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Institutional Information Communication Technology Capacity influence on E-Learning Utilization for Instruction in Kenyan Universities

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Abstract

E-Learning is globally recognized as a significant strategy in improving relevancy, efficiency, cost-effectiveness, and quality of higher education. The paper presents a discussion of Information Communication Technology (ICT) infrastructure capacity influences on e-Learning utilization in instruction in Kenyan universities, with a view to determining strategies that universities employ to enhance e-Learning utilization. It opines that e-Learning has not been very popular as a method for instruction in universities, due to limited institutional ICT infrastructure capacities to fully implement e-Learning. The study used the mixed methods research design methodology to debate, reflect, critique, and discuss institutional capacities by universities in utilizing e-Learning in instruction. The reviewed different data sources, borrowed and immensely used government publications, e-Learning books, journals and research articles were used in document analysis. The researchers also used own intuitive

experience and knowledge in e-Learning utilization in instruction. E-Learning utilization demands for collaborative effort between government, universities, faculty and students, as well us bodies like the Commission for University Education (CUE). It was found that there are several major barriers to institutional capacities of universities in utilizing e-Learning in instruction. First, was the procurement of technology and sourcing of funds. It was seen that the total capitation for funding the programs was as low as 3%. Secondly, internal barriers arising from within individual institutions and faculty. Majority of the universities for a long time have relied on face to face interaction between students and faculty. However, in the wake of the Covid-19 pandemic, all learning institutions including universities, colleges and schools were forced to close down and seek alternative methods of instruction. It was found that most universities have moderate capacities to utilize e-Learning, but are yet to exploit its full potential. The study also established that nearly all the faculty were aware and used e-Learning for instruction but to a limited extent. Findings revealed that faculty prefer blended mode of instruction, but complained of limited bandwidths and poor connectivity for faculty and students far off from the university campuses. To mitigate the challenge, universities must strive to train and retrain the faculty on how to use technology and not about technology. Based on the review carried out in six universities; all the universities have some technologies in place including Computer Based Learning, Virtual Learning, video conferencing, content delivery via networks, use of memory sticks and emails. All have an e-Learning portal, module and platforms used for e-Learning. Majority of the university dons consider bandwidth, networking and a reliable Learning management system (LMS) as critical infrastructure for e-Learning utilization. Development and improved utilization of e-Learning is practically possible with enhanced institutional capacities. Enhanced use implies enhanced information transfer, reduced movement of faculty and students allow adequate time for faculty to invest in innovative teaching; enable faster transfer of information while students actively learn on their own. This would help bridge the gap and reduce pressure on existing resources. E-Learning could be the solution to the problem of increased student enrolment and reduced quality of university education. However, to ease the burden of financing university programs, public-private sector partnerships need to be encouraged. The study established that universities must provide students with affordable internet. To a large extent it delves into possible benefits and opportunities that would arise if universities realize and utilize fully the available institutional infrastructure and e-Learning resources. Demand is made upon the universities to develop and operationalize e-Learning policy and invest more in capacity building, set up infrastructure to deliver instruction online.

Key words: e-Learning utilization, instruction, institutional capacity

Introduction

Increasing growth in higher education in Kenya and the world has led to increased demand for quality university education. The demand continues to exert pressure on existing physical and human resources leading to adoption of e-Learning by universities in an attempt to attract and reach more students. Growth in student enrolment has also been impressive. Only 1000 students were enrolled in 1963 and today there are over 276,349 university students in Kenya, both full-time and part-time (Nyerere, 2020). The combination of high enrolments, low funding, inadequate infrastructure, Low internet connectivity, inadequate academic staff, low remuneration, and poorly managed satellite campuses with no decent teaching and learning facilities or no access to innovative technology, has hit even established universities hard. The implication being that teaching doesn't

advance beyond the traditional face to face methods (Makokha & Mutisya, 2016).
Nyerere, Gravenir & Mse (2012) concur with Boit & Kipkoech (2012), that demand for university education continues to surpass supply. Universities have put in place measures to cope with the ever increasing demand for higher education, by enrolling more students through diversified methods of content delivery from traditional face-to-face to incorporate e-Learning. Most universities have adopted blended learning but lag behind in full implementation due to inadequate e-Learning skills and infrastructure (Boit & Kipkoech, 2012).

It will take a combination of strategies to restore quality in university education in Kenya, particularly at public universities. The state, regulatory authorities and the institutions themselves will need to be involved. A probable solution to this problem is for the universities to fully embrace e-Learning in instruction and supervision as well as research. This would ease work performance and reduce time taken to complete certain instructional activities including course delivery and supervision. It would enhance efficiency and effectiveness in content delivery; promote effective utilization of available resources with more interactive learning leading to improved performance and ensure equitable distribution of quality education.

Despite Kenya currently leading in Eastern Africa with faster internet speeds, most universities are faced with lack of adequate data on costs, logistics, policies and cost of implementation. Universities that report some activity with e-Learning are limited and have poorly developed modules and weak infrastructure base. Thus, need to review existing constraints as opportunities that can help improve use of e-Learning. In view, of the fact that e-Learning strongly relies on available infrastructure, funding uptake; staffing and what the universities need to do and can do. The study sought to find out the resource capacities of the universities for improved use of e-Learning in instruction and supervision. The focal point being to establish the influence of institutional capacity on e-Learning utilization in Kenyan universities and seek to establish strategies put in place for enhanced use of e-Learning in instruction and supervision.

Reasons for Low Rates of Acceptance and Use of e-Learning

Odhiambo (2009), in a study on reasons for low rates of acceptance and use of e-Learning, compared perceptions of e-Learning in Jomo Kenyatta University of Agriculture and Technology (JKUAT) and the United States International University (USIU). Focus was on interactivity and usability of Moodle and WebCT learning management systems (LMSs) used in the universities. Findings indicated audio-visual forms of content delivery, as having potential to improve effective learning. There is need to go beyond the potential for e-Learning use and operationalize e-Learning policies, programs and platforms for achievement of the potential. The study found out that universities in Kenya lacked requisite ICT infrastructure and skills. The study recommended that universities should partner with the private sector to improve ICT infrastructure, build capacity, and standardize e-learning programs in the country.

Mutisya and Makokha (2016), in a study on challenges affecting adoption of e-Learning in Public universities in Kenya, found out that faculty cited insufficient Internet connectivity, denial of copyrights for their developed e-Learning modules, limited information and communication

technology (ICT) skills, lack of incentives, shortage of computers/laptops, inadequate computer laboratories, and insufficient time for online interaction. Students, on the other hand, ranked insufficient Internet connectivity as the number-one challenge, followed by: lack of computers/ laptops, inadequate computer laboratories, limited ICT skills, and insufficient time for online interaction, are the major constraints to e-Learning utilization. There is need for the universities to build the institutional resource capacity for effective implementation of e-Learning utilization. Equally equip the faculty with requisite e-Learning skills, while ensuring the use of more interactive platforms and modules for instruction and supervision.

Capacity of Universities to Implement e-Learning

A comprehensive review of the capacities of universities to fully implement e-Learning was done. The fundamental obstacle to the growth of e-Learning being lack of access to the necessary technology infrastructure, for without it there can be no e-learning (Naidu, 2003).

In Europe, over 80% of the universities use digital courseware such as digital textbooks, curricula and reference materials, online repositories for educational material, tools and management systems for content development and course management and student portals, either throughout the entire university or at some faculties (Gaebel, Kupriyanova, Morais & Colucci. 2014) .

The Kingdom of Bahrain as a country has institutional capacity in ICT. However, this capacity is not being used for knowledge development (Nina, 2012). Multiplicities of factors in the educational system impede the effective implementation of best practices in general and in particular successful e-Learning.

In Africa, the e-Learning Africa report (2012) highlights some of the most significant constraining factors as being limited bandwidth (17%), followed by the lack of financial resources, inadequate human resource capacity and limited electricity, all with 11%. According to Eke (2011), Infrastructure like electricity, computers and Internet are not yet fully in place to enhance e-Learning utilization in instruction and supervision.

In Ghana, Awidi (2008), in his study called developing an e-Learning strategy for public universities in Ghana, points out that universities must develop visionary strategic plans for e-Learning policies and their implementation. In order to have a successful transformation, Uys et al (2004) concurs with Awidi (2008) that e-Learning needs to be implemented within a strategically developed framework based on a clear and unified vision and a central educational rationale, hence a need for a comprehensive and strategic framework with particular emphasis on bandwidth management by HE institutions in low bandwidth environment which can facilitate the fundamental shift from once for life learning model to lifelong learning style.

In Uganda, a study carried out on implementation of e-Learning in institutions of higher learning showed that e-Learning involved instructional material delivery (80%), less contact hours for discussions (12%), and with a very low conduct assessment (2%). The findings showed that infrastructure and technical incompetence, staff and student attitude limits complete acceptance

and adoption of e-Learning (Kasse and Balunywa, 2013). However, the study did not spell out the extent it affected the instructional process.

Implementation of e-Learning is generally expensive for an average university at the initial start-up stages. Inadequate financing of e-Learning is a major barrier to successful implementation in Kenyan Universities. Despite, Kenyan public universities making annual budgetary allocations for e-Learning implementation, studies show that the allocations are inadequate to carry out all important e-Learning activities like training of staff on e-Learning, maintenance, e-content development, Internet bandwidth and e-Learning infrastructure development. It's evident that most ICT and e-Learning related projects in most universities rely on donor funding, with majority of Kenyan universities not prioritizing e-Learning in their budgetary allocations.

Moreover, universities in Kenya lack affordable and adequate Internet bandwidth, due to high cost of bandwidth. Despite the introduction of bandwidth subsidy by the Kenyan Government through the Kenya Education Network (KENET) and arrival and operationalization of the undersea backbone fibre optic cables in Kenya in the year 2012, the cost of Internet bandwidth is still high; hence currently most universities cannot afford to procure adequate internet bandwidths. As explicitly stated in the E-Readiness Survey of Kenyan Universities (Kashorda & Waema, 2014) Report, faster internet connectivity is critical to an institution using e-Learning to support teaching and learning. The report rates the current price of $160 per Mb/s as very high price in comparison to developed countries.

A case study of Kenyatta University and University of Nairobi by Nyerere et al. (2012), on status of and challenges hindering realization of full potential of Open Distance and e-Learning (ODeL) in Kenya, found that provision of ODeL faces numerous challenges that affect its effective implementation. The challenges include low use of program facilities, delays in production of digital materials and inadequate funding and understaffing. The study not only identified the challenges but failed to provide in depth information on the use of e-Learning in instruction. The institutional capacities on the other hand act as a barrier to effective implementation of e-Learning. These barriers are vast and are categorized into internal and external barriers. The internal barriers are based on perceptions and attitudes of the faculty who are expected to implement. Studies have indicated that most faculties are technophobic and use e-Learning to a very limited extent. Lack of technical skills and manipulative ability limits uptake of e-Learning in higher education institutions. The external barriers limiting full utilization of e-Learning for instruction and supervision are inadequate infrastructure and technologies required for effective implementation. Lack of funds, internet connectivity and low band width and other necessary infrastructure constraint full realization of the benefits of e-learning utilization.

Research Methodology

The study utilized a mixed methods design that involved elements of quantitative and qualitative research approaches like use of quantitative and qualitative viewpoints, collection of data, analysis and inference techniques. For purposes of this paper, the independent variable was influence of institutional capacity on e-Learning utilization. The dependent variable was instruction and

supervision in public and private universities in Kenya. Quantitative approach helped to study the narratives by Heads of Department, faculty and students on e-Learning utilization for instruction and supervision in Kenyan universities. The qualitative approach involved a regression analysis of the data collected on capacity of universities to sustain e-Learning use. Primary data was obtained from university faculty, departmental heads and students of selected public and private universities. This study was conducted in 3 private and 3 public universities in Kenya. The universities provided a blend of urban and rural settings that directly influence how e-Learning programs are undertaken. The universities were selected based on their world ranking in use of e-Learning and location.

The accessible population comprised of faculty and students in schools of education in the respective universities offering common e-Learning courses. The study used a multi stage random sampling procedure. The sampling method divided a population into groups for conducting research. During the sampling, the study population was split into sub groups at various stages to make it simpler for primary data collection. The study used multistage random sampling because the population was too vast and researching every individual was impossible. The study was carried out in six (6) universities from which 12 Heads of Department, 90 faculty members, 335 students and 6 directors of distance and open electronic Learning (ODeL) programs were selected to take part in the study. Two sets of questionnaires were used to get information from students and faculty of selected universities. A face to face interview was used to obtain information from heads of department of education and directors of e-Learning. Piloting was done to establish ability of research instruments to collect data. Content validity was assessed by checking for ambiguity, confusion and poorly prepared items. Spearman Brown Prophecy Formula was applied to obtain reliability of the questionnaire in entirety. Data was mainly collected by the researchers using both hard copy and soft copy formats of the research instruments. Data analysis involved a variety of descriptive and inferential statistics. The descriptive analysis involved the use of the Statistical Package for Social Sciences Programme for Windows Version 22 tool to perform statistical data analysis. Regression analysis was used to analyze data on the influence of institutional resource capacity of the universities to utilize e-Learning. Frequency tables were mainly used to present descriptive information collected from the respondents. Informed consent was sought from divisions of Research and Innovation of respective universities through departmental heads. Arrangements were made by the researcher to ensure that only participating individuals in the study were given the questionnaires.

Results and Discussion

In this section, we present results emerging from the study. The information obtained from the research study, in line with literature involving much more recent studies that informed the study. The results are summarized into two sections. First, institutional capacities of universities to use e-Learning in instruction and supervision. Secondly, discussion of the findings. The study involved a research study of 3 public and 3 private universities in Kenya.

The information was gathered from primary sources and secondary sources, mainly documents and internet sources. The main sources of information were faculty, students and Heads of Department. Directors of ODeL came in handy providing critical information on institutional capacities. This enabled a comprehensive review that helped to justify and enrich results for purposes of wider interpretation and application.

Capacities of Universities to Utilize e-Learning in Instruction and Supervision

The initial task of the paper was to assess extent institutional infrastructure resource capacities influence e-Learning use in instruction and supervision in universities in Kenya. To achieve these, students, faculty and Heads of Department as well as Directors of e-Learning were asked to indicate institutional capacities that influence use of e-Learning in instruction and supervision. Specifically the study assessed the type of internet connectivity, internet reliability, adequacy and level of utilization.

Table 1 *Type of Internet Connectivity Available*

Internet Connectivity	Students Frequency	Percent	Faculty Frequency	Percent	HODs Frequency	Percent
Wireless	225	67.2	36	40.0	7	58.3
Fibre optic	18	5.4	33	36.7	4	33.3
Local Area network	35	10.4	8	8.9	1	8.4
Cable	0	0	13	14.4	0	0
All	54	16.1	0	0	0	0
None	2	0.6	0	0	0	0
Others	1	0.3	0	0	0	0
	335	100	90	100.0	12	100.0

Source: Researcher

Each student, faculty and HOD indicated whether the university uses wireless, fibre optic, local area networks or a combination or none. Most (67.2%) students, 40.0% of the faculty and 58.3% of the HODs were in agreement that universities mainly used wireless connections. However, a 10.4% of students, 8.9% of faculty and 8.4% of HODs reported that Local Area Networks were in use as a neglible (5.4%) proportion of students said, they used fibre optic. On the contrary 36.7% of faculty and 33.3% HODs said that they used fibre optic connections. At least 16.1% of the students reported all types of internet connectivity were available in the universities. None of the students, faculty and HODs reported total absence of internet connectivity.

Stability of the Internet

Despite internet availability, its stability is critical to successful utilization in e-Learning. To ascertain whether available internet sources were stable and reliable, the faculty indicated that the internet was stable. The findings on stability of the internet are presented in Table 2.

Table 2 *Stability of the Internet as Reported by Faculty*

	Frequency	Percent	Valid Percent	Cumulative Percent
Very Stable	14	15.6	15.6	15.6
Stable	53	58.9	58.9	74.4
Slightly stable	12	13.3	13.3	87.8
Unstable	11	12.2	12.2	100.0
Total	90	100.0	100.0	

Source: Researcher

Findings in Table 2 indicate that three quarters (74.5%) of the faculty felt internet was stable (58.9%) and very stable (15.6%). In a few instances, 13.3% of the faculty said internet was slightly unstable. On the contrary, 12.2% reported internet was unstable. One faculty from one university noted that if there is something good that the university did was to set up a stable internet source.

Reasons for Stability of Internet by Faculty

Table 3 presents opinions of the faculty on reasons for stability of internet. A wide range of reasons were given on stability by faculty.

Table 3: Cause of Instability or Poor Internet Connectivity

	Frequency	Percent	Valid Percent	Cumulative Percent
Limited bandwidth	15	16.7	16.7	16.7
Large number of users	4	4.4	4.4	21.1
Unstable internet	18	20.0	20.0	41.1
Poor connectivity	11	12.2	12.2	53.3
Very stable	32	35.6	35.6	88.9
Others	10	11.1	11.1	100.0
Total	90	100.0	100.0	

Source: Researcher

More than one third (35.6%) of the faculty maintained that internet was very stable, about while 16.7% reported limited internet availability, as 28.9% said limited bandwidth (16.7%) and poor internet connection (12.2%). Fewer (4.4%) faculty attributed the low internet stability to large number of users. Similar views were held by the students. The rest (11.1%) of the faculty remained silent about stability of internet.

Level of Internet Availability in Universities

Results presented in Table 4 on availability of internet as reported by the students. The students rated internet availability as readily available, unavailable and lowly available.

Table 4: Level of Internet Availability in Universities as expressed by Students

	Frequency	Percent	Valid Percent	Cumulative Percent
Readily available	183	54.6	54.6	54.6
Unavailable	38	11.3	11.3	66.0
Low level of availability	112	33.4	33.4	99.4
Telkom coverage is poor	1	.3	.3	99.7
Others	1	.3	.3	100.0
Total	335	100.0	100.0	

Source: Researcher

Over half (54.6%) of the students opined that internet was readily available, with a third (33.4%) reporting low levels of availability while few (11.3%) students said internet was unavailable. The findings showed that internet was available in the universities but at varied levels. Students from private universities indicated a higher level of availability than those in public universities. In cases

of low availability, students suggested possible reasons. Some of the reasons given by students are presented in Table 5.

Table 5: Reasons for Poor Internet Connectivity

	Frequency	Percent	Valid Percent	Cumulative Percent
Inadequate funds for e-Learning programs	35	10.4	10.4	10.4
Inadequate infrastructure	18	5.4	5.4	15.8
Limited bandwidths due to high cost	59	17.6	17.6	33.4
Classrooms lack internet connection	17	5.1	5.1	38.5
I don't know	8	2.4	2.4	40.9
large student population	142	42.4	42.4	83.3
Away from the school router	19	5.7	5.7	89.0
Others	28	8.4	8.4	97.3
Poor choice of service provider thus poor connectivity	6	1.8	1.8	99.1
Fewer computers are available	3	.9	.9	100.0
Total	335	100.0	100.0	

Source: Researcher

Nearly half (42.4%) of the students cited large number of users as cause of low internet availability. Less than a quarter (17.6%) said limited bandwidths and inadequate funds (10.4%) for e-Learning are reasons for low internet availability. Distance from school router reduced accessibility to internet as reported by few (5.7%) students. Weak signal and poor choice of service providers were cited by a neglible (1.8%) percentage. A few (0.9%) students reiterated that availability of fewer computers was the reason for low connectivity.

Adequacy of Resources for e-Learning

Determining institutional capacities for e-Learning utilization, required adequacy of available resources to be confirmed. The resources may be available but adequacy needs to be established. A likert's scale was used to determine adequacy of the resources. The students stated whether resources were adequate, inadequate or none (unavailable) or didn't know.

Table 6: Adequacy of Resources for e-Learning

Resources	Adequate		Inadequate		None		I don't know	
Computers	218	65.1	100	29.9	5	1.5	12	3.6
Printers	164	49.0	127	37.8	17	5.1	27	8.5
Projectors	180	53.7	114	34.0	14	4.2	27	8.1
Computer laboratory	223	66.6	98	29.3	4	1.2	10	3.0
Textbooks on ICT	182	54.3	91	27.2	17	5.1	45	13.4
Computer accessories	181	54.0	129	38.5	9	2.7	16	4.8

Source: Researcher

Generally, over half (57.1%) of the students said computers (65.1%), printers (49.0%), projectors (53.7%), computer laboratories (66.6%), text books on ICT (54.3%) and computer accessories (54.0%) were available. At least a third (32.8%) of the students opined that universities have inadequate resources. An equal number (29.9%) of students agreed that computer laboratories (29.9%) and computer accessories (29.3%) were inadequate. Also inadequacy of printers (37.8%), projectors (34.0%) and text books on ICT (27.2%) as reported by the students.

Faculty responses on Availability of Resources in Departments

Views of the faculty were sought for purposes of knowing availability of the resources. Data collected from the faculty was presented in Table 7.

Table 7: Availability of Resources in Departments as reported by Faculty

	Computers		**Printers**		**Computer laboratory**		**Textbooks on ICT**		**Computer Resources**	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Available	83	92.2	71	78.9	76	84.4	65	72.2	45	50.0
Unavailable	6	6.7	18	20	13	14.4	24	26.7	44	48.9
Others	1	1.1	1	1.1	1	1.1	1	1.1	1	1.1

Source: Researcher

Findings presented in Table 7 represent views of the faculty that; computers (92.2%), printers (78.9%), projectors (84.4%), computer laboratory (84.4%) and textbooks on ICT (72.2%) and computer accessories (50.0%) were available. Almost half (48.9%) of faculty pointed out that computer accessories were unavailable, as 24.0% faculty said textbooks on ICT (24.0%) were unavailable. Heads of Department unanimously agreed that institutions have the resources and goodwill to adequately implement e-Learning. The e-Learning Directors concurred with faculty that universities have resources but yet to achieve optimal utilization for instruction.

Level of Effectiveness of e-Learning Technologies

The faculty were expected to indicate level of e-Learning technologies effectiveness. The views of the faculty and students are as shown in Table 8.

Table 8: Level of Effectiveness of e-Learning Technologies

	FACULTY						**STUDENTS**					
	Effective		**Moderate**		**Ineffective**		**Effective**		**Moderate**		**Ineffective**	
Computer based learning	42	46.7	42	46.7	6	6.7	71	21.2	206	61.5	71	21.2
Web based Learning	37	41.1	38	42.2	15	16.7	8	23.2	176	52.4	81	24.5
Video conferencing	40	44.4	31	41.1	19	21.1	85	25.3	168	50	82	24.4
Wireless and Mobile devices	39	43.3	37	41.1	14	15.6	111	33	139	41.4	84	25
Virtual classroom	53	58.9	23	25.6	14	15.6	106	31.5	147	43.8	81	24.2

Content delivery via networks	48	53.3	30	33.3	12	13.3	106	31.5	147	43.8	81	24.2
IPods/Tablets	46	51.1	33	36.7	11	12.2	43	12.8	128	38.1	159	47.5
Memor y sticks							159	47.5	128	38.2	43	12.8
Emails	52	57.8	24	26.7	14	15.6	154	45.8	106	31.5	72	21.5

Source: Researcher

Majority (84.5%) of the faculty said that virtual classrooms were effective (58.9%) and moderately effective (25.6%) e-Learning technologies. However, 15.6% faculty felt that virtual classes were ineffective. On the other hand most (82.7%) students indicated that computer based learning is used, with 21.2% saying it's highly utilized, 61.5% responded moderately utilized and 21.2% said lowly utilized.

Emails were identified as the most commonly used technology in e-Learning as reported by more than half of the faculty (57.8%). However, 45.8% of students felt emails are more effective. Contrary to the view of 45.8% of the students that emails are very effective. At least one third (31.5%) of students reported moderate level of effectiveness compared to 26.7% of the faculty. In both cases fewer faculty (15.6%) and 21.5% of the students felt that emails were ineffective.

More than half (53.3%) of the faculty argued that delivery of content via networks is effective, with a third reporting it is moderately effective (33.3%). The rest (13.3%) said content delivery over networks is ineffective. Fewer students (31.5%) concurred with the faculty that content delivery over networks is effective, as 43.8% said it is moderately effective. The use of IPods/Tablets was singled out as effective by half (51.1%) of the faculty. The opinion was supported by a third (36.7%) of the faculty who said IPods/Tablets were moderately utilized. The use of IPods was said to be ineffective by 12.2% of the faculty.

Wireless and mobile technologies were seen as effective by nearly half (43.3%) the faculty, with 41.2% saying it was moderately effective as the remaining faculty said it was ineffective. Wireless and mobile technologies are highly utilized as indicated by one third (33.3%) of students. On average 41.4% said they used wireless and mobile technologies to a moderate extent. The use of video conferencing was rated effective by 44.1% faculty who said it was effective while 41.1% said it was moderately effective. However, 21.1% said it was ineffective. A half (50.0%) of students felt that video conferencing was moderately used, while 25.4% said video conferencing was highly utilized, as 24.4% said it was lowly utilized.

Web Based Learning was rated effective (41.1%) and moderately effective by 42.2% of the faculty, compared to 25.3% of the students who said it was effective. Some 16.7% faculty said web based learning was ineffective in relation to 24.4% the students who reported it was ineffective. Equally, half (52.4%) of the students agreed that it was moderately utilized. Additionally, 43.8% believed it was moderately utilized. Views held by 24.4% of the students were that wireless and mobile technology strategy was lowly utilized. Nearly half (47.5%) of the students reported that memory sticks were highly utilized, while 38.1% said moderately effective. According to 12.8% of the students memory sticks were the least utilized.

Universities Capacity to Sustain e-Learning

The researcher sought to find out from the faculty, students, Heads of Department and e-Learning Directors whether the universities had capacity to sustain e-Learning utilization. Most Heads of Department were of the view that the universities have capacity but are yet to exploit their full potential even with the existing resources. However, one Head of Department noted that the university had a low capacity to implement e-Learning utilization, since it had inadequate resources. Study findings presented in Table 9 indicate opinions of faculty.

Table 9: Opinion on Capacity of Universities to Sustain e-Learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Invest more in ICT infrastructure	10	11.1	11.1	11.1
Adopt a more stable platform	7	7.8	7.8	18.9
Infuse teaching, admission and supervision into online programs	1	1.1	1.1	20.0
Provide faster internet	3	3.3	3.3	23.3
Enhance e-Learning literacy among faculty	22	24.4	24.4	47.8
Increase availability of e-Learning resources	15	16.7	16.7	64.4
University has capacity	29	32.2	32.2	96.7
Others	3	3.3	3.3	100.0
Total	90	100.0	100.0	

Source: Researcher

Slightly more than one (32.2%) of faculty said universities have capacity to sustain use of e-Learning. Enhancement of e-Learning strategy as seen by 22.4% of the respondents is a sure way to sustain e-Learning. It was the opinion of more than a quarter (28.8%) of faculty that universities must invest more in ICT infrastructure (11.1%) and increase availability of e-Learning resources (16.7%). A limited number (12.2%) said that provision of faster internet (3.3%), infusion of e-Learning in instruction and admission (1.1%) and adoption of more stable platforms (7.8%) could enhance e-Learning utilization.

Opinion of Students on Capacity of Universities to sustain e-Learning

Successful implementation of e-Learning depends on universities level of utilization of available resources to sustain e-Learning. To this end, the study sought to establish the capacity of the universities to sustain e-Learning. The respondents were limited to 'yes' or 'no' responses.

Table 10: Students Views on Capacity of Universities to Sustain e-Learning

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	240	71.6	71.6	71.6
NO	72	21.5	21.5	93.1
I don't know	21	6.3	6.3	99.4
Others	2	.6	.6	100.0
Total	335	100.0	100.0	

Source: Researcher (2023)

Findings in Table 10 indicate that 71.6% of students felt universities have capacity to sustain e-Learning, while about a quarter (21.5%) opined that universities do not have capacities. At least 6.1% were not sure or did not attempt to say anything. It is one thing for a university to have resources, but it is another altogether for it to utilize the resources optimally for the intended purpose. To ascertain sustainability, each student justified his or her choice.

Reasons for Sustainability of e-Learning in Universities

According to findings presented in Table 11, a wide range of reasons were given on the level of sustainability of e-Learning in universities.

Table 11: Reasons for Sustainability of e-Learning in Universities

	Frequency	Percent	Valid Percent	Cumulative Percent
Lack of funds	31	9.3	9.3	9.3
Lack Technical expertise	16	4.8	4.8	14.0
Need for collaboration among faculty and students	26	7.8	7.8	21.8
Universities to seek for cheaper internet options	22	6.6	6.6	28.4
Inability of portal to handle a large number of users	22	6.6	6.6	34.9
Poor e-Learning services offered	14	4.2	4.2	39.1
Ease management of student information	16	4.8	4.8	43.9
Continued success in the use of e-Learning	31	9.3	9.3	53.1
Others	33	9.9	9.9	63.0
Poor network connectivity	6	1.8	1.8	64.8
University has adequate resources	91	27.2	27.2	91.9
e-Learning is unaffordable by most students	3	.9	.9	92.8
Most students do not have access to reliable internet	9	2.7	2.7	95.5
Proper planning and organization	9	2.7	2.7	98.2
Inadequate computers and computer accessories	6	1.8	1.8	100.0
Total	335	100.0	100.0	

Source: Researcher (2023)

The reasons for universities being able to sustain e-Learning were mainly threefold as reported by the 335 students. First, availability of adequate e-Learning resources was reported by slightly more than a quarter (27.2%) noting continued success (9.3%) in use of e-Learning. Thirdly, proper planning and organization of e-Learning accounted for by a neglible number (2.7%) of students. On the other hand, inability by most students to access e-Learning resources was the least (2.7%) hindrance to sustainability of e-Learning. A minority reported lack of computers and computer

accessories (1.8%) and poor internet connectivity (1.8%) as stumbling blocks to sustainability.

The key institutional components that limit e-Learning were poor internet connectivity, limited bandwidths due to prohibitive cost, and inadequate training of faculty and technical support staff for successful utilization of e-Learning. The review indicated that most universities do not have pure online programs but utilize the blended mode of instruction. The universities have internet but it is limited by bandwidths and prohibitive cost of internet bundles.

Institutional Capacities of Universities to Utilize e-Learning

Findings of the study from the research study questions indicated that most students and faculty agreed that wireless and fibre optic connections were mainly used. However, Local Area Networks and Cable Networks are utilized to a limited extent by both students and faculty in all the universities. This can be attributed to a shift to faster and more efficient internet connections like fibre optic and wireless. The study aligns to the finding that use of Virtual Standard Area Technology is limited to few universities with roughly 10% of universities being able to share resources via LAN's (Local Area Network) (Farrel, 2007).

Most respondents reported that available internet was quite stable and reliable, although few students and faculty reported low levels of internet availability. In some instances, when there is a high traffic flow, internet tends to slow down. This calls for the need to expand bandwidths while making it affordable. The finding is in line with Mutisya & Makokha (2016), who in a study on challenges affecting adoption of e-Learning in Public universities in Kenya; found out from the faculty that insufficient Internet connectivity was a major limitation to institutional capacities.

Most respondents were in agreement that computers, printers, projectors, computer laboratories, text books on ICT and computer accessories were available. The most abundant resource being computers but challenge remains low computer to high student ratio. Otherwise with adequate computers and other resources more and more users can access and utilize e-Learning in the instructional process. The findings indicate that the resources are available but in some cases inadequate. This can be agreeably true as the students reported a high number of users limiting internet access and use. Equally, in cases where resources were reported readily available and adequate they are not optimally utilized. The finding affirms findings of a study in South Africa by Leach (2003) that showed that utilization of computers impacts positively on student academic achievement and performance as well as classroom practice.

Results of the study showed that content delivery via networks was most effective, with a third of the respondents reporting moderately effective as the rest said it was ineffective. According to most students Computer Based Learning was moderately used while memory sticks were least utilized in e-Learning. The memory sticks are a more recent technology thus the slow adoption and use. Recent studies by Nina (2017) show that some faculty are not techno-savvy and are fairly reluctant in acceptance of new technologies in instruction and supervision.

The respondents noted that investing more in ICT infrastructure and increasing availability of

e-Learning resources, providing faster internet and infusing e-Learning in admission and instruction would enhance the institutional capacities. The finding aligns with Adum, (2013), who said that universities must prioritize and invest heavily in development and support of e-Learning. Enhanced investment in e-Learning is a sure way of ensuring that it is fully embraced by all.

The respondents said that failure to access e-Learning resources, lack of computers and computer accessories and poor internet connection are stumbling blocks to sustainability of e-Learning in universities. To resolve these, Mugenda (2020) argues that universities need to prioritize e-Learning in their budgetary allocations. Studies by Kashorda and Waema (2014) showed that most universities allocate less than 5% of their budget to technology.

The findings revealed that most universities have moderate capacities to utilize and sustain e-Learning. This was attributed to the large number of users, limited bandwidths and inadequate funds for e-Learning. However, a majority of students and faculty from the private universities were confident that the universities have capacity to implement e-Learning fully. The finding agrees with Nyerere et al. (2012) on status of and challenges hindering realization of full potential of Open Distance and e-Learning (ODeL) in Kenyatta University and University of Nairobi, that provision of ODeL faces challenges like inadequate funding and poor internet connectivity. The level of investment by universities in e-Learning is critical in enhancing learner's achievement.

Distance from the schools, weak signal and poor choice of service providers. Most students far off the campus are not able to access university internet system, but rely on use of mobile Wi-Fi which is fairly expensive. They are supported by Jacobsen (2005) who concurred with Urwin (2005) that to improve quality of instruction, the best line of action would be to improve institutional capacities to access and utilize online support and facilitate instruction.

Conclusion

Kenya like other East African nations faces a myriad of challenges associated with inadequate infrastructure for full realization of the benefits associated with e-Learning. The study therefore concludes that for successful utilization of e-Learning, universities must seek to invest more in e-Learning infrastructure and capacity building faculty, students and technical support staff on e-Learning utilization.

The study discovered that key factors responsible for enhancing e-Learning were capacity of universities to implement and utilize e-Learning. The institutional capacity to utilization is determined by availability of stable and reliable internet, e-Learning resources, and university support system, as well as student and faculty characteristics and technological aspects. Despite the fact that the study was conducted in six universities in Kenya, the results are generalizable to a greater extent in the context of faculty level of utilization. Universities, acknowledge that implementation of e-Learning holds a substantial opportunity for expansion and increased accessibility to higher education.

Universities have moderate capacities to implement e-Learning utilization in instruction. Effective implementation of e-Learning is hindered by limited internet bandwidths and high cost of internet.

The study further found out that poor internet connection, inadequate computers, slower internet connectivity as well as unreliable networks were perceived as serious bottlenecks to e-Learning utilization. The universities must seek to utilize their capacities optimally while seeking alternative mechanisms of e-Learning improvement.

Implication of the findings on influence of institutional capacities is that utilization of e-Learning in Kenya requires that universities enhance capacities for e-Learning utilization in instruction. It is possible if the universities invest more in e-Learning infrastructure, train and retrain faculty on e-Learning use, and ensure that students have access to affordable internet. Equally the blended mode of instruction is dependent upon universities investing more in infrastructure and human resource capacity. A combined effort among the universities through research on the most viable e-Learning technologies can not only contribute towards improved uptake of higher education but enhance access and quality of university education.

Recommendation

The government must invest more in providing infrastructural support and collaborate with the universities if they are to fully implement e-Learning. To ease the burden of financing university programs, public private partnerships need to be encouraged. Universities should prioritize e-Learning, channel more funds towards enhancement of e-Learning infrastructure, training and retraining of the faculty.

It is recommended that a national survey be carried out to determine the current status of e-Learning utilization in curriculum delivery in universities in Kenya. Universities must equally develop mitigation measures and strive to utilize the limited resources prudently, efficiently and effectively. A careful analysis of the various mitigation strategies in place may help the government, commission for university education and international organizations come up with working strategies for enhanced efficiency and effectiveness in course delivery and research through e-Learning.

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