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Influence of Utilization of Information Communication and Technologies on Quality of Distance Teaching and Learning in Kenyan universities

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Abstract **– Information Communication Technologies (ICTs) have transformed the way people live, work and how they carry out their businesses. With advent of ICTs, distance learning has become an alternative and supplement for face to face learning. The study investigated influence of ICTs infrastructure on quality of distance teaching and learning in Kenyan universities. The study was guided by mixed methods research approaches which involve mixing of quantitative and qualitative data. The target population was ODeL directors, lecturers who taught ODeL students, ICT technical staff and ODeL students from the selected universities that offer programmes through ODeL. Stratified, systematic and purposive sampling was used to select the samples. The sample size was comprised of 4 ODeL directors, 78 lecturers, 4 ICT technical staff and 156 ODeL students. Four universities were purposively sampled for the study. Data was collected by use of document analysis guide, questionnaires and interview guide. Descriptive and inferential statistics were used to analyze the data. Analysis of quantitative data was done by the help of Predictive Analytical System (Version 20.0). Qualitative data was coded and analyzed in themes that emerged from the narratives. Data was presented in graphs and tables. The study at a mean of (3.78) established that utilization of ICT infrastructure influenced quality of distance teaching and learning. The study concluded that ICT enables flexibility in scheduling of personal time and at the same time it enables independent learning among students. The study recommended that the Learning Management System (LMS) that are used by distance teaching universities should be capable of hosting various interactive features to improve the quality of distance teaching and learning.**

Keywords **– Information Communication and Technologies, Distance Teaching and Learning, Influence, Utilization, Quality.**

I. INTRODUCTION

Information Communication and Technologies (ICTs) have transformed the way people live, work and how they carry out their businesses. They have become the primary medium of instruction. Use of Information Communication Technology is an essential trend in education for the 21st century. Students need the ability to use ICT knowledge to communicate, collaborate, analyze, create, innovate, and solve problems in order to be successful in a global economy. According to Afshari; Kamariah; Luan; Bahaman and Fooi, (2009) application of ICT systems have effects on the educational environments and it gives learners great flexibility, encourage risk-taking, help students to be active learners and enhance their higher order thinking.

In order to solve the myriad of challenges facing the education sector, the deployment of educational ICTs, process of learning and superior testing and assessment techniques are paramount. In developing countries, ICT needs to be embraced and mastered by the players in the education sector so as to allow them to keep pace with the developed nation. Sampath Pannerselvam, & Santhanam, (2007) argue that today, educational ICTs are being developed with the aim of making education accessible while also improving the quality of education.

Gakuu and Kidombo (2010) argue that ICT enables access to learning as they can resolve some of the challenges faced by education systems in developing countries. They further point out that when teachers use ICT as a teaching tool, it improves instructional delivery, hence making learning more effective. As reforms take place, issues such as the quality of ICT-based learning need to be addressed. Information Communication Technology makes learning an interactive experience and learner- centered.

Ul-Amin (2013) argues that the integration of Information and Communication Technologies can help revitalize teachers and students, and can also improve and develop the quality of education by providing regular support in difficult subject areas. Information Communication Technology provides new educational approaches. In face to face classrooms, teaching revolved around teachers planning and guiding students through a series of instructional processes to achieve the learning outcome. Information Communication Technology promotes flexible learning. Ul-Amin argues that ICT increases the flexibility of delivery of education so that learners could access information anytime and anywhere. This helps to prepare the learners for lifelong learning and improve quality of learning. Information Communication technology improve the quality of learning by facilitating both the synchronous and asynchronous teaching and learning.

In this connection, Information and communication technologies (ICTs) are seen as potent and powerful tools for educational transformation. Mathur (2016) argues that when ICTs are deployed appropriately, they can help increase access to education, reinforce the significance of education and elevate the quality of education by helping make schooling an engaging, active process connected to real life.

II. METHODOLOGY

This study used the mixed method approach for concurrent triangulation. Specifically, convergent parallel

research design was used. According to Creswell (2015), mixed method approach involves mixing of both qualitative and quantitative approaches. The study used convergent parallel design.

The study was carried out in four universities which were purposively sampled on the basis of offering ODeL programmes. The universities included two public universities, College of Education and External Studies of University of Nairobi, and Kenyatta University, Digital school. The other universities that were included in the study were two private universities, Kenya Methodist University; Digital Campus and Africa Nazarene University; Institute of Open Distance Learning. The target population was 4 ODeL directors from the four universities. The study also targeted 78 lecturers who taught 4th year open, distance and e-learning (ODeL) students in the Bachelor of Education (Arts) programme. Four (4) ICT technical support staff was targeted. The study also targeted 3,101 ODeL Bachelor of Education students (Arts).

The sample size for lecturers comprised of twenty five (25) lecturers from University of Nairobi; School of Continuing and Distance Education, twenty (20) lecturers from Kenyatta University; Digital School, eighteen (18) lecturers from Kenya Methodist University; Digital Campus and fifteen (15) lecturers from Africa Nazarene University; Institute of Open and Distance learning. In total, seventy eight (78) lecturers were purposively sampled from the selected universities. The researcher sampled four (4) ICT technical support staff from the four universities. In this case, one (1) ICT technical support staff from each university was sampled to participate in the study. The researcher used purposive sampling to select fourth year ODeL students taking Bachelor of Education (Arts) to take part in the study. The sample size for the students comprised of; 156 ODel students. Fifty six were from University of Nairobi, 40 students from Kenyatta University, 30 students from Kenya Methodist University and 30 from Africa Nazarene University.

Data was collected using open and closed ended questionnaires for lecturers and ODeL students, interview guides for ODeL directors and ICT technical staff and documents analysis guide. Data was analyzed using descriptive statistics such as the mean, mode and percentages. Predictive Analytical System (PAS) version 20.0 was used to analyze the data.

Data collected through in depth interviews was transcribed from audio tapes to words. Data was organized using research objectives and then coding was done. The findings were then analyzed in the thematic forms. Narrative discussions were used to present the results. Documents were analyzed using content analysis. Results from the interviews and document analysis were used to validate results from the questionnaires in order to draw study conclusions and recommendations.

III. Response Rate

A total of one hundred and fifty six (156) questionnaires were distributed to the female and male students who are currently pursuing their studies through open and distance learning mode in the four universities. Also a total of seventy eight (78) questionnaires were administered to ODel lectures from the same universities. This represented 75% and 76 % respectively. Out of four ODeL directors sampled for In-depth interviews, one (1) declined to be interviewed translating to 75% response rate. Out of four ICT technical staff sampled for in-depth interviews, one (1) also declined translating to 75% response rate. According to Mugenda and Mugenda (2003), above 70% response rate is acceptable. Table 1 shows the response rate.

Table I: Response Rate

Respondents	Sample size	Return rate	Response rate (%)
ODeL Students	156	117	75
ODeL Lecturers	78	60	76
ICT technical staff	4	3	75
ODeL Directors	4	3	75
TOTAL	**242**	**183**	**75.5**

IV. Results and Discussions

The research objective was concerned with finding out the influence of utilization of ICTs infrastructure on quality of distance teaching and learning. The respondents were asked to rate their opinions on the level of agreement on how they perceived the use of ICT in enhancing quality in ODeL. Data that was collected was analyzed using frequencies, percentages and means where; strongly disagree (1), disagree (2), not sure (3), agree (4) and strongly agree (5) were used

Students' Opinion on Influence of Utilization of ICT Infrastructure

The study sought to find out students' opinion on influence of utilization of ICT infrastructure on quality of distance teaching and learning. Statements and responses are shown in Table I.

Table 1. Students Opinion on Influence of Utilization of ICT Infrastructure

Utilization of ICT Infrastructure	N		Extent of Influence SA	A	NS	D	SD	Mean
Students use the internet to locate information quickly for assignments, research to prepare for exams and other education opportunities.	117	F	88	26	0	3	0	4.70
		%	75.2	22.2	0	2.6	0	
Internet usage allows students to access the knowledge of experts not locally available.	117	F	89	26	1	0	1	
		%	76.1	22.2	.9	0	.9	4.72
Through use of ICT, lecturers and students interact, support and encourage each other and share ideas and materials to advance learning.	117	F	61	50	5	0	1	
		%	52.1	42.7	4.3	0	.9	4.41
ICT enables flexibility scheduling of personal time.	117	F	63	44	7	2	1	
		%	53.8	37.6	6.0	1.7	.9	4.43
ICT enables independent learning among students	117	F	65	43	6	1	2	
		%	55.6	36.8	5.1	.9	1.7	4.46
I don't enjoy the opportunities offered by	117	F	9	13	6	35	54	2.04
		%	7.7	11.1	5.1	29.9	46.2	

ICT in distance learning.

Use of ICT in distance teaching and learning doesn't enable adequate learner support services such as orientation, counselling services, mentorship and tutoring.	117	F %	19 16.2	29 24.8	17 14.5	25 21.4	27 23.1	2.89
I am not able to access e-resources when I am off campus	117	F %	15 12.9	25 21.4	8 6.8	34 29.1	35 29.9	2.56
I am not able to access my examination results when I am off campus	117	F %	14 12	12 10.3	5 4.3	41 35.0	38 38.5	2.19

The findings indicated that majority of students (mean of 4.70) strongly agreed that internet allows students to locate information for assignments, research, to prepare for examinations and other education opportunities. In addition, they agreed that internet usage allows students to access the knowledge of experts' not locally available (mean of 4.72). This implies that the ICTs enabled ODeL students to search for relevant information for their assignments, conducts quality research work and adequately prepare for trimester examinations. This agrees with Mugenda (2008) that the use of ICTs makes it easy and fast for the researchers to complete their research work. In addition, Jamtsho and Bullen (2007) pointed out that ICTs enable easier assignment submission and shorten assignments turnaround time. To improve on quality of ODeL, Mboroki (2007) recommended that continuous assessments be taken as a feedback tool in order for students to feel fully prepared for trimester examinations.

Opinion was sought on whether through use of ICTs, lecturers and students support and encourage each other and share ideas and materials to advance learning. At a mean of (4.41) the students responded positively to the statement. This means that with use of Interactive Learning Management Systems; leaner-learner and learner tutor interactions are enhanced. This improves quality of distance teaching and learning. Commission for University Education (2014) recommends that for distance teaching universities to offer programmes that are comparable to traditional programmes, they must put in place interactive Learning Management Systems.

The study sought opinion on whether ICTs enables flexibility in scheduling of personal time and whether ICTs enables independent learning among students. The students agreed at a mean of (4.43) that ICT enables flexibility in scheduling of personal time and at the same time it enables independent learning among students. This is in line with Jerome Bruner's (1990) constructivist learning theory that in students' centred learning, students have greater responsibility for their own learning. Students seek, synthesize and share their knowledge with other students. This also agrees with Ngeera (2010) that computer based instruction is one of the most important distance education approaches. It offers opportunities for individualizing instructions, offers education to learners at various locations and it provides learning opportunities to people who would have difficulties participating in distance education programmes.

Asked whether the students were able to enjoy opportunities offered by ICTs in distance learning, at a mean of (2.04), the students disagreed with the statement that they were not able to enjoy opportunities offered by ICT in ODeL. It is important for a distance learner to be computer literate and to enjoy all opportunities offered by ICTs. This is based on the fact that, teaching and learning no longer solely depend on printed instructional materials.

Students were further asked whether use of ICT in distance teaching and learning enable adequate learner support services such as orientation, counselling services and library services. At (mean = 2.89) students disagreed with the statement that ICTs does not enable adequate learner support services. This implies that majority of the students were of the opinion that ICT enable adequate learner support services such as orientation, counselling services, mentorship and tutoring. Learner services according to Jamtsho and Bullen (2007) promotes learning as they provide information and resources to the learner. In addition, Mungai (2014) argues that orientation into distance learning system enables learners to know their responsibilities and they are also assisted in improving their reading and study skills to undertake independent learning which involves reading and notes making.

Students were further asked whether they were able to access e-resources when off campus. At mean of (2.56) students disagreed with the statement that they were not able to access e-resources when they were off-campus. Regarding ability to access examination results when off campus, majority (Mean = 2.19) of students disagreed with the statement that they were not able to access examination results when they were off campus. With the availability of students' portal, students' data should be captured including students' examination results. Providing prompt feedback for evaluation, students learning motivation is enhanced, students track their own progress and improve on their failures (UNESCO, 2011).

Lecturers are able to mark Continuous Assessments Tests and submit examination grades online	60	F %	33 55.0	17 28.3	3 5.0	6 10.0	1 1.7	4.25

The overall mean was computed and generally, it was established from the students at a mean of (3.6) that utilization of ICT infrastructure influenced quality of distance teaching and learning in the sampled universities. However, in some aspects, students were not able to fully utilize the potentials offered by ICTs. Such areas are; provision of adequate learner support services, not able to access e-sources when off campus and not able to access examination results when off campus.

Lecturers' Opinion on Influence of Utilization of ICT Infrastructure

The study further sought to find out lecturers' opinion on influence of utilization of ICTs infrastructure on quality of distance teaching and learning. Responses are shown in Table 2.

Table II. Lecturers' Opinion on Utilization of ICT Infrastructure

Use of ICT Infrastructure	N		Extent of Influence SA	A	NS	D	SD	Mean
Lecturers' use the internet to locate teaching ideas quickly for research, to prepare courses and other education opportunities.	60	F	46	13	1	0	0	
		%	76.7	21.7	1.7	0	0	4.75
Internet usage allows lecturers to access the knowledge of other experts not locally available.	60	F	36	23	1	0	0	
		%	60	38.3	31.7	0	0	4.58
Through use of ICT, lecturers and students interact, support and encourage each other and share ideas and materials to advance learning.	60	F	37	22	1	0	0	
		%	61.7	36.7	1.7	0	0	4.6
I don't enjoy the opportunities offered by ICT in distance teaching.	60	F	2	3	3	19	33	
		%	3.3	5.0	5.0	31.7	55	1.7
Use of ICT in distance teaching and learning doesn't enable adequate learner support services such as orientation, counselling services and library services.	60	F	8	16	4	23	9	
		%	13.3	26.7	6.7	38.3	15.0	2.8

From Table 2 at a mean of (4.75) lecturers' agreed that they use the internet to locate teaching ideas quickly, for research, to prepare courses and other education opportunities. In addition, at a mean of (4.58), lecturers also agreed that internet usage allows lecturers to access the knowledge of the other experts who are not locally available. Lecturers thus agreed that internet usage allows locating information locally available and information that is globally available. This is an advantage over the print technologies which is only available locally; hence, lecturers could source for teaching materials from other sources. The findings were affirmed by the report from the directors who reported that books and journals written by various professors in the world were accessed by ODeL students online. One director said that;

"With proper orientation and continuous capacity building, ICT could enhance quality more than print technologies especially with availability of digital libraries and audio support."

Majority of the lecturers at a mean of 4.6 agreed that through use of ICT, lecturers and students interact, support and encourage each other, share ideas and materials to advance learning. Information Communication Technologies allows students and lectures to interact and share ideas. The Learning Management Systems that are developed should be capable of hosting discussion forums; instant messaging and announcements to improve the quality of teaching by facilitating both real time and recorded teaching. From the in-depth interviews conducted, ODeL directors and ICT technical support staff reported that the sampled universities use Learning Management Systems such the Moodle, Canvas, Claroline and m-Elimu. Online social networking tools are also used to advance learning. Murumba (2012) points out that blogs, wikis and other social networking applications allow teachers and students to create and share information in an open forum.

Asked whether use of ICT in distance teaching and learning enabled adequate learner support services such as orientation, counselling services, and mentorship and tutoring, majority (mean = 2.8) of the lecturers were of the opinion that ICT enabled adequate learner support services. Learner support services are of major concerns to the distance learners as it enables the students to be integrated into the institutional system and culture. Distance learners require an effective counselling support system at all levels to reduce dropout rates. Open and distance learning providers need to realize that there is a paradigm shift brought about by fast emerging ICTs technologies that can provide effective learner support services such as tele - tutoring and tele - mentoring. Thapliyal (2014) found out that although distance learners were satisfied with quality of distance learning programmes, they were concerned with the learner support services and infrastructure facilities available in the institution.

From the findings, both the lecturers and the students at a mean of (mean = 2.8) disagreed with the statement that ICT does not provide adequate learner support services. With increased use of mobile phones, learner support services can greatly be enhanced. Melinda (2007) noted that student's support services like tutorials, library, guidance and counselling and academic and administrative support must be available in various forms, such as, online and by use of instant messaging. The study disagreed with Mungai (2014) who carried out a study among lecturers and students in public universities to establish the level of adequacy of support services during the pre-course, on the course and post-course. The responses by both the students and lecturers were that students' support services were inadequate at pre-course and that the students did not get an orientation on computer-mediated learning.

Lecturers were asked whether they were able to mark Continuous Assessments Tests and submit examination grades online. At a mean of (4.25), majority of the lecturers agreed that they were able to mark continuous assessment tests online and submit examination grades online. Majority of the lecturers agreed that they were computer literate and hence, marking examinations and submitting grades online was not a major challenge. This implies that prompt feedback on assignments and examinations was achievable. This differed with the findings by Nyerere et al. (2012) that distance learners felt that they did not receive adequate student support services, and they did not receive feedback on their assignments and examinations on time. This implies that substantial improvements towards ODeL may have taken place since 2012. The overall mean was computed and it was established from the students and lecturers at a mean of (3.78) that utilization of ICT infrastructure influenced quality of distance teaching and learning.

Hypothesis Test on Influence of Utilization of ICT Infrastructure

The study sought to establish from the students and lecturers the influence of utilization of ICT on quality of distance teaching and learning. The null hypotheses stated that there is no significant relationship between utilization of ICT infrastructure and quality of distance teaching and learning in Kenyan universities.

The study sought opinions from students to establish the influence of utilization of ICT infrastructure on quality of distance teaching and learning. Table 3 shows the results of the fitness of the model.

Table III Model Fitness Tests for ICT Utilization based on students opinions

Test	Type of Statistic	Value of Statistic	P-Value
Omnibus	Chi-Square	17.510	0.000
Hosmer and Lemeshow	Chi-Square	5.361	0.718
Model Summary Nagelkerke R Square = 0.185			

Omnibus test of model coefficient on utilization of ICT shows the significance of the predictive capacity of the model. It can be observed that the p – value of the model was p = 0.000 which is less than 0.05. This shows that the model had significant predictive capacity which means that ICT utilization significantly explains the variations in the quality of distance teaching and learning. Model summary shows that utilization of ICT predicts 18.5% of the variations quality of distance teaching and learning based on the Nagelkerke R Squared which is a pseudo Pearson's R square.

Hosmer and Lemeshow Test measures whether utilization of ICT is fit for prediction with the null hypothesis that the model is fit against the alternate that the model is not fit. The results show that $\chi 2$ (8) = 5.361, p = 0.718. Therefore, the null hypothesis is not rejected implying that the model is fit and therefore, utilization of ICT has significant predictive capacity.

Table IV ICT Utilization Hypothesis Test based on students opinions

Variables	B	S.E.	Wald Test	P - value	Odds Ratio
ICT Utilization: No ICT Utilization (reference)	-	-		-	1.000
Present ICT Utilization	0.227	0.060	14.309	0.000	1.255
Constant	3.208	0.849	14.285	0.000	0.040

The Logistic Function 1

Ln (P/ (1-P)) = -3.208 + 0.227X1

Where;

P: Probability of Quality of Distance Teaching and Learning

Ln (P/1-P): Logit of Quality of Distance Teaching and Learning

X1: ICT Utilization

From Table 4 and the Logistic Regression Function (1), it can be observed that the marginal increase in utilization of ICT increases the logit of the quality of distance teaching and learning by 0.227 while holding all other factors constant. In addition, looking at the odds ratio it can be construed that unit increase in utilization of ICT increases the odds (likelihood) of quality of distance teaching and learning by 1.255 while controlling other factors.

The findings indicate from the students that utilization of ICT infrastructure significantly influences quality of distance teaching and learning. This is indicated by p= value of 0.000 which is less than 0.05. Therefore, the null hypothesis was rejected. Orientation of ODeL students into the system and continuous induction is paramount to enable ODeL students to effectively utilize ICT infrastructure for quality distance learning. Mungai (2014), points out that orientation of ODeL students into the system allows the students to learn their responsibilities and how to improve on their study skills. Information communication technologies enable independent and flexible learning.

The study sought to establish from the lecturers the relationship between utilization of ICT and quality of distance teaching and learning.

Table V Model Fitness Tests for ICT Utilization based on Lecturers opinions.

Test	Type of Statistic	Value of Statistic	P-Value
Omnibus	Chi-Square	6.483	0.011
Hosmer and Lemeshow	Chi-Square	10.838	0.094
Model Summary Nagelkerke R Square = 0.137			

Omnibus test of model coefficient (ICT Utilization) shows the significance of the predictive capacity of the model. It can be observed that the p – value of the model was p = 0.011 which is less than 0.05. This shows that the model has significant predictive capacity which means that according to the lecturers, utilization of ICT significantly explains the variations in the quality of distance teaching and learning. Model summary shows that utilization of ICT predicts 13.7% of the variations Quality of Distance Teaching and Learning based on the Nagelkerke R Squared which is a pseudo Pearson's R square.

Hosmer and Lemeshow Test measures whether utilization of ICT is fit for prediction with the null hypothesis that the model is fit against the alternate that the model is not fit. The results show that $\chi 2$ (6) = 10.838, p=0.094 > 0.05. Therefore, the null hypothesis is not rejected implying that the model is fit and therefore, utilization of ICT has significant predictive capacity.

Table VI ICT Utilization Hypothesis Test based on Lecturers opinions

Variables	B	S.E.	Wald Test	P – value	Odds Ratio
ICT Utilization: No ICT Utilization (reference)	-	-		-	1.000
Present ICT Utilization	0.245	0.103	5.638	0.018	1.278
Constant	-3.547	1.621	4.790	0.029	0.029

The Logistic Function 2

Ln (P/ (1-P)) = -3.547 + 0.245X1

Where;

P: Probability of Quality of Distance Teaching and Learning

Ln (P/1-P): Logit of Quality of Distance Teaching and Learning

X1: ICT Utilization

Table 6 and the Logistic Regression Function (2) indicates that a marginal increase in utilization of ICT increases the logit of the quality of distance teaching and learning by 0.245 while holding all other factors constant. Also, looking at the odds ratio, it can be construed that unit increase in utilization of ICT increases the odds (likelihood) of quality of distance teaching and learning by 1.278 while controlling other factors. The results also showed that there is a significant influence of utilization of ICT on quality of distance teaching and learning based on lecturers responses. The p = value was 0.018 which is less than 0.05 therefore the null hypothesis was rejected. Utilization of ICT in distance learning has grown significantly especially with use of mobile phones and distance teaching universities have embraced it. The findings agree with recommendations made by Kilemi et al., (2007) that ICTs are significantly changing the way Kenyan people work and how they carry out their businesses and hence public universities have to embrace, be familiar and have access to ICTs.

Through the interviews, ICT technical staff reported that utilization of ICT in distance learning was faced with various challenges such as Learning Management Systems downtime although it was minimal. In addition, they reported that other challenges faced in teaching using Learning Management System (LMS) was that some lecturers were not able to use LMS effectively. However, according to ODeL institutional polices that were analyzed; they showed that this challenge could be solved by training of lecturers on how to use LMS effectively. One of the policy documents read in part;

All virtual learning instructors must undergo requisite virtual learning orientation and training. Virtual learning instructors are required to participate in regular faculty development and training leading to a virtual learning competence and certification.

V. Conclusion

There was an agreement that ICT enables flexibility in scheduling of personal time and at the same time it enables independent learning among students. Students were able to access examination results when off campus. With the availability of students' portal, students' data should be captured including students' examination results. Lecturers provide assignment and examination results online and this enhances learning motivation. Utilization of ICTs infrastructure in distance teaching and learning was found to be a significant variable in influencing quality of distance teaching and learning. Therefore, distance teaching universities need to utilize available ICT infrastructure for teaching and learning.

VI. Recommendation

The study recommended that ODeL providers should provide adequate learner support services such as online and face to face tutorials to influence the students' positively. The findings indicate that the sampled universities use Learning Management Systems as a platform for teaching and learning. It was therefore, recommended that the Learning Management Systems that are developed should be capable of hosting various features to enhance adequate interactivity between the tutor and a distance learner. Similarly, Learning Management Systems should facilitate synchronous and asynchronous teaching and learning. This is because the findings indicate that majority of the students used their computers while at home to conduct personal studies.

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