

## Research Article

# The Impact of Context Awareness and Ubiquity on Mobile Government Service Adoption

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Context awareness and mobile factor ubiquity are considered key factors when it comes to mobile technology development and diffusion. Context is vital in interactive applications particularly when the context of users changes frequently and rapidly in the environment of handheld-mobile and ubiquitous technology systems. The understanding of the context and ubiquity in the development and diffusion of mobile government can influence the delivery of efficient public services. Mobile context-aware computing systems can respond to the changes in the environment in an intelligent way to provide a better consumer experience for users. This study explored the impact of context awareness and mobile factor ubiquity on the adoption of mobile government services. The framework of this study was based on the unified theory of acceptance and use of technology (UTAUT). The structural equation model (SEM) with SmartPLS 3.0 was used to conduct the data analysis. The analysis which was based on the 366 samples generated has shown that while context awareness was not significant in determining both the performance and intention to use, it was however significant in determining the effort expectancy of mobile government services. Also, mobile factor ubiquity was found to be a positive predictor of effort expectancy, intention to use, and context awareness. However, the mobile factor ubiquity does not determine the performance expectancy of mobile government services. The implications (managerial and theoretical) of these and other result findings of the study are discussed.

## 1. Introduction

The unique characteristics of mobile communication and computing technologies [1–3] coupled with the high penetration rate of the mobile handset [4–6] have enabled government and key stakeholders to redirect and redesign the delivery of public services from the fundamental e-government system to a more integrated mobile government system. This application of mobile communication and computing technologies to redirect and design e-government services may be termed mobile government (m-government) [7, 8]. The mobile government can be defined as an integrated strategy that involves the utilization of all kinds of wireless and mobile technology, services, applications, and devices for providing improved benefits to key parties in e-government systems such as citizens, businesses,

and all government departments [9]. It is also defined as the use of mobile technology by the public sector to transform and enable the provision of information and services through mobile devices to citizens anytime and anywhere [10–12]. Governments are thus responding swiftly to these demands of convenience and efficiency in service delivery by using mobile government (integrating available mobile and wireless infrastructure) as a new service delivery channel [13, 14].

The utilization of mobile computing technology in central and local governments ensures that service delivery to the public and in people's home is based on convenient locations rather than citizens having to visit government offices to access services [15]. Mobile government as compared to e-government enables more efficiency and effectiveness through cheaper, easier, and faster information

exchange, more transparency, accountability, and reduced corruption, promoting m-democracy through enhanced citizen participation [16–19]. The context awareness and ubiquity characteristics brought about by advancement in mobile technology make its application in mobile government an important one. The context-awareness and ubiquity enable public sector agencies to reorganize the delivery of public services to be context-specific and location-based. The context may describe information relating to the user, location, devices (hardware profile) network, and computational objects, availability, reliability, and security which enables an objective to choose the best options in-between alternative actions [20]. The ubiquity and rapid development in mobile and wireless technology present an opportunity to improve mobile government services in that the mobility of mobile government enables and facilitates citizen access to ubiquitous services which is unavailable in e-government [21, 22]. The location-based capabilities of mobile technology can estimate the location of the device, produce a service based on the estimated location, and deliver the location-enhanced service to that device [23]. These capabilities in the form of context-awareness and ubiquity can facilitate the delivery of mobile government services based on the estimated location of citizens. This location-based potential, for instance, has enabled the provision of mobile government services when it comes to emergency management and service delivery [24]. Context awareness can be described as the physical and social situation in which computational devices are embedded to obtain and utilize information about this context of a device to deliver services that apply to the setting [25, 26].

The objective of this research paper is to explore the impact of two important factors and features in mobile technology such as context awareness and mobile factor ubiquity on the adoption of mobile government services. These two mobile computing technologies (context awareness and ubiquity) are relevant in the context of mobile government since they encourage users to use mobile government services that are delivered to meet their context-specific situation or environment. The idea of context becomes only germane if the mobile government systems can support context adaptation or context awareness in service delivery [27, 28]. Context awareness and ubiquity along with the key constructs (performance expectancy and effort expectancy) of the unified theory of acceptance and use of technology (UTAUT) (the theoretical framework) were used to design the conceptual model of the study. One of the major factors accounting for the change and shift from the traditional e-government to a more integrated mobile government system is the ability of mobile technology to provide uninterrupted location-based services. As indicated by [15, 29], the use of mobile technology in government not only provides an alternative means of interaction and public service delivery but importantly it adds to the mobility of the government itself thus transcending the traditional e-government system by developing and providing personalized (context/localization)-based services to meet citizens' demand for mobility and efficiency of services. It has been emphasized that the integration of context awareness and

ubiquity in m-government design can influence higher levels of e-participation and user experience [30, 31].

While context awareness and ubiquity are important aspects of mobile computing that have been used in mobile government development, little research has paid attention to these important factors on the adoption of mobile government services. For instance, context awareness has been experimented with when it comes to bike-sharing behavior with results indicating that context and ubiquity are positively related to the behavioral adoption of bike sharing [32]. Studies in e-commerce application domains such as mobile payment [26], mobile/e-tourism [33, 34], smartphone advertising [35], and the Internet of things (IoT) [36, 37] have demonstrated how context awareness and ubiquity are instrumental in driving the adoption of these technology application systems. But when it comes to the domain of m-government diffusion studies, there is absence of adequate integration and experimentation of context awareness and ubiquity on the behavioral uptake of m-government services, especially when it comes to understanding how context awareness and ubiquity can drive the intention to use, performance expectancy, and effort expectancy of mobile government services. As indicated by Al-Nuaim [38] and Al-Hariry and Al-Nuaim [39], context awareness and ubiquity are new research fields that have rarely been studied, and thus this may have accounted for its unexplored nature when it comes to m-government adoption research. This is the gap that this research wants to fill. Hence, the inquisition of these factors on the adoption of mobile government services is an important and timely one that seeks not only to contribute to the mobile government adoption literature but also vitally contribute to the development and diffusion of mobile government services. It will empower governments and policymakers to design context-aware m-government that can deliver efficient public services to citizens regardless of their mobility and location. The major research question is as follows. To what extent do context awareness and mobile factor ubiquity affect the adoption of mobile government services?

The research paper is ordered as follows: the literature review, discussion of the background, theory, and research hypotheses development, research model, research methodology, results and analysis, discussion with implications, conclusion, and limitation of the study.

## 2. Literature Review

*2.1. Mobile Technology Development.* Mobile technology is considered a technology that accompanies where the user is located and it is made up of two-way communication systems and computing devices along with its connecting technological network [40, 41]. Mobile technology is described as an internet-empowered system such as smartphones, tablets, notebook computers, and watches [42, 43]. These mobile devices through communication networks can share voice, data, and applications like mobile apps [40, 43]. Broadly, mobile technology has to do with mobility systems such as General Packet Radio Service (GPRS), Multimedia Messaging Service (MMS), Bluetooth, 3/5G, wireless fidelity

(Wi-Fi), Global Positioning System (GPS), Wireless Application Protocol, and Short Message Service (SMS) [42, 44].

The latest data generated by the International Telecommunication Union (ITU) on the consumption of mobile technology systems has shown progressive trends. The report estimates that 4.9 billion people (63%) of the world's population are currently using the Internet as of 2021 which is an increase of 17% as compared to 2019 (ITU, 2021). The report also revealed that about 2.9 billion (37%) people in the world have never used the Internet (ITU, 2021). During the pandemic, the number of Internet users increased by 10% in the first year of the pandemic. In terms of the digital gender divide, global averages of 62% of men use the Internet as compared to 57% for women (ITU, 2021). When it comes to the urban-rural gap, 76% of people in urban areas use the Internet as compared to 39% in rural settlements. A key finding of the reports shows that there seems to be a generational gap across the world when it comes to mobile Internet usage with 71% of the world's population age (15–21) using the Internet as compared to 57% of all other age categories (ITU, 2021).

*2.2. Mobile Government (M-Government).* The impressive statistics reported by the International Telecommunication Union (ITU) on the nature of diffusion of mobile technology systems have a corresponding impact on the development and diffusion of mobile government. Mobile government is the leveraging of mobile technology systems to enhance electronic government systems to better deliver public services [45–47]. Governments around the world are diverting towards the mobile government due to the higher penetration rate of mobile devices which has surpassed personal computers and thus improves the level of interaction between the governments and their citizens [48, 49].

M-government through enabling environment of mobile technology transforms e-government service systems such as government to government services (G2G), government to citizens (G2C), government to business (G2B), and government to employees (G2E) into mobile devices/systems [50]. The change from e-government to m-government creates public value and reduces the level of the digital divide in the population creating services that are mobile friendly, accessible anywhere, and highly flexible to operate by government, employees, citizens, and businesses [50]. Additionally, m-government encourages social inclusion in the governance and administration of state institutions [51, 52]. It is important to stress that m-government does not seek to replace e-government but rather to complement it in terms of providing diverse systems of communication, access to information, and data with the ultimate goal of the provision of effective and efficient public services for all [50, 53]. Ultimately, the transformation driven by m-government is illustrated in Figure 1 depicting the levels of interaction. The focus of this study is the m-government to citizen interaction.

The m-government to citizen forms of interaction can empower the availability of support and solutions for citizens. The forms are shown in Table 1.

The typical m-government service systems are described in Table 2.

*2.3. Mobile Government Adoption Studies.* The development in new forms of technology innovations is as important as the factors driving its acceptance among the population since it can contribute to the success of any technology which includes m-government. It has been elaborated that attracting and facilitating citizens' continued acceptance of m-government is key to the achievement of sustainability and success in m-government development [48, 61]. In the mobile technology arena, there is a plethora of adoption and diffusion research studies that seek to understand the driving forces behind new technological systems such as e-government/mobile government [53, 62], mobile payment/e-commerce [63, 64], and e-health [65, 66]. Since the focus of this paper is on m-government, a summary of the recent m-government adoption literature will be presented along with its accompanying theories.

A study that interrogated mobile government security response systems (SRS) for crisis management and the factors influencing its adoption found that awareness, perceived compatibility, perceived response time, and trust were the major determinants of the acceptance of m-government security response system [67]. Through utilization of the value-based adoption model (VAM) to understand the continued usage of m-government services, it was shown that the relationship between mobility, personalization, and localizability and the continued intention was mediated partially by perceived value [68]. The same study revealed that compatibility moderated the interaction between perceived value and mobility, localizability and security, and perceived value and continuous intention [68]. Also, research seeking to examine the critical success factors (CSFs) driving the adoption intention of m-government services reported that perceived usefulness, trust, perceived mobility, power distance, quality of service, awareness, perceived cost, and personal initiatives were significant in influencing people's acceptance of m-government services [69]. The study however reported that the perceived ease of use was unrelated to the behavioral adoption of intention to use m-government services [69]. This finding contradicts other studies that have demonstrated that the perceived ease of use of technology drives its subsequent behavioral acceptance [70, 71].

Analyzing the kinds of m-government applications in use at the local government levels showed that there were a total of 362 m-government applications with the majority accounting for community-based services (86%) while the rest were based on business activities applications (14%) [72]. Additionally, a comparative study concerning the adoption of m-government services between Bangladesh and USA citizens showed varying differences between the two countries when it comes to the factors driving their acceptance of m-government services. Factors such as

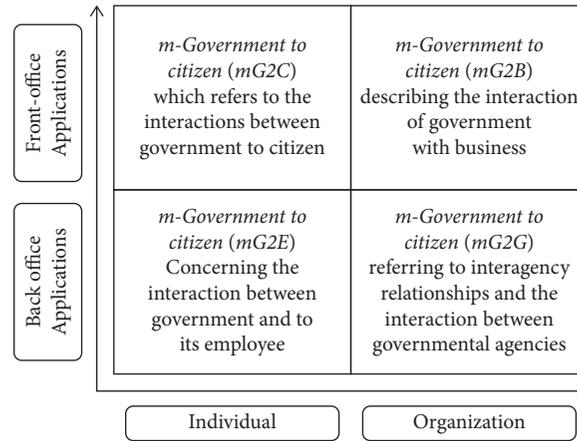


FIGURE 1: Nature of m-government services [54].

TABLE 1: M-government to citizen (M-G2C).

Support and solutions	Descriptions
Mobility and ubiquity	The key benefit of m-government is unique mobility which provides the potential to connect with people across the board, anywhere and anytime. This element provides a heightened manner of the ubiquity of government and thus citizens have access to public services beyond the regulated office hours [55, 56].
Delivery of location-based public services	The potential mobile technology to determine the specific physical location of people empowers the provision of location-based public services [57]
Timely delivery of information	The real-time connection and quicker access enabled by mobile devices can ensure the timely availability of crucial and specialized data and information
Ease of use (user friendly)	The higher nature of personalization and customization of mobile devices makes them handy and less difficult to use [58]
Emergency management	Mobile and wireless technology can be used during emergency and natural disasters to provide dissemination of information in a prompt manner [59, 60]

TABLE 2: M-government application services [54].

Complexity/ cost	Back-office applications	Front-office applications
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> </div> <div> <p>Low</p> </div> </div>	Field survey/inspection: statistics management, meter reading, land use/prices, consumer prices, etc.	Information provision: messaging retrieval—SMS alerts for various issues (such as energy shortage, results notifications, and meetings), job openings, public transportation, tourism, weather, and location-based services (LBSs).
	Facility/project management: buildings, parking lots, roadway facilities, construction projects, warehousing inventory, etc.	Emergency report response: reporting accident, fire, crime, and other major disasters and taking emergency measures
	Regulation/police/law enforcement: driving/parking enforcement, incident reporting, pollution monitoring, etc.	Information collection/poll/voting: bulletin board, policy monitoring, opinion poll, voting, etc.
	Teleworking/collaboration: out of office; sanctions/transactions, wireless inter-departmental/agency data sharing, etc.	Permit/licensing/registration: application, registration, permit, licensing, etc.
High		Tax/payment: tax, fees, charges, and fines via mobile payment methods

perceived ease of use, perceived usefulness, perceived security and privacy, and perception of reliability were found to be positively related to the adoption of m-government from the respective perspective of both countries [73]. Also, the perception of security influenced the perceived reliability of m-government systems for both countries [73]. However,

from the perspective of both countries, the perception of reliability does not influence the perceived usefulness of m-government systems [73]. Also, the perceived empathy was found to be significant in influencing the intention to use and reliability of m-government systems in the context of Bangladeshi citizens but not for USA citizens [73].

Furthermore, from the perspective of both countries, factors of perceived image and perception of enjoyment do not lead to the intention to use m-government systems [73]. While the perception of compatibility was not significant in determining the adoption of m-government systems for the Bangladeshi citizens, it was however significant predictor for the USA citizens [73]. Interestingly, the results showed that the two countries felt that perception of compatibility does not lead to the perceived enjoyment in the use of m-government systems [73]. Finally, the paper reported that the perception of enjoyment had a direct effect on the perceived compatibility of m-government systems for USA citizens but not for the case of Bangladeshi citizens [73].

The summary of literature presented above does demonstrate how the factors influencing the adoption of m-government are diverse and vary between and among countries based on each countries' unique characteristics which have been well illustrated through the comparative study between the USA and Bangladeshi citizens by Shareef et al. [73]. These diverse findings are fundamental to providing policy direction for government, policy-makers, and practitioners in efforts to better strategize the development and diffusion of m-government. This thus warrants the continued research studies that seek to provide and understand the underlying characteristics for m-government adoption for each situation and can avoid the challenge of using one country's m-government parameters as yardsticks for the other countries. It is in this light that this current study fills the research gap by the examination of the impact of context awareness and ubiquity on the adoption of m-government services. The literature reviewed shows that none of the papers reviewed have paid attention to these critical elements of context awareness and ubiquity in the diffusion of m-government services. This is buttressed by the arguments that mobile technology ubiquity and context awareness are new research directions especially in the context of m-government and thus may have accounted for its limited investigation in m-government research [38, 39].

*2.4. Technology Adoption Theories and Models.* Many theories and models have been developed to explain the extent of technology adoption and diffusion. These theories and models elicit the underlying characteristics for the adoption and diffusion of any given technology such as mobile government and e-government. Some of these theories and models are the motivational model [74], PC utilization [75], technology acceptance model [76, 77], diffusion of innovation theory [78], theory of reasoned action [79], social cognitive theory [80, 81], theory of planned behavior [82], and unified theory of acceptance and use of technology [83]. Most of these theories' models are either used singularly or combined with other models to conduct research. The summary of these theories and models is shown in Figure 2.

Some of these theories and models with definitions and key constructs are described in Table 3.

### 3. Theory and Hypothesis Development

*3.1. Unified Theory of Acceptance and Use of Technology (UTAUT).* One of the widely used technology acceptance theories is the technology acceptance model (TAM) devised by Davis [77] to explain the user acceptance and use of new information systems. The main constructs in the TAM that influence the intention to use are perceived usefulness and perceived ease of use [77]. The technology acceptance model has gone through various extensions and modifications of which the UTAUT is one. The UTAUT is used to measure and understand the factors determining the user adoption behavior of information technology [83]. According to the UTAUT model, the user adoption of new information technology is determined by social influence, performance expectancy, effort expectancy, and facilitating conditions [83]. The UTAUT was based on the integration of eight important models in information system adoption studies, and it has been found to outperform the eight individual models which include the TAM model [83, 87]. Since its development, the UTAUT has been applied and experimented within various fields to explain and understand the individual behavior towards a particular technology. For instance, it has been used in the fields such as e-commerce, online shopping, and social commerce [88–91], e-government [92, 93], mobile banking and mobile payment [26, 94–97], e-learning [98, 99], e-tourism [100, 101], and mobile Internet usage [102].

These diverse areas in the application (extensions and modifications) of the UTAUT do provide different perspectives to the understanding of the factors accounting for technology adoption and diffusion. Extension and modification of the UTAUT model have been encouraged as new mechanisms to include the measuring and the elucidation of the consequences of the technology adoption intention and usage behavior [103, 104]. It is based on this fundamental principle that in this study, context awareness and ubiquity along with the key constructs (performance expectancy and effort expectancy) of the unified theory of acceptance and use of technology (UTAUT) (the theoretical framework) were used to design the conceptual model of the study. Social influence, facilitating conditions, gender, age, and experience were excluded from the modified model to provide new perspectives of the capacity of the UTAUT model to still predict adoption behavior in an extended and modified form. Several studies [105–108] have excluded some of the UTAUT constructs for purposes of achieving certain research goals. For instance, Warsame and Ireri [109] excluded experience and voluntariness of use as moderators for the reason that study was cross-sectional and that it was clear that no one was being forced to use M-Pesa services. This is supported by Rahman et al. [110] who indicated that users (drivers) are considered to have greater control over the decision to use advanced driver assistance system (ADAS) technologies, and thus the issue of voluntariness becomes invalid. Similarly, Puspitasari et al. [111] removed experience and voluntariness of use from their research model for the reason that the respondents were already familiar with the system due to the system training provided and the usage

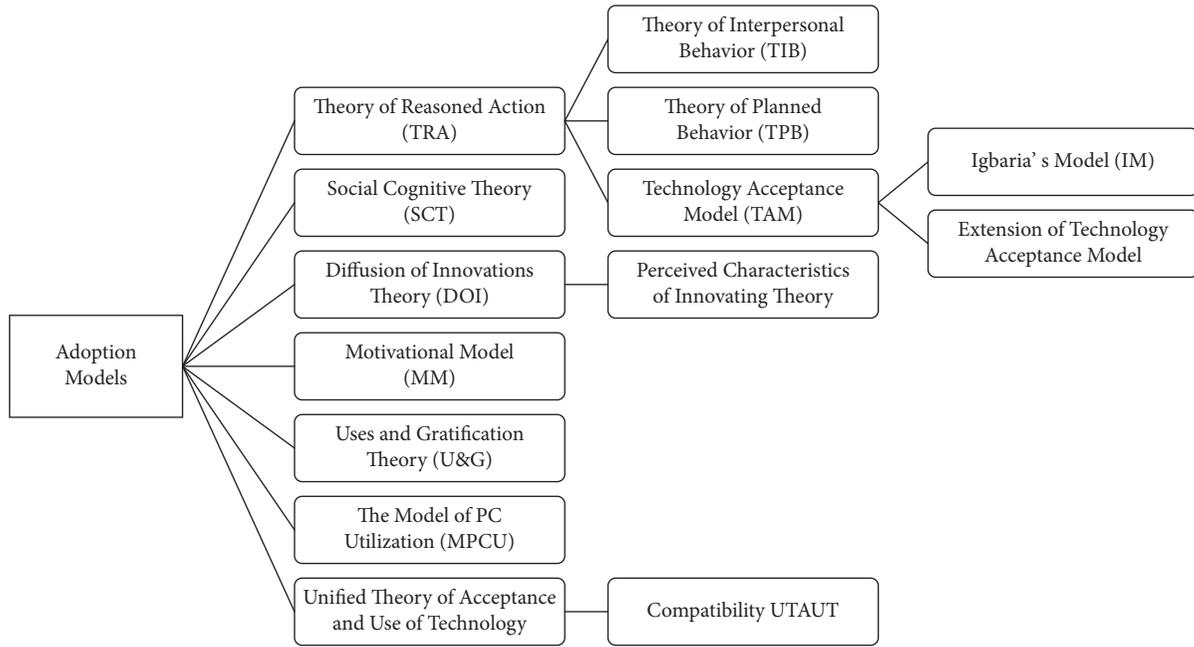


FIGURE 2: Summary of technology adoption theories and models [84].

TABLE 3: Technology adoption theories/models' description and key constructs.

Theory/model	Description	Key constructs and definitions
Theory of reasoned action (TRA) [85]	Has its origin in social psychology and stipulates three constructs: behavioral intention, attitudes, and subjective norm. It stipulates that the behavioral intention of individuals is based on their attitudes and subjective norms.	Attitudes: the total belief concerning a behavior weighted by the evaluations of these beliefs. Perception about whether most people approve or disapprove of one's behavior. Behavioral intention: the nature of attitudes towards behavior and subjective norms towards behavior that affects a person.
Theory of planned behavior (TPB) [86]	This theory was developed from the theory of action. It adds the new construct of perceived behavioral control (PB) to the variables in the TRA.	Perceived behavioral control: individual understanding of the ease or difficulty of performing a course of action which is based on the self-efficacy of the action (how well the course of action will be executed).
Technical acceptance model (TAM) [77]	This theory states that behavioral adoption of technology is dependent on two key constructs: perceived usefulness and perceived ease of use which were based on Bandura's self-efficacy theory.	Perceived usefulness: the extent to which people understand that using a system leads to better job performance. Perceived ease of use: the conception that using a technological system will be free of effort. Job fit: the belief that using a system will improve his or her job performance. Complexity: the extent to which technology is considered comparatively hard to operate and use. Long-term consequence: results of a course of action that is beneficial in the future.
The model of PC utilization [75]	This model is grounded on the theory of human behavior and it differs from the theory of reason action due to the unique distinction between cognitive and affective elements of attitudes. It explains that behavior is influenced by what people do (attitudes), what they think they should do (social norms), what they do often (habits), and the anticipated results of their action/behavior.	Affective towards use: the feeling of joy, pleasure, depression, disgust, or hate when it comes to an individual act. Social factors: internalization of the reference group's subjective culture and interpersonal agreement made with others within social settings. Facilitating conditions: availability of the needed/suitable conditions that enhance system utilization. Performance expectancy: this is the extent to which people understand that using system applications can empower them to attain better job outcomes.
Unified theory of acceptance and use of technology [83]	This theory is considered as the consolidation of earlier eight theories such as TRA, TAM, MM, TPB, DOI, SCT, and PC utilization model. The purpose was to provide a comprehensive model/theory that is applicable in a diverse range of applications.	Effort expectancy: it refers to how a system is termed as easy to use. This is the consideration of users that important people require them to use a specific technology. Facilitating conditions: the user's perception that there exists organizational and technical infrastructure to encourage technology use.

of the Integrated Licensing Service Information System was voluntary. This study ascribes to the reasons provided for the exclusion of the gender, age, experience, and voluntariness of use; in addition to that, sometimes these constructs provide inconsistent results leading to them being removed from research models [112, 113].

Scholars have indicated that attention has been shifting from TAM to UTAUT due to the inherent limitation in the TAM as compared to the UTAUT [103, 114]. The UTAUT is designed to be superior in performance to other theories since it can explain about 70% of the variance (higher predictive powers) in behavioral adoption [83], thus accounting for its application in this research.

**3.2. Performance Expectancy.** Performance expectancy is considered as the extent to which an individual user believes that the use of a new information system will contribute better to his or her job performance [83]. Performance expectancy is the most powerful factor when it comes to understanding user adoption of technology [115]. Performance expectancy in the context of mobile government is the ability of users to have access to unimpeded access to quality public services the fast way possible 24/7. The positive perception held by citizens that the use of all types of wireless and mobile technology, services, applications, and devices can improve the benefits and improved services delivery to citizens, businesses, and the government sector itself can influence the decision of the user to use mobile government services. Past studies have demonstrated that the performance expectancy of mobile government services has a positive impact on the intention to use mobile government services [116]. Accordingly, H1 was proposed.

H1: performance expectancy is positively related to the intention to use mobile government services.

**3.3. Effort Expectancy.** Effort expectancy can be explained as the individual users' perception that the new technology or information systems will not need much mental and physical effort [83]. In other words, the user of new technology anticipates that using any new information system or technology should not be hindered by any technology design challenges or difficulties. Thus, in the development of mobile government services, the user expects that the technology design will be done in a way so as not to pose a challenge in their effort to access quality public services through the mobile government system. Prior research experimented and validated the positive significant impact of effort expectancy on the intention to use [116–118].

H2: effort expectancy is positively related to the intention to use mobile government services.

Besides, the less challenging users experience in accessing new technology is, the better their understanding of the performance expectancy of such a system. The usefulness and the benefits of mobile government services will be dependent on the extent to which users easily and smoothly operate mobile government interfaces and website systems. Studies have validated the positive significant

impact of effort expectancy on performance expectancy [119]. Consequently, H3 was proposed.

H3: effort expectancy is positively related to the performance expectancy of mobile government services.

**3.4. Intention to Use.** The intention to use is the possibility of a user harboring the desire to embrace and engage the use of a new technology system. According to [120], users that harbor a higher desire to engage a technology system are more prone to become adopters and can recommend the use of such technologies to others [121]. It thus follows that citizens that have the desire to engage and interact with e-government services will, in turn, have a high probability to recommend its adoption to other citizens. This potential to recommend adoption is an important factor for the sustainability and growth of a particular technology system [122] such as the mobile government. It has been established that the intention to use has a positive significant effect on recommendation intention [123, 124]. Accordingly, H4 was proposed.

H4: intention to use mobile government services is positively related to the intention to recommend the adoption of mobile government services.

**3.5. Context Awareness.** Context awareness is an important architecture in the development of the mobile environment since the proliferation of mobile devices in our routine life calls for a complete re-organization of the IT architecture that supports it [20]. Context awareness assists an application to respond appropriately to and take advantage of these changes [20]. Context is defined as any information that can be used to characterize the situation of an entity, where an entity can be a person, place, and physical or computational object [125]. Context is also seen as any information that can be used to characterize a particular situation of an entity, where an entity is a place, person, or object that is important to the interaction between users and a technology application [26, 126]. Context awareness, on the other hand, is context as in location, identifies nearby hosts and accessible devices, and changes to those things over time [127]. It enables applications software/programs with these capabilities to study the environment and then react according to the environment in terms of where you are, who are you with, and what resource areas are close to you, which are the three important components of context [26]. A particular software is context-aware if it uses context to provide relevant information or services to the user where relevance depends on the user's task [26]. The ultimate objective of context awareness is to acquire and utilize information about the context of a device to provide services that are in line or suitable to the setting [25].

Context awareness in the context of mobile government is the application of appropriate mobile software or program to provide government-related public services and information depending on the users' location, environment, or regions. Since the delivery of government services varies based on the region, city, and level of urbanization within a particular jurisdiction, providing context awareness of

public services will enable the government to tailor services to meet the demands of citizens within a specific geographical area. The creation of context-aware public services through the enabling environment of the mobile government has the potential to influence the performance expectancy, effort expectancy, and intention to use context awareness services concerning mobile government. It was demonstrated that context awareness has a positive influence on user adoption [26, 128, 129]. Accordingly, H5, H6, and H7 were proposed.

H5: context awareness is positively related to the performance expectancy of mobile government services.

H6: context awareness is positively related to the effort expectancy of mobile government services.

H7: context awareness is positively related to the intention to use mobile government services.

**3.6. Mobile Factor Ubiquity.** Ubiquity is considered one of the most important characteristics of mobile services which enable users to have access to mobile services anytime and anywhere [26, 130]. Ubiquity provides benefits such as continuity, immediacy and speed, portability and mobility, and searchability and reachability [130] of services without a limited physical location and 24/7 availability. The development of mobile services that can be accessed anytime and anywhere based on types of time and location-sensitive properties is collectively called ubiquity or mobile ubiquity [131–133]. According to [134], ubiquity incorporates the idea of accessibility, reachability, and portability into one construct which enables access to networks at anytime from anywhere and in turn is reachable at any time and any place.

Applying the concept of ubiquity in the field of mobile government means the integration of mobile technologies to provide government-related public services that can be accessed by citizens anytime and anywhere. The ability of citizens and the general public to have access to mobile government services through the mobile factor of ubiquity (i.e., unlimited time and space) can influence the people's perception of the performance, effort expectancy, and the intention to use mobile government services. Cao and Niu [26] revealed that ubiquity has a positive significant effect on the user adoption of new technologies. H8, H9, and H10 were therefore proposed.

H8: mobile factor ubiquity is positively related to the performance expectancy of mobile government services.

H9: mobile factor ubiquity is positively related to the effort expectancy of mobile government services.

H10: mobile factor ubiquity is positively related to the intention to use mobile government services.

H11: mobile factor ubiquity is positively related to the context awareness of mobile government services.

## 4. Research Model

The research model based on the research hypothesis developed in the previous section is depicted in Figure 3.

**4.1. Research Methodology.** To test and validate the proposed research model for this study, a questionnaire was used to collect data online from college students (from Jiangxi University of Science and Technology) who formed the targeted sample population of the study. College students (youth) are important segments of society especially when it comes to familiarity with new forms of technology such as mobile technology, the fundamental for m-government. M-technologies (human-technology interaction in different and dispersed contexts) like smartphones (mobile) are highly accepted, used, and integrated into the daily routines of young people (including college students) [135, 136]. The technology savvy habits of college students have led to them being described as net generation [137–139]. College students' technology savvy tendencies empower them to be in a position to appreciate the context of m-government. The questionnaire was designed, hosted online, and shared with students via social media networks such as WeChat, QQ Messenger, and personal e-mail contacts. Social media was used as the medium to reach the respondents of the study because it is widely used in China especially among college students, and thus it was easier to connect and elicit responses from the respondents. The variables of the questionnaire were adapted from previous studies but reframed and worded to reflect the content of the study. They were adapted as follows: context awareness and mobile factor ubiquity [126, 140], performance expectancy, effort expectancy, and intention to use [83, 123], and intention to recommend adoption [123]. The questionnaire was made up of two parts: the first part contained the constructs that were examined in this study and the second contained the basic demographic information about the respondents such as age, gender, and education. The constructs in the questionnaire were measured on a five-point Likert scale such as 1 = strongly disagree (SD), 2 = disagree (D), 3 = neutral (N), 4 = agree (A), and 5 = strongly agree (SA). The questionnaire items used are given in Appendix A. The questionnaire was first prepared in English and then translated into Chinese for maximum comprehension of the targeted respondents.

Pretesting and piloting of the questionnaire were undertaken to ensure that concerns that respondents may have were incorporated into the final data collection instrument. Pretesting and piloting are usually conducted before the main data collection (survey) is implemented [141, 142]. It was carried out to ensure the collection of primary data and the adequacy of the research instrument, determine the feasibility of the full-scale survey, estimate variability in outcomes to aid in deciding sample size, and finally to assess the logistical challenges which might happen using proposed methods [141, 143]. It empowers research to give appropriate feedback from the respondents of any ambiguities and hard questions and also to estimate the amount of time it takes to complete a questionnaire [141, 144]. The feedback generated during the pretesting and piloting stages was instrumental in revising and rewording some of the questions in the instrument and thus removing any ambiguity that may exist in the questionnaire. The results of the

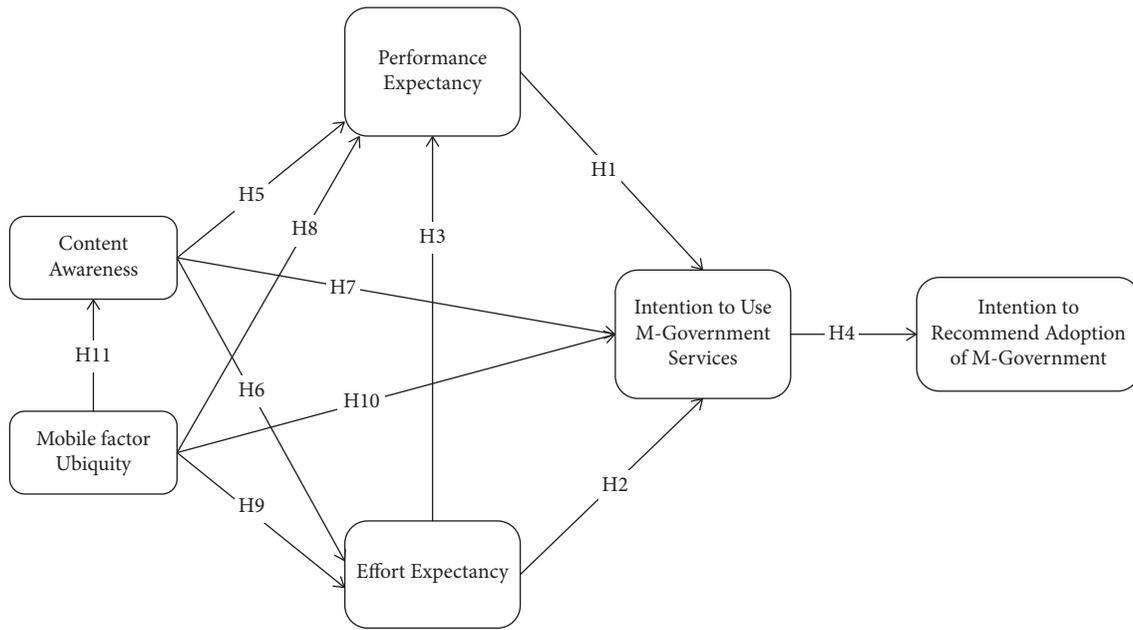


FIGURE 3: Research model.

pretesting and pilot stages were not however included in the final data analysis due to their small nature (numbers). This view is supported and elaborated by Van Teijlingen and Hundley [141] who indicated that even though pilot studies do provide some inclination of the possible sample size rate in the main survey, this cannot be certain because they do not have a good statistical foundation and are mainly based on small numbers.

The convenience sampling technique was used in this study, and it is a form of sampling technique that empowers researchers to collect data from respondents that are easy to reach due to proximity [145, 146]. It is considered to be the popular sampling approach for data collection since it is viewed to be unbelievably prompt, not complicated, and economical [147, 148]. Additionally, convenient sampling was used as compared to other sampling techniques because convenient sampling provides a quicker data collection mechanism and inexpensive methodology, is easy to apply to research, has low-cost dimension and promptly available sample, and does not have many rules to follow [149–151]. The questionnaire was hosted online for about a month (October to November 2019), and 366 respondents participated in the study. The questionnaire was designed in a way that no respondent could leave out a response, and hence no missing data were recorded. Therefore, the 366 responses received were used for the data analysis. The data gathered were analyzed with SPSS and SmartPLS 3.0 using the structural equation model technique. The SEM was chosen since it has recently become the most popular statistical tool which integrates many kinds of statistical procedures like multiple regression, factor analysis, and ANOVA [152, 153]. Also, the SEM is considered to be flexible due to its ability to deal not only with simple or multiple linear regression but also chiefly with a system of regression equations, and it can

work on many equations simultaneously [154, 155]. In SEM, adequate sample size is needed and a minimum sample size of 200 is required to arrive at satisfactory results [156, 157]. This justified the use of the 366 samples generated in this study which was used for the data analysis.

**4.2. Common Method Bias.** In situations where researchers use self-acclaimed or reported data, the issue of common method bias (CMB) may arise [158, 159]. It is thus important that tests are conducted to determine the existence of common method bias if any. Harman’s single factor test was used to test for the existence of CMB [160]. The single factor test explains that to show the nonexistence of CMB, a single factor should not explain more than 50% of the variance. Our tests showed that no single factor accounted for more than 31.7% of the variance. This signifies that the issue of CMB was not a challenge for this study.

## 5. Results and Data Analysis

**5.1. Demographic Statistics.** The demographic characteristics of the respondents who participated in this study are shown in Table 4. It can be observed that female respondents (53.7%) were more than male respondents (46.7%). In terms of the age distribution, the majority are between the age groups of 18 and 25 (88%), and a greater portion of the respondents were undergraduate students.

**5.2. Measurement Model.** SmartPLS 3.0 using the structural equation modelling technique (SEM) was used to test the reliability and validity of the constructs (measurement model) used in this study. The analysis of the goodness-of-fit indices of measurement model indicates a good model fit

TABLE 4: Demographic statistics.

Item		Frequency	Percentage
Gender	Male	171	46.7
	Female	195	53.3
Age	18–15	332	88.0
	26+	44	12.0
Education	Undergraduate	259	70.8
	Masters	107	29.2

(chi-square = 521.751; df = 260; CMN/df = 2.111; GFI = 0.914; NFI = 0.943; TLI = 0.912; RMSEA = 0.037). All the goodness-of-fit indices meet acceptable levels for the goodness of fit [161, 162]. The results of the measurement model are shown in Table 5. The average variance extracted (AVE), composite reliability, Cronbach's alpha, and factor loadings were used to test the reliability and validity of all the constructs applied in the study. The estimated minimum value for Cronbach's alpha and composite reliability is 0.70 [163]. As illustrated in Table 5, the threshold for Cronbach's alpha and composite reliability was met and confirmed. The average variance extracted is recommended not to be less than 0.50 [163]. This criterion was also met. It can, therefore, be concluded that all the variables used in this study met the quality, reliability, and validity criteria, confirming the convergent validity of the questionnaire items experimented in our study. As part of the further second-level criteria to assess the validity of our measurement items, the Fornell–Larcker criterion was used to compute the discriminant validity. The results of the discriminant validity are shown in Table 6. The principle of Fornell and Larcker states that discriminant validity would have occurred when the square root of the AVE is greater than the paired inter-correlation between the construct and other variables [163, 164]. As can be observed in Table 6, all the square roots of the AVE (in bold) are higher than the corresponding paired inter-correlations (off-diagonal values). Overall, this is an indication that the discriminant validity criterion has been met. Another degree of discriminant validity using the HTMT is shown in Table 7. As per the heterotrait-monotrait (HTMT) criterion, a value below 0.850 is an indication of discriminant validity [165].

**5.3. Structural Model.** The results of the structural model tested (research hypotheses) are shown in Table 8. The performance expectancy was found to be significant in influencing the intention to use mobile government services ( $\beta = 0.269, p < 0.05$ ). H1 was supported. Also, effort expectancy was demonstrated to have positive and significant impact on both the intention to use ( $\beta = 0.610, p < 0.05$ ) and performance expectancy ( $\beta = 0.633, p < 0.05$ ) of mobile government services. Hence, H2 and H3 were supported. Also, the intention to use was a significant predictor of the intention to recommend the adoption of mobile government services ( $\beta = 0.834, p < 0.05$ ). H4 was also supported. Interestingly, while content awareness was not significant in determining the performance expectancy of mobile government services ( $\beta = 0.073, p > 0.05$ ), it was however significant in influencing the effort expectancy of mobile

government services ( $\beta = 0.819, p < 0.05$ ). H5 was therefore not supported while H6 was supported. Also to our surprise, context awareness was not a significant predictor of the intention to use ( $\beta = 0.034, p > 0.05$ ). Accordingly, H7 was not supported. Furthermore, while mobile factor ubiquity was not significant in influencing the performance expectancy of mobile government services ( $\beta = 0.018, p > 0.05$ ), it was however significant in determining both the effort expectancy ( $\beta = 0.171, p < 0.05$ ) and intention to use mobile government services ( $\beta = 0.684, p < 0.05$ ). H8 was not supported while H9 and H10 were supported. Lastly, the mobile factor ubiquity was found to be significant in determining the context awareness of mobile government services ( $\beta = 0.767, p < 0.05$ ). H11 was therefore statistically supported. The graphic depiction of the validated research model is shown in Figure 4.

## 6. Discussion

This study investigated the impact of context awareness and ubiquity on the adoption of mobile government services. Context awareness and ubiquity are two major features of mobile technology development that enable the provision of tailored services to consumers 24/7 without geographical limitation. The results findings have provided further understanding of the impact of these factors (context and ubiquity) on the adoption of mobile government services. The SEM analysis conducted showed that performance expectancy and effort expectancy were both positive predictors of the intention to use mobile government services. These findings illustrate how the design of mobile government applications that yield or meet the expected service delivery (benefits) of the consumer and the ease of use that citizens can experience while interacting with m-government sites can have on the intention to use mobile government services. Our results support the previous study that also demonstrated that both performance expectancy and effort expectancy are significant determinants of the intention to use mobile government services [108, 166]. Other studies have also validated and supported the findings that performance expectancy is the most significant determinant of technology adoption due to anticipated perceived benefits from such technology for their performance [167–169]. On the contrary, other researchers have shown that performance expectancy does not necessarily influence the adoption of technology (m-government) [170].

Also, it was shown that the effort expectancy of mobile government services has a direct positive impact on the performance expectancy of mobile government services. This means that m-government platforms that are designed with ease of use features such as easy to navigate and browse m-government sites, faster download and upload time, quick feedback mechanism, and so on have the potential to contribute to the usefulness or performance expectancy that consumers anticipate from public service delivered through the mobile government. The finding on the positive impact of effort expectancy on performance expectancy is corroborated by previous studies that proved and validated the same outcome [119, 171]. The ease of use of any technology

TABLE 5: Measurement model.

Constructs	Code	AVE	Composite reliability	Cronbach's alpha	Loading
Content awareness (CA)	CA1	0.957	0.985	0.978	0.976
	CA2				0.978
	CA3				0.982
Mobile factor ubiquity (MFU)	MFU1	0.920	0.972	0.956	0.915
	MFU2				0.888
	MFU3				0.955
Performance expectancy (PE)	PE1	0.938	0.984	0.978	0.940
	PE2				0.969
	PE3				0.965
	PE4				0.882
Effort expectancy (EE)	EE1	0.931	0.982	0.975	0.948
	EE2				0.923
	EE3				0.895
	EE4				0.957
Intention to use (IU)	IU1	0.946	0.981	0.971	0.966
	IU2				0.918
	IU3				0.955
Intention to recommend adoption (ITRA)	IRA1	0.912	0.969	0.952	0.924
	IRA2				0.940
	IRA3				0.873

TABLE 6: Discriminant validity.

Constructs	CA	MFU	PE	EE	IU	IRA
CA	<b>0.978</b>					
MFU	0.667	<b>0.959</b>				
PE	0.574	0.551	<b>0.969</b>			
EE	0.684	0.663	0.788	<b>0.965</b>		
IU	0.466	0.769	0.752	0.570	<b>0.973</b>	
ITRA	0.562	0.631	0.673	0.579	0.733	<b>0.955</b>

The square root of AVEs and the correlation coefficient are given in bold. CA, content awareness; MFU, mobile factor ubiquity; PE, performance expectancy; EE, effort expectancy; IU, intention to use; ITRA, intention to recommend adoption.

TABLE 7: Discriminant validity (heterotrait-monotrait (HTMT) criterion).

Constructs	CA	MFU	PE	EE	IU	IRA
CA	<b>0.812</b>					
MFU	0.749	<b>0.780</b>				
PE	0.637	0.671	<b>0.809</b>			
EE	0.746	0.799	0.718	<b>0.829</b>		
IU	0.622	0.700	0.692	0.701	<b>0.810</b>	
ITRA	0.714	0.691	0.673	0.759	0.720	<b>0.815</b>

CA, content awareness; MFU, mobile factor ubiquity; PE, performance expectancy; EE, effort expectancy; IU, intention to use; ITRA, intention to recommend adoption.

drives its subsequent adoption since users can have a user-friendly environment in which they can operate and access needed services, and this has been corroborated by other research findings [172–174]. Few studies have however demonstrated that the extent of ease of use (effort expectancy) of technology does not influence its acceptance [170, 175, 176]. The nondirect effect of effort expectancy on the technology adoption can be attributed to people’s over

familiarization with new technologies (mobile) which make them well acquainted with such technologies, and thus the issue of ease of use does not arise.

Furthermore, the results demonstrated that the intention to use is a predictor of the recommendation adoption of mobile government services. This means that citizens that have the desire to use mobile government services have a high tendency to also recommend its adoption to others. This desire to recommend the adoption of technology is an important factor that can contribute hugely to the development and diffusion of mobile government among the large citizen population. This finding is in line with studies that also showed that intention to use is positively related to the intention to recommend adoption [123, 124, 176, 177].

In addition, contrary to our expectations, our analysis revealed that while context awareness was a significant predictor of the effort expectancy of mobile government services, it, however, does not influence or determine significantly the performance expectancy and intention to use mobile government services. The experimentation of context awareness in the context of mobile government adoption is limited, and hence this may account for these surprising results. However, in the context of mobile payment adoption, studies have validated and demonstrated that effort expectancy and performance expectancy moderate significantly the relationship between context awareness and the adoption intention [26]. The positive impact of context awareness on effort expectancy is an indication that creating context-aware rich information and services in mobile government, available in the user’s environment or region, can influence the effort expectancy of mobile government services. Context-aware innovations that make use of contextual data can enhance service customization driven by quality personalized feedbacks and objectives in service delivery which ultimately results in the adoption and

TABLE 8: Hypotheses tested.

Hypotheses	Direction	Path	T value	Significance	Supported
H1	PE→IU	0.269	6.790	0.000***	Yes
H2	EE→IU	0.610	11.290	0.000***	Yes
H3	EE→PE	0.633	20.644	0.000***	Yes
H4	IU→ITRA	0.834	73.520	0.000***	Yes
H5	CA→PE	0.073	1.328	0.185	No
H6	CA→EE	0.819	68.919	0.000***	Yes
H7	CA→IU	0.034	0.713	0.476	No
H8	MFU→PE	0.018	0.427	0.670	No
H9	MFU→EE	0.171	6.161	0.000***	Yes
H10	MFU→IU	0.684	21.488	0.000***	Yes
H11	MFU→CA	0.767	51.120	0.000***	Yes

\*\*\*represents  $p < 0.05$ .

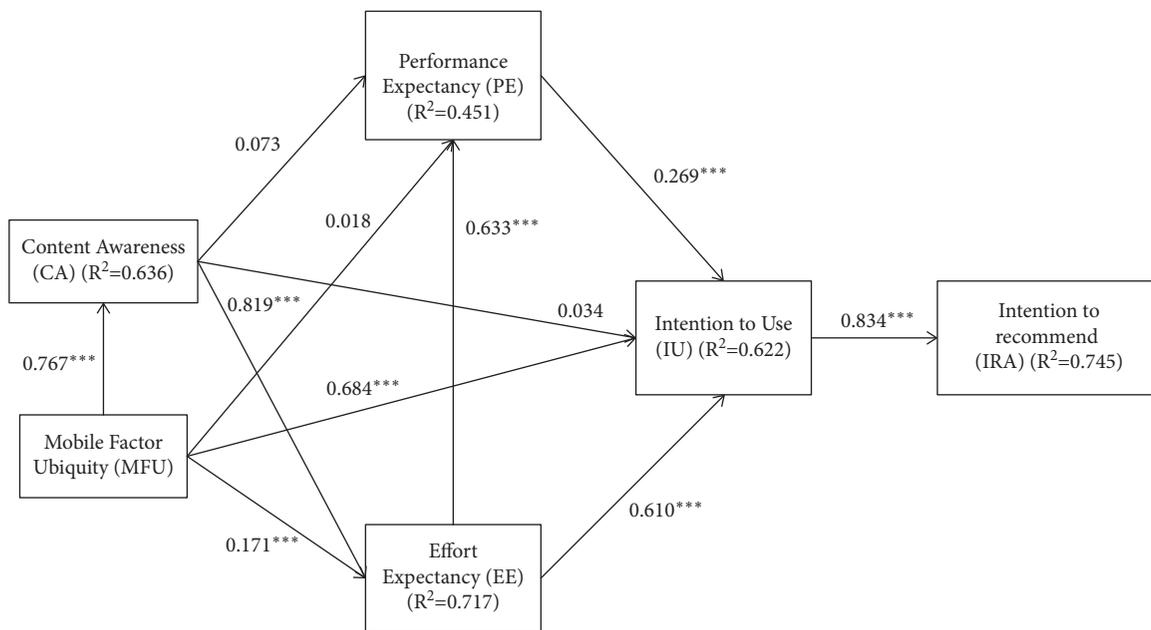


FIGURE 4: Validated structural model.

diffusion of any technology such as m-government [178–180]. Mobile government context-aware services systems can empower context generation where information and services can be accessed via mobile devices based on location, people, or places of interest close by [181, 182].

Again, our results showed that while mobile factor ubiquity was not significant in influencing the performance expectancy of mobile government services, it was however significant in determining both effort expectancy and intention to use mobile government services. Besides, mobile factor ubiquity was a significant determinant of the context awareness of mobile government services. It must be emphasized again that within the arena of mobile government, few studies have explored the ubiquity factor in mobile government adoption. But it has been explored in payment adoption, where performance and effect expectancies were found to be significant in moderating the impact of ubiquity and the user adoption intention [26]. Other researchers elaborated how technology adoption and diffusion can be

driven by the nature of ubiquity in the design of any given technology [183, 184].

*6.1. Implications for Theory.* Our study has provided some interesting outcomes which have theoretical implications for academia and researchers, particularly when it comes to the mobile government and e-government adoption literature. First, it extended the UTAUT with context awareness and mobile factor ubiquity and the intention to recommend adoption to explain the user adoption of mobile government services. Secondly, while context awareness and ubiquity were examined as moderating factors moderating the relationship between performance and effort expectancy in a study by [26], in this study, we examined the direct impact of these two factors on both the performance and effort expectancy and the intention to use. Also, the relationship between mobile factor ubiquity and context awareness was empirically validated. Mobile factor ubiquity accounts for

63.6% of the variance in context awareness while context awareness and ubiquity accounts for 71.7% of effort expectancy of mobile government services. Context awareness, ubiquity, and effort expectancy also account for 45.1% of the variance in performance expectancy while context awareness, ubiquity, performance expectancy, and effort expectancy explain about 62.2% of the variance in the intention to use mobile government services. Lastly, the intention to use accounted for about 74.5% of the variance in the recommendation adoption. These empirical findings are unique to this study and thus broaden our understanding of the context awareness and ubiquity of the adoption of mobile government services.

*6.2. Implications for Practice.* The validation of context awareness and mobile factor ubiquity in the context of mobile government service adoption has practical implications for the adoption and development of mobile government. The government using these two important mobile technology characteristics (context awareness and ubiquity) can devise ways and methods to improve the delivery of public services to meet the service quality dimension aspirations of citizens and the general public. Context awareness and mobile factor ubiquity showed a positive impact on the effort expectancy of mobile government services. The government should focus on enriching the context awareness and ubiquity of mobile government services that provide benefits such as speed, continuity, immediacy, portability, and searchability in the service delivery through mobile government to citizens. These elements of continuity, immediacy, portability, and enhanced searching potential of service will go a long way to improve the effort expectancy associated with the development and use of mobile government service from the consumer/citizen perspective. Additionally, the provision of basic technical components (service infrastructures) is required for the development and implementation of ubiquitous and context-aware services (m-government), especially technology and communication systems such as Wi-Fi hotspots and Internet connection, Global Positioning System (GPS), Bluetooth, good bandwidth, mobile cellular networks, access control systems, and smart-card-based services. Ensuring the interoperability of these service infrastructures is vital for ubiquitous systems to work to deliver any m-government driven services.

Furthermore, the mobile factor ubiquity showed a direct influence on the intention to use and context awareness of mobile government services. This implies that the development of ubiquitous mobile government services that can be accessed anytime and anywhere regardless of the regional locations of citizens and location-sensitive services can drive the decision of citizens to engage and take up the use of mobile government services. It can also enrich and broaden the perception of citizens when it comes to the context awareness of mobile government services. Hence, government and stakeholders need to take advantage of the ubiquity characteristics that mobile computing offers to design and develop mobile government services with the flexibility of space and time. The information-capturing

capabilities of mobile ubiquity are enhanced and automated to capture and analyze the experiences and service expectations of people to use these pieces of information to provide flexible and universal access to services. The Internet, sensor technologies, and network embedded systems should empower the discovery of information-capturing capabilities of ubiquitous systems.

Furthermore, the positive direct effect of performance expectancy and effort expectancy on the intention to use mobile government services has implications for the development of mobile government technologies that are easy to use and accompanied by important benefits to the user. That is, the development of mobile government technologies with features that are easy to use such as faster download and upload of documents and ease to navigate website content (higher browsing speed) can positively influence the intention to use mobile government services. Also, mobile government services that provide better usefulness and benefits that will enable the consumer to enhance his or her access to public services can, in turn, drive their desire and intention to adopt mobile government services.

Also, the validated positive relationship between effort expectancy and performance expectancy of mobile government is an indication that the easiness of the design and development of mobile government services should be important to policymakers and government since it can determine and influence the expected performance or benefits by users in mobile government services. Lastly, the intention to use showed a positive direct effect on the intention of citizens to recommend the adoption of mobile government services. This is an important finding which implies the development and diffusion of mobile government services. Government and policymakers must ensure that citizen interaction and engagement with mobile government services present them with satisfactory service delivery, enhanced service quality, and a good image of the mobile government system. These dimensions would ultimately drive them to recommend the adoption of mobile government services to others such as friends, colleagues, and people within their inner cycle which is important to drive upward faster the uptake of mobile government services. This faster uptake can ensure the faster diffusion of the mobile government and its success as well.

## 7. Conclusions

This study extended the UTAUT model by integrating it with context awareness, mobile factor ubiquity, and intention to recommend explaining the user adoption of mobile government services. The result findings have enriched the understanding of context awareness and mobile factor ubiquity on the adoption of mobile government services. The findings showed that context awareness and mobile factor ubiquity both influence the effort expectancy of mobile government services. Also, mobile factor ubiquity demonstrated a positive impact on the intention to use and context awareness of mobile government services. Contrarily to our expectations, context awareness had no significant impact on both the performance expectancy and

intention to use mobile government services. Again, the mobile factor ubiquity did not determine the performance expectancy of mobile government services.

Furthermore, the behavioral intention was influenced both by performance expectancy and effort expectancy. Effort expectancy had a positive direct effect on the performance expectancy of mobile government services. Finally, the intention to use has a direct positive impact on the intention of citizens to recommend the adoption of mobile government services. These findings have provided empirical evidence to government agencies and other stakeholders to have these two factors in mind (context awareness and mobile factor ubiquity) when it comes to the development of mobile government services. A mobile government designed and implemented with enriched context awareness and ubiquitous dimensions would in no doubt influence and drive the adoption of mobile government services.

*7.1. Limitation and Future Research.* Even though our study has provided empirical evidence that broadens our understanding of context awareness and ubiquity on the adoption of mobile government services, there are still some limitations associated with our study. First, the validated research model and methods may be applied and tested in other developing countries whose findings and analysis may or may not validate the current result findings. That is, the results could be different from our study. Second, this, therefore, demands that our findings should not be over-generalized and interpreted. Third, the data used are cross-sectional data and longitudinal research is needed to measure citizens' intention over a specific period. Fourth, the moderating impact of performance and effort expectancy on the relationship between context awareness and ubiquity and the adoption intentions were not explored. Future studies will, therefore, seek to expand the sample size to measure these moderating relationships in addition to mediating effects as well. Additionally, to provide a better validation of the UTAUT model in the context of context awareness and ubiquity, future research will be carried out to include demographic factors such as gender, age, and experience as moderators along with social influence and facilitating conditions. This will enable an understanding of the moderating impact of these demographic factors on the adoption of m-government services. Finally, the importance-performance map analysis (IPMA) approach will be used in these proposed future studies to determine the importance and performance of the indicators in these studies.

## Appendix

### A: Questionnaire Items

Content awareness (CA):

CA1: mobile government service provides services based on my location.

CA2: mobile government service provides information based on my environment.

CA3: mobile government service provides information or services based on my status/needs.

Mobile factor ubiquity (MFU):

MFU1: I can use the mobile government anywhere.

MFU2: I can use more government services at any time.

MFU3: in every situation, I can use mobile government services.

Performance expectancy (PE):

PE1: using mobile government services will be convenient.

PE2 using mobile government services will be more quickly.

PE3: using mobile government services will be more efficient.

PE4: using mobile government services is beneficial to me.

Effort expectancy (EE):

EE1: learning how to use mobile government services will be easy for me.

EE2: I think using mobile government services is easy.

EE3: I have the skills needed to use mobile government services.

EE4: my interaction with mobile government is clear and understandable.

Intention to use (IU):

IU1: I will use mobile government services.

IU2: I will use mobile government to access services I need.

IU3: I use mobile government services for my transactions.

Intention to recommend adoption (ITRA):

IRA1: I will recommend mobile government to others.

IRA2: I will recommend mobile government adoption to my friends and family.

IRA3: I will recommend mobile government adoption to people I value and respect in society.

## Data Availability

The data used to support the findings of this study are included within the article.

## Conflicts of Interest

The authors declare that they have no conflicts of interest.

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