Factors Affecting the Adoption of E-Learning Systems in Public Higher Learning Institutions in Tanzania: A Case of Institute of Accountancy Arusha (IAA)

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Abstract

In most developing countries, governments attempt to enforce the movement from analogue to digital for all their sectors, from public to private. These technological advancements have been noted to bring necessary and unavoidable changes to businesses and learning environments. Higher learning institutions have adopted various e-learning systems to support learning, research, and publication activities to stay competitive in global academic systems. However, most public higher learning institutions in Tanzania lag behind in the adoption of these systems. Thus, research shows a failure of these institutions in utilising the full benefit that today's Information and Communication Technology (ICT) can offer in learning environments. Thus, this study examines factors affecting the adoption of such a system in developing countries like Tanzania, taking the Institute of Accountancy Arusha (IAA) as a case study. The study used a mixed methodology where thematic and descriptive analysis was used to analyse both qualitative and quantitative research data. The study population was 187 teaching staff, a sample size of 126 was obtained, and 157 study participants were involved in the study. The study found that factors affecting the adoption of e-learning systems in public higher learning institutions in Tanzania include lack of ICT infrastructure, lack of technical and managerial support and lack of computers and e-learning knowledge among facilitators. Thus, the study recommended investments in adequate and reliable ICT facilities, high intermate speed and bandwidth, and policies that support e-learning and training programs about e-learning knowledge and use. Also, this study recommends the use of the Multi-Factors Adoption Model (MFAM11) for the successful adoption of an e-learning system in public higher learning institutions in Tanzania.

1. Introduction

Most Higher Learning Institutions (HLIs) have recently insisted on the appropriate use of Information and Communication Technology (ICT) in the teaching and learning process in order to satisfy a demand for education and offset the scarcity of resources [1] [2]. As a result, the implementation of an e-learning system among higher learning institutions is the way ahead for learners and lecturers to continue to improve their knowledge and career growth. E-learning at higher learning institutions throughout the world is intended to improve and assist their teaching and learning processes at the lowest cost feasible [3].

Many researchers, including [4], present definitions of e-learning from various angles. The use and or application of ICT tools such as computers, software, and the internet in the process of teaching and learning activities in higher learning institutions was the subject of this study. In this regard, an e-learning system is thought to aid in boosting access to training, interaction, and communication in order to speed up the learning process. As a result, the implementation of e-learning methods and technology will enable education to reach the majority of learners and expand learners' capacity to access education from a variety of locations rather than being bound to a physical classroom [2], such as through television, computers, and the internet. As a result, to bridge the gap between the growing demand for higher education and the limited number of resources available, such as lecturers, e-learning is viewed as an urgent answer for public higher learning institutions.

Although the e-learning system is critical for streamlining educational delivery in public higher learning institutions, many studies have demonstrated that there are numerous obstacles to its deployment in underdeveloped countries, including Tanzania. Some of the challenges mentioned include a lack of ICT infrastructure [5] [6], a lack of technical and managerial support [6] [7], a lack of computer and e-learning knowledge among facilitators [6]. This study's intention is to examine these factors if they are the same factors that hinder the adoption of e-learning systems at IAA, as the institute shifted from Sharepoint to Moodle, while still these systems are not being used to their full potential.

In underdeveloped/developing nations, the e-learning system is still in its infancy. In developing nations, the situation of e-learning adoption is not promising. In their empirical assessment, researcher in reference [8] found that most public higher learning institutions in developing countries suffer from a lack of resources and technical skills when compared to developed nations. Furthermore, public higher learning institutions that sought to completely implement

an e-learning system failed, owing to a lack of strategic planning, opposition to change, the cost of technology, and inadequate course delivery. Researchers in reference [9] and [10] revealed that public higher learning institutions in nations mostly use computers to compose text using the MS-Word application, search the web, and send e-mail, with only a handful using them to enhance e-learning activities. Meanwhile, there is minimal direct use of ICT technology in real teaching and learning activities, such as e-learning in underdeveloped/developing nations like Tanzania.

According to [11] "The e-learning strategies mainly employed by most of the Nigerian universities are in the form of prepared lectures on a CD-ROM that may be played as and when the need arises." This is because the quantity of computer systems available cannot accommodate enough students, causing the e-learning process to be less engaging than it should be. Furthermore, the majority of students comes from low-income families and has no expertise in or exposure to ICT solutions. This means students may not always be able to afford a computer and internet connection at home while studying. Because of the way things are now, students must use public internet cafes, which do not have enough bandwidth and slow down e-learning in the country.

Insufficient ICT and e-learning infrastructure, financial constraints, a lack of affordable and adequate Internet bandwidth, a lack of operational e-learning policies, a lack of technical skills in e-learning and e-content development by teaching staff, and a lack of interest and commitment were among the challenges identified by [12] during the implementation of e-learning in Kenya. These issues were gleaned from the 127 people that participated in the survey. Researcher in reference [12] highlighted three crucial components for effective e-learning implementation: technological components (network access and Internet capacity; and a trustworthy learning management system (LMS)), organisational components, and pedagogical components. Researcher in reference [13] highlighted the following ICT adoption challenges in the Gambia: To name a few, low income, a lack of R&D, a lack of internet bandwidth, a lack of ICT access, obsolete technology, a lack of a maintenance culture, and a lack of ICT skills.

Tanzania's government promotes both commercial and public entities to employ ICT in response to the country's e-learning or ICT solutions adoption. As a result, there is a strong push to spend extensively on ICT, with a focus on higher learning institutions to aid in the deployment of e-learning. As a result, the Tanzanian government gave a tax break on ICT facilities in order to encourage consumers and institutions to acquire and utilise ICT equipment in educational settings [14]. Similarly, the government funded a project to build 10,000 kilometres of fibre-optic cable across the country, connecting over 100 districts. In this regard, e-learning is an efficient means to reach a large number of learners at a low cost and use technology as a competitive advantage by exploiting telecommunication networks and providing adequate resources and competent people.

Despite the government's efforts and assistance, several researchers have iden-

tified several e-learning system adoption barriers, some of which may be impossible to meet simultaneously. This is due to a scarcity of resources, such as ICT skills and experience, a support budget, an internet connection, and ICT infrastructure. E-learning technology in Africa, particularly in Tanzania, is still in its infancy. As a result, without an early response, the identified barriers may persist. The utilisation of an e-learning system in the teaching and learning process in public higher learning institutions requires trained professionals, such as students and lecturers. This is because e-learning necessitates a certain level of technical knowledge besides a scarcity of resources. As a result, a scarcity of e-learning professionals in underdeveloped nations contributes greatly to e-learning technology challenges and, as a result, reduced utilisation of ICT systems [2] [15] [16] [17].

Public higher learning institutions in Tanzania are falling behind in adopting e-learning as a way of delivering education. Due to restricted and sluggish internet bandwidth, [7] reported that higher learning institutions in Tanzania, notably UDSM, use blended learning, in which CDs were shown to be effective alternatives to learning materials. As a result, face-to-face learning techniques are still used, and ICT applications are only used to supplement learning activities. According to researcher in reference [18], instructors at the Open University of Tanzania (OUT) utilise ICT technologies, including computers and the internet, to teach, seek learning materials, communicate (staff email system), and set examinations rather than generate study materials and present presentations to students. It has also been noticed that internet access is a hardship for students because there is a hidden cost of using the internet both within and outside of university learning facilities.

Similarly, Moodle software has been introduced at Sokoine University of Agriculture (SUA), Institute of Accountancy Arusha (IAA), University of Dar es Salaam (UDSM) and other public higher learning institutions in Tanzania. This is an open-source Learning Management System (LMS) for implementing and facilitating an e-learning system [19]. Mzumbe University (MU) and the Muhimbili University of Health and Allied Science (MUHAS) have also introduced e-learning to aid facilitators and students in the learning and research process [20]. However, the e-learning system is not fully implemented since there are insufficient computers and other ICT resources, such as the internet, to accommodate all students and staff at all times. MUHAS attempted to implement an e-learning system in 2006 but failed, owing to a variety of obstacles [20]. As a result, they employ a blended learning strategy (e-learning systems, CDs, and conventional teaching) similar to other institutions in countries that have previously introduced e-learning systems [6] [7] [17] [19].

Despite the fact that most public higher learning institutions in Tanzania have a local area network (LAN) and a limited internet connection, and lecturers' offices are equipped with computers, the infrastructure in place is not constantly upgraded. Researchers in reference [21] suggest that the adoption and usage of ICT systems in Africa typically fail due to a lack of concern for upgrading the

requirements of the intended users as well as putting current IT infrastructures in place. As a result, it is stated that the primary hurdle to e-learning adoption is a lack of ICT infrastructure and that no e-learning can be implemented in such an environment [22]. In this spirit, public higher learning institutions must consider a strategic development plan to mitigate the factors that can obstruct proper e-learning implementation, such as electric power stability, bandwidth, and computer availability in computer rooms [15] [17]. Various researchers, including [23], have recommended the use of the Multi-Factors Adoption Model (MFAM11) for the successful adoption of an e-learning system in public higher learning institutions in Tanzania.

As a result, the purpose of this study was to first analyse factors affecting the adoption of e-learning systems in Tanzania. Second, suggest feasible adoption methods to assist public higher learning institutions, as the primary practitioners of the e-learning system, in reducing identified obstacles through efficient use of already available resources. Furthermore, these goals are anticipated to address the following questions:

1) What are the major barriers to e-learning adoption in public higher-learning institutions, particularly IAA?

2) What techniques are available to assist public higher learning institutions in developing countries in effectively implementing e-learning?

2. Methodology

From Socio Technical System theory, this study utilised a descriptive research design where a mixed method was applied. Both qualitative and quantitative data were used to analyse factors affecting the adoption of e-learning systems at IAA. The use of mixed methods in analysing the adoption and application of online learning systems is highly supported by other researchers like [15] [24]. Quantitative data were collected through questionnaires consisting of statements arranged in the logical order of a 5-point Likert scale, directing participants to choose their ideas by ticking only one cell in the concept column. 1) strongly disagree, 2) disagree, 3) neither agree nor disagree, 4) agree, and 5) agree strongly. To obtain an in-depth analysis of the factors affecting the adoption of e-learning systems at IAA, qualitative data collection was performed through unstructured interviews.

Both probability and non-probability sampling were used. Purposively, 20 class representatives from 10 courses were selected as they had all the necessary information on the use of e-learning systems from their fellow class members. One information and communication technology manager, five system administrators, and five technicians were also purposively selected for the interview. By using a descriptive technique, content analysis was employed to analyse qualitative data. The study-maintained validity and reliability by involving e-learning system experts to review questionnaires and interview questions before they were distributed and interviews were conducted. Furthermore, participant con-

sent to be involved in this study was highly considered before questionnaires were distributed and interviews were conducted to maintain the validity and reliability of the study. The study population included all 187 academic staff members at IAA. The Kothari formula, which states that $n = N/1 + N(e)^2$ [25] was used to obtain a sample size of 126. This makes a total of 157 study participants.

3. Findings and Discussions

The study analysed data obtained from key informant interviews that involved the Information and Communication Technology Manager (ICTM), five system administrators, five technicians, and 20 class representatives from 10 different modules at IAA. Also, questionnaires were distributed to 126 facilitators obtained as a sample for this study through a 5-point Likert scale. Regarding the factors that affect the adoption of e-learning systems at IAA, the majority of respondents had negative responses. These evaluations are based on an adopted five-point Likert scale. Most respondents consider inadequate ICT facilities, training, internet bandwidth and speed and policies to hinder the full adoption of e-learning systems at IAA (Table 1).

Table 1. Factors affecting the adoption of e-learning at IAA.

SN	PROPOSITION	SDA %	DA %	NS %	A %	SA %	MEAN
1. LACK OF ICT INFRASTRUCTURE							
1.1	IAA has reliable ICT infrastructures to facilitate any e-learning system.	32	18	12	21	17	12
1.2	IAA has reliable power backup (electrical generators, inventors and UPs) to support the adoption of any e-learning system.	41	24	8	11	16	8
1.3	IAA regularly update its ICT infrastructures to cooperate with the adoption of up-to-date e-learning systems.	39	36	9	10	6	6
1.4	At IAA, there is reliable internet access with high speed and good bandwidth as the cost of internet in the country for institutional use is affordable.	37	28	16	12	7	4
1.5	IAA ICT department has a maintenance culture to repair and upgrade ICT facilities, including assurance that all computers in the labs and offices are connected to the LAN and working smoothly.	46	36	5	9	4	4
2. LACK OF TECHNICAL AND MANAGERIAL SUPPORT							
2.1	IAA have ICT/information system security policies that adequately support the adoption of e-learning systems.	38	23	8	26	5	5
2.2	Each department at IAA has full ownership of the e-learning system used.	56	24	4	8	8	4
2.3	IAA provide reliable and timely technical support for both facilitators and students while using e-learning systems.	58	26	3	9	4	3
2.4	Management of IAA supports ICT research and development and provides regular awareness and training programs.	63	31	1	3	2	1
3. LACK OF COMPUTER AND E-LEARNING KNOWLEDGE AMONG FACILITATORS							

Continued

3.1	IAA provides regular awareness and training programs about e-learning.	23	29	6	23	9	6
3.2	All facilitators at IAA have full skills to use the e-learning system provided by the institute.	45	37	0	10	10	0
3.3	IAA has enough computers to accommodate all students to use the e-learning system for all modules.	56	29	1	12	2	1
3.4	My office computer is UpToDate and reliable to use any e-learning system.	46	26	0	17	11	0
3.5	I prefer an e-learning system for my module to a traditional teaching system (physical class-based).	51	24	0	14	11	0
3.6	IAA conduct enough research and development program to enhance ICT capabilities in supporting e-learning.	62	29	0	5	4	0

Note: SA: Strongly Agree, A: Agree, NS: Neither Agree nor disagree, DA: Disagree, SDA: Strongly Disagree. Source: Researchers (2022).

3.1. Lack of ICT Infrastructures

ICT infrastructure has a bigger impact on whether an e-learning system is successful or unsuccessful. According to this survey, the biggest obstacles to the successful deployment of e-learning are ICT infrastructures. This is based on the reality that e-learning depends on ICT resources, such as having adequate computers available to both students and instructors. Meanwhile, this study found that at IAA, there is no reliable ICT infrastructure to adequately support any eLearning system (Item 1.1). Therefore, a lack of ICT infrastructure also contributes to limited access to technology and the capacity to run these systems constantly. During the interviews, respondents argued that "the computers we are using are out of date, and so are the operating systems in both offices and classrooms." The use of outdated hardware and software can result in limited access to most services and limited access to the utilisation of e-learning systems. Furthermore, it's against government procurement policy for government organisations to use ICT facilities for more than 10 years without replacing them with new ones [26]. These results are pertinent to the study in reference [27], which found that the majority of ICT solutions in poor nations struggle due to a lack of ICT infrastructure. Similar [12], at higher learning institutions in Kenya, these authors encountered technological difficulties that hampered the development of an effective e-learning system. Thus, IAA management should invest in reliable and adequate ICT facilities to support e-learning systems.

The issue of reliable power supply has also been a challenge to most developing countries in the adoption of ICT solutions, especially e-learning in public higher learning institutions. The study found that currently, IAA has no reliable power supply to adequately support e-learning systems (Item 1.2, 1.3). Power outage during interviews, respondents argued that "it is difficult to work with e-learning systems as power keeps going off and every time it does, you have to start all over again with whatever you were doing." Another argued that "if we had reliable UPS, it could have helped to save changes when power is off so that you can continue where you left off when power returns, but we "do not have re-

liable UPS and things are difficult in using e-learning systems." Both facilitators and students can be discouraged from adopting e-learning systems, as supported by the study of [15]. Therefore, for the proper implementation of e-learning systems, the institute needs to invest in reliable Uninterrupted Power Supplies (UPS) and have a reliable power backup like a standby generator dedicated to computer labs to support e-learning systems.

According to the majority of academics, Tanzania's restricted internet availability and high internet access costs are further barriers to e-learning. This study's findings show that respondents disagree and strongly disagree that the cost of the internet is affordable for the institute's use and there is good internet speed and bandwidth (Item 1.4). The study is consistent with findings in reference [3] that poor internet access or speed is another issue that hinders the use of e-learning in higher learning institutions. The experience in Tanzania demonstrates that an unstable electricity supply has contributed to the issue of poor internet connectivity and accessibility issues. According to the literature, an unstable electrical supply is another issue that makes it difficult to access the internet, [6] [7] [17]. This result is in line with research in reference [3] and [28], who found that the cost of internet access and the speed of the connection are additional barriers to the adoption of e-learning in higher learning institutions of developing nations, including Tanzania. The government should offer an alternative and dedicated internet speed to learning institutions at an affordable cost, while the management of these institutions should have a dedicated budget for reliable internet speed and bandwidth to support e-learning systems.

According to the research, outdated technology and a lack of maintenance contribute to the e-learning obstacles (Items 1.3, 1.5). According to the aforementioned conclusions, the country's ICT infrastructure is severely inadequate. The majority of public higher learning institutions in Tanzania do, in fact, have local area networks (LAN), but not every computer in the computer rooms is functioning properly. This suggests that existing technologies are not properly maintained and updated frequently enough, which prevents them from continuously saving many pupils. This assertion that ineffective maintenance and ineffective user assistance tactics are one of the major barriers to implementing ICT solutions is supported by the study by [16]. In addition, the majority of students come from low-income families, making it difficult for them to always afford to have their home computers connected to the internet. Management of the institute through the office of Information Technology (IT) should have a regular system check of all the computer labs to ensure that they are performing accordingly in supporting e-learning.

3.2. Lack of Technical and Managerial Support

When insufficient technical and managerial support acts as a barrier, it is discovered that management support is not significantly invested in ICT research and development, which gives the majority of educational "stakeholders" poor technological confidence. In order to make this argument very obvious, the sur-

vey discovered that inadequate ICT training for lecturers is among the barrier to the successful adoption of e-learning (Item 2.4). Also, inadequate ICT/information system security policies that encourage the safe utilisation of ICT facilities and e-learning systems are a challenge at IAA (Item 2.1). Furthermore, the IAA department fails to have ownership of e-learning systems and keeps treating the IT department as owners of the system, which results in a failure to fully adopt and adequately use any eLearning system that the institute introduces (Item 2.4). Accordingly, this is seen to be the result of insufficient technical and management assistance, and as a result, e-learning practitioners have a poor degree of ICT competence [17]. As a result, throughout the entire public higher learning institution society, there are relatively few technical professionals that can help the e-learning user [3]. Institute management should invest in adequate training programmes on different e-learning technologies used at the institute.

Every educational institution is required to have superior resource people, as is common knowledge. This is achievable if they are exposed to high-quality education and training that will enhance and pique their curiosity and enable them to continue doing research and development while staying current with emerging technologies. However, inadequate technological support eventually leads to a decrease in enthusiasm and commitment to using e-learning [12], which leads to resistance to change. Good internet speed and bandwidth have also been found to be a challenge at IAA (Item 2.4), along with technical support for both facilitators and students. Similar findings from [29] and [16] support the idea that effective management support and other support services are technically significant factors in the implementation of any ICT solution and acceptance of e-learning technology in higher learning institutions.

E-learning policies and their implementation strategies must always be part of the higher learning institutions' clearly defined ICT strategic plans. Findings from the study show that respondents do not perceive their policies to have acceptable eLearning guidelines. During interviews, one respondent argued that "public higher learning institutions' ICT policies are just for compliance with government guidelines and international standards, though this can be important but also a reflection of the real situation in a learning environment, like the adoption of e-learning systems, should be clearly stated in these policies". These claims are in line with those of the research conducted by [30]. It has been noted that any higher education institution's acceptance and implementation of e-learning depend heavily on the framework provided by its e-learning policy [12]. The operational e-learning policy was named one of the few studies in Tanzania's literature that prevented successful e-learning implementation. Higher learning institutions in Tanzania must create an acceptable e-learning policy to give public higher learning institutions a competitive edge in e-learning.

3.3. Lack of Computers and E-Learning Knowledge among Facilitators

Because ICT competency is a catalyst for new technology based on the benefits

of e-learning in educational institutions, it is essential for the successful implementation of e-learning [30]. Therefore, public higher learning institutions should always seek new ways to teach e-learning users in order to foster technological competence, academic competence, motivation, and commitment, all of which will lessen resistance to change. Further to this, management support is essential to ensure all facilitators are equipped with reliable knowledge of how to adequately use the e-learning system introduced by their institutions to be able to provide adequate knowledge and skills to their students. The current study found that this is not the case for IAA (Item 3.1). The development of ICT infrastructure should also concentrate on the technological capabilities required to support the entire user community, *i.e.*, educational stakeholders, though this is also not the case at IAA (Item 3.2). Public higher learning institutions in Tanzania should improve teachers' and students' knowledge of the pedagogical elements of e-learning that are required for successful e-learning implementation [12] [31]. Additionally, the success of e-learning depends on the stakeholders' ICT proficiency, technological readiness, and content quality.

The results of earlier research in poor nations demonstrate that ICT solutions like e-learning systems have a high failure rate [6] [7]. One of the causes is a lack of research and development in the field of information and communications technologies (Item 3.6), which leads to a poor definition of demand during the requirement analysis for the environment of developing countries [31]. As a result, the newly adopted system will need extensive customisation, which is costly in a way that public higher-learning institutions cannot afford. Also, the lack of enough computers in computer labs, as well as facilitators' having properly working computers in their offices, is a struggle for most public higher learning institutions, including IAA (Items 3.3 and 3.4). Most facilitators have refrained from using and adopting e-learning systems as a result (Item 3.5). IAA management should invest in supporting facilitators' research and publication on related issues and investing in adequate infrastructure to support e-learning systems.

4. Conclusions and Recommendations

To meet the high and rising demand for higher education, the functions of e-learning systems in enhancing the delivery of education to a large population in various higher learning institutions are well known and well-documented. However, the benefits of e-learning are not fully utilised in public higher learning institutions in Tanzania including IAA, since there are numerous barriers to e-learning implementation. The most frequent barriers listed in national literature were culled by the researchers, which include but are not limited to lack of ICT infrastructure, lack of technical and managerial support, and lack of computer and e-learning knowledge among facilitators. The study concluded that ICT infrastructures are the most prevalent barriers cited by numerous studies, followed by challenges in using technology, such as computers and the internet.

This happened because most public higher learning institutions don't have enough computers or adequate bandwidth (good internet access) to accommodate facilitators as well as students all the time.

This study concludes that successful e-learning implementation is doable if these obstacles can be removed. It is the recommendation of the current study that public higher learning institutions in Tanzania should invest in fundamental tactics that will assist in improving and successfully implementing the e-learning systems, such as upgrading and modernising ICT infrastructure, spending on ICT research and development, and e-learning components, which are thought to be crucial elements for successful e-learning implementation. Furthermore, the management of public higher learning institutions should emphasize well-defined policies that support e-learning and have a good budget for ICT facilities as well as regular awareness and training programmes to enhance e-learning knowledge for both facilitators and students. In addition, through various literature, this study recommends the use of the Multi-Factors Adoption Model (MFAM11) for the successful adoption of an e-learning system in public higher learning institutions in Tanzania as it has been proven successful by most researchers, including the research conducted by [21]. And last, the study recommends that the government lower internet tariffs for students, facilitators, and public higher learning institutions.

The study's limitations are based on the fact that it is focused on public higher learning institutions in Tanzania. More research can be conducted at other public learning institutions and private higher learning institutions. Adopting e-learning systems can solve learning challenges in secondary schools, so researchers can analyse the adoption in these learning environments. More models can be analysed to test the success factors in the adoption of various e-learning systems besides MFAM11. Last, the limitation to the successful adoption of e-learning systems in Tanzania and other developing countries is not limited to the factors analysed in this study. More research can be conducted to analyse different factors depending on the nature of the learning environment and institutions in question.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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