A Critical Review of eLearning Research Trends in Tanzania

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Abstract: This study adopted bibliometric and content analysis methods to explore research trends on eLearning implementation in Tanzania between 2007 and 2017. A total of 74 articles from electronic databases, conference proceedings, and selected electronic journals were reviewed. The study found out that there is an increasing interest in eLearning research with the majority of studies conducted by researchers from three universities. Quantitative research design was found to be the most preferred research design by eLearning researchers in Tanzania mostly engaging students' population. Despite the proliferation of mobile telephony in Tanzania, this study revealed that mobile and game-based learning were the least investigated eLearning technologies. The study also shows that Internet access and lack of support were the most ranked challenges hindering eLearning implementation in Tanzania. The research gaps identified in this study are crucial for decision makers in both looking for better ways to stimulate further research in more strategic ways and in setting strategies to overcome barriers that hinder eLearning implementation in Tanzania.

Keywords: eLearning, Tanzania, eLearning Tanzania, eLearning trends, eLearning publications

Introduction

Over the past few years, there has been a dramatic advance in information and communication technologies (ICT) infrastructure in Tanzania. The cost of Internet across the country has gone down by more than 50% due to the roll out of two submarine cables: the Eastern Africa Submarine Cable System and the Southern and Eastern Africa Communication Network (MWTC, 2016). The country has also witnessed a significant decrease in the price of mobile devices to as low as US$30, allowing many users able to access the Internet via mobile devices (Mtebe & Kondoro, 2016). Additionally, Internet users have increased from 29% in 2014 to 40% in 2016 while mobile penetration has increased to 80% of the total population by 2017 (TCRA, 2017).

Given these developments, educational initiatives directed towards ICT integration in teaching and learning at all levels of education have grown exponentially. Increasingly, ICT integration in education is now being described as a mode of teaching and learning that not only increases students' motivation and deepens understanding of the subject matter but also promotes collaborative and lifelong learning; as well as helping students to think and communicate creatively (Webb, 2005). Studies have also revealed that integrating ICT in education could lead to significant educational and pedagogical outcomes beneficial for both students and teachers (Jimoyiannis, 2008).

With these benefits in mind, the government of Tanzania and other stakeholders have taken giant steps in equipping schools with computers, supporting initiatives in installing eLearning platforms, as well as supporting teachers with technological, pedagogical and content knowledge and skills for

ICT integration. For instance, the Shuledirect initiative-developed eLearning platform, consisting of eight subjects, benefiting more than 10,000 learners countrywide (Shuledirect, 2018). Halostudy, the latest initiative in Tanzania, has developed multimedia enhanced content for science and mathematics subjects (Halostudy, 2018). The developed content has been deployed in 426 secondary schools connected with Halotel Internet in Tanzania (Mwakisole, Kissaka, & Mtebe, 2018). A recent report by the Ministry of Education, Science and Technology (MoEST) indicates that approximately 31.4% of 3,601 government secondary schools are equipped with computers, of which 20.1% have Internet services (MoEST, 2017).

At the higher education level, universities such as the University of Dar es Salaam (UDSM), Open University of Tanzania (OUT), and Mzumbe University have taken advantage of ICT to widen access to education via ICT-mediated distance education and to complement campus-based courses with online instructions. The University of Dar es Salaam, for instance, offers three blended distance programs: a Postgraduate Diploma in Education (PGDE), a Postgraduate Diploma in Engineering Management (PGDEM) and a Master's degree in Engineering Management (MEM) via regional centres in Mbeya, Mwanza, Dar es Salaam, and Arusha (Mtebe & Raphael, 2013). These courses are delivered via Moodle, with some face-to-face meetings in the middle of each semester. The Open University of Tanzania also uses Moodle to offer its programs via 28 regional centres in Tanzania (Bhalalusesa, Lukwaro, & Clemence, 2013a). Likewise, Mzumbe university have been offering a Master's of Business Administration, Master's of Science in Accountancy and Finance, Master's of Science in Procurement, and Master's of Science in Project Planning and Management in a blended mode of delivery through Mwanza centre.

In addition to these eLearning initiatives, there are already researchers conducting eLearning research at various levels of education in Tanzania. This is evident from the number of published articles in international and local journals as well as a number of local conferences dedicated to ICT in education. Nevertheless, there has been relatively little study conducted to systematically review research trends and barriers to eLearning implementation in Tanzania over the past ten years. Therefore, little is known about research gaps existing in the current trends in eLearning research in Tanzania.

This study adopted bibliometric and content analysis to investigate research trends in eLearning implementation in Tanzania between 2007 and 2017, through systematically reviewing articles published in journals, conference proceedings, and selected electronic journals. The findings from this study are expected to promote further research in areas where the research gaps have been identified. Furthermore, the findings will serve as a base for fruitful discussions and dialogues on possible interventions to overcome the most intriguing barriers that hinder eLearning implementation among stakeholders and decision makers in Tanzania.

Methodology

The study used bibliometric and content analysis designs in reviewing the research done in Tanzania between 2007 and 2017. Bibliometric analysis provides quantitative statistics related to regarding growth of papers by year and citations, rankings of most prolific contributors, authorship patterns, rankings of geographical distribution of authors, rankings of most productive institutions, collaboration among institutions, range and percentage of references per paper, and frequency distribution of subject descriptors (Ellegaard & Wallin, 2015; Keshava, Gireesh, Ganjihal, & Gowda,

2008). To obtain bibliometric indicators relevant to this study, recent studies conducted on eLearning in various contexts were examined. Table 1 shows a summary of articles reviewing eLearning research trends in various contexts, and their bibliometric indicators.

Table 1: Selected Studies with their Bibliometric Indicators

No.	Researcher	Bibliometric Indicators
1.	(Cheng et al., 2014)	eLearning for continuing education and professional development, eLearning in healthcare, use of social media for eLearning, and the integration of knowledge management with eLearning
2.	(Hung, 2012)	Publication tie trends, subject area, prolific universities, prolific journals
3.	(Hsu et al., 2009)	Research topic, research sample group, and learning domain
4.	(Shih, Feng, & Tsai, 2008)	Motivation, information processing, instructional approaches, learning environment, prior experience, metacognition, and cognitive psychology characteristics
5.	(Tsai, Shen, & Chiang, 2013)	Sample groups, major contributing countries, subject domains and the research methods involved (qualitative, quantitative or mixed)

The content analysis was used to group bibliometric indicators that were found to be relevant to the study. These indicators were sample groups, subject domains, research methods involved, educational levels, and technology investigated. These proposed bibliometric indicators led to the formulation of six research questions as a basis of investigation:

- What has been a common subject domain for eLearning research in Tanzania between 2007 and 2017?
- What have been the preferred sample groups for investigations?
- What has been a most commonly preferred sample group?
- What types of research designs have been preferred in their investigation?
- Which education level (primary, secondary, vocational, teachers' education, higher education) has been more researched?
- Which eLearning technologies have been most investigated in Tanzania?

Thus, to answer these questions, a systematic review of the existing literature was conducted in order to collect empirical data about eLearning implementation in Tanzania.

Data Search

Studies relevant to eLearning implementation were searched using a combination of agreed-upon keywords. The keywords used included "elearning in Tanzania", "learning management system Tanzania", "eLearning system Tanzania", "technology enhance learning, Tanzania", "blended learning Tanzania", "online learning, Tanzania", online education, Tanzania", "technology learning,

Tanzania", "mobile learning, Tanzania", "game-based learning, Tanzania", "open learning, Tanzania", distributed learning, Tanzania", open educational resources, Tanzania", "digital content, Tanzania". These keywords were used to search relevant articles in prominent electronic databases that are relevant to technology enhanced learning. These searched databases include Google scholar, ScienceDirect, EBSCO, Education Resources Information Center (ERIC), Taylor & Francis, IngentaConnect, Emerald, Institute of Electrical and Electronics Engineers (IEEE), Computer Society Digital Library (CSDL), Association for Computing Machinery (ACM), and Springer.

Moreover, some specific journals and conference proceedings (See Table 1) were examined. The choice of these journals and conference proceedings was based on the following criteria:

- Refereed journals are indexed by prominent databases
- Refereed journals have a publication history of five years or more
- Peer reviewed journals or peer reviewed conference proceedings.

Table 2: Selected Journals and Conference Proceedings Used to Search Articles

No.	Name of the Journal	URL
1.	*The Journal of Learning for Development (JL4D)*	http://jl4d.org
2.	*The International Review of Research in Open and Distributed Learning*	http://www.irrodl.org
3.	*The Electronic Journal of Information Systems in Developing Countries*	http://www.is.cityu.edu.hk/staff/isrobert/ejisdc.htm
4.	*International Journal of Education and Development using Information and Communication Technology (IJEDICT)*	http://ijedict.dec.uwi.edu
5.	*The Australasian Journal of Educational Technology*	https://ajet.org.au/index.php/AJET
6.	*IST-Africa*	http://www.ist-africa.org/home/

Sample

A total of 74 articles were selected out of 81 articles identified based on a thorough review of articles published between 2007 and 2017. A detailed analysis of these articles found that seven articles were opinion articles, conceptual articles, or technical notes. These articles were excluded from further process in critical analysis.

Data Analysis

A checklist of bibliographic indicators was prepared using Microsoft Excel before detailed analysis was conducted. Six researchers—three instructional designers and three information system experts—were involved. These researchers were given a seminar on the purpose of the study which explained in detail how categories were defined before the review process began. Each article was

reviewed by three researchers independently. After completion of the review process, researchers met and discussed how they arrived at their conclusions. A summary of bibliometric indicators on eLearning implementation was generated from the aggregate records and these findings are explained next.

Findings

Publication Time Trends

The number of articles published between 2007 and 2017 is shown in Figure 1. The result shows that the interest of researchers in eLearning has been increasing as the number of articles published from 2007 has been increasing rapidly. However, there are few articles published in 2017 compared to those published in 2016. This anomaly can be accounted for by the timing of this study, since it was conducted between July and August 2017. Therefore, some articles published after August 2007 may have been omitted.
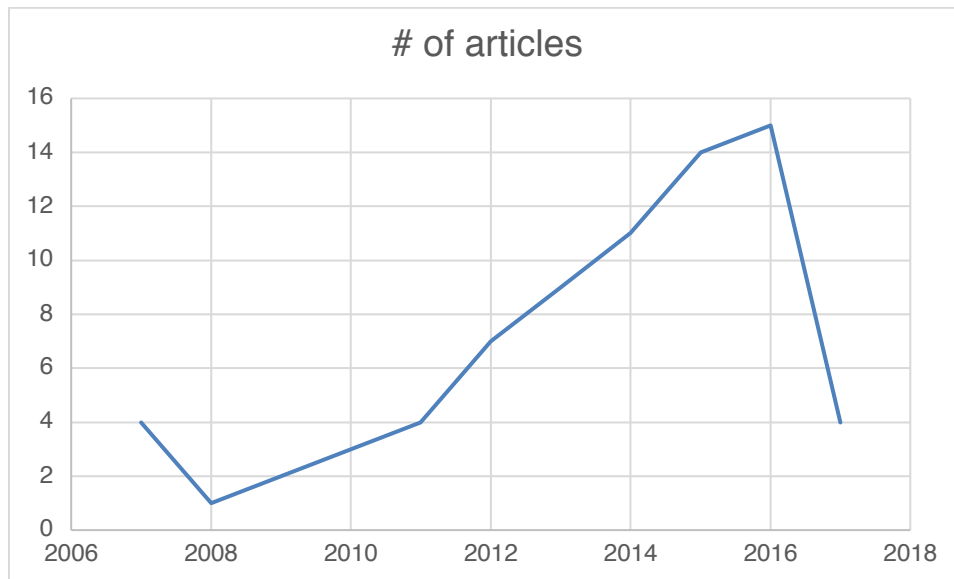

Figure 1: Frequency of publications by year.

Prolific Universities

The contribution of each university in eLearning research was investigated. Based on author affiliations, the study identified universities that produced the most publications. The result shows that, of 74 reviewed articles, 27 were published by researchers from the University of Dar es Salaam (UDSM), followed by 10 articles from Sokoine University of Agriculture (SUA), and nine articles from the University of Dodoma (UDOM). The Nelson Mandela Institute of Science and Technology (NMIST) was found to have five articles published by its researchers followed by three articles from the Muhimbili University of Health and Allied Sciences (MUHAS). The Institute of Finance Management (IFM), Dar es Salaam Institute of Technology (DIT), and Mzumbe University (MU) were found to have a least number of published articles as shown in Figure 2.
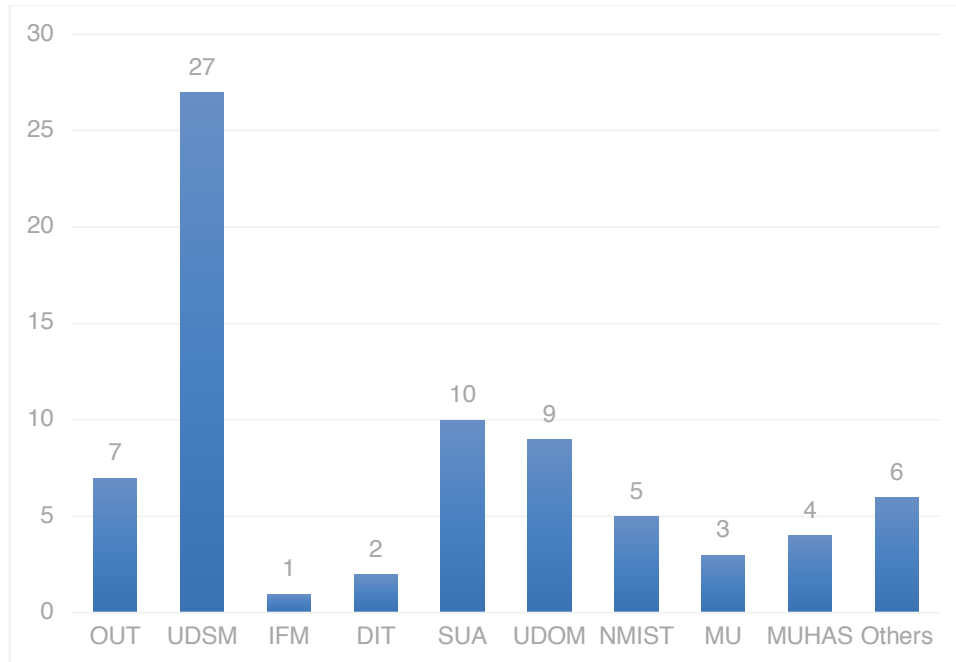
Figure 2: Contribution of articles from various universities in Tanzania.

Research Designs

Similar to many other fields, eLearning research tends to employ a quantitative, qualitative, or mixed research design, depending on the nature of the research. Out of 74 reviewed articles, more than half of the articles (42) employed quantitative design, followed by 15 articles employing qualitative research design. Seven articles did not specify which research method was adopted (See Figure 3).
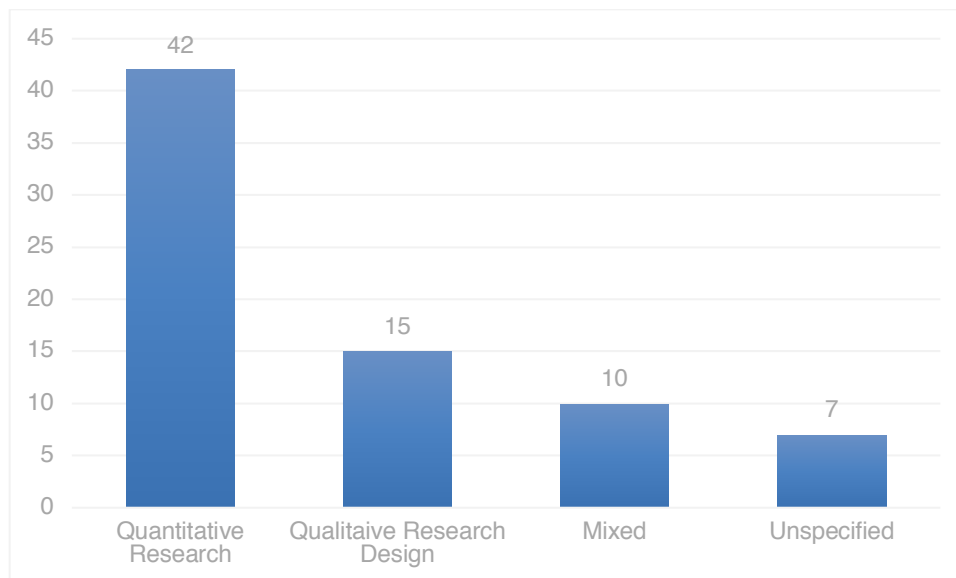

Figure 3: Employed research design in reviewed articles.

Data Collection Tools

The distribution of data collection instruments used in the reviewed articles is indicated in Figure 4. The result shows that questionnaire was the most preferred data collection tool with a total number of 42 articles followed by a combination of questionnaire and interviews with 10 articles. Seven articles did not specify data collection tools employed especially those focused on proposed frameworks and models. The distribution of articles with research instruments used in the reviewed articles is shown in Figure 4.
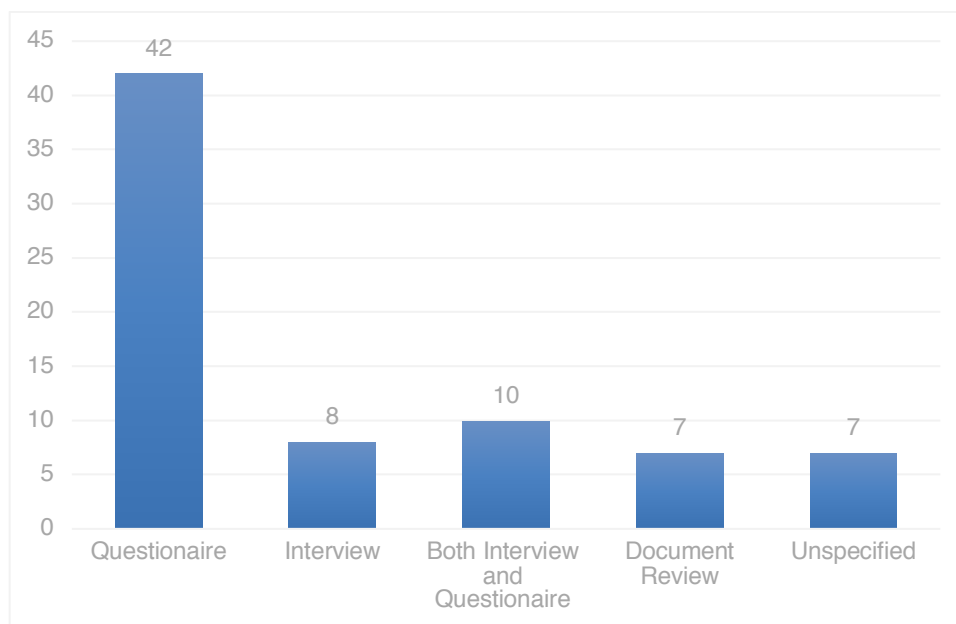
Figure 4: Research instruments used in the reviewed articles.

Educational Levels

The reviewed articles were categorized at an educational level based on the focus of the research. It was revealed that nearly two-thirds (53 articles) were conducted in higher education, followed by 16 articles in secondary education. There were relatively few articles in vocational education, primary education, and teachers' education as is shown in Figure 5.
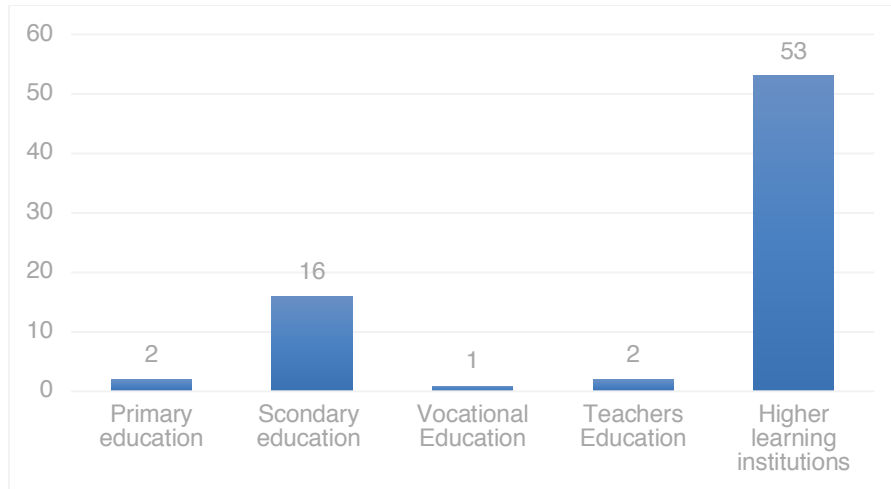
Figure 5: Number of published articles per educational levels.

eLearning Technologies

The adoption and use of eLearning has attracted researchers from education, computer science, engineering and many other fields of study. Similarly, various eLearning technologies have been adopted in various levels of education. Accordingly, research on the effectiveness of various technologies have been conducted. In this study, eLearning technologies adopted and used in various research were investigated. It was revealed that 31 articles investigated various aspect of Learning Management Systems (LMSs). Furthermore, a good number of articles (21) did not specify any technology but, rather, conducted research on general eLearning. Interestingly, 12 articles focused on various aspects of digital content as shown in Figure 6.
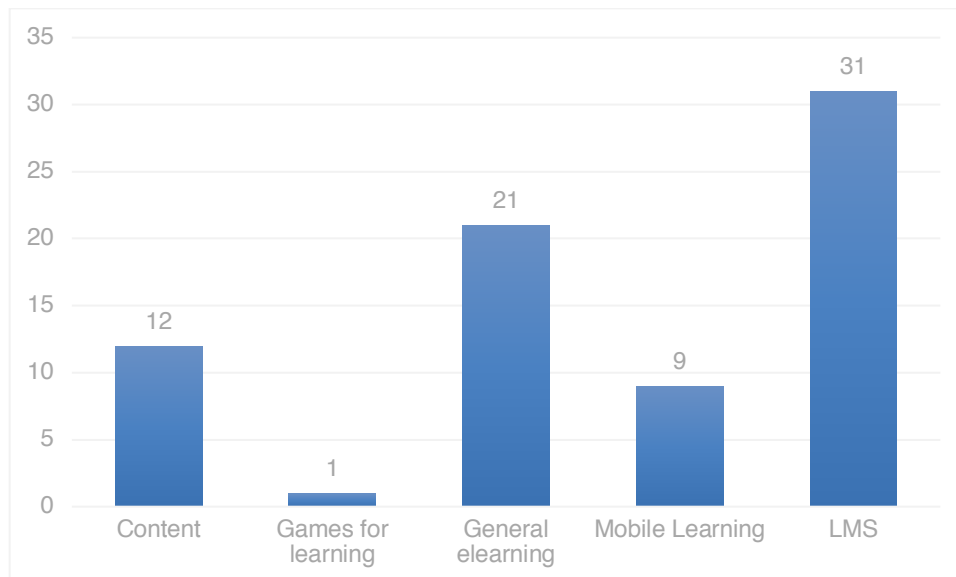

Figure 6: The type of eLearning technologies investigated.

Population Groups

As for the distribution percentages of the sample population groups involved in the selected articles, many of the studied population were students, with 31 articles followed by instructors/teachers with

19. The study further found out that pupils and administrators were the least studied population groups in eLearning research in Tanzania as shown in Figure 7.
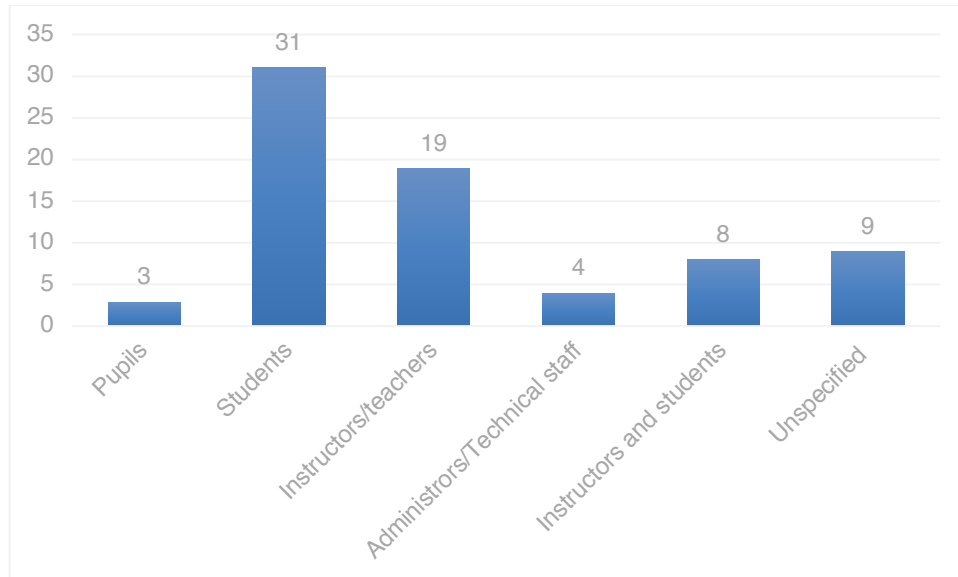

Figure 7: The distribution of population groups involved in the reviewed articles.

Challenges

Out of 74 reviewed articles, 45 of them investigated challenges hindering eLearning implementation in Tanzania. Lack of Internet connectivity (30%) is the most highly ranked barrier that inhibits eLearning implementation in Tanzania, followed by lack of support (25%) and lack of awareness and negative attitude towards ICT (21.7%). However, lack of policies, lack of facilities, and inadequate funds were the least-ranked barriers to eLearning implementation in Tanzania (See Figure 8).
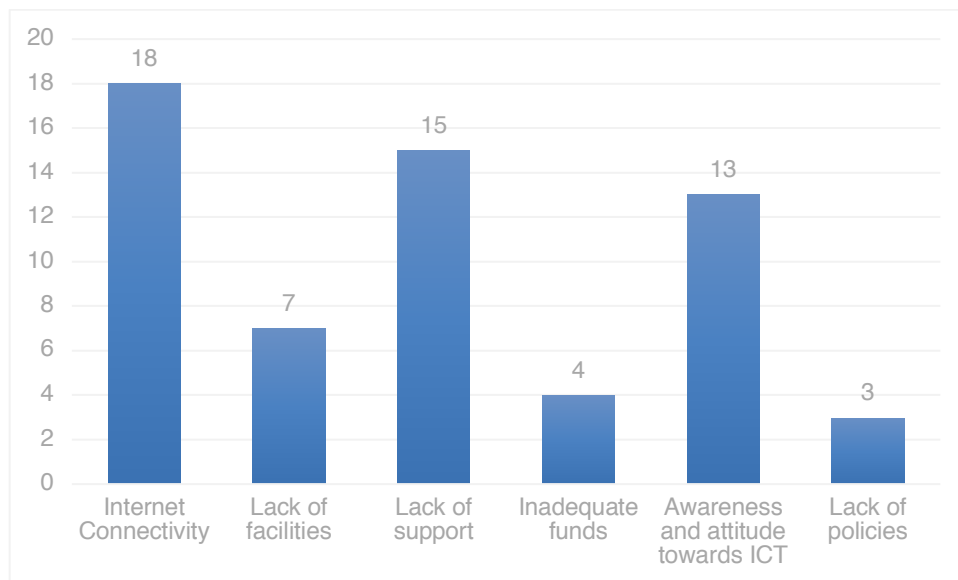

Figure 8: Challenges facing eLearning implementation in Tanzania.

Discussion and Research Gaps

This article systematically reviewed articles published from 2007 to 2017 to establish eLearning research trends and barriers to eLearning implementation in Tanzania. The study showed that eLearning research has been growing rapidly in Tanzania, the same way as global eLearning research trends. For instance, Hung (2012) reviewed 689 articles from the SSCI database published from 2000 to 2008 and found that from 2001 to 2005, eLearning publications increased from 15 to 101—a 154.7% compound growth rate, while publications of eLearning grew from 107 in 2007 to 121 in 2008 (Hung, 2012). Likewise, Cheng et al. (2014) reviewed eLearning research trends in the workplace environment from 2000 to 2012 and found that eLearning publications dedicated to eLearning in the workplace have been growing rapidly since 2000.

Other interesting studies are those of (Zawacki-Richter, Bäcker, & Vogt, 2009) and (Zawacki-Richter, Bozkurt, Alturki, & Aldraiweesh, 2018) which reviewed research trends in distance Education Research and MOOCs, respectively. These articles used frameworks to critically analyze the trends of distance education and MOOCs published in the literature. The two frameworks presented in these articles are useful and could be adopted in this study. However, the small sample size did not allow the applicability of these frameworks in this study.

Therefore, as ICT infrastructure continues to improve, the number of eLearning initiatives will continue to be implemented in various levels of education in Tanzania. Consequently, the research on the eLearning effectiveness of eLearning solutions will continue to grow, both in academia and in the workplace. Despite the increased number of articles focusing on various aspects of eLearning, this study has clearly shown that few researchers have been involved in eLearning research. The study has shown that of 74 reviewed articles, more than 50% (37), were published from two universities, with 27 articles from UDSM and 10 articles from SUA. Given the advancement of ICT infrastructure and continued penetration of mobile telephony in Tanzania, the integration of ICT to enhance teaching and learning at every level of education cannot be underestimated. There is a need for more researchers to get involved in eLearning research in order to inform decision makers and other stakeholders on the effectiveness of ICT integration in education in Tanzania.

Another clear research gap shown in this study is that, there have been relatively few studies done on eLearning effectiveness in various contexts in Tanzania. Furthermore, the scope of studies that have tried to investigate eLearning effectiveness have been limited to case studies testing only small user groups. For instance, Ongoro and Mwangoka (2014) developed a game-based solution to enhance literacy skills for preschoolers and it was tested for its effectiveness in 12 preschools across three regions in Tanzania. The game-based learning solution was found to improve preschoolers' alphabetical skills compared to other means of delivery. Moreover, Mwalumbwe and Mtebe (2017) developed a Learning Analytics tool and used the tool to determine the causation between LMS usage and students' performance. Using data from the LMS log of two courses delivered at Mbeya University of Science and Technology (MUST), the study found that some LMS features, such as discussion posts, peer interaction, and exercises, had a significant effect on students' academic achievement using the eLearning system.

Msoka, Mtebe, Kissaka, and Kalinga (2015) developed an interactive physics experiment and piloted it in two schools with 157 students to investigate whether interactive experiments can be used as an

alternative to physical experiments. The findings from this study indicated that interactive physics experiments can be used as a substitute and/or a support in cases where there is inadequate laboratory equipment. Shimba, Mahenge, and Sanga (2017) conducted a study to determine the effectiveness of a simulation approach (virtual labs) versus a hands-on-lab approach for teaching and learning computer networking skills in universities in Tanzania, using SUA as a case study. Using the method involving a control group and an experimental group, the hands-on lab-approach was found to be more effective for imparting practical and problem-solving skills, and knowledge and competency to students compared to the simulation approach. Other studies that investigated the effectiveness of various eLearning interventions include animations and simulations that can enable students to learn difficult concepts (Mtebe & Twaakyondo, 2012), SMS-based quizzes as a tool for conducting assessment in secondary schools (Mtebe, Kondoro, Kissaka, & Kibga, 2015), and mobile Moodle (Mtebe & Kondoro, 2016).

As indicated previously, the majority of existing studies are case studies tested in small user groups. This implies that there is a need for more rigorous methods encompassing larger samples that still need to be done in Tanzania in order to gain a true picture of the impact of various eLearning intervention across different sectors. Moreover, some non-intrusive tools such as learning analytics and data mining techniques, are recommended. These tools can provide educators with informed decisions about how learners use eLearning solutions without relying on learners or instructors' opinions through questionnaires and interviews.

Another interesting research gap identified in this study is that students have been the most researched population group compared to other key stakeholders. The study recommends research be extended to other key areas, such as management and administration, policy issues, and to other stakeholders such as communities at work places and parents. Additionally, the study found out that most research reviewed (57%) adopted quantitative research design. Thus, the finding implies a paucity of researchers using other research methods such as analytics, data mining, and experimental designs methods and even qualitative and mixed designs. The use of diverse research designs is instrumental in determining the impacts of eLearning implementation in improving learning performance.

Moreover, the study revealed that despite the proliferation of mobile technology in Tanzania, there have been few research articles on mobile learning and game-based learning. For instance, out of 74 reviewed articles, only nine conducted research on some aspect of mobile learning while one article explored game-based learning. A detailed investigation of these articles revealed that the majority of them focused on users' attitude and perceptions of mobile phones (e.g., Kafyulilo, 2014; Kihwele & Bali, 2013; Mtebe & Raisamo, 2014b; Mtega, Bernard, Msungu, & Sanare, 2012) while few studies (e.g., Mtebe et al., 2015; Ongoro & Mwangoka, 2014) focused on the effectiveness of these technologies in enhancing teaching and learning. These findings imply the need for more research on the impact of mobile phones on eLearning in Tanzania.

The study also found that most of the research done on eLearning implementation in Tanzania is concentrated in higher education. Nearly two-thirds (53) of the reviewed articles represent research conducted at the university level, followed by 16 articles on secondary education. This implies that there is room for more studies to be done at other education levels such as primary, vocational, and teachers' education in Tanzania. More specifically, research is needed in the lower levels of education,

given the presence of many initiatives equipping schools with ICT facilities and sharing digital content for enhancing teaching and learning.

Finally, the study found that only 12 reviewed articles investigated the development and use of digital content at various levels of education in Tanzania. Even existing research (e.g., Mtebe & Raisamo, 2014a; Muganda, Samzugi, & Mallinson, 2016; Nihuka & Voogt, 2012; Samzugi & Mwinyimbegu, 2013) has shown that there is lack of enough digital local content in the public domain. Partly, the reason can be explained by the fact that most of the currently existing content is from Western countries and tends to describe learning as it happens in those countries, which normally mismatches with the understandings of children in developing counties (Kam, Mathur, Kumar, & Canny, 2009). This implies that there is a need for more efforts to be directed not only to research in digital content but to enabling the availability of quality locally developed content. Therefore, more research is needed on the development and use of local digital content in Tanzania.

Challenges Facing eLearning Implementation

Out of 74 reviewed articles, 45 investigated barriers that hinder eLearning implementation at various levels of education in Tanzania. Lack of Internet access and lack of support were the most ranked challenges, appearing in 30% (18 articles) and 25% (15 articles), respectively. More specifically, studies have described cost and low Internet speed being the main challenges to eLearning implementation in Tanzania. For example, studies have shown that one university was paying 104 million TShs (Tanzanian Shillings) (Lwoga, 2012) while another university was paying approximately US$ 3100 per month (Tedre, Ngumbuke, & Kemppainen, 2010) for Internet connectivity. Even the cost of mobile Internet provided by many mobile companies is still high. The subscription of 10GB of Internet cost around US$ 20 per month, which is expensive to the majority of Tanzanians.

Some researchers have investigated alternative solutions for delivering eLearning in a cost-effective way in order to overcome the cost of Internet connectivity. For instance, Mahenge, Mwangoka, and Simba (2014) proposed a cost-effective mobile learning approach for resource and network constrained environments. The proposed solution was said to have the potential to reduce the cost of bandwidth usage and cut down the server's workload. The proposed solution was piloted in some schools and found to enable use of eLearning content in an offline environment to overcome Internet connectivity problems. Similarly, Mselle and Kondo (2013) studied the use of an Offline Personal Learning Environment for learning mathematics in secondary schools in Tanzania. Students and teachers perceived the solution was effective and helped to overcome Internet connectivity problems.

Another challenge ranked as the second highest factor hindering eLearning implementation in Tanzania was identified in the reviewed articles as lack of support. The support services pointed out in many studies lacked training, lacked pedagogical support, and lacked technical and managerial support (Bhalalusesa, Lukwaro, & Clemence, 2013b; Kisanga & Ireson, 2015; Lwoga, 2012; Mtebe & Raphael, 2013; Munguatosha, Muyinda, & Lubega, 2011; Sife, Lwoga, & Sanga, 2007). These studies have shown that many users are still insufficiently trained in the appropriate integration of eLearning into the classroom. There is a need to continue conducting research on the most effective way of providing both technical and pedagogical support services to the users.

Conclusion

This study set out to determine eLearning research trends and barriers to eLearning implementation in Tanzania by reviewing articles published from 2007 to 2017 in journals, conference proceedings, and selected electronic journals. A total of 74 articles met the specified criteria and were critically reviewed out of 81 articles that were found to deal with some aspect of eLearning implementation in Tanzania. It was clear from this study that the number of researchers involved in eLearning research has been increasing every year showing that eLearning research is also growing. However, many of reviewed articles were found to have been conducted by researchers from three universities indicating a lack of researchers from other universities in Tanzania being involved in eLearning research. The study also found that the most commonly used research methods were quantitative, qualitative, mixed method, and unspecified, in that order. The most commonly preferred sample type was the purposive sample, and students were the most commonly chosen sample group.

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