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The Impact ofTechnical Factors on eLearning Implementation in Botswana Tertiary Institutions: The case of BOCODOL

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ABSTRACT

The use of technology in education, especially at tertiary level, continues to grow against the background of increasing research that suggests that positive outcomes can be realized from its use in teaching and learning. This studysought to investigate how Technical factors influence eLearning implementation in the Botswana tertiary education context. Literature review undertaken has shown that the few studies carried out do not provide the education sector with adequate information to address eLearning initiatives.

The research was a case study, situated within the Unified Theory of Acceptance and Use of Technology (UTAUT) theoretical framework model. It combined both quantitative and qualitative approaches for purposes of triangulation and complementarity. The study was framed around one (1) main research question out of which thehypothesiswas drawn. The main research question was: "To what extent do the technical factors influence the implementation of eLearning in selected Botswana tertiary institutions?"

The mixed methods research involved a total of onehundred and six (106) participants comprising of a total of sixty-six (66) students/learners and forty (40) staff members.Data were collected from staff membersand students using questionnaires, and a written interview for the eLearning specialists. The Statistical Packages for Social Sciences (SPSS) were used for data analysis. The results revealed a convergence of opinions betweenstudents and staff results indicated that Technical factors had a significant positive influence on eLearning implementation at Botswana College of Distance and Open Learning (BOCODOL). The study concluded that; the Technical factors had a positive influence on eLearning implementation at tertiary level. The study contributes to the existing body of knowledge as the results can be used to inform practice regarding how eLearning may be implemented in the context of Botswana tertiary institutions.

Key words: *Technology, eLearning, Specialists, Technical Factors, Hypothesis and Theoretical Framework*

INTRODUCTION

In recent years there has been an increase in pressure on institutions to adopt eLearning, however this initiative has been faced with a number of barriers. The implementation ofeLearning in higher education systems throughout the world has been influenced by a number of pressures and drivers. A good and well-functioning eLearning infrastructure has the potential to enable institutions to deliver and support education within and beyond the borders of their countries,and to enable the teaching and learning process to take place with ease. To achieve this, institutions need to introduce strategies and policies whichguide the implementation of flexible academic frameworks, innovative pedagogical approaches that support commitment to equivalence of access for students (MacKeogh & Fox, 2008). Studentsare increasinglyusing electronic technologies in their daily lives (An & Williams, 2010), and to acquire knowledge. This situation presents an opportunity for tertiary institutions world-wide to harness these technologies for teaching and learning purposes(Abuzaid, 2010).

There has not been an adequate research done to guide implementation of eLearning at the tertiary level within the Botswana context. The few studies conducted do not adequately articulate the discrete issues and challenges regarding critical factors that influence eLearning implementation. As a distance learning institution, it would be of great benefit to Botswana College of Distance and Open Learning (BOCODOL) learners to have access to the latest teaching and learning technologies, hence the need for the college to explore the implementation of eLearning in its development and delivery of courses.In September 2006, the College embarked on a project to pilot the use of technology in the provision of learner support services. However, this project was not successful due to the prohibitive costs of Internet café rates, because the target group was comprised of secondary school learners who were not employed and hence had no money to pay for the connectivity.

There is evidence that there was little research conducted at local level, and the few studies conducted (Batane and Mafote, 2007; Ndume, Tilya & Twaakyondo, 2008) do not adequately discuss the issues and challenges regarding the influence of technical factors on eLearning implementation. This creates a knowledge gap that this study will contribute towards.

Problem Statement

While there has been a lot of enthusiasm regarding eLearning implementation at tertiary level in Botswana, there were fewcomprehensive studies conducted to investigate these initiatives to determine the level of influence technical factors had on eLearning implementation in the Botswana context. The implication of this situation is that there was no empirical evidence upon which tertiary institutions in Botswana such as BOCODOL can benchmark against for eLearning initiatives now and for the future. It was therefore critical that this knowledge base be created so as to provide Botswana tertiary institutions with a foundation upon which they can benchmark for eLearning implementation.

Research Hypotheses Statement

The study proposed the following hypotheses upon which this research study was undertaken, as informed by the literature review and also guided by the theoretical framework:

H_1 – Technical factors have a significant positive influence on eLearning implementation

Ethical Considerations

Consideration ofresearch ethics involves the application of fundamental ethical principles to a variety of topics involving scientific research (Resnik, 2011). An essential ethical aspect to always consider and protect when doing research is the issue of confidentiality and protection of participants' identity (Maree, 2007). In this study all relevant ethical considerations were adhered to. Participants were informed verbally and in writing about their rights to voluntary participation, informed consent, confidentiality, anonymity, and their right to withdraw at any stage of the study if they so wished.

THEORETICAL FRAMEWORK

This study was premised on the view that the implementation of a new technology to improve teaching and learning requires well-coordinated implementation strategies with a clear understanding of theories of diffusion and acceptance of technological innovations by users as articulated by Rogers (2003). The research was a case study, situated within the Unified Theory of Acceptance and Use of Technology (UTAUT) theoretical framework model. While technology-mediated or enhanced methods of instruction offer a number of potential benefits, the use of these technologies by Open schools in the global South seems to be limited (Du Vivier & Ellis, 2009).

REVIEW OF RELATED LITERATURE

Wild, Griggs, and Downing (2002) say that eLearning is a revolutionary way to empower workforce with skills and knowledge it needs to turn change to an advantage. Any country trying to empower its workforce to become more skilled and improve productivity, needs to seriously find ways of harnessing the potential in eLearning to achieve this in a cost effective manner. According to Doak (n.d), Technology integration, if done properly, can do many things to help in the process of creating more authentic learning environments and more. He further argues that many of the studies report that, if the learning environment is technologically rich; it can increase self-esteem and enthusiasm for learning.There is no doubt that technological developments have resulted in some positive contribution to economic growth in many countries around the world, especially during the past decade. In a research conducted by Thomas (2009), to determine the degree to which online learning is taking place in the United States Institutions, there is evidence that points towards a continuing increase on the use of online learning in public schools. Thomas (2009) also intimates that there is need for educators to understand that technology in online learning is just meant to mediate between students and their teachers and should actually focus on the learning process and not on teachers teaching.However, even though many research studies have been conducted in the area of eLearning at a global level, at times the results obtained from some of them cannot be generalized to other areas due to a number of factors.

In thedeveloping world, institutions experience challenges in implementing eLearning initiatives becausethey are not in control of the provision of the necessary enabling environment in the form of Information and Communication backbone and support infrastructure. According to Rena (2008), this is due to lack of favorable conditions for deployment of new technologies in developing countries. Mostof these countries do not have clear eLearning policies that guide development and implementation processes and procedures

required to effectively achieve success in eLearning. Brown, Anderson and Murray (2007) have observed that countries need to undertake policy initiatives designed to provide access to the physical infrastructure supporting broadband access, which is considered essential for effective eLearning provision. Within Botswana, few eLearning research studies have beenconducted, mostly at University of Botswana as evidenced by the few scholarly articles retrieved from Google search.

RESEARCH METHODOLOGY ADOPTED FOR THIS STUDY

This study adopted to use a predominantly quantitative approach supported by some qualitative, data for triangulation. A mixed methods approach leaning more towards quantitative (positivist) paradigm was used to inform the design of this study for triangulation and complementarity purposes. A case study approach was adopted with a focus on BOCODOL. Case studies are set in contexts that enable clear boundaries drawn around them. These contexts may relate to factors such as geographical location, organizational and institutional contexts (Cohen, Manion & Morrison, 2007). In this case, the geographic setting was Botswana, and the institutional context was BOCODOL. As a research design, case study offers richness and depth of information not usually offered by other methods (Chabaya, Chiome, & Chabaya, 2011).

The sampling technique used in this study included a mixture of random selection and purposeful selection techniques because the study adopted a combination of quantitative and qualitative research methodologies for purposes of triangulation and in-depth understanding of the research problem.

Table 1

Sample Population

	BOCODOL
Students/Learners	66
Staff (Lecturers/Tutors)	40

Altogether, there were a total of one hundred and six (106) participants comprising of a total of sixty-six (66)students/learners and forty (40) staff members as indicated in Table 1. This number was considered large enough to generate adequate data to provide in-depth understanding of the eLearning implementation situation at the BOCODOL.

RESEARCH INSTRUMENTS

This study used questionnaires for staff and students, and a written interview targeting eLearning Specialists so as to collect more detailed information about their perceptions, attitudes, feelings and experiences on eLearning for purposes of triangulation. The study found the questionnaire more appropriate as it is a tool that respondents were most likely to be familiar with due to its wide use in most researches. A Cronbach alpha analysis of the reliability of the research questionnaires was performed to establish the level of internal validity of the instruments. The results in in Table 2 indicate very high, reliability values ranging between .883 and .933.The research instruments were also pilotedto test reliability of the results. Following the pilot, the questionnaires were modified so as to improve their design and validity against issues of elements ambiguity, language clarity, relevance of questions and clarity of instructions.

Table 2

Chronbach's Alpha Reliabilitytest for the variables

	Cronbach's Alpha	
Variables	**Staff Questionnaire**	**Student Questionnaire**
eLearning Implementation	.933	.933
Technical Factors	.883	.883

DATA ANALYSIS AND INTERPRETATION OF RESULTS

Data analysis has multiple facets and uses different approaches, encompassing diverse techniques under a variety of names, in different business, science, and social science domains. According to Bogdan and Biklen (2003), data interpretation is about developing ideas from the findings and relating them to the literature and broader concepts of the research.In this study, data analysis was both quantitative and qualitative, using frequency distributions and data emerging from the analysis was presented in tables and verbal responses from e-learning specialists. The findings were arrived at from an analysis of the responses of the questionnaires from students and staff. The quantitative data was analyzed using Statistical Package for Social Sciences (SPSS). The data was grouped into mainly two (2) sets, for staff and students for ease of analysis. This approach enabled the researcher to analyze and be able to compare the results between staff and students for similarities and differences.

DATA PRESENTATION

Response Rate

Table 3 presents the response rates for staff and students in raw scores as well as percentages. The table shows that the response rate from the students'respondents was sixty-six (66) and a total of thirty-seven (37) (59.64%) responses were received.

Table 3

Response Rate for both staff and students

Category	Sample Size	Responses	Response Rate %
Staff	40	37	92.5
Students	66	37	59.64

The sample size for staff was forty (40) and a total of thirty-seven (37) (92.5%) responses were received. Additionally, the written interviews by eLearning Specialists provided complementary data used for triangulation and complementarity purposes.

Demographic Characteristics

Table 4 and Table5 provide the demographic data for staff and students who responded to the questionnaires in this study. Table 4 presents data on student responses by Gender, whereas Table 5 presents them by Age group. Table 4 indicates that a total of thirty-seven (37) students responded. Table 5 shows that the majority of students were in the age range of Below 30 and 31- 40, totaling 81.1%.

Table 4

Student Respondents Distribution by Gender

	Gender		
	Male	Female	**Total**
BOCODOL	13	24	**37**

Table 5

Student Respondents by Age Groups

		Below 30	31 - 40	41 - 50	51 - 60	Missing	**Total**
	f	19	11	5	2	0	**37**
	%	51.4	29.7	13.5	5.4	0	**100**

Only a few students, 13.5% fell within the 41-50 age range, and also had two (2) students within the age 51-60 range. Table 6 shows the distribution of respondents by gender for staff.

Table 6

Staff Respondents Gender and Age Distribution

Institution			Age Group				Total
			31 - 40	41 - 50	51 - 60	Above 60	
BOCODOL	Gender	Male	7	12	2	0	21
		Female	1	11	4	0	16
	Total		**8**	**23**	**6**	**0**	**37**

Student Data on Technical Factors Affecting eLearning

Table 7 indicated that a total of 37.8% of students say access was hassle free.It also shows that 35.1% of Students seemed not to be very sure whether access was hassle free or not, compared to 24.3% of students who believed that access to resources was not easy. Table 8 shows only 32.4% of Students agreeing that they had adequate bandwidth speed for their Internet access. Majority 37.8% of Students indicated that the bandwidth speed was not adequate.

Table 7

Student Responses on Access to IT Resources Hassles

		Access to IT resources hassle free						
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Missing	**Total**
BOCODOL	f	4	10	13	7	2	1	**37**
	%	10.8	27.0	35.1	18.9	5.4	2.7	**100**

Table 8

Student Responses on Bandwidth and Speed

		Bandwidth available provides adequate speed						
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Missing	**Total**
BOCODOL	f	2	10	10	14	0	1	**7**
	%	5.4	27.0	27.0	37.8	0	2.7	**100**

Table 9 indicates that 67.6% of students agreed that they had equipment and infrastructure in place.The results indicate that students were of the view that infrastructure, equipment and connectivity had influence on the implementation of eLearning.

Table 9

Student Responses on Equipment and infrastructure availability

		Adequate Infrastructure available					
		Strongly Agree	Agree	Not Sure	Disagree	Missing	**Total**
BOCODOL	f	5	20	9	2	1	**37**
	%	13.5	54.1	24.3	5.4	2.7	**100**

These results suggest that technical factors had a positive influence on eLearning implementation as postulated in H1.

Staff Data on Technical Factors Affecting eLearning

Table 10indicates that 37.8% of BOCODOL staff were satisfied with infrastructure availability, while 40.5% of staff indicated that they were not satisfied with the infrastructure available.

Table 10

Staff Responses on Availability of Equipment and Infrastructure

Equipment and infrastructure in place			
Options		Frequency	Percent (%)
	Strongly Agree	1	2.7
	Agree	13	35.1
	Not Sure	8	21.6
	Disagree	13	35.1
	Strongly Disagree	2	5.4
	Missing	0	0
	Total	**37**	**100**

The responses from the eLearning specialists correspond with those of the staff members.

BOCODOL Specialists:

Excerpt 3: "The institution does not have necessary resources to facilitate eLearning implementation. Only the human resource is available."

Excerpt 4: "The institution has less resources to facilitate eLearning, the issue of Internet access is a problem."

Table 11indicates that only 21.6% of staff were satisfied with the Internet connectivity bandwidth speed within their institutions, while 67.6% of staff disagreed, as they encountered connectivity challenges. The eLearning specialists also concurred with the staff assertion that the bandwidth was not adequate.

Specialist Reported that:

Excerpt 7: "The bandwidth is not adequate."

Excerpt 8: "The bandwidth is very limited for delivery of eLearning and it becomes an obstacle in taking online classes by Students."

Table 11

Staff Responses on Bandwidth Speed Adequacy

Bandwidth speed adequate for required connectivity			
Options		Frequency	Percent (%)
	Strongly Agree	0	0
	Agree	8	21.6
	Not Sure	4	10.8
	Disagree	20	54.1
	Strongly Disagree	5	13.5
	Missing	0	0
	Total	**37**	**100.0**

Table 12 below on hassle freeaccess to IT resources indicated that only 13.5% of staff believed that access to IT resources was easy within their institutions, while 64.9% of staff disagreed, and alluded to experiencing difficulties in accessing IT resources.

Table 12

Staff Responses on Access to IT Resources

Access to IT resources hassle free			
Options		Frequency	Percent (%)
	Strongly Agree	0	0
	Agree	5	13.5
	Not Sure	8	21.6
	Disagree	22	59.5
	Strongly Disagree	2	5.4
	Missing	0	0
	Total	**37**	**100.0**

The results of the table above suggest that staff could not freely access IT resources. The findings from this analysis indicated deficiency in the provision of the necessary Technical ICT resources for eLearning. The eLearning specialists commented that:

Specialist Responses:

Excerpt 13: "ELearning portal should be available to Students all the time, which is not the casedue to limited bandwidth."

Excerpt 14: "We need to have a separate dedicated line for eLearning separate from the general administration line."

Excerpt 15: "There is need to invest more in resources such as software and more training to address technical related challenges."

The responses from the staff and specialists indicated that BOCODOL was not well equipped with resources. It was clear that technical issues such as infrastructure, equipment and connectivity were a challenge experienced as an obstacle that needed to be addressed for eLearning to be realized. These results suggest that technical factors have a positive influence on eLearning implementation as postulated in H1.

Testing of the Hypothesis

Testing of the hypothesis was done by carrying out Bivariate Factor analysis between the dependent variable and the independent variableusing the Pearson correlationcoefficient. In statistics, the Pearson correlation coefficient is a measure of the linear correlation (dependence) between two variables giving a value between +1 and −1. A value of 1 indicates total positive correlation, 0 is no correlation, and −1 shows total negative correlation (Cohen & Manion, 2001).

The results for staff and students Pearson correlation as shown in Table 13 indicate that the Pearson correlation between Technical Factors and Level of eLearning implementation for staff was.460, which was higher than the critical r-value of .329, indicating a high level of correlation. For students, the correlation was .921, which was also higher than the critical r-value of .329. This lead to the conclusion that both staff and students believed that Technical Factors had significant positive influence on eLearning implementation.This led to theretention of the first hypothesis that "Technical Factors have significant positive Influence on eLearning Implementation".

Table 13

Staff and Students Variables Correlations

		Staff	Students
Level of Implementation of e-Learning	Pearson Correlation	.460	.921
	Sig. (2-tailed)	.004	.000
	n	37	37

P< .05; Critical r- value = .329; df = 35

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

Research is the foundation of educational growth and development and hence education should be a research-active profession (Nenty& Adedoyin, 2010). It is on this basis that the study suggests that the activity of research on this new and rapidly evolving aspect of modern teaching and learning technologies needs to be continuously undertaken. The results would not only inform implementation, but would alsoguide thought processes to assist tertiary institutions tofind ways of improving the way they can facilitate and support students in their learning endeavors using available 21st Century ICT resources.

O'Neill, Singh, and O'Donoghue (2004) argue that institutions that are striving to be among the top worldwidein the delivery of, and access to their programmes and services are those that utilize technology very well. They are of the view that technology infrastructure is one of the critical success factors for eLearning implementation and the functionality of the infrastructure should be ensured at all times. Ali and Magalhaes (2008) concur with this view as they indicate that literature reveals that the barriers to the adoption and implementation of eLearning are either related to organizational or technical issues. The study has shown that the issue of technical infrastructure forms a pillar around which eLearning implementation should be built. Gunawardana (2005) concurs with this view and believes that for eLearning to succeed, in the developing world, it needs to be built on the existence of infrastructure and some degree of connectivity. However, he further argues that this will not happen without lowered price barriers, enhanced rural access and increased ICT literacy.Results revealed that perceptions of students and staff on the influence of equipment and infrastructure on the implementation of eLearning were similar. The observations of the specialists' responses indicated that BOCODOL was not so well resourced to effectively facilitate eLearning

implementation.The overall impression from both staff and students was that Technical factors significantlypositively influenced eLearning implementation at BOCODOL.

CONCLUSIONS

The study found that a few research,though not necessarily fully adequate, has been done showing favorable results towards eLearning. Condie and Manro (2007, p. 3) posit that "Evidence of the impact on learning and teaching indicates that, where the use of ICT is most effective in enhancing the learning experience, teachers have been able to integrate a number of technologies to develop innovative approaches to learning and teaching." According to O'Neill et al. (2004, p. 318), there was need to work towards overcoming all the barriers to successful eLearning implementation such as Technology, ICT skills for students and staff as well as providing all the necessary enabling resources. It is from this study that provision of the necessary ICT resources plays a critical role in the success of eLearning implementation. Infrastructure needs to address issues of Connectivity, Bandwidth, Flexibility, adaptability and scalability. This observation concurs with overall view of the research outcome on the hypothesis that, "Technical Factors have significant positive influence on eLearning Implementation".Beyond the findings of the study, more research ought to be carried out so as to show how the theory of eLearning implementation may hold differently or similarly in a contact tertiary institution versus an ODL one.It is therefore very important that the status of ICT infrastructure and equipment availability be fully assessed before commencing an eLearning initiative.

[Good findings of where BOCODOL was at the point of this research being carried out. It is therefore necessary in view of the passage of time that another evaluation is carried out to determine the current situation in the Institution. There is need therefore to have an indicative statement to the effect that there has been some developments which have changed the landscape as was when the research was carried out.

RECOMMENDATIONS

The following are recommendations made for consideration by UB and BOCODOL in order to facilitate and improve the implementation of eLearning within the institutions.

1. The research findings indicated that technical factors had significant positive influence on eLearning Implementation. Students, staff and eLearning specialists have indicated that the issue of infrastructure provision was key to successful eLearning implementation.
2. Additionally, the results also indicate that institutional management must be in the driving seat of the eLearning initiative for the institution to be successful in implementing it. This is important because if management is well informed about the project, it will then be in a better position to allocate resources adequately from an informed position. This will greatly enhance chances of success of the initiative being implemented.
3. Additionally, the results also indicated that staff members needed to be provided with appropriate motivation to encourage them to embrace eLearning implementation through some comprehensive motivation strategy that would have to be developed to facilitate more positive results.

AREAS FOR FURTHER RESEARCH

The researcher concludes thatthe results of this study are generalizable, though acknowledging that thisview could still be subject to debate, as the eLearning phenomenon is a dynamic field that continues to evolve rapidly. The findings of this study have raised areas in which further studies could be undertaken to establish deeper understanding in some specific issues impacting eLearning implementation in Botswana tertiary institutions, contact and ODL:

1. Research could be conducted to establish how the ICT infrastructure deployment by Government, influenced eLearning implementation across the entire education spectrum.
2. Research could be conducted to establish if Social media tools have any pedagogical relevance and benefit to the education environment in terms of appropriateness and applicability to teaching and learning.

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