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The Use of the Internet via Mobile Devices among Graduate Students of the University of Ghana

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ABSTRACT

This study focused on the use of the Internet via mobile devices among graduate students of the University of Ghana. The survey methodology was used to analyze the perceived use, attitude of graduate students of the University of Ghana (UG) towards the use of the Internet via mobile devices. The respondents numbering 244 answered questions on attitude, perceived ease of use, actual use and challenges of the Internet via mobile devices among graduate students of UG. Responses were analyzed to ascertain the use of the Internet via mobile devices among graduate students in the University. The study revealed that graduate students of UG used mobile phones in accessing the Internet for their information needs due to its portability, easy use, faster and convenience. Additionally the students used MTN as their core telecom network service to access the Internet. Besides, mobile devices were used for academic purposes especially for research work. The benefits obtained by the students in accessing the Internet via mobile devices included broadening of knowledge, convenience of search and wider access to information. Major limitations however were small screen size, low memory capacity, slow transmission speed and lack of skill to operate the mobile device.

In conclusion, the Technology Acceptance Model via Wireless Internet should be used for all graduate students' programmes, because Internet via mobile devices has a unique role in UG. The study recommended a partnership between Internet Service Providers (ISPs) and Technology Manufacturers to tailor made mobile devices that support Internet access and also meet the desired needs of students whilst ISPs and UG management respectively improve on Internet services and integrate mobile devices to teaching, learning and research activities.

KEYWORDS: Technology Acceptance Model (TAM), Ease of Use (EOU) and Information Communication Technology (ICT).

Background to the Study

Globally, mobile devices are being used to access the Internet for information. It is, however, a small section of the populace who access the Internet through these devices. Several factors account for the low use of the Internet, one of which is the fact that the elderly in society are of the view that technology is for the younger generation and this explains why older workers in organizations are reluctant to use this technology, compared to workers who fall within the youth bracket. Wireless communications and services are aided by the coming together of two technologies- the Internet and wireless technology like mobile phones and Personal Digital Assistants. The increase in growth of Wireless Internet via Mobile Devices (WIMD) is creating unparalleled opportunities for electronic (e)-commerce. Consumers and businesses are enabled to build connectivity by going beyond the range of time and place, increasing accessibility and enlarging their social and business networks. The increase in growth shall ensure their ubiquity, convenience, localization and personalization for users of communications and service activities (Lu et al., 2003).

Bruner and Kumar (2003) assert that the success of mobile commerce depends on the willingness of consumers to adapt a brand new technology and engage in operations with the use of systems and devices which are at variance with what they have used previously. The Technology Acceptance Model (TAM) is used to predict employees' behaviours and attitude when introduced to new

technologies in workplaces. The use of TAM gives insight regarding the factors that affect consumers' acceptance of technology. TAM asserts that usefulness and Ease of Use (EOU) influence the intention of an individual in using a system. The main idea behind TAM is that a person's behavioural intention to use a system is influenced by two main factors: its EOU and its usefulness. Usefulness is the extent to which a person believes a system can perform a task. However EOU is the level at which an individual thinks that using a system will be free of mental effort.

Asif and Krogstie (2011) posit that mobile learning devices have become much more diverse groups of wearable and portable technologies. Cell phones and other mobile devices are shifting from being a luxury to a necessary commodity and thus ordinary consumers are increasingly adopting mobile devices. Internet connection has become accessible and present everywhere simultaneously through the use of mobile devices. Graduate students stand to benefit through mobile Internet if they accept the model as an alternative to desktop Internet access. Mobile information systems were expanding fast with regard to when and where to execute learning for various settlements. Communication between teachers and students was changing very fast through mobile computing, which could also be used to effectively develop instructional quality. Campus information system for students is described as 'An integrated group of information resources, accessible by computer through the campus institutional external and internal web environment, that a university places at the disposal of its users to enable them to consult it and/or provide a selection of significant and relevant data, in the wide context of their university life in its academic, administrative and social senses, in order to improve student's knowledge base'. This idea holds true for new students who are unfamiliar with present day routines and practices. New students may also find it difficult to locate their bearings on campus. Thus, it is important to have key information accessible to students on university campuses, especially among graduate students.

School of Research and Graduate Studies (2010) posits that, the University of Ghana (UG) was established in 1948 by the name University College of the Gold Coast on the recommendation of Asquith Commission on the then Higher Education. Asquith Commission proposed among other things, the establishment of University Colleges in affiliation with the University of London. Elliot Commission published two reports of which the majority had it that two University Colleges in the Gold Coast (Ghana) and Nigeria should be set up and the minority report indicated that one University College should be set up for British West Africa. The minority report was accepted by the British Government and established it at Ibadan in Nigeria. Based on the refusal of the people of the Gold Coast to accept the recommendation, the British Government reviewed its decision and agreed to set up the University College of the Gold Coast now University of Ghana.

There are myriad problems that affect students' attitude to the use of Information Communication Technology(ICT) facilities on campus. Empirical evidence is the slow Internet connectivity at the ICT center. It is quite frustrating to use the desktop computers at the University of Ghana Graduate School to access the Internet for research work because it is very slow. Students spend too much time on the computers, trying to get to a particular website for relevant information to aid research works. This affects students' attitude towards access to Internet via the desktop computers. Consequently, few students actually use the computers at the Graduate School to access the Internet. For instance having access to the desktops at the ICT center is not easy. One has to battle with the issue of distance and the limited number of ICT equipment at the centre. The ICT center is opened to students at 8.30 am and closes at 4.30 pm during week days but it is closed during weekends. Graduate students browse for only a few hours a day, apart from the fact that they do not have access to the computers at the Graduate School during weekends. Graduate students are therefore handicapped when they depend on this facility to search for information for their research works. Hence, it is a small section of graduate students who visit the center to use the facility since a sizeable number of graduate students have acquired their own laptops in order to access the Internet for their research works, anytime and at anywhere.

Little attention has been given in literature to acceptance of WIMD by users even though there has been an increasing amount of wireless mobile activity. A study on WIMD user acceptance was therefore good enough in providing useful information, considering the young stage of WIMD development and implementation (Lu, et al., 2003).

Statement of the Problem

Access to relevant information is one of the key concerns of many students who are research-oriented. However, students of the University of Ghana and in most developing countries face many challenges in terms of access to and use of technology for learning and research. This becomes even more acute, especially at the postgraduate level where research is a major component and access to information, particularly journals (e-journals) is key. Putzerand Park (2012) postulate that, a technological device such as the smartphone and its corresponding interface should suit the necessities of the functions that a device is intended to support. This is significant primarily because not every mobile device can support salient functions, and one of the fundamental keys to adoption is whether the particular device and the user interface meet the clinician's requirements for effectiveness, screen size for readability, and suitability for other related functions that may be needed. Thus, the researcher is of the view that if the salient functions of mobile devices do not support readability,

storage of retrieved documents and effective academic research works etc, graduate students will have a negative attitude towards the use of the Internet via mobile devices.

Alzaidiyeen et al. (2011) postulated that the complexity of a technology is the inhibitor that discourages the adoption of an innovation. Users are concerned with the effort required to use applications (such as mobile commerce and online banking) and the complexity of the process involved. A study conducted at the University of Sains, Malaysia, indicates that there is a statistically significant difference in the perceived ease of use of mobile devices between males and females, with results favouring males more than females(a Mean (M= 3.68) with Standard Deviation (SD= 0.67) while females' group reported a Mean (M= 3.37) with Standard Deviation (SD= 0.51). In an academic setting like the University of Ghana, it is a cause of concern if a significant number of female graduate students perceive the ease of use of mobile devices as complex, since it will be difficult accessing the Internet for academic information to support research. Putzerand Park (2012), older physicians with considerable clinical experience need a broad personal experience with a device such as a smartphone along with superior technological experience before they will accept and adopt a new mobile technology. Thus, it is the researcher's view that unless older graduate students have a wider technological experience, they will not accept and adopt the use of mobile devices in accessing academic information on theInternet.

Aboelmaged (2010) opines that some challenges of mobile devices are inability to use some application software on most mobile devices, slow Internet connectivity and inability to store bulky files on most of them etc. This becomes a concern as most of these mobile devices have low memory storage capacities which make it extremely difficult for users to download and store relevant information. Moreover, some software like word processors and other statistical applications are mostly not supported by these mobile devices.Thus, the research was undertaken to ascertain graduate students' attitude, perceived ease of use, perceived usefulness and challenges of using the Internet via mobile devices so as to come out with some findings on ways to improve upon the use of the Internet via mobile devices among graduate students of the University of Ghana.

Purpose of the Study

The purpose of the study was to ascertain the attitude, perceived ease of use and evaluate the use of the Internet via mobile devices by graduate students of the University of Ghana, with a view to identifying problems and making suggestions for their resolution.

Objectives of the Study

The following were the specific objectives:

i. To determine the attitude of graduate students towards the use of the Internet via mobile devices
ii. To assess the perceived ease of use of the Internet via mobile devices by graduate students
iii. To evaluate the use of the Internet via mobile devices by graduate students

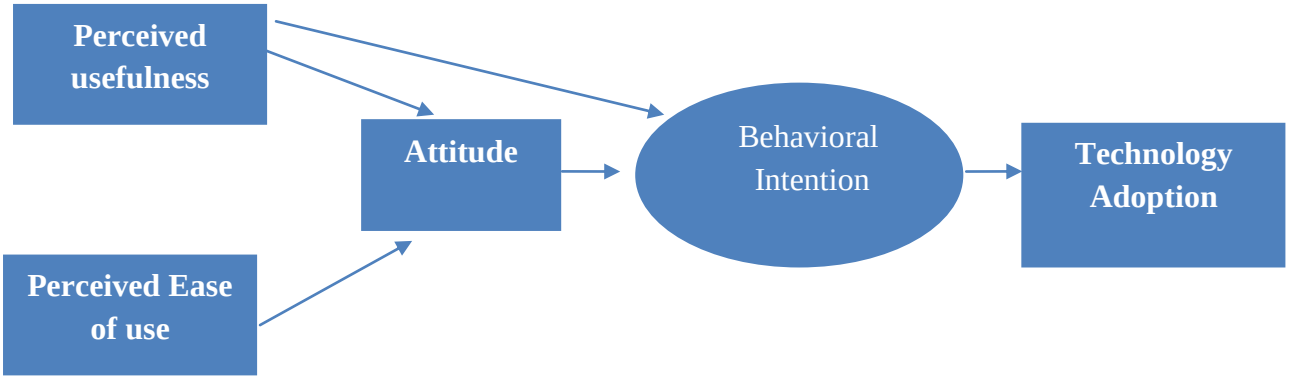
Research Questions

i. What is the attitude of graduate students towards the use of the Internet via mobile devices?
ii. What is the perceived ease of use of the Internet via mobile devices by graduate students?
iii. What are the uses of the Internet via mobile devices by graduate students?

Conceptual Framework

This study adopted the Technology Acceptance Model for wireless Internet (TAM for wireless Internet)via mobile devices alluded to by Lu et al. (2003) which was originally propounded by Davis (1989). Several studies centered on the adoption of mobile services were based on TAM for wireless Internet which was originally meant to predict users' acceptance of information technology and its use on the job. In TAM for wireless Internet, user acceptance is determined by attitude towards use and intention to use instead of actual use, because Wireless Internet via Mobile Devices (WIMD) is at an infant stage, defined by restricted adoption and use.

Figure 1: Technology Acceptance Model for Wireless Internet



Source: Lu et al. (2019).

Attitude towards use in TAM model influences one's intention to adopt a particular system. Before a system is improved upon, users usually are most likely to form their own beliefs and attitudes as regards the system. Thus, in consumer research, attitude is considered as the most important construct. It is used to foretell the likelihood of a consumer adopting a technology. Currently, consumers have formed favourable or unfavourable attitude about any new technology, irrespective of the fact that they have either used the technology or not. It is important to investigate attitude towards WIMD and how it relates with intention to use a system in order to predict usage behaviour. It is hypothesized that attitude to WIMD will have a considerable constructive outcome on intent to employ WIMD.

Perceived usefulness in TAM for wireless Internet was from the beginning used to refer to the productivity, performance and effectiveness of a job. Perceived usefulness directly influences one's intentions to use a system more than attitude. Attributes of future consequences are improved productivity, effectiveness, job performance or satisfaction. The consequent outcome of one's career prospects or social status is referred to as long term consequence. Behavioural intention in using a technology depends on perceived near-term usefulness, perceived long-term usefulness and perceived ease of use. Perceived near-term usefulness of WIMD will have a considerable positive consequence on attitude to using WIMD; perceived long-term usefulness of WIMD will have a considerable positive consequence on attitude to using WIMD; perceived near-term usefulness of WIMD will have a considerable positive consequence on intent to use WIMD; perceived long-term usefulness of WIMD will have a considerable positive consequence on intent to use WIMD.

Perceived ease of use also influences one's attitude towards use in the TAM for wireless Internet. Perceived ease of use refers to the mental effort engaged in using a system. When perceived ease of use is improved, it may result in improved performance. While advance performance defines perceived usefulness that is the same to near-term usefulness, perceived ease of use will have a nonstop positive result on perceived near-term usefulness. For any up and coming Information Technology/Information System, perceived ease of use is the main determinant of users' adoption and usage behavior. In explaining perceived usefulness and the attitude towards using WIMD the following were hypothesized; perceived ease of using WIMD will have a significant positive result on attitude to using WIMD; perceived ease of using WIMD will have a significant positive result on perceived near-term usefulness of WIMD.The idea behind these associations is that the ease of use of technology and its usefulness will positively influence the intended users' attitude and intention towards using the technology. As a result the use of technology will increase (Lu et al., 2003). Thus, if UG graduate students perceive the use of Internet via mobile devices as easy and their attitude towards these facilities is positive, they will adopt and use the Internet via their mobile devices for both academic and personal works.

Attitude towards the Use of the Internet via Mobile Devices

Attitude is a cause of intention. Attitude is grouped into two constructs; that is attitude towards the object and the behaviour. The latter looks at the examination of a particular behavior which points to a particular behavioural intention which in turn ends up in a specific behavioural action. A prospective users' attitude towards using a mobile device determines one's intention to adopt as portrayed by theTAM for wireless Internet. Before a system is developed users may have formed some beliefs and attitudes as regards the system to be developed. In like manner attitude is the most important construct in consumer research and it is popularly used to predict consumers' likelihood to use a new technology. Technology innovation has been introduced to modern day consumers and as a result they may have formed favourable or unfavourable attitudes about technology innovations, without regard to whether they have used the product in question (Lu et al., 2003).

Abbasi et al. (2010), however, postulate that academics or academicians in universities have no choice than to accept the Internet. They accept Internet mainly because of its usefulness and relative advantages in building their careers and professional achievements. This postulation of Abbasi et al. (2010) is in agreement with TAM for wireless Internet. Thus, students in their quest for relevant information resort to many sources to meet their needs. Such sources may include the library, lecturers, the Internet via mobile devices. With the rate at which the Internet via mobile devices is serving many users in diverse areas, students develop positive attitude and trust in the facility for such relevant information. In Pakistan, Internet is still a newer innovation and so academics find it difficult to operate and use it. Many academics are unfamiliar with the process and procedures of the Internet. As a result they are unwilling to use the Internet because of the frustration they go through when using it and therefore are unable to realize Internet's perceived usefulness. Abbasi et al. (2010), co-workers and heads of institutions are very influential in the acceptance and confirmation of the Internet. The attitude of top-management of universities is mainly bureaucratic and academics attach so much importance to the messages passed through top-management which must be obeyed. This explains why academics rate Internet use as essential. Government of Pakistan is supporting research skills among academics through the initiation of projects such as providing Internet facility and Internet related research facilities.

Academics are under obligation to use electronic journals to carry out their research to get promoted. As a result, management support in allocating resources and

recognizing individual's efforts are most likely to enhance the usefulness and usage of the Internet adoption. The researcher's view is that, academics have a positive view towards the Internet because they are compelled by top management of universities to use the Internet for their research works. The situation would have been different if academics and students were not under any obligation to use the Internet. However, though a users' attitude towards the Internet could be negative because of the newness of a particular technology introduced, an extensive user education embarked upon for academics and students, would make them develop a positive attitude towards a fairly new technology (Abbasi et al. 2010).

A study by Oliver (2005), conducted in Australia and South East Asia, among University students suggests that students were in favour of mobile technologies such as laptops and handheld computers though they were faced with challenges such as cost, computing power and security. To most students Personal Digital Assistance (PDAs) were not genuine, were easily lost and broken, did not have computer capacity and they were being stolen. The general staff of an Australian University spoke well of the potential of PDAs but emphasized the challenges in implementation especially with reference to accessing wireless networks. Oliver's (2005) research conducted revealed that out of 16 student volunteers in Engineering, Business and Education,all of them had different degrees of interest and exposure to technology. No student among them had used a PDA in the past but all of them were familiar and comfortable with computer and mobile phones. Four ways of students' response to PDAs' possibilities were realized. Students expressed so much delight when they took delivery of PDA devices. In the second stage under a Dutch project, students used experience and new applications. The Australian students were issued with PDAs and detailed manuals on how to operate and install software applications and update them. A non-technologically inclined student returned her PDA and cited her lack of trust with the technology and a lack of time in participation. The researcher is of the view that despite a user education session for Internet users, some of them will still have a negative attitude towards using a computer to access the Internet.

Aboelmaged (2010) supports the idea that attitude is a key determinant of the intention to use a particular system which in turn leads to actual usage behavior. The reason for this is that people make decisions logically and procedurally based on the information they have. Attitude is the most influential factor in determining one's intention to use e-procurement and that explains why it is important to develop and control users' attitude to ensure successful implementation. This is contrary to the idea that attitude does not influence behavioural intention before implementation stages. Liu and Li (2010) postulate that compatibility is the extent to which an innovation is perceived as being in harmony with existing values, former experiences and the needs of latent users. The researcher thinks that attitude of mobile users is affected by the information they get from people around them. People with little or no knowledge about mobile data services' usage have their decisions about mobile services negatively affected by peer or family members. It is when people are not well informed about the use of technology, that they allow the views of other people to determine their attitude towards a technology.

Okello-Obura (2010), the library users' attitude to information is slowly moving away from printed documents to electronic resources and therefore, it is their prerogative to know in detail the availability and organization of e-resources. The introduction of Open Access Journals (OAJs) and other resources is creating a different attitude toward e-resources. Attitude to access e-resources could be attributed to problems faced in accessing them. When there are inadequate computer technologies to access e-resources or there is poor Internet connections, students' attitude could be negatively affected. A study conducted on Library and Information Science (LIS) students revealed that the majority of them felt that they would under-perform academically without e-resources. This position has been confirmed by some researchers. LIS postgraduate students are divided on promoting OAJs to help in fighting plagiarism of people's intellectual works. However, OAJs would continue to enjoy the support of academic libraries and LIS professionals. Many of them are of the view that a university loses its worth without e-resources. The researcher also shares the same opinion that poor Internet connectivity can negatively affect an individual's attitude using a mobile device to access the Internet.

Mafe et al. (2010), assert that attitude stands for the affective determinant of intention. Attitude mediates between beliefs and intentions. There is a very strong relationship between attitude and intention or behaviour. Personal traits variously impact on a user's readiness to adopt an innovation. Therefore, people with very good innovativeness are more likely to develop favourable beliefs about Information Technology (IT) innovation and adopt it as against people with lower levels of IT innovation. The researcher is however of the opinion that despite one's innovativeness, one's bitter experience in the use of technology can compel him or her to adopt a negative attitude to a technology.

Perceived Ease of Use of the Internet via Mobile Devices

Perceived ease of use is one's evaluation of the degree to which operating an information system is devoid of mental effort. This construct ties to a person's evaluation of the mental effort engaged in using a system. When perceived ease of use is improved, it leads to improved performance. Some researchers have proved the effect of ease of use on

attitude. It must be borne in mind that before users will adopt a technology like the Internet via mobile devices, the technology must be easy to use so that users will develop a positive attitude towards the technology and subsequently use it as indicated by TAM for wireless Internet. Ease of use plays a key role in exploring technology use. A few empirical studies reveal that perceived ease of use plays a key role in determining the adoption of technological innovation. Perceived ease of use impacts a lot on perceived usefulness and intention to adopt a new Information Technology. First adopters of Wireless Internet Mobile Technology saw perceived ease of use as crucial in assessing system's usefulness (Lu et al., 2003).

Frempong (2009) posits that in business, mobile telephony is preferred to fixed line telephony because, it is comparatively easy to access and flexible to use. For example, mobile phones provide ease of subscription and this has led to its popularity as the most versatile technology for economic activities. Riquelme and Rios (2010) also posit that, gender had some effect on perception of ease of use and usefulness but ease of use is more of an issue for females rather than males. Thus, the researcher's view is that, in adopting mobile phones for communication in the world of business, its ease of use is ranked high among consumers. Likewise, more females were likely to use mobile phones to access the Internet because of its ease of use. With relatively very low mental effort, users are able to access the Internet to embark on a good research.

Aboelmaged (2010) asserts that the complexity of a technology discourages its adoption. This construct is a key characteristic of e-business applications, online banking and mobile commerce. Users are particular with the effort needed to operate a technology and its complex nature. A favourable and compelling one's experience is enhanced by perceived ease of browsing, classifying information and performing businesses. A technology is able to enhance one's performance based on how simple it is to use it. This relationship is well grounded on technology framework. Perceived ease of use is key in determining attitude and usefulness which also enhances the acceptance level of e-procurement. This is contrary to previous researches which consider ease of use as an elementary precondition for a system design and should not influence attitude at the advanced level of adoption. However this construct directly influences perceived usefulness and attitude towards use.

Aboelmaged (2010) further expresses the view that when users are unfamiliar with a system, ease of use becomes major in determining attitude and usefulness. Thus 'e-procurement technology should consider increasing the attractiveness of the system by creating e-procurement system that has user-friendly, easy-to-control and informative interfaces, fast web sites access and page down-loads and short transaction times'. Asif and Krogstie (2011) in a study conducted among a group of Norwegian University of Science Technology students at Norway, realized that 89% users of learning resource service were of the view that the service will make it easier for them to focus on their study related resources and assignments, while 85% of student respondents were happy to realize that their learning resource could be found on their mobile devices and expressed the desire to use it and 78% of them found it easy to use. The researcher shares the same view.

Pitt et al. (2010) assert that Smartphones are programmed with an accelerometer that is sensitive to movement and varies the display accordingly and allow the user to 'virtually steer' the device and detect movements such as vibrations. Moreover the latest i-phones have a three-axis gyroscope, which when paired with the accelerometer are able to record accurately the acceleration and rotation rate of users. Also Smartphones have in-built positioning capabilities that enable a user to know his location. Geographical co-ordinates are established with the use of the cellular infrastructure, Wi-Fi networks and Global Positioning System (GPS). With the aid of an accelerometer, a built-in digital compass automatically adjusts the position of maps to correspond with the direction a user is facing. Proprietary development kit and APIs can be downloaded unto Smartphones to play games, do business activities, make restaurant reservations and obtain information up-dates on airline flights. For instance, the car rental Zipcar makes it easy for customers to reserve a car using their downloadable application and to find the actual vehicle without human assistance by going to its precise GPS location and using the i-phone to honk the vehicle's horn, flash its lights and open its doors. The researcher's view is that if users can easily download all sorts of applications to engage in games when accessing electronic (e) materials on the Internet, it could reduce users' stress levels when browsing the Internet, especially when the Internet is very slow. Thus users will develop a positive attitude towards technology.

Bruner and Kumar (2003), when consumers believe that a system is easier to use, they are likely to perceive that it would be more useful because they can direct their efforts and time to engage in other things rather than how to use a system. Similarly, when a system is easier to use, users become very effective and efficient at their use which leads to a lot of enjoyment and fun. Consumers who prefer visual processing will find it easier to use mobile devices to perform tasks such as moving from one piece of information in an interactive manner on the Internet as compared to users who have low visual orientations. From a consumer's point of view, mobile devices vary in respect of their ease of use. Mobile devices are characterized by the fact that they are small, difficult to differentiate between text and graphics and require more effort to enter data. These make mobile devices difficult to use than desk-top computer systems. Thus ease of use depends on the type of devices used to access the Internet. The researcher thinks that there is no positive correlation between a user's preference for visual

processing and his ability to easily use mobile devices. Likewise, how does an individual who focuses on using his mind to see, be enabled to easily use mobile devices to perform a task on the Internet? The two scenarios are different

Liu and Li (2010), complexity is about 'the degree to which an innovation is perceived as relatively difficult to understand and use'. The more complex an innovation is perceived according to Innovation Diffusion Theory (IDT) and Technology Acceptance Model (TAM), the slower the rate of adoption will be. Small screen size and keyboard of mobile phones must be enlarged so as to promote the adoption of mobile Internet. Perceived ease of use is of less or no significance as compared with perceived usefulness. However, during the exploratory stage of technology, ease of use is key to developing IT/IS. Based on these, it is the researcher's view that perceived ease of use is the most primary variable that must be considered in the early stages of the adoption of any IT in relation to perceived usefulness.

Use of the Internet via Mobile Devices

Out of a total of 6,767,805,208 global Internet users, 3,808,070,503 Internet users are in Asia. Internet users have grown from 133,900 in year 2000 to 18,500,000 in year 2009. Pakistan's government encouraged foreign investors to invest in Information Technology (IT) infrastructure and broadband. Despite all efforts, educational institutions do not use and take advantage of the key significance of Internet in their academic and research work. While Internet use is 10.6 percent in Pakistan; it is 32 percent in Iran, 29.21 percent in Saudi Arabia, 62 percent in Malaysia, 86 percent in United Arab Emirates (UAE) and 12.5 percent in Indonesia (Abbasi et al., 2011). Thus, despite the huge investments in IT, if nothing is done to improve its ease of use, users will refuse to adopt mobile devices to use the Internet. Longe et al. (2009) also opine that Africa now boasts of over 50 million Internet users, representing about 5% Internet diffusion rate on the continent. Some parts of Sub-Saharan Africa, particularly West Africa is taking the lead to bridge the digital divide by connecting to other parts of the world through fiber-optic cables. Countries such as Seychelles and Mauritius have benefitted from the advantage of established infrastructure and have been able to rise above teething problems ensuing from ICT spread.

Armah (2010) asserts that, the use of the Internet has enabled many users in Ghana to access the Online Public Access Catalogue (OPAC) and databases. Electronic (e) - mail is used to offer services such as reference services, inter-library loan and document delivery. Through e-mail, there is a much more improved link among academic and research libraries in Ghana. Internet has also improved the exchange of ideas and collaboration among students and researchers. The researcher is of the view that certain factors induced the less use of the Internet in Pakistan, as against Internet use in Ghana and one of these could be the culture of the people which affects their attitude. It is very strange that researchers in the two different parts of the world vary in terms of their level of use of the Internet in accessing e-journals for research work. There is every reason to use mobile devices to access the Internet. Apart from using mobile devices to access materials either in the physical library or virtual library, they could be used for reference services.

According to Advanced Information Technology Institute (2008), a research was conducted in some selected districts of the Central Region in Ghana, with specific emphasis on the fishermen of Moree and it was realized that fishermen used mobile phones to communicate with their agents and customers in order to know where prices of fish were most competitive. In the same vein the librarian could use a mobile device for inter-library loan for effective service. This is because as posited by TAM for wireless Internet, once a librarian forms a positive perception about the Internet via mobile devices for basic services like electronic-mail, Short Messages System (SMS), etc their attitude towards the technology is going to be positive, which will go a long way in adopting such technology for other advanced library services like the OPAC, inter-library loan etc.

Chae and Kim (2003) posit that the Mobile Internet System (MIS) is different from Stationary Internet System. The MIS provides a lesser level of available system resources. Second, there is immediate connectivity which allows mobile Internet use in times of need anywhere and anytime. Third, it is more personal compared to the stationary Internet. These characteristics influence customers' preference for services. In commerce, customers prefer to buy low risk rather than high risk products for several reasons. Users can get low risk products conveniently with minimal search costs. Mobile Internet users consider using SMS services in the communication domain because of instant connectivity and privacy given to them. Also, consumers prefer more individually customized content on the mobile Internet because it gives more privacy than that of the stationary Internet. There is no doubt in the view of the researcher that users of mobile devices would use mobile devices to access the Internet because, it allows a relatively high customization of information and some level of privacy for the user, compared to desktop computers.

Frempong (2009) asserts that in year 2007, in a household and individual user survey in Ghana, it was revealed that the level of use of mobile phones was very high in urban centers than in rural areas. Sixty (60) percent of Ghanaians, whose ages were 16 and above had active Subscriber Identity Module (SIM) cards which they used to communicate. The researcher is thus of the view that, if the University of Ghana acquires a software that allows its students to access materials from its physical library, no matter where graduate students are in Ghana, more of them will use mobile devices to access information for their

research works. Gamos (2009) posits that in the social and business fronts, mobile devices are of great value. They are used to contact people during emergencies. They are also used to access news and entertainment. In Ghana mobile devices are mostly used to access information on remittances and job opportunities. In the view of the researcher, mobile devices could also be used to inform users of UG library when books borrowed from the library are long overdue and if there are some charges; they are made known to users.

Mbambo-Thata (2010), the University of South Africa (UNISA) library offered mobile phone services in the year 2008 to its learners. Since UNISA is an Open Distance Learning Institution (ODLI), its library service has been structured to reach UNISA students irrespective of wherever they find themselves. UNISA uses SMS to get students informed about registration, examinations, assignments and other similar important pieces of information. UNISA library also acquired and used AirPAC, a product of Innovative Interfaces Inc., to customize the website of the library for small screens so that students and staff with web-enabled mobile phones can access the library website, request learning documents, search some databases and generally manage their patron records.

The product was advertised very well through both print and electronic media to its numerous students who lived in the towns and villages and probably had web-enabled phones. A video was used to introduce clients, besides newsletter, posters and presentations to faculty. The library staff were also informed and educated on AirPAC to equip them to effectively introduce their clients to another tool to reach the library. All these were put in place to ensure that users of UNISA library were properly equipped to effectively and efficiently access library materials which was lauded by many. Okello-Obura (2010) posits that, one cannot access e-resources without adequate computer skills. Growth in society's access to information via ICT has changed students' perception of what the library has to offer. If libraries are to preserve their significance in the cycle of needs of students, then they must adapt and change. Students' ability to find and retrieve information effectively is a transferable skill, useful for their future life as well as enabling the positive and successful use of the electronic resources while at school. Some researchers are of the view that in this digital era any student at the higher level, who intends to achieve good results, should have the ability to explore the digital environment by acquiring and practicing the skills necessary to exploit the e-resources. These skills include knowledge of the structure of the database, the instructions that the searcher must enter into the mobile device and an understanding of the way these instructions are linked to one another.

Okello-Obura (2010) continues by indicating that, some researchers have indicated that skills required to access the maximum potential of electronic resources are much greater than those required for searching printed sources. Computer skills give library users a practical understanding of how their computers and printers operate, how to troubleshoot problems, how to locate an Internet website and a host of other technology-based skills that help the library user to be more successful in the technological world. In the opinion of the researcher, users of mobile devices can actually download e-materials which are relevant to their work because they need no special skills in doing that when using mobile devices.

Cummings et. al (2010) is of the view that i-Phone, iPod Touch, most modern BlackBerrys and Palm Pre have merged easy downloading, storing and viewing of PDF documents, Microsoft Office files and spreadsheet formats. Thus, developments in future will aid many users of academic libraries to easily use library services using the handheld mobile computing devices. Also these devices are able to connect to the Internet faster, using Wi-Fi connections than using slower and more expensive cell phone connections. A user that is connecting to an academic library website through a mobile device will most likely have a particular task in mind. These tasks may probably differ a little by institution but include tasks related to the catalog interface. Thus the researcher is of the view that lack of access to appropriate mobile devices affects its use for Internet access, a view which Bruner and Kumar (2003) share.

Research Design

The research design that was used to examine the use of the Internet via mobile devices among graduate students of the University of Ghana was survey research. The reason is that this research design allows the collection of a large amount of data from a sizable population in a highly economic way. The quantitative research approach was embarked upon – this research is sustained by the procedural valuesof positivism and held fast to the standards of stringent research design developed prior to the commencement of the research. It employs quantitative measurement and statistical analysis (Sarantakos, 1993). According to Busha and Harter (1986), it is one of the oldest and widely used methods in the Social Sciences. They further indicated that survey research method is the most widely used for any research work in librarianship. Alreck and Settle (1985) described survey research as comprehensive, versatile and efficient. Survey research provides extensive quantitative data relatively cheaper while broad generalization can be made from comparatively smaller number of observation as long as probability sampling methods are used (Blumer and Warwick, 1993).

Selection of the Case

The researcher decided to select UG as the study area because it is the first among all public Ghanaian Universities to be established in Ghana and as a result the findings of this

research could fairly be applied in other Universities in Ghana. The compositions of students in UG are Diplomats, Undergraduates and Post-graduates students but the researcher decided to make post-graduates his unit of study because among the three groups of students, graduate students are used to academic research, hence the decision of the researcher to make graduate students his unit of study.

Population of the Study

The population for the study is graduate students of the University of Ghana, a homogeneous group, whose population in year 2009/2010 stood at 2,876 (University of Ghana Basic Statistics, 2010). Koul (2001) postulates that population is a group of human entities and non-human entities like objects and institutions of learning. Population parameter is the type of population which the researcher wants to investigate. A group could be a sample as well as a population at a given time. Sometimes researchers prefer to study the whole group of interest to them, which is a difficult thing to do. Populations that attract attention are mostly bigger, varied and scattered over a vast territorial area. Finding out and reaching out to the entire units of a population can be time-consuming and expensive. This explains why samples are chosen to study.

Sample Size

A sample size is a small unit of a population that is chosen to study and analyze; that is, a sample is a subset of a population, selected to represent that population. The main goal is to get a representative sample or a small collection of units from a much larger collection or population, study the smaller group and produce accurate generalizations about the larger group. The right sample size depends on the nature of a population and the purpose of a study. Large samples become more representative of a population thereby making the results more reliable and valid (Nwana, 1982). Thus some members of a population constitute a sample. The quest for research has created the need for an efficient method of determining the sample size to represent a given population (Krejcie and Morgan, 1970).

Khan (2006), there is various ways of determining the sample size needed to achieve representativeness for a given population. One is to select a minimum of 10% of the population. This view is shared by Alreck and Settle (1985) who expressed the view that, occasionally it was necessary to have a more than 10% sample of a population for confidence building, provided that the resulting sample was less than approximately 1,000. Therefore, for a 1,000 unit population, an experienced researcher may decide to make do with 10% sample size. For a 5,000 population, the least sample size may be 100 and the maximum may be almost 500, or 10%. Thus, for a population of 2,876, a 10% sample size was chosen for this study.

Sampling Technique

Convenience sampling was used for the study. In convenience sampling, all the subjects for the study that the researcher happened to meet were considered. The process was continued until the required sample size was obtained. The issue about convenience sampling is that subjects who can easily be reached might vary from the usual population with regard to the significant variables to be measured. Thus, they do not represent the entire population. Nonetheless, in researches where convenience sampling is used, less emphasis is placed on representativeness (Sarantakos, 1993). According to Neuman (2007), convenience sampling is simple to construct, evaluate, cheap and gives quick results. Subjects for the study were not available at a go, so the researcher selected respondents who were available at the UG graduate school ICT center and were willing to participate in the study. When a student hinted that he was a graduate student, he automatically qualified to take part in the research work by way of answering a questionnaire. The reason being that all graduate students whether in year one, two or three are seriously engaged in assignments and formal research works, which are key components of graduate academic work.

Instrumentation

In information science research, various data collection instruments are used. These data collection instruments consist of questionnaires, interviews, observations etc. Each instrument has its strengths and weaknesses (Aina, 2002). The desired level of data accuracy and relevance, economy of resources, efficiency and completeness informs the actual technique to use. In this study, questionnaire was used to collect data. According to Stark and Roberts (1996), a questionnaire is a formally ordered outline of questions presented in a uniform way to a number of persons. The questionnaire was used because it was hoped that the questions would represent both facts and opinions which have many advantages. Fraenkel and Wallen (2000) posit that, survey questions should be measured by four main standards. They are 'Is this a question that can be asked exactly the way it is written?'; 'Is this a question that will mean the same thing to everyone?'; 'Is this a question that people can answer? and 'Is this a question that people will be willing to answer, given the data collection procedures?.' 'Yes' should be the answer to each of the above questions. If any of the standards is violated in a survey questionnaire, then the questionnaire should be rewritten. These standards were the basic guide for the designing of the questionnaire used in this study. To most respondents questionnaires are very popular and convenient. The application of questionnaire minimizes bias and undue influence from both respondents and researcher.

The questionnaire had five sections which were captioned under the following: Section A was on attitude of

graduate students towards the use of Internet via mobile devices, which covered variables such as mobile devices used by graduate students, how long mobile devices have been used, whether students would like to use mobile devices to access the Internet, what students use the Internet for among others. Section B dealt with perceived ease of use of Internet via mobile devices, which also covered variables such as whether it was easier to access the Internet via mobile devices. Section C was on actual use of Internet via mobile devices, which looked at variables such as how often the Internet is used via mobile devices, the benefits derived thereof among others and finally Section D dealt with challenges students face in using mobile devices to access the Internet and the variable looked at included obstacles to the use of mobile devices in accessing the Internet which comprised screen size, slow transmission speed, memory capacity etc.

The questionnaire contained both closed-ended and open-ended questions. Both types of questions have their strengths and weaknesses. Closed-ended questions are easy to administer and analyze and a researcher needs to tabulate the number of responses to each alternative in order to understand what the respondents think about an issue. Respondents are usually less willing to create a written response than to simply 'check off or circle the right alternative' (Fraenkel and Wallen, 2000).In open-ended questions subjects can reply as they like and they are not limited to a single alternative. Also, responses are constructed and written by respondents. The major benefits of open-ended questions are that respondents have the liberty to reveal their attitudes and motives and to qualify or explain their answers. Open-ended questions are richer and complete in response. The questionnaire was used as an instrument for the study because of the large sample size that the researcher had to deal with, for in 10 minutes, a respondent could complete a questionnaire. Also, it was less expensive to administer and it offered great anonymity.

Mode of Data Collection

The researcher administered the questionnaires at the ICT Center at the graduate school. This was because it was not easy to identify a graduate student among all other students. Besides, they were fewer in terms of numbers and scattered all over the campus, making it difficult to easily come across one. The researcher politely approached graduate students upon their arrival at the Graduate School and requested for their assistance to enable him collect data on the use of the Internet via mobile devices among UG graduate students. The respondents were also assured of confidentiality and as a result, many of them accepted to answer the questionnaires immediately, while others took them away and promised to give them to the ICT attendant at the graduate school for collection. Thus the researcher gave a questionnaire to each student who accepted to participate in the study, until the two hundred and eighty-eight questionnaires were all exhausted. Some declined to participate in the study, citing reasons as being busy with their assignments and no time to waste. After one week, students were no longer visiting the Graduate School ICT center frequently to access the Internet so the researcher went back to the attendant to collect the returned questionnaires. This was because the second semester examinations were very close at the time, so it was difficult getting them at the Graduate School ICT center. The researcher therefore arranged with six students; two assigned to each of the three main Graduate Hostels namely: Legon Hall Annex C, Valco Hall Phase 1 and Phase 2, to administer the questionnaires in the halls.

The researcher then trained the six students to administer the questionnaires in Legon Hall Annex C, Valco Phase 1 and Valco Phase 2, in an attempt to collect the data in time before students go on vacation. The research assistants therefore approached potential respondents in the graduate halls of residence and explained the purpose of the study. They also assured them of confidentiality and were civil towards them, so that they would freely provide the much needed information for the research. Some students readily answered the questions and gave them back to the research assistants immediately, while others kept them close to two weeks. The research assistants went back to collect the rest of the data each day of the week. In all two hundred and eighty-eight questionnaires were distributed to the subjects of this study but two hundred and forty-four questionnaires were received.

Method of Data Analysis and Presentation of Results

The data was analyzed by the use of the Statistical Package for Social Sciences (SPSS). The best tools to summarize the data and create the right tables, graphs and evaluate the relationships among variables are the computer and the SPSS package (Tagoe, 2009). The results were presented in tables showing frequencies and percentages. The presentation of results was done in line with the stated objectives as follows: attitude of graduate students towards the use of the Internet via mobile devices; perceived ease of use of Internet via mobile devices by graduate students; level of use of Internet via mobile devices by graduate students; challenges in the use of mobile devices for Internet access and recommendations to enhance the adoption of the Internet via mobile devices.

Problems Encountered and Limitations of the Study

Some students were not ready to give the researcher their attention and some gave very rude remarks on approaching them but the researcher ignored the comments. On many occasions the researcher had to call some respondents, just to collect data from them but they kept postponing the time. Finally, the researcher arranged with respondents as to when to meet them. On one occasion, the researcher had to stay on

campus till 11.00 p.m to collect data. Generally, the results of the data was not affected in anyway because, all graduate students whom the researcher interacted with, had at least one mobile device or the other, which they used to access the Internet.

Gender of Respondents

As part of the background information, the researcher tried to find out the gender of the respondents. The results revealed that 151 representing 61.9% of the respondents were males as compared to the females who were 93 representing 38.1% of the total sample for the study.

Table 1. Gender use of Internet via Mobile Devices

Use of Internet via Mobile Devices	Males		Females	
	Frequency	Percent	Frequency	Percent
Yes	102	67.5	65	69.9
No	49	32.5	28	30.1
Total	151	100	93	100

Source: Field work, 2020**.**

From Table 1, it was revealed that out of the 244 respondents, 102 (67.5%) of male graduate students used mobile devices for Internet access while 49 (32.5%) did not. As regards the female graduate students, it was revealed that 65 (69.9%) used the mobile devices for Internet access while 28 (30.1%) did not. The data shows that the number of female respondents who use the mobile devices for Internet access is slightly more than the number of male respondents who use the mobile devices for Internet access. One potential reason for more female respondents could be that females are more likely to be interested in the usage and acceptance of mobile devices as established by Banda (2011) that more females used mobile phones than males.

Level of Students

The level of graduate students was sought to determine the number of academic years the students had spent so far in school. From the responses gathered from the respondents as indicated on Table 4.2, it was revealed that 184 (75.4%) of the graduate students were in their second year of study (these were the total number of MPHIL, MBA and MPA students).58 (23.8%) were in their first year of study (these were the MA students), while 2 (0.8%) of the graduate students were in the third year of study (these were the PHD students). This shows that the majority of the graduate students were in the second year of study.

Programme of Study and Faculty of Graduate Students

The researcher identified the relationship that existed between the programme of study and the faculty which graduate students were. The following are the results in Table 4.2.

Table 2: Programme of Study and Faculty of Graduate Students

Programme	Faculty				
	Arts	Science	Social studies	Business School	Total
MA	15 (40.5%)	3 (7.1%)	40 (42.6%)	-	58(23.8%)
MPHIL	20 (54.1%)	38 (90.5%)	49(52.1%)	6(8.5%)	113 (46.3%)
MBA	1(2.7%)	-	2 (2.1%)	63 (88.7%)	66 (27%)
MPA	-	1 (2.4%)	2 (2.1%)	2 (2.8%)	5 (2%)
PHD	1 (2.7%)	-	1 (1.1%)	-	2 (0.8%)
Total	37 (100%)	42 (100%)	94 (100%)	71 (100%)	244 (100%)

Source: Fieldwork, 2020

Table 2 shows the programme of study and faculty of graduate students. The MA graduate students in Arts, Science and Social Studies were 15 (40.5%), 3 (7.1%) and 40 (42.6%) respectively. In addition, the MPHIL graduate students in Arts and Social Studies faculty were 20 (54.1%) and 49 (52%) respectively. This means that the MPHIL students belonging to the Social Studies faculty were more than those in the Arts and Science faculties.

Use of Internet via Mobile Devices

The respondents answered the questions about their attitude towards using the Internet via mobile devices. These questions were asked to determine the type of devices used and duration of mobile device usage.

Table 3. Mobile Devices Used by Graduate Student

Mobile devices used	Frequency	Percent
Ipod	23	9.4
Ipad	18	7.4
I-phone	24	9.4
Mobile phone	161	66.0
PDA	7	2.9
Laptop	6	3.4
Mobile phone and Laptop	4	1.6
Palmtop	1	0.4

Source: Field work, 2020.

From Table 3, it was revealed that 161 (66.0%) of the graduate students used the mobile phone as a mobile device. This could be as a result of the positive perception and attitude they had developed about the usage of the mobile phone after using it over a period, which is what TAM postulates. Among the other mobile devices, 23 (9.4%) of the respondents use iPod while 24 (9.8%) of the respondents mentioned i-Phone as the type of mobile device they use. It was clear that the mobile phone was the dominant mobile device used by the graduate students. The study also sought to know the number of years that the respondents had used the mobile devices and it was revealed that 112 (45.9%) respondents had used the device (s) for between 7-9 years, 36 of the respondents representing 14.8% had used the mobile device(s) for over 10years and above. Only 33 (13.5%) of the graduate students had used the mobile device(s) for just between 1-3 years.

Table 4. Duration of Use of Mobile Devices

Duration	Frequency	Percent
1-3 years	33	13.5
4-6 years	62	25.4
7-9 years	112	45.9
10 years and above	36	14.8
Total	243	100

Source: Field work, 2020.

The results in Table 4revealed that most of the graduate students of University of Ghana, Legon had used mobile devices for quite a long period of time. Furthermore, the respondents were asked by the researcher about whether they liked accessing the Internet via the mobile devices they used. In response, the majority 182 (74.6%) affirmed that they use mobile devices to access Internet services. However, 62 representing 25.4% stated that they do not use mobile devices to access Internet services. Reasons were sought as to why respondents accessed the Internet via mobile devices.

Table 5. Accessing the Internet via Mobile Devices

Reasons for accessing the Internet via mobile devices	Frequency	Percent
It is flexible	9	3.6
Easy access	28	11.5
It is convenient	30	12.3
It is fast	16	6.6
It is hand/portable and mobile	34	14.0
It saves time	11	4.5
It is user friendly	15	6.1
Good connectivity	26	10.6
It is affordable	13	5.3
No response	62	25.4

Source: Field work, 2020.

From Table 5, it is clear that most of the respondents 30 (12.3%) out of the population sampled for the study, used Internet via mobile devices due to its convenience. Since it is convenient to use the Internet via mobile devices with little mental effort, users must have developed a positive attitude towards its use and subsequently adopting it. Configuration of mobile devices for Internet access was sought. The data shows that 132 students representing 54.1% had configured their mobile devices for the use of the Internet service while 112 graduate students representing 45.9% indicated that their mobile devices had not yet been configured for the use of the Internet. The findings show that majority of the graduate students had configured their mobile devices for Internet accessibility. The impression created here was that, the Internet usage via mobile devices was high among the graduate students.

Table 6. Use of Internet by Graduate Students

Internet use	Frequency	Percent
Access information	11	4.5
Entertainment	9	3.7
Sports	8	3.3
Check mails	7	2.9
Facebook	14	5.7
Research work	71	29.1
Access information, emails and face book	10	4.1
Access information, entertainment, sports, emails and face book	17	7.0
Entertainment, sports and emails	2	1.0
Access information, emails and research work	9	3.7
Access information,, sports, emails and research work	6	2.5
Access information, sports, emails and face book	7	2.9
Emailing and face booking	6	2.4
Sports, emails and research work	42	17.2
Access information, entertainment, sports, emails, research work and face book	25	10.2

Source: Field work, 2020.

In order to understand what the graduate students use the Internet for, 71 (29.1%) of the respondents indicated that they use the Internet for research works, 42 (17.2%) respondents said they use the Internet to read sports news, check mails and send mails, 17 (7.0%) use the Internet to access information, entertainment, sports, check mails and face book. This is an indication that majority of graduate students use the Internet via mobile devices for their academic pursuits.

Reasons for Use of the Internet via Mobile Devices

Responses by the graduate students revealed the following as their perception of the ease of use of the Internet via mobile devices. Concerning the ease of use of the Internet via mobile devices, 165 (67%) of the respondents affirmed it was easy to use while 35 (14%) of them thought otherwise. Based on the view of the majority, it can be said that using mobile devices for Internet access was easy.

Table 7: Reasons for Using Internet via Mobile Devices

Reasons for using Internet via mobile devices	Frequency	Percent
Portability	46	27.8
User friendly	24	14.6
Faster	11	6.7
Convenience, portability and Faster	19	11.5
Convenience	20	12.1
Portability, User friendly and Faster	27	16.4
Faster and enhances academic prospects	18	10.9
Total	165	100

Source: Field work, 2020.

It could be observed from Table 7 that portability of devices was seen as the main reason why the students used mobile devices as it constituted 46 (27.8%) of the various reasons given by the students for using mobile devices. Again, user

friendliness came second as a reason why the students used mobile devices with 24 (14.6%) of the respondents indicating so. Students use the Internet via mobile devices for their academic pursuits mainly because of the portability and user-friendliness of Internet usage via mobile devices which leads to the development of a positive attitude among users and the subsequent adoption of the technology. Faster and convenience in using the devices were given as the rest of the reasons for using the devices, with faster representing 11 (6.7%) and convenience representing 20 (12.1%) respectively.

Access to Internet via Mobile Devices

People want more specific information when they are mobile. Therefore, the content and service people used to access the Internet may be quite different from those used when they are in a fixed location. The ultimate value of using Internet via mobile device is to get the required content and services by taking advantage of their portability and accessibility (Goldman, 2000). Table 4.8 depicts the individual responses.

Table 8. Access to Internet via Mobile Devices

Remarks	Access to Internet		Access to academic information	
	Frequency	Percent	Frequency	Percent
Very easy	18	7.4	20	8.2
Easy	86	35.2	100	41.0
Somewhat easy	59	24.2	57	23.4
Difficult	24	9.8	20	8.2
Very difficult	8	3.3	1	0.4
Total	195	100	198	100

Source: Field work, 2020.

It can be observed that 86 (35.2%) of the respondents found it easy to access the Internet via the mobile devices while 59 (24.2%) of the respondents found it somewhat easy. Again, Table 4.8 shows that most of the graduate students of the University of Ghana use the Internet through their mobile devices to access academic information for their various studies. It could be observed that 100 (41%) of the respondents found it easy to access academic information from the Internet via their mobile devices. This could be attributed to the research-oriented nature of their study. Furthermore 57 (23.4%) of the respondent found it somewhat easy to use the Internet via mobile devices to search for information for their academic works.

Types of Mobile Networks Used

In Ghana, there are five networks available to every citizen to choose from. The researcher thus sought to know which of the networks respondents were using in accessing the Internet via mobile devices.

Table 9. Types of Networks Used

Mobile Networks Used	Frequency	Percent
Tigo	17	7.0
MTN	122	50.0
Vodafone	24	9.8
Airtel	18	7.4
Expresso	1	0.4
Tigo and MTN	12	4.9
MTN and Airtel	13	5.3
Airtel and Tigo	1	0.4
Vodafone and Airtel	4	1.6
Vodafone and Tigo	15	6.1
Expresso and Tigo	17	7.0

Source: Field work, 2020.

Table 9 shows that all the respondents were using all the five networks available in the country. For the purpose of this research, it can be said that majority (50%) of the respondents use MTN for browsing the Internet via mobile devices.

Frequency of Internet Use via Mobile Devices

One of the objectives of the study was to find how often respondents used Internet via mobile devices. With this objective, the researcher wanted to know the frequency of Internet use via mobile devices by graduate students. Responses received are shown in Table 4.10.

Table 10. Frequency of Internet Use via Mobile Devices

Frequency of Internet use via mobile devices	Frequency	Percent
Daily	97	39.9
Weekly	42	17.2
Few times in a month	19	7.8
Few times in a year	8	3.3
Total	166	100

Source: Field work, 2020.

Table 10 shows the frequency of the Internet use via mobile devices. Out of the total population sampled, 97 (39.8%) use the Internet via mobile devices daily, 42 (17.2%) use the Internet via mobile devices weekly, 19 (7.8%) use the Internet via mobile devices a few times in a month while 8 (3.3%) of the respondents indicated that they use the Internet via mobile devices, a few times in year.

Benefits Derived from Using Internet via Mobile Devices

Mobile devices, especially cell phones, have experienced three-generation in development. The first generation provided the ability of mobile phone communications. The second generation improved the reception and enabled a range of sophisticated services to be offered by using the Global System for Mobile communications (GSM). The third generation offered wireless Internet access by using GPRS (General Packet Radio Service). With GRPS, data transmission speeds will expand from 9.6 or 14.4 kbps in the GSM system to the current 115 kbps (Kenyon and Perkins, 2000). It can support a wide range of services ideal for mobile users, including unified messaging, e-shopping, location-based, and time critical services (Dornan, 2001)). With the huge mobile subscriber base in China and the long habit of using mobile phones in various business activities, the potential for m-commerce is tremendous. Based on the objectives of the study and the assertions made by Kenyon and Perkins and Darrow and Harding, the researcher wanted to know from the respondents the benefits they derived from using the Internet via mobile devices.

Table 11. Benefits of Internet Use via Mobile Devices

Benefits	Frequency	Percent
Broadening Knowledge	51	20.9
Convenience of search	92	3707
Broadening of knowledge and quicker access to information	2	0.8
Broadening of knowledge and wider access to information	2	0.8
Convenience of search and wider access to information	97	39.8

Source: Field work, 2020.

Table 11 shows that 97 (39.8%) respondents indicated that benefits derived from using mobile devices for Internet services was the convenience of search and wider access to information. In addition, 92 (37.7%) claimed that the mobile devices were used to access Internet services because of the benefit of convenience in searching. Again, 51 (20.9%) of the respondents indicated broadening knowledge, as the benefit of using mobile devices for Internet services.

Conclusions

This study examined the use of the Internet via mobile devices among graduate students of the University of Ghana, Legon, based on TAM for wireless Internet in order to explain the perceived usefulness, perceived ease of use, attitude and technology adoption within this conceptual frame-work.

The study's conclusion is that the TAM for wireless Internet should be applied to all graduate students' programmes because the use of the Internet via mobile devices has a unique role to perform in the UG educational system and should therefore be adopted as tools for learning. It was also concluded that the mobile service providers must provide better services to encourage more students to use mobile devices to access the Internet for academic pursuits or to search for information to supplement lecture notes. The study also realized that almost all the graduate students used one type of mobile device and were aware that they could be used to access the Internet for several purposes.

The study finally concluded that Network Service Providers must improve upon service delivery. For instance, if the network providers could improve on their transmission speed, memory capacity of their infrastructures and reduce

cost of service etc, students would develop good attitudes and finally adopt their services. The use of mobile devices for accessing the Internet by the graduate students of the University of Ghana needs to be considered.

Recommendations

Finally, in pursuance of the research objectives, the following recommendations were made based on the findings of the study.

Enhanced Transmission Speed

One main reason why students will opt for the Internet to access information rather than going to the library is the faster transmission rate that comes with the Internet. The Internet is seen as a faster source from which information could be sought by students for their academic works. There is therefore the need for all the service providers to expand their broadband to accept more data transfer at the most fastest speed. Network providers should therefore endeavour to ensure that there is constant and faster internet transmission speed. This will help students to develop positive perception and finally adopt their services.

Subsidized Cost of Internet Access

Access to information is one of the fundamental rights of every Ghanaian including the graduate student as postulated in the 1992 Constitution. As a result, no person should be denied information because of his/her economic status. Internet Service Providers should provide services at lesser or no cost to enable students have easy access to academic information. This could be done by creating a platform on their websites or any other appropriate medium where students could subscribe to services specifically aimed at them.

Constant Upgrading of Internet Infrastructure by the Service Providers

A major challenge of Internet to Network Service Providers is the use of obsolete infrastructure. There is constant invention of IT infrastructure which renders the current ones obsolete within the shortest possible time. Since this comes at a cost, most Service Providers fail to upgrade their systems which also go a long way to affect their services. Service Providers should therefore as a matter of policy ensure that they are abreast of the current innovations in the industry so as to offer the best to their customers. If this is done, it will help customers (in this case the graduate students) to develop a positive attitude towards their services and finally adopt them as alluded to by TAM for wireless Internet.

Provision of Variety of Products and Services

Most times, people are satisfied when there are variety of products and services for them to choose from. The various Service Providers should make available to customers variety of services and products. For instance, Service Providers like MTN and Vodafone have a product like blackberry phones which support a lot of services like downloading and quicker surfing of the Internet. When this is done, students or the customers will have access to products they like and not just what is available.

Partnership between Network Providers and Manufacturers of Mobile Devices

Producing goods and services that meet the requirements of customers is one of the main aims of production companies. In their efforts to provide services that best serve their customers, the various Internet Service Providers could enter into partnership agreements with the manufacturers of these mobile devices so that they provide products that best serve the interest of their customers. In this case, the Service Providers could state the size of the memory of the mobile devices they want for their users and even customize them to suit the kind of services they will provide.

Use of Mobile Devices in Teaching and Learning at the University of Ghana

Teaching and learning through the use of mobile devices have proved to be effective as students can submit assignments, access the library, etc even when they are not on the premises of the university. It is therefore recommended that UG authorities should consider the introduction of the use of the Internet via mobile devices in teaching and learning at all levels of the University for effective and easy access to information anywhere at any time.

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