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ADOPTION OF MOBILE COMMERCE SERVICES AMONG ARTISANS IN DEVELOPING COUNTRIES

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ABSTRACT

Aim/Purpose	This paper aims to analyze how artisans in Ghana are incorporating mobile commerce into their everyday business and how perceived usefulness, perceived ease of use, subjective norms, age, gender, expertise, and educational level affected the adoption and usage of m-commerce.
Background	This study integrates well-established theoretical models to create a new conceptual model that ensures a comprehensive mobile commerce adoption survey.
Methodology	A cross-sectional survey was conducted to measure the constructs and their relations to test the research model.
Contribution	The study's findings confirmed previous results and produced a new conceptual model for mobile commerce adoption and usage.
Findings	Except for gender, perceived ease of use, and subjective norms that did not have specific effects on mobile commerce adoption, age, educational level, perceived usefulness, expertise, attitude, and behavioral intention showed significant effects.
Recommendations for Practitioners	First of all, mobile commerce service providers should strategically pay critical attention to customer-centered factors that positively affect the adoption of mobile commerce innovations than focusing exclusively on technology-related issues. Mobile service providers can attract more users if they carefully consider

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promoting elements like perceived usefulness and perceived ease of use which directly or indirectly affect the individuals' decision to adopt information technology from consumer perspectives.

Second, mobile commerce service providers should strategically focus more on younger individuals since, per the research findings, they are more likely to adopt mobile commerce innovations than the older folks in Ghana.

Third, service providers should also devise strategies to retain actual users of m-commerce by promoting elements like behavioral intentions and attitude, which according to the research findings, have a higher predictive power on actual usage of m-commerce.

Recommendations for Researchers	The conceptual model developed can be employed by researchers worldwide to analyze technology acceptance research.
Impact on Society	The study's findings suggested that mobile commerce adoption could promote a cashless society that is convenient for making buying things quicker and easier.
Future Research	The research sample size could be increased, and also the study could all sixteen regions in Ghana or any other country for a broader representation.
Keywords	mobile commerce, attitude, artisans, behavioral intention, adoption, actual use

INTRODUCTION

Mobile phone usage has become the leading channel for accessing communications because implementing mobile technology is more efficient and provides greater adaptability and convenience to its subscribers than the landline telephone (Jahanshahi et al., 2011; Sanjay, 2007). Mobile commerce (m-commerce) services are transforming businesses in every industry and, as a result, are being accepted as one of the primary means of conducting business transactions in developing countries. The widespread usage of mobile devices in business transactions in both evolving and developed countries has disrupted traditional business processes and positioned wireless communication as a prime conduit for leapfrogging traditional infrastructure through a familiar and standard technology (Safeena et al., 2011). The rapid penetration and popularity of mobile devices, coupled with the continuous advancement in mobile technologies, have catapulted m-commerce as a new business phenomenon (Sarkar et al., 2020; Zheng et al., 2019). The access of wireless technologies and mobile devices has transformed and made it easier and faster to communicate and provided opportunities for businesses to redefine the art of connecting with potential customers.

Robust mobile technology infrastructure is also found to positively influence the economic growth of a country. It supports a study conducted by the World Bank among 120 countries which observed that for every 10% increase in mobile subscriber base, there is a corresponding increase of approximately 0.8% in the Gross Domestic Product (Qiang, 2009; Yadav et al., 2016). Businesses realize the great potential and immense benefits of delivering tailored services through m-commerce platforms among users and firms worldwide. Laudon and Traver (2014) define mobile commerce as "the use of mobile devices such as smartphones and tablets to enable online transactions". Mobile commerce refers to indirect or direct monetary transactions, such as banking, travel reservations, and shopping, implemented through a wireless telecommunication network via mobile devices (Kleijnen et al., 2007; Laudon & Traver, 2014). M-commerce is a subset of e-commerce that allows firms and individuals to perform business transactions in a wireless environment through mobile devices (Yadav et al., 2016; Zhang et al., 2012).

Ultimately, m-commerce allows patrons to use mobile internet everywhere and at any time to transact business since geographical location doesn't constitute a restraint. According to Lee and Wong (2016),

m-commerce is an extension of e-commerce from a fixed area of a business to one that can be accessed everywhere and anytime (Tarhini et al., 2019). M-commerce is a general term used for transactions such as mobile banking, mobile ticketing, mobile shopping, mobile payments, mobile booking, mobile coupons, and any acquisition of goods and services that require the use of the mobile phone. The ubiquitous presence of mobile technologies, the growing penetration of wireless devices, and the continuous improvement of mobile payment safety have resulted in the increasing use of mobile devices to deliver mobile commerce (Min et al., 2012). The m-commerce market has become one of the most promising growth markets worldwide due to its rapid adoption (AlFahl, 2018).

Mobile commerce customers want uninterrupted connection, improved service delivery speed, flexibility, simplicity, ease of use, convenience, cost-effectiveness, added value, and varying means for connecting (Hillman & Neustaedter, 2017). The widespread use of mobile devices to access and conduct banking and payment transactions has been highly successful due to the rising costs of acquiring and maintaining expensive bank branches and installing and applying modern technologies. These challenges and happenings result from the increasing use of portable devices, strengthening the business justification for the mobile money business model in many African countries such as Ghana, Kenya, and Nigeria (Glavee-Geo et al., 2020). Mobile banking has seen tremendous success in developing countries due to the low penetration of formal banking. Banking regulators have issued guidelines in these countries to ensure easy, safe, and fraud-free transactions across all mobile banking platforms (Thakur & Srivastava, 2013).

M-commerce and, for that matter, mobile money transactions are not only limited to one continent. Mobile money (“money transfer”) has become very popular in Africa, Asia, the Middle East, and South America (Glavee-Geo et al., 2020). Much research has been done within mobile commerce in general, but there is insufficient literature on its adoption by artisans in developing countries such as Ghana.

This study used factors such as Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and Subjective Norms (SN) to predict the customer’s behavioral intentions and attitude to adopt m-commerce services. The Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) were integrated to develop our new conceptual model, which is simple, coherent, and dynamic with better explanatory power and predictability based on a solid theoretical foundation.

Prior studies failed to address how low-income earners such as artisans in developing countries are using a wide range of sophisticated mobile devices such as smartphones and tablets for mobile online shopping and buying, as well as for making payments in physical locations (Chau et al., 2021; Faqih & Jaradat, 2015; Pipitwanichakarn & Wongtada, 2020; Tuffour et al., 2018). Secondly, despite Ghana having the world’s third-highest mobile phone penetration rate, behind China and Kenya, and being named the fastest-growing mobile money market in Africa by the World Bank over the last five years (Collins, 2021; Ngila, 2021), there is little empirical research on mobile commerce adoption compared to other jurisdictions. Our objective was to see how each factor in our conceptual model affects artisans’ behavioral intention to use mobile commerce services. This study aims at contributing to our knowledge of how artisans in developing countries are taking advantage of mobile commerce in transacting their businesses. It also adds to the existing knowledge on mobile commerce by filling in critical gaps identified in the literature.

The research is divided into the following sections. First, the theories relating to the constructs under study are discussed in the literature review, followed by the conceptual model and hypotheses. The research design and methods used to conduct the study are then detailed, followed by the results of the investigation. The data was analyzed using SmartPLS 3.3.3. and the findings were then reviewed in light of existing literature. Finally, the research findings, implication, conclusion, limitations, and future directions are discussed.

LITERATURE REVIEW

M-COMMERCE UPTAKE IN GHANA

MTN, Ghana's leading telecoms provider, partnered with a few banks to establish MTN Mobile Money, allowing Ghanaians to conduct various simple financial transactions using their mobile phones. MTN Mobile Money is a mobile phone or internet-based cash management service (Larkotey et al., 2013). Subscribers can utilize this service without having to open or maintain a bank account, and they can access their funds outside of banking hours or at any time. MTN Mobile Money enables customers cash management freedom, convenience, security, and ease of use in line with MTN's pay offline for as long as users can access MTN's network (Larkotey et al., 2013). Currently, all banks in Ghana, including the ARB Apex Bank and its affiliates, Savings and Loans Companies and Third Party Payment Providers, use the Ghana Interbank Payment and Settlement Systems Limited's (GhIPSS) payment infrastructure for inter-bank transactions, mobile money transactions within the same network as well as different networks (GhIPSS, 2007). Some of the critical services of GhIPSS that support m-commerce uptake in the country include:

- GhIPSS Instant Pay (GIP): GIP is an interbank account-to-account credit transfer service that operates in real-time. It enables payments to be moved electronically from one bank account to another as a single instant payment across financial institutions. Financial institutions deliver the service using mobile banking APPs, USSD, Internet banking, in-branch, ATM, and POS devices. GIP can be used to pay for goods and services by both businesses and individuals (GhIPSS, n.d.-b).
- Mobile Money Interoperability (MMI): MMI is a service that allows funds to be transferred directly and seamlessly from one mobile money wallet to another across networks. It enables users to transfer money from their wallet to their bank account and from their bank account to their wallet (GhIPSS, n.d.-c).
- Ghana's Universal QR Code Scheme (GhQR): GhQR is an innovative and simple way to pay a retailer by scanning a QR Code shown on the seller's mobile phone using your phone. The money is quickly transferred to the merchant, just like paying cash. GhQR is interoperable because a merchant can accept payments from consumers with bank accounts, wallet accounts, or card accounts from several banks and payment service providers across the country using a single QR Code image displayed in a shop. Merchants can also accept payments using GhQR by saying a QR Code generated by a bank, mobile money provider, or payment service provider. The GhQR generated for the merchants might be either static or dynamic. Merchants have unique Terminal IDs allocated to each of their points of payments or tills, in addition to QR codes, to facilitate receipts through USSD from customers using feature phones (GhIPSS, n.d.-a).

The effects of implementing the GhIPSS system have resulted in an increment in financial transactions on mobile devices and platforms. The total value of mobile money (MoMo) transactions in Ghana via mobile phones and tablets reached GH83.8 billion in April 2021, up from GH 32.8 billion in April 2020, according to Bank of Ghana data (Ankiilu, 2021). The Covid-19 pandemic restrictions prompted more Ghanaians to transmit cash to their family and friends using mobile phones and tablets, resulting in this significant increase (Ankiilu, 2021). Businesses have also been using the MoMo platforms for transactions since the beginning of the pandemic in March 2020, especially MTN Mobile Money, AirtelTigo Money, and Vodafone Cash.

Mobile Money, or MoMo as more commonly known, is gaining traction. Since its launch in Ghana in 2009 by MTN Ghana, a subsidiary of Scancom PLC, it has seen tremendous development in terms of the number of agents and subscribers (Ankiilu, 2021). The Bank of Ghana's data shows that financial transactions in Ghana are rapidly shifting away from traditional banks and toward platforms

like MTN Ghana, Airtigo Money, and Vodafone Cash. Increasingly, the range of mobile-accessible goods and services has expanded to include, among other things, the purchase of mobile communication credits, financial services, and the payment of government bills or salaries (Ankiilu, 2021).

According to Awiagah et al. (2016), the rates of mobile cellular subscription (MCS) and mobile density are improving in Ghana. They cited World Bank data which shows Ghana's MCS similarly exceeding the global average of 93 per 100 persons. In addition, in the report on *Mobile-Payment Banking in Africa: Five Strategies*, transactions using mobile wallets and phones accounted for 87% of GDP in Kenya and 82% in Ghana (Collins, 2021). The Bank of Ghana's March 2021 *Summary of Economic and Financial Data* indicates that the number of active mobile money accounts increased from 14.7 million in February 2020 to 17.5 million in February 2021, while the number of active agents increased from 235,000 to 465,000 (Ngila, 2021). The World Bank has named Ghana the fastest-growing mobile money market in Africa over the last five years (Collins, 2021; Ngila, 2021). It indicates that Ghana provides a favorable environment for m-commerce development and adoption.

THEORETICAL BACKGROUND

The Technology Acceptance Model (TAM) propounded by Davis (1989) and its subsequent extensions, TAM2 and TAM3, remain the most widely used models in IS/IT adoption research and other fields of study. The TAM2 is an extension of the TAM, which uses domain-specific constructs when applied in new technology (Venkatesh & Davis, 2000). TAM3, which Venkatesh and Bala (2008) proposed, addresses frequent criticism of the TAM model. TAM3 thereby provides practical direction to practitioners on developing suitable interventions and mechanisms to encourage users to positively modify their behaviors toward adoption, acceptance, and usage of the new technology (Faqih & Jaradat, 2015). According to Faqih and Jaradat (2015) and Pipitwanichakarn and Wongtada (2020), TAM3 constructs of perceived usefulness and perceived ease of use were significant factors in explaining the individual's intention to adopt mobile commerce. Their research is in line with other research that shows m-commerce is influenced by both PU and PEOU (Pipitwanichakarn & Wongtada, 2019). Pankomera and van Greunen (2019) researched and found perceived usefulness and perceived ease of use as essential factors for m-commerce adoption. Our research uses PU and PEOU from TAM to examine artisans' behavioral intention to adopt m-commerce. According to Chong et al. (2011), m-commerce adoption research studied mainly models such as the TAM and Diffusion of Innovation (DOI). They stated further that even though these models are well established, their investigations mainly focus on decisions to adopt technology that is based on perceived ease of use, benefits, and technology characteristics (e.g., compatibility, trialability). Though m-commerce is a sub-set of e-commerce, its features are different from the latter. For example, users of m-commerce services might have more concern about privacy and security issues since data is transferred wirelessly thus making interception much easier (Chong et al., 2011).

TAM, whose primary constructs include behavioral intention (BI), attitude toward using (AT), perceived usefulness (PU), and perceived ease of use (PEOU), provides a basis for understanding the effect of external factors on internal beliefs, attitudes, and intentions.

Behavioral intention (BI) "is referred to the motivational factors that influence a given behavior where the stronger the intention to perform the behavior, the more likely the behavior will be performed" (LaMorte, 2019). According to Venkatesh et al. (2012), behavioral intention is the individual willingness to use and continue to use technology and the factor that determines technology usage. The most significant determinant of one's actual behavior is the BI. Perceived usefulness and perceived ease of use both influence attitude.

THEORY OF PLANNED BEHAVIOR

The Theory of Planned Behavior (TPB) evolved from the Theory of Reasoned Action (TRA), which states that attitudes toward behavior, subjective norms, and perceived behavioral control directly affect behavioral intentions and behaviors. TPB recognizes that behavior can be deliberate and planned. The additional construct added to TRA helps to account for situations where an individual lacks the control or resources necessary to freely carry out the targeted behavior (Ajzen, 1991).

In support of TPB, three constructs determine behavioral intentions: attitude toward the specific behavior, subjective norms, and perceived behavioral control. Perceived behavioral control describes people's perceptions of their ability to perform a given behavior and influences intention (Ajzen, 1991). TPB perceives human behavior as guided by three kinds of beliefs: behavioral beliefs, normative beliefs, and control beliefs. According to Zhang et al. (2012), the most significant difference between TPB and TAM is that whilst TAM focuses on users' internal perceptions, TPB pays critical attention to external factors.

The construct, subjective norm (SN), refers to the belief that a person's perception that most people who are important to them think they should or should not perform a particular behavior. It has been proven that SN directly affects both behavioral intention (BI) and perceived usefulness (PU), indirectly influencing actual use. Additionally, it has also been established that experience and voluntariness can impact SN (Zhang et al., 2012). According to LaMorte (2019), SN refers to "the belief about whether most people approve or disapprove of the behavior". It relates to a person's beliefs about whether peers and people of importance think they should engage in the behavior. Kao & L'Huillier's (2022) research shows that construct attitude from TPB significantly influences mobile commerce adoption.

Similarly, Pankomera and van Greunen's (2019) research found social influence critical for m-commerce adoption in developing countries. However, the study by Kao & L'Huillier (2022) showed that subjective norm has a significant negative effect on behavioral intention to adopt mobile commerce. We use the constructs AT and SN from TPB to investigate m-commerce adoption by artisans.

According to LaMorte (2019), perceived behavioral control (PBC) "refers to a person's perception of the ease or difficulty of performing the behavior of interest". PBC varies across situations and actions, which results in a person having varying perceptions of behavioral control depending on the situation. This construct created the modification from TRA to TPB.

DIFFUSION OF INNOVATION THEORY

E. M. Rogers, in 1962 developed the Diffusion of Innovation (DOI) theory. According to LaMorte (2019), "DOI originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system". One of the oldest social science theories used in technology adoption frameworks, DOI tries to explain factors affecting spreading new ideas or technologies through cultures (Sahin, 2006; Tuffour et al., 2018). The result of this diffusion is that people adopt a new idea, behavior, or product as part of a social system. For adoption to be successful and practical, the person must first perceive the idea, behavior, or product as new or innovative. It is only through this process that diffusion is possible. The four elements that affect ideas or technology diffusion are innovation, communication channels, time, and a social system (Rogers, 1995; Tuffour et al., 2018). According to Wu and Wang (2005), DOI and TAM appear to be similar to some extent. For instance, a relative advantage in DOI is identical to perceived usefulness, while complexity is identical to perceived ease of use. Hence DOI and TAM can supplement each other well. Once integrated, both theories better clarify and predict information technology acceptance behavior (Zhang et al., 2012).

RESEARCH MODEL AND HYPOTHESES

The Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), and Diffusion of Innovations (DOI) have consistently been used and accepted as valid models in information technology-related research, including both electronic and mobile commerce. These three models hold supplementary roles. TAM focuses on internal perceptions, TPB concentrates on external influences, and DOI emphasizes innovation characteristics (Zhang et al., 2012). This research utilizes some of the constructs in Zhang et al.'s (2012) conceptual model and added constructs from Tuffour et al. (2018) to create a new conceptual model that ensures a comprehensive study on mobile commerce. All constructs used in this study have been tested by many researchers who were expected them to influence mobile commerce adoption.

According to the literature, DOI appears similar to TAM in several ways. For example, DOI's relative advantage and complexity are comparable to TAM's PU and PEOU (Wu & Wang, 2005). Additionally, DOI and TAM are excellent complements to one other. They provide a better explanation and forecast of information technology acceptance behavior once combined (Zhang et al., 2012).

In light of TAM's validity in explaining and forecasting users' acceptance behavior and its widespread use in mobile commerce adoption studies, this study adopts the constructs PU and PEOU from the technology acceptance model and supplements it with AT and SN from TPB. The integration of these constructs produces a solid theoretical foundation for our new conceptual model. Figure 1 shows our new conceptual model of the study, whilst Table 1 shows the definitions and sources of critical constructs used.

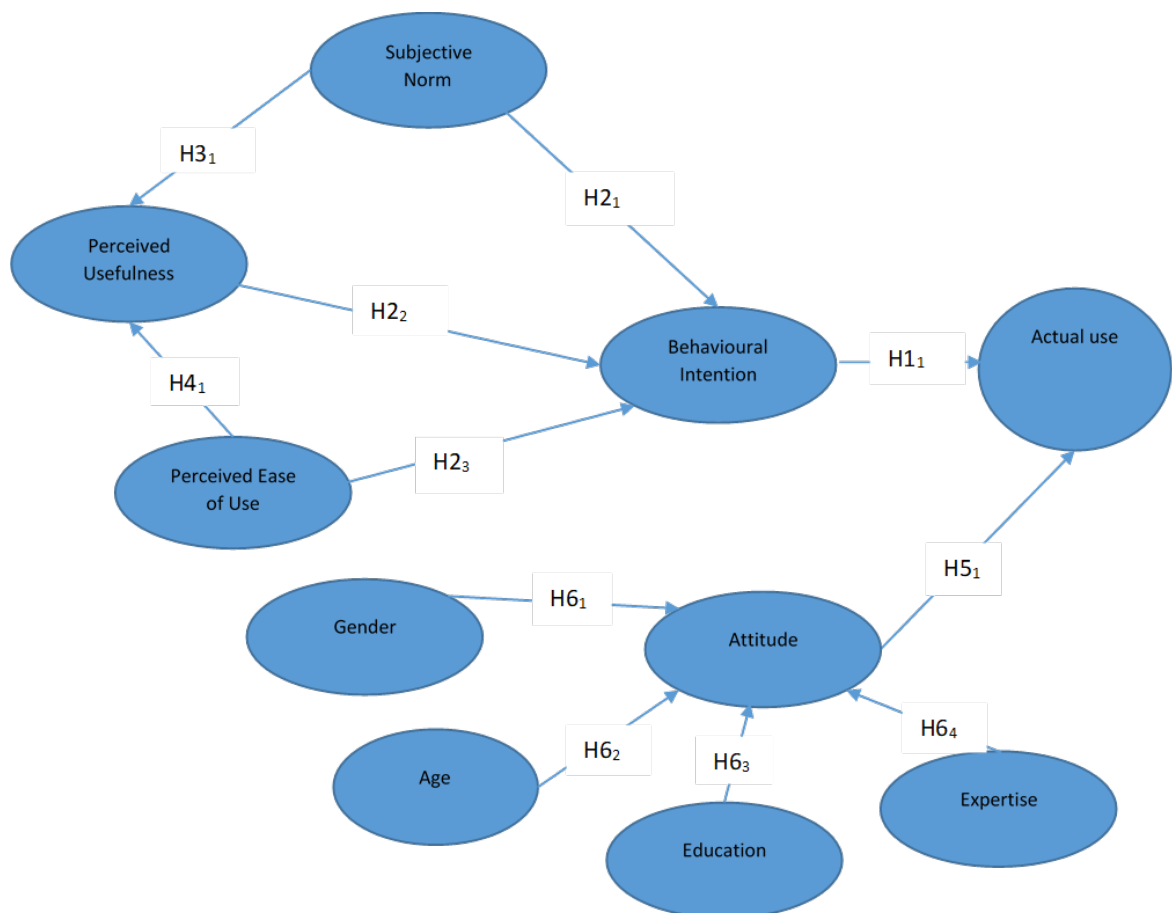


Figure 1. Conceptual model

Table 1. Main constructs in the proposed model

Construct	Definition	Source
Perceived Usefulness (PU)	The degree to which a person believes that using a particular system would enhance their job performance	Davis (1989)
Perceived Ease of Use (PEOU)	The degree to which a person believes that using a particular system would be free of effort	Davis (1989)
Subjective Norm (SN)	A person's perception that most people who are important to him think he should or should not perform the behavior	Fishbein and Ajzen (1975)
Perceived Behavioral Control (PBC)	A person's perception of the ease or difficulty of performing the behavior of interest	Ajzen (1991)

Source: Zhang et al. (2012)

The constructs, perceived usefulness, and ease of use in TAM are easy to understand and employ in information systems research design. A person's intention to use new technology is positively related to the person's perception of how useful the technology is and how easy it could be used (Davis, 1989). The construct perceived usefulness affected an individual's intention to use mobile commerce (Singh & Srivastava, 2018; Zarm pou et al., 2012).

In the perspective of m-commerce, perceived usefulness and perceived ease of use have a favorable impact on intention to use. The perceived usefulness of m-commerce is predicted to impact technology adoption positively, i.e., the more suppliers see the benefits of adopting it, the more likely they are to accept it. Additionally, vendors will be more ready to get m-commerce if they believe the technology is straightforward to understand (Pipitwanichakarn & Wongtada, 2019). Vendors will regard m-commerce as more valuable if perceived as easy to use. As a result, they will be more willing to adopt the technology. In the same vein, if vendors can offer superior benefits over alternative technological platforms like m-commerce, users such as artisans will adopt m-commerce more quickly. Hence, the following hypotheses can be formulated:

- H1₁. Behavioral intention has a significant positive influence on the usage of m-commerce.
- H2₂. Perceived usefulness has a positive effect on the behavioral intention to use m-commerce.
- H2₃. Perceived ease of use positively influences the behavioral intention to use m-commerce.
- H4₁. Perceived ease of use has a positive influence on the perceived usefulness to use m-commerce.

Venkatesh and Davis (2000) found that subjective norms in TPB directly influence behavioral intention and perceived usefulness, thereby indirectly influencing actual use. Many research relating to mobile commerce testified that subjective norm has a positive and significant association with behavioral intention (Awiagah et al., 2016; Kim et al., 2009; Kumar et al., 2020; Verma et al., 2021; Wei et al., 2009; Zhang et al., 2012). According to Deb and Agrawal (2017), subjective norms influence the ultimate acceptance of m-commerce services. Based on the above discussion, the researchers suggest the following hypotheses:

- H2₁. Subjective norm has a positive influence on the behavioral intention to use m-commerce.
- H3₁. Subjective norm has a positive influence on the perceived usefulness to use m-commerce.

An individual's educational level has proven to significantly influence their attitude towards adopting mobile commerce (Cullen & Kabanda, 2018; Tuffour et al., 2018). Expertise could refer to having a

high level of knowledge or skills acquired through formal or informal education. Therefore, the researchers find education and expertise as important factors and are included in the research. They suggest the following hypotheses:

H6₃: Education level of an artisan has a significant effect on attitude to adopt and use mobile commerce.

H6₄: Expertise of an artisan has a significant effect on attitude to adopt and use mobile commerce.

According to Tuffour et al. (2018), as people age, they attain the social status that makes them mature to use the internet and other IT-related facilities. The research also indicated that the male gender does not significantly influence attitude to adopt mobile commerce and service. In contrast, according to a report submitted by Dai et al. (2007), males show more intention to adopt mobile commerce than females. The researchers, therefore, consider an individual's age and gender as variables of interest for this study and suggest testing the following hypotheses:

H6₁: Females are more likely to adopt the use of mobile commerce than males.

H6₂: Age of an artisan has a significant effect on mobile commerce adoption.

According to Tuffour et al. (2018), small enterprise owners' attitudes significantly affect mobile commerce and service use. Sarkar et al.'s (2020) research findings identified several behavioral outcomes. It posited that exposure and use of m-commerce might translate into implicit and explicit behavior, which suggests that some of the behavioral effects may be internalized in the form of attitude (Sarkar et al., 2020). The researchers deem it appropriate to test the hypothesis:

H5₁: Artisans' attitude has a significant effect on their use of mobile commerce.

RESEARCH DESIGN AND METHOD

The study was conducted by surveying factors influencing artisanal workers' adoption of mobile commerce in Ghana. A cross-sectional survey was conducted to measure the constructs and their relations to test the research model.

MEASUREMENT AND DATA COLLECTION

In this study, a survey instrument was developed based on established measures of constructs from mobile commerce literature. All the items used for the constructs of this study were adopted and modified from previous studies that were found to exhibit strong content validity.

The survey instrument collected information about the demographic characteristics of respondents, and the research constructs in the modified conceptual model, namely perceived usefulness, perceived ease of use, attitude, and subjective norms. As stated previously in this study, these constructs in the model are operationalized from existing measures developed, tested, and employed in previous research studies. The scale for the constructs used was modified from studies built on TAM, TPB, and Structural Equation Model (SEM) (Bhatti, 2007; Tuffour et al., 2018; Zhang et al., 2012). The items of the constructs were measured using a five-point Likert-type scale with anchors ranging from strongly disagree (1) to strongly agree (5) with three labeled as neutral.

The three items used to measure the construct subjective norms were almost identical to those of Bhattacharjee (2000) and Bhatti (2007). The five items that were used in the construct perceived usefulness construct and the four in perceived ease of use were adapted from Bhatti (2007) and Zhang et al. (2012). The questions describing the demographic characteristics were adapted from Bhatti (2007). The demographic characteristics were measured based on gender, age, educational level, and artisanal expertise. The first section consisted of four questions for eliciting demographic data, while the other area captured twenty-one items related to the constructs. The questionnaire was pre-tested on 30 artisans in Madina, a suburb in Accra. The purpose of the pre-test was to identify any ambiguity in the wordings and ensure that it had strong face validity. The measured reliability on the pre-

tested questionnaire using Cronbach's alpha was between 0.73 and 0.84 for the instrument questions. Experts' opinions on the analysis of the pre-test showed a strong face validity and reliability, hence, the adoption of the questionnaire for this research.

The population and sample size

This study was conducted at artisanal shops in the Greater Accra Region of Ghana. Stratified random sampling techniques were used to collect data from the artisans randomly. A paper-based questionnaire was distributed to a representative sample. This survey method was selected over a web-based survey because it was challenging and almost impossible to find potential respondents' online details through which they could be reached. The study used descriptive analysis to detect the respondents' demographic and general characteristics and provided a descriptive profile. The acceptable minimum sample size for Partial Least Square (PLS) analysis is at least ten times the number of most complex construct items (Gefen et al., 2000). Assuming that all the constructs used in this survey are complex, then ten times the twenty-two items of these constructs will give a sample size of 220. The sample size is referred to as the number of elements to be included in the study (Sekaran, 2006).

The survey targeted 350 potential respondents of artisans in the Greater Region of Ghana, but 338 responses were received. The sample consisted of 69.2 % males and 30.8% females. The results also show that almost 57.7 % of the respondents were between the ages of 20 and 29, and the lowest, 11.5%, represented age categories of under 20 and 40-49.

All the respondents have had some level of formal education. Out of 338 respondents, 55.9% represent the highest number of our respondents who have had senior high/technical education. However, a very few of the respondents representing 1.8%, had higher national diploma/degree certificates. Additionally, the results further revealed that currently, within the space of the artisans, the highest expertise is in the electrical industry, contributing 28.1% and the least representing construction workers (2.4%). This is indicated in Table 2.

Table 2. Demography of respondents

ATTRIBUTE	CATEGORIES	PERCENTAGE (%)
Gender	Male	69.2
	Female	30.8
Age	Under 20	11.5
	20-29	57.7
	30- 39	19.2
	40-49	11.5
Education	Primary	15.4
	JHS	26.9
	SHS/Technical	55.9
	HND/Degree	1.8
Expertise	Construction Worker	2.4
	Electrician	28.1
	Auto mechanic	11.8
	Hair/Nail Stylist	15.4
	Dressmaking/Tailor	23.1
	Welder	19.2

RESULTS

The survey data was captured in SPSS vs 25, converted to a comma-separated values (CSV) file format, and exported to SmartPLS vs 3.3.3 for all our inferential statistical analyses and the results for the structural model. The descriptive statistical results were generated using SPSS.

MEASUREMENT MODEL

The measurement model was evaluated by the PLS technique using SmartPLS 3.3.3. Cronbach's alpha was used to measure the reliability of constructs, whilst composite reliability was also measured to test the model's internal consistency. Information in Table 3 shows that all constructs' Cronbach alpha and composite reliability values exceeded the acceptable level of 0.7 as recommended by Fornell & Larcker (1981), Nunnally (1978), and Ofori et al. (2018). The model's convergent validity was measured using two standards: (1) average variance extracted (AVE) for each variable should exceed 0.5; and (2) indicator factor loadings should also exceed 0.5 as recommended by Hair, Black, et al. (2010) and Ofori et al. (2018). By our measures, the AVE ranged from 0.55 to 0.72, which were above the acceptable. According to Hair, Ringle, et al. (2011), the convergent validity is suitable whenever the AVE values exceed 0.500, and hence our convergent validity is acceptable since all our evaluated AVE values are above 0.500

In reporting the discriminant validity, the researchers followed the Fornell-Larcker criterion, suggesting that AVE for each latent construct should be higher than the construct's highest squared correlation with any other latent construct (Fornell & Larcker, 1981). In addition, Chin (1998) suggests that each indicator's loading should be greater than all its cross-loadings. This is evident in Table 4 where all indicators load their highest on their respective construct and that no indicator loads higher on other constructs than on its intended construct. The Discriminant validity was evaluated using a heterotrait-monotrait ratio of correlation (HTMT) criterion as recommended by Henseler et al. (2016) and shown in Table 5.

Table 3. Construct reliability and validity

Item	Construct	Factor Loadings	CA	CR	AVE
	Actual Use		0.799	0.883	0.716
AU01	I use mobile commerce for transactions	0.846			
AU02	I use mobile commerce to make payment for some products purchased	0.916			
AU03	I use mobile commerce to buy parts/ raw materials for my work	0.770			
	Attitude		0.773	0.869	0.688
AT01	Buying things or making mobile transactions is something I like doing	0.795			
AT02	My general opinion on mobile commerce is good	0.870			
AT03	Using mobile commerce to buy a product seems an intelligent idea to me	0.822			
	Behavioral Intention		0.751	0.857	0.667
BI01	I intend to continue using mobile commerce transactions in the future	0.861			

Item	Construct	Factor Loadings	CA	CR	AVE
BI02	I will always try to use mobile commerce	0.761			
BI03	I plan to continue to use mobile commerce	0.826			
	Perceived Ease of Use		0.843	0.889	0.668
PEOU01	Learning to use M-commerce is easy for me	0.889			
PEOU02	It is easy to make M-commerce do what I want it to	0.849			
PEOU03	My interaction with M-commerce is clear and understandable	0.791			
PEOU04	M-commerce is compatible with existing technology	0.732			
	Perceived usefulness		0.792	0.857	0.548
PU01	Using M-commerce makes me save time	0.640			
PU02	M-commerce contributes to the betterment of life	0.744			
PU03	It is fashionable to use M-commerce	0.871			
PU04	M-commerce would not lead to an invasion of personal privacy	0.722			
PU05	It is safe to make a purchase using M-commerce	0.705			
	Subjective Norm		0.762	0.861	0.674
SN01	People important to me think I should use M-commerce	0.832			
SN02	It is expected that people like me to use M-commerce	0.823			
SN03	People I look up to expect that I use M-commerce	0.808			

Table 4. Discriminant validity using Fornell–Larcker Criterion

	Actual Use	Attitude	Behavioral Intention	Perceived Ease of Use	Perceived Usefulness	Subjective Norm
Actual Use	0.846					
Attitude	0.662	0.829				
Behavioral Intention	0.622	0.737	0.817			
Perceived Ease of Use	0.241	0.129	0.201	0.817		
Perceived Usefulness	0.316	0.350	0.402	0.276	0.741	
Subjective norm	0.068	0.114	0.107	0.080	0.160	0.821

Notes: Construct correlations with the square root of AVE along the diagonals

Table 5. Heterotrait-monotrait ratio (HTMT)

	Actual Use	Attitude	Behavioral Intention	Perceived Ease of Use	Perceived Usefulness	Subjective Norm
Actual Use						
Attitude	0.841					
Behavioral Intention	0.801	0.958				
Perceived Ease of Use	0.269	0.144	0.22			
Perceived Usefulness	0.387	0.473	0.488	0.321		
Subjective norm	0.162	0.182	0.158	0.146	0.222	

STRUCTURAL MODEL ASSESSMENT

The structural model results for testing our proposed hypotheses are shown in Table 6. Since p-values in all hypotheses are less than 0.05 other than H2₁, H2₃, and H6₁, all the proposed hypotheses were accepted except H2₁, H2₃, and H6₁ at a 5% level of significance.

Table 6. Path coefficients and their significance

Hypotheses	Path	β	t	p	Results
H6 ₂	Age -> Attitude	-0.127	2.769	0.006	supported
H5 ₁	Attitude -> Actual Use	0.447	6.859	0.000	supported
H1 ₁	Behavioral Intention -> Actual Use	0.292	4.199	0.000	supported
H6 ₃	Education -> Attitude	-0.298	6.827	0.000	supported
H6 ₄	Expertise -> Attitude	0.222	3.943	0.000	supported
H6 ₁	Gender -> Attitude	-0.108	1.908	0.057	Not supported
H2 ₃	Perceived Ease of Use -> Behavioral Intention	0.096	1.196	0.232	Not supported
H4 ₁	Perceived Ease of Use -> Perceived Usefulness	0.265	5.070	0.000	supported
H2 ₂	Perceived Usefulness -> Behavioral Intention	0.369	4.975	0.000	supported
H2 ₁	Subjective norm -> Behavioral Intention	0.040	0.747	0.456	Not supported
H3 ₁	Subjective norm -> Perceived Usefulness	0.139	2.266	0.024	supported
		R²			
	Actual Use	0.478			
	Attitude	0.106			
	Behavioral Intention	0.172			
	Perceived Usefulness	0.095			

Notes: SRMR= 0.106; ns-not significant

Regarding the outcome of artisans' behavioral intention, H1₁ states that behavioral intention has a significant positive influence on the usage of m-commerce. The results support the positive effect of behavioral intention on actual usage m-commerce ($\beta = 0.292$; $p = 0.000$). Our results did not show both subjective norm and perceived ease of use having significant positive influence on the behavioral intention to use m-commerce ($\beta = 0.040$; $p = 0.456$ and $\beta = 0.096$; $p = 0.232$ respectively). Hence, we did not find support for H2₁ and H2₃. The results confirm that H2₂, perceived usefulness, positively influences behavioral intention to use m-commerce ($\beta = 0.369$; $p = 0.000$). H3₁ and H4₁

hypothesized the positive influence of subjective norm and perceived ease of use on perceived usefulness were confirmed ($\beta = 0.139$; $p = 0.024$ and $\beta = 0.139$; $p = 0.024$ respectively). H4₁ also hypothesized the positive influence of subjective norm on perceived usefulness was confirmed ($\beta = 0.265$; $p = 0.000$). Our results also support the positive effect of intention on actual usage of m-commerce ($\beta = 0.447$; $p = 0.000$). The results did not show that our hypothesized H6₁, gender, has a significant positive influence on attitude to mobile commerce ($\beta = -0.108$; $p = 0.056$), hence, we did not find support for H6₁. Our hypothesized results, H6₂ and H6₃, show that both age and education negatively affect attitude to use m-commerce ($\beta = -0.127$; $p = 0.006$ and $\beta = -0.298$; $p = 0.000$ respectively). Our hypothesized H6₄ shows a significant positive influence of expertise on attitude ($\beta = 0.222$; $p = 0.000$).

The multicollinearity test is a necessary statistical test to be executed for completeness. Multicollinearity measures the correlation between a variable's predictors (Kock, 2011). Variance inflation factors (VIFs) are calculated for each predictor variable item to determine the degree of multicollinearity. VIFs less than 5 indicate no multicollinearity (Hair, Black, et al., 2010). Table 7 shows that all VIFs values are within the recommended range. It suggests no multicollinearity among the model's predictors. Thus, multicollinearity is not a significant concern in this investigation.

Table 7. Multicollinearity

Constructs	Indicators	VIF
Actual Use	AU01	1.933
	AU02	2.522
	AU03	1.574
Attitude	AT01	1.403
	AT02	1.999
	AT03	1.750
Behavioral Intention	BI01	1.648
	BI02	1.373
	BI03	1.594
Perceived Ease of Use	PEOU01	1.938
	PEOU02	2.251
	PEOU03	2.149
	PEOU04	1.586
Perceived Usefulness	PU01	2.415
	PU02	2.755
	PU03	3.789
	PU04	3.077
	PU05	2.428
Subjective Norm	SN01	1.403
	SN02	1.663
	SN03	1.663

Our research model's predictive validity was demonstrated using the variance explained (R^2) as the central criterion for assessing the structural model recommended by Henseler et al. (2016). It was found that the study's primary construct (actual use) has an R^2 value of 0.478. In contrast, the remaining constructs, attitude, behavioral intention, and perceived usefulness, had a variance of 0.106, 0.172, and 0.095, respectively. According to Hair, Risher, et al. (2019) and Shmueli et al. (2019), a higher level of R^2 of 0.75 is substantial, 0.50 is moderate, and 0.25 is measured as weak. Our results

show actual use with a value of 0.478 is moderate whilst the remaining are weak. However, the acceptable R^2 values vary depending on the environment, and in some areas, such as market forecasting, an R^2 value as low as 0.10 is deemed satisfactory (Raithel et al., 2012). These values give indications of sufficient values of R^2 , as shown in Table 6.

Q^2 is a measure of predictive significance that determines whether a model is predictive or not (>0 is good). It also establishes the endogenous components' predictive value. Q^2 values greater than zero suggest that data has been adequately reconstructed and that the model is predictive (Joseph F. Hair et al., 2019). The Q^2 values for our research are all greater than zero, as shown in Table 8.

Table 8. Model's predictive accuracy

	RMSE	MAE	$Q^2_{predict}$
Actual Use	1.001	0.82	0.011
Attitude	0.963	0.763	0.085
Behavioral Intention	0.993	0.741	0.031
Perceived Usefulness	0.964	0.801	0.078

Researchers have questioned whether the concept of model fit, as used in CB-SEM research, is useful for PLS-SEM applications (Hair, Hult, et al. 2017; Lohmöller, 1989; Rigdon, 2012). While the concept of model fit is essential in CB-SEM, it is less critical in PLS-SEM (Hair, Sarstedt, et al., 2019). The issue of model fit has resulted in some researchers coming to the false conclusion that PLS-SEM is ineffective for hypothesis testing and confirmation (Westland, 2015). Our model fit, SRMR = 0.106, is not significant. We choose not to focus on it as cautioned by Hair, Hult, et al. (2017) since the primary aim of the PLS method is to forecast indicators using component expansion (Hair, Ringle, et al., 2011; Jöreskog & Wold, 1982).

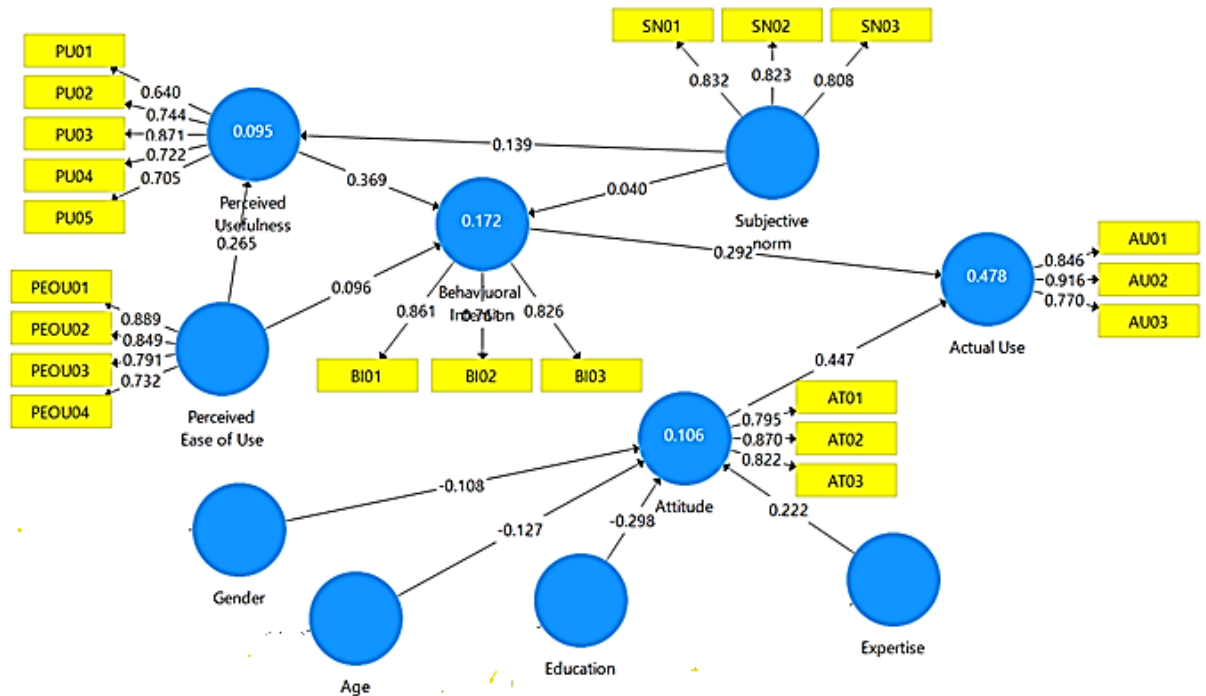


Figure 2. PLS results for structural model

Figure 2 depicts the estimation of path coefficients according to structural equation modeling using SmartPLS. Of the 11 pairs of relationships in our proposed model, 9 pairs are significant at the 0.05 level.

DISCUSSION AND CONCLUSIONS

An analysis of the total effect of the structural equation model for this study is presented in Table 9. Our research findings indicate that perceived usefulness affects the behavioral intention to use mobile commerce. This finding is consistent with Davis (1989) and Zarpou et al. (2012) as captured in the literature but contradicts studies done by Bhatti (2007) and Zhang et al. (2012), which failed to show significance. The finding also indicates a significant positive influence of the total effect of perceived usefulness on actual usage of mobile commerce ($\beta = 0.108$; $p = 0.000$) as shown in Table 9. It implies that artisans perceive m-commerce to be useful but they actually use m-commerce services in their day-to-day transactions.

Table 9. Total effect

Hypotheses	Path	β	t	p	Results
Total Effect	Age -> Actual Use	-0.057	3.073	0.002	Supported
	Age -> Attitude	-0.127	2.769	0.006	Supported
	Attitude -> Actual Use	0.447	6.859	0.000	Supported
	Behavioral Intention -> Actual Use	0.292	4.199	0.000	Supported
Total Effect	Education -> Actual Use	-0.133	5.810	0.000	Supported
	Education -> Attitude	-0.298	6.827	0.000	Supported
Total Effect	Expertise -> Actual Use	0.099	3.525	0.000	Supported
	Expertise -> Attitude	0.222	3.943	0.000	Supported
Total Effect	Gender -> Actual Use	-0.048	2.001	0.046	Supported
	Gender -> Attitude	-0.108	1.908	0.057	Not Supported
Total Effect	Perceived Ease of Use -> Actual Use	0.056	2.192	0.029	Supported
	Perceived Ease of Use -> Behavioral Intention	0.193	3.121	0.002	Supported
	Perceived Ease of Use -> Perceived Usefulness	0.265	5.070	0.000	Supported
Total Effect	Perceived Usefulness -> Actual Use	0.108	3.637	0.000	Supported
	Perceived Usefulness -> Behavioral Intention	0.369	4.975	0.000	Supported
Total Effect	Subjective norm -> Actual Use	0.027	1.448	0.148	Not Supported
	Subjective norm -> Behavioral Intention	0.091	1.645	0.101	Not Supported
	Subjective norm -> Perceived Usefulness	0.139	2.266	0.024	Supported

The study also establishes that subjective norms directly influence the perceived usefulness to adopt mobile commerce. It confirms studies done by Bhatti (2007) and Zhang et al. (2012) and is also consistent with Venkatesh and Davis (2000). Social influences help to shape a person's valuation of their confidence in or ability to use a system well, which confirms why subjective norms are often used to explain the rapid adoption of technology. This study reveals a significant effect of normative pressure to use.

Our findings show that perceived ease of use significantly influences perceived usefulness to use mobile commerce. This finding was in accord with Zhang et al. (2012) and Davis (1989). The result also suggests a positive significant total effect of perceived ease of use on actual usage of mobile commerce ($\beta = 0.056$; $p = 0.029$) as shown in Table 9. It also implies that artisans perceive m-commerce to be easy to use and use m-commerce services in their everyday transactions.

The findings also show that behavioral intention has a significant positive influence on the actual use of mobile commerce. This finding was in accord with Zhang et al. (2012) and Davis (1989). In the

same vein, an attitude has a significant positive effect on the actual use of mobile commerce. This finding confirms with previous results of Tuffour et al. (2018).

The study established that artisans' expertise has a significant positive influence on their attitude to adopt m-commerce and has a substantial positive effect on their actual usage of m-commerce ($\beta = 0.099$; $p = 0.000$), as shown in Table 9.

The adverse effects of age on attitude to adopt m-commerce, with an indicative coefficient of -0.127 , shows that the lower the age, the more positive attitude of the individual to adopt mobile commerce which contradicts Tuffour et al. (2018), Cullen and Kabanda (2018), and Dai et al. (2007). The finding further indicates that individuals of a lower age turn to use more m-commerce services than those of a higher age ($\beta = -0.057$; $p = 0.002$), as shown in Table 9.

Our findings show that the total effect of gender (with a female dummy value of 2) negatively influences the actual usage of mobile commerce. It implies that males use mobile commerce more than their female counterparts ($\beta = -0.048$; $p = 0.046$), as shown in Table 9.

Also, the negative effects of education on attitude, with an indicative coefficient of -0.298 , show that the lower artisans' education, the more positive attitude towards mobile commerce which contradicts Cullen and Kabanda (2018) and Tuffour et al. (2018).

Artisans' attitude has the most substantial significant and positive influence on mobile commerce's actual usage, followed by behavioral intention with predictive powers of 44.7% and 29.2%, respectively.

IMPLICATION

Mobile commerce has become a new, convenient, and user-friendly platform for individuals and organizations to conduct business transactions. The research has also brought some implications for mobile commerce providers and researchers. For practical implications, mobile commerce service providers and governments in developing countries can use the information gathered in this study to design a plan to improve customer use of mobile commerce services. It can be done by focusing on factors that influence customer behavioral intention to adopt m-commerce.

First of all, customers often choose mobile applications because they provide a better user experience. They have been optimized to provide a fast and streamlined shopping experience that is simple to browse and just takes a few clicks, resulting in more sales and leads as the consumer has a far more delightful experience than with other techniques. Mobile commerce service providers should strategically pay critical attention to customer-centered factors that positively affect the adoption of mobile commerce innovations than focusing exclusively on technology-related issues. Mobile service providers can attract and retain more users if they carefully consider promoting elements like perceived usefulness and perceived ease of use which directly or indirectly affect the individuals' decision to adopt information technology from consumer perspectives.

Secondly, the beauty of e-commerce is that one can always find new customers to target. Anyone who visits a website can become a customer, and m-commerce platforms are no exception. Since our findings show that younger people are more likely to adopt and use mobile-friendly websites and Apps, m-commerce service providers could develop mobile targeting strategies to enhance their chances of gaining new customers. Mobile retargeting, for example, is an m-commerce feature that allows businesses to target advertisements at customers who visit their website. Various technologies available in m-commerce enable firms to continue to attract new clients, so companies should use them to boost sales and leads.

Thirdly, m-commerce is beneficial not only to online sales but also to in-store sales of businesses. Customers utilize their mobile devices to search for products they see in stores, such as product reviews, pricing alternatives, and if neighboring stores have certain items in stock. Businesses can ex-

pect to grow sales in-store and online with the correct m-commerce platform, ensuring they're catering to a broader clientele. M-commerce service providers should therefore devise strategies to attract and retain m-commerce customers. According to our findings, it can be achieved by promoting factors such as perceived usefulness and behavioral intentions, which have a significant positive effect on the adoption and usage of m-commerce services.

In terms of theoretical implication, our newly developed conceptual model showed that perceived ease of use and subjective norms positively influence perceived usefulness, whilst perceived usefulness was positively associated with behavioral intention. Attitude and behavioral intention positively impact customers' adoption and usage of m-commerce services. As a result of this research, a new conceptual model based on the integration of TAM and TPB was developed. Researchers can conduct future research to test the robustness of this new model.

CONCLUSION

This research study developed and tested a new conceptual model based on the extended TAM with additional constructs and analyzed the moderating effects on individual adoption and actual usage of mobile commerce. The research results demonstrated that the number of convergences of our findings far outweighs divergence among previous findings.

Apart from gender, perceived ease of use, and subjective norms that did not have specific effects on mobile commerce adoption, all the remaining constructs showed significant results. The moderating effect of age, educational level, perceived usefulness, expertise, attitude, and behavioral intention on mobile commerce adoption would surely be helpful information for mobile commerce service providers to develop appropriate strategies to enhance operational excellence and gain competitive advantage.

The limitations of our research include small sample size and a smaller study site (Accra). For future research, the samples size could be increased, and also the study site could be expanded to include all the sixteen regions of Ghana to give a broader representation. Further studies can also be conducted to test the new conceptual model developed by the authors.

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Adoption of Mobile Commerce Services

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