A REVIEW OF E-LEARNING SYSTEMS' ADOPTION IN TANZANIA UNIVERSITIES

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Abstract
E-learning system is a form of teaching and learning in which a virtual learning environment is created which provide a smooth transfer of knowledge content between tutor and learner or learner and learner in which an Internet is acting as a medium of networking (wired or wireless) between communicating digital devises and learning sessions may be either synchronous or asynchronous. The objective of this paper is to assess the extent to which e-learning systems have adopted in the public and private universities in Tanzania and its associated challenges by randomly reviewing the past research studies and analysing contents contained in an official website of universities. This research found that the adoption of e-learning systems in Tanzania's Universities is still very low, at about 46% of universities have adopted e-learning systems for both Public and Private Universities with 75% of e-learning application software being Moodle based. Also, the finding show that the e-learning systems' adoption are facing with several challenges including ICT Infrastructure, ICT Policy, ICT Training to mention the few, however there are several interventions which had been taken including introduction of new National ICT Policy, Rise of data operators. This snapshot is useful to provoke for more academic enquiry in Tanzania and developing world at large to find the best model for e-learning systems adoption. The findings also have the potential to policy makers, universities and other stakeholder to understand the rate of e-learning adoption in order to justify the total investment based on that technology.
***Keywords**: e-learning system, adoption, Tanzania, universities, model*

1 INTRODUCTION

1.1 University as an organization

A university is the highest level of institution, dedicated to professional and intellectual development of mankind, and society in general (URT, 1999). Before year 1995, the Tanzania had only public universities (Bang, 2014) but as demand of universities education kept on increasing the government was officially allowed the private universities to be established and operate so as to cater for this highest education. Tanzania has a total of thirty-three (33) universities in which twelve (12) of them are public owned and twenty-one (21) are private owned. On top of that, it has five (5)-public university owned campuses, centres and institutes, sixteen (16)-private university owned campuses, centres and institutes (TCU, 2016). Each of the universities either university owned public or private university owned have basic Information and Communication Technology (hereafter ICT) infrastructure connecting offices, classrooms, laboratories and other important buildings (Lwoga, 2012). The word adoption in this context refers to the acceptance and use of e-learning technology for educational purposes (Maina & Nzuki, 2015).In this article use of the word e-learning and e-learning system will be used interchangeably, same will apply to the use of learner and student as well as instructor and tutor.

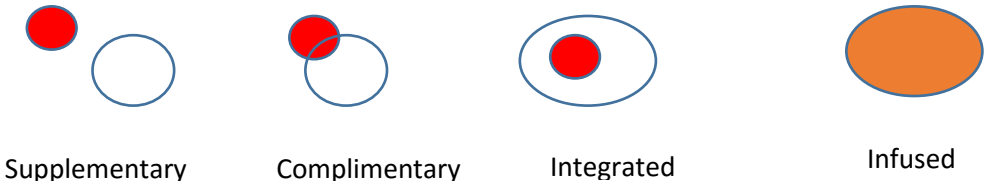
1.2 E-Learning systems

E-learning system is a form of teaching and learning in which a virtual learning environment is created which provide a smooth transfer of knowledge content between tutor and learner or learner and learner in which an Internet is acting as a medium of networking (wired or wireless) between communicating digital devises and learning sessions may be either synchronous or asynchronous-learning system is a form of Information, which is specific used in learning and teaching environment *(*Ahmed, 2010; Ahmed, 2013; Monahan, McArdl et al, 2008; Wang et al., 2007*)*.It carries all element of Information system including software (Learning Management System), hardware infrastructure, including accessing devises with computing ability like laptop, desktop, smartphone, networking infrastructure. In this system, the instructor would have a chance to post learning materials, conduct assessment, communicating with his/her class members as well as his/her companion (Hassanzadeh et al., 2012).

The learner would have a chance of accessing learning materials, sitting for any sort assessment (exam, quiz, test, etc), communicating with peer learners and instructor. The teaching and learning using this system provide a room to be conducted in real-time environment or at any one convenient time, so it provides flexibility which never being there in traditional learning (physical interacting learning), also it will encourage and accommodate self-paced learning, on top of that it save time because there is no need of coming into the class every day for learners and instructors (physically interaction may be an option), furthermore it save space especially in developing countries in which a learning resources (classroom, books, manuals, etc) are limited (Ansong et al., 2016; Yew & Jambulingam, 2015; Holsapple & Lee-Post, 2006).

eLearning systems in the organization in particular at the university has a paradigm shift from being a supplementary system to complimentary system and later to be an integral part and current as infused system as shown in figure 1(Kihoza et al., 2015; Manitoba Education, 2006). The universities worldwide are in that state of shift among those four states of accommodating e-learning in particular, however most of universities which adopted e-learning systems in Tanzania are in state of supplementary or complimentary.

Figure 1: Pradigm shift of e-learning systems (Kihoza et al, 2015; Manitoba Education, 2006)



1.3 eLearning systems' investment

Tanzania has been progressively investing in e-learning for the past five years, despite a limited resource the country has, as shown in figure 3. Most of this investment is a public owned investment (Adkins, 2013). The growth rate in e-learning investment for the African countries is approximately 15.2% from which the average growth of Tanzania e-learning investment in Tanzania is 19.1 % (Adkins, 2013). In East African Tanzania is ranked second in term of e-learning investment whereas Kenya is the first in East Africa as shown in figure 2. Tanzania was expected to invest around $ 11.73 million by 2016, this is huge investment with respect to limited resource that the country has.

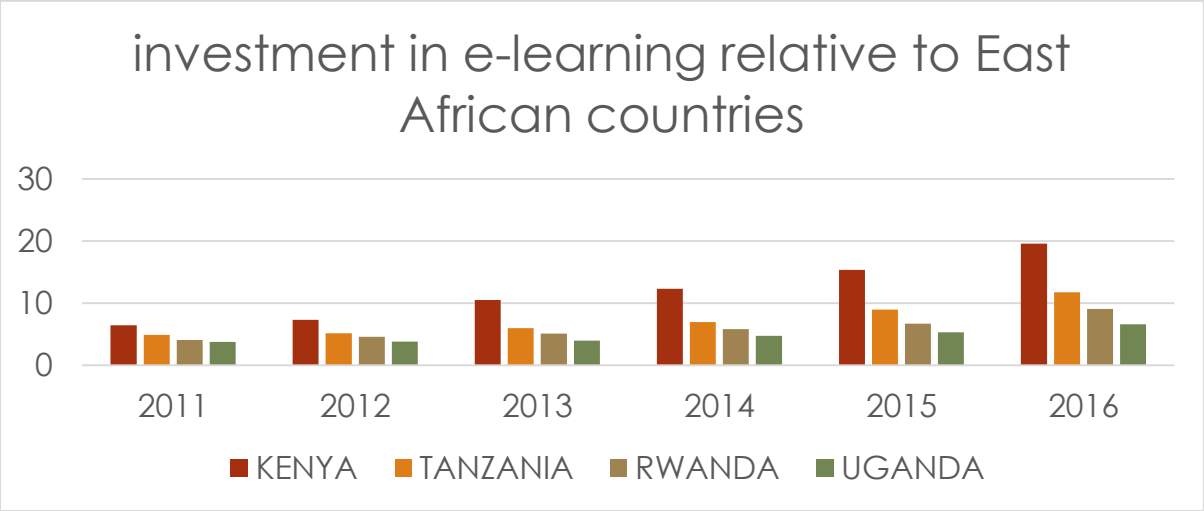


Figure 2:E-learning investment in East Africa in terms of million dollars. Data from (Adkins, 2013).

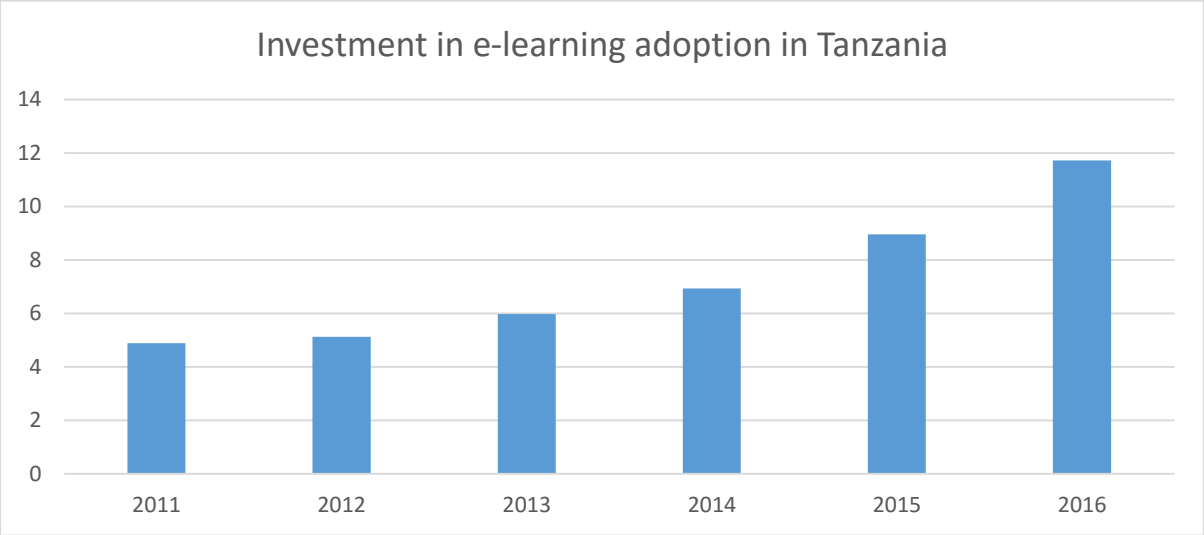


Figure 3:Tanzania E-learning investment from 2011 to 2016.Data from (Adkins, 2013).

2 Purpose of the study

In developing countries, the use of Information Systems particularly e-learning system is often seen as a life line solution to overcome educational systems deficiencies in Universities. Tanzania as one of the developing countries have struggled to cope with the changing learning environment in University. Now due to the amount of investment and expectation of the public funds, then there is a need of performing an assessment to find the extent to which an e-learning system have being adopted in the public owned and private owned universities in Tanzania and its associated challenges, since there are no current studies which posit the situation at the moment. The aim of this study was to assess the current position of adoption of eLearning systems in Tanzania, its associated challenges. So, the *main research question was what is the position of e-learning systems adoption in Tanzania's Universities and associated challenges?*

3 E-LEARNING ADOPTION IN TANZANIA'S UNIVERSITIES

3.1 PUBLIC UNIVERSITIES

Public universities refer to all universities owned, managed and operated by the government of Tanzania but controlled by MoEVT (URT, 1999). In this section, the e-learning system adopted by the public universities will be explained.

In a study done by Mtebe and Raisamo (2014a) on acceptance and use of e-learning in East Africa, University of Dar es salaam was used as a sample unit, and both university's students and instructors were involved. The study found that the University was still using Moodle as e-learning platform, however it was still facing the following challenges (i) lack of computers, (ii) low internet bandwidth (7Mbps to 20Mbps), (iii) absence of policies and (iv) lack of e-learning skills .The study suggest the following interventions (i) Workshops to lectures to sensitize them with the new eLearning systems, (ii) Developing and frequently updating the higher learning Institutions' ICT policy to reflect the changes of e-learning systems, (iii) Improving reliability and speed of their Internet access, (iv) Strengthening an IT unit, so that users will have opportunity to be attended timely and effectively and (v) e-learning should be user friendly to attract people to maintain its usage.

Lwoga and Komba (2015) studied the adoption of e-learning system in University of Mzumbe, particularly in the school of Business. The challenges found there include, (i) User interface (ii) Weak ICT policy (iii) Management support (iv) Technical support (v) Limited skills (vi) Lack of awareness (vii) Resistance to change and Lack of time to prepare the e-content by staff members. The Mzumbe university was also using Moodle based e-learning application

In another study by Mtega et al. (2012) found that there was high prospect of mobile-learning (m-learning) in Sokoine Agriculture University (SUA) though it was still limited by several challenges including (i) low ICT skills to both staff and students, (ii) limited bandwidth of Internet and limited mobile phone storage and (iii) e-learning systems not being customized to suit application domain (Mtega et al., 2013), SUA University was also using Moodle based e-learning application.

The study conducted in the Ardhi University by Mgendi (2010), identify different challenges facing the university, which include (i) unreliable electricity, (ii) bureaucracy of the management in making decision and (iii) lack of political will by management. On top of that there were other challenges which were mentioned by Mtebe and Rainamo (2014) include ICT infrastructure, lack of promotion of e-learning system and outdated ICT policy, unlike majority of public universities in Tanzania, this university did prove total failure to e-learning since e-learning was used for quite short time and it went on not being permanent system, and at last it was uninstalled (Mgendi, 2010). The State University of Zanzibar (SUZA) is one of those public university located in Tanzania mainland which is using Moodle as e-learning management system.

Open University of Tanzania (hereafter OUT) is a public owned university which have being a beneficiary of the e-learning system, Moodle based, because it was a university designed purposely for learning and teaching via open and distance. So, it

was one of those university which chipped-in earlier on the course of eLearning system adoption. Despite little glimpse of success, there are still challenges of its implementation (Mnyanyi. et al., 2010) which include (i) ICT Infrastructure (unreliable internet, computing devises and unreliable electricity), (ii) human resources (skilled personnel in e-learning systems development, system support and skilled instructors for developing content) and (iii) attitudinal factor (fear factors in users of e-learning systems and digital devises).

In the other hand, there was a study in OUT in collaboratively e-content development by the instructors (Nihuka & Voogt, 2012). This study came in as one of the intervention in the challenges pointed out by Mnyanyi. et al. (2010). The outcomes of that research were helpful in re-designing of teaching content in OUT, though this study can't be generalized into other universities in Tanzania because of qualitatively nature of the research.

Muhimbili University of Health & Allied Sciences (hereafter MUHAS), is one of the public-owned university in Tanzania, which deployed e-learning (Moodle base in 2009 as a second attempt after the first attempt of 2006 failed (Nagunwa & Lwoga, 2013). It was learned that the current e-learning system at MUHAS was facing several challenges including (i) ICT Infrastructure, (ii) Relevant technologies, (iii) Human resources-learning policy, staff and (iv) students training and unawareness of e-learning system. There was glimpse of interventions to smoothen the application of e-learning system at MUHAS, including a programme called AURA (African University Research Approaches). The first round of this programme was in 2015, (Mloka & Lwoga, 2016).

The University of Dodoma (UDOM), the e-learning systems (UDOM LMS) which is Moodle based is facing with several challenges for it to realize its fully potential (Ngeze, 2016). Those challenges (i) include lack of reliable internet, (ii) slow internet (small bandwidth), (iii) unreliable electricity power, ICT training to both students and staff.

Mbeya University of Science and Technology (MUST) is another public university located upcountry which is basically an Engineering University. As any other university, it has an eLearning system in place. There are several challenges associated with e-learning systems which has been reported (Loppa & Kayange, 2014) which include, (i) ICT Infrastructure (unreliability of internet and unavailability of computers), (ii) low bandwidth, unstable and (iii) unreliable electricity power, interoperability and insecurity), (iv) Human resource (unskilled tutors and eLearning support), (v) ICT Policy, Legal and (vi) ethical issues (provision of less than stated internet bandwidth). The good thing about MUST they developed their own e-learning application.

3.2 PRIVATE UNIVERSITIES

Private Universities refer to all Universities owned and managed and operated by private organizations or individuals, but controlled by MoEVT (URT, 1999). Tumaini University Makumira (TUMA) is a private university, which are well established with six (6) campuses (Tedre et al., 2010) which are Kilimanjaro Christian Medical College, Makumira University College, Dar es Salaam College, Stefano Moshi Memorial University College, Iringa college and Sebastian Kolowa University College by then. An e-learning was first installed in 2007 which is Moodle based and since then it facing with several challenges (Tedre et al., 2010) which include: (i) Equipment (low number of computing facilities), (ii) Networks (limited internet bandwidth), (iii) System administration (less expertise, counterfeit software, rampant malware i.e. virus, adware, Trojan horse, spyware and worms), (iv) Staff and Training, Pedagogical issues and (v) Funding.
Other universities with e-learning systems includes Muslim University of Morogoro (MUM), St. John's University of Tanzania (SJUT), Catholic University of Health and Allied Sciences (CUHAS), Sebastian Kolowa Memorial University (SEKOMU), University of Iringa (UoI) and Aga Khan University (AKU) in which their hyperlinks in their official websites were used to review the type of e-learning adopted.

4 METHODOLOGY

This article uses the random literature reviews on e-learning system in the context of Universities. This review covers journals' articles, reports and other useful literatures from year 1990 to 2016 in Tanzania. On top of that it collects information contained in the different website of both public owned and private owned universities in Tanzania. The e-learning systems were started to be introduced in developing countries from year 1990 (Naresh & Reddy, 2015) and Tanzania is typical developing country so it is reasonable to use the year 1990 as the starting year of collection of literatures.
This research adopts Schwarz et al. (2007) procedure of article selection, articles filtering and evaluation. The same approach was also employed by Sorgenfrei et al.(2016).

Figure 2: Schwarz et al (2007) procedure

The articles were selected from top journals which include Emerald, IEEE (Computer Society) and others from google scholar database. Thereafter articles were filtered using keyword "e-learning in Tanzania" or "virtual learning in Tanzania "or "online learning in Tanzania" or "e-learning system in Tanzania". The total of fifty (50) articles and reports were found to contain those keywords.

After being filtered the articles and reports were fully read to see if they related with the subject matter and given context which is e-learning systems or e-learning in Universities in Tanzania. At the end, the sum of twenty (20) articles and two (2) reports were qualified to be used in the discussion of the assessment of e-learning systems in Tanzania Universities.
The contents of the respective universities' websites were browsed through their URL (Universal resource locator) as shown in the Appendixes A and B attached.

5 DISCUSSION

Literature shows that currently, eight (8) out of twelve (12) of public universities have adopted e-learning systems, while seven (7) out twenty-one (21) of private universities have e-learning systems as well. All of public universities have automated student management systems except one (1) for public universities and four (4) for private universities.

Table 1: Number of information systems in Tanzania Universities

	PUBLIC UNIVERSITIES	%	PRIVATE UNIVERSITIES	%	TOTAL	%
e-Learning systems	8	67%	7	33%	15	46%
Student management systems	11	92%	17	81%	28	85%
Number of universities	12		21		33	

Source: Literature reviews

In specific type of e-learning system, currently seven (7) out of eight (8) of adopted e-learning in public owned universities are Moodle based while five (5) out of seven (7) of e-learning adopted in private owned universities are Moodle based, so the total number of Moodle based systems in both private owned and public owned universities are twelve (12) (Appendix A & B). The percentage of Moodle based is twelve out of fifteen (12/15) which is equal to seventy-five (75%). Furthermore, the literature shows (Appendix A) that Open source (free software) is the most preferred in universities with seventy-five percentage (75%) as e-learning system compared to licenced or internal development, this result is a little bit lower, but close to the previous research done by Munguatosha et al. (2011) which shows that 78% of Higher Learning had adopted Moodle-based e-learning system in Tanzania. The reasons for such preference is Moodle platform is easy and cheap to customize than either to buy or to develop a new system from scratch considering the limited resources with which the Universities have got (Munguatosha et al., 2011).

Table 2: List of universities with e-learning system in Tanzania

	Universities with e-learning systems in Tanzania	
s/n	Public Universities is **67%**	Private Universities is **33%**
1	UDSM	TUMA
2	SUA	MUM
3	OUT	SJUT
4	SUZA	CUHAS
5	MZUMBE	SEKOMU
6	MUHAS	UoI
7	UDOM	AKU
8	MUST	
	The percentage of the universities with e-learning in Tanzania is **46%**	

Source: Literature reviews

6 CHALLENGES

The common challenges which encountered by the universities are (a) ICT Infrastructures (low bandwidth, this is evidenced by Mtebe and Raisamo (2014e), who found that 9 out 11 universities had less than 20Mbps, unavailability of computing devises particularly computers, (b) ICT Policy (outdated or no policy at all), (c) ICT Training and Awareness (No internal e-learning training for both IT Support/developers and instructors). Also, there were no awareness campaign for learners and tutors.

7 INTERVENTIONS

To respond to the challenges associated with e-learning in both private and government universities the following action were taken on board.

i. ICT Training programmes in Tanzania Universities examples in MUHAS, AURA (African University Research Approaches), AURA is the programme to strengthening research and teaching practices in sub-Saharan Africa, in OUT, collaboratively e-content development by the instructors (Nihuka & Voogt, 2012) and other internal and external ICT training to Universities main stakeholders.
ii. The introduction of new National ICT Policy (ICT, 2016) which each individual University's ICT policy has to re-adjust to reflect it.
iii. The rise of data operators in Internet subscriptions in Tanzania which has made the individual internet accessibility to be cheap and reliable (Ngeze, 2015) which will reduce the ISP dependency characteristics.
iv. Installation of SEACOM, a national fiber-optic cable backbone project. It was expected to serve more than 60 plus research and education institutions at a discounted rate (Lwoga, 2012). Before, one university was paying up to 104,000Tsh (around 50,000 USD per annum).
v. Migration of 3G/4G data access (bandwidth) for mobile users in Tanzania (Ngeze, 2015).

8 CONCLUSION

The rate of adoption of e-learning systems in Tanzania is still very low, about 46% of universities have attained the adoption. This is low relative to the adoption in developing countries which is about 52 % (Isaack & Hollow, 2012). Having e-learning systems does guarantee neither smooth running nor maximum realization of its benefits as there still challenges associated with it including lack of ICT infrastructure, lack of updated ICT Policy, Training for instructors, learner and support staff although there were interventions including ICT Training programmes in Tanzania Universities, new national ICT Policy, increase of bandwidth which is due to SEACOM (submarine fiber cable project). This paper contribution is useful to provoke for more academic enquiry in Tanzania and developing world at large to find the best model for e-learning systems adoption. The findings also have the potential to policy makers, universities and other stakeholder to understand the rate of e-learning adoption in order to justify the total investment based on that technology.

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Appendix A-Public Universities.

S/N	Name of University	e-learning type & year	Student management system	Universities' Website link
1	University of Dar es salaam (UDSM)	MOODLE ▪ 2008	ARIS	https://www.udsm.ac.tz/
2	Sokoine University of Agriculture (SUA)	MOODLE	SUASIS	www.suanet.ac.tz/
3	Open University of Tanzania (OUT)	MOODLE (OUTLeMS) ▪ 2009	SARIS	www.out.ac.tz/
4	Ardhi University (ARU)	None	ARIS 1 & 2	www.aru.ac.tz/
5	State University of Zanzibar (SUZA)	MOODLE	SARIS	www.suza.ac.tz/
6	Mzumbe University (MU)	MOODLE ▪ 2009	ARIS	www.mzumbe.ac.tz/
7	Muhimbili University of Health & Allied Sciences (MUHAS)	MOODLE ▪ 2009	SARIS	www.muhas.ac.tz/
8	Nelson Mandela African Institute of Science	None	SS	www.nm-aist.ac.tz/

	and Technology (NMAIST)			
9	University of Dodoma (UDOM)	MOODLE (UDOM LMS) ▪ 2008	SARIS	www.udom.ac.tz/
10	Mbeya University of Science and Technology (MUST)	e-learning	SIMS	www.mustnet.ac.tz/
11	Moshi Cooperative University (MoCU)	None	MUSARIS	www.mocu.ac.tz/
12	Mwalimu Julius K. Nyerere University of Agriculture and Technology (MJNUAT)	None	None	www.mjnuat.ac.tz/

Appendix B-Private Universities.

S/N	Name of University	e-learning systems and status	Student management system	Website link
1	Hubert Kairuki Memorial University (HKMU)	None	None	www.hkmu.ac.tz/
2	International Medical and Technological University (IMTU)	None	None	www.imtu.edu/
3	Tumaini University Makumira (TUMA)	MOODLE ▪ 2007	SARIS	www.makumira.ac.tz/
4	St. Augustine University of Tanzania (SAUT)	None	SMIS	https://saut.ac.tz/
5	Zanzibar University (ZU)	None	ZUISI	www.zanvarsity.ac.tz/
6	Mount Meru University (MMU)	None	SARMS	www.mmu.ac.tz/
7	University of Arusha (UoA)	None	None	www.uoa.ac.tz/
8	Teofilo Kisanji University (TEKU)	None	TAIS	www.teku.ac.tz/
9	Muslim University of Morogoro (MUM)	MOODLE	SARIS	www.mum.ac.tz/
10	St. John's University of Tanzania (SJUT)	MOODLE ▪ 2016	SIS	www.sjut.ac.tz/
11	University of Bagamoyo (UoB)	None	SIS	www.uob.ac.tz/
12	Catholic University of Health and Allied Sciences (CUHAS)	e-learning platform	ESIS	www.bugando.ac.tz/
13	St. Joseph University in Tanzania (SJUIT)	None	STUDENT PORTAL	www.sjuit.ac.tz/
14	United African University of Tanzania (UAUT)	None	SRMS	www.uaut.ac.tz/
15	Sebastian Kolowa Memorial University (SEKOMU)	MOODLE	SARIS	www.sekomu.ac.tz/
16	University of Iringa (UoI)	MOODLE	SAMIS	www.uoi.ac.tz/
17	Abdulrahman Al-Sumait Memorial University (SUMAIT)	None	SARIS	www.sumait.ac.tz/
18	Mwenge Catholic University (MWECAU)	None	UMS	www.mwecau.ac.tz/
19	Ruaha Catholic University (RUCU)	None	SARES	www.rucu.ac.tz/
20	Eckernforde Tanga University (ETU)	None	None	www.etu.ac.tz/
21	Aga Khan University (AKU)	LEAP (In-house learning system)	ORACLE PEOPLESOFT ENTERPRISE	https://www.aku.edu/