experiential aspects. High trust perception affects customers' attitudes and beliefs about m-commerce and inhibits or encourages its adoption and use. Further, the results of this study extend the earlier research on m-commerce adoption by identifying the relevance of all the factors in context to culture.

Secondly, the study collates the findings to suggest that though there is little difference in customer' intention to use m-commerce across eastern and western culture, there were some differences observed concerning perceived risk. The differences in customers' perception towards structural assurance and perceived risk may be attributed to the difference in technology infrastructure and available support to resolve technical problems. Customers' from western culture have a better understanding of security, privacy issues and loss of confidential data as they have more exposure and experience with using technology in day-to-day interactions. Thus, they can fathom technological complexities and are cautious about data loss, hacking, and privacy-related problems. In eastern culture, customers are unable to comprehend these problems because of poor technology infrastructure, and support mechanisms to combat risk-related problems. Lack of awareness of the transaction related problems lowers customers' perception of risk in developing countries. Customers' may not be able to differentiate the security risks and therefore exhibit fewer concerns in adopting m-commerce. The unavailability of awareness programs about technological risks, unreliable transaction, and network platforms, and little knowledge to combat security problems makes customers prone to the risks. However, in developed countries, support mechanisms and awareness about security problems enable customers to be able to differentiate these risks.

Thirdly, an important contribution of the research is that it categorizes the outcomes into customers' attitude, loyalty, satisfaction, and behavioral intention to use m-commerce. Earlier studies have examined the relationship concerning a few behavioral outcomes; however, the current research has identified several behavioral outcomes. The findings posit that exposure and use of m-commerce may translate into implicit and explicit behavior. This implies that some of the behavioural outcomes may be internalized in the form of attitude and loyalty; whereas others may have visible impact on behaviour. Some of the outcome variables such as satisfaction, loyalty, and attitude may have a long-term impact on customers' behavior, while the behavioral intention may translate into usage behavior. The unique aspect of the study is that it proposes and suggests that outcomes may be measured according to various determinants like technology acceptance factors,

risk, quality, mobile related factors which strengthen the likelihood that customer may use m-commerce in the future. It provides an integrated framework that coalesces various attributes and highlights the applicability of these dimensions in mobile commerce use.

5.2. Practical implications

The findings will enable companies offering m-commerce platform to harness the advantages of m-commerce by focussing on relevant factors important in a particular culture. It is important to understand that risk perceptions influence trust. Therefore, it is vital to reduce the fear and uncertainty by providing transactional assurance and confidentiality. The model proposes that technology acceptance factors may be strengthened so that customers find it convenient, easy to use, hassle-free, and accessible. It entails developing systems that would facilitate convenient transactions across different platforms, reinforces confidentiality, ease of use, and provide useful features that would enhance job fulfilment. Companies using m-commerce to target customers may focus on platforms that are user-friendly and easy to understand. Culture and language related adaptations need to be done in order to enhance the acceptability among consumers. Trust is influenced by service and safety attributes. Consumer perception about m-commerce quality can be improved by customizing the services according to cultural nuances. It should facilitate interactivity, search, and purchase. The service and design quality should be customized according to specific technology infrastructure and network issues. The element of ubiquity and portability may be used for improving accessibility perception and consequently trust.

It is apparent that m-commerce is perceived as the new platform for engaging and contacting customers and user interface elements need to be improved to boost confidence and trust. Customer engagement can be enhanced by improving the technology acceptance factors. Refinement of various website related features can create a perception of comfort and trust. It is therefore important for marketers to understand the relevant functional attributes that can be used for improving service portfolio and customer interaction touch points. Building and designing m-commerce platforms according to customer service expectations would help in strengthening customer relationship. It is also important to analyze the customer characteristics such as disposition to trust while designing m-commerce dimensions. Thus, building trust in m-commerce would require strengthening of various elements so that the competitiveness of m-commerce is enhanced.

5.3. Limitations and future research directions

Despite the rigorous methodology used in the study, the study has some limitations similar to other research articles employing meta-analysis. First, the research articles were extracted from only popular databases, and hence some of the relevant research articles might not have been extracted which were not present in these databases. Hence, future researchers may consider wider range of databases. Second, publication bias owing to the greater likelihood of studies reporting significant results getting published could be another issue which could affect the results of the study. Third, only quantitative studies were used to conduct the analysis which could lead to potential sampling bias. Fourth, due to fewer number of studies, present meta-analysis could not analyze various potential antecedents of trust in m-commerce, e.g., commitment, familiarity, relative advantage, switching intention, offline trust, trialability, reputation, interactivity, convenience and habit. Future research may investigate the relationship of trust with these variables. Fifth, though this study validated the proposed hypotheses related to antecedents and consequences of trust in m-commerce, all the relationships were assessed separately. Future researchers may test these relationships together using meta-analysis structural equation modelling technique.

6. Conclusions

Present research synthesizes the results from the previous studies on trust in m-commerce by using meta-analysis technique. Particularly, the study examined the influence of technology acceptance factors (perceived usefulness and perceived ease of use), quality factors (system quality, information quality, service quality, and user interface), risk factors (structural assurance, perceived security, perceived risk, and perceived privacy), mobile factor (ubiquity), and individual factor (disposition to trust) on trust in m-commerce. All the hypothesized antecedents of trust in m-commerce were significant except perceived privacy. Further, the study found that trust in m-commerce influences various behavioral outcomes (attitude, user satisfaction, behavioral intention and loyalty). It was also found that culture significantly moderates the hypothesized relationships except in the cases of perceived ease of use, disposition to trust, and attitude.

Appendix A. Summary of studies used for each construct

Factor Category	Factor	Studies	Reference No.
Technology acceptance factors	Perceived Usefulness	74	Afshan & Sharif, 2016; Ahmad & Khalid, 2017; Akter et al., 2013; Al-Adwan, Al-Adwan, & Berger, 2018; Al-Jabri, 2015; Alalwan, Dwivedi, & Rana, 2017; Almaiah, 2018; Awad & Dessouki, 2017; Baabdullah, 2018; Beza et al., 2018; Blaise et al., 2018; Chang et al., 2017; Chauhan, 2015; Chong, Chan, & Ooi, 2012; Chong, 2013; Deng, Lu, Zhang et al., 2010; Dew, Hidayanto, & Shihab, 2017; Farah et al., 2018; Groß, 2015; Gu et al., 2009; Hajiheydari & Ashkani, 2018; Hamidi & Chavoshi, 2018; Khalilzadeh et al., 2017; Kim, 2017; Koenig-Lewis et al., 2010; Koksal, 2016; Ku, Lin, & Yan, 2017; Kumar, Adlakaha et al., 2018; Kumar, Israel et al., 2018; Li & Yeh, 2009, 2010; Liébana-Cabanillas et al., 2017; Liu & Guo, 2017; Liu et al., 2014; Luo et al., 2010; Lwoga & Lwoga, 2017; Mohd & Mohd, 2017; Narteh, Mahmoud, & Amoh, 2017; Nel & Boshoff, 2017; Nikou & Economides, 2017; Oliveira et al., 2014; Phonthanukitithaworn et al., 2016; Qasim & Abu-shanab, 2016; Qu et al., 2018; Saxena, 2017; Shankar & Datta, 2018; Shao & Zhang, 2018; Shaw, 2014, 2015; Shin, 2009; Slade, Dwivedi, Piercy, & Williams, 2015; Suki, 2012; Verkijika, 2018; Wei et al., 2009; Yeh & Li, 2009; Zarmpou, Saprikis, Markos, & Vlachopoulou, 2012; Zhang & Mao, 2008; Zhang, Lu et al., 2018; Zhou, 2011a, 2011b, 2011c, 2013a, 2014; Zhou & Lu, 2011a
	Perceive Ease of Use	68	Afshan & Sharif, 2016; Ahmad & Khalid, 2017; Al-Adwan et al., 2018; Al-Jabri, 2015; Alalwan et al., 2017; Almaiah, 2018; Awad & Dessouki, 2017; Baabdullah, 2018; Beza et al., 2018; Blaise et al., 2018; Chang et al., 2017; Chauhan, 2015; Chong & Chong, 2013; Chong, 2013; Farah et al., 2018; Groß, 2015; Gu et al., 2009; Hajiheydari & Ashkani, 2018; Hamidi & Chavoshi, 2018; Khalilzadeh et al., 2017; Koenig-Lewis et al., 2010; Koksal, 2016; Ku et al., 2017; Kumar, Adlakaha et al., 2018; Kumar, Israel et al., 2018; Li & Yeh, 2009, 2010; Liébana-Cabanillas et al., 2017; Lin, 2011; Liu & Guo, 2017; Liu et al., 2014; Lwoga & Lwoga, 2017; Matemba & Li, 2018; Mohd & Mohd, 2017; Narteh et al., 2017; Nel & Boshoff, 2017; Nikou & Economides, 2017; Oliveira et al., 2014; Phonthanukitithaworn et al., 2016; Qasim & Abu-shanab, 2016; Qu et al., 2018; Saxena, 2017; Shankar & Datta, 2018; Shaw, 2014, 2015; Shin, 2009; Singh & Srivastava, 2018; Slade et al., 2015; Suki, 2012; Verkijika, 2018; Wei et al., 2009; Yeh & Li, 2009; Zarmpou et al., 2012; Zhang & Mao, 2008; Zhang, Lu et al., 2018; Zhou, 2011b, 2011c, 2012a, 2014, 2018; Zoghlami et al., 2018)

Quality factors	System quality	15	Akroush et al., 2011; Gao & Waechter, 2017; Gao et al., 2015; Gu et al., 2009; Hajiheydari & Ashkani, 2018; Lee, Shin, & Lee, 2009; Silic & Ruf, 2018; Zhou, 2014, 2011b, 2012b, 2013a; Zhou, Li, & Liu, 2010
	Information quality	18	Gao & Waechter, 2017; Gao et al., 2015; Hajiheydari & Ashkani, 2018; Janson, Hoffmann, Hoffmann, & Leimeister, 2013; Lee et al., 2009; Silic & Ruf, 2018; Ting, 2018; Zhou, 2014, 2011, 2012b, 2013; Zhou, Li et al., 2010; Zoghlami et al., 2018
	Service quality	15	Akter et al., 2013; Dahiyat & Akroush, 2011; Deng, Lu, Wei et al., 2010; Dew et al., 2017; Gao & Waechter, 2017; Gao et al., 2015; Hajiheydari & Ashkani, 2018; Ofori et al., 2018; Silic & Ruf, 2018; Zhou, 2012b, 2013a, 2011c; Zhou & Lu, 2011b
	User interface	6	Arcand, PromTep, Brun, & Rajaobelina, 2017; Lee et al., 2009; Li & Yeh, 2010; Nikou & Economides, 2017; Stewart & Jürjens, 2018; Vaithilingam et al., 2013
Risk factors	Perceived risk	25	Al-Jabri, 2015; Awad & Dessouki, 2017; Blaise et al., 2018; Chang, Shen, & Liu, 2016; Chin et al., 2018; Farah et al., 2018; Gao & Waechter, 2017; Jaradat et al., 2018; Khalilzadeh et al., 2017; Lu, Yang, Chau, & Cao, 2011; Luo et al., 2010; R.F. Malaquias & Hwang, 2016; Marett, Pearson, Pearson, & Bergiel, 2015; Marriott & Williams, 2018; Narteh et al., 2017; Ozturk et al., 2017; Shao & Zhang, 2018; Shin, 2010; Slade et al., 2015; Verkijika, 2018; Yang et al., 2015
	Perceived security	22	Almaiah, 2018; Arcand et al., 2017; Chin et al., 2018; Fan et al., 2018; Gao et al., 2015; Janson et al., 2013; Khalilzadeh et al., 2017; Khasawneh et al., 2018; Kumar, Adlakaha et al., 2018; Kumar, Israel et al., 2018; Lwoga & Lwoga, 2017; Matemba & Li, 2018; Park & Tussyadiah, 2017; Shao & Zhang, 2018; Shin, 2009; Singh & Srivastava, 2018; Stewart & Jürjens, 2018; Ting, 2018; Vaithilingam et al., 2013; Zhou, 2011e; Zhou, Li et al., 2010; Zoghlami et al., 2018
	Structural assurance	13	Afshan & Sharif, 2016; Kim et al., 2009; Ku et al., 2017; Lin & Lu, 2011; Luo et al., 2010; Oliveira et al., 2014; Silic & Ruf, 2018; Tan, 2013; Xin et al., 2015; Zhou, 2012a, 2012b, 2013b, 2011b
	Perceived privacy	9	Chang et al., 2016; Chin et al., 2018; Dew et al., 2017; Khasawneh et al., 2018; Libaque-sa et al., 2016; Matemba & Li, 2018; Ozturk et al., 2017; Zhang, Lu et al., 2018; Zhou, Li et al., 2010
Mobile factors	Ubiquity	9	Jia, Hall, & Zhu, 2015; Liébana-Cabanillas et al., 2017; Lin & Lu, 2011; Lwoga & Lwoga, 2017; Nikou & Economides, 2017; Zhou, 2011e, 2012a, 2013b; Zhou, Li et al., 2010
Individual factors	Disposition to trust	12	Cheung & To, 2017; Deng, Lu, Wei et al., 2010; Dew et al., 2017; Kim et al., 2009; Ku et al., 2017; Lin, Lu, Wang, & Wu, 2011; Luo et al., 2010; Marriott & Williams, 2018; Oliveira et al., 2014; Zhang & Mao, 2008; Zhou, 2011a
Behavioural outcomes	Attitude	19	Awad & Dessouki, 2017; Chauhan, 2015; Cheung & To, 2017; Deng, Lu, Zhang et al., 2010; Fan et al., 2018; Groß, 2015; Hajiheydari & Ashkani, 2018; Khalilzadeh et al., 2017; Lin, 2011; Saxena, 2017; Shin, 2009; Shin, 2010
	User Satisfaction	27	Akroush et al., 2011; Akter et al., 2013; Apostolos, 2016; Arcand et al., 2017; Berraies et al., 2017; Cao et al., 2018; Dahiyat & Akroush, 2011; Deng, Lu, Wei et al., 2010; Dew et al., 2017; Gao et al., 2015; Hajiheydari & Ashkani, 2018; Kumar, Adlakaha et al., 2018; Kumar, Adlakaha et al., 2018; Kumar, Israel et al., 2018; Lee et al., 2009; Li & Yeh, 2009; Ofori et al., 2018; Sampaio, 2017; Silic & Ruf, 2018; Suki, 2012; Thakur, 2018; Ting, 2018; Yeh & Li, 2009; Zhou, 2011c; Zhou, 2013a; Zhou, 2014; Zhou & Lu, 2011b; Zoghlami et al., 2018
	Behavioural intention	80	Afshan & Sharif, 2016; Ahmad & Khalid, 2017; Al-Adwan et al., 2018; Al-Jabri, 2015; Alalwan et al., 2017; Almaiah, 2018; Awad & Dessouki, 2017; Baabdullah, 2018; Beza et al., 2018; Blaise et al., 2018; Chauhan, 2015; Cheung & To, 2017; Chin et al., 2018; Chong, 2013; Deng, Lu, Zhang et al., 2010; Farah et al., 2018; Gao & Waechter, 2017; Gong, Zhang, Zhao, & Lee, 2016; Groß, 2015; Gu et al., 2009; Hajiheydari & Ashkani, 2018; Hamidi & Chavoshi, 2018; Janson et al., 2013; Jaradat et al., 2018; Khalilzadeh et al., 2017; Kim et al., 2009; Leong, Jaafar, & Sulaiman, 2018; Li & Yeh, 2009; Liébana-Cabanillas et al., 2017; Lin, 2011; Lin et al., 2011; Liu & Guo, 2017; Liu et al., 2014; Lu et al., 2011; Luo et al., 2010; Lwoga & Lwoga, 2017; Marriott & Williams, 2018; Mohd & Mohd, 2017; Narteh et al., 2017; Nel & Boshoff, 2017; Nikou & Economides, 2017; Oliveira et al., 2014; Phonthanukitithaworn et al., 2016; Qasim & Abu-shanab, 2016; Qu et al., 2018; Saxena, 2017; Shankar & Datta, 2018; Shao & Zhang, 2018; Shaw, 2014, 2015, Shin, 2009; Shin, 2010; Silic & Ruf, 2018; Singh & Srivastava, 2018; Slade et al., 2015; Tan, 2013; Ting, 2018; Verkijika, 2018; Wei et al., 2009; Yang et al., 2015; Zarmpou et al., 2012; Zhang & Mao, 2008; Zhou, 2011a, 2011c, 2012a, 2013a; Zhou & Lu, 2011a; Zhou, Li et al., 2010
	Loyalty	11	Akroush et al., 2011; Apostolos, 2016; Berraies et al., 2017; Dahiyat & Akroush, 2011; Deng, Lu, Zhang et al., 2010; Kim, 2017; Ofori et al., 2018; Ozturk et al., 2017; Sampaio, 2017; Zhou, Li et al., 2010; Zoghlami et al., 2018

Appendix B. Profile of the papers used in meta-analysis

Study	Sample size	Country	Context
Farah et al. (2018)	368	Pakistan	Mobile banking
Kumar et al. (2018)	250	India	Mobile wallets
Zhang et al. (2018b)	520	Global	Mobile banking
Almaiah (2018)	275	Jordan	Mobile information system
Qu et al. (2018)	320	China	Mobile payment
Hajiheydari and Ashkani (2018)	1348	Iran	Mobile application
Verkijika (2018)	372	Cameroon	Mobile application
Beza et al. (2018)	220	Ethiopia	Mobile SMS service
Ting (2018)	293	USA	Mobile shopping
Hamidi and Chavoshi (2018)	300	Iran	Mobile learning
Shankar and Datta (2018)	381	India	Mobile payment
Marriott and Williams (2018)	435	UK	Mobile shopping
Baabdullah (2018)	600	Saudi Arab	Mobile social network games
Matemba and Li (2018)	212	South Africa	Mobile wallets
Ofori et al. (2018)	235	Ghana	Mobile data services
Blaise et al. (2018)	165	USA	Mobile commerce
Chin et al. (2018)	214	USA	Mobile application
Zoghlami et al. (2018)	256	Tunisia	Mobile banking
Thakur (2018)	421	India	Mobile shopping
Cao et al. (2018)	219	China	Mobile payment
Khasawneh et al. (2018)	404	Jordan	Mobile banking
Fan et al. (2018)	186	China	Mobile payment
Fan et al. (2018)	196	USA	Mobile payment
Jamshidi, Keshavarz, Kazemi, & Mohammadian (2018)	927	Iran	Mobile banking
Singh and Srivastava (2018)	855	India	Mobile banking
Zhou (2018)	309	China	Mobile banking
Silic and Ruf (2018)	107	Switzerland	Mobile banking
Leong et al. (2018)	808	Malaysia	Mobile commerce
Jaradat et al. (2018)	332	Jordan	Mobile services

Al-Adwan et al. (2018)	444	Jordan	Mobile learning
Stewart and Jürjens (2018)	209	Germany	Mobile financial services
Kim (2017)	300	South Korea	Mobile messenger
Cheung and To (2017)	480	China	Mobile application
Ahmad and Khalid (2017)	120	UAE	Mobile government services
Park and Tussyadiah (2017)	411	China	Mobile travel booking
Nel and Boshoff (2017)	344	South Africa	Mobile services
Ozturk et al. (2017)	396	USA	Mobile hotel booking
Mohd and Mohd (2017)	300	Malaysia	Mobile application
Narteh et al. (2017)	300	Ghana	Mobile banking
Gao and Waechter (2017)	851	Australia	Mobile payment
Alalwan et al. (2017)	343	Jordan	Mobile banking
Nikou and Economides (2017)	145	Europe	Mobile learning
Khalilzadeh et al. (2017)	412	USA	Mobile payment
Awad and Dessouki (2017)	461	Egypt	Mobile banking
Liébana-Cabanillas et al. (2017)	224	Serbia	Mobile commerce
Chang et al. (2017)	164	China	Mobile social media
Chang et al. (2017)	94	China	Mobile social media
Liu and Guo (2017)	211	China	Mobile computing
Liu and Guo (2017)	232	China	Mobile computing
Arcand et al. (2017)	375	Canada	Mobile banking
Berraies et al. (2017)	361	Tunisia	Mobile banking
Sampaio (2017)	383	Brazil, India	Mobile banking
Lwoga and Lwoga (2017)	292	Tanzania	Mobile payment
Saxena (2017)	311	India	Mobile government services
Chang et al. (2016)	136	Taiwan	Tourism
Malaquias & Hwang (2016a)	307	Brazil	Mobile banking
Phonthanukitithaworn et al. (2016)	785	Thailand	Mobile payment
Qasim and Abu-shanab (2016)	253	Jordan	Mobile payment
Koksal (2016)	776	Lebanon	Mobile banking
Afshan and Sharif (2016)	198	Pakistan	Mobile banking
Malaquias & Hwang (2016b)	1077	Brazil	Mobile banking
Libaque-sa et al. (2016)	512	Korea	Mobile internet
Apostolos (2016)	573	Greece	Mobile services
Gao et al. (2015)	462	China	Mobile commerce
Xin et al. (2015)	302	New Zealand	Mobile payment
Marett et al. (2015)	3033	Afghanistan	Mobile phone
Yang et al. (2015)	390	China	Mobile shopping
Al-Jabri (2015)	253	Saudi Arab	Mobile banking
Slade et al. (2015)	268	UK	Mobile payment
Chauhan (2015)	225	India	Mobile money
Groß (2015)	128	Germany	Mobile shopping
Oliveira et al. (2014)	194	Portugal	Mobile banking
Zhou (2014)	194	China	Mobile banking
Shaw (2014)	284	Canada	Mobile wallets
Liu et al. (2014)	409	China	Mobile government services
Zhou (2014)	226	China	Mobile payment
Chong & Chong (2013)	410	China	Mobile commerce
Chong (2013)	376	China	Mobile commerce
Akter et al. (2013)	216	Mexico, India, Bangladesh	Mobile health
Vaithilingam et al. (2013)	209	Malaysia	Mobile banking
Zhou (2013a)	195	China	Mobile payment
Zhou (2013b)	285	China	Mobile commerce
Zhou (2012a)	200	China	Mobile banking
Zhou (2012b)	240	China	Mobile banking
Zarmpou et al. (2012)	445	Greece	Mobile services
Suki (2012)	200	Malaysia	Mobile commerce
Lu et al. (2011)	961	China	Mobile payment
Zhou and Lu (2011b)	269	China	Mobile services
Zhou (2011)	210	China	Mobile banking
Zhou (2011)	229	China	Mobile website
Zhou (2011)	277	China	Mobile payment
Dahiyat and Akroush (2011)	756	Jordan	Mobile Services
Lin (2011)	368	Taiwan	Mobile banking
Zhou and Lu (2011a)	268	China	Mobile commerce
Lin & Lu (2011)	332	China	Mobile brokerage
Akroush et al. (2011)	1000	Jordan	Mobile telecommunication
Shin (2010)	294	USA	Mobile payment
Deng, Lu, Zhang, et al. (2010)	152	China	Mobile services
Deng, Lu, Zhang, et al. (2010)	68	China	Mobile services
Deng, Lu, Zhang, et al. (2010)	541	China	Mobile messenger
Zhou, Li, et al. (2010)	305	China	Mobile SNS
Li and Yeh (2010)	200	Taiwan	Mobile commerce
Luo et al. (2010)	122	USA	Mobile banking
Zhou, Lu, et al. (2010)	250	China	Mobile services
Koenig-Lewis et al. (2010)	263	Germany	Mobile banking
Yeh and Li (2009)	212	Taiwan	Mobile commerce
Lee and Chung (2009)	276	Korea	Mobile banking
Gu et al. (2009)	910	Korea	Mobile banking
Shin (2009)	296	Korea	Mobile wallets

Kim, Shin, & Lee (2009)	192	Korea	Mobile banking
Wei et al. (2009)	222	Malaysia	Mobile commerce
Zhang and Mao (2008)	262	China	Mobile advertising
Kumar, Israel, & Malik (2018)	744	India	Mobile banking
Janson et al. (2013)	106	Germany	Mobile applications
Jia et al. (2015)	216	China	Mobile payment
Jia et al. (2015)	106	China	Mobile payment
Shaw (2015)	597	USA	Mobile wallets
Shao and Zhang (2018)	740	China	Mobile payment
Dew et al. (2017)	606	Indonesia	Mobile services
Ku et al. (2017)	399	China	Mobile applications
Gong et al. (2016)	273	China	Mobile payment
Tan (2013)	302	New Zealand	Mobile payment
Li and Yeh (2009)	212	Taiwan	Mobile services

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