



Article

Contemporary Mobile Commerce: Determinants of Its Adoption

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Abstract: Mobile commerce is the next generation of electronic commerce that allows consumers to perform many transactions via a mobile phone instead of a desktop computer. To online businesses, this commerce channel also allows them to have almost non-stop accessibility to a large population of mobile device users. This study examines the factors affecting intention to use contemporary mobile commerce on the basis of integrating perceived security, subjective norm, innovativeness, and self-efficacy into the TAM model. Statistical analysis results show that self-efficacy and innovativeness are positively related to perceived ease of use. Perceived ease of use has a positive effect on perceived usefulness. Perceived ease of use, perceived usefulness, perceived security, and subjective norm have a positive relationship with intention to use mobile commerce. The theoretical and practical implications are discussed. Finally, future research directions are outlined.

Keywords: mobile commerce; perceived security; subjective norm; innovativeness; self-efficacy

1. Introduction

With the ubiquity of desktop computers and the Internet in the late 1990s, traditional commerce has evolved into e-commerce [1]. While traditional commerce is characterized by interactions between customers and company employees, e-commerce is characterized by interactions between customers and a company's website [2]. The essence of e-commerce is that at a specific place, home, or corporate office, with a desktop computer connected to the Internet, consumers can search for necessary information on companies' websites and make purchasing decisions for preferred goods or services [3].

Thanks to outstanding advances in telecommunications, communications technology, and wireless Internet, e-commerce is evolving into a new stage called mobile commerce [4]. With mobile commerce, consumers are no longer limited by space and time [5]. In other words, with just a handheld device connected to the wireless Internet, consumers can search for information, perform interactions, and make purchasing decisions regarding their favorite goods or services [6]. With this advantage, mobile commerce is expected to continue to boom in the coming years [7].

Mobile commerce benefits not only consumers but also businesses and governments [8]. The first advantage for businesses is that mobile commerce can generate significant operational cost savings, because businesses are not required to make large investments in establishing physical branches or offices to deal face-to-face with potential customers. In other words, with handheld devices (smart/mobile phones, tablets, or personal digital assistants) connected to the wireless Internet, consumers can search for information, interact with businesses' websites, and make purchasing decisions about any preferred product or service [9].

The second advantage for businesses is that mobile commerce offers them a set of opportunities for extensive integration into the regional and global economy [10]. With technology, our world is becoming figuratively smaller and the physical borders between countries are becoming more blurred. The interaction and exchange between the people and businesses of one country and the people and businesses of another country are no



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longer limited by space and time. Businesses can manufacture in one country and sell products/services to citizens of another without being physically present in the foreign country.

The third advantage for businesses is that people use smart/mobile phones not only to buy and sell products or services, but also to access social networks to share shopping experiences. Thus, mobile commerce can also help businesses build marketing strategies and manage customer relationships in efforts to target an expanded customer base and save on operating costs [11].

For the government, the emergence of mobile commerce as a catalyst pushes the government to invest more in digital infrastructure to become a smart government. The smart government, in turn, will create favorable conditions for mobile commerce to reach its fullest potential in meeting the expectations and needs of every actor in the economy. As a result, the economy will grow and develop sustainably, people's living standards will be improved, and people's confidence in the government will be enhanced.

One of the most important metrics to measure the success of mobile commerce is consumer acceptance [12]. Specifically, consumers will use mobile commerce platforms to share information, conduct exchanges or interactions, make purchasing decisions for goods or services, and ultimately make mobile payments. To date, there have been many studies conducted in the e-commerce and mobile commerce environments. The prominent objectives of these studies are to find the factors affecting the intention to use mobile commerce [10]. The theoretical foundations used in these studies are based on individual technology acceptance models, a combination of them, or the integration of other factors towards enhancing explanatory power for mobile commerce adoption [13].

However, most of these studies were conducted several years ago and their results are inconsistent in the sense that a factor is statistically significant in one study, but not statistically significant in another study. The identified factors of the past may no longer be relevant to the contemporary mobile commerce environment. Nowadays, there are many new functions, utilities, and applications integrated into mobile commerce platforms. In addition, new generation smart/mobile phones, tablets, or other handheld devices possess unique characteristics that are completely different from their previous versions. The perception consumers have about these features, functions, utilities, and applications is still a question that needs to be answered.

It is worth noting that the US smartphone market is one of the largest in the world, with 298 million users in 2021 [14]. About 79% of these people use a mobile device to purchase goods/services; there are about 167.8 million mobile shoppers in the US [15], while the US population is about 337 million people. Despite the large percentage of mobile shoppers, mobile commerce retail sales accounted for only 5.8% of total retail sales in the US in 2021 [16]. This means that mobile commerce in the US has plenty of room to grow. According to eMarketer's projections, by 2026, mobile commerce retail sales in the US will reach \$700 billion [17].

However, to turn this potential into reality, there is still a lot of work to be done [18,19]. One of the needs is to conduct new studies periodically in newer mobile commerce environments to identify new factors that influence mobile commerce adoption and to examine whether support for previously tested relationships can be found in data collected from later environments. This study is aimed at filling a research gap by explaining mobile commerce adoption in a more current environment compared with previous studies. This study also aims at extending a previous model, a version of the TAM, by including perceived security and subjective norm as two additional independent variables and by adding two factors, self-efficacy and innovativeness, which may have the potential to indirectly impact a consumer's decision to adopt mobile commerce, through perceived ease of use as the mediator variable. Whatever the results, this study will help add to the body of existing knowledge, however incongruent, that has developed through the research efforts of many who, over the years, used samples from different cultural and national boundaries to answer the question of what factors influence individuals' adoption of mobile commerce. It can help answer which previously tested theoretical relationships

hold the test of time at the time when this study was conducted, for how long compared with previous studies, and across which cultural and country boundaries such as Mexico, Spain, Greece, Serbia, Malaysia, Thailand, Vietnam, China, South Korea, Jordan, Pakistan, India, and the like, where samples for previous studies were collected. It can add to the reliability of previously discovered theoretical relationships and it can also lead to questions as to how studied effects and relationships hold strong, weaken, or change over time and across environments that are influenced by many tested, untested, and untestable factors.

2. Literature Review and Theoretical Framework

2.1. Mobile Commerce

Mobile commerce can be viewed as the next generation of electronic commerce that allows consumers to perform many, if not all, of the transactions that can be performed with electronic commerce on a desktop computer. Mobile commerce offers consumers a convenient way to always have access to purchase products and services regardless of time or location. This is also a benefit to online businesses, as they now have almost non-stop accessibility to a large population of mobile device users.

Some view mobile commerce as a stripped-down version of electronic commerce specifically made to accommodate the smaller screens of mobile devices. However, Carlsson and Walden [20] emphasize that mobile commerce is not an abbreviated version of electronic commerce; it is instead an innovative way for businesses and consumers to conduct transactions regardless of their locations. Thus, mobile commerce is commonly viewed as a subset of electronic commerce that involves the use of wireless handheld devices such as smartphones for engaging in commercial transactions through the Internet [21].

Mobile commerce is the one- or two-way exchange of value facilitated by a mobile consumer electronic device which is enabled by wireless technologies and communication networks [22]. Dholakia and Rask [23] define mobile commerce as any activity that involves monetary transactions conducted over a mobile telecommunications network. Siau and Shen [24] define mobile commerce as transactions conducted via mobile devices using wireless telecommunications networks. Zhang et al. [25] define mobile commerce as simply a wireless form of electronic commerce. The commonality of these definitions resides in the use of wireless handheld devices by consumers and organizations to conduct transactions [26]. Therefore, the definition of mobile commerce for this study is the use of wireless handheld devices by consumers and organizations to conduct monetary transactions.

Although mobile commerce is an evolved form of e-commerce, it has some unique characteristics as follows:

- Ubiquity—In mobile commerce, this can be seen as a prominent feature. With a handheld device connected to the wireless Internet, consumers can search for information and perform interactive and transactional activities anytime and anywhere.
- Reachability—In mobile commerce, with the help of a smartphone, tablet, personal digital assistant, or another mobile device connected to the Internet, consumers can “touch” any company they want to do transactions with.
- Localization—In mobile commerce, the location of consumers plays a very important role. Once a consumer’s location is determined, companies can offer location-based services or applications.
- Personalization—In mobile commerce, companies can easily provide personalized products and services to individual consumers to help them have great experiences, leading to customer satisfaction and loyalty.
- Dissemination—In mobile commerce, most consumers use a smartphone, tablet, or a mobile handheld device, so they can conveniently access social networks to share information and experiences related to shopping on mobile commerce platforms. Companies can take advantage of this to increase their customer base.

- Convenience—Advances in information and communication technology allow consumers to use handheld devices for work, entertainment, and especially shopping purposes. That is the foundation for mobile commerce to grow and develop.
- Interactivity—In mobile commerce, interfaces, functions, attributes, and utilities are highly interactive. Transactions and exchanges involving information search, selection of preferred products or services, and finally payment are effective immediately after clicking “OK”.

2.2. Studies on Mobile Commerce and Research Model

Communication technologies and the wireless Internet are changing the interactions and interfaces between companies and consumers in the mobile commerce environment [10]. The expanded reach provided by mobile commerce can benefit all actors in the economy [11]. Previous studies were carried out to explore the factors influencing mobile commerce acceptance (See Table 1). Based on analyses of 1130 articles published on topics related to mobile commerce, Du and Li [27] developed a conceptual map of m-commerce research in which they identified referenced theories such as technology acceptance model, game theory, expectation confirmation model, unified theory, commitment-trust theory, decision making process, theory of reasoned action, and network externality theory. Seminal papers or books that presented some of the prominent theories applied in m-commerce research include the theory of reasoned action (TRA) [28], the theory of planned behavior (TPB) [29], the technology acceptance model (TAM) [30,31], the innovation diffusion theory (IDT) [32], the task-technology fit model (TTF) [33], and the unified theory of acceptance and use of technology (UTAUT) [34], to name a few.

Table 1. Recent empirical and theory-based research in mobile commerce adoption.

Authors (Year)	Factors Investigated	Subjects	Main Findings
Pedersen (2005) [35]	Perceived user friendliness, perceived usefulness, external influence, inter-personal influence, self-control, self-efficacy, facilitating conditions, attitude towards use, subjective norm, and behavioral control.	232 respondents, mostly from North America and Europe.	Perceived friendliness and external influence are positively related to perceived usefulness. External influence, internal personal influence, and self-control have impacts on subjective norm. Subjective norm and perceived usefulness are positively related to attitude towards use. Self-efficacy and facilitating conditions impact behavioral control. Attitude towards use, subjective norm, and behavioral control are positively related to intention to use.
Yang (2005) [36]	Innovativeness, past adoption behavior, knowledge, technology cluster, age, gender, specialization, perceived usefulness, and perceived ease of use.	866 undergraduate students form the largest university in Singapore (National University of Singapore).	Perceived usefulness influences attitude toward using mobile commerce. Innovativeness, past adoption behavior, technology cluster adoption, age, and gender affect adoption behavior. Male respondents tend to perceive mobile commerce favorably.
Bhatti (2007) [37]	Perceived usefulness, subjective norm, personal innovativeness, ease of use, and perceived behavioral control.	Data were collected from undergraduate and graduate students in Dubai, UAE.	Subjective norm has a positive relationship with perceived usefulness, perceived ease of use, and perceived behavioral control. Perceived ease of use positively influences behavioral intention. Perceived behavioral control are positively related to perceived ease of use and behavioral intention.
Bigne et al. (2007) [38]	Frequency of mobile use, length of mobile use, affinity, gender, age, education, income, non-store shopping experience, attitude towards mobile commerce, and frequency of mobile commerce.	270 mobile shoppers and 336 non-mobile shoppers in Spain.	Age, attitude towards mobile commerce, previous Internet shopping experience, and relations with the mobile (frequency, length of mobile use, and mobile affinity) are the main predictors of mobile commerce decision, while age, length of mobile use, mobile affinity, consumer attitude towards mobile commerce, and previous mobile commerce experience are the most relevant factors influencing future mobile commerce intention.

Table 1. Cont.

Authors (Year)	Factors Investigated	Subjects	Main Findings
Khalifa and Shen (2008) [39]	Cost, convenience, privacy, efficiency, security, perceived usefulness, ease of use, subjective norm, and self-efficacy.	202 mobile service subscribers in Hong Kong.	Perceived usefulness is influenced by cost, convenience, privacy, efficiency, and security. Self-efficacy has a positive impact on ease of use and intention to adopt. Ease of use and subjective norm have positive impacts on perceived usefulness. Perceived usefulness has a positive impact on intention to adopt.
Li et al. (2008) [40]	Gender, ease of use, usefulness, price, wireless trust, and age.	372 undergraduate students in a private university in the northeast United States.	The adoption rate of mobile commerce for both male and female respondents was similar at about 30%. Price, ease of use, and usefulness rather than gender were significant in distinguishing between adopters and non-adopters.
Aldas-Manzano et al. (2009) [41]	Ease of use, usefulness, attitude, innovativeness, affinity, and compatibility.	470 mobile telephone users in Spain.	Innovativeness, affinity, and compatibility are positively related to mobile shopping intention. Ease of use is positively related to perceived usefulness. Ease of use and perceived usefulness are positively related to attitude towards mobile shopping. Perceived usefulness and attitude towards mobile shopping are positively related to mobile shopping intention.
Dai and Sombultawee (2009) [42]	Perceived value added, innovativeness, security perception, privacy perception, perceived usefulness, perceived ease of use, perceived cost, compatibility, perceived enjoyment, and subjective norm.	190 responses, of which 84 from the US and 106 from China.	Innovativeness, perceived usefulness, perceived ease of use, perceived cost, and subjective norm have impacts on intention to use for Chinese respondents. Innovativeness, privacy perception, perceived usefulness, compatibility, and perceived enjoyment have impacts on intention to use for respondents in the US.
Toh et al. (2009) [43]	Perceived usefulness, perceived ease of use, social influence, trust, and perceived cost.	222 students in Malaysia.	Perceived usefulness and social influence have positive impacts on intention to use mobile commerce, while perceived cost is negatively related to intention to use mobile commerce.
Li and Yeh (2010) [44]	Design, usefulness, ease of use, and customization.	200 students from three universities in Taiwan.	Design aesthetics is positively related to usefulness, ease of use, and customization, which in turn have positive impacts on mobile commerce trust.
Zhou et al. (2010) [45]	Task characteristics, technology characteristics, performance expectancy, effort expectancy, social influence, facilitating conditions, and task technology fit.	250 mobile banking users, of which 83 were students and 167 were professionals in China.	Task and technology characteristics have impacts on task technology fit. Technology characteristics has an impact on effort expectancy. Task technology fit and effort expectancy have impacts on performance expectancy. Task technology fit, performance expectancy, social influence, and facilitating conditions are positively related to user adoption.
Chung and Holdsworth (2012) [46]	Perceived risk, trustworthiness, observability, trialability, compatibility, complexity, and relative advantage.	530 students in Kazakhstan, Morocco, and Singapore.	Perceived risk, trustworthiness, observability, trialability, compatibility, complexity, and relative advantage determine behavioral intention to adopt mobile commerce. Culture has a moderating effect on these determinants in Kazakhstan and Morocco.
Chong et al. (2012) [47]	Trust, cost, social influence, variety of services, perceived usefulness, perceived ease of use, and trialability.	222 consumers in China and 172 consumers in Malaysia.	Trust, social influence, variety of services, and cost have impacts on mobile commerce adoption among Malaysian respondents, while trust, cost, and social influence have impacts on mobile commerce adoption among Chinese respondents.
Khalifa et al. (2012) [48]	Perceived behavioral control, subjective norm, and attitude towards mobile commerce.	202 mobile phone users in Dubai, UAE.	Subjective norm and attitude towards mobile commerce have positive impacts on intention to adopt mobile commerce.

Table 1. *Cont.*

Authors (Year)	Factors Investigated	Subjects	Main Findings
Shih and Chen (2013) [49]	Attitude towards use, perceived ease of use, tool experience, tool functionality, perceived usefulness, task technology fit, and task requirements.	421 real estate salespersons with experience of using mobile commerce in Taiwan.	Attitude towards use and task technology fit have direct positive impacts on behavioral intention.
Zhou (2013) [50]	Structural assurance, ubiquitous connection, contextual offering, trust, flow, and perceived usefulness.	285 mobile shoppers in China.	Structural assurance and ubiquitous connection have impacts on trust and flow. Contextual offering has impacts on trust, flow, and perceived usefulness. Trust is related to flow. Flow is related to perceived usefulness. Trust, flow, and perceived usefulness are positively related to purchase intention.
Mishra (2014) [51]	Attitude towards the behavior, subjective norm, and perceived behavioral control.	234 respondents in India.	Attitude towards the behavior and perceived behavioral control have positive impacts on users' acceptance towards mobile commerce.
Han et al. (2016) [52]	Personal innovativeness, system quality, content quality, service quality, perceived usefulness, perceived ease of use, and perceived playfulness.	532 students from two universities in Vietnam.	Perceived usefulness, perceived ease of use, and perceived playfulness have positive impacts on intention to use. Personal innovativeness, system quality, and content quality have positive impacts on perceived usefulness. Personal innovativeness, system quality, and service quality are positively related to perceived ease of use. Content quality is positively related to perceived playfulness.
Ng (2016) [53]	Consumer impulsiveness, social influence, exploratory acquisition of product, exploratory information seeking, online trust, technology acceptance readiness, perceived ease of use, and perceived usefulness.	330 students from two universities in Hong Kong.	Online trust, consumer impulsiveness, social influence, and technology acceptance readiness are directly positively related to adoption of mobile commerce.
Moorthy et al. (2017) [54]	Usage barrier, value barrier, risk barrier, tradition barrier, image barrier, and perceived cost barrier.	227 mobile phone users in Malaysia.	Usage barrier, value barrier, risk barrier, tradition barrier, and image barrier influence mobile commerce adoption intention.
Choi (2018) [55]	Service ubiquity, location-based service, user control, usefulness, and ease of use.	379 undergraduate and graduate students in one university in South Korea.	Service ubiquity, location-based service, ease of use, and user control have positive impacts on use-fulness. Service ubiquity and user control are positively related to ease of use. Usefulness and ease of use have positive impacts on smartphone-based mobile commerce.
Ghazali et al. (2018) [56]	Trust, perceived ease of use, perceived usefulness, attitude, personal innovativeness, subjective norm, and perceived behavioral control.	453 respondents in Malaysia.	Trust, attitude, personal innovativeness, and perceived behavioral control are positively related to mobile shopping intention. Perceived ease of use and perceived usefulness are positively related to attitude. Perceived ease of use has a positive impact on perceived usefulness.
Khoi et al. (2018) [57]	Social value, hedonic value, utilitarian value, attitude, subjective norm, and perceived behavioral control.	382 mobile phone subscribers in Vietnam.	Hedonic value, utilitarian value, attitude, subjective norm, and perceived behavioral control are positively related to intention to adopt mobile commerce.
Saprikis et al. (2018) [58]	Trust, relationship drivers, innovativeness, perceived usefulness, perceived ease of use, skillfulness, enjoyment, and anxiety.	473 respondents in Greece.	Trust, relationship drivers, perceived ease of use, skillfulness, and enjoyment have positive impacts on perceived usefulness. Relationship drivers, innovativeness, perceived usefulness, and enjoyment have positive impacts on behavioral intention. Enjoyment and innovativeness are positively related to perceived ease of use. Anxiety is negatively related to perceived ease of use. Skillfulness have a positive impact on enjoyment. Skillfulness is negatively related to anxiety.

Table 1. Cont.

Authors (Year)	Factors Investigated	Subjects	Main Findings
Sun and Chi (2018) [59]	Past non-store shopping experience, trust, personal innovativeness traits, security and privacy concerns, subjective norm, perceived usefulness, perceived ease of use, observability, and compatibility.	287 consumers in China.	Past non-store shopping experience, subjective norm, perceived usefulness, perceived ease of use, and compatibility have positive impacts on intention to use mobile commerce.
Verkijika (2018) [60]	Performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, perceived risk, and perceived trust.	372 respondents in four towns in Cameroon.	Perceived risk, perceived trust, social influence, facilitating conditions, and hedonic motivation are positively related to behavioral intention to adopt.
Al-Adwan et al. (2019) [61]	Differences in risk perception, differences in convenience perception, differences in personalization perception, value difference perceptions, differences in end-user devices perception, differences in communication network perception, and technology difference perceptions.	451 students in three private universities in Jordan.	Differences in risk perception, differences in convenience perception, differences in personalization perception, differences in end-user devices perception, and differences in communication network perception have influences on consumers' behavioral intention.
Anastasei and Dospinescu (2019) [62]	Trust in online electronic word of mouth (eWOM), type of product review eWOM (e.g., paid vs. non-paid), eWOM credibility, perceived source of expertise, and eWOM adoption intention.	Online survey of 352 individuals in Romania.	People with a low trust in online recommendations only trust non-paid, genuine reviews (eWOM). Subjects who manifest a high trust in online recommendations tend to have equal trust in both paid and non-paid product reviews.
Chung (2019) [63]	Complexity, relative advantage, compatibility, power distance, observability, collectivism, uncertainty avoidance, trialability, trust, and concerns about order fulfillment.	779 respondents in Kazakhstan, Kyrgyzstan, and Uzbekistan.	Compatibility, complexity, observability, trialability, relative advantage, and trust have positive impacts on intentions towards mobile commerce.
Bui et al. (2020) [10]	Variety of services, social influence, cost, trust, gender, age, education, trialability, perceived ease of use, and perceived usefulness.	496 respondents in Vietnam.	Perceived ease of use, perceived usefulness, variety of services, and trialability are positively related to intention to use mobile commerce. Perceived ease of use, trust, variety of services, social influence, and trialability have positive impacts on perceived usefulness.
Marinkovic et al. (2020) [64]	Perceived trust, gender, epistemic value, comparative value, customer involvement, perceived compatibility, satisfaction, performance expectancy, effort expectancy, and social influence.	402 respondents in two shopping malls in Belgrade, Serbia.	Performance expectancy, effort expectancy, and social influence have positive impacts on satisfaction. Satisfaction is positively related to customer involvement and continuance intention. Perceived compatibility is positively related to customer involvement. Customer involvement is positively related to epistemic value. Epistemic value, comparative value, and trust have positive impacts on continuance intention.
Yoo (2020) [65]	Perceived quality of augmented reality in m-commerce (e.g., system, information, and visual quality), perceived diagnosticity, satisfaction, and loyalty.	Data collected online from 283 mobile shoppers in Korea.	System quality, information quality, and visual quality have positive impacts on diagnosticity. Information quality, visual quality, and perceived diagnosticity have positive impacts on satisfaction. Perceived diagnosticity has a positive impact on satisfaction. Satisfaction is positively associated with loyalty.
Anwar et al. (2021) [66]	Consumer innovativeness, perceived value, perceived risk, perceived cost, and perceived ubiquity.	398 responses, of which 186 from India and 212 from Pakistan.	Ubiquity has a positive impact on value, while risk and cost have a negative influence. Innovativeness moderates the relationships between identified antecedents and value, apart from the relationship between cost and value. Value positively affects actual usage and is enhanced by innovativeness.

Table 1. *Cont.*

Authors (Year)	Factors Investigated	Subjects	Main Findings
Chimborazo et al. (2021) [67]	Perceived usefulness, perceived ease of use, social influence, facilitating condition, and hedonic motivation.	169 undergraduate and graduate students in one university in Spain.	Perceived ease of use is positively related to perceived usefulness. Social influence, facilitating conditions, and hedonic motivation have positive impacts on usage intention.
Yang et al. (2021) [68]	Interpersonal influence, perceived utilitarian value, perceived hedonic value, portability, and visual appeal.	199 respondents from the largest mobile shopping platform (Taobao) in China.	Portability and visual appeal have positive impacts on perceived hedonic value. Perceived hedonic value is positively related to the urge to buy impulsively. Interpersonal influence moderates the relationship between perceived hedonic value and urge to buy impulsively.
Anastasiei et al. (2022) [69]	Social media usage, credibility, type of appeal, purchase risk, and purchase intention.	Data collected online on a sample of 369 Romanian individuals.	Level of social media usage is positively related to perceived credibility. Rational messages have higher credibility than emotional messages. Perceived risk is lower when the message content is rational as opposed to emotional. Message credibility and purchase intention are positively related. Message credibility and perceived purchase risk are negatively related.
Kao and L’Huillier (2022) [70]	Attitude towards mobile commerce, subjective norm, perceived behavioral control, and attitude towards social distancing.	170 responses collected using M-Turk (online research panel) in the US.	Attitude towards mobile commerce and subjective norm are positively related to behavioral intention. Attitude towards social distancing and perceived behavioral control are negatively related to behavioral intention.
Misra et al. (2022) [71]	Performance and effort expectancy, social influence, and disturbance concerns.	254 respondents in India.	Performance and effort expectancy and social influence have positive impacts on behavioral intention.
Sanchez et al. (2022) [72]	Tradition, perceived risk, performance expectancy, effort expectancy, social influence, hedonic motivation, and facilitating conditions.	864 consumers of the seven municipalities of the state of Baja California in Mexico.	Performance expectancy, social influence, hedonic motivation, and facilitating conditions have positive impacts on intention to use mobile commerce, while tradition is negatively related to intention to use mobile commerce.

Table 1 summarizes the results of previous studies. The results indicate inconsistencies between the studies. There are factors that are identified as having a significant effect on intention to use mobile commerce in one research setting but are found to have no significant effect on intention to use mobile commerce in another research setting. This causes problems in both theory and practice.

3. Theoretical Framework and Research Hypotheses

One of the possible reasons for such inconsistencies among the past studies is that the research environments of these studies are characterized by the degree of development at the different stages of the evolving mobile commerce environment, while contemporary mobile commerce is far different from the mobile commerce that was available 3 years, 5 years, 7 years, or 10 years ago.

The technology acceptance model (TAM) was used as a framework for this study. Since the TAM focuses on the acceptance of systems in which usage is voluntary, it should fit well with the context of mobile commerce adoption in which its usage is also voluntarily. The first two factors in the proposed model, perceived ease of use and perceived usefulness, were derived from the TAM. The authors strongly believe that contemporary mobile commerce is still influenced by the two variables in the TAM model. If consumers feel that using mobile commerce is not easy and/or using mobile commerce is not useful, they will not use mobile commerce. Four additional factors, based on a review of the literature, were added to increase the model’s ability to explain system usage. These additional factors are: (1) self-efficacy; (2) innovativeness; (3) perceived security; and (4) subjective norm.

Previous studies have produced inconsistent results on the role of perceived ease of use. The reason may be that they do not consider the individual characteristics of users.

Therefore, self-efficacy and innovativeness are considered in this study. Furthermore, mobile commerce is characterized by the purchase and sale of goods/services that are executed via a mobile device, which may be less secure than traditional shopping. Thus, there is a high likelihood that perceived security should be a major concern for consumers. In addition, mobile commerce is considered a trend in which consumers tend to see how they should behave to ‘fit in’ with their referent group. Therefore, this construct is integrated into the proposed model. Figure 1 depicts the extended research model in this study.

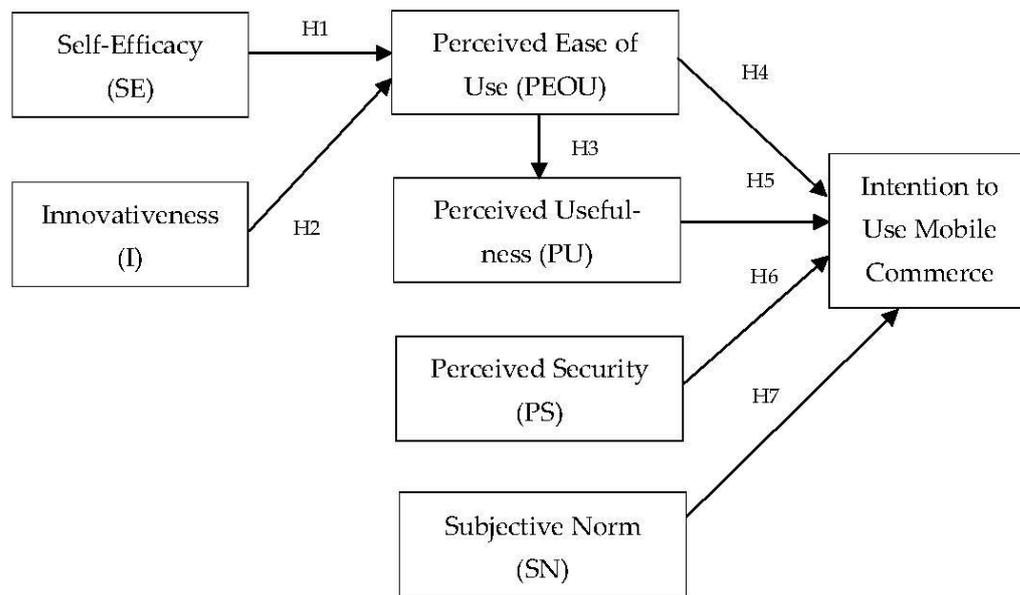


Figure 1. Research model.

3.1. Self-Efficacy (SE)

Self-efficacy is the perception that one has of their ability to successfully use technology to accomplish a task [73]. Accessing the Web is relatively easy with the use of most mobile devices. However, online shopping with traditional e-commerce websites on a mobile device may not be as straightforward given the much smaller screen size of mobile devices. Thus, finding a retailer that sells a product, finding the product on the retailer’s website, placing an order, and making a payment via a mobile device may be considered an arduous task for some [74]. Prior studies have found a positive relationship between self-efficacy and ease of use [31]. A high score on self-efficacy may be viewed as one’s perceived level of positive digital orientation and belief in digital capability [75] and competence [76], which can help an individual take a leap of faith and go through a metamorphosis, a digital transformation that participation in mobile commerce symbolizes. We believe that the level of self-efficacy that a consumer has will directly impact their perception of how easy mobile commerce is to use, just as easy as a butterfly coming out of a cocoon. Thus, we hypothesize that:

H1: SE influences perceived ease of use.

3.2. Innovativeness (I)

Innovativeness is defined differently across multiple disciplines [77]. A widely accepted definition among researchers is the degree of early acceptance of innovation [78]. Rogers [32] defined innovativeness as the degree to which an individual adopted innovation before others did. Kim and Park [79] presented two dimensions of consumer innovativeness: product-specific innovativeness, where consumer innovativeness varied from one product category to another, and life innovativeness, the innate predisposition of innovativeness from a socio-psychological perspective, including cognitive and sensory traits. Agarwal and Prasad [78] developed a modified technology acceptance model,

finding that personal innovativeness positively moderated the relationship between the perceptions of relative advantage, ease of use, compatibility, and the decision to adopt an innovation. An individual's high score on innovativeness can be interpreted as an indicator of one's entrepreneurial orientation and versatile dynamic capability [80], which can help one develop the perception that mobile commerce is easy enough to be within one's dynamic digital capability. Thus, we hypothesize that:

H2: *Innovativeness influences perceived ease of use.*

3.3. Perceived Ease of Use (PEOU)

Perceived ease of use is one of the foundational factors of the TAM. For this study, perceived ease of use is focused on the perception that a consumer has about the amount of effort it would require to use mobile commerce [31]. The TAM has enjoyed an extensive amount of testing in IS research and it has repeatedly been shown to influence behavioral intention [25,31]. The TAM also ties perceived ease of use to perceived usefulness. The easier that a system is perceived to be used, the more likely the user will find the system to be useful [31]. Gefen and Straub [81] demonstrated that perceived ease of use is a significant factor in explaining PU. Mirhoseini et al. [82] found, in an experimental study, that task complexity is negatively related to satisfaction with online shopping because complexity can be expected to require higher mental efforts or cognitive load on the part of mobile shoppers. The opposite of perceived complexity can be understood as perceived ease of use. Perceived ease of use can be conceptually linked by mobile shoppers as beneficial because it reduces mental efforts, cognitive burden, reduces risks and anxiety of potential failure, and improves satisfaction with the m-commerce system. Thus, we hypothesize that:

H3: *PEOU influences perceived usefulness.*

In addition, the easier mobile commerce is perceived to use, the more likely perceived ease of use will influence a consumer's intention to use mobile commerce. Thus, we hypothesize that:

H4: *PEOU influences consumers' intention to use mobile commerce.*

3.4. Perceived Usefulness (PU)

Perceived usefulness is the other foundational factor in the TAM. For this study, perceived usefulness is the consumer's expectation that mobile commerce will enhance their ability to find the best product [31]. Prior studies have repeatedly demonstrated a significant link between perceived usefulness and intention [25,31,83]. Perceived usefulness has been linked to e-commerce intention [84] and to mobile commerce intention [85]. Based on the theory of mental accounting, as applied to explain the effect of update frequency of mobile apps on consumer interest in m-commerce [86], it can be argued that individuals will evaluate the potential risks against potential benefits as they decide whether to engage in mobile commerce or not. Perceived usefulness represents the potential benefits which can positively influence an individual's intention to participate in mobile commerce. Thus, we hypothesize that:

H5: *PU influences consumers' intention to use mobile commerce.*

3.5. Perceived Security (PS)

Perceived security is a crucial part of trust, and previous studies have demonstrated the vital role that security plays [87,88]. In online shopping, personal information (i.e., credit/debit card information) is often required to be transmitted over the Internet. Security involves the protection of personal information that is transmitted over the Internet and possibly stored as part of a commercial transaction [89]. An opposite construct of perceived security is perceived risk. Numerous studies show that perceived risk is negatively related to individuals' intention to use a system [90,91]. A low score on perceived security indicates mobile users' perception of uncertainty and potential risks in the context of the mobile commerce platforms. Thus,

the instinct of self-preservation and risk-aversion may lead individuals to be less willing to participate in mobile commerce [92] when individuals perceive that the mobile commerce platform's risk management is not adequate, and the perceived risks outweigh the required security or other benefits. Thus, we hypothesize that:

H6: *PS influences consumers' intention to use mobile commerce.*

3.6. Subjective Norm (SN)

Subjective norm is the perception that an individual has on how they should behave to 'fit in' with their referent group [93]. This perceived social pressure from one's referent group is a strong motivator in determining the actions of an individual [94]. Previous research has demonstrated that subjective norm has a positive influence on behavioral intention [95,96]. Research in the context of social commerce and influence marketing show that individuals are influenced by others whom they consider important and trustworthy [97,98]. Positive effects of influencers have been especially observed in members of Generation X and Millennials [97]. A high score on subjective norm represents one's readiness to fit in with those whom one considers important and to conform to expectations of one's referent group. Thus, it can be argued that the force of subjective norm is at play in influencing the intention of individuals to engage in mobile commerce. Thus, we hypothesize that:

H7: *SN influences consumers' intention to use mobile commerce.*

4. Research Methodology

4.1. Development of Measurement Instrument

The survey instrument for this study was developed by adapting the survey items for PU and PEOU from studies by Venkatesh and Davis [99] and Venkatesh et al. [34]. Survey items for the other factors added to the TAM were adapted and modified from prior studies. The following lists the sources from which the survey items were drawn and adapted for the other factors used in this study: perceived security [100,101]; innovativeness [32,102]; social norm [39,103]; self-efficacy [39,104]; and intention [105]. In addition, several tests were conducted to validate that these items are appropriate measures for the constructs in the proposed research model. The survey items were measured on a five-point Likert scale ranging from 1—strongly disagree to 5—strongly agree. To check the validity of the survey items, three professors and two research assistants were asked to read over the instrument and provide feedback. All necessary changes were made to improve the survey instrument.

4.2. Data Collection

An online survey was employed using Qualtrics to gather respondent data. Social media posts and word-of-mouth were used to recruit participants who are consumers living in the United States. The participation was completely voluntary. The participants were informed that they could withdraw from the survey at any time. The participants were also encouraged to send this link to friends, family members, and work colleagues via popular social networks, such as Facebook, Twitter, and LinkedIn, to invite them to participate in the survey.

The data were collected between the period from February to May 2022. There were 591 respondents. Out of 591 respondents, 16 were disregarded because they were incomplete. Therefore, the valid sample size was 575. The participants' demographics are listed in Table 2.

Table 2. Participants’ demographics (*n* = 575).

Gender		Male	Female	No Answer				
		251	307	17				
		43.60%	53.46%	2.94%				
Education		High School	Associate	Bachelor	Master	Doctoral	No Answer	
		116	121	226	98	9	5	
		20.24%	20.93%	39.45%	16.96%	1.56%	0.87%	
Age (years)		18–25	26–35	36–45	46–55	56–65	Above 65	No Answer
		242	175	87	42	17	8	4
		41.87%	30.62%	15.05%	7.44%	2.94%	1.38%	0.69%
Ethnicity		African American	Anglo/White	Asian	Hispanic	Native American	Other	No Answer
		59	208	57	222	5	18	6
		10.21%	36.16%	9.86%	38.75%	0.87%	3.11%	1.04%
Annual Income		Under \$20,000	\$20,000–40,000	\$40,001–\$60,000	\$60,001–80,000	\$80,001–100,000	Over \$100,000	No Answer
		195	76	77	65	60	91	11
		33.91%	13.15%	13.49%	11.25%	10.55%	15.74%	1.90%

5. Data Analysis

The statistical software applications of SPSS 25 and AMOS 24 were used to analyze the data. The data analysis is described below.

5.1. Reliability Test

To test the internal consistency of the instrument, reliability tests were performed on each factor for each sample group. The Cronbach’s alpha values (see Table 3) for the reliability tests were greater than the recommended value of 0.70 [106]. Based on the reliability test results, the internal consistency of the measurement instrument is acceptable.

Table 3. Reliability statistics.

Constructs	Cronbach’s α
SE1, SE2, SE3, SE4	0.912
I1, I2, I3, I4	0.888
PEOU1, PEOU2, PEOU3, PEOU4, PEOU5	0.911
PU2, PU3, PU4, PU5	0.821
PS2, PS3, PS4	0.775
SN2, SN3, SN4, SN5	0.931
INT2, INT3, INT4, INT5	0.927

5.2. KMO and Bartlett’s Test

The KMO and Bartlett’s test were performed to evaluate the degree of unidimensionality of the scales (see Table 4). The sphericity tests resulted in *p*-values of 0.000 for all three sample groups. The sampling adequacy was also supported with values of 0.921.

Table 4. KMO and Bartlett’s Tests.

KMO and Bartlett’s Test		
KMO Sampling Adequacy Measurement.		0.921
Sphericity Test	Approx. Chi-Square	12,189.030
	Degree of Freedom	378
	Significance	0.000

5.3. Common Method Bias

Harman’s single factor test was used to ensure that the model was free from common method bias. The SPSS application was used to derive the result by conducting an un-rotated, single-factor constraint factor analysis. As shown in Table 5, the highest variance explained by one factor was 40.082%, indicating that there is no concern with common method bias in the samples.

Table 5. Total variance explained.

Component	Total Variance Explained					
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.223	40.082	40.082	11.223	40.082	40.082
2	2.473	8.833	48.915	2.473	8.833	48.915
3	2.012	7.187	56.102	2.012	7.187	56.102
4	1.864	6.658	62.760	1.864	6.658	62.760
5	1.622	5.792	68.552	1.622	5.792	68.552
6	1.327	4.741	73.293	1.327	4.741	73.293
7	1.035	3.698	76.990	1.035	3.698	76.990
8	0.603	2.153	79.144			
9	0.566	2.022	81.166			
10	0.489	1.745	82.911			
11	0.468	1.672	84.583			
12	0.419	1.497	86.080			
13	0.379	1.354	87.435			
14	0.365	1.303	88.737			
15	0.355	1.268	90.005			
16	0.306	1.094	91.100			
17	0.302	1.080	92.179			
18	0.299	1.068	93.247			
19	0.257	0.919	94.167			
20	0.254	0.907	95.073			
21	0.242	0.865	95.939			
22	0.222	0.792	96.731			
23	0.189	0.676	97.407			
24	0.180	0.643	98.049			
25	0.170	0.608	98.658			
26	0.137	0.489	99.147			
27	0.129	0.462	99.609			
28	0.110	0.391	100.000			

5.4. Analysis of Factor Loadings

The factor loadings were verified to determine that each survey item loaded onto the appropriate factor (see Table 6). The results provide evidence that the survey items loaded onto nine factors, explaining 76.990 percent of the total variance. The items with factor loadings below the suggested level of 0.5 [107] were removed from the data analysis.

Table 6. Factor analysis.

	Rotated Component Matrix ^a						
	Component						
	1	2	3	4	5	6	7
Self-Efficacy 1	0.256	0.181	0.783	0.194	0.167	0.084	0.053
Self-Efficacy 2	0.282	0.114	0.825	0.207	0.170	0.034	0.020
Self-Efficacy 3	0.164	0.076	0.867	0.122	0.133	0.008	0.028
Self-Efficacy 4	0.125	0.101	0.838	0.006	0.162	0.122	0.015

Table 6. Cont.

Rotated Component Matrix ^a							
	Component						
	1	2	3	4	5	6	7
Innovativeness 1	0.125	0.198	0.054	0.773	0.169	0.030	-0.079
Innovativeness 2	0.192	0.172	0.191	0.817	0.116	0.169	-0.013
Innovativeness 3	0.132	0.133	0.109	0.859	0.088	0.086	-0.021
Innovativeness 4	0.220	0.089	0.134	0.778	0.173	0.185	0.058
Perceived Ease of Use 1	0.731	0.171	0.253	-0.010	0.201	0.130	-0.036
Perceived Ease of Use 2	0.793	0.159	0.209	0.191	0.139	0.191	0.039
Perceived Ease of Use 3	0.809	0.141	0.130	0.202	0.186	0.113	0.006
Perceived Ease of Use 4	0.772	0.157	0.201	0.226	0.119	0.152	0.080
Perceived Ease of Use 5	0.710	0.210	0.181	0.244	0.276	0.146	-0.011
Perceived Usefulness 2	0.080	0.170	0.128	0.124	0.106	0.796	-0.042
Perceived Usefulness 3	0.070	0.170	-0.009	0.091	0.059	0.813	0.022
Perceived Usefulness 4	0.326	0.161	0.054	0.152	0.270	0.686	-0.040
Perceived Usefulness 5	0.363	0.190	0.101	0.108	0.235	0.600	-0.029
Perceived Security 2	-0.008	0.099	0.091	-0.114	0.028	-0.072	0.822
Perceived Security 3	0.022	-0.180	-0.015	0.014	0.206	0.031	0.773
Perceived Security 4	0.034	0.008	0.007	0.051	-0.054	-0.009	0.883
Social Norm 2	0.206	0.734	0.120	0.230	0.343	0.147	-0.020
Social Norm 3	0.168	0.852	0.147	0.153	0.198	0.174	-0.036
Social Norm 4	0.178	0.854	0.116	0.140	0.133	0.216	-0.041
Social Norm 5	0.237	0.804	0.133	0.187	0.152	0.221	0.011
Intention to Use Mobile Commerce 2	0.239	0.159	0.278	0.156	0.715	0.248	0.063
Intention to Use Mobile Commerce 3	0.323	0.289	0.261	0.185	0.675	0.199	0.106
Intention to Use Mobile Commerce 4	0.278	0.286	0.180	0.280	0.744	0.170	0.079
Intention to Use Mobile Commerce 5	0.281	0.303	0.241	0.192	0.754	0.171	0.085

^a Extraction method: principal component analysis. Rotation method: Varimax with Kaiser normalization.

5.5. Convergent and Discriminant Validity

As shown in Table 7, in order to test the convergent validity, the average variance extracted (AVE) for all constructs were calculated to ensure that they were >0.5 [108]. To assess the discriminant validity, the square root of AVE was calculated and compared with the inter-construct correlations. The results in Table 7 demonstrate that the discriminant validity is supported, as the square root of the constructs' AVE was greater than the correlations of the construct with all other constructs [108–110].

Table 7. Correlation matrix and average variance extracted (AVE).

Constructs	AVE	Square Root of AVE	SE	I	PU	PEOU	PS	PS	INT
SE	0.6869	0.8288	1						
I	0.6520	0.8075	0.368 **	1					
PU	0.5313	0.7289	0.287 **	0.385 **	1				
PEOU	0.5836	0.7639	0.521 **	0.475 **	0.507 **	1			
PS	0.6843	0.8272	0.073	-0.022	-0.028	0.045	1		
SN	0.6601	0.8125	0.385 **	0.457 **	0.518 **	-0.032	-0.032	1	
INT	0.5222	0.7227	0.547 **	0.505 **	0.546 **	0.142 **	0.621 **	0.142 **	1

** Correlation is significant at the 0.01.

5.6. Multicollinearity Test

Since multicollinearity can have harmful effects, multicollinearity was assessed in the research model [111]. Table 8 below reveals the variance inflation factor (VIF) ranging from 1.014 to 1.899; all are less than 10, indicating that multicollinearity is not a concern in this dataset.

Table 8. Multicollinearity test.

Model	Coefficients ^a					Collinearity Statistics	
	Unstandardized Coefficients		Stand. Coefficients	t	Sig.	Tolerance	VIF
	Beta	Std. Error	Beta				
(Constant)	-0.397	0.155		-2.569	0.010		
Perceived Usefulness	0.190	0.034	0.180	5.584	<0.001	0.645	1.550
Perceived Ease of Use	0.262	0.039	0.241	6.749	<0.001	0.527	1.899
Perceived Security	0.125	0.025	0.132	5.075	<0.001	0.986	1.014
Innovativeness	0.115	0.029	0.124	3.973	<0.001	0.694	1.442
Social Norm	0.284	0.035	0.269	8.032	<0.001	0.597	1.674
Self-Efficacy	0.200	0.030	0.210	6.766	<0.001	0.695	1.439

a. Dependent variable: intention to use social commerce.

5.7. Structural Equation Model

SPSS AMOS 24 was used to examine the research model. The seven (7) SEM fit measurements were assessed to ensure the overall model’s goodness of fit. All goodness of fit indices fell within the acceptance levels (see Table 9), indicating that the model demonstrated a good fit with the data [112–114].

Table 9. Fit indices for the models.

Indices of Fit	Value Recommended	Model Value
df/Chi-square	≤3.00	1.749
Goodness of fit	≥0.90	0.995
Adjusted goodness of fit	≥0.80	0.976
Root mean square error of approximation	≤0.06	0.036
Comparative fit index	≥0.93	0.997
Tucker–Lewis index	≥0.90	0.989
Normed fit index	≥0.90	0.992

5.8. Hypothesis Testing

The results of hypothesis testing are shown in Table 10. Figure 2 displays the characteristics of the causal paths, including the standardized path coefficients.

Table 10. Hypothesis testing and results.

H#	Hypothesis Testing	(β)	Critical Ratio	p-Value
1	Self-Efficacy → Perceived Ease of Use	0.351	11.226	***
2	Innovativeness → Perceived Ease of Use	0.281	9.145	***
3	Perceived Ease of Use → Perceived Usefulness	0.470	12.227	***
4	Perceived Ease of Use → Intention to use MC	0.212	4.916	***
5	Perceived Usefulness → Intention to use MC	0.153	4.371	***
6	Perceived Security → Intention to use MC	0.125	5.137	***
7	Subjective Norm → Intention to use MC	0.469	11.725	***

*** indicates significance level <0.001.

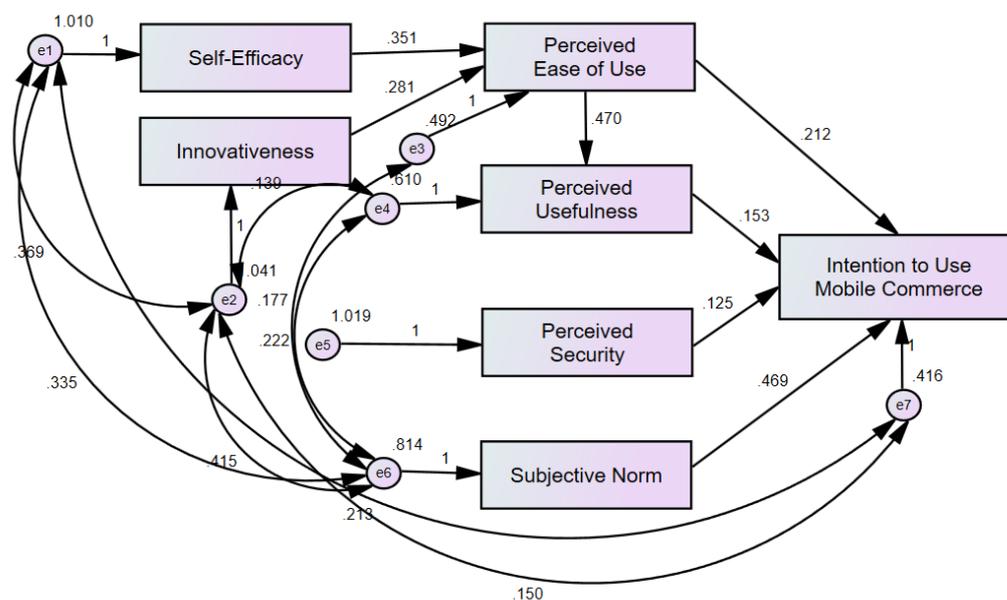


Figure 2. Factors influencing intention to use mobile commerce.

6. Results and Discussion

Based on the results shown in Table 7 above, all hypotheses were supported. Regarding hypothesis H1, the results reveal that self-efficacy has a significant positive influence on perceived ease of use ($\beta = 0.351, p\text{-value} < 0.01$). Having the skills and knowledge necessary to use technology does influence an individual’s perception of the ease of use of a new technology. As a result, people with higher levels of self-efficacy usually find it easier to use new technology than those who have lower levels of self-efficacy. This result is consistent with earlier research conducted by Pedersen [35] and Khalifa and Shen [39].

Regarding hypothesis H2, the analysis also reveals a significant positive relationship between innovativeness and perceived ease of use ($\beta = 0.281, p\text{-value} < 0.01$). Subjects with higher innovativeness tend to be better with technology and thus find it easier to use mobile commerce. Thus, consumers with a high level of innovativeness are more willing to engage in mobile commerce. This finding is in line with the findings of studies by Aldas-Manzano et al. [41], Dai and Palvia [42], Ghazali et al. [56], Han et al. [52], Kalinic and Marinkovic [115], Saprikis et al. [58], and Yang [36]. However, it is contrary to the findings of studies conducted by Bhatti [37] and Sun and Chi [59].

The result also shows a significant relationship and provides support for hypothesis H3. Perceived ease of use has a positive influence on perceived usefulness ($\beta = 0.470, p\text{-value} < 0.01$). The relationship between perceived usefulness and perceived ease of use was validated by many prior studies [116–119]. When consumers perceive a new technology as requiring little to no effort to use to achieve their goals, they will find the new system more useful.

For hypothesis H4, the analysis also provides support for this hypothesis. Perceived ease of use has a significant influence on intention to use mobile commerce ($\beta = 0.212, p\text{-value} < 0.01$). This finding confirms the study by King and He [120].

The data, according to our findings, also lend support to H5. Perceived usefulness has a positive influence on intention to use mobile commerce ($\beta = 0.153, p\text{-value} < 0.01$). This finding is consistent with previous research, which found a positive relationship between perceived usefulness and intention to use new technology [10,81]. The usefulness of mobile commerce can most likely be found in the portability of the mobile device, thus allowing them to commerce anytime at their convenience.

The results also confirm hypothesis H6, providing evidence that perceived security influences intention to use mobile commerce ($\beta = 0.125, p\text{-value} < 0.01$). This finding implies that subjects who find mobile commerce to be secure will have a higher likelihood

to use mobile commerce. This finding is in line with the findings of studies by Dai and Palvia [42], Wei et al. [43], and Sun and Chi [59]. However, it is contrary to the findings of studies conducted by Khalifa and Shen [39].

Regarding hypothesis H7, subjective norm has a significant influence on subjects' intentions to use mobile commerce ($\beta = 0.469$, p -value < 0.01). The actions of family members and friends should have a considerable impact on consumers' intention to use mobile commerce given its social nature. This finding is in line with the findings of studies by Dai and Palvia [42], Kao and L'Huillier [70], Khalifa et al. [48], Khoi et al. [57], Pedersen [35], and Sun and Chi [59]. However, it is contrary to the findings of studies conducted by Ghazali et al. [56] and Mishra [51].

7. Conclusions and Study Implications

The intention of consumers to engage in mobile commerce was examined in this study. The technology acceptance model (TAM) was the foundation used for this study. Seven factors made up the final research model, which was proposed and examined using SEM along with the statistical software programs SPSS 25.0 and AMOS 24. The two personal characteristic factors added to the TAM of self-efficacy and innovativeness were found to have a significant positive influence on perceived ease of use. The factors perceived ease of use, perceived usefulness, and subjective norm were found to have a significant positive influence on the intention to use mobile commerce. In addition, the factor perceived security was found to have a significant relationship with the intention to use mobile commerce.

7.1. Theoretical Implication

For the theoretical perspective, this study makes significant contributions to the relevant field of research. First, the study was conducted in the contemporary US mobile commerce environment. The US is a developed country and has a lot of potential to realize the benefits of mobile commerce. The factors influencing intention to use mobile commerce identified in this study serve as a good reference framework for other countries deploying resources to promote the growth and development of mobile commerce in their economies.

Second, previous studies using the TAM yielded inconsistent results because their research environments were characterized by different levels of sophistication, complexity, and modernity of mobile commerce. There are studies that show that perceived ease of use and perceived usefulness are statistically significant, while other studies have found that perceived ease of use and perceived usefulness are not statistically significant. This study is based on the argument that at any level of development of mobile commerce, if consumers perceive that using mobile commerce is not simple and/or not beneficial, they will not accept mobile commerce. This study confirms the importance of two factors in the TAM model.

Third, previous studies often considered perceived ease of use in isolation as an exogenous variable. This study goes further and shows that perceived ease of use is influenced by self-efficacy and innovativeness, which is the significant contribution of this study.

Fourth, while previous studies have examined the impact of perceived security and subjective norms independently and separately from the TAM, this study emphasizes that mobile commerce is an irreversible trend, and of course is not limited by space and time, leading to higher risk, so perceived security and subjective norm are integrated into the TAM. The extended model in this study based on the integration of self-efficacy, innovativeness, perceived security, and subjective norm into the TAM will serve as a reference for other studies on mobile commerce in general and its specific applications in particular.

7.2. Practical Implication

From the practical standpoint, this study shows that perceived ease of use, perceived usefulness, perceived security, and subjective norm are positively related to intention to

use mobile commerce. Perceived ease of use and perceived usefulness should be given adequate attention by mobile commerce businesses. It is important that they communicate with phone companies to create mobile interface environments with simple and useful applications. Such interface environments should facilitate the participation of consumers in different levels of mobile commerce activities in convenient and simple ways.

The layout and navigation of information must be logical, aesthetic, and simple so that consumers can easily find relevant information, compare products and services of interest, and make informed decisions on purchasing the most preferred products and services. When consumers perceive the benefits generated from mobile commerce and when using mobile commerce is effortless, their intention to use mobile commerce is enhanced.

Perceived security plays an important role in determining the success of mobile commerce. Consumers are rightly concerned about security breaches since security breaches can place the consumer at a higher risk of financial loss. To drive customer confidence and increase mobile commerce usage intention, mobile commerce businesses and phone companies must continuously enhance their hardware and software applications with the ultimate goal of protecting the financial and private information of customers, thereby avoiding situations where this information is leaked, stolen, or used illegally. This requires the use of advanced encryption algorithms to help protect personal and financial information for customers. In addition, companies that engage in mobile commerce should have clear, publicly available policies that state how customers' data are protected from unauthorized use.

Subjective norm also plays a crucial part of mobile commerce adoption. Given the social nature of mobile commerce, consumer intentions to use mobile commerce should be significantly influenced by the actions of family members and friends. In addition, providing links on mobile commerce sites to social media sites could have a positive impact on helping consumers become customers as they see their referent group referring, liking, and sharing these mobile commerce sites via social media.

Furthermore, self-efficacy and innovativeness were also found to have a positive relationship with perceived ease of use. Therefore, mobile commerce companies should collaborate with phone companies to deploy marketing and promotion strategies and solutions to convey an important message that mobile commerce is an irreversible trend. The message should also emphasize that mobile commerce benefits everyone, regardless of age, gender, and social status. Using mobile commerce is the embodiment of innovation, creativity, and dynamism. Doing so will further promote subjective norms and innovativeness among consumers, which in turn will positively influence mobile commerce usage intention; enhanced innovation will increase perceived ease of use, leading to increased intention to use mobile commerce.

8. Limitations and Directions for Future Research

The sample used has an inherent limitation, as is the case with many empirical studies. The sample data were collected from self-selected participants that responded to social media posts and word-of-mouth promotion of this study. Thus, most if not all the study participants were social media users. Therefore, mobile commerce consumers that do not participate on social media websites may not be adequately represented in this study. Thus, the ability to generalize based on the results of this study may be limited. Future studies could reduce this possible limitation by collecting sample data that may produce more generalizable results. Future studies could incorporate national culture into the model to uncover any distinctions between individualistic and collectivist cultures. Future research may also examine other factors, such as demographic factors. Last but not least, comparative studies between developing countries and developed countries should be conducted to examine if there are differences in impacts of the predictors on intention to use mobile commerce.

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