Information Systems and e-Business Management

How consumer innovativeness, technological expertise, and consideration set size can explain mobile commerce use: An extended understanding using a moderation–mediation model

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Declarations of interest: none

Funding: This work was supported by the Vietnam National Foundation for Science and Technology Development (NAFOSTED) under Grant No. 502.02-2018.311.

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Abstract

This study integrates consumer innovativeness (CI) and technological expertise (TE) in consumer attitudes and mobile commerce use (MCU) and introduces consumer consideration set size (CSS) as a moderator and a mediator of these relationships. Based on a survey sample of 577 Vietnamese consumers, it uses a structural equation modelling approach to test the hypotheses. The findings show that attitudes, CI, TE, and CSS have direct positive effects on MC use. The results also indicate a significant moderation effect between CI and TE on MCU. In particular, this study demonstrates that CSS is an important moderator and mediator in the relationships between attitudes, CI, TE, and MCU. The inclusion of mediation effects sharply increases the explained variance of MCU from 25.0% to 37.3%, with an effect size of 49.2%, compared with the model that only includes the direct effects. When the moderator effects are added, the explained variance of MCU increases to 51.7%, with an effect size of 38.6%, compared with the mediation model. Thus, the inclusion of mediation and moderation extends our understanding of the innovativeness–attitude–behaviour relationship in explaining MCU. A deeper understanding of the size and structure of the consideration set is essential to obtain a higher consumer adoption rate and increase loyalty, especially for innovative consumers with high TE.

Keywords Consumer attitudes, Consumer innovativeness, Technological expertise, Consideration set size, Mediating and moderating effect, Mobile commerce use.

1 Introduction

Scholars have emphazised the need to explore and investigate why and how consumers adopt mobile commerce (MC) and engage in the continuance use of MC, especially from the perspectives of consumer attitudes and individual differences (Baker-Eveleth and Stone 2020; Ovčjak et al. 2015). In the digital age, with different competitive channels (e.g., e-commerce [EC], MC, in-store, and others) developed to attract consumers and build customer loyalty, it is important for both practitioners and academic researchers to understand consumer decision-making, choice, and use of MC (Maity and Dass 2014; Shin et al. 2017; Chen 2019). Different theoretical approaches are used to explore the depth and breadth of mobile commerce attitudes and use (Tang 2019; Liu et al. 2019), based especially on well-known theories such as technology acceptance models (TAM; Davis 1989) or the unified theory of acceptance and use of technology (UTAUT; Venkatesh et al. 2003). Those theories are extended with inspiration from other theoretical approaches in the areas of personality theories (e.g., Xu et al. 2016) or personal values (e.g., Song et al. 2014), to name a few examples. In other words, there is considerable research in this area, and the number of theoretical constructs, relationships, and theories that are used is large and continually growing. Therefore, this study integrates the attitude-behavior framework (Ajzen and Fishbein 2000) and consumer decision-making process (Hauser 2014; Roberts and Lattin 1997; Roberts and Dant 1991) to develop a moderation–mediation model, highlighting the combined role of consumer innovativeness (CI), technological expertise (TE), and consideration set size (CSS) in explaining mobile commerce use (MCU).

The core hypotheses in most studies are that general or specific attitudes, defined as perceived usefulness or ease of use, explain the intention and/or adaption/MCU (e.g., and Marinkovic 2015; Liu et al. 2019; Montazemi and Qahri-Saremi 2015; Ovčjak et al. 2015). Attitudes are frequently tested together with alternative predictors, such as trust, involvement, or mobility, as predictors in direct-effect models concerning the intention to use/acceptance of MC (Liébana-Cabanillas et al. 2017). In other studies, attitudes are defined as mediators between those and other predictors (e.g., norms, innovativeness, perceived control, self-efficacy, perceived ease of use, perceived usefulness,

or perceived value) in more complex structural models (Kalinic and Marinkovic 2015; Liu et al. 2019; Zhang et al. 2012). A third, minor, group of studies includes some of the main constructs or predictors in previous studies as moderators between attitudes and intention/use or between more general constructs (e.g., social norms or perceived value (Nel and Boshoff 2019; Wu et al. 2016). Despite the growing literature, with its many different theoretical approaches and a myriad of theoretical constructs and alternative relationships (Manthiou et al. 2014; Ovčjak et al. 2015; Tang 2019), few studies test alternative structures of relationships showing, for example, how attitudes are related to MC adoption in the same study. For example, Manthiou et al. (2014) investigate the two routes (reasoned versus social) of consumers' decision-making processes on behavioral change toward purchasing on Facebook fan pages. Thus, this study will contribute to the established literature by exploring whether and how alternative model structures, such as direct effects, mediation, and moderation, can improve the explanation of MCU. Since most studies rely on cross-sectional surveys, we discuss and use a cross-sectional survey as a basis for our discussion.

Consumers' considerations or associations of alternative product or brand alternatives are essential in their choice and decision-making process (Aurier et al. 2000; Caplin et al. 2019). The EC literature contends that CSS has an essential role in explaining consumer online behaviors (Gu et al. 2012) and, particularly, in identifying the right customers, in the right manner, and at the right time, first and foremost, by data-driven methods to compete with new digital entrants (Pousttchi and Dehnert 2018). Because, "if being considered constitutes a necessary condition for being purchased, then set size plays a crucial role on consumer behavior, choice probabilities and then on marketing strategy" (Aurier et al. 2000, p. 308). CSS is studied in previous research together with attitudes, expertise, and behavior, both as a predictor and as a moderator (e.g., Spassova and Isen 2013; Tuu and Olsen 2013). Notably, the number of brands, products, or stores that consumers consider in their shopping decision process seems to be essential to their choice decisions (Caplin et al. 2019). However, this role of CSS in the context of consumer MC channel choice compared with, for example, in-store, may be different from its role in the context of competitive brands and transaction-specific situations. Since the research on CSS reached its peak in the 1990s, few studies

include this phenomenon in EC (Gu et al. 2012; Parra and Ruiz 2009; Pousttchi and Dehnert 2018; Punj and Moore 2009), and no study that we are aware of uses CSS to explain MCU. Our third main contribution is to introduce the role of CSS, both as a predictor and as a moderator, to extend the understanding of how and why it influences MCU.

The CI → attitude → MC adaption/use relationships are used in prior studies (Kalinic and Marinkovic 2015; Kaushik and Rahman 2015; Lu 2014) and serve as a traditional route to extend the knowledge of whether and how attitudes form MCU. TE or knowledge are also the basis for determining whether and how consumers perceive new technology and EC to be easy to use in, for example, TAM studies (Bransford et al. 2000). TE is suggested to influence the mechanisms through which consumers interact with mobile devices (Ziefle and Schaar 2010) and allows consumers to compare products and prices quickly in online transactions (Pousttchi and Dehnert 2018). Since innovative consumers are knowledgeable and experienced (Grewal et al. 2000), it is fascinating to examine how CI and TE can independently influence or combine to influence on MCU. Online purchasing expertise is also one of the few constructs used as a moderator in recent EC studies but is a relatively underexplored construct in MCU (Wu et al. 2016). In addition, TE is suggested to moderate the effect of innovativeness on the co-creation of IT consultant service value and improve customer relationship quality (Oesterle et al. 2020). However, the combination of whether and how CI (Kalinic and Marinkovic 2015; Kaushik and Rahman 2015; Lu 2014) and TE (Bransford et al. 2000) influence attitudes and MCU are, to our knowledge, not explored in the previous MC literature.

Summarily, the main contributions of this study aim at answering some underexplored questions, such as “How and why does CSS simultaneously mediate and moderate the effects of attitudes, CI, and TE on MCU?” or “How can consumer innovativeness and technological expertise can be combined to influence attitudes and MCU?” Most previous studies focus extensively on direct effects (see Tang 2019), some focus on mediation effects (e.g., Montazemi and Qahri-Saremi 2015; Zhang et al. 2012), and just a few concentrate on moderation effects (Nel and Boshoff 2019; Wu et al. 2016). Thus, this study fulfils a call for integrating mediation and moderation mechanisms

to develop and test behavioral theories generally (Karazsia and Berlin 2018) and information management specifically (Riquelme et al. 2016).

A structural equation modeling approach based on a survey sample of Vietnamese consumers is conducted to test the proposed hypotheses. The remainder of the study is arranged as follows. Section 2 provides the theoretical background. Section 3 presents the methods. Section 4 explains the results. Section 5 elaborates on the main discussions, limitations, and future research.

2 Theoretical framework

2.1 Consumer attitudes and actual mobile commerce use

Actual use (behavior) is an ultimate dependent variable and a critical variable in technology adoption models (Davis 1989; Venkatesh et al. 2003). Technology adoption includes initial adoption, which is concerned with first-time usage, and post-adoption, which involves continuance of usage (Venkatesh et al. 2008). Continuance intention refers to individuals' intention to continue to use technology, and actual usage is traditionally defined in terms of frequency or duration of use (Venkatesh et al. 2003). Those differences are similar to the different facets of consumer loyalty defined as intentional and behavioral loyalty (Oliver 1999). This study defines use as a combination of frequency and duration (Venkatesh et al. 2008) of MCU.

The study defines attitudes towards MC as a psychological tendency that is expressed by evaluating MC with some degree of favor or disfavor (Eagly and Chaiken 1993). Furthermore, attitudes can be considered as an evaluation of the desirability and motivation of MCU (Davis 1989). Previous studies in the context of MC provide evidence showing a positive effect of attitudes on adoption or usage behaviors (Khoi et al. 2018). When intention is excluded, the attitude–use/behavior relationship in MC contexts is just moderate (Liu et al. 2019; Ovčjak et al. 2015; Zhang et al. 2012). Thus, this study suggests that:

H1 Attitudes toward MC have a moderately positive effect on MCU.

2.2 Consumer innovativeness

Based on the personality-value-attitude-behavior framework (Fishbein and Ajzen 2010), previous studies suggest that the inclusion of individual traits, values, and tendencies is vital to increase the

exploratory ability for attitudes and behaviors (Eagly and Chaiken 1993). One important individual difference in explaining adaption and use of new products, experiences, or change is consumer innovativeness (Amoroso and Lim 2015; Citrin et al. 2000; Kalinic and Marinkovic 2015). Innovativeness is considered to be routed in the more general openness to experiences in personality (e.g., Costa and McCrae 1992) and openness to change in value theories (e.g., Schwartz et al., 2012)**.** However, regardless of CI as a key variable in the literature of diffusion of innovation (DOI; Kaushik and Rahman 2015; Rogers 1995), we only know a little about how CI can link with MC adoption or MCU (e.g., Kalinic and Marinkovic 2015; Lu 2014). The literature identifies two types of innovativeness (Kalinic and Marinkovic 2015). The first, called innate innovativeness, reflects a natural tendency (i.e., a personality trait) to seek out new information, stimuli, or experiences. The second, termed domain-specific innovativeness or consumer innovativeness, captures an individual's tendency to learn about and adopt new products/services within a specific domain of interest. This study focuses on CI because it is suggested to be more effective than innate innovativeness in explaining the actual use of a new and innovative service and in managing electronic customer relationship (Kalinic and Marinkovic 2015; Kaushik and Rahman 2015; Lu 2014), such as MC.

Prior studies indicate that CI has a positive effect on attitudes and MCU (Amoroso and Lim 2015; Kalinic and Marinkovic 2015; Kaushik and Rahman 2015; Lu 2014; Thakur and Srivastava 2014). However, most previous studies indicate that CI has an indirect link or a weak association with usage behaviors, including MCU, because of mediators and moderators such as perceived ease of use, perceived usefulness, cognitive absorption, or intention (Citrin et al. 2000; Kalinic and Marinkovic 2015; Lee et al. 2007; Lee 2019). Prior studies also reveal that attitudes can mediate the effects of CI on intention, continuance intention, or technology adoption/use (Citrin et al. 2000; Kalinic and Marinkovic 2015; Lee et al. 2007; Lee 2019). The above findings are interesting in relation to the further exploration of whether the relationship between CI and MCU is direct, mediated, or moderated. Before proceeding, the following hypotheses are suggested:

H2 CI has a positive effect on MCU.

H3 Attitudes toward MC are influenced by CI (a) and mediate the effect of CI on MCU (b).

2.3 Expertise in mobile technology

Most prior studies define and measure TE as user experience or as a consequence of repeated use based on the self-reported duration and frequency of technology usage (see Ziefle and Schaar 2010 for a review), which is similar to the definition of MCU in the present study. TE also reflects the essential characteristics of expertise in information technology, such as easy-to-realize critical information features, offering much content knowledge at a low cost, comprehensively reflecting applicable contexts, and having high flexibility to adapt to new occasions (Bransford et al. 2000). Therefore, this study defines and uses the concept of expertise in domain-specific mobile technology as consumers' mobile technology interests, enthusiasm, literacy, and perceived ability when handling mobile devices in MC transactions (Ziefle and Schaar 2010). This definition includes associations with the original or modified technology acceptance models (Bransford et al. 2000), such as perceived ease of use, perceived usefulness, mobility, self-control, or facilitating conditions (Kalinic and Marinkovic 2015; Liu et al. 2019; Ziefle and Schaar 2010). Although expertise in mobile technology can relate to the use of mobile devices, frequent online shopping could enable consumers' expertise in handling these mobile devices for MC to be formed, developed, and consolidated over time. Thus, the combination of the two related phenomena of expertise in mobile technology and online shopping behavior could generate a deeper understanding of how consumers conduct MC in real life. This study expects to contribute by investigating whether TE can moderate the effect of CI on attitudes, CSS, and MCU.

Previous studies find a positive association between TE and mobile technology acceptance because consumers with high TE often feel easier, convenient, and more useful in using mobile devices (e.g., Arning and Ziefle 2010). Consumers with higher TE in a specific domain (e.g., MC) are also likely to obtain more effective outcomes because they have high structural levels of organised knowledge, more complex literacy structures, more elaborate mental approaches, and more effective strategies for solving problems (Bransford et al. 2000). Thus, it can be argued that consumers who have high MC expertise could have a high frequency of MC transactions because

they have a strong ability to find proper solutions and strategies to conduct effective MC transactions. The motivational, emotional, experiential, and cognitive aspects of TE are found to affect the acceptance of mobile technology in the specific domain of medical care (Ziefle and Schaar 2010). With high TE, consumers can solve problems thoroughly and develop flexible solutions and alternatives for MC transactions (Downing et al. 2005). Thus, regarding the lack of empirical evidence showing the direct links between TE, attitudes, and MCU in the current literature, this study's authors believe that consumers with high TE have more favorable attitudes and higher levels of MCU than consumers with low TE. This also implies that TE has an indirect effect on MCU via attitudes because of the belief that consumers with higher TE could have more favorable attitudes towards the use of mobile devices to conduct MC transactions or for shopping, which is similar to other fields, such as mobile device-based health care services (e.g., Ziefle and Schaar 2010).

H4 TE has a positive effect on MCU.

H5 Attitudes toward MC are influenced by TE (a) and mediate the effect of TE on MCU (b).

2.4 Consideration set size

A consideration set is defined as the set of alternatives brought to a consumer's mind on a particular choice occasion (Rortveit and Olsen 2007) and could be reflected by different dimensions, such as stability, size, variety, and preference dispersion (Punj and Moore 2009). However, size plays the most crucial role and attracts the most previous studies (Caplin et al. 2019). Furthermore, while CSS is unobservable in the offline consumption context, the advantages of MC and informatics technology allow marketers to develop tools to track consumers' online shopping history or make their CSS observable (Gu et al. 2012; Parra and Ruiz 2009). Previous studies on the internet environment often focus on explaining the formation of CSS (Gu et al. 2012; Parra and Ruiz 2009; Pousttchi et al. 2015). Thus, we do not know whether CSS can directly impact or moderate the effects of other constructs (attitudes, CI, or TE) on MCU.

The more extensive CSS, the more categories, brands, products, websites, online stores, and apps are taken into consideration and the greater the opportunity for consumers to find an option that satisfies their individual preferences (Punj and Moore 2009). A larger CSS can represent all the potentially available options and provide the variety and stimulation that are inherently satisfying (Iyengar and Lepper 2000). Therefore, a more extensive CSS may lead to longer and more intense use of MC. In addition, a more extensive CSS increases the likelihood of preference matching, reduces the uncertainty by representing the available options, and allows consumers to maintain flexibility (Spassova and Isen 2013). Hence, a more extensive CSS can facilitate the conducting of MC transactions. Although no evidence is presented in the literature confirming a relationship between CSS and MCU, previous studies demonstrate that CSS has a positive effect on rechoice or repurchase behavior (Rortveit and Olsen 2007; Spassova and Isen 2013). Besides, in the internet environment, it is suggested that a larger CSS can contain more alternatives for matching needs than a smaller one (Punj and Moore 2009).

Roberts and Lattin (1997) suggest that scholars should employ a two-step process involving consideration rather than a one-step process to predict consumer behaviors more accurately. This two-step process is also expected to become increasingly typical in the digital world to understand consumers' decision-making (Pousttchi and Dehnert 2018). This implies that CSS may also mediate the impact of attitudes on MCU. Previous studies also confirm the existence of the attitudes–CSS relationship. For example, Rortveit and Olsen (2007) not only tests the direct relationship between attitudes and CSS but also validating the indirect effect of attitudes on consumer choice via CSS in product choice settings. Although no similar evidence can be found in the MC literature, we believe that the relationship may exist and propose that:

H6 CSS has a positive effect on MCU.

H7 CSS is influenced by attitudes toward MC (a) and mediates the effect of attitudes toward MC on MCU (b).

The relationship between CI and CSS is underexplored in the current literature. To our knowledge, only one study, by Jung and Kim (2005), in the mass communicated advertising area, indicates that CI has a negative relationship with CSS. They argue that innovative consumers are more likely to obtain information from mass communicated advertising and to be affected by that information and thus to consider fewer products. However, the specifications of MC (search, save, or compare products) may encourage innovative consumers to consider more products to increase the possibility of choosing the right products. Innovative consumers are usually very open to new experiences for learning and memorizing everything in which they are interested. Therefore, they can gain more substantial knowledge of all aspects related to online products, brands, stores, categories, or the like than consumers with low innovativeness (Lu 2014; Thakur and Srivastava 2014). Therefore, during MC transactions, it is expected that innovative consumers will have more evoked and searched alternatives in their CSS than consumers with low innovativeness. They are more likely to perform MC transactions not only because they tend to do so but also because they have a higher tendency to manage and process a more extensive CSS than consumers with low innovativeness do. Thus, this study suggests:

H8 CSS is influenced by CI (a) and mediates the effect of CI on MCU (b).

Previous studies (Parra and Ruiz 2009; Punj and Moore 2009) suggest that CSS is part of TE or that TE has a role as a necessary antecedent of the consumer consideration process (Pousttchi and Dehnert 2018). Empirical evidence supports the direct effect of consumer knowledge on CSS and the indirect effect of consumer knowledge on behaviors via CSS in the context of product choice or consumption (e.g., Rortveit and Olsen 2007). Therefore, this study expects that, if consumers have high (low) TE for MC transactions, they will take more (fewer) categories, brands, products, websites, online stores, and apps into consideration, which leads to increased MCU.

H9 CSS is positively influenced by TE (a) and positively mediates the effect of TE on MCU (b).

2.5 Moderation effects

Because innovative consumers tend to seek novelties and are highly motivated to try and learn new things (Kalinic and Marinkovic 2015; Kaushik and Rahman 2015), it is logical to argue that consumers with high innovativeness have more knowledge about innovative technologies than consumers with low innovativeness. Individuals with high innovativeness are also believed to have high risk-taking tendencies regarding new information technologies or services (Lee et al. 2007), including MC (Lu 2014). Previous studies also reveal that consumers can allocate a variety of resources (e.g., TE) to multiple needs or goals (Roberts and Dant 1991). A few prior studies proposed that individual resources may activate individual goals and moderate the associations between individual tendencies and behaviors (e.g., Lönnqvist et al. 2011). However, only when individuals have high motivation and capacity to devote their cognitive resources to the job are they found to engage in extensive deliberation on the available information, which requires more in-depth consideration of information (Eagly and Chaiken 1993). MC provides continuously updated innovations relating to mobile applications, software, and tools (Lu 2014). Therefore, the more TE that consumers have, the greater their ability to allocate it to MC to fulfill their need for innovativeness in the specific domain of MC. In other words, while innovativeness can lead consumers to facing new challenges, their TE is a 'key' to open all things. This implies that innovative consumers with high TE are more likely to devote more time and to conduct more transactions via MC than consumers with low TE. Based on this discussion, the following hypothesis is suggested:

> **H10** TE is positively influenced by CI (a) and has a positive moderating effect on the relationship between CI and MCU (b).

CSS is suggested as a moderator in a few studies, but the empirical evidence is limited and controversial. For example, Iyengar and Lepper (2000) demonstrate a negative moderating effect of CSS of competing brands on the relationship between consumer preference and rechoice because consumers face difficulties in obtaining the supplementary benefits from a wide range of brands of similar products. On the contrary, Tuu and Olsen (2013) find a positive moderating effect of CSS

on consumer satisfaction and loyalty towards a product category because different alternatives with heterogeneous benefits in consideration set size also help consumers to obtain supplementary benefits easily. Thus, this study advocates a new moderating mechanism by integrating the perspectives of the theory of attitude strength (Visser et al. 2006) and dual-mode processing models (Fazio 2007) to explore whether CSS is a positive moderator in the relationships between attitudes, CI, and MCU.

Previous studies indicate that the nature and structure of CSS contain complex cognitive organization and mental processes (Parra and Ruiz 2009; Pousttchi and Dehnert 2018). A more extensive CSS includes a higher level of consumer experiences, knowledge, accessibility, and involvement than a smaller one (Rortveit and Olsen 2007). Therefore, it seems that the valence of CSS's moderating effect (positive or negative) depends on the amount and nature of the information available and the consumers' ability to facilitate complex psychological processes and process information. Current theories, such as the dual-mode processing models, also distinguish between two modes of information processing, the central and heuristic patterns (e.g., Fazio 2007). Generally, these models propose that information processing requires the ability and motivation to devote cognitive resources to the task (Ajzen and Fishbein 2000).

Although these two modes present distinct mechanisms for processing information, they differ in the levels that describe bipolarity in an information-processing continuum ranging from shallow to profound (Ajzen and Fishbein 2000). The MC context makes it easier for consumers to process information thanks to the development of multi-information sources (Thakur and Srivastava 2014). Therefore, consumers with a larger CSS devote more cognitive resources to engaging in in-depth deliberation on the available information and the considered alternatives than consumers with a smaller CSS. The above discussions imply that CSS in the MC context can reflect strength-related attitudinal attributes (Fazio 2007; Visser et al. 2006), which means that CSS may play a role as a positive moderator in the relationships between attitudes and MCU. Therefore, attitudes that are based on a larger CSS are more confident and stronger than ones based on a smaller CSS. In other words, CSS may increase the predictive ability of attitudes for the consequences, such as MCU.

H11 CSS positively moderates the effect of attitudes toward MC on MCU.

In a qualitative study, Ma et al. (2016) report that inactive users' attitudes toward MC are ambivalent because they experience both advantages of smartphones and external and internal psychological barriers from mobile services. In contrast with inactive users, innovative individuals are active information seekers, have a keen interest in new ideas, and show stronger attitudes toward the use of information systems and new technologies (Lu 2014; Wang and Dai 2020)). These additional pieces of evidence not only consolidate H_{11} but also necessitate further exploration of the moderator role of CSS in the relationship between CI and MCU besides the relationship between attitudes and MCU, simultaneously.

Although previous studies suggest exploring the moderation mechanism between CSS and individual tendencies, only a few empirical pieces of evidence exist. While innovative consumers are believed to have stronger positive tendencies than others involving online shopping behaviors (Amoroso and Lim 2015; Lee et al. 2007), a larger CSS can help to consolidate their self-confidence in choosing a particular alternative from their consideration set (Pieters and Verplanken 1995). Tuu and Olsen (2013) discuss that a larger CSS may help consumers to satisfy their innovative tendency better by giving them more chances to gain more new experiences and benefits; thus, it enhances the effect of consumer satisfaction on repurchase loyalty. Also, Lee (2019) indicates that the effect of consumers' innovativeness on their intention to use mobile devices is stronger among consumers with higher new experiences. Because a larger CSS could bring more positive results from new experiences and benefits to innovative consumers, a larger CSS may stimulate them to spend more time and make a higher frequency on MC transactions. Thus, CSS may increase the predictive power of CI on MCU.

H12 CSS positively moderates the effect of CI on MCU.

The proposed model is shown in Figure 1.

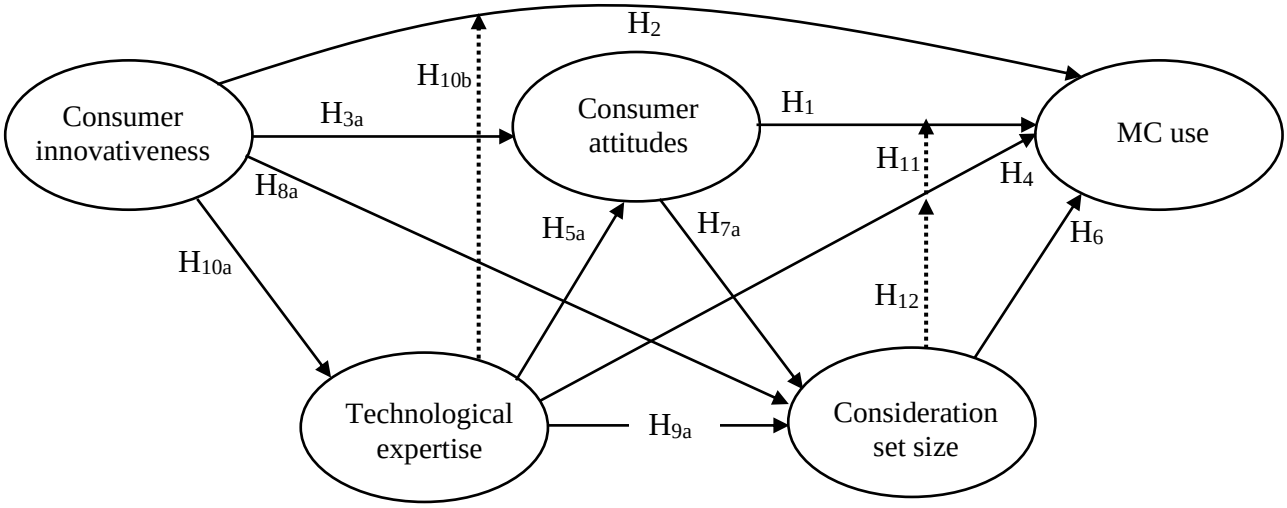

Fig. 1 The theoretical model

Note: ⟶ direct effect; ⋯⋯▸ moderating effect; the indirect effects (H_{3b}, H_{5b}, H_{7b}, H_{8b}, H_{9b}) are not shown in the theoretical model.

3 Methods

3.1 Data collection and sample description

MC in Vietnam is at an impressive growth stage, with MC transactions expanding at an annual growth rate of 24.2% to 2021, by which point it is expected to represent a $7.8 billion market, and more than 49% of businesses in Vietnam receiving orders through mobile applications (Dharmaraj 2019). Vietnamese consumers also have a choice of MC providers, as up to ten telecommunication companies are operating at the present time. Different mobile apps and services are provided across business areas, such as e-banking, e-tourism, e-pay, or even e-public services. These features make Vietnam an interesting context in which to investigate the role of consumers' attitudes and factors in explaining MCU.

Customers of the three biggest communication providers in Vietnam (VNPT, Mobifone, and Viettel) in some of its main cities (Ho Chi Minh, Nha Trang, Da Lat, Rach Gia, and Da Nang) were the primary respondents. Because consumers who have used MC were unidentified, the data were conveniently collected. Customers who had used MC at least once a month were selected. The data collection was conducted via face-to-face interviews using a self-administrated questionnaire. Before conducting the survey, we clearly explained what MC is. Also, we emphasized that we

focused on respondents' perception and there was no right or wrong answer. We balanced the male and female respondents in our collected sample. Of the 600 cases collected, 23 were rejected because of missing data. The typical respondents were married (68.06%) and had at least graduated from high school (96.86%). Their average age was 31 years, ranging from 16 to 63, and their average income per month was about USD 350.

3.2 Measurements

The measurements for the studied constructs were derived from previous studies. Precisely, the four items measuring attitudes came from Khoi et al. (2018) and the six items measuring CI were suggested by Citrin et al. (2000). This study adapted the measurement scale of TE suggested by Ziefle and Schaar (2010). The respondents were required to rate their agreement level with the items (see Table 1) using a five-point Likert scale ranging from (1) completely disagree to (5) completely agree.

Previous studies also provide three items for measuring MCU: "How many times per week do you believe you use MC?", "How many hours per week do you believe you use MC?", and "On average, how many times per week do you engage in online transactions via MC?" (Venkatesh et al. 2008). A self-reported scale was used by asking the respondents to give an appropriate number for the three above items starting with an introduction in the form of "In relating to using mobile devices such as smartphones, tablets, or the like to conduct online transactions or online shopping, please indicate …". Because a measurement for CSS has not yet been developed in the MC context, we adapted the CSS scale from Rortveit and Olsen (2007) with some minor modifications. More specifically, the CSS measurement was defined as follows: "Thinking about a typical transaction on an MC platform, please indicate (1) How many online stores do you usually visit? (2) How many online brands do you typically visit? (3) How many products do you often consider?". Since the answers on the items of both MCU and CSS were widely ranged, making their distributions non-normal, they were then re-coded from one to seven to generate the form of the normal distribution for these items. For example, with the first item of MCU, the answers ranged from less than 1 time to 15 times per week (*Skewness* = 2.85 and *Kurtosis* = 21.11). Thus, they were recoded into seven

intervals (1 = less than 1 time; 2 = 1 time; 3 = 2 times; 4 = 3 times; 5 = 4 times; 6 = 5 times; and 7 = from 6 times per week). The re-coded answers made this item's responses normally distributed (*Skewness* = 0.28 and *Kurtosis* = 0.05; Tabachnick and Fidell 2007). Data re-coding is a necessary method to correct the distribution errors of raw data in behavioral studies (Lavrakas 2008) and has been widely used in previous studies in the field of marketing and business regarding consumer loyalty, online buying, and using mobile services (Li et al. 1999; Mort and Drennan 2007; Taylor and Levin 2014; Tuu and Olsen 2013).

3.3 Analytical procedures

To ensure the internal consistency and the convergent and discriminant validity of the constructs (Anderson and Gerbing 1988), a CFA was performed using AMOS 24 (Arbuckle 2016). Next, a structural equation model was used to estimate the theoretical model. The fit is reported by χ^2, as well as three other fit indices: the root mean square error of approximation (*RMSEA*), goodness-of-fit index (*GFI*) and the comparative fit index (*CFI*). An *RMSEA* < 0.08 indicates an acceptable model fit, while an *RMSEA* < 0.05 indicates a good model fit. *GFI* and *CFI* should be > 0.90 (Browne and Cudeck 1992).

4 Analytical results

4.1 Reliability and validity

A confirmatory factor analysis was conducted. The results in Tables 1 and 2 indicated that the measurement model fit the data well (χ^2 = 230.56; *df* = 158; *p* = 0.000; *RMSEA* = 0.028; *GFI* = 0.961; *CFI* = 0.987). The composite reliabilities were in the range from 0.78 to 0.91, exceeding the minimum value of 0.60. Except for a relatively low value of the extracted variance of technological expertise (0.47), the extracted variances of the intended constructs surpassed the recommended threshold of 0.50, with values ranging from 0.51 to 0.78. The factor loadings on the constructs were all significant ($p < 0.001$; *t*-value > 15), with values ranging from 0.66 to 0.95, showing the acceptable convergent validity of the constructs.

Table 1 Factor loadings, composite reliability, and extracted variance

Constructs	Factor loadings	t-values	Composite reliability	Extracted variance
Consumer innovativeness			0.86	0.51
In general, I am among the first in my circle of friends to visit a new MC website or app when it appears online	0.71	18.42		
If I heard that a new MC retail site was available online, I would be interested enough to shop from it	0.71	18.68		
Compared to my friends, I seek out pretty much all information over the MC website or app	0.73	20.00		
In general, I am the first in my circle of friends to know of any new MC retail websites or apps	0.72	18.16		
I will visit a new MC website or app even if I have not heard of it before	0.69	17.75		
I know about new MC retail websites or apps before most other people in my circle do	0.73	19.83		
Expertise in mobile technology			0.78	0.47
My technological interest in using mobile devices is high	0.66	15.95		
My enthusiasm for mobile technology in MC is high	0.67	16.25		
My technical literacy to use mobile devices in MC is excellent	0.68	16.50		
My ability to deal with mobile devices in MC is very good	0.72	17.77		
Consumer attitudes			0.84	0.57
I like the idea of using MC	0.77	20.34		
Using MC is a wise idea	0.71	18.37		
Using MC is a good idea	0.80	21.60		
Using MC is a positive idea	0.74	19.28		
Consideration set size			0.91	0.78
How many online stores do you usually visit?	0.89	26.68		
How many online brands do you usually visit?	0.80	22.52		
How many online products do you usually consider?	0.95	30.59		
MC use			0.80	0.58
Frequency of MC use	0.72	18.08		
Duration of MC use	0.73	18.53		
Average frequency of conducting MC transactions	0.83	21.81		

Note: All factor loadings are significant at $p < 0.001$.

Table 2 Construct means, standard deviations, and correlations

Constructs	Mean	SD	Correlations									
			Basic model					Common method variance model				
			1	2	3	4	5	1	2	3	4	5
1. CI	3.96	0.61	**0.71**					-				
2. TE	3.70	0.72	0.45	**0.69**				0.45	-			
3. CA	3.70	0.72	0.50	0.57	**0.75**			0.50	0.57	-		
4. CSS	3.78	0.98	0.41	0.50	0.54	**0.88**		0.39	0.49	0.54	-	
5. MCU	3.94	1.08	0.40	0.46	0.53	0.48	**0.76**	0.39	0.46	0.54	0.47	-
χ^2 (*df*), *p*			230.56 (158), 0.000					191.37 (142), 0.000				
GFI			0.961					0.968				
CFI			0.987					0.991				
RMSEA			0.028					0.025				

Note: All correlations are at $p < 0.001$; the diagonal values are the squared root of average variance extracted (AVE). CA: consumer attitudes; CI: consumer innovativeness; CSS: consideration set size; TE: technological expertise; MCU: MC use.

Most of the correlations were lower than 0.60, and the correlation between each of the constructs, with the highest value of 0.57, was lower than the square root of the *AVEs*, with the lowest value being 0.69. All of these demonstrated the discriminant validity of the studied constructs (Fornell and Larcker 1981). Besides, previous studies have emphasised the potential problems in estimating causal relationships caused by multi-sources such as social desirability and motif consistency in self-reported data; thus, we adopted the common method factor approach to test the common method bias (Podsakoff et al. 2003). Following this approach, a common latent factor whose indicators were all the key constructs' indicators was added to the measurement model. The results (Table 2) indicated that the fit indices of the common-method factor model were slightly better than those of the basic model. However, the inter-correlations were almost the same between the two models. Thus, the common method bias was not problematic.

4.2 Hypothesis testing

This study used the general path analysis framework for mediation and moderation effects (Edwards and Lambert 2007) and the two-step estimation approach developed by Ping (1995) to test the moderator effects. Additionally, three nested models (direct effect, mediated effect, and

moderated effect) were generated to estimate the sizes of the mediator and moderator effects. This study also included gender, age, and income as control variables (Liu et al. 2019). The results indicated that all three nested models had acceptable fit indices and that all the proposed hypotheses were supported. Because the results are consistent across the three models, the following conclusions are based on the full model (see Table 3).

Table 3 Results of the hypothesis testing

Relationships/hypotheses			Direct effect model		Mediated effect model		Full model	
			Beta	t-values	Beta	t-values	Beta	t-values
Direct effect								
CA → MCU	H_1	β_1	0.31	6.11***	0.28	4.27***	0.29	4.84***
CI → MCU	H_2	β_3	0.12	2.26*	0.11	2.04*	0.15	2.81**
TE → MCU	H_4	β_5	0.18	3.02**	0.15	2.38*	0.16	3.11**
CSS→ MCU	H_6	β_6	0.27	5.87***	0.21	3.90***	0.18	3.68***
CI → CA	H_{3a}	β_2			0.31	5.97***	0.31	5.97***
TE → CA	H_{5a}	β_4			0.43	7.28***	0.43	7.28***
CA → CSS	H_{7a}	β_7			0.34	5.91***	0.34	5.90***
CI → CSS	H_{8a}	β_8			0.13	2.77**	0.14	2.81**
TE → CSS	H_{9a}	β_9			0.24	4.28***	0.24	4.27***
CI → TE	H_{10a}	β_{10}			0.45	8.42***	0.45	8.42***
Mediating effect [a]								
CI → CA → MCU	H_{3b}	$\beta_{14}=\beta_2\times\beta_1$			0.09	3.84***	0.09	3.92***
TE→ CA → MCU	H_{5b}	$\beta_{15}=\beta_4\times\beta_1$			0.12	4.17***	0.12	4.28***
CA→ CSS → MCU	H_{7b}	$\beta_{16}=\beta_6\times\beta_7$			0.07	3.68***	0.06	3.33**
CI→ CSS → MCU	H_{8b}	$\beta_{17}=\beta_6\times\beta_8$			0.03	2.32*	0.03	2.29*
TE→ CSS → MCU	H_{9b}	$\beta_{18}=\beta_6\times\beta_9$			0.05	2.89**	0.04	2.49*
Moderating effect								
CI × TE → MCU	H_{10b}	β_{11}					0.11	2.81**
CA × CSS → MCU	H_{11}	β_{12}					0.14	3.57***
CI × CSS → MCU	H_{12}	β_{13}					0.17	4.07***
Controlled effect								
Gender → MCU		-	-0.04	-0.92^{ns}	-0.04	-0.99^{ns}	-0.06	-1.73^{ns}
Age → MCU		-	-0.12	-2.48*	-0.11	-2.48*	-0.11	-2.73**
Income → MCU		-	0.09	1.85^{ns}	0.08	1.85^{ns}	0.10	2.52*
Fit indices								
χ^2/df			696.43/220		292.09/215		406.32/281	
P			0.000		0.000		0.000	
GFI			0.901		0.958		0.949	
CFI			0.916		0.986		0.979	
RMSEA			0.061		0.025		0.028	
R^2 (MCU)			25.0%		37.3%		51.7%	
Effect size			-		49.2%		38.6%	

Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; [a] mediating effects are tested with the bootstrapping procedure in AMOS 24.0; CA: consumer attitudes; CI: consumer innovativeness; CSS: consideration set size; TE: technological expertise; MCU: MC use

Direct effects. The results supported all the hypotheses about the direct effects. Regarding the impacts on MCU, attitudes had the strongest effect (H_1: $\beta_1 = 0.29$; $t = 4.84$; $p < 0.001$), followed by CSS (H_6: $\beta_6 = 0.18$; $t = 3.68$; $p < 0.001$). CI and TE also had significantly positive effects on MCU (H_2: $\beta_3 = 0.15$; $t = 2.81$; $p < 0.01$; H_4: $\beta_5 = 0.16$; $t = 3.11$; $p < 0.01$, respectively). Besides, both CI and TE had strong direct effects on attitudes (H_{3a}: $\beta_2 = 0.31$; $t = 5.97$; $p < 0.001$; H_{5a}: $\beta_4 = 0.43$; $t = 7.28$; $p < 0.001$). In addition, attitudes (H_{7a}: $\beta_7 = 0.34$; $t = 5.90$; $p < 0.001$), CI (H_{8a}: $\beta_8 = 0.14$; $t = 2.81$; $p < 0.01$), and TE (H_{9a}: $\beta_9 = 0.24$; $t = 4.27$; $p < 0.001$) had significantly positive effects on CSS. Finally, the results indicated a positive effect of CI on TE (H_{10a}: $\beta_{10} = 0.24$; $t = 4.27$; $p < 0.001$), which supported hypothesis H_{10a}.

Indirect effects. The results supported hypotheses H_{3b} and H_{5b}, indicating that CI and TE had indirect effects on MCU via attitudes (H_{3b}: $\beta_{14} = 0.09$; $t = 3.92$; $p < 0.001$; H_{5b}: $\beta_{15} = 0.12$; $t = 4.28$; $p < 0.001$, respectively). The indirect effects of attitudes (H_{7b}: $\beta_{16} = 0.06$; $t = 3.33$; $p < 0.01$), CI (H_{8b}: $\beta_{17} = 0.03$; $t = 2.29$; $p < 0.05$), and TE (H_{9b}: $\beta_{18} = 0.04$; $t = 2.49$; $p < 0.05$) on MCU via CSS were also confirmed.

Moderating effects. The estimated results supported H_{10b}, showing that TE had a positive moderating effect on the effect of CI on MCU ($\beta_{11} = 0.11$; $t = 2.81$; $p < 0.01$). Hypotheses H_{11} and H_{12}, which proposed that CSS positively moderates the relationships between attitudes and MCU ($\beta_{12} = 0.14$; $t = 3.57$; $p < 0.001$) and between CI and MCU ($\beta_{13} = 0.17$; $t = 4.07$; $p < 0.001$), were also supported.

Effect sizes. The results showed that the direct effect model explained about 25% of the variance of MCU. The mediated effect model increased the explained variance of MCU to 37.3%, with the effect size over the direct effect model being 42.9%. Finally, the full model, including all of the direct, indirect, and moderating effects, considerably improved the explained variance of MCU ($R^2 = 51.7\%$) compared with the mediated effect model (*effect size* = 36.8%). Therefore, the inclusion of the mediation and moderation mechanisms generates an in-depth understanding of the attitude–behavior framework in explaining MCU.

5 Discussion

This study integrated CI and TE into the attitude–behavior framework (Ajzen and Fishbein 2000) to explain MCU as a mediated and moderated process. Primarily, it explored whether and how the mediation and moderation mechanisms of CSS influence the relationships between attitudes, CI, and TE to explain MCU. The results show that attitudes, CI, TE, and CSS positively influence MCU. TE positively moderates the effect of CI on MCU. The results also confirm the mediating role of attitudes in the effects of both CI and TE on MCU. In particular, CSS was demonstrated to be an important mediator and moderator in those relationships. The inclusion of mediating and moderating effects increased the explained variance of MCU by more than a hundred percent (106.8%) in the effect size compared with using direct effects only.

5.1 *Theoretical implications*

This study provides an alternative model to the traditional models, such as TAM or UTAUT (Davis 1989; Venkatesh et al. 2003), to explain how consumers engage in processing the information available in the internet environment to make decisions on MCU. It differs from most previous studies by focusing on consumers' intention to adopt MC and the first-time usage of MC (Lee 2019; Zhang et al. 2012) and including consumers' intention to adopt MC as a mediator in MCU (Celik 2016). The result indicates that attitudes have a significantly positive effect on MCU. Such knowledge is important to demonstrate that attitude theories (Eagly and Chaiken, 1993; Fishbein and Ajzen, 2010) would be appropriate to generate a deeper understanding of how consumers, even for inactive ones, can make their decisions for MC (Ma et al. 2016). However, as with previous studies, the magnitude of this effect is just moderate (β = 0.29; Khoi et al. 2018; Liu et al. 2019; Ovčjak et al. 2015; Zhang et al. 2012). Because the attitude-behavior framework is open to allow for integrating the variety of psychological constructs (e.g., individual tendencies, personalities, or core values; Eagly and Chaiken 1993) and mental processes (reasoned and automatic; Ajzen and Fishbein 2000) to increase the predictive ability for consumer behaviors, this study makes a primary

contribution by including CI, TE, and CSS as the central constructs in the decision-making process to explain MCU.

The associations between attitudes and CI (β = 0.31) and TE (β = 0.43) are interesting as they reveal that innovative consumers and consumers with high TE are more likely to have favorable attitudes towards MC. This study also confirms the positive links between CI, TE, and MCU, which are consistent with the theoretical perspectives and previous studies that suggest CI and TE as essential determinants of the adoption of new technologies (Lee et al. 2007; Thakur and Srivastava 2014; Ziefle and Schaar 2010). It is worth noticing that the definition of TE in this study contains in its content the most important factors (e.g., the ease of use, perceived usefulness, or facilitating conditions) from the different models of technology acceptance (e.g., DOI, TAM, or UTAUT). Thus, the empirical evidence supporting the role of TE in explaining attitudes and MCU confirms that TE is a fundamental alternative construct for those above factors. Also, because most previous studies often found the effects of CI and TE on usage behaviors or MCU via mediators (Amoroso and Lim 2015; Citrin et al. 2000; Kalinic and Marinkovic 2015; Lee 2019; Lu 2014; Wang and Dai 2020; Zhang et al. 2012), direct associations between CI, TE, and MCU provide additional empirical evidence to understand how CI and TE can be related to MCU.

The results also confirm the mediation mechanisms of the CI/TE–attitudes–MCU relationships (Downing et al. 2005; Kalinic and Marinkovic 2015; Lee 2019; Ziefle and Schaar 2010). Furthermore, this study found a positive effect of CI on TE and, uniquely and newly, a significant moderation effect between CI and TE on MCU, which is consistent with the view of consumer resource allocation (Roberts and Dant 1991). The findings that CI and TE jointly influence attitudes and, especially, MCU, are interesting in understanding their combined role in contributing to explaining MCU above and beyond attitudes. Our findings are expected to reflect how these two distinctive features can combine to enhance our understanding of attitudes and MCU. Therefore, this study helps to reflect new features and periodic changes ready to be adopted by innovative consumers, especially with high TE, which are not captured in previous studies (Oesterle et al. 2020; Zhang et al. 2012). It also consolidates the personality-value-attitude-behavior

framework (Fishbein and Ajzen, 2010; Ajzen and Fishbein 2000) to improve our knowledge for innovative behaviors such as MCU.

Since previous studies often focus on explaining the formation of CSS in the internet environment (Pousttchi and Dehnert 2018; Punj and Moore 2009), the finding that CSS has a direct association with MCU is unique, which is different from offline settings of consumer choice of products or brands (Rortveit and Olsen 2007; Spassova and Isen 2013), providing empirical evidence to further understand how CSS can predict consumer behavior and MC channel choice for online shopping. This finding is also distinct from the suggestion made by Punj and Moore (2009), who assert that a larger CSS could make consumers face obstacles, particularly in the limitation of the time that they have at their disposal to process it. Thus, the result implies that consumers may be familiar with MC and form a CSS to help them make more accurate decisions when conducting transactions via MC.

The results confirm CSS as a mediator (Pousttchi and Dehnert 2018; Roberts and Lattin 1997; Rortveit and Olsen 2007) between attitudes and MCU, thereby helping to validate the two-step approach of consumers' decision-making process integrated into the attitude–behavior framework (Ajzen and Fishbein 2000). In addition, besides the direct associations between CI, TE, and CSS, the mediating role of CSS is further confirmed through the links of CI → CSS → MCU and TE → CSS → MCU. All these findings are new and relevant, especially as only one study in the literature (Jung and Kim 2005) shows a negative association between CI and CSS. This study confirms that CI and TE are essential to understanding how consumers can interact with the information-free environment of MC to form CSS and make decisions on MCU. Innovative consumers are more likely not only to search for relevant information but also to set a priority for integrating new alternatives into their CSS (Lu 2014; Thakur and Srivastava 2014). This strategy seems to be useful for them to enhance the right choice in the MC environment, urging them to use more time and expertise with higher frequencies in engaging in MC. Thus, a focus on CSS is vital to gain a more comprehensive understanding of how consumers conduct different behaviors from attitudes, individual tendencies, and resources. These findings respond to the call for discovering the

antecedents of CSS (Punj and Moore 2009) to enhance our knowledge about how consumers process information in the internet environment. Thus, this study contributes to explaining how CSS can be formed in the MC context and affect MCU. It also implies that the inclusion of CSS as an alternative construct for intention as a mediator is rational to increase the predictive power for MCU (Aurier et al. 2000; Roberts and Lattin 1997).

This study extends and helps to explain the mixed findings from previous studies (Iyengar and Lepper 2000; Spassova and Isen 2013; Tuu and Olsen 2013) by clarifying and confirming the positive moderating role of CSS in the relationships between attitudes and MCU based on the perspectives of the strength-related attitudinal attributes and information processing models (Fazio 2007; Visser et al. 2006). A larger CSS can help consumers to limit wrong choices, unlike the condition of lacking information about products in the offline context (Spassova and Isen 2013). It also makes it easier to obtain additional heterogeneous benefits, including an increase in the possibility of being satisfied (Tuu and Olsen 2013), and then to form consumer loyalty towards MC.

Furthermore, the new finding confirming a positive moderating role of CSS in the relationship between CI and MCU is exciting in providing an understanding of how innovative consumers engage in using MC. Therefore, our approach based on CSS to link consumers' cognitive processes, attitudes, individual tendencies, perceived resources, and the variety and preference dispersion is innovative for efforts to understand MCU. Thus, it extends our knowledge about the mediation and moderation perspectives between shopping contexts and individual tendencies (Amoroso and Lim 2015; Jin 2013; Lee et al. 2007; Tuu and Olsen 2013), especially in the MC context.

5.2 Practical implications

First, attitudes have a substantial impact on MCU. Therefore, marketers who want to utilize MC as a new business channel should develop appropriate policies to form and consolidate attitudes as a critical condition for a successful business. For example, marketers can aim at improving belief attributes, privacy, and security as well as convenience or joy. Capturing the changes in customer attitudes might be an essential activity for businesses to design customer-centric products/services and develop relevant strategies, especially with the support of technology systems.

Second, innovative consumers with high TE could be targets for persuasive messages to increase their MCU. The identification of innovative individuals can be very valuable for market segmentation and targeted marketing. Furthermore, MC businesses should continually develop and integrate new technologies, for example, recommendation systems based on artificial intelligence and machine learning, to attract innovative consumers, especially those with high TE, and to involve them in the process of value co-creation (Lu 2014). For consumers with low expertise, businesses in the MC environment should also develop consulting services to determine consumer shortages in skills and knowledge and educate them with the expertise needed to reduce their workload (Oesterle et al. 2020).

Third, CSS plays an essential role in explaining MCU as a determinant, mediator, and moderator. This knowledge is crucial for marketers to identify the customers for whom they can entirely base their marketing campaigns on attitudes and innovative tendencies as drivers of MCU. They need not only to observe CSS predicted by their attitudes and innovativeness but also to learn the psychological process whereby these factors are associated with MCU, in particular, the different positive roles of CSS as a predictor, a mediator, and a moderator. Furthermore, one possible recommendation for marketers and managers is to illustrate and communicate their MC websites, apps, e-stores, and products as being suitable for conducting MC transactions. For example, they can utilize social media platforms to publish and disseminate information to increase consumers' awareness and thus increase the chances of being included in their CSS. Also, communication campaigns are needed to nurture consumer innovativeness and stimulate technological expertise as two important forces for forming a more extensive CSS, which in turn increases the choice probability of MC to compete with competitive channels.

5.3 Limitations and future research

This study has some limitations. First, CSS's characteristic of dynamism was not considered in this study. Future studies should conduct a longitudinal investigation to determine how this characteristic affects MCU radically. Second, future studies should also include both innate and domain-specific innovativeness (Kalinic and Marinkovic 2015; Kaushik and Rahman 2015).

Different types and measures of expertise have been investigated in the EC literature, such as industry, functional, technological, or social expertise (Oesterle et al. 2020; Ziefle and Schaar 2010). Future research should use an objective measure of TE (Ziefle and Schaar 2010) or include other types of IT expertise (Oesterle et al. 2020). Furthermore, different factors can affect the formation of CSS in MC (Punj and Moore 2009). Thus, such elements (e.g., electronic decision aids, product attributes, expressiveness, habit, involvement, or self-efficacy) could be included in the model in future studies (Pousttchi and Dehnert 2018). Besides, future studies should devote efforts to discover the differences of using MC regarding various demographic variables such as age, gender, and income level. For example, the young versus the elderly or even within the young segment could have different response patterns, which are attractive to scholars to know the variability of their behaviors to MC. Finally, although Vietnam is a promising MC market, this study uses self-reported scales to measure the intended constructs in a convenient sample. Therefore, the results will be more generalisable if the collected data are representative or extended to different countries.

References

Ajzen I, Fishbein M (2000) Attitudes and the attitude-behavior relation: Reasoned and automatic processes. Eur Rev Soc Psychol 11:1–33

Amoroso D, Lim R (2015) Exploring the personal innovativeness construct: the roles of ease of use, satisfaction and attitudes. Asia Pacific J Inf Syst 25:662–685

Anderson JC, Gerbing DW (1988) Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin 103:411–423

Arbuckle JL (2016) IBM SPSS Amos 24 user's guide. IBM Corporation, USA

Arning K, Ziefle M (2010) Ask and you will receive: training novice adults to use a PDA in an active learning environment. Int J Hum-Comput Int 2:21–47

Aurier P, Jean S, Zaichkowsky JL (2000) Consideration set size and familiarity with usage context. ACR North American Advances 27:307–313

Baker-Eveleth L, Stone RW (2020) User's perceptions of perceived usefulness, satisfaction, and intentions of mobile application. Int J Mob Commun 18:1–18

Bransford JD, Brown AL, Cocking RR (2000) How People Learn: Brain, Mind Experience and School. National Academy Press, Washington, DC

Browne MW, Cudeck R (1992) Alternative ways of assessing model fit. Sociol Methods Res 21:230–258

Caplin A, Dean M, Leahy J (2019) Rational inattention, optimal consideration sets, and stochastic choice. Rev Econ Stud 86:1061–1094

Celik H (2016) Customer online shopping anxiety within the Unified Theory of Acceptance and Use Technology (UTAUT) framework. Asia Pacific J Mark Logist 28:278–307

Chen Y (2019) Research on personalized recommendation algorithm based on user preference in mobile e-commerce. Inform Syst E Bus Manag 18:837–850

Citrin AV, Sprott DE, Silverman SN, Stem DE (2000) Adoption of Internet shopping: the role of consumer innovativeness. Ind Manag Data Syst 100:294–300

Costa PTJr, McCrae RR (1992) Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual, Psychological Assessment Resources, Odessa, FL

Davis FD (1989) Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Quart 13:319–340

Dharmaraj S (2019) Growth in Vietnam’s telecom industry. https://www.opengovasia.com/growth-in-vietnams-telecom-industry/. Accessed 30 Aug, 2019

Downing RE, Moore JL, Brown SW (2005) The effects and interaction of spatial visualization and domain expertise on information seeking. Comput Human Behav 21:195–209

Eagly AH, Chaiken S (1993) The Psychology of Attitudes. Harcourt Brace Jovanovich College Publishers, Orlando, FL, US

Edwards JR, Lambert LS (2007) Methods for integrating moderation and mediation: a general analytical framework using moderated path analysis. Psychol Methods 12:1–22

Fazio RH (2007) Attitudes as object–evaluation associations of varying strength. Soc Cogn 25:603–637

Fishbein M, Ajzen I (2010) Predicting and Changing Behavior: The Reasoned Action Approach. New York: Taylor & Francis Group.

Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. J Mark Res 18:39–50

Grewal R, Mehta R, Kardes FR (2000) The role of the social-identity function of attitudes in consumer innovativeness and opinion leadership. J Econ Psychol 21:233–252

Gu B, Konana P, Chen H-WM (2012) Identifying consumer consideration set at the purchase time from aggregate purchase data in online retailing. Decis Support Syst 53:625–633

Hauser JR (2014) Consideration-set heuristics. J Bus Res 67:1688–1699

Iyengar SS, Lepper MR (2000) When choice is demotivating: Can one desire too much of a good thing? J Pers Soc Psychol 79:995–1006

Jin C-H (2013) The effects of individual innovativeness on users' adoption of Internet content filtering software and attitudes toward children's Internet use. Comput Human Behav 29:1904–1916

Jung H, Kim W (2005) Investigating the effects of consumer innovativeness on shape of consideration sets: focusing on comparison between consideration sets of innovators and non-innovators. ACR North American Advances 32:212–218

Kalinic Z, Marinkovic V (2015) Determinants of users' intention to adopt m-commerce: an empirical analysis. Inform Syst E Bus Manag 14:367–387

Karazsia BT, Berlin KS (2018) Can a mediator moderate? Considering the role of time and change in the mediator-moderator distinction. Behav Ther 49:12–20

Kaushik AK, Rahman Z (2015) Self-service innovativeness scale: introduction, development, and validation of scale. Serv Bus 10:799–822

Khoi NH, Tuu HH, Olsen SO (2018) The role of perceived values in explaining Vietnamese consumers' attitude and intention to adopt mobile commerce. Asia Pacific J Mark Logist 30:1112–1134

Lavrakas PJ (2008) Encyclopedia of survey research methods. Sage Publications, Inc., Thousand Oaks

Lee C-C, Cheng HK, Cheng H-H (2007) An empirical study of mobile commerce in insurance industry: Task–technology fit and individual differences. Decis Support Syst 43:95–110

Lee MS (2019) Effects of personal innovativeness on mobile device adoption by older adults in South Korea: the moderation effect of mobile device use experience. Int J Mob Commun 17:682–702

Liébana-Cabanillas F, Marinković V, Kalinić Z (2017) A SEM-neural network approach for predicting antecedents of m-commerce acceptance. Int J Inf Manag 37:14–24

Li H, Kuo C, Rusell MG (1999) The impact of perceived channel utilities, shopping orientations, and demographics on the consumer's online buying behavior. J Comput Mediat Commun 5(2), JCMC521. 10.1111/j.1083-6101.1999.tb00336.x

Liu Y, Wang M, Huang D, Huang Q, Yang H, Li Z (2019) The impact of mobility, risk, and cost on the users' intention to adopt mobile payments. Inform Syst E Bus Manag 17:319–342

Lönnqvist J-E, Walkowitz G, Verkasalo M, Wichardt PC (2011) Situational power moderates the influence of Self-Transcendence vs. Self-Enhancement values on behavior in ultimatum bargaining. J Res Pers 45:336–339

Lu J (2014) Are personal innovativeness and social influence critical to continue with mobile commerce? Internet Res 24:134–159

Ma Q, Chan AH, Chen K (2016) Personal and other factors affecting acceptance of smartphone technology by older Chinese adults. Appl Ergon 54:62–71

Maity M, Dass M (2014) Consumer decision-making across modern and traditional channels: E-commerce, m-commerce, in-store. Decis Support Syst 61:34-46

Manthiou A, Tang LR, Bosselman R (2014) Reason and reaction: the dual route of the decision-making process on Facebook fan pages. Electron Mark 24:297–308

Montazemi AR, Qahri-Saremi H (2015) Factors affecting adoption of online banking: A meta-analytic structural equation modeling study. Inf Manag 52:210–226

Mort GS, Drennan J (2007) Mobile communications: a study of factors influencing consumer use of m-services. J Advert Res 47:302-312

Nel J, Boshoff C (2019) Online customers' habit-inertia nexus as a conditional effect of mobile-service experience: A moderated-mediation and moderated serial-mediation investigation of mobile-service use resistance. J Retail Consum Serv 47:282–292

Oesterle S, Buchwald A, Urbach N (2020) Investigating the co-creation of IT consulting service value: empirical findings of a matched pair analysis. Electron Mark. 10.1007/s12525-020-00426-3

Oliver RL (1999) Whence consumer loyalty? J Mark 63:33–44

Ovčjak B, Heričko M, Polančič G (2015) Factors impacting the acceptance of mobile data services–a systematic literature review. Comput Human Behav 53:24–47

Parra JF, Ruiz S (2009) Consideration sets in online shopping environments: the effects of search tool and information load. Electron Commer Res Appl 8:252–262

Pieters RG, Verplanken B (1995) Intention-behaviour consistency: Effects of consideration set size, involvement and need for cognition. Eur J Soc Psychol 25:531–543

Ping RA (1995) A parsimonious estimating technique for interaction and quadratic latent variables. J Mark Res 32:336–347

Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP (2003) Common method biases in behavioral research: A critical review of the literature and recommended remedies. J Appl Psychol 88:879–903

Pousttchi K, Dehnert M (2018) Exploring the digitalization impact on consumer decision-making in retail banking. Electron Mark 28:265–286

Pousttchi K, Tilson D, Lyytinen K, Hufenbach Y (2015) Introduction to the special issue on mobile commerce: Mobile commerce research yesterday, today, tomorrow—what remains to be done? Int J Electron Commer 19:1–20

Punj G, Moore R (2009) Information search and consideration set formation in a web-based store environment. J Bus Res 62:644–650

Riquelme IP, Román S, Iacobucci D (2016) Consumers' perceptions of online and offline retailer deception: A moderated mediation analysis. J Interact Mark 35:16–26

Roberts JH, Lattin JM (1997) Consideration: Review of research and prospects for future insights. J Mark Res 34:406–410

Roberts SD, Dant RP (1991) Rethinking resource allocation in modern society: a meanings-based approach. J Econ Psychol 12:411–429

Rogers EM (1995) Diffusion of Innovations. Free Press, New York

Rortveit AW, Olsen SO (2007) The role of consideration set size in explaining fish consumption. Appetite 49:214–222

Schwartz SH, Cieciuch J, Vecchione Mi, Davidov E, Fischer R, Beierlein C, Ramos A, Verkasalo M, Lönnqvist J-E, Demirutku K, Dirilen-Gumus O, Konty M (2012) Refining the theory of basic individual values. J Pers Soc Psychol 103:663–688

Shin N, Kim D, Park S, Oh J (2017) The moderation effects of mobile technology advancement and system barrier on m-commerce channel preference behavior. Inform Syst E Bus Manag 16:125–154

Song J, Kim J, Jones DR, Baker J, Chin WW (2014) Application discoverability and user satisfaction in mobile application stores: An environmental psychology perspective. Decis Support Syst 59:37–51

Spassova G, Isen AM (2013) Positive affect moderates the impact of assortment size on choice satisfaction. J Retail 89:397–408

Tabachnick BG, Fidell LS (2007) Using Multivariate Statistics. Pearson Education, New York

Tang AKY (2019) A systematic literature review and analysis on mobile apps in m-commerce: Implications for future research. Electron Commer Res Appl 37. https://doi.org/10.1016/j.elerap.2019.100885

Taylor DG, Levin M (2014) Predicting mobile app usage for purchasing and information-sharing. Int J Retail Distrib Manag 42:759-774

Thakur R, Srivastava M (2014) Adoption readiness, personal innovativeness, perceived risk and usage intention across customer groups for mobile payment services in India. Internet Res 24:369–392

Tuu HH, Olsen SO (2013) Consideration set size, variety seeking and the satisfaction-repurchase loyalty relationship at a product category level. Asia Pacific J Mark Logist 25:590–613

Venkatesh V, Brown SA, Maruping LM, Bala H (2008) Predicting different conceptualizations of system use: the competing roles of behavioral intention, facilitating conditions, and behavioral expectation. MIS Quart 32:483–502

Venkatesh V, Morris MG, Davis GB, Davis FD (2003) User acceptance of information technology: toward a unified view. MIS Quart 27:425–478

Visser PS, Bizer GY, Krosnick JA (2006) Exploring the latent structure of strength-related attitude attributes. Adv Exp Soc Psychol 38:1–67

Wang L, Dai X (2020) Exploring factors affecting the adoption of mobile payment at physical stores. Int J Mob Commun 18:67–82

Wu W-Y, Quyen PTP, Rivas AAA (2016) How e-servicescapes affect customer online shopping intention: the moderating effects of gender and online purchasing experience. Inform Syst E Bus Manag 15:689–715

Xu R, Frey RM, Fleisch E, Ilic A (2016) Understanding the impact of personality traits on mobile app adoption – Insights from a large-scale field study. Comput Human Behav 62:244–256

Zhang L, Zhu J, Liu Q (2012) A meta-analysis of mobile commerce adoption and the moderating effect of culture. Comput Human Behav 28:1902–1911

Ziefle M, Schaar AK Technical expertise and its influence on the acceptance of future medical technologies: what is influencing what to which extent? In: G. L, M. H, A. H (eds) HCI in Work and Learning, Life and Leisure. USAB 2010, Heidelberg, 2010. Springer, pp 513–529