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ICT Infrastructure: A Key Prerequisite for Adoption of Open and Distance Learning in Public Universities in Kenya

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Abstract:

Education managers all over pay special attention to the four fundamental characteristics of Access, equity, quality and relevance of education as they design and implement education and training systems. Universities continue to explore new methods of teaching to address the four characteristics that define and drive education and training systems in higher education, which is a key pillar for social development as the country works towards the attainment of Vision 2030. Open and distance learning (ODL) enhances access and equity in education as demanded by Constitution 2010 and Vision 2030. One, measures of access in education is adequacy or otherwise of (ICT) infrastructure, materials and teachers. Resources have been committed to development and implementation of distance learning materials and facilities, but adoption of distance learning modes is minimal at the Kenyan Public universities. This paper explores the readiness of public universities to adopt open and distance learning in terms of information communication technology (ICT) infrastructure. The study indicators were: computer availability; internet availability and internet connection points. The study objectives were: to establish the extent to which availability of personal computers influences managers' participation in ODL activities; to determine the extent to which availability of internet influences managers' participation ODL activities; to establish the extent to which number of internet connection points influences managers' participation in ODL activities. The research employed cross-sectional descriptive survey design; and multi-stage stratified sampling design. The findings indicated that availing necessary ICT infrastructure is a key requisite for adoption of ODL in public universities in Kenya.

Key words: Participation, adoption, open and distance learning, ICT infrastructure, university managers, ICT help desk, internet connection points, access and equity

1 . Introduction

Education is a key pillar in development. Universities have continued to develop new methods of teaching in order to reach many people who cannot access education through the conventional methods. The importance of adopting distance education at all levels of education in Kenya and globally cannot be overemphasized. It is becoming increasingly evident that the country, and indeed the world at large, is yet to overcome the challenge of access and equity in higher education. The traditional face-to-face education is increasingly becoming inadequate to cater for higher educational needs (Vision 2030). As Kenya works towards the attainment of Vision 2030 a lot has to be done in education to increase equity and access to allow many people to participate in the development. A lot of resources have been committed to development and implementation of DE materials and facilities but adoption of DE continues to be minimal at the Kenyan Public universities. Information Communication Technology (ICT) has made the role of distance education in educational institutions to take on new and radical dimensions. Distance education offers new possibilities for universities to provide equal *learning* opportunities for their students. Many universities have not embraced distance education in general for fear that it would undermine the traditional educational system, limit student interaction with peers and teachers and eradicate the platforms where deliberate academic discourse takes place, (Mathews, 1999). Access to educational opportunities for all is a major challenge facing most developing countries. Distance education broadens access to education, (Gakuu, 2006); and the adoption of distance education in the institutions of higher learning will provide alternative methods of ensuring that the social demand for higher education is met.

2. Objectives

This article is guided by five objectives:

- To establish the extent to which availability of personal computers influences managers' participation in DE activities
- To establish the extent to which internet connectivity influence managers' participation in distance educational activities.
- To establish the extent to which number of internet connection points influences managers' participation in DE activities

3. Literature Review

Garrison and Baynton (1987) define learner support as the resources that learners can access in order to carry out the learning processes. Garrison further observes that in distance education, support is concerned with a range of human and non-human resources to guide and facilitate the educational transaction. Providing support services and facilities to the distance learners is an important part of creating the feeling of belonging for students who do not have access to traditional clues (Martin, Moskal, and Morse, 1997). Some of the support services that should be considered include access to library materials and facilities, (this includes e-library and ICT facilities), delivery of course materials, traditional mail services, counseling, mentoring, job placement, and peer interaction (Boettcher & Cartwright, 1997).

A World Bank report (Daniel, 2001) stated that the four challenges for distance education include: Gaining recognition of the economic importance of universities; Overcoming the low political and financial support; Recognition of the baseline needs of staffing and equipment; and the globalisation effects on students and student movement McDougall, Young and Apan (2001). The four challenges converge into one issue: support facilities. This includes the ICT facilities. This is because, if there is to be recognition of economic importance of distance education, support in terms of resources is required. To overcome low political and financial support, there is a need for lobbying at political arenas and budgetary allocation meetings. This in turn means there will be more ICT facilities availed by increased funding. The recognition of baseline needs of equipment is the starting point of provision of adequate facilities that are required in the provision of quality distance education.

Mayadas (1998) defined quality through five pillars for effective asynchronous distance learning, including: student satisfaction; access to desired courses and accompanying support; learning effectiveness; faculty (staff) satisfaction; and cost effectiveness; while McDougall et al (2001) defines quality as the standard of the infrastructure provided to the student. Therefore, from this perspective, quality encompasses issues such as development of course materials, staff, delivery systems and support mechanisms. Distance education depends a lot on the support facilities and ICT infrastructure. These include the computers, and internet connectivity. Phipps and Wellman, (2001) says the great challenge in the provision of support facilities in higher learning is how to finance and establishing policies on how the financing of the infrastructural support should be provided. He recommends that ways should be established on how to acquire resources, and policies be established on how to distribute the finances to ensure adequate availability of support facilities.

One of the fundamental beliefs (philosophy) in distance education is that the instructional leader requires a unique bundle of competencies. He needs to know how to make best use of the technologies available in order to personalize instruction and actively involve students in the learning experience (Dooley, 2005). Such unique bundles of competencies and best use of technologies cannot be realized with the necessary ICT infrastructure which the university managers must provide for adoption of distance education to be accelerated. In distance education ICT and support facilities available play a key role in determining the success of distance learning. Learners embarking on distance education programme are faced with many constraints such as financial constraints, constraints of time, distance, physical disabilities, and family commitments (Willis, 2006). Since distance learners are varied according to their socio-economic backgrounds, adequate provision should be made by institutions in providing administrative and organizational support. (Idrus & Lateh, 2000). The faculty requires professional and technical support to be able to offer courses through distance. If the managers do not provide ICT infrastructure and the necessary support to the faculty and the students, the adoption of ODL in the universities will be low as the managers participation remain low and evident lack of support of distance education activities.

4. Theoretical Framework

Peters (1991) analysed distance education as industrialised form of teaching. In his view, distance education represents the industrialised form of teaching, with the following aspects, typical for an industrial process: Rationalisation, division of labour, mechanisation, assembly line, mass production, planning and preparation and standardisation. All these aspects are interdependent in an industry if a finished product is to be received. This applies to distance education where the management, teacher, the learner, administration, material and infrastructure among others should work together for learning to take place. The management should endeavour to provide all the necessary ICT infrastructure and support in order to provide quality distance education as the end product of the entire process.

The study also used Moore's theory structure for distance education, the theory of independent study, (Moore 2000). Moore analyses distance education on two dimensions, distance and student autonomy. This study seeks to expand on the need for adoption of distance education and its related technology to take care of the distance and increase student autonomy. To increase the students autonomy and bridge the gap (distance) between the learner and the teacher the necessary ICT infrastructure and facilities must be availed.

5. Conceptual framework

This study is based on a conceptual framework guided by four independent variables and one dependent variable. From the literature review, university managers must provide the necessary ICT infrastructure and support facilities to be able to participate in distance education. The indicators used to determine the ICT infrastructure available are: Internet availability; connectivity; availability of personal; and number of internet connection points. The study was further guided by one dependent variable, participation in distance education. The indicators of the dependent variable were: distance education workshops and seminars attended; distance materials prepared; use of computers for teaching purposes; use of email for teaching purposes; courses offered through distance. This is illustrated in Figure 1.

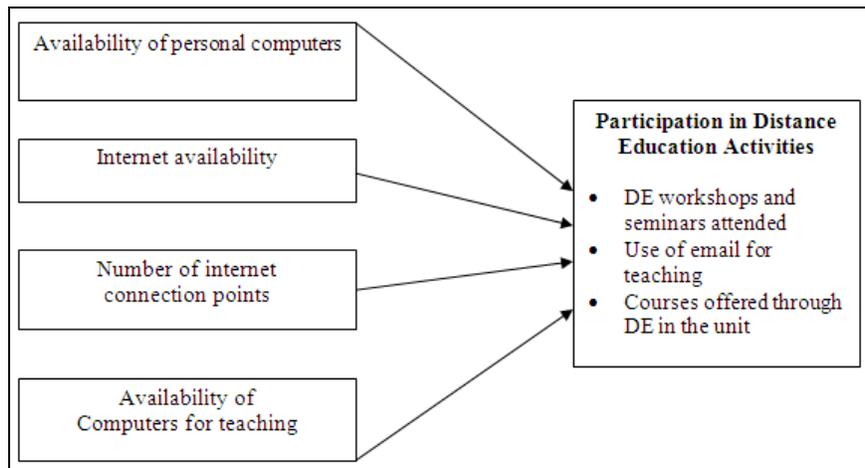


Figure 1: Conceptual Framework showing influence of support facilities on university managers' participation in distance education

6. Research Methodology

This study aimed at determining the extent to which availability of ICT infrastructure influenced university managers' participation in distance education activities in public universities in Kenya. One hundred and ninety six (196) university managers were randomly selected for the study and questionnaires administered to them. This study is part of a larger study conducted in public universities in Kenya to establish factors that influence managers' participation in distance education activities.

This research used mixed mode approach, that is, both quantitative and qualitative approach. The research design that was employed in this study was cross-sectional descriptive survey design. This study was carried out on a sample drawn from the public universities and at the end of the study; a description of the public university management in Kenya was inferred from what was found from the sample. This study is based on philosophical foundations of positivism and postmodernism.

This study looks at the university managers' participation in DE. It pre-supposes that there are factors that are influencing managers' participation in DE and these factors need to be elicited and addressed to increase participation and adoption of DE in the universities.

The study population comprised of the top university management in the seven public universities in Kenya, namely; University of Nairobi, Kenyatta University, Egerton University, Moi University, Jomo Kenyatta University of Agriculture and Technology, Maseno University and Masinde Muliro University.

The sample comprised vice-chancellors, college principals, deans of faculties and schools, and heads of academic departments in the public universities in Kenya. At the time of study, there were 121 managers at the university of Nairobi- 4 deputy vice-chancellors, 6 principals, 29 deans/directors and 83 heads of academic units (chairmen). Kenyatta University had a total of 54 managers comprising 3 deputy vice-chancellors, 3 principals, seven deans/directors and 41 heads of academic units (chairmen). Moi university had 68 managers comprising 2 deputy vice-chancellors, 3 principals, 13 deans/directors and 50 heads of academic units (chairmen). Jomo Kenyatta University of Agriculture and Technology had 51 managers comprising deputy vice-chancellors, 3 principals, 11 deans/directors and 34 heads of academic units (chairmen). Egerton university had 37 managers comprising 3 deputy vice-chancellors, 3 principals, 8 deans/directors and 23 heads of academic units (chairmen). Masinde Muliro University of Science and Technology had 26 managers comprising 3 deputy vice-chancellors, 6 deans/directors and 17 heads of academic units (chairmen). The target population was 399 managers and this is summarized in Table 1.

Heads of academic departments	277	136
Deans/Directors of faculties/schools/institutes	80	38
Principals of colleges/campuses	21	08
Deputy Vice-chancellors of the universities	18	14
Total	396	196

Table 1: Target population and Sample Size

7. Research Findings

The findings of the study were analyzed thematically and presented according to the objectives of the study. The data is drawn from survey questionnaires.

The study sought to analyse the extent to which ICT infrastructure influences managers' participation in distance education activities. The following indicators were considered and analysed: Internet availability; connectivity; availability of computers; availability of opportunities for training; availability of ICT help desk.

Data collected was analysed using descriptive and inferential statistics. Survey data concerning university managers' participation in distance education and factors that influence their participation, using self-administered questionnaires was collected.

7.1. Access to Personal Computer (PC) in the Office

Access to a personal computer was considered key in encouraging participation in distance education activities. This is because in the current age, most of distance education activities rely on technology. The findings on this indicator are summarized in Table 2.

Access to PC in office	Frequency	Percentage
Yes	123	86.0
No	20	14.0

Table 2: Access to Personal Computer in the office

The data collected indicated that most university managers (86.0%) had personal computers; and only 14.0% had no access to personal computers. This could have been as a result of the administrative tasks that the university managers are expected to perform in their respective positions. Besides the administrative duties that university managers used their personal computers to perform, they used the computers for various purposes as indicated in Table 3.

Managers' Response	Frequency	Percent	Score	Remarks on level of participation
Administration	56	39.1	1	Low
Personal Use	26	18.2	1	Low
Teaching	33	23.1	1	Very low
Other uses	28	19.6	1	Very low

Table 3: Purpose of the Personal Computer in the Office

The data collected indicated that 39.1% of the university managers used computers for administrative purposes; 18.2% of the respondents used their personal computers in the offices for personal purposes; and 23.1% admitted that they used their personal computers in office for teaching purposes. This indicated that there was low use of computers for teaching purposes. This was an indicator of low participation in distance education whose core functions are performed either administratively through support services available or through teaching.

7.2. Availability of Computers

The indicator 'availability of computers' was considered important in that with the technology taking the centre stage in the provision of distance education, any university unit (department, school, faculty, institute College or campus) without computers may not be in a position to participate in distance education activities as may be necessary. The findings on this indicator are summarized in Table 4.

No. of computers	Frequency	Percentage
1-5	50	50.5
6-10	33	33.3
11-15	10	10.1
16-20	5	5.1
Over 20	1	1.0

Table 4: Number of Computers Available in the Department

From the data presented in Table 4, it is evident that over 50.5% of the departments have 1-5 computers, while 1.0% have over 20 computers. It is clear that much investment has not been put in purchase of computers in the teaching departments in the public universities. Though the ratio of computer to staff is a better indicator of availability of computers in the department, 1-5 computers may not be sufficient for a department to use for both teaching and administrative purposes in the department.

7.3. Internet Availability and Internet Connection Points

Internet availability and the number of connection points available was considered to be important in determining the level of participation in distance education activities. This is because with internet, online learning and use of materials available via web is possible. In addition, interaction with students via e-mail, chats and other threads is possible. The findings on the results of this factor are summarized in Table 5.

No. of Internet connection Points	Frequency	Percentage
None	19	19.2
1-5	76	76.8
6-10	4	4.0
Over 10 points	0	0

Table 5: Number of Internet Connection Points in the Departments

The data collected revealed that the departments sampled had few Internet connection points. Table 5 indicated that majority of the departments had less than five points of Internet connections; and none had more than ten points of Internet connections. 19.2% of the university managers sampled in this study indicated that their units had no Internet connection points. 76.8% had 1-5 points of internet connections; and 4.0% had between 6 and 10 internet connection points. This was an indicator that Internet and Web-based distance education activities had not been emphasized in the departments and the teaching units in the public universities in Kenya.

Closely related to the factor on internet availability and connection points is the Internet speed. On examining this factor, the findings summarized in Table 6 presents the results.

Internet Speed	Frequency	Percentage
Slow	36	36.4
Satisfactory	56	56.6
Fast	4	4.0
Extremely fast	3	3.0

Table 6: Internet Speed

The data showed that 36.4% of the sampled departments had slow internet speed. This is a speed of 50 mbps. 56.6% of the sampled departments have a satisfactory internet speed of 80 mbps; 4.0% of the sampled departments had fast internet speed of 100 mbps, and only 3.0% of the sampled departments had extremely fast internet speed of over 150 mbps. In essence, this implied that 63.6% of the department had satisfactory internet speed and this should not be a hindrance on participation distance education activities.

7.4. University Managers' Participation in Distance Education

The variable of 'university managers' participation in distance education (the dependent variable in this study) was measured by five key factors which were identified and analysed from a list of eighteen factors which were used to analyse both the dependent and independent variables. The five factors used to analyse the dependent variable (university managers' participation in distance education) are: distance education workshops and seminars attended; distance education workshops and seminars organized for staff; use of computer for teaching; use of email address for teaching purpose; and courses offered through distance mode. Each of these factors is analysed and the results of the analysis is presented in this section.

7.5. Distance Education Workshops and Seminars Attended

The factor 'Distance education workshops and seminars attended by university managers' was regarded as an indicator of level of university managers' participation in distance education. It was studied through the questionnaire item that required the managers

to state whether they had attended distance education workshops and seminars. The results of this examination yielded the results presented in Table 7.

Managers' responses	Frequency	Percentage
No	85	59.4
Yes	58	40.6
Total	143	100.0

Table 7: Participation in Distance Education Development Workshop and Seminars

The results summarized in Table 7 indicated that 59.7% of the managers sampled in this study had not attended distance education workshops and seminars. 40.3% of the sampled managers in this study had attended distance education workshops and seminars. This indicates low participation since distance education is a new phenomenon in Kenyan universities and as such, much of the information is passed on during these workshops and seminars to enable the managers participate more in distance education activities.

7.6. Use of Computers for Teaching Purposes

The factor 'use of computers for teaching purposes' was also considered an important indicator on how a manager participates in distance education activities. The findings on this factor are summarized in Table 8.

Managers' Response	Frequency	Percentage
No	53	37.1
Yes	63	44.1
Non-response	27	18.8

Table 8: Use of Computers for Teaching Purposes

The results presented in Table 8 indicate that 44.1% of the sampled university managers use their computers for teaching purposes. Thirty seven point one percent (37.1%) of the managers do not use the computers for teaching purposes, and 18.8% of the managers did not respond to the question on whether they use the computer for teaching purposes. Considering 0-25% category to indicate very low participation with a score of 1; 26%-50% category to be low participation with a score of 2; 51%-75% category to be high participation with a score of 3; and 76% and above to be very high participation with a score of 4. This shows low use of computers for teaching purposes.

7.7. Use of e-mail Communication for Teaching Purposes

The factor 'use of e-mail communication for teaching purposes' was considered important in establishing participation in distance education. The results are presented in Table 9.

Managers' Response	Frequency	Percent
No	70	48.9
Yes	40	28.0
Non-response	33	23.1
Total	143	100.0

Table 9: Use of e-mail Communication for Teaching Purposes

The results on the factor 'use of e-mail communication for teaching purposes' indicate that 48.9% of the university managers sampled did not use e-mail communication for teaching purposes; 28.0% of the managers admitted that they used e-mail communication for teaching purposes. However, 23.1% of the managers did not respond to the questionnaire item on whether they used their email addresses for teaching purposes or not. This indicates that there has not been much use of e-mail communication for teaching purposes among the university managers. 0-25% response was considered to be very low participation; 26%-50% category to be low participation; 51%-75% category to be high participation; and 76% and above to be very high participation. Therefore the use of e-mail for teaching purposes has been low. This may translate to low participation of university managers in distance education activities.

8. Discussions

The influence of availability of distance education ICT infrastructure on university managers' participation in distance education' was studied guided by the following factors: internet availability; internet connection points; computer availed to the lectures for teaching purposes; access to personal computer; and availability of ICT help desk. Access to a personal computer was considered key factor in determining the university managers' participation in distance education. This is because one cannot assert to possess distance education knowledge without some computer skills. From the study, it was established that over 50% of the departments

had 1-5 computers. This is an indicator that there are not adequate distance education facilities to promote participation in distance education activities.

It was further established that 38% of the departments had not availed any of the available computers to lecturers for teaching purposes. This is an indicator that there is not much participation in distance education in these departments. The study also established that there were departments in the universities (19.6%) that had no internet connection. This indicates that there is very low, if any, participation in distance education. This is because most of distance education materials can be accessed through internet. The sampled managers however agreed that there were ICT technical help desks to assist the staff on any issue related to use of computers and related technology. The distance education support facilities were found to be available at the universities. Upon correlating the availability of distance education facilities and participation in distance education activities, spearman correlation coefficient was used and this gave an r of 0.591. This indicates that there is weak positive relationship between availability of distance education support facilities and participation in distance education activities.

The ICT infrastructure available at the universities influence participation in distance education activities. The survey findings established that university managers agreed that the various ICT infrastructure were available at the universities. The overall median of ICT infrastructure listed was 3. This falls within the class of uncertain. This shows that most of the support facilities are seen by the university managers to be inadequate or not available at all. The university managers rated the availability of special projects to stimulate use of technology as the lowest with a median of 2. This was followed by the availability of materials via web, and guidance and counseling unit in distance education with a median of 3. The university managers rated the clear examination and certification procedure highest with a mean of 4. This may be explained by the fact that the examinations and certification is a core component in the universities and they are handled centrally for both the regular and distance programmes. The fact that the managers agree that there are not many projects to stimulate use of technology, is an indicator of the low participation in distance education activities.

Technology is important in promotion of distance education and related activities, and therefore the fact that there is little being done to promote technology use shows that participation in distance education activities is still low at the public universities. Access to computers and internet connectivity determine the success of teaching. A learning institution (schools) leadership plays a crucial role in using ICT integration across education and can hinder or facilitate use of technology in education, (Fullan, 2003;) and this also applies to distance education.

The availability of ICT infrastructure for distance education was found to be important in determining the level of participation in distance education activities by the university managers. The managers admitted that the ICT infrastructure and support facilities available were not adequate. This negatively influenced their participation in distance education. This is in concurrence with the findings of Preston (2000) who established that lack of technical support and other support facilities was a hindrance to the use of computers and other information technology in teaching. It also agrees with what Keiyoro (2010) established that access to computers and internet connectivity determine the success of teaching through technology. There is a positive relationship between the availability of distance education support facilities and participation in distance education activities.

A correlation between the availability of distance education ICT infrastructure and facilities and participation in distance education gave $r=0.591$. This is a positive relationship. This indicates that the two are related. Therefore, availability of ICT infrastructure influences participation in distance education activities.

9. Conclusion and Recommendations

Based on the findings of the study, the following conclusions were made: The university managers' level of participation in distance education activities in Kenyan public universities is very low. This was indicated by the following specific factors that were analysed: low number of university managers who have participated in distance education training workshops and seminars; the limited use of computers available and emails for teaching purposes; the low number of courses that are offered through distance education mode; and the distance education workshops and seminars organized for staff by the managers. This was the dependent variable in this study.

Availability of ICT infrastructure for distance education were found to influence participation in distance education. These were studied under the following: access to personal computer; internet availability; internet connection points; computers available for teaching; and availability of ICT help desk. It was concluded that for increased level of participation in distance education, the necessary ICT infrastructure and support facilities should be available at the universities. The findings of this study established that the university managers sampled indicated that there were ICT infrastructure available but they were not adequate.

This study makes the following recommendations that can guide the planning on how distance education can be expanded as the country struggles with issues of access and equity in higher education.

ICT infrastructure and support facilities are necessary for participation in distance education activities. This then calls for the university management to avail the necessary ICT infrastructure to ensure participation in distance education activities. This will include provision of computers for teaching, adequate internet provision with reliable speed, incentives, support services and motivation among other support facilities.

Participation of managers in distance education is dependent on the availability of ICT infrastructure for distance education and the support facilities. Universities need to work towards identifying strategies that can improve managers' participation. Managers at different levels of managers should be taken into consideration. Further, the study established that if distance educators at the universities are to succeed in their campaign for alternative methods of teaching, the managers' participation in distance education activities should be enhanced. This may be achieved through attitude transformation and training on distance education. In addition, the necessary distance education facilities should be availed at the universities.

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