

Information Communication Technology (ICT) Use for Postgraduate Studies by Students in Universities in Kenya

Emily Nyabisi

Department of Educational Management and Curriculum Studies, Mount Kenya University, Kenya

Abstract-Higher education, especially postgraduate training, plays a critical role in developing a highly skilled workforce for a competitive global economy and sustainable development. However, postgraduate training in most African countries, Kenya included, faces several challenges; key among them the long periods of time taken to complete the training. This is despite advancement in technology that should be utilized for timely completion of postgraduate studies. This study sought to assess the use of ICT by post graduate students in Universities in Kenya; by exploring the areas of use, proficiency in use, effect of use on progression and the challenges of using ICT. The data for the study was collected from a small, representative group of postgraduate students from six randomly selected universities in Kenya. The data was collected using questionnaires and interview schedules; in a mixed methods approach. The quantitative data was analyzed by use of both descriptive and inferential statistics; whereas the qualitative data was analyzed thematically. The findings of this study were used to make recommendations for enhancing the use of ICT in postgraduate training.

Key Words: Postgraduate training; Information Communication Technology; Utilization; Proficiency.

I. INTRODUCTION

The importance of education in general, and higher education in particular, in the development of any nation cannot be overemphasized. It is this recognition that education at all levels is a powerful tool in promoting sustainable development that led to the concept of 'Education for Sustainable Development.' Reference [18] notes that in 2002, the United Nations declared 2005-2014 as *the Decade of Education for Sustainable Development*; with the objective of integrating the principles and practices of sustainable development into all aspects and levels of education and learning. To this end, higher education is specifically singled out as playing the crucial role and responsibility of developing students and all types of learners into critical and creative thinkers, and professionals with relevant competencies and capabilities through education, training and research. Subsequently, in the Nagoya Declaration made by participants attending the conference on Higher Education for Sustainable Development in Nagoya, Japan on 9th November 2014, a commitment was made to support activities towards sustainable development, including implementation of the Global Action Programme (GAP) on Education for

sustainable development [25]. The GAP was recognized as a key mechanism to mobilizing stakeholders to accelerate progress towards sustainable development at all levels and areas of education and learning; drawing on, among others, information communication technologies (ICT) towards transforming learning and training environments. This therefore implies that ICT can be relied on to transform and accelerate learning progress in higher education; and specifically at the postgraduate level of study.

Considerably, postgraduate training is an important component of higher education; since it is at this level that individuals are trained in the generation of knowledge that is used in all spheres of the National and global economy. However, the rate and numbers of postgraduate students being produced in Kenya are inadequate to meet national needs that include staffing the increased number of universities, replacing an ageing faculty, and providing the professional cadres required in government, the private sector, international agencies and the Non-Governmental Organizations (NGO) community. Further, most postgraduate students in Kenya tend to be of advanced age; and therefore have lesser years of active scholarly service to give as compared to developed countries where postgraduates graduate at a relatively younger age [20], [3]. The low rate of completion by postgraduate students is attributed to the challenges experienced by the students, mostly at the research level. Since research is one of the major pillars of postgraduate studies, postgraduate students in most universities have to undertake research and write a research dissertation in order to graduate. However, in most cases, students enrolled for postgraduate courses do very well at the class work level (Lectures and examinations); but fail to transit to the research level and complete their course of study [28].

Most Universities provide some form of research training for post graduate students. However, there are considerable variation in how research methods are taught across Universities [5]. Some universities offer research methods training as a stand-alone course that students are required to take; others include the training within another module of study; and still others provide it as additional, non-credit workshops that students can attend if they choose. However, there is no indication whether postgraduate students

receive pedagogical training in the use of ICT as part of their research methodology training in order to facilitate progression and timely completion of their studies. Therefore, pedagogical issues in the teaching of research methodology, especially the use of ICT for research, have yet to become a major focus of scholarship in most Universities [21].

II. STATEMENT OF THE PROBLEM

Postgraduate training is a critical level in the higher education system that can be used for generating knowledge for sustainable development. However, postgraduate training in most African countries, Kenya included, is encumbered by challenges; key among them the long periods of time taken to complete the training. Consequently, the rate and the numbers of postgraduate students being produced are inadequate to meet the national staffing needs for sustainable development. This is despite advancement in ICT; a tool that should be utilized for research and academic writing at the postgraduate level to ensure timely completion of postgraduate studies. This study therefore sought to establish the level of utilization of ICT in Postgraduate studies by students in Kenyan Universities.

III. RESEARCH QUESTIONS

The questions that this study sought to answer were:

- i. What are the areas of use of ICT by postgraduate students?
- ii. What is the level of proficiency in use of ICT by postgraduate students?
- iii. What is the effect of use of ICT on the progression of postgraduate students?
- iv. What are the challenges of using ICT by Postgraduate students?

IV. LITERATURE REVIEW

The literature for this study was reviewed thematically based on the research questions. This was done in order to provide a basis for comparing the findings of this study with those of other related studies. The review of literature also provided the theoretical and conceptual frameworks for this study.

A. *ICT Use in Postgraduate Studies*

ICT is the integration of both hardware (computers) and its associated software (applications and systems) to produce, store, process, display and distribute certain information. The use of ICT incorporates both electronic technologies and information handling tools to manage information and knowledge [22]. In contemporary society, ICT affects almost every aspect of life, and its influence has changed the way of life of many people. The development of technology is also bound up with development in education at all levels [27]. Therefore, universities have not been left behind in trying to accommodate the needs of contemporary society; and prepare for future challenges, opportunities, and benefits of new technologies.

Reference [16] and [4] show that students at all levels, including in the university, can use ICT to enhance their academic writing in many ways. Similarly, the application of ICT in research has caused significant transformation in postgraduate studies; because it helps to save time and money used during and after research, and also reduces the difficulty in working with big data or information resources which were impossible in the past. More specifically, a student engaged in research at the postgraduate level can use ICT in activities such as writing proposals, searching online for literature, collecting and analyzing data, checking research work for originality, as well as communicating with their supervisor through the electronic mail. ICT incorporates the use of computers, which have got various programs and tools to support academic writing; key of which are word processors and the internet. Students can utilize word processors, such as Microsoft Word, to support faster typing and avoid grammatical and spelling errors. Writers with spelling difficulties can also use word banks to select words as well as generate ideas of word choice; or use spell checkers in identifying misspellings or typing errors. Word processors further support the writing process by enabling easy drafting and editing; since users can move the written text around the page easily using facilities such as 'delete', 'cut', 'copy' and 'paste'. Therefore, there is no pressure to worry about rewriting entire texts after editing. The font, size, color and style of the text can also be changed easily; and parts of the text can also be underlined, bolded or typed in italics for emphasis. Often, additional features such as borders, drawings, and tables can be added to the text.

After the writing and formatting, ICT also plays a big role in the presentation of information through presentation programs in the computer, such as Microsoft Power Point. Such programs help the presenter with an easier access to their presentation; and provide the participants with visual information which compliments the presenter's talk. Certain presentation programs also offer an interactive integrated hardware element designed to engage an audience or facilitate presentations across different geographical locations through the internet. Using visual aids such as power point slides serves to enhance the presentation of one's work by holding the interest and focusing the attention of the listeners. Further, power point presentations serve to support the message being delivered and also guide any further discussions on the presentation [12].

In addition to writing, formatting, and presentation, ICT also supports the location of research or informational materials through the internet. There are many more e-resources for research on the internet; than physical libraries can provide [2]. Thus, instead of looking for information in physical library books only, postgraduate students can use a computer linked to the internet to explore different e-sources and find useful academic information for research purposes. This is because any kind of information on any topic under the sun is available on the Internet. Consequently, through the

internet, the student can access online journals, newsletters, book reviews, conference proceedings, and any other type of sequential publication that is available on the World Wide Web (www). There is a spontaneous dispersion of information to various users of the internet when such information is added to a web site.

The internet also enables transmission and transfer of information from one user to another. With the help of the internet, the user can either get more information from, or pass on the required information to others. Thus, the internet creates a comparatively inexpensive avenue for releasing research information and articles, and aids in maintaining a reference list and items to read [1]. This aspect of the internet can be used by the postgraduate student in the dissemination of their research findings, which is a key requirement in most postgraduate programs. In due course, other researchers could access and make use of this circulated information and articles for their own research work. Hence, the web is regarded as a model medium for quick dissemination of information as it enables postgraduate students and academic institutions to disseminate information to a wider audience around the globe through websites and e-publications [17].

B. Proficiency in Use of ICT for Postgraduate Studies

The development of technology creates a need for training or the acquisition of ICT skills; for proficiency in use of ICT. The acquisition of ICT skills opens up new possibilities that allow one to increase their proficiency and effectiveness in using ICT [14]. It would therefore be imperative for students enrolled for postgraduate studies to receive some form of training so as to acquire skills in use of ICT for their research. Reference [10] points out that students admitted for postgraduate studies should take at least one basic technology course so as to continue their development of computer knowledge. Throughout their coursework, the students should also be required to use technology when appropriate to enhance their studies; and there should be mechanisms to evaluate their proficiency in use of technology. This will not only ensure that the students are proficient in their use of ICT, but will also provide evidence-based evaluation of this proficiency. However, this may not be easily realized in universities in Africa since developing countries continue to experience difficulties in adapting policies and regulations for use of technology in education. This is because policies on ICT use in education are not always accompanied by detailed implementation plans or commitment from those who should implement them in the educational institutions [11].

C. Effect of ICT use on Progression and Completion of Postgraduate Studies

Postgraduate students usually conduct research and write project reports or theses in order to complete their studies. While writing their reports or theses, the students experience different steps and changes in order to reach the final piece of writing. Therefore, postgraduate students need

to enhance their use of ICT in order to keep track of their writing progress to completion. Apart from supporting postgraduate research activities, technology also makes post graduate students independent and able to progress in their writing with very minimal support from their research supervisors. Additionally, ICT enables quick progression and completion of postgraduate studies as it helps students to access a wide range of up-to-date information sources in an easy and timely manner, process information quickly and develop high quality reports [24]. To this end, students are able to get information that enables them to easily hypothesize and test research ideas for themselves, test and validate the theories used in their research, and work independently of their research supervisor, though still with some supervision.

This implies that using technology, the student is able to do a lot of research work independently, without reverting to their research supervisor after each little step; and this makes their progression easier and faster. Digital learning resources are also less expensive and more useful for easy access [4]. This is especially useful to postgraduate students who are financially constrained to buy the required resources; or have limited time to access the resources from physical libraries in their institutions. The time spent travelling to the library to locate literature for research is therefore drastically reduced using ICT, and this translates to faster progression and completion of postgraduate studies.

D. Challenges of ICT use in postgraduate studies

In spite of the perceived benefits of ICT utilization for postgraduate studies, the effectiveness of this utilization by postgraduate students can be hampered by various factors. One of the disadvantage of using ICT in scholarly writing is that with respect to clarifications, offer of explanations, as well as interpretations, the use of ICT in academic writing might be less effective than the traditional method of face to face encounter with the supervisor at every step of the writing process [8]. This is especially true where the postgraduate student sends their research document to the supervisor through email; and the supervisor reviews the document and equally sends back the document on email. The student may not understand some of the review comments, but they lack an opportunity to seek for clarification as would be the case in face – to face supervision.

Sourcing for information from the internet may also lead to information overload [23]. This is because the internet provides a huge amount of information, some of which is not relevant to the student seeking research information. In due course, one can easily get confused with the infinite amount of information and not know how to sieve through for only that which is useful to their research. The postgraduate student may therefore be predisposed by inadequate selection skills of the literature relevant to their study, as well as the ease to copy and paste any, and all, material from the internet to one's writing. Additionally, with the large amount of information freely available on the internet, the possibility of plagiarism is

heightened. Plagiarism is the action or practice of taking someone else's work and passing it off as one's own [7]. A student can easily download information and research materials from the internet and pass it off as their own work, without acknowledging the original source of the information. However, most universities currently use different plagiarism detection software and online tools; and have developed plagiarism policies to try and address this vice. For instance, some universities now require that thesis submission includes a soft copy which is subjected to anti-plagiarism software; and the thesis cannot pass if it does not meet a set level of originality.

Use of ICT in postgraduate studies may also deteriorate the socialization role and the role of supervisors as the directors of the process of research. This is especially true where the student and their research supervisor go through the entire supervision process without ever meeting physically; courtesy of technology [9]. In such cases, the supervision process is just a mechanical process of passing the research document back and forth between the student and the supervisor for review and corrections; until the student completes their studies. The student therefore misses out on valuable guidance and mentorship from the supervisor that can only be achieved through physical interaction.

Using ICT also predisposes the user to virus threat. A computer virus is a program that interrupts the normal functioning of the computer systems [26]. The internet can be used as a medium for the spread of a computer virus to the fullest, since computers that are attached to the internet are more likely to be attacked by the virus. In due course, this attack could result to the computer hard disk crashing, leading to loss of work saved on the computer. This is often a big setback for a student who had made substantial progress in writing their research and has to start all over again. Additionally, computers are machines which often face malfunction due to wear and tear. A student may therefore complete and save their research work in the computer; but the same computer malfunctions just before the work is submitted; resulting in a waste of effort and time since the student has to start the work all over again.

E. Theoretical framework

This study was based on the Technology Acceptance Model (TAM) as discussed in [6], [13] and [15]. According to this theory, technology user acceptance is defined as the demonstrable willingness to employ information technology for the tasks it is designed to support. User acceptance is viewed as the pivotal factor in determining the success or failure of using any kind of technology. Without acceptance, users will seek alternative ways to get their work done without using the technology, or they will be dissatisfied and perform the tasks in an inefficient manner; thus negating the presumed benefits of using technology.

As indicated in the Technology Acceptance Model in Figure 1, user acceptance of any technology is determined by

two factors: perceived usefulness and perceived ease of use. Perceived usefulness (U) is the degree to which a user believes that using the system will enhance performance; whereas perceived ease of use (E) is the degree to which the user believes that using the system will be free from effort. The user's attitude toward using the technology (A); which constitutes feelings of favorableness or un-favorableness toward the system, is significantly determined by U and E. Behavioral intentions to use the system (BI) are determined by A and U; whereas the actual use of the technology is determined by BI.

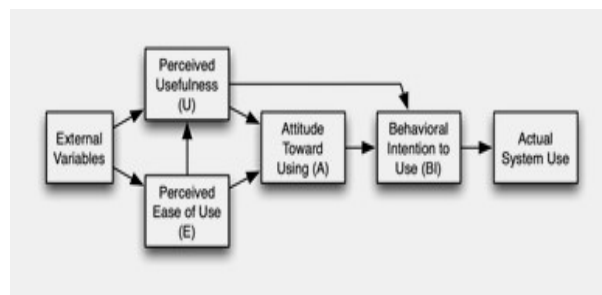


Figure 1. Technology Acceptance Model (TAM)

With regard to the variables explored in this study on use of ICT for postgraduate studies, the perceived usefulness (U) of ICT would be the effect of ICT on progression and completion of postgraduate studies as explored in research question 3; whereas the ease of use (E) would be determined by the level of proficiency and challenges in using ICT, as explored in research questions 2 and 4. These two factors that constitute (E) would determine the actual use of ICT, as explored in research question 1 on areas of use of ICT in postgraduate studies. The external variables affecting U and E, and the intervening aspects of attitude (A) and behavioral intention to use (BI) as presented in the Technology Acceptance Model were not explored in this study.

F. Conceptual framework

Based on the application of the theoretical framework to the research questions, the concepts explored in this study can therefore be represented as shown in the conceptual framework in figure 2.

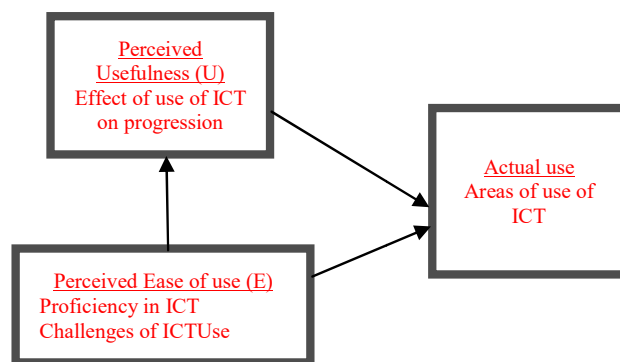


Figure 2: Conceptual framework (Researchers' own conceptualization based on the TAM Model and the Research questions)

V. MATERIALS AND METHODS

This study adopted a mixed methods approach that sought to collect both quantitative and qualitative data on utilization of ICT by postgraduate students. The design used was descriptive survey since the study was exploratory in nature and sought to collect, summarize, present and interpret information for the purpose of clarifying the variables under study. The study findings can therefore be used as a pre-cursor to more research on the variables under study; including the factors in the TAM not explored in this study. The target participants for the study were students taking postgraduate studies; at both Masters and Doctorate (PhD) levels in six randomly selected Universities in Kenya. Non-probability sampling, specifically purposive sampling, was applied to find out how the sample, a small, representative group of postgraduate students, utilize ICT; for purposes of illustration and explanation. In this case, the selected sample may not have been fully representative of the entire population; but the main advantage was in the selection of a few informative-rich cases for analysis of the variable of study. The total sample size was 47 postgraduate students at both Masters and PhD levels of study from six Universities in Kenya. Data was collected using a self – administered semi structured questionnaire and face to face interviews; thus providing for triangulation of methods. The quantitative data targeting research questions 1 – 3, on areas of ICT use, levels of proficiency in using ICT and effect of ICT use in progression, was analyzed using descriptive statistics and presented using frequency tables, pie charts and graphs. The data targeting research question 4 on challenges in using ICT was analyzed qualitatively by extracting the main themes in the responses and presenting them in prose form.

VI. RESULTS AND DISCUSSION

The analysis of data and results of this study are presented according to the research questions; after presentation of the demographic information of the study participants.

A. Demographic Information

This section presents the general characteristics of the respondents on the basis of category of institution, level of study, age group, and ICT tools owned by the student.

1) *Category of Institution*: As shown on Table 1, the forty-seven respondents for this study were drawn from six universities in Kenya; five Public and One Private. The distribution of the respondents between the two categories as indicated in Table 1 shows that majority of the respondents (68.1%) were drawn from public universities; whereas the remaining 31.9% were drawn from the private university. This distribution is reflective of the proportion of public and private universities in Kenya; where the public universities are more than the private universities. At the time of study, Kenya had a total of 36 chartered universities (22 public and 14 private). The six universities that had a representation in the sample represented 16.7% of the total number of chartered

Universities in Kenya. When the study population is less than 10,000, a sample size of between 10% and 30% is a good representation of the target population [19]; hence the 16.7 % of the Universities sampled were considered adequate for data collection and analysis.

Table 1 Category of University Sampled

	P	S ¹	(%) ¹	S ²	(%) ²
Public	22	5	13.9	32	68.1
Private	14	1	2.8	15	31.9
Total	36	6	16.7	47	100

Key

P - Total number of universities

S¹ - Number of universities sampled

(%)¹ - Percentage of sampled universities

S² - Number of students purposively sampled from the sampled universities (constituting N for the study)

(%)² - Percentage of total number of students (N) sampled in the sampled universities

2) *Respondents Level of Study*: As presented in Figure 3, out of the 47 sampled participants, 81% were Masters students whereas 19% were enrolled for PhD. This is a general reflection of postgraduate studentship in Kenya; where there are lesser students at the PhD level than at the Masters level.

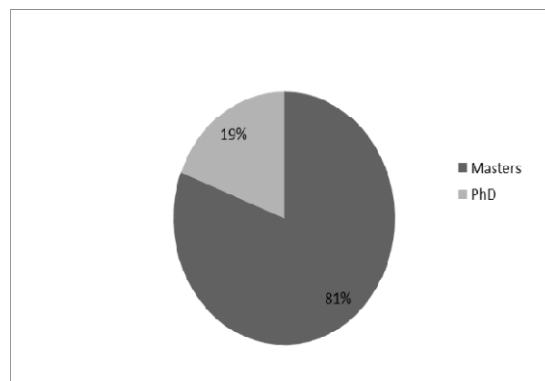


Figure 3: Respondents' Level of Study

3) *Respondents Age Group*: Figure 4 shows that majority of the respondents were within the age bracket of 36-45 years (38.3%). Whereas 34% of the respondents were between the ages of 25 – 35 years; there was a significant 21.3% of the respondents who were between the ages of 46-55 years. This, combined with the majority age bracket, makes for a total of 59.6% of the respondents being above 35 years. This is indicative of the observation that most students enrolling for post graduate studies in Kenya do not immediately enroll after obtaining their undergraduate degree; but rather, at a later point in life. This would account for most postgraduate graduates being of advanced ages and not at their

prime; and this may affect use of technology in their studies in terms of proficiency and challenges in use.

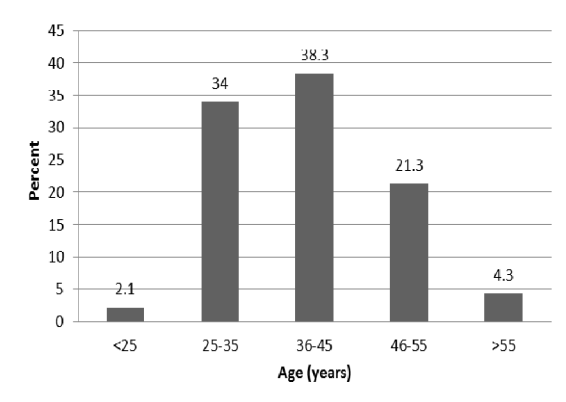


Figure 4: Respondents' age group

4) *ICT Facilities Owned by Postgraduate students:*

As presented in Table 2, majority of the respondents indicated ownership of a laptop or personal computer, flash disk and an email address. These are basic ICT tools that would facilitate personal typing and editing of one's own work, saving and retrieval of typed work, and communication with the supervisor. However, a majority of the respondents (61.1%) indicated that they do not own a printer. This means that they have to rely on a third party for the printing of their documents for submission and presentation.

Table 2 ICT Facilities owned by the students

ICT Facilities	Own	Do not Own
Laptop/Personal Comp	97.8	2.2
Printer	38.9	61.1
Flash Disk	97.8	2.2
Email address	100	0

B. *Research Question 1: What are the areas of use of ICT by postgraduate students?*

To answer this question, the respondents were asked to indicate their ability to personally carry out various aspects of their postgraduate research using ICT. The responses are indicated in Table 3.

Table 3 Respondents' ability to use various aspects of ICT

Statements	N	Mean	Standard Deviation
Typing	47	1.2	0.5
Saving and retrieval	47	1.3	0.4
Online literature search	45	1.2	0.4
Data analysis	47	2.8	0.7
Checking plagiarism	47	2.3	0.8
Online supervision	47	1.5	0.7

Key

Mean of 1 - Very able

Mean of 2 - Moderately Able

Mean of 3 - Not able

The data on Table 3 shows that majority of the respondents indicated that they are able to use ICT for typing of their own work, saving and retrieval of typed work, searching online for literature and communicating online with their research supervisor. However, a majority of the respondents indicated diminished ability to use computer software for data analysis and checking their own work for originality / plagiarism. This implies that a majority of the postgraduate students are able to use the basic ICT tools very well. These include word processors, internet and e-mail. However, the students experience a diminished ability in using advanced ICT software for aspects such as data analysis and running of originality checks. There is therefore need for training or the acquisition of ICT skills; for proficiency in use of all aspects of ICT by the postgraduate student. Incorporating training of ICT as part of postgraduate coursework will enhance the ability to use various aspects of ICT for postgraduate studies

C. *Research Question 2: What is the level of proficiency in use of ICT by postgraduate students?*

To answer the second research question, the respondents were asked to indicate whether training in ICT was part of their postgraduate studies. A cross tabulation was also done on the average ability to use ICT for postgraduate studies against training in ICT. The results are presented in Figure 5 and Table 4 respectively.

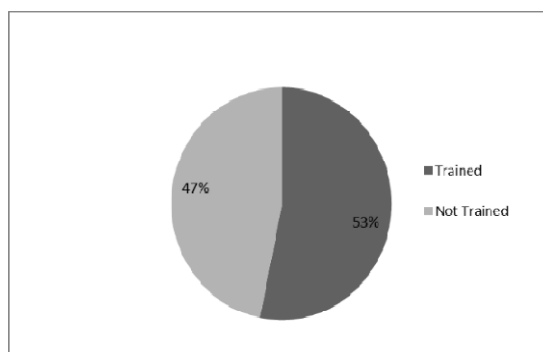


Figure 5: Training in ICT as part of postgraduate studies

The data in figure 5 shows that whereas the majority (53%) of the respondents indicated that training in ICT was part of their postgraduate course work, the other 47% had not received training in ICT at postgraduate level. This implies that the 47% who had not received training in ICT would not be fully proficient in using ICT for their postgraduate research. This aspect is presented in the cross tabulation of average proficiency in use of ICT against training as shown in Table 4

Table 4 Cross tabulation of ability to use against training in ICT

Training	Proficiency in use ICT		
	Very Able	Moderately Able	Not Able
Trained	10	15	0
Not Trained	4	18	0
Total	13	34	0

The data on table 4 shows that 10 out of the 25 (40%) respondents who had been trained in ICT as part of their postgraduate coursework indicated that they were able to use ICT for their research work. This was as opposed to a lesser number of 4 out of 22 (18.1%) respondents who had not been trained who indicated that they were able to use ICT tools for their research work. However, the qualitative data collected showed that even those who had received ICT training had not been extensively exposed to practical aspects of ICT such as data analysis and plagiarism check. This agrees with the observation that in developing countries, ICT use in education is not always accompanied by detailed implementation plans or commitment from those who should implement them.

D. Research Question 3: What is the effect of use of ICT on the progression of postgraduate students?

The respondents were asked to indicate whether they agreed or disagreed that their ability to carry out various aspects of their postgraduate studies using ICT enhanced various aspects of progression in their studies. The responses are indicated in Table 5.

Table 5 Effect of ability to use ICT on Progression

Statement	N	Mean	Standard Deviation
1. Typing own work enhances understanding of the study	46	1.5	0.7
2. Saving typed work enhances timely making of corrections	46	1.0	0.3
3. Searching online enhances effectiveness of literature review	45	1.0	0.3
4. Own data analysis enhances accuracy in analysis	45	1.0	0.0
5. Ability to check own work for plagiarism reduces waiting time	45	1.2	0.6
6. Communicating online with supervisor enhances supervision	44	1.1	0.4

Mean: 1 indicates agree; 2 indicates Disagree.

The data on table 5 shows that a perfect mean of 1.0 was obtained for responses on saving of typed work, searching online for literature and the ability to analyze one's data. This means that all the respondents agreed that the ability to use these various aspects of ICT would enhance particular aspects of progression in their postgraduate studies. However, the statement on typing own work enhances understanding of the

study had a mean of 1.5, which means that typing of one's own work was not considered as critical to progression as the other aspects of ICT use. These findings imply that using technology, the postgraduate student would be able to do a lot of research work independently, thus making their progression easier and faster.

E. Research Question 4: What are the challenges of using ICT by postgraduate students?

The Responses to answer this question were qualitative in nature and were obtained through an open ended question in the questionnaire and also through the interview schedule. The key challenges (recurrent in respondents' responses) in the use of ICT by postgraduate students were:

- i. Lack of proper knowledge in some critical aspects such as generating table of contents and figures, locating relevant search sites, and data analysis using computer software
- ii. Lack of sufficient teaching personnel with PhD in ICT to teach ICT at the postgraduate level
- iii. Loss of information due to viruses and computer malfunctioning
- iv. Limited access to certain links that require subscription to online literature sources
- v. Lack of internet connection to access online material
- vi. Lack of timely response to online communication by research supervisors.

VII. CONCLUSIONS

The following conclusions were made from the findings of this study:

1. A majority of postgraduate students are able to use the basic ICT tools for their research. However, the students experience a diminished ability in using advanced ICT software and tools
2. A significant number of students are not trained in ICT as part of their postgraduate coursework. Those who are trained are more proficient in using ICT for their studies than those who are not trained
3. The ability to use various aspects of ICT enhances progression in postgraduate studies
4. There are pertinent challenges in the use of ICT by postgraduate students that should be addressed by training institutions

VIII. RECOMMENDATIONS

From the findings and conclusions of the study, the following recommendations were made:

1. There should be more practical research workshops, clinics, and seminars for postgraduate students on how to use critical aspects of ICT in research; such as data analysis and anti - plagiarism software.
2. Training in ICT should be a compulsory or core subject-area in postgraduate coursework taught before commencement of research work.

3. Postgraduate students should be encouraged to type their own research work to enhance their understanding of the research.
4. The identified challenges in use of ICT by postgraduate students should be addressed by all training institutions. Some of the proposed solutions by the respondents to the identified challenges were:
 - i. Continuous practical sessions on all aspects of ICT use for postgraduate students
 - ii. Universities to train more teaching staff in ICT at the PhD level
 - iii. Installation of anti-virus software and regular maintenance of ICT infrastructure
 - iv. Universities to subscribe to varied online information sources and also make postgraduate students aware of such subscriptions.
 - v. Universities should provide free Wi-Fi and enhanced internet connectivity, especially for use by postgraduate students.
 - vi. Universities should develop and implement policy guidelines on communication, especially proof of feedback, between research supervisors and their students.

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