

EFFECT OF COVID-19 ON E-LEARNING DELIVERY: AS AN APPLICATION OF PROJECT BASED AT NU VISION KABUGA RWANDA.

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ABSTRACT

The concern of this study is to explore effect of covid-19 on e-learning delivery: as an application of project based at NU Vision High School Kabuga, Rwanda. The specific objectives include to assess the effect of access point on E-Learning delivery in NU Vision High School, to analyse the effect of internet security on E-Learning delivery in NU Vision High School and to determine the effect of database on E-Learning delivery in NU Vision High School. The study adopted descriptive research design using quantitative and qualitative approaches. Agent theory of E-Learning projects planning and Project management theory of change were used in this study. The population involved in this was staff from NU Vision High School. The total population for this study was therefore composed by 214 persons. Purposive sampling technique was used to sample 139 respondents taken as sample size. Descriptive statistics with frequency distribution and correlation and regression analysis were used to analyze the data. Frequency tables were used to present the data to facilitate understanding and interpretation. The qualitative data was consolidated, analysed in terms of content and a narrative report was produced presenting the respondents' views on explore effect of COVID-19 on E-learning delivery: As an application of project based at NU Vision High School. The study will be a great important to the existing knowledge in E-Learning delivery and will contribute to increasing E-Learning projects planning standards amongst the project management professionals and the entire project industry. Findings indicated that of Access point, internet security database have an effect on E-Learning delivery in NU Vision High School. Besides, findings also revealed the coefficient of correlation equal to $r= 0.802$, $p \text{ value}=0.000$. In this regard, regression analysis was used to conclude the results of the undertaken study and to provide some recommendations. This study recommends that prevent issues regarding the session security, NU Vision High School, should use session ID which is adequately long and unpredictable.

key words: E-learning delivery. Covid-19,
Internet security

teachers in subject delivery and makes the classroom environment more enjoyable.

Background of the study

Globally, internet technologies and mobile applications have transformed the education system from the traditional structure to the modern method of teaching. Self-efficiency of the teachers in terms of technology, subject knowledge, and content developments reflect on the students' attitude towards the teachers. Technological advancement has evolved the face of education in creating learning opportunities. Technology in education is not only beneficial for the students but also the

In European countries like Spain, Belgium, Italy, Sweden, etc., the implementation of E-Learning projects is difficult, partly because of the need to satisfy the large number of donors. As a result, different knowledge and values of the community need to be taken into account and it is important that there are e-learning projects that formulate decision-making processes and implement them. In North, Central and South America, the e-learning projects planned for the project are involved in decision-making such as democratic rights; it is generally considered to be a well-

established level of community development (Weber, 2016).

Among the most developed countries in Asia; a study project preparation system that combines methods, materials, techniques and methods. E-learning projects are usually needed to develop any project because they determine the time needed to complete a project. The e-learning plans mainly focus on the control and management of access materials and services, project management which provides additional support and support for access to these products. In Africa, companies and groups of companies from various countries including Seychelles, Gabon, Ghana, Egypt and Rwanda, can accelerate the pace of E-Learning projects in the field of communication; E-Learning project planning is a lasting relationship that grows stronger and stronger over time in a project, program (Weber, 2016).

In Africa, E-Learning projects performance are the means by which the development institutions, and non-government organizations (NGOs) deliver a range of services to raise awareness of beneficiaries, it is important to look at the available best practices of E-Learning projects planning in decision making and implementation for community development project by looking at the model put in place to achieve E-Learning projects planning. E-Learning projects are recognized as a significant part of project plans with the significant potential of project sources and the global shift towards cleaner project (Prahinski, 2017). In Rwanda, school closures are one of the non-pharmaceutical measures that were introduced to control the spread of COVID-19. Following the identification of the first case of COVID-19 in Rwanda on 14 March 2020, the government took immediate steps to control its spread. Although online learning is a

common trend in this new technological era, scholars such as Schleicher (2020) observe that it confronts a number of challenges such as a lack of infrastructure to support online learning, and poor network connections. The pandemic also disrupted assessment, which is one of the key activities in the teaching and learning process, as it evaluates whether students have acquired the relevant knowledge and skills. As noted by Reimers and Schleicher (2020) and Joseph (2020) many HEIs did not develop online curricula to facilitate the online learning process. This severely affected many HEIs' internal assessment processes. This study contributes to the existing literature in an important way as it focusing on the impact of the COVID-19 pandemic on the learning process in Rwanda.

Statement of problem Majority of developing countries do not have long term policies on the development and support of E-Learning projects, which proceed to be undertaken without the necessary E-Learning projects planning and policy. The lack of policy meant that the majority of E-Learning projects diffusion efforts have not only been unplanned by Government, but have been practiced mostly as informal sector operations beyond the government framework, therefore unable to mobilize the database from the government and its great donors

In Rwanda, for instance, there is inadequate general expertise of project in the applicable areas. The projects are not successful because of lack of sufficiency resources, this problem is large extent to blame for the usually inadequate rules and regulations of renewable project plans. Provided that there is inadequate technical knowledge in the formal project sector (Vleuten, 2017).

As an Internet-based learning method, online learning depends on the Internet for its execution (Alwi & Fan, 2010). However, there are any number of illegal activities and security threats taking place on the Internet. Consequently, the e-learning environment is inevitably exposed to constant security threats, risks, and attacks. To have a good e-learning system access point, internet security and even data base are highly needed in helping learning management system. In response to increasing threats, researchers have developed a number of countermeasures and solutions to improve security in online learning which would help the system to be accurate, safe and reported.

Rwandan E-Learning projects are still facing many barriers in accessing financial services, including restrictions in the legal and regulatory environment, lack of financial training; inappropriate and inaccessible products and services, and low financial capabilities. Financial capability is serious challenge that E-Learning projects performance faces in order to make sound personal finance decisions, suited to their social and financial circumstances. Projects don't have enough access to formal financial services, reasons include legal restrictions, high transaction costs and low funds.

Specific objectives of the study

Specifically, this study attempts to:

- i. To assess the effect of access point on E-Learning delivery in NU Vision High School
- ii. To analyse the effect of internet security on E-Learning delivery in NU Vision High School.
- iii. To determine the effect of database on E-Learning delivery in NU Vision High School.

LITERATURE REVIEW

Theoretical review

The study is guided by theories including Agent theory of E-Learning projects planning and Connectivism theory, as are discussed in the subsequent sections:

2.3.1. Agent theory

The innovation of agent theory of E-Learning projects planning system lies (1) in making the distinction between desired and actual outcomes and (2) in requiring stakeholders to model their desired outcomes before they decide on forms of intervention to achieve those outcomes. A common error in describing agent theory of E-Learning projects planning system is the belief that it is simply a methodology for planning and evaluation (Merchant, 2017).

The agent system of the E-Learning project planning program is rather a powerful theoretical approach that provides a robust distribution of energy. In addition, the process inevitably involves a lot of feedback from participants. The E-Learning project planning agent system can start at any level of activity, depending on the application. The idea developed at the outset is good to inform planning. Surprisingly making an example of change, trainees can make a lot of decisions about strategies and tactics. By monitoring and reviewing available information,

stakeholders can continually improve the feedback of system staff on e-Learning projects as evidenced. This theory is linked with this study as it provides how students are learnt by using e-learning delivery. Besides, while using E-Learning project planning program, the institution must create a well and good access point with strict internet security which will help the program to be well taught. This theory embraces the specific objectives one and two of this study.

Connectivism theory

According to Goldie (2016), connectivism is to a certain degree a new theory of learning suggesting that learners need to combine general manner, theories, and thoughts in a useful manner. The theory emphasizes that technology is a key part of learning process and that persistent connectedness provide people with opportunities to make choices about their learning. The theory states that some of the digital technology features such as web browsers and search engines form significant tools that help in online learning implementation.

As such, education, being an important aspect of people's lives, is a subject of technology. As Strong & Hutchins (2009) state, learning only happens within the ever-changing networks and only happens after information sources and specialized nodes are connected and that it can occur in non-human appliances. In online education, learning happens when various stakeholders interact; an example is the interaction of students and teachers. For this reason, is why this theory was selected.

Empirical review

The COVID-19 pandemic is the defining global health crisis of our time, and it is

adding a fair amount of complexity in how different activities are being conducted (Adnan and Anwar, 2020). Such effects are crucial on higher education, forcing all teaching and learning activities to face a sudden transition to wholly online learning contexts (Toquero, 2020). While the educational environments are still struggling with the digitalisation and digital transformation challenges and finding optimal ways to adapt, the Coronavirus pandemic has fundamentally affected their core: staff and students (Adedoyin and Soykan, 2020; Aristovnik *et al.*, 2020; Strau and Rummel, 2020). For them, the period is inevitably very stressful as all learning and teaching activities – e.g. all classes, meetings, seminars, supervisions and exams were forced to move online within short notice (Bao, 2020; Hodges *et al.*, 2020).

Though such transformation is not entirely new for such institutions, they are all now forced to move away from traditional teaching and learning structures to a virtual environment as old education models are no longer adaptable to the challenges of rapidly changing educational environments (Van Nuland *et al.*, 2020).

(Nakamura *et al.*, 2017). Given the relatively recent events in terms of COVID-19 and quarantine situation worldwide, e-learning has become increasingly important as one of the optimal solutions for education (Radha *et al.*, 2020).

Sun *et al.* (2008) stated that personal perceptions about e-learning could influence attitudes and impact whether a user would intend to use to e-learning in the future. Uppal *et al.* (2018) and Kim and Frick (2011) mentioned that the supportiveness of the service, information quality and system quality are different aspects of e-learning quality, which could

also impact the decision of the users. Moreover, Benigno and Trentin (2000) stated that e-learning is potentially affected by factors such as student characteristics, student-student interaction, learning materials, learning environment, and information technology (IT). Also, Selim (2007) mentioned that there are eight critical success factors of participation in e-learning (e.g. instructor's attitude towards and control of the technology and student motivation and technical competency).

Furthermore, Sun (2008) suggested that perceived e-learning satisfaction is depended on the six dimensions: learner, instructor, course, technology, design and environmental. Sun (2008) concluded that learner computer anxiety, instructor attitude toward e-learning, e-learning course flexibility, e-learning course quality, perceived usefulness, perceived ease of use, and diversity in assessments were the critical factors affecting learner's perceived satisfaction.

Garavan (2010) conceptualized participation in e-learning and quantitatively validated the research model. In their model, the participation in e-learning is formed by

the general-person characteristics (e.g. age and social class), motivation to learn and instructional design characteristics of e-learning (content quality and learner support, feedback and recognition). Additionally, the perceived barriers and enablers to e-learning are potentially affected by the proper instructional design of e-learning. Fleming (2017) identified that predictors of future use and overall satisfaction from using e-learning are low perceived complexity of the e-learning system, the knowledge of e-learning, and available technical support for e-learning.

Zhang (2012) presented a research model that evaluates the impact of multiple factors on the intention to continue participation in the e-learning systems. Zhang (2012) concluded that the intention to participate depends directly and indirectly on the psychological safety communication climate, on the perceived responsiveness of e-learning system and self-efficacy, as well as satisfaction from the previous use of the system. Furthermore, satisfaction and membership of the community were found to affect the intention to continue participation in e-learning.

COVID-19 has affected education all over the world. Universities and schools are remained closed (Murphy, 2020). Consequently, the upsurge of e-learning is happening in the education system (Bozkurt et al., 2020). Though online learning helps to

teach or learn in the pandemic period, implementation of a planned and structured online learning system is essential to have a successful e-learning system. Many universities already have a significant transition to e-learning in the pandemic

period. This conceptual framework presents the main variables and their indicators; this study consists research variables including access point; internet security and database as independent variables and E-Learning delivery as dependent variable

RESEARCH METHODOLOGY

Research Design

The research used a descriptive case study to collect qualitative and quantitative data. This method is preferred because the descriptive research method allows for an in-depth analysis of a particular research problem and answers the "who, what, when, where and how" questions associated with a particular research problem, but cannot definitively establish an answer to the "why" question. The purpose of this descriptive survey research design was obtained pertinent and precise information concerning the current status of phenomenon and whenever possible to draw valid general conclusions from facts discovered.

Target population

Roger (2003) defines the target population, as a group of individuals or a body of people or any collection of items under consideration from which samples are taken for measurement. The population under study is comprised by 214 employees (staff) of NU Vision High School.

Sample size

The sample size was calculated Using Yamane simplified formula to calculate sample sizes, with

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the marginal error of 5% through level of confidence of 95%. Thus, this formula is applied to the above sample

$$n = \frac{214}{1 + 214(0.05)^2} = \frac{214}{1.535} = 139.413 \cong 139$$

Therefore, for the case of this study, the sample size is 139 respondents as employees of NU Vision High School, then, current researcher chose the sample size of population to be questioned through simple random sampling technique.

This study used purposive and random sampling techniques. The purposive sampling techniques, also called judgement sampling, is deliberate choice of a respondent due to the qualities of respondent possesses. Purposive sampling was used to select head teacher and dean of studies from the schools sampled.

GENERAL CONCLUSION AND RECOMMENDATION

Summary of major findings

According to findings made research project aimed on specific objectives as shown below.

Findings on effect of access point on E-Learning delivery in NU Vision High School

The first of objective of this study was assess the effect of access point on E-Learning delivery in NU Vision High School. The study revealed that they use modem to work as access point to converts data from a digital format was rated by 55% strongly agreed and 30% agreed. Moreover, modem is used to keep off automatic answer modes as 60% agreed and 35% strongly agreed ad 5% were neutral. Regarding mobile phones, respondents were asked if they use mobile

phone to make and receive calls over a radio frequency link, more than a half of them (60%) agreed that statement and 35% strongly agreed and 5 were neutral as well as 54% respondents also were agreed that to provide access to the public switched telephone network was another statement, 13% strongly agreed, respectively were neutral, 3% disagreed and 9% strongly disagreed. Concerning, radio receiver, respondents were used to intercepts radio waves and converts them to tiny alternating currents as a half of 50% of respondents agreed, 28 % strongly agreed but 23% were neutral on that statement but 80% of respondents strongly agreed that they use a wireless access point to include a radio receiver/transmitter and antenna and 13% agreed, and 7 were neutral. On the point of laptops, respondents were asked at which level laptops are used in integrating webcams and built-in microphones, while many also have touchscreens.

The majority of 95% of respondents strongly agreed and 5% agreed that statement, additionally laptop can access the internet from any location that supports the laptop's connection technology as agreed by 79% of respondents and strongly agreed by 5%, respectively 8% were neutral, 3% disagreed and 5% strongly disagreed that statement. Besides, regarding a router, respondents were asked the level of agreement on how router is used by respondents as it is positioned where two or more networks meet at each point of presence on the internet. On that statement, 68% agreed and 27% strongly agreed but 5% were neutral.

Additionally, the router examines a packet header's destination IP address and compares it against a routing table to determine the packet's best next hop in NU Vision High School as 63% strongly agreed

and 22% agreed that statement and 13% were neutral but 7% disagreed. These findings are in agreement with Goldie (2016), who defined E-learning to mean any learning that is enabled electronically. They however narrowed this definition down to mean learning that is empowered by the use of digital technologies. He also added that because of the COVID -19 pandemic, the teaching and learning of mathematics and science education has changed as students could not meet their lectures in compliance with the measures to fight the spread of that pandemic.

Findings on effect of internet security on E-Learning delivery in NU Vision High School

The second objective of this study was to analyse the effect of internet security on E-Learning delivery in NU Vision High School. The findings revealed that on the first variable which is encryption standard, respondents were asked which level of agreement they use to protect data stored on computers and storage devices as the majority of 88% strongly agreed and 3 agreed but 9 were neutral on that statement. Moreover, more than a half of some respondents (66%) were neutral on the statement that to use encryption standard help to reorganize data of a computer file to make it unreadable, respectively 6% of respondents disagreed and 8% of respondents strongly disagreed but 24% strongly agreed and agreed.

The second variable concerning company warranty, respondents were asked if it is used to promote the reliability and quality of a product in my institution as the majority of 66% agreed and 30% strongly agreed but only 2% were neutral on that statement. Additionally, the warranty used, was to cover computers against defects as 93% respondents strongly agreed and 7%

agreed but 5% were neutral. Regarding genuine software as third variable of internet security, if it protects against viruses, spyware, malware and risks as the, respondents (68%) were neutral, respectively 17% disagree, 7% strongly agreed whereas 10% agreed that statement as well as 33% agreed that genuine software to prevent virus detention but also a big number of 42% were neutral about that statement but also 8% of them agreed that it has role of providing a real-time protection to address the ongoing security needs. Regarding original operating system. Respondents were asked the level of agreement on whether original operating system is used at NU Vision High School to control the operation of a computer. Almost the whole respondents (95%) strongly agreed and 5% of respondents agreed.

Further, 79% of respondents agreed that the original operating system in institution direct the inputs and output of data and to keep tracks of files and 5% of respondents agreed, respectively 8% were neutral, 3% disagreed and 5% strongly disagreed. Concerning online certificate where the respondents were asked which level of agreement online certification is used to improve connectivity of students in the institution. Most of them (68%) were neutral others 2% strongly agreed, 6% agreed, 17% disagreed and 8% strongly disagreed. Besides 33% agreed that that online certification is used to enable students in my institution to save their time and money by eliminating the need for commuting from one place to another and the majority of respondents (48%) were neutral. Moreover, 11% of respondents strongly agreed and 5% agreed that online certificate to encrypt online data/information communications between end-user's browser and a website, respectively 60% were neutral, 16% disagreed, and 7% strongly disagreed that statement. These findings concur with Allen

(2013) who stated that security is essential as a means to retain users' trust in the online learning environment because any risk can dramatically affect students' perceptions of a system's reliability and trustworthiness. As a result, it is crucial to identify the underlying factors that can cause security issues in online learning and to identify the limitations of the current security protection methods. Then, counter-measures can be developed to mitigate the security risks inherent in online learning.

Findings on effect of database on E-Learning delivery in NU Vision High School

The third objective of this study was to determine the effect of database on E-Learning delivery in NU Vision High School. The results showed that encryption standard was used to protect data stored on computers and storage devices as the majority of 88% strongly agreed. Moreover, more than a half of some respondents (66%) were neutral on the statement that to use encryption standard help to reorganize data of a computer file to make it unreadable, respectively 6% of respondents disagreed and 8% of respondents strongly disagreed but 24% strongly agreed and agreed.

The second variable concerning company warrantly, respondents were asked if it is used to promote the reliability and quality of a product in my institution as the majority of 66% agreed and 30% strongly agreed but only 2% were neutral on that statement. Additionally, the warrantly used, was to cover computers against defects as 93% respondents strongly agreed and 7% agreed but 5% were neutral. Regarding genuine software as third variable of internet security, if it protects against viruses, spyware, malware and risks as the, respondents (68%) were neutral, respectively 17% disagree, 7% strongly agreed whereas 10% agreed that statement as well as 33% agreed

that genuine software to prevent virus detention but also a big number of 42% were neutral about that statement but also 8% of them agreed that it has role of providing a real-time protection to address the ongoing security needs.

Moreover, regarding original operating system, almost the whole respondents (95%) strongly agreed and 5% of respondents agreed. Further, 79% of respondents agreed that the original operating system in institution direct the inputs and output of data and to keep tracks of files and 5% of respondents agreed, respectively 8% were neutral, 3% disagreed and 5% strongly disagreed. Further, the last variable is online certificate where the respondents were asked which level of agreement online certification is used to improve connectivity of students in the institution. Most of them (68%) were neutral others 2% strongly agreed, 6% agreed, 17% disagreed and 8% strongly disagreed. Besides 33% agreed that that online certification is used to enable students in my institution to save their time and money by eliminating the need for commuting from one place to another and the majority of respondents (48%) were neutral. Moreover, 11% of respondents strongly agreed and 5% agreed that online certificate to encrypt online data/information communications between end-user's browser and a website, respectively 60% were neutral, 16% disagreed, and 7% strongly disagreed that statement. These findings are in agreement with Caird (2018) who stated that security is essential as a means to retain users' trust in the online learning environment because any risk can dramatically affect students' perceptions of a system's reliability and trustworthiness. As a result, it is crucial to identify the underlying factors that can cause security issues in online learning and to identify the limitations of the current security protection methods. Then, counter-measures

can be developed to mitigate the security risks inherent in online learning.

Conclusion

The study concluded that the development of the e-learning systems should be done using safety methods and internationally recognized standards. The data transfer between the system and administrators or content operators should be done on encrypted SSL channels through the web administration interface.. The internet security is used in the institution as central aspect of cybersecurity by managing cyber threats and risks associated with the internet, web browsers, web apps, websites and networks. Thus, it should use encryption standard, company user warrantly, genuine software, original operating system and online certificate. Lastly, the study also revealed that database affects E-learning delivery by file composition, historical storage, hard disc server, reporting and tabulation. The use of distributed databases in e-learning systems has the goal to improve access to information and also rapid collection.

Recommendation further research

Based on the findings and conclusion researched, the following recommendations were addressed to:

- i. The access point is a wireless network device that acts as a network site to connect to the local network. Access points should be used to extend a wireless network connection and increase the number of users who can connect to it so that students should use a good wireless connexion while study on e-learning.
- ii. To prevent a cyber-attack, NU Vision High School an e-learning platform

designer should assure that the pages in the Web site return user inputs only after validating them for any malicious code and use testing tools extensively during the design phase to eliminate such XSS holes in the e-learning application before it goes into use

- iii. In order to protect the data base, some key security mechanism should be taken into consideration such as online certificate, security management standards and encryption methods which help to provide the psychological confidence level to the e-learners.

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