

# Integrating Information and Communication Technology in Education: Accessibility, Reliability and Convenience in Tertiary Institutions in the Upper West Region of Ghana

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**Abstract:** The zeal to integrate the internet and other information technologies in tertiary educational practice has now gained a paramount importance in Ghana. Most of the tertiary institutions have been providing internet connectivity and other Information and Communication Technology (ICT) facilities to their students to aid academic work in order to enhance academic performance. However, these ICT facilities are not effectively integrated into the teaching and learning environment. Consequently, this study assessed the availability, accessibility and ease of use of internet and information technology equipment in tertiary institutions in the Upper West Region of Ghana. In total, 481 respondents from three academic institutions took part in a survey conducted through systematic random sampling technique. The study revealed that students access to the internet and ICT facilities have serious challenges such as internet unreliability and inadequate ICT equipment. Finally, the study recommended improvement in internet facilities and increased bandwidth subscription.

**Keywords:** Information and Communication Technology (ICT), Upper West Region of Ghana.

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## 1. INTRODUCTION

The integration of Information and Communication Technology (ICT) in education is now a common practice. Higher educational institutions globally have increasingly adopted ICT as tools for teaching, curriculum development, staff development, and student learning (Attuquayefio&Addo, 2014; Kumpulainen, 2007; Usluel, As\_kar, & Bas\_, 2008). While some institutions mount ICT as a programme of study, others learn it as minor courses of computer literacy or computer application. The important aspect of these programmes is that every institution of higher learning recognizes the importance of ICT in the training of their students. This is because ICT offers opportunities for enhancing strategic teaching and learning. In higher institutions, learning is expected to be blended in nature where a student can assess both the library and other external resources of the institution at the comfort of their homes. This is observed in the curricula and installations of ICT infrastructure, capacity building programmes, and acquisition of computer literacy skills by both staff and students. ICT has dramatically reshaped teaching and learning processes in higher education (Pulkkinen, 2007; Wood, 1995) and its integration in education is more critical than before. ICT brings a change in learning environments available for education (Pajo& Wallace, 2001). The use of ICT offers powerful learning environments and can transform the teaching and learning process so that students can deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001; de Corte et al., 2003). It is considered as an important means to promote new methods of instruction in teaching and learning as it is used to develop students' skills for cooperation, communication, problem solving and lifelong learning (Plomp et al., 1996; Voogt, 2003). So, educational institutions maintain their relevance, training and academic standards in this technology-driven world by adopting Information and Communication Technology (ICT).

Ghanaian higher institutions like any other higher educational institutions elsewhere have adopted ICT. One major step of ICT adoption is the establishment of ICT Directory to provide policy direction and oversee ICT installations in the institutions. Among the major achievements in this direction are the establishments of computer laboratories and ICT centres provided with cable and wireless internet and intranet installations. Some offices are furnished with ICT equipment and are hooked to internet infrastructure. However, the state of these ICT installations and their usage has not been ascertained. The study of Brain and Leon & Rotunda (2007) confirms this by stating that the results of frequent Internet use, particularly among students, has become a highly controversial issue. The study explains that there is no consensus on what exactly the internet is used for among a targeted group of people. This, according to the study is probably due to the limited amount of research on the subject. Indeed, integrating ICT in higher education in Ghana has been bedeviled with similar controversies and damning challenges which have been evidenced by Seymour Goodman et al. (2004) that over 1000 Internet cafés in Ghana provide Internet without adequate computers, a phone line, or a subscription to an Internet Service Provider. The unavailability and poor state of internet facilities coupled with inadequate ICT equipment does not give enough room for students to have full access to the technologies. Students on many occasions are sighted lurking on particular locations within campuses just to access internet facilities and equipment. Again, they are forced to rely on congested internet cafés in and outside campus for their research and studies which wastes their precious time. The poor situation is reported to have contributed to the fall in students' performance of late. Consequently, students complete their institutions with ICT skills that do not make them employable in ICT related jobs on the market. This study therefore seeks to analyze the level of internet accessibility and reliability as well as the barriers that hinder the effective use of ICT equipment in tertiary institutions in the Upper West Region of Ghana. Further, it explores the convenient utilization of the internet and other ICT installations in the institutions. It is important to explore these factors because they are key for effective adoption of ICT for academic activities such as teaching, learning and research.

## 2. THE IMPORTANCE OF ICT INTEGRATION IN EDUCATION

Information and Communication Technology (ICT) in schools in Ghana has operational history with real commitment by the development of the national ICT for Accelerated Development Policy in 2003. This unveiled the use of ICT pervasively in Ghana and the number of computers for educational purposes increased in Ghanaian institutions.

The importance of ICTs in every country's developmental plan cannot be over emphasized. Information and Communications Technology (ICT) has been identified as a significant tool to be used in the delivery of quality education. ICTs present a revolutionary approach to addressing developmental questions due to their unequalled capacity to provide access to information instantaneously from any location in the world at a relatively low cost. The resulting new interconnected digital world heralds a fluid and seamless flow of information, capital, ideas, people and products. With the convergence technologies, information availability is no longer restricted to text and hardcopy but includes real-time audio and video data. Information and Communication Technology (ICT) no doubt has positive impact on its application domain. It is widely used by academics and non-academics in carrying out their daily activities to enhance efficiency and increase productivity. Technology offers opportunities for enhancing strategic learning (Lopez-Nicolas & Soto-Acosta, 2010). The potential of all individuals including the challenged could be enhanced by the use of multimedia packages and other electronic learning tools.

ICTs potentially provide equal opportunities to access the full cycle of education in Ghana. Equitable access to quality of education hinges on the quality of teaching and learning for enhanced student achievement and research programmes (ICT in Education Policy, 2002). When ICT is properly integrated into the school system, teaching and learning activities are enhanced. For instance, the internet which is referred to information super "high way" provides teachers and learners access to rich information beyond the local school environment.

The rapid integration of ICT in higher education has transformed human society from the information age to knowledge age (Hamilton-Ekeke & Mbachu, 2015). The effective usage of Information and Communication Technology by students is a necessity to improve the quality of learning in any tertiary institution. Consequently, the use of ICT in schools by students is a necessity to improve the quality of learning in any tertiary institution.

ICT plays a critical role in the fabric of every institution. It is heavily deployed in the teaching and learning process, in research and even in rendering community service. Internet creates real life context among the players in education as it strengthens teaching and learning, provides powerful resources and services for students, thereby enabling them meet their

educational needs (Hamilton-Ekeke & Mbachu, 2015). Social and educational networking is very important in creating knowledge among teachers and students by facilitating exchange of ideas and providing opportunities for both staff and students.

The potential of ICT to improve all aspects of people's lives is no dissenting argument. Everyone in one way or the other has something to do with the use of computers, the internet, and other telecommunication technologies. The deployment of ICT in the delivery of the core services of teaching and research by institutions has undoubtedly changed the way higher education is executed (Ololube, Kpolovie & Makewa, 2015).

ICTs can help to make schools less stressful workplaces for both teachers and students and its effective integration and use guarantee workplace success. According to Kpolovie & Awusaku, (2016), ICTs are important components in education and their lack leads to a lack of confidence in integrating them into the teaching and learning process. (Kpolovie & Awusaku, 2016) established that simply having ICT in schools will not guarantee its effective use. In spite of the quantity and quality of technology installations in schools their usefulness is realized only when the teachers and students make effective use of them.

### **ICT accessibility and convenience in higher education:**

Kpolovie and Awusaku (2016), opines that ICT accessibility is the ability to access the functionality and possible benefit of some system or entity. ICT accessibility is about making sure services and information can be used by a wide range of people (Kpolovie & Awusaku, 2016). It is also about adjusting computer equipment to enable users to be more productive.

ICT accessibility is also the degree to which ICT is easily reached by many authorized people as possible. Kpolovie & Iderima, (2016) defines accessibility the ability to right of entry and the actual frequent application of that ability in utilizing the functionality and possible benefits of ICT tools, facilities, systems or entities. This means that ICT accessibility is the right of entry and ease of use of ICT infrastructure and resources.

This right of entry and use of ICT infrastructure and resources in schools is a necessary condition to the adoption of ICT in Education. Effective adoption and integration of hardware and software facilities into teaching and learning transactions and research engagements in universities and other tertiary educational institutions is indispensable for quality education delivery (Kpolovie & Iderima, 2013; Ololube, Kpolovie & Makewa, 2015; Kpolovie & Obilor, 2013a; 2013b; 2013c; 2014).

The impact and effectiveness of ICTs rest on the extent to which end-users: learners, teachers, managers and administrators have access to energy, hardware, software and connectivity. For e-Learning to be successful, learners must have regular access to reliable infrastructure. Kpolovie & Awusaku (2016) reported that ICT facilities are significantly more accessible in the Federal university in Nigeria. Obviously, if teachers cannot access ICT resources, then they will not use them. Therefore, access to computers and updated software are key elements to effective adoption and integration of ICT in higher institutions of learning. Accessibility barriers occur when the design of ICT fails to allow for variation in users' abilities.

A study conducted using four Federal Unity Schools (FUS) in South Eastern Nigeria revealed that majority (66%) of the students never had access to ICT usage (Kpolovie & Awusaku, 2016).

This evidence supports the work of Abdulkai (2004) who found a positive connection between educators' attitude towards ICT and proprietorship or school ownership and availability to class ICTs, the level of accessibility and number of ICT areas in the school. He also inferred that there was a noteworthy relationship between the proximity of ICTs and attitude towards ICTs.

Shooman defines reliability as the probability of no failure within a given operating period. The reliability is the probability that there are zero failures in trying to make use of the system (Shooman, 2002). Reliability is able to be trusted to do something that is expected or able to be trusted to be accurate or provide correct result. It is about is the probability of no failures in an interval.

Convenience can be defined as users' time and effort cost associated with accessing a resource. Therefore, ICT users' convenience can be defined as users' time and effort cost associated with accessing ICTs in an ICT integrated environment. It is the quality of being or making things easy, useful, or of increasing comfort. It is about a software or hardware that makes life easier or more comfortable, especially a labor-saving tool. Studies reveal that ease of use influences teachers' decisions to use ICT in the classroom.

### Obstacles to ICT integration:

Technology adoption in higher institutions of learning is often poorly implemented (Attuquayefio & Addo, 2014) and many faculty members are reluctant to integrating technology in teaching tasks (Jacobson, 1998). Attuquayefio and Addo (2014) and Becta (2004) observed that there are myriad of obstacles that affect ICT integration in educational institutions. One major problem facing ICT in higher education is inadequate modern infrastructure and equipment. The ICT facilities needed to enhance effective teaching and learning pose a very serious limitation in many universities in Ghana (Edumadze & Owusu, 2013). ICT tools and resources such as laptops, speakers, projectors, and reliable internet connectivity are still not in abundant supply in the public universities in Ghana. When it comes to the availability of such tools and resources, the students are the worst hit victims (Abaidoo and Arkorful, 2014). According to Barkar & Su-Luan et.al (2009) the efficient and effective use of technology depends on its availability and equity of access to resources by teachers, students and administrative staff. This inadequacy makes it difficult for staff and students to derive the accompanying benefits of integrating ICT in the school system. The Ghanaian universities lack infrastructure, affordable and sufficient bandwidth, and the human resource capacity to exploit the technology. This makes Ghanaian universities lagging behind in the global ICT context (Abaidoo and Arkorful, 2014).

Attuquayefio and Addo (2014) study summarized the obstacles to technology adoption as:

A summary of various obstacles identified by different researchers is provided in Table 1.

**Table 1: Tabular summary of the obstacles to ICT adoption**

Obstacles Identified	Authors
Technology unreliability	Butler and Sellbom (2002)
Lack of access to computing	Fabry and Higgs, (1997); Ertmer, (1999), Guha, 2000; Mumtaz, 2000; Preston et al., (2000); Pelgrum, (2001); Snoeyink and Ertmer (2001), (Bosley and Moon, 2003; Becta 2005
Uncertainty about its worth	Butler and Sellbom (2002)
Lack of institutional support	Cuban et. al (2001);Chizmar and Williams (2001); Snoeyink and Ertmer, 2001); Butler and Sellbom (2002)
Lack of financial support	Chizmar and Williams (2001),
Lack of Training	Veen, (1993); Wild, (1996), Simpson, Payne, Munro, Hughes, & Lynch; (1999); Kirkwood, Van Der Kuyl, Parton, & Grant, (2000); Preston et al., 2000

Adapted from Attuquayefio and Addo (2014)

### 3. METHODOLOGY

This study used a survey strategy and a random sampling technique to select 500 students from three higher institutions of learning in the Upper West Region of Ghana. Pre-tested self-administered questionnaire was used to collect data for the study. Out of the 500 questionnaires given to respondents, 481 were completed and returned (response rate of 96.2%). The sampling units were: academic and non-academic staff, undergraduates, Higher National Diploma students, Diploma in Education students, Diploma in Business Studies and Certificate students. There were 384 males and 133 females who took part in the survey as indicated in Table 1.

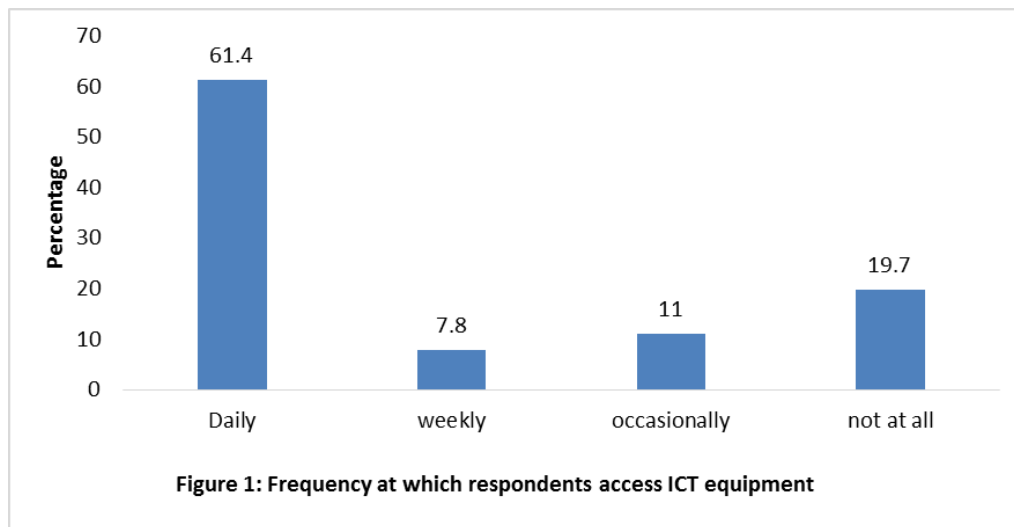
### 4. DATA ANALYSIS AND DISCUSSION

**Table 2: Characteristics of Respondents**

Variables	Frequency	Percentage (%)
<b>Ages (years)</b>	(N=481)	
18-25	303	62.9
26-35	155	32.2
36-45	16	3.3
≥ 45	7	1.5
<b>Total</b>	<b>481</b>	<b>100.0</b>
<b>Gender</b>		
Male	348	72.3
Female	133	27.7
<b>Total</b>	<b>481</b>	<b>100.0</b>

Source: Fieldwork, 2017

According to Ajayi (2008), the effective utilisation of ICT in teaching and learning depends on the availability of these facilities and teachers' competence in using them. Figure 1 rather revealed that there are inadequate, functional ICT facilities in tertiary institutions in the Upper West Region which can be frequently accessed by all students throughout in a week as just 7.8% have weekly access to them. This may hamper their ability to use them for effective learning throughout the week. Again, occasional access (11% of respondents) to ICT facilities is not enough to equip them with the necessary skills to cope in the job market after their training in these institutions. Though majority (61.4%) of the students have daily access to ICT equipment for use in coursework, some (19.7%) of the respondents never have access to ICT equipment. This revelation corroborates Kpolovie and Awusaku (2016) assertion that majority (66%) of students in Nigeria never had access to ICT usage. Such students have to depend solely on the dwindling traditional sources to support coursework.



It takes both time and effort to learn and efficiently operate ICT equipment. Any inconvenience that information technologies users face limits their ability to effectively use the tools. In Table 3, only 10.4% of the respondents are highly convenient in their use of the ICT facilities in their institutions while a huge majority of (89.6%) respondents feel some inconvenience as they use ICT facilities. This may be the reason why majority (54.3%) of the respondents indicates in Table 6 that they access the internet just once a week in their institutions. The inconvenience is a demotivating factor to respondents which has the potential of creating uncertainty about ICT integration worth (Butler and Sellbom, 2002 as cited by Attuquayefio and Addo, 2014).

**Table 3: Convenience in using ICT Tools**

Variables	Frequency	Percent
Highly convenient	50	10.4
Moderately convenient	281	58.4
Not convenient	150	31.2
Total	481	100.0

Source, Fieldwork, 2017

The use of ICT offers powerful learning environments which can transform the teaching and learning process so that students can deal with knowledge in an active, self-directed and constructive way (Volman & Van Eck, 2001; de Corte et al., 2003). There is no justification in our study that this can occur with regards to the use of the internet. Looking at Table 4, about a third (32.6%) of the respondents is not aware of internet connectivity in their institutions which will transform their learning process. This huge figure indicates that most of the respondents do not use the internet in their institutions. Consequently, they will have to resort to commercial internet service providers outside their campuses at an extra cost to them, possibly increasing the cost of their education.

**Table 4: Respondents awareness of Internet connectivity in their institutions**

Variables	Frequency	Percent
Yes	324	67.4
No	157	32.6
Total	144	100.0

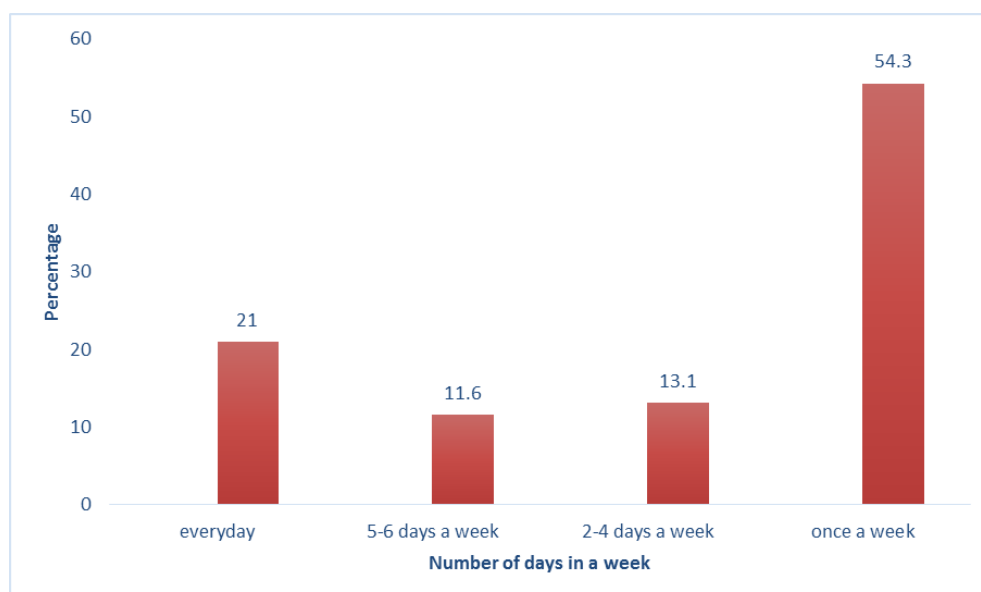
Source, Fieldwork, 2017

Assertion by Abaidoo and Arkorful (2014) that Ghanaian universities do not have adequate infrastructure, affordable and sufficient bandwidth, and the human resource capacity to exploit the technology has been affirmed in Table 5 as the study reveals that 41.3% of the respondents do not have internet access. Where the internet service is available, some respondents do not make use of it. This is discerned from a comparison between Tables 4 and 5. Although respondents' awareness of internet availability in their institutions stands at 67.4% as indicated in Table 4, only 58.7% of the respondents in Table 5 use the internet leaving a difference of 8.7%. who never use it. This situation might have arisen from the fact that students have to pay for the service. It could also be attributed to lack of equipment for accessing the internet as it is indicated in Figure 1 that (19.7%) of the respondents do not have access to ICT equipment.

**Table 5: Students' access to the internet in their institutions**

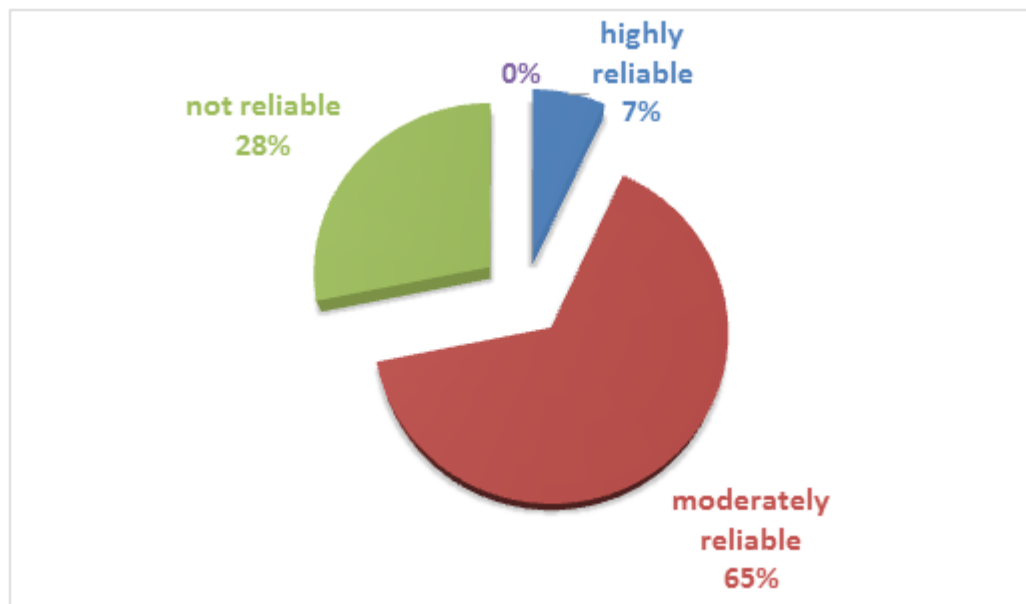
Variables	Frequency	Percent
Yes	266	58.7
No	187	41.3
Total	453	100.0

We find out from Table 6 that access to the internet within a week is not differentiated so much looking at the close relativities of the percentage values. We are equally happy to note that majority of the respondents who have access to the internet are using it to support their learning. Figure 2 gives us a fair idea of how many students use the internet every day (21%) and at least once a week (54.3%). The usage of the internet throughout a week is a positive outcome. However, there is no indication of the effectiveness of its use and this must concern school authorities.



**Figure 2: Rate at which students access the internet to support coursework**

The United States National Telecommunication and Information Authority (NTIA 1995), for example, called the internet the “key to the Information Age”. But the internet cannot be key to information age in an institution when it is not reliable. As indicated in Figure 3, the percentage of respondents which says internet is not reliable stands at (28%) leaving a few 7% who say it is highly reliable. This is not good enough as students will waste precious time on internet access more so when their time schedules may not give them the luxury of spending more time outside the lecture halls and theatres. If the respondents cannot rely on the ICT installations on campus to support their coursework and other academic activities, they will be discouraged from patronizing these facilities. Consequently, the facilities will not have value for money.



**Figure 3: Reliability of internet connectivity in the institutions**

The study reveals that though some institutions provide internet service to (67.4%) of the respondents as indicated in Table 4, institutions face significant barriers as they integrate the internet into their operations. Such barriers include the fees and charges they collect from students. Looking at the response in Table 6, respondents are clearly divided over the payment for internet use. As 54.9% of the respondents pay before accessing the internet, 45.1% do not pay. Their assertion is due to the fact that the Student Representative Council (SRC) in some of the institutions provides wireless internet facility which students access without direct payment. They however pay SRC dues, which is used to fund projects like the provision of internet service. Further interaction with the management also indicated that students are charged ICT user fees which is paid as part of the school fees.

**Table 6: Payment for internet service in the institutions**

Variables	Frequency	Percent
Yes	264	54.9
No	217	45.1
Total	481	100.0

## 5. CONCLUSION, IMPLICATIONS OF THE STUDY AND THE WAY FORWARD

Even though ICT integration in tertiary institutions in the Upper West Region of Ghana has been undertaken, accessibility, reliability and convenient utilization of ICT resources are still major challenges. The study finds results consistent with past studies that ICT adoption in Ghana is fraught with a number of challenges (Abaidoo & Arkorful, 2014; Edumadze & Owusu, 2013; Attuquayefio & Addo, 2014).

The study established that there is a sizable portion of the students who have no access to ICTs, especially internet on campus. For them, neither reliability nor convenience of such services is an issue to them. Again, many students do not make use of online content or services that can help them get access to rich content for coursework.

The results of this study have implications for potential positive social change at the individual level, organizational level, and at the societal level. The results of this study might have empirical implications at the societal level because it revealed that 19.7% of the respondents never have access to ICT equipment. Such students have to depend solely on the dwindling traditional sources to support coursework and this may lead to their poor acquisition of ICT skills thereby making them unemployable in the society. Academic institutions must therefore be supported by the communities in which they are located.

As indicated, the results of this study might also have implications at the organizational level because majority (54.3%) of the respondents indicates that they access the internet just once a week in their institutions which is inadequate. School authorities must create the awareness of Internet and other ICT installations on campus. Equally, 28% of respondents say internet is not reliable and this must be an urgent issue which must be tackled by internet service providers.

The results of this study may inform policy makers of the need to make internet service available to students as about a third (32.6%) of the respondents is not aware of internet connectivity in their institutions. If such a situation is not tackled, they will have to continue to resort to commercial internet service providers outside their campuses. Students may cultivate negative behaviors that might hinder their academic progression. .

In their quest to increase internet penetration, the managers of the institutions should look for other approaches in addition to the traditional policies to make ICT facilities more accessible and less expensive. ICT should be made available by adopting wireless connectivity instead of the wired connectivity which is always located within a certain portion of the institutions, most often the administration block. It is also recommended that even within the limited resources, lecture halls and theatres should be given priority with increased bandwidth subscription. All library facilities within the campuses should have internet connectivity for students to use for their research and coursework. This study has not established respondents' effective use of the internet and other ICT facilities on campuses to support academic work. Therefore, there is the need for further research to determine the effective use of ICT installations to support coursework.

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