DETERMINANTS OF DIGITAL LEARNING IMPLEMENTATION IN PUBLIC PRIMARY SCHOOLS: A CASE OF NAIROBI COUNTY SCHOOLS

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ABSTRACT

Digital learning has become a widely accepted learning module in recent years and has been linked with positive, cumulatively progressive gains in learning outcomes. This study sought to assess the Digital Learning Strategy Implementation in public primary schools in Nairobi County. Records in the County Education Office indicate that there are 196 public primary schools within Nairobi County that have implemented the digital learning strategy. Specifically the study sought to assess and determine the influence of digital content, digital infrastructure, security of ICT infrastructure and equipment and resource allocation on the digital learning implementation strategy. To achieve these objectives the study adopted a descriptive research design. The target population were the users of the digital learning system in these schools. Three users from each school were identified from the stakeholders who interact with the platform on a regular basis by the nature of their jobs. These were the ICT Teachers the Deputy Head Teacher and Head teachers. The data collection instrument of choice used to collect primary data was questionnaires. These were administered through a drop and pick methodology because of it was convenient for the respondents to complete at their pace. The data collected was analysed using descriptive statistics, correlation and regression analysis. The results of the correlation analysis indicated that there was a weak correlation between the digital content and ICT infrastructure, but a stronger correlation between the was also done to establish the relationship between the implementation strategy as the dependent variable and digital content, ICT infrastructure, Security and Resources as the independent variables. Results of the study gave a strong positive correlation between the independent and dependent variables. The results of this study will be of immense benefit to the teachers, students and the government bodies charged with its implementation such as the ICT Authority.

Key Words: *digital learning implementation, public primary school, Nairobi County schools*

INTRODUCTION

Technology has totally transformed our way of life; from how we communicate to how we conduct business and now it is changing how we learn. All aspects of our lives involve the use of technology in one way or another (Brynjolfsson, 2017). According to Holzberger (2013) digital learning involves the use of technology in the teaching and learning process. It involves the application of digital infrastructure such as computers and the internet in delivery of education to overcome barriers of learning such as location and time to achieve learning that revolves more around the leaner than the teacher, that is, student-centred(Lin, Chen, & Liu, 2017).

The Kenya vision 2030 aims to put Kenya on the global map as a competitive and prosperous country through development in along three main pillars; economic, social and political.

Education is envisaged in the social pillar with the goal producing quality and equitable education for all for sustainable development by 2030. A prime objective is the provision of quality education that prepares learners to competitively function within a highly integrated, technologically-oriented and information-based global economy (Onyango, 2015).

Integration of ICT in learning is however facing some challenges including lack of funding to support the purchase of the infrastructure to improve access to educational materials, lack of training for teachers to adopt ICT as a teaching tool and unavailability of computers are of the challenges that hinder full integration of ICTs in education. Due to the overwhelming some bias in developing ICT based content this may be a challenge towards digital integration. In Nairobi, for instance, 71% of schools have a computer but in the former Eastern province less than 20% do (Gioko, 2011).Digital learning has become a widely accepted learning module in recent years and has been linked with positive, cumulatively progressive gains in learning outcomes. This research sought to assess the implementation of digital learning strategy on the performance of public primary schools in Nairobi County.

PROBLEM STATEMENT

In spite of the critical role of ICT in improving learning, its adoption in education in Kenya has been limited. Multiple impediments to the implementation of digital learning in Kenya have been reported. First, shortage of qualified teachers to teach ICT in schools with schools that have received the equipment but not using them because they are not conversant with the technology (Wanjiru, 2013).Second, burglary with more than 16,000 tablets distributed to primary schools under the Digital Learning Programme being stolen since the initiative started (Andanyi, 2018). Third, lack of infrastructure with schools in rural areas such as Baringo County and Pokot County reporting not using the equipment because of lack of classrooms with pupils forced to sit on stones in the open and the few classrooms present being in very squalid conditions (Wanzala, 2018). Fourth, some schools in Trans Nzoia County are reporting that instead of becoming a learning tool, the devices seem to be a source of entertainment for the pupils. Fifth, some parents are outright complaining that the programme is a misplaced priority with many counties grappling with more burning issues like insecurity, poverty and drought (Nyamai, 2018). Digital learning continues to gain momentum in Kenya with the project rolled out in academic institutions from primary, secondary and Tertiary levels embracing the strategy. There are however clear indications that the implementation of the digital learning is facing some significant challenges that must be addressed if the programme is to be effective.

GENERAL OBJECTIVE

The main objective of this study was to find the determinants of digital learning implementation in public primary schools within Nairobi County, Kenya.

SPECIFIC OBJECTIVES

1. To assess the influence of digital content on digital learning implementation
2. To determine the influence of security of ICT infrastructure and equipment in digital learning implementation

THEORETICAL REVIEW

Diffusion of Innovation Theory

Diffusion of Innovation (DOI) Theory developed by E.M. Rogers in 1962 originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The end result of this diffusion is that people, as part of a social system, adopt a new idea, behaviour, or product(Rogers, 2003).It was further proposed by Medlin (2001) who suggested that diffusion of innovations theory is the most appropriate for investigating the adoption of technology in institutions and businesses. According to Rogers (2003), a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome.

Diffusion is the process by which an innovation is communicated through certain channels over time among the members of a social system. An innovation is an idea or object that is perceived to be new (Rogers E. M., 1985). According to this theory the rate of diffusion is affected by an innovation's relative advantage, complexity, compatibility, trial-ability and observe-ability. The diffusion of innovation theory was relevant because it explained the schools in Kenya are adopting technological innovations in the teaching and learning process.

Technology Acceptance Theory

A number of theoretical models have been proposed to facilitate the understanding of factors impacting the acceptance of information technologies. Among these studies, the Technology Acceptance Model -TAM- (Davis, 1989).TAM assumes that beliefs about usefulness and ease of use are always the primary determinants of information technologies adoption in organizations. According to TAM, these factors provide a basis for perception towards the adoption of a specific system which then determines the actual usage of the system. However, the original TAM model was created to examine Information Technology adoption in business organizations. The model's suitability for predicting general individual acceptance, especially in education, needs to be explored (Saveri & Chwierut, 2018).

The original TAM predicts acceptance based on the end-user's perception on the usefulness as well as ease of use of a technology to achieve an objective. The founder of TAM integrated the model in an institutional set-up and discovered that adoption of a system is greatly dependent on the perception of employees about how it will affect performance. He defined ease of use as hoe an individual believes the adoption of a certain technology would not require strenuous effort from them.

Shah, Bhatti, Iftikhar, Qureshi and Zaman (2013) used Technology Acceptance Model (TMA) for the assessment of student behaviour using E-learning in rural and Urban Area of Pakistan. Result indicated infrastructure of e-learning environment (information quality, service quality and system quality) has a direct effect with perceived usefulness of e-learning and ease to use which lead to positive intentions towards use of E-learning.

This theory was relevant to this study as it provided a framework for digital learning acceptance by the users, both teachers and pupils.

Disruptive Innovation Theory

Disruptive innovation theory was first introduced by Bower and Christensen in 1995 (Bower & Christensen, 1995). Disruptive innovation is defined as an innovation that attacks an existing business, and offer great opportunities for new profit growth. Disruptive innovation is also defined as something that changes social practices, the way we live, work and learn(Assink, 2006).There are two key elements of disruptive innovation which are important to the education sector. The elements are technology enabler, and business model innovation (Christensen et al., 2011). Digital learning is considered as a technology driver that is capable of disruptively changing the teaching learning process and jeopardizes the existence of the traditional learning models.

Hilmi (2016) used the disruptive innovation theory to explain the dynamic changes in learning with the recent introduction of massive open online courses (MOOCs) which is seen as a strong technological force influencing the education landscape meant to give readers, especially practitioners in education sector a way of understanding the nature of disruptive innovation and how disruptive innovation is influencing the education landscape.

The theory of disruptive innovation explained how digital learning in Kenya is revolutionizing education through the use of innovative technological innovations.

EMPIRICAL REVIEW

Empirical review looks into previous studies conducted by different researches taking into consideration the objective, concept, context, methods and the findings in order to identify research gap and to compare results of current study to those of previous ones.

Digital Content and Digital Learning Strategy Implementation

Gioko (2011) assessed the effect of digital content utilization in teaching and learning in Kenyan secondary schools that have embraced e-learning. The study focused on teachers and students who form the nerve centre of teaching and learning process. The findings revealed some positives and negative impacts on teaching and learning accruing from use of digital content. Learner participation, motivation, stimulating content, self- directed discovery and enhanced understanding of concept came out as the positive effects while inadequate content, shallow coverage of concepts and lack of infrastructure were the negatives. From the research

training of both teachers and students was recommended to capacitate them in utilization of available open resources for building custom digital learning resources to fill in the huge need.

The use of technology teaching and learning process is believed to affect the attitude and performance of students today. A study by Eyyam and Yaratan (2014) identified challenges facing implementation of digital strategy in schools. Major constraints identified included, shortage of equipment in schools and inadequately trained teachers on use of ICT in teaching. As measures against these issues, the study recommended that ICT training be a part of teacher training and to equip them with skills and knowledge to enhance service delivery in ICT integrated learning.

Zwart, Luit, Noroozi and Goei(2017) conducted a study to investigate the relationship between digital learning material (DLM) and students' mathematics learning in Dutch vocational education. A pre-test–post-test design was used. Apprenticeship students were asked to complete assignments and to discuss them with their peers and the online teacher. The results showed that DLM can enhance students' mathematics learning in vocational education. The learning enhancement was mostly due to the use of instructional clips and structuring of the content of the mathematics tasks.

Security and Digital Learning Strategy Implementation

There are concerns that evolved from the use of modern technologies for learning that may affect their adoption negatively, the important ones being the security risks and vulnerability attack issues on learning contents and private information on digital learning devices (Kambourakis, 2013). Security issues in learning platforms that have been exploited are related to vulnerabilities in the operating system and flaws in the application software or network facilities (Jang-Jaccard & Nepal, 2014).

Many institutions are rushing into adopting ICT without cautiously planning or putting in place measures against security risks. The Internet attracts illegal activities and e-learning is no exception. Hayaati and Fan (2010) discussed the security factors that need to be considered when implementing e-learning within an educational institutions. The study identified information security management as a critical measure against cyber threats.

Internet threat against e-learning systems is a real challenge considering the multitude of individuals and networks accessing the internet every day. Bandara, Ioras and Maher (2014) attempted to understand the concept of monitoring, measuring and managing cyber security in relation to e-learning systems. The study demonstrated the e-learning systems under study had a high prevalence of internal cyber-attack and there lacked proper IT policies and procedures in e-Learning systems to meet the security requirement required to protect the systems from cyber-attacks. Since e-learning systems are open, interconnected and distributed, it is important to ensure that users only have access to the right information at the appropriate time.

RESEARCH METHODOLOGY

Research Design

This research used descriptive design to assess the determinants of digital learning strategy implementation in public primary schools within Nairobi County. This design was appropriate as it enabled the researcher to gather practical and clearly defined information from experienced respondents its findings are conclusive.

Target Population

This study targeted the personnel that interact with digital learning process in public primary schools within Nairobi County. These personnel comprise the head teachers, teachers and ICT staff in the respective schools. The study focussed on the schools that have implemented the digital learning strategy. There are 205 public primary schools in Nairobi County. However, the digital learning strategy has been implemented in only 196 public primary schools with installation in 9 schools still pending (ICT Authority, 2018). Therefore, the target population of this study is 196 public primary schools in Nairobi County that have implemented digital learning strategy.

Data Source and Collection Instruments

This study employed primary data collection instrument. The study used questionnaires that were administered using the drop and pick method to all the 196 primary schools in Nairobi county identified as having implemented the digital learning strategy.

Data Analysis Methods

Regression analysis was conducted to determine the relationship between the dependent and the independent variables. The following model will be adopted by the study;

$$ESI = \alpha + \beta_1 DC + \beta_2 SC + \varepsilon$$

Where: ESI= E-Learning Strategy Implementation; DC= Digital Content; SC= Security; α = Constant; β_1, $\beta_{2,}$ = regression coefficients; ε= Error term

RESEARCH RESULTS

Correlation analysis

The Pearson correlation test was conducted on the digital content, infrastructure, security and resource allocation (the independent variables) to determine their statistical relationship digital learning strategy implementation (the dependent variable). Using Pearson correlation coefficient (r) and p-value analysis, a correlation is considered significant when the probability value is below 0.05 (p-value ≤ 0.05).

Table 1: Correlation Analysis

		1	2	3
(1) Digital content	Pearson Correlation	1		
(2) Security	Pearson Correlation		1	
(3) Implementation of digital learning strategy	Pearson Correlation	.424**	.128	1
	Sig. (2-tailed)	.000	.133	

From table 1 above, there is a positive correlation between digital content, security, and the implementation digital learning strategy with R correlation coefficients of 0.424 and 0.128 respectively. This means that an increase in digital content and security would increase digital learning strategy implementation. The study concludes that there is a positive relationship between the independent variable and dependent variables.

Regression analysis

The study sought to establish the influence of each of the independent variables (digital content, security) on digital learning strategy implementation in public primary schools with digital learning in Nairobi County.

Table 2: Model Summary for multiple regression

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.669[a]	.448	.383	.65489

a. Predictors: (Constant), Digital content, Security

The findings in the table above indicate that the value of R is 0.669 while the value of R square is 0.448. This means that the independent variables will result in a variation of 44.8% in digital learning strategy implementation in public school Nairobi County. 55.2% of the variation in digital learning strategy implantation can be explained by other variables not presented in this study.

Table 3: Multiple regression Coefficients

		Unstandardized Coefficients		Standardized Coefficients		
Model		**B**	**Std. Error**	**Beta**	**t**	**Sig.**
1	(Constant)	.421	.622		.676	.500
	Digital content	.700	.159	.341	4.397	.000
	Security	.368	.131	.420	2.817	.008

a. Dependent Variable: Implementation of digital learning strategy

Table 3 above present the results of the coefficients analysis of determinants of digital learning strategy implementation in public schools in Nairobi County. From the results presented in Table 3 above, the regression equation therefore becomes:

$$ESI = 0.421 + 0.700 \text{ Digital Content} + 0.368 \text{ Security} + \varepsilon$$

According to the findings, digital content practices (β=0.700, p-value=0.00) and security (1=0.368 p-value=0.08) were significant in predicting the digital learning strategy implementation since their p-values were less than 0.05.

The model revealed that digital content and security have positive effects on digital learning strategy implementation in public schools in Nairobi County by factors of 0.700, and 0.368 respectively. This means that a unit change in digital content and security would lead to changes in digital learning strategy implementation by factors of 0.700 and 0.368 respectively.

DISCUSSION

Digital content and implementation of digital learning strategy

The first specific objective of this study was to examine the effect of digital content on the implementation of digital learning strategy in public schools in Nairobi County. The regression analysis revealed that digital content has a significant positive effect on the implementation of digital learning strategy in public primary schools in Nairobi County. The findings of the study are in line with Zwart, Luit, Noroozi and Goei (2017) who found out that use of instructional clips and structuring of the content of the mathematics tasks on digital learning material (DLM) improved the students' mathematics learning in Dutch vocational education.

Gioko (2011) investigated how the use of digital content influenced teaching and learning in secondary schools that have embraced e-learning in Kenya. The result revealed that there is a significant positive correlation between digital content and learners' participation, motivation and self- directed discovery. The study concluded that the use of digital content enhances the understanding of concepts by students. The findings of the current study support this observation that digital content positively affects the implementation of digital learning strategy in public schools in Kenya.

Security and implementation of digital learning strategy

The second specific objective of this study was to examine the effect of security on the implementation of digital learning strategy in public schools in Nairobi County. To achieve this objective, the study used a descriptive research design to examine the effect of security aspects such as storage rooms, theft, cybercrimes and cyber bullying, and misuse of digital equipment. The regression analysis revealed that security has a significant positive effect on the implementation of digital learning strategy in public primary schools in Nairobi County. The findings of the study are in line with Hayaati and Fan (2010) who emphasized that appropriate security management is critical for the implementation of digital learning strategy. The e-learning programme is highly susceptible to cyber security concerns such as cyber-attacks and cyber bullying which can leave learners vulnerable to malicious internet users.

Physical protection of the digital infrastructure is also important to prevent theft and damage of digital equipment. The findings of a study conducted by Tsindoli and William (2018) revealed that security for e-learning equipment impaired the implementation of e-learning programmes in schools. Computers are highly valuable and the risk involved in installing the equipment and other learning resources is high. Therefore, primary schools require computer laboratories and storage facilities to ensure that the equipment is safe.

Barik, & Karforma, (2012) assessed the risks and remedies the implementation of e-learning system. He observed that student, teacher and controlling authorities of e-learning are exposed to different level of security risks. Since the internet is the backbone of the entire e-learning, hackers can used different loopholes of technology to attack the system, manipulation the learning content, alter the teaching, examination, evaluation and grading system, steal personal information or prevent authorised learner from accessing the e-learning system. Therefore, effective implementation of digital learning system requires a strong and reliable security measures from both physical and electronic threats.

Awidi, (2013) examined the policy and strategy issues that have influenced the process of e-learning implementation at the University of Ghana. The study revealed that lack of adequate security for the protection of available infrastructure and e-resources and periodic theft of routers, and computer accessories from the laboratories were the main challenges facing the implementation of e-learning strategy at the university. The findings of the current study also revealed that security is important in the implementation of digital learning strategy in public schools in Nairobi County.

CONCLUSIONS

The study sought to determine the influence of digital content on the implementation of digital learning strategy in public primary schools in Nairobi County. From the results of the analysis, the study concluded that digital content has a significant positive influence on the implementation of digital learning strategy. It was also concluded that the provision of a relevant, comprehensive, readily available digital contents that covers the syllabus will increase students' participation in learning and positively contribute to the performance of the students in public schools in Nairobi County.

The study sought to determine the influence of security on the implementation of digital learning strategy in public schools in Nairobi County. From the results of the analysis, the study concluded that security has a significant positive influence on the implementation of digital learning strategy in public schools in Nairobi County. Public primary school should have appropriate infrastructure such as computer hardware and software, well equipped computer laboratories, stable powers supply and secure internet connection for proper implementation of the digital learning strategy.

RECOMMENDATIONS

Government should also put in place adequate measures to ensure security of network and information systems to prevent cyber-crimes and cyber-bullying and guarantee safety of person information. Regulators of digital learning program should ensure that the digital content is comprehensive, relevant, and interactive and covers the syllabus well. All stakeholders in the e-learning program should work together need to be prepared which involves training schedules and even public awareness through media, seminars and workshops Strategically involving headmasters and parents is necessary for the institutionalisation and longer-term sustainability management of the laptop project.

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