Analysis of E-Exams performance under COVID-19 Pandemic at Kabale University, Uganda

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Abstract

There has been a shift in the mode of conducting exams from the physical appearance of students to the electronic examinations due to the COVID-19 pandemic. This paper presents the experiences in the management of e-exams as part of the summative evaluation of students. This was achieved by establishing the readiness strategies for managing e-exams, determining the performance of e-exams management and ascertaining the challenges faced during the management of e-exams. Objectives one and three were achieved by reviewing secondary data gathered from various reports from the University and objective two was achieved by analysing the primary data from the e-learning system. The results of the study indicated that Kabale University was strategically positioned to conduct e-exams through university policies, management support, infrastructural acquisition, competent human resource, technical and awareness training of staff and students. The   performance rates of e-exams varied from one faculty to another with the least and most attendance rates being 88.62% and 96.85% respectively, and with an overall performance of 92.18% at the university level. Regardless of the success stories, the study identified challenges which the university is already resolving and others that need more attention. The study identified that the e-exam took the form of multiple-choice questions and take-home exams. The challenges were technical e.g., lack of equipment, unreliable Internet and electricity problems; economical e.g., lack of money to buy data; social e.g., lack of conducive environment to sit for examinations at homes and integrity e.g., difficult to confirm the authenticity of the examinees' identity. The paper recommends the exploration of viable solutions that support   diverse forms of e-exams while regulating exam malpractices, like enabling software applications that limit the students' ability to navigate and search through the computer and internet, live proctoring option to monitor candidates and having response teams to attend to examinees.

Introduction

As a result of the advanced diffusion of information technology with the increasing availability of online assessment platform options, online examinations are being increasingly implemented in higher education institutions as a means of supplementing or even replacing paper-based tests (Nicol, 2007). Online examinations, commonly known as electronic examinations (e-exams) and previously as computer-based assessments, can be defined as "a system that involves the conduct of examinations through the web or the intranet (Ayo *et al.*, 2007). There is a body of research highlighting a number of key benefits of online examinations, as well as some notable challenges from the perspectives of both teachers and students (Nicol, 2007). In summary, e-exams are a combination of assorted questions designed by a software application, known as the learning management system, to detect an individual's performance (Awad Ahmed, *et al.*, 2021).

Kabale University was first established in 2002 as a not-for-profit community institution by the people of Kigezi region-South Western Uganda. The University opened first with forty-two (42) students and presently has an enrolment of above 4000. The students (postgraduate and undergraduates) are diverse from all parts of Uganda, and the neighbouring countries of Kenya, Tanzania, Rwanda, Burundi, Congo (DRC) and South Sudan among others (Kabale University Strategic Plan, 2020). In 2015, Kabale University was transformed from a private to a public University under Statutory Instrument No. 36 of 16th July 2015, under the Universities and Other Tertiary Institutions Act 2001 (as amended). Before this change in legal status, the University had obtained a Charter in 2014 (Certificate No. UI.CH.008) – the last stage of accreditation by the Uganda National Council for Higher Education. Kabale University is therefore a unique institution in Uganda, enjoying the status of being the first institution of its kind to transform from private to public (Kabale University Background, 2021)

In 2019, the university management advocated for e-learning and subsequently approved an e-learning policy (Kabale University e-Learning Policy, 2020). A strategy for rolling out e-learning was developed beginning with the formation of an e-learning committee, followed by the formation of an e-learning department under the Information and Communication Technology (ICT) Services Unit. Two full-time staff were recruited with excellent knowledge and experience (of over eight years) in e-learning management and implementation. The e-learning system (available at https://elearning.kab.ac.ug/) was rolled out in December 2019 and has since been modified, updated, patched, and fine-tuned to match the learning (students and teachers), institutional and technology needs.

A needs-based assessment was conducted on both staff and students and the survey showed that 93% and 94% of the staff and students respectively were ready to start on online teaching and learning. The e-learning system has amplified open and distance learning which was previously in place with capabilities to render both synchronous and asynchronous online learning. The system has functionalities that enable the lay out the management of courses, material/content upload, the embedding of open educational resources (OERs) and other resources readily available on the internet, scheduling of live classes (using both licensed and open-source platforms like ZOOM, BigBlueButton, Google MEET, etc.), and assessing learners (using multiple choice and essay questions). Both recess and ordinary students (3,500) have been enrolled in the learning management system and this has created a tremendous learning experience for staff and students. Training sessions on the use of the system were conducted and a total of 305 teaching staff and their administrators were equipped with technical and pedagogical skills of teaching online. The students were also trained (hands-on and in phases) how to use the different functionalities of the system in learning. Several recordings on the navigation of the system were created and uploaded on the YouTube platform with links connecting to the e-learning website.

In 2021 the University conducted examination using e-learning where the examination was in form of Take-home open book questions and

multiple-choice objective questions and all these were conducted for the first time. The aim of the study was therefore to analyze the e-exams performance under Covid-19 pandemic at Kabale University. This was to determine the readiness strategies for managing e-exams; establish the performance of e-exams; and ascertain the challenges faced in the management of e-exams.

Readiness strategies for managing e-exams
Universities need a number of considerations for the effective implementation of e-exams (Khitam, 2019). For example, online exam design where you maintain a bank of validated questions for adaptive testing, developing different types of questions type and providing immediate meaningful feedback. Online exam security where one maintains confidentiality, minimize cheating and provide authentication. Online exam purpose where there's a need to have a formative exam for learning and linking analysis of results to quality assurance criteria plus institutional support where integrating the online exam within the strategic plan, providing resources and facilitating procedure and providing support for teachers and students are very vital for the success of e-examination.

There are a number of challenges in managing examination using e-learning (Cárdenas and Sánchez, 2005) such as Information security which is the main challenge in e-learning as a web-based application. The Internet causes more possibilities for compromised information security risks. Financial limitations for example high cost lack of possessing home computers and low Internet penetration, especially in the Arab world. Investment in constructing necessary infrastructure and providing a budget for developing e-learning systems is expensive and risky (Sabbah, 2010). Pedagogical limitations: Decision-makers believe that e-learning results in a fast shift in pedagogy (Abouchedid and Eid, 2004). Attitudinal limitations: Absence of a vision and plans before understanding the attitude of teachers and students; the key players in developing and evaluating e-curricula. Technical challenges such as course-creators are faced with additional technical difficulties. Often, course creators are not specialized; instructors' experience in developing courses and/or utilizing the available delivery tools is either low

or absent (Abouchedid and Eid, 2004). The need for robust and reliable network architecture, load balancers and fault tolerance to fulfil the heavy loads on peaks time (Sabbah, 2010). Design and usability weaknesses make e-learning systems unprofessional, unacceptable and difficult for users to deal with (Jones and Burns, 2010).

There has been a shift in the mode of conducting exams from the physical appearance of students to the electronic examinations due to the COVID-19 pandemic. E-learning has become a potential prop approach of technology in education that provides current learners with authentic knowledge acquisitions. The literature review revealed that most of the research studies are undertaken to showcase the learners' and staff members' perceptions towards the online examination. There is hardly any study that has been undertaken to cognize the essential considerations needed for the successful implementation of online exams in higher educational institutions and sharing their experience. This paper presents the experiences in the management of e-exams as part of the summative evaluation of students.

Materials and methods

This paper presents the experiences of Kabale University in the management of e-exams as part of the summative evaluation of students. Specifically, this paper discusses the readiness strategies for managing e-exams, assesses the performance of e-exams management by looking at the students' submission rate of answered scripts, and examines the challenges faced by University in the management of e-exams. To answer objectives one (1) and three (3), the study used secondary data gathered from document reviews of various reports from the University leaders/management and faculty leaders/deans. Objective two (2) was achieved by extracting, filtering and analyzing the primary data from the University Learning Management System. The data presented information of Text using frequencies and percentages.

Results

Readiness for managing e-exams

This objective was achieved using secondary data gathered from document reviews of various reports from the University leaders/management and faculty leaders/deans in relation to the reviewed literature. The results indicated that the universities have strategically positioned strategies to conduct e-exams as shown below:

Management Support

Kabale University formulated a strategic plan 2020-21 with a great focus on embracing Information Technology in the teaching and learning processes. The university management has been actively advocating for e-learning through interventions like e-learning policy, financial support, formation of an e-learning committee, followed by the formation of an e-learning department

Institutional Policies

The University council has approved the ICT and e-learning policies. The University also aspires to recruit and nurture excellent teaching staff by pursuing the aspiration that every educator is a digital educator, and all teaching staff members are supported in the appropriate use of the full breadth of learning technologies.

Infrastructural Acquisition

Currently, the University has 315 computers connected to the internet and access points around the university campuses. There are two (2) computer Laboratories accessed by students and an electronic library that helps to access the resources for example online databases through the consortium of Uganda University Libraries–Science Direct and Emerald, Academic Information Management System for students' admission and payments. The University has three (3) servers for Learning Management System, Video Conferencing, and Hosting Multimedia with an Internet connection of 74MBPS of dedicated bandwidth.

The Learning Management System is based on an open-source Moodle platform. The e-learning system has functionalities that enable the layout, the management of courses, material/content upload, scheduling of live classes (using ZOOM, BigBlueButton, Google MEET, etc.), and assessing learners. A total of 3,500 have been enrolled in the learning management system and this has created a tremendous learning and evaluation experience for staff and students.

Human Resource Recruitment

According to the human resource statistics of 2020, Kabale University has continued to expand its academic and administrative staff profile by retaining and employing highly qualified academic staff at various levels. The University has 361 staff, the teaching staff are 253 while the non-teaching staff are 108 (Kabale University Human Resource Report, 2020). With the ICT services department and Faculty of Computing, Library and Information Science members playing a vital role in facilitating digital education at the university

Technical and Awareness Trainings

Since 2019, training sessions on the use of the e-learning system and digital technologies in teaching, learning and assessment have continuously been conducted and a total of 305 teaching staff and their administrators have been equipped with the technical and pedagogical skills of teaching online. The students were also trained on how to use the different functionalities of the system in learning and evaluation. Several recordings on the navigation of the system have been created and uploaded on the YouTube platform with links connecting to the e-learning portal plus specialized training on e-exams (setting, grading, and marking) has been conducted. Regular and relevant training for students on e-exams has also been conducted.

Readiness Assessment

A needs-based assessment was conducted by the university on both staff and students and the survey showed that 93% and 94% of the staff and students respectively were ready to start on online teaching and learning. The e-learning system has amplified open and distance learning which was previously in place with capabilities to render both synchronous and asynchronous online learning.

External Funding

The University is in the process of establishing a digital centre of excellence and is the only one in Uganda. This centre is supported by Ecole

Polytechnique Federale De Lausanne (EPFL). The other African countries that benefited from the competitive call are Kenya, Tanzania, Ivory Coast and Senegal and Nigeria. The project is aimed at building the necessary infrastructure to produce quality digital educational content, such as Massive Open Online Courses and Open Educational Resources and build technical capacity of staff at Kabale University

Approval from the National Council for Higher Education

In 2020 and 2021, the National Council for Higher Education conducted an evaluation on the readiness of Kabale University in e-learning, teaching and assessment with a minimum score of 76% obtained from an evaluation of various capabilities.

Performance of E-Exams Management

The analysis of the participating students in the e-exams and submission of their answered scripts, the performance rates varied from one faculty to another. Chronologically, the results showed that the Directorate of Graduate Training received the highest submission rate of 96.85% , Faculty of Science (94.40%), Faculty of Engineering, Technology, Applied Design and Fine Art (93.47%), School of Medicine (93.35%), Faculty of Arts and Social Sciences (92.86%), Institute of Language Studies (92.19%), Faculty of Education (90.71%), Faculty of Agriculture and Environmental Sciences (90.31%), Faculty of Economics and Management Sciences (90.25%), and Faculty of Computing, Library and Information Science (88.62%). Overall, the average submission rate of students at the university level was 92.30%.

Challenges Faced in the Management

The faculty reports highlighted several issues that students faced while undergoing online/e-learning and e-exams. The challenges include the following:

Technical

Some students complained of having limited knowledge to do online examinations like failure to operate devices, having devices with poor specifications and connect them over the internet. There were some reported incidences of unreliable internet connectivity for remote areas and unstable electricity for charging mobile devices. Relatedly, there were reports on the heavy traffic for cross-cutting courses (having over 1000 students) across the entire university. The traffic caused the e-learning server to temporarily freeze and this delayed the exam access for about 30 minutes.

Economic

The Students complained of having inadequate finances to buy data and supporting equipment to use in the examinations and access to course content uploaded on the e-learning platform.

Social

Most students complained of non-conducive environments to sit for online examinations given that homes are associated with many interruptions and can't be set (or replicated) as ordinary classrooms.

Integrity

Different faculties opted to use various types of exam questions; some used Multiple Choice Questions, essay questions or a blend of MCQs and essay questions. At a university level, the open-book type of exams was opted for. The choice of this type of exam was made by putting into consideration the environmental and infrastructure capabilities of the students. It was noted that the faculties found it difficult to confirm the authenticity of the examinees' identity and answered papers.

Discussion

Many interventions like university policies, management support, infrastructural acquisition, competent human resource recruitment, technical and awareness training of staff and students, readiness assessment, sourcing for external funders through project proposal writing, and approval from the National Council for higher education have been put in place to prepare the university in getting ready for e-learning and e-exams. Such interventions are similar to those for the effective implementation of e-exams (Khitam, 2019).

In the analysis of the submissions of the student's answered scripts, the performance rates varied

from one faculty to another. The Faculty of Computing, Library and Information Science had 88.62% (making it the least in the performance) and the Directorate of Graduate Training had 96.85% (making it the best in the performance) and with an overall average submission rate of 92.30% at the university level. This implies that at least nine out of ten students were able to attempt and submit their answered scripts into the e-learning system. Such results haven't been published online by any other scholars around the globe.

On ascertaining the challenges faced by the learners while doing online exams, the faculty reports indicated that a number of technical, economic, social and integrity issues affected in one way or the other the success of the examination. Technical issues that relate to the infrastructure setup like freezing of servers are common in systems without well-designed, robust and reliable network architecture. E-learning systems require load balancers and fault tolerance dependent systems to handle heavy loads during peak hours (Sabbah, 2010). The technical, economic and social issues on the side of students reported at Kabale University aren't in isolation of the constraints affecting other students across the globe. For example, high cost, lack of possessing home computers and low internet penetration were reported in the Arab world and thus investing in constructing necessary infrastructure and providing a budget for developing and supporting e-learning systems is expensive and risky but a necessary evil (Sabbah, 2010). More related challenges faced while conducting e-exams were reported as internet speed, cost and authenticity in some studies (Awad Ahmed, *et al.*, 2021)

Conclusion

The results of the study indicated the University was strategically positioned to conduct e-exams through university policies, management support, infrastructural acquisition, competent human resource recruitment, technical and awareness training of staff, readiness assessment, sourcing for external funders, and approval from the national higher education regulator. the performance rates varied from one faculty to another with results of with the submission rates

varying between 88.62% (as the least performance) to 96.85% (as the best performance) and with an overall performance of 92.30% at the university level which implies that at least nine out of ten students were able to attempt and submit their answered scripts into the e-learning system. The submission statistics indicated that students adopted the system of e-exams very easily and this helped the university to continue business as usual during the challenging times of the Covid-19 pandemic. Regardless of the success stories, the study identified challenges which the university is already resolving and others that need more attention. For example, the study identified that the e-exam took the form of multiple-choice questions and take-home exams which aren't proctored synchronously, lack of authenticity of examinees who sit for exams and many others.

Recommendations

It has been a good experience to explore technology in conducting exams, but there are still some challenges. The paper recommends the exploration of viable solutions that supports diverse forms of e-exams while regulating exam malpractices, like evaluating students using intensive continuous evaluation using formative assessments, enabling software applications/plugins that limit the students' ability to navigate and search through the computer and internet, live proctoring option to monitor candidates doing exams. Any institution considering conducting e-exams as an alternative to the ordinary summative examinations should invest in redundant systems that can handle heavy traffic from students during the e-exam period. National and international universities should devise various ways of ensuring that students are able to access the necessary infrastructure to conduct e-learning and e-exams. For example, initiatives like the laptop loan schemes can help learners to access computers without necessarily paying the bills at once. The researchers also recommend that institutions should conduct the exam through intensive continuous assessments.

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