Massive Open Online Courses (MOOCs): Emerging Possibilities for Quality Education in Uganda

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Abstract
Massive open online courses (MOOCs) are a recent but widely accepted e-learning initiative. World ranking universities have taken initiatives to offer diverse programs based on the learners' needs and demands. Thus, learners from different corners of the world including developed as well as developing countries are reaping benefits from MOOCs. Regardless of these benefits, Uganda as a developing country has not yet established any platform to incorporate MOOCs in her tertiary education. Additionally, there is lack of evidence to show the necessity of implementing MOOCs, more particularly from the students' perspective in Uganda's education system. In order to start finding ways to help students interested in MOOCs, there is a need to investigate how these students view and understand MOOCs. The main purpose of this study is to investigate the emerging possibilities for quality education in Uganda through MOOCs.A quantitative research approach was selected as a research methodology for this study. 74 computer discipline students from four universities in Uganda participated in a structured questionnaire that was constructed to achieve the research purposes. Quantitative descriptive analysis of the results revealed that: majority of the students found MOOCs platform to be useful in their learning contexts and they showed positive attitudes towards attaining MOOCs programs. However, the study revealed that there are not enough resources available for a successful MOOCs implementation in the country. The findings of this study provide empirical evidence for the need of MOOCs in improving access to education. The study offers recommendations for the policy makers and educators to introduce ICT policies to back-up the introduction of MOOCs in Uganda's education system as well as financing and supervising the implementation of MOOCs in Uganda.

Keywords: MOOCs; ICT; Quality Education; Uganda.

Introduction

The Internet is increasingly being adopted by existing higher education providers as a mode of online teaching and learning. This online learning has taken a new turn with the introduction of Massive Open Online Courses (MOOCs), a recent addition to the options of online learning(Adams, Liyanagunawardena, Rassool, & Williams, 2013).

These courses are created around curated, open collection of subject specific resources and have gained immense popularity over a short period of time, attracting millions of participants and crossing the barriers of location, gender, race and social status; making 2012 the year of MOOCs (Pappano, 2012; Woruba & Abedin, 2015).

The potential of MOOCs to deliver education around the globe has created a great interest not only in academic circles but also in the news, making MOOCs a contemporary buzzword(Daniel, 2013).

These MOOCs are considered as a solution to providing developing countries with high-quality education at low or no cost. But with recent technological advances, the challenge in the education enterprise is the transition to digitally native pedagogies and learning approaches in least developing countries such as Uganda, where learning methods are elementary and technology penetration is relatively low(Johnson, Adams, & Cummins, 2012). Keeping that in mind, Uganda as a developing country has taken steps in recent years to integrate information and communication technologies (ICTs) in all its sectors with particular focus in the education sector where, as indicated in its ICT policy, the integration of computer technologies should be the driving force towards lifelong learning (Farrell, 2007). But up until now, no steps have been taken to incorporate MOOCs in Uganda's tertiary institutions and no evidence so far indicates whether such a platform can be implemented in Uganda from the perspective of the students. This study therefore is aimed at investigating the need for such a popular e-learning platform in a country where educational costs are increasing.

Whereas recent studies have majorly focused on assessing e-learning readiness in Uganda's education sector (Omoda-Onyait & Lubega, 2011) as well as how MOOCs should be designed for developing countries such as those

in Africa (Benedict Oyo & Kalema, 2014), there have been, to the best of my knowledge, no studies on the need to implement MOOCs in Uganda as a developing country. Therefore, this study aimed to assess the need for introducing such a platform at tertiary institutions along with the traditional classroom model.

Research Questions
In order to realize the aforementioned objective, the following research questions needed to be answered:

1) Does Uganda possess the requisite resources to enable successful MOOCs implementation?
2) How useful is the MOOCs platforms to the students?
3) What are students' attitudes towards MOOCs?

Review of Related Literature
The following section will review the literature related to this study.

What is a MOOC?
A MOOC has been defined by The European Commission as "an online course open to anyone without restrictions (free of charge and without a limit to attendance), usually structured around a set of learning goals in an area of study, which often runs over a specific period of time (with a beginning and end date) on an online platform which allows interactive possibilities (between peers or between students and instructors) that facilitate the creation of a learning community(T. R. Liyanagunawardena, 2015). As it is the case for any online course, it "provides some course materials and (self) assessment tools for independent studying"(Spyropoulou, Demopoulou, Pierrakeas, Koutsonikos, & Kameas, 2015).

The open online course "Connectivism and Connective Knowledge" (also known as CCK08) led by George Siemens and Stephen Downes offered by the University of Manitoba (Canada) in 2008 is considered the first MOOC(T. R. Liyanagunawardena, Adams, & Williams, 2013). Since its success, a range of both topics and platforms has emerged and educational institutions as well as learners around the world have shown a remarkable interest in MOOCs.

Given the pervasiveness of information technologies in education, researchers and governments are beginning to visualize a paradigm shift towards higher education for all, anytime and anywhere (Jordan, 2014; Materu, 2007). This is therefore the type of education that MOOCs can deliver. Hence a MOOC is a model of educational delivery that is, to varying degrees, massive (no limit on enrolment), open (optional admission requirements and usually no tuition), online, and a course with defined curriculum leading to an award of a completion certificate (Initiative, 2011).

Major MOOCs Platforms
According to Ryan (2013) , the current popularly available MOOCs are as described below:

Coursera (www.coursera.org)
Established by two Stanford University professors, is currently the biggest MOOC platform providing 212 different courses in such areas as: economics and business, computer sciences, biology, social sciences, music and film, medicine, health, food and nutrition, physical and earth sciences. Coursera has a consortium of 33 of the most well-known and highly regarded universities in the world delivering free online courses including Harvard, Stanford, Pennsylvania, Washington, London, Edinburgh, Toronto and Melbourne.

Udacity (www.udacity.com)
This has a focus on computer science courses and provides a range of topics from beginner courses to intermediate and advanced courses.

EdX (www.edx.org)
Owned by the prestigious academic institutions Harvard University and Massachusetts Institute of Technology, draws content from a selection of their highly regarded courses.

Khan Academy (www.khanacademy.org)
This is a MOOC platform for young learners from kindergarten to Year 12 with courses centered on mathematics and science: biology, chemistry and physics, as well as some elements of economics and history.

FutureLearn (www.futurelearn.com)
This is the newest significant player reflecting how MOOCs are constantly changing. FutureLearn comprises a consortium of 12 major UK universities including The Open University, which has considerable experience in distance and online education, Birmingham, Warwick, Cardiff, Leeds, Bristol and St Andrews. Their web site is live but the courses and content are still being developed.

In addition, many high profile and elite universities are now offering their standard courses as open courses where people can watch the lectures online and access course slides and materials. To achieve the formal qualification people, need to apply and enroll with the respective universities, pay the program fees and satisfactorily complete the assessment requirements associated with each course.

So, such platforms have been used by learners even in the developing countries though on a small scale. This study will base on students' familiarity with these successful platforms to assess the need to develop and implement local platforms suiting local content as given in the leading universities in Uganda.

MOOCs Interest Groups
There are three major MOOCs interest groups. These shall be discussed below as briefly explained by Sharma and Rani (2014).

Students
Students are the main interest group of this study and MOOCs are providing a great platform, high quality content for them across the globe. These students are able to access online courses of their interest. Such courses promote young individuals towards higher education thereby experience quality learning.

Teachers/Instructors
In academics also teachers need to improve and learn new technologies. MOOCs provide a good way out for the faculty members to improve their teaching skills and to share their knowledge. MOOCs have also come up with a new concept of flipped classrooms. So, MOOCs are the driving force for change in educational system and skill improvement of teachers.

Planners and Administrators
They are excited because they can now skill, scale and speed. By skill I mean that all the courses that are offered aim to improve the skills of the individual, scale focus on massive ability of MOOCs to provide learning ability to thousands simultaneously and speed ensure the speeding learning experience with quality course content.

So, such focus groups are the main concern of an investigation into how MOOCs could be effectively implemented in any given institution. But due to time constraints, this study, with all its findings, will only concentrate on students and the recommendations given will only help in achieving the solutions needed to ensure students embrace MOOCs with little constraints.

MOOCs Participation in Developing Countries and Challenges Faced
MOOCs allow a single teacher/lecturer to teach thousands and sometimes tens of thousands of participants in a single course delivery (Ryan, 2013). With this size class, there is little participant contact with the lecturers, although some have scheduled times when they join online forums with participants to discuss various aspects of a course or provide further explanation on a topic. Regarding the geographical distribution of current MOOCs participants, recent studies have shown that a large majority of them are from North America and Europe, with limited participation from Asia and even less from Africa (T. R. Liyanagunawardena et al., 2013).This limited participation in MOOCs from the developing countries such as Uganda, is most likely due to a prohibitive factor of lack of access to technology.

Available studies also argue that while MOOCs are beneficial and attractive for some cohorts of learners, they are not suitable for everyone(Ayala, Dick, & Treadway, 2014).

Regardless of the availability of pockets with good infrastructure, such as the capital city and a few other major urban areas, many of the towns and almost all of the rural areas have only unreliable or part-time electricity, and no internet connectivity (T. R. Liyanagunawardena et al., 2013). Hence its justifiable to say that technology is the enabler for MOOCs and with the growing use of smart phones and mobile computing, participants can maintain on-

going connection with their MOOC class and interaction with other participants when they are at work, home, travelling and at any time of the day.

In addition to the above problems, available literature regarding learner experiences in MOOCs has shown that "the delivery environment, digital literacy, structure of learning, English language proficiency, the perceived value of learning and critical literacies to efficiently evaluate large quantities of information play a key part in shaping a learner's MOOC experience" (T. Liyanagunawardena, Williams, & Adams, 2013, p. 2). The discussion below will highlight the technology adoption and ICT penetration together with the initiatives in place that will ensure platforms such as MOOCs can implemented.

The state of Technology Adoption and ICT Penetration in a Developing Country

Recent studies have shown that technology adoption leading to innovation in developing countries are, by nature problematic, characterized by poor business and governance conditions, low education levels and mediocre infrastructure (Aubert, 2005). This is due to the fact that most decisions in developing countries for appropriate technology advances are inclined towards cost basis and range availability (Stewart, 1977). In that regard, there is an oBSc. SErved shift in which intrinsic value should outweigh cost and risk when considering technology driven projects. Hence, new technology decisions have been towards developed country technologies. Therefore, because MOOCs are theoretically available to everyone, they still require a certain level of familiarity with technology (Younos, 2012). The lack of this familiarity in most parts of developing countries such as Uganda, greatly limits the pool of potential users, as Internet connections and tech-savviness become rare as distance from urban areas increases (T. Liyanagunawardena et al., 2013).

In order to mitigate challenges such as lack of digital familiarity, Uganda developed its initial ICT national policy framework document in 2003 which recognized that she would need to embrace the goal of "lifelong education for all"(Farrell, 2007, p. 2). Objective 2 of the policy addresses literacy improvement and human resource capacity-building with strategies that include:

1. Integrating ICT into mainstream educational curricula as well as other literacy programmes to provide for equitable access for all students regardless of level
2. Developing and managing ICT centers of excellence to provide basic and advanced ICT training.
3. Setting up mechanisms that promote collaboration between industry and training institutions to build appropriate human resources capacity.
4. Promoting the twinning of training institutions in Uganda with those elsewhere to enhance skills transfer

A suBSc. SEquent e-readiness assessment in 2004 revealed that a focused and coordinated approach to implementation was required. This led to the establishment of an ICT Working Group that tabled a number of recommendations (Yiga et al., 2010). One of the recommendations executed early in 2006 was the establishment of a Ministry of ICT to address the convergence of ICT and to provide co-ordination of policy development.

Another recommendation from the Working Group was that an ICT policy for schools be developed. This, together with the evolution of the national policy, has provided impetus for the Ministry of Education to expand its focus on the use of ICT.

Presently in Uganda, access to computers and access to Internet are two separate issues, with the former more abundantly available than the latter. Within education, the introduction of computer studies in secondary school curriculum as indicated in the National ICT Policy is boosting access to computers in many parts of Uganda where all public secondary schools irrespective of their location now have access to state-of-the-art networked computers (Oyo & Williams, 2014).

This ensures that by the time they enroll for university degrees in higher education institutions, they are well versed, to some extent, with computers and some basic internet skills. It is worth mentioning that sharing computers in secondary schools acts as an intervention for enabling access to the internet for extensive use during the years at the tertiary level which is a in fact, a prelude to effective access to and usage of MOOCs.

In conclusion, the state of technology adoption and usage in Uganda along with the ICT policy is a sure way that will, in the near future, guarantee that MOOCs can be implemented at the tertiary institutions. This, it's hoped will democratize education, which is becoming an increasingly expensive investment in many parts of the world

especially in Uganda where youths have difficulties accessing education. The following section will highlight the existing opportunities in integrating such a promising platform including available examples of studies where such a measure has been a success.

Opportunities for Integration of MOOCs in Traditional Classrooms

Recent studies have shown the existence of opportunities offered by MOOCs in wrapping on-campus courses around existing MOOCs (Koller, 2012). In addition to that, MOOCs can greatly improve students' learning outcomes and reduce costs when offered using hybrid formats (Griffiths, Chingos, Mulhern, & Spies, 2014). To that end, various steps to integrate MOOCs in the traditional classroom settings to enhance learning experiences have already been proposed in many studies by (Bruff, Fisher, McEwen, & Smith, 2013), (Caulfield, Collier, & Halawa, 2013), (Gibbons & Chakraborti, 2011) and (Griffiths et al., 2014). The term "*distributed flip*" was born as a result of employing this approach (Caulfield et al., 2013) or *blended* / *hybrid* model as indicated in studies by (Bruff et al., 2013) and (Griffiths et al., 2014) which allows teachers to integrate online content and activities with face-to-face to enhance optimal learning process. Finally, different integration models have been proposed that attempt to transform the structure and approach of teaching and learning by blending MOOCs in the existing traditional classrooms(Israel, 2015). Such measures are suitable for Uganda as a developing country where much emphasis is put on the traditional-style classroom setup to deliver the desired content to learners.

Methodology

A discussion of the methods and procedures that were used in conducting this research is described here under

Design of the Research

The descriptive research using the survey method was employed because the study is cross sectional in a sense that the environment under which it wastaken remained unchanged. Also, through his assistants, the researcher was able to interact with the participants to get the actual information regarding thepossibilities of MOOCs implementation in Uganda.

Population

Because the goal of this study was generate an understanding of emerging possibilities for quality education in Uganda through MOOCs (rather than articulate empirical claims about their usage in Uganda), data was collected from the target population which comprised of students from four of the leading universities in Uganda which are: Makerere University Kampala (MUK), Kyambogo University (KYU), Mbarara University of Science and Technology (MUST) and Islamic University in Uganda (IUIU). These universities were selected because of their popularity in uganda and the exposure they have to some level of well funded ICT infrastructures.

Sampling

The purposive sampling technique was used to pick twenty 20studentsfrom each of the selected universities currently in 2nd, 3rd and 4th year of their respective programs due tothe limited number of participants that have exposure in the area being researched.Studentsenrolled in different computer science and information technology (IT) related courseswere considered because I didn't want to be disturbed by factors such as lack of digital familiarity.

Tools for Data Collection

The questionnaire tool consisting of Likert-type five-point scale was used to collect data from students of the said institutions because of the sample size which made it economically feasible to get the required responses from the participants within a shorter time. The Likert-type five-point scale was described as follows: 1 represents strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree. The above scale was chosen because it helps the participants indicate the extent of their agreement/disagreement to each of the items as was the case with the study of "E-learning Readiness Assessment Model: A Case Study of Higher Institutions of Learning in Uganda" by (Omoda-Onyait & Lubega, 2011). These questionnaires were administered by distributing them directly to individuals through the help of assigned research assistants in the respective universities. A letter of request was sent to the respective department heads, who, upon acceptance, instructed a representative in charge of printing, distribution and administering the questionnaire to meet the selected group ofparticipants. After collecting the data, the questionnaireswere scanned and emailed to the researcher for analysis.

Detailed Description of Received Questionnaires

In the study, a total of eighty (80) students were sampled and questionnaires were distributed to them with the help of the assigned research assistants.A total of 74 (92.5%) fully completed questionnaires were returned. The shortfall was due to the fact that students were busy preparing for end of semester final examinations and so the turn up was not as expected in most universities apart from only one university. The results are as illustrated in table 1 below;

Table 1: Questionnaire return rate

Name of the university	**N0. Issued out**	**N0.returned**	**Pecentage**
Makerere University Kampala(MUK)	20	19	95%
Mbarara University of Science and Technology (MUST)	20	20	100%
Kyambogo University (KYU)	20	18	90%
Islamic University In Uganda (IUIU)	20	17	85%
Total	**80**	**74**	**92.5%**

The table below summarises the students who successfully completed the returned questionnaires from all the universities considered in this study.

Table 2: The table below contains the summary of the sample that was considered

Student	**Programme of study**	**Year of study**	**University**
Student-01	BIT	3rd Year	MUK
Student-02	BIT	3rd Year	MUK
Student-03	BSc. CS	2nd Year	MUK
Student-04	BSc. CS	3rd Year	MUK
Student-05	BSC. SE	4th Year	MUK
Student-06	BIT	3rd Year	MUK
Student-07	BSc. CS	3rd Year	MUK
Student-08	BIT	3rd Year	MUK
Student-09	BSc. CS	3rd Year	MUK
Student-10	BIT	3rd Year	MUK

Student-11	BSC. SE	3rd Year	MUK
Student-12	BSc. CS	3rd Year	MUK
Student-13	BSC. SE	3rd Year	MUK
Student-14	BIT	3rd Year	MUK
Student-15	BSc. CS	3rd Year	MUK
Student-16	BSc. CS	2nd Year	MUK
Student-17	BSC. SE	3rd Year	MUK
Student-18	BIT	3rd Year	MUK
Student-19	BIT	2nd Year	MUK
Student-20	BICT	3rd Year	KYU
Student-21	BICT	3rd Year	KYU
Student-22	BICT	3rd Year	KYU
Student-23	BICT	2nd Year	KYU
Student-24	BICT	3rd Year	KYU
Student-25	BICT	3rd Year	KYU
Student-26	BICT	3rd Year	KYU
Student-27	BICT	2nd Year	KYU
Student-28	BICT	3rd Year	KYU
Student-29	BICT	3rd Year	KYU
Student-30	BICT	2nd Year	KYU
Student-31	BICT	2nd Year	KYU
Student-32	BICT	3rd Year	KYU
Student-33	BICT	3rd Year	KYU
Student-34	BICT	3rd Year	KYU
Student-35	BICT	2nd Year	KYU
Student-36	BICT	2nd Year	KYU
Student-37	BICT	3rd Year	KYU
Student-38	BSC. CE	3rd Year	MUST
Student-39	BIT	3rd Year	MUST
Student-40	BIT	3rd Year	MUST

Student-41	BSc. CS	3rd Year	MUST
Student-42	BIT	2nd Year	MUST
Student-43	BSC. CE	4th Year	MUST
Student-44	BSc. CS	3rd Year	MUST
Student-45	BIT	3rd Year	MUST
Student-46	BIT	3rd Year	MUST
Student-47	BSc. CS	3rd Year	MUST
Student-48	BIT	3rd Year	MUST
Student-49	BSC. CE	4th Year	MUST
Student-50	BSc. CS	3rd Year	MUST
Student-51	BSc. CS	3rd Year	MUST
Student-52	BIT	2nd Year	MUST
Student-53	BIT	3rd Year	MUST
Student-54	BSc. CS	3rd Year	MUST
Student-55	BSC. CE	2nd Year	MUST
Student-56	BIT	3rd Year	MUST
Student-57	BIT	3rd Year	MUST
Student-58	BIT	3rd Year	IUIU
Student-59	BSc. CS	2nd Year	IUIU
Student-60	BSc. CS	2nd Year	IUIU
Student-61	BIT	3rd Year	IUIU
Student-62	BIT	3rd Year	IUIU
Student-63	BIT	2ndYear	IUIU
Student-64	BIT	3rd Year	IUIU
Student-65	BSc. CS	2nd Year	IUIU
Student-66	BSc. CS	3rd Year	IUIU
Student-67	BIT	3rd Year	IUIU
Student-68	BSc. CS	2nd Year	IUIU
Student-69	BSc. CS	3rd Year	IUIU
Student-70	BSc. CS	3rd Year	IUIU

Student-71	BSc. CS	3rd Year	IUIU
Student-72	BIT	3rd Year	IUIU
Student-73	BIT	3rd Year	IUIU
Student-74	BIT	2nd Year	IUIU

Key:
BIT**: Bachelor of Information technology**
BSc. CE: Bachelor of Science in Computer Engineering

BSc. SE: Bachelor of Science in Software Engineering

BICT: Bachelor of Information and Communication Technology

Procedure for Data Analysis
The Wilcoxon signed rank test; a non-parametric analytical technique was used to analyze the data obtained from the returned questionnaires. This technique was chosen because it focuses on the association of grouped data thereby looking at all levels of possible interaction effects (Gibbons & Chakraborti, 2011).In this regard, it was used to identify what interactions and interrelationships that exist within the variables that were under investigation. These variables included: availability of resources, Attitude towards MOOCs as well as the Usefulness of the new technology.

Presentation, Analysis and Interpretation of Data

The results collected from the questionnaires were analyzed and presented in the following tables

Table 3: Summary of the results on the various attributes

Attributes	Qn.NO	Level of disagreement ($E_{(x)}$)	Level of agreement ($E_{(y)}$)	Difference $E_{(x)}- E_{(y)}$	Modulus	Rank	Signed Rank
Availability of Resources for MOOCS	5	57	12	45	45	3	3
	6	61	11	50	50	4	4
	7	40	33	7	7	1	1
	8	53	17	36	36	2	2
Attitudes towards MOOCS	9	28	43	-15	15	1	-1
	10	24	48	-24	24	2	-2
	11	21	52	-31	31	4	-4
	12	15	57	-42	42	5	-5
	13	9	65	-56	56	7	-7
	14	13	59	-46	46	6	-6
	15	23	48	-25	25	3	-3
	16	17	52	-35	35	3	-3

Usefulness of MOOCS platform	17	20	46	-26	26	2	-2
	18	6	65	-59	59	5	-5
	19	16	50	-44	44	4	-4
	20	26	41	-15	15	1	-1

Analysis

The Wilcoxon signed rank test was used in the study to identify what interactions and interrelationships existed within the variables that were being investigated. The test was carried out by calculating for each factor, the difference between the level of agreement and disagreement. I later ranked the differences by their absolute value by ignoring the sign giving 1 for the smallest difference, 2 for the next smallest and so on. Then I carried out the summation of the ranks of the positive (T^+) differences and summation the ranks of the negative differences.

The test statistic is the lesser of these two sums. If the null hypothesis was true and there was no difference, then I would expect the rank sums for positive and negative ranks to be the same H_0: $E_{(x)} = E_{(y)}$; hence I accept the null hypothesis. In the event that the null hypothesis is to be rejected against the alternative hypothesis H_1: $E_{(x)} < E_{(y)}$, there must be a difference between the positive and negative ranks.

During analysis the test level α was at 5% which is equivalent to 0.05.

The critical region was determined using this expression $T^+ \leq T_{0.1\,,\,n}$ where T^+ is calculated by adding all the positive signed ranks.

Each attribute was analyzed independently in the following section.

Availability of resources for MOOCs

Here, just like all the other attributes, I considered both the null (H_0) and alternative (H_1) hypotheses.

Null hypothesis H_0: There are enough resources available for MOOCs in our university;

Alternative hypothesis H_1: There are no enough resources available for MOOCs in our university.

Results on availability of resources were computed as follows:

The maximum possible value of W:

$$W = \frac{N(N+1)}{2}$$

$$= \frac{4(4+1)}{2}$$

$$= 10$$

Earlier on, I noted in the null hypothesis that there are enough resources available for MOOCs; I then would expect the value of W to approximate to zero within the limits of random variability. This now implied that any particular observed value of W belongs to a sampling distribution whose mean is equal to zero, hence $-\mu W = 0$.

For any particular value of N, it can be shown that the standard deviation of the sampling distribution of W is equal to:

$$-\delta_W = \sqrt{\left[\frac{N(N+1)(2N+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{4(4+1)(2*4+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{(180)}{6}\right]}$$

$= \pm 5.48$

This value was used for computing the z-ratio. The z-ratio must include ± 0.5 corrections for continuity in Wilcoxon test.

Thus, the structure of the z-ratio for the Wilcoxon test was:

$$Z = \frac{(w-\mu W)\pm 0.5}{\delta W}$$

The correction for the continuity is "- 0.5" when W is greater than -μW and "+ 0.5" when W is less than -μW. Since -μW is in all instances are equal to zero, the simpler computational formula is:

$$Z = \frac{w-0.5}{\delta W}$$

$$Z = \frac{10-0.5}{5.48}$$

$Z = +1.734$. ($W = 10$, $-\delta_W = \pm 5.48$)

From the table of critical values of Z read from Wilcoxon signed rank test table, I observed that the value of Z = +1.734 is significant. I then rejected the null hypothesis H_0 and accepted the alternative hypothesis H_1 which says that that there are no enough resources available for MOOCs.

Attitudes towards MOOCs

Null hypothesis H_0: Students have negative attitudes towards MOOCs;

Alternative hypothesis H_1: Students have positive attitudes towards MOOCs.

Results on attitudes towards MOOCs were computed as follows:

The maximum possible value of W:

$$W = \frac{N(N+1)}{2}$$

$$= \frac{7(7+1)}{2}$$

$= 28$

I noted in the null hypothesis that the students have negative attitudes towards MOOCs; I then would expect the value of W to approximate to zero within the limits of random variability. This now implied that any particular observed value of W belongs to a sampling distribution whose mean is equal to zero, hence $-\mu W = 0$.

For any particular value of N, it can be shown that the standard deviation of the sampling distribution of W is equal to:

$$-\delta_W = \sqrt{\left[\frac{N(N+1)(2N+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{7(7+1)(2*7+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{(840)}{6}\right]}$$

$= \pm 11.83$

This value was used for computing the z-ratio. The z-ratio must include± 0.5 corrections for continuity in Wilcoxon test.

Thus, the structure of the z-ratio for the Wilcoxon test is:

$$Z = \frac{(w-\mu W)\pm 0.5}{\delta W}$$

The correction for the continuity is "- 0.5" when W is greater than -μW and "+ 0.5" when W is less than -μW. Since -μW is in all instances are equal to zero, the simpler computational formula is:

$$Z = \frac{w-0.5}{\delta W}$$

$$Z = \frac{28-0.5}{11.83}$$

$$Z = +2.325.\ (W = 28, -\delta W = \pm 11.83)$$

From the table of critical values of z read from Wilcoxon signed rank test table, I observed that the value of z = +2.325 is significant. I reject the null hypothesis H_0 and accept the alternative hypothesis H_1 that students have positive attitudes towards MOOCs.

Usefulness of MOOCS Platform

Null hypothesis H_0: The new technology (MOOCs) is not useful in our situation;

Alternative hypothesis H_1: The new technology (MOOCs) is useful in our situation.

Results on the usefulness of MOOCs platform were computed as follows:

The maximum possible value of W:

$$W = \frac{N(N+1)}{2}$$

$$= \frac{5(5+1)}{2}$$

$$= 15$$

I noted in the null hypothesis that the new MOOCs technology is not useful in our situation; it's expected that the value of W will approximate to zero within the limits of random variability. This now implies that any particular observed value of W belongs to a sampling distribution whose mean is equal to zero, hence -μW = 0.

For any particular value of N, it can be shown that the standard deviation of the sampling distribution of W is equal to:

$$-\delta_W = \sqrt{\left[\frac{N(N+1)(2N+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{5(5+1)(2*5+1)}{6}\right]}$$

$$= \sqrt{\left[\frac{(330)}{6}\right]}$$

$$= \pm 7.42$$

This value is used for computing the z-ratio. The z-ratio must include± 0.5 corrections for continuity in Wilcoxon test.

Thus, the structure of the z-ratio for the Wilcoxon test is:

$$Z = \frac{(w-\mu W)\pm 0.5}{\delta W}$$

The correction for the continuity is "- 0.5" when W is greater than -μW and "+ 0.5" when W is less than -μW. Since -μW is in all instances are equal to zero, the simpler computational formula is:

$$Z = \frac{w-0.5}{\delta W}$$

$$Z = \frac{15-0.5}{7.42}$$

$$Z = +1.954.\ (W = 15,\ -\delta W = \pm\ 7.42)$$

From the table of critical values of z read from Wilcoxon signed rank test table, I observed that the value of z = +1.954 is significant. I then rejected the null hypothesis H_0 and accepted the alternative hypothesis H_1 which says that the new technology (MOOCs) is useful in our situation.

Table 4: Summary of the computed variables

N0.	Attribute	N	W	δ_W	Z
1)	Availability of Resources for MOOCs	4	10	± 5.48	+1.734
2)	Attitudes towards MOOCs	7	28	±11.83	+2.325
3)	Usefulness of MOOCs platform	5	15	± 7.42	+1.954

Results/Findings

Through students with computer and IT background, the researcher realized the interaction and interrelationships that existed within the variables that were investigated during the study. The results of those interactions have been discussed below with their corresponding variables:

1. Firstly, the findings indicated that there are no enough resources available for MOOCs. This is a major problem in most developing countries particularly in Africa where the number of students admitted to a given program do not actually match with the resources available.
2. Secondly, our investigation found out that students have positive attitudes towards MOOCs. This is attributed to the fact that majority of the students have had access to or are currently enrolled in various MOOCs and have found ease while engaging in them.
3. Also, it was found out that majority of the participants found the new technology (MOOCs) to be useful in their situation. This is due to the benefits they got from their experiences with it. Such benefits include the ability for MOOCs to motivate participants to learn without the physical influence of anyone, improvement in time management skills, ability to get education at a low cost and access to world class instructors among others.

Discussions

The findings of this study provide empirical evidence on which policy makers and institutional administrators can base in their quest to introduce MOOCs in Uganda's tertiary institutions. Overall, it was determined from the findings that students found MOOCs to be useful in their situation due to the benefits that majority of students enjoyed while undertaking MOOCs. This is attributed to the fact that most learners enroll in MOOCs mainly because they want to learn about a certain topic, or to increase their knowledge and to refresh what they had learned before (Breslow et al., 2013; Kolowich, 2013). It is worth noting that the findings found out that the students had a positive attitude towards the MOOCs platform. This is because majority of the participants find using MOOCs platform as a simple way of acquiring cheap education and to them, incorporation of suchtechnology into the education system of Uganda is a wise move. Participants also recommended MOOCs as one of the alternatives for the traditional teaching-learning approaches as well as indicating that MOOCs have the potential to increase the literacy rate in Uganda.

Although this study is limited to the context of Uganda as a developing country, it provides evidence that all developing countries face the challenge of limited resources as the findings suggest which are in line with other

studies where 'access to ICT comprises far more than merely providing computer and internet connections (Warschauer, 2003).

Implication of the Research

1. The study will be of importance to policy makers, institutional executives and administrators in helping to assess the need for implementing MOOCs at tertiary institutions in Uganda.
2. The researcher hopes the results of the study will be useful to future researchers with interest in further examining the usefulness and approaches of integrating MOOCs on the already existing traditional methods of learning models.
3. This study will also help in assessing the rate of technology penetration and adoption among the leading institutions in the country so as to establish the ways to better utilize such technologies in order to democratize education thereby reducing the literacy rate.

Limitations of the study

The research was restricted to the investigation of the emerging possibilities for quality education in Uganda through MOOCs from the perspective of the students. This means the remaining MOOCs interest groups namely: Teachers/Instructors as well as Planners/Administrators were not considered. This was so as to determine whether MOOCs implementation is convenient for the students with their acquired ICT skills got from their respective computer discipline courses.

The study was conducted in Uganda with participants only from four of the leading universities namely: Makerere University Kampala (MUK), Kyambogo University (KYU), Mbarara University of Science and Technology (MUST) and Islamic University in Uganda (IUIU).

Conclusions

This was primarily an investigative study aimed at investigating the emerging possibilities for quality education in Uganda's leading universities through MOOCs. This was done through a quantitative analysis of the variables namely: availability of resources for MOOCs, students' attitudes towards MOOCs, usefulness of MOOCs platform. Finally, to the majority of the students who found this platform appealing, it can be concluded that once fully implemented, the MOOCs initiative will generally reduce the cost of education and lead to increased literacy rate in Uganda as a developing country.

Recommendations

The following recommendations can be made for future actions that will eventually lead to the implementation of MOOCs in Uganda as a developing country.

1. There is need for the government to come up with clear ICT policies to back-up the introduction of MOOCs in Uganda's education system.
2. A second aspect is the provision of finances to universities from the government, private sector, donors...etc which will facilitate the implementation of such a promising platform which already has good results in the developed countries such as the USA.
3. There should be appropriate supervision of university management in line with acquisition of the necessary MOOCs infrastructure and establishment of MOOCs centers in higher institutions of learning.
4. In order to address the cultural diversity of the learners and their varying learner needs, more work needs to be done on the introduction of MOOCs technology in a Ugandan education system especially in the use of agents for personalized learning and real-time feedback generation.

References

Adams, A., Liyanagunawardena, T., Rassool, N., & Williams, S. (2013). Use of open educational resources in higher education. *British Journal of Educational Technology, 44*(5), E149-E150.

Aubert, J.-E. (2005). Promoting innovation in developing countries: A conceptual framework. *World Bank Policy Research Working Paper*(3554).

Ayala, C., Dick, G., & Treadway, J. (2014). The MOOCs are Coming! Revolution or Fad in the Business School. *Communications of the Association for Information Systems, 35*(1), 12.

Breslow, L., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. *Research & Practice in Assessment, 8*.

Bruff, D. O., Fisher, D. H., McEwen, K. E., & Smith, B. E. (2013). Wrapping a MOOC: Student perceptions of an experiment in blended learning. *Journal of Online Learning and Teaching, 9*(2), 187.

Caulfield, M., Collier, A., & Halawa, S. (2013). Rethinking online community in MOOCs used for blended learning. *Educause Review Online*, 1-9.

Daniel, S. J. (2013). Making Sense of MOOCs: Musings in a Maze of Myth, Paradox and Possibility [J]. *Open Education Research, 3*, 006.

Farrell, G. (2007). Survey of ICT and education in Africa: Uganda country report.

Gibbons, J. D., & Chakraborti, S. (2011). *Nonparametric statistical inference*: Springer.

Griffiths, R., Chingos, M., Mulhern, C., & Spies, R. (2014). Interactive online learning on campus: Testing MOOCs and other platforms in hybrid formats in the university system of Maryland. *Ithaka S+ R*.

Initiative, E. L. (2011). Seven things you should know about MOOCs.

Israel, M. J. (2015). Effectiveness of integrating MOOCs in traditional classrooms for undergraduate students. *The International Review of Research in Open and Distributed Learning, 16*(5).

Johnson, L., Adams, S., & Cummins, M. (2012). Technology Outlook for Australian Tertiary Education 2012-2017: An NMC Horizon Report Regional Analysis. *New Media Consortium*.

Jordan, K. (2014). Initial trends in enrolment and completion of massive open online courses. *The International Review of Research in Open and Distributed Learning, 15*(1).

Koller, D. (2012). How online courses can form a basis for on-campus teaching. *Forbes, http://www.forbes.com/sites/coursera/2012/11/07/how-online-courses-can-form-a-basis-for-on-campus-teaching*.

Kolowich, S. (2013). The professors who make the MOOCs. *The Chronicle of Higher Education, 18*.

Liyanagunawardena, T., Williams, S., & Adams, A. (2013). The Impact and reach of MOOCs: A developing countries' perspective. *eLearning Papers*(33).

Liyanagunawardena, T. R. (2015). Massive Open Online Courses. *Humanities, 4*(1), 35-41.

Liyanagunawardena, T. R., Adams, A. A., & Williams, S. A. (2013). MOOCs: A systematic study of the published literature 2008-2012. *The International Review of Research in Open and Distributed Learning, 14*(3), 202-227.

Materu, P. N. (2007). *Higher education quality assurance in Sub-Saharan Africa: status, challenges, opportunities and promising practices*: World Bank Publications.

Omoda-Onyait, G., & Lubega, J. T. (2011). E-learning readiness assessment model: a case study of higher institutions of learning in Uganda *Hybrid Learning* (pp. 200-211): Springer.

Oyo, B., & Kalema, B. M. (2014). Massive open online courses for Africa by Africa. *The International Review of Research in Open and Distributed Learning, 15*(6).

Oyo, B., & Williams, D. (2014). *Towards universal higher education in Uganda using MOOCs.* Paper presented at the 9th International eLearning Africa Conference.

Pappano, L. (2012). The Year of the MOOC. *The New York Times, 2*(12), 2012.

Ryan, L. (2013). Moocs are on the move: A snapshot of the rapid growth of moocs. *European Foundation for Management Development: White Paper: MOOCs-Massive Open Online Courses*.

Sharma, A., & Rani, R. (2014). *A 3-level model for implementing MOOC in India.* Paper presented at the MOOC, Innovation and Technology in Education (MITE), 2014 IEEE International Conference on.

Spyropoulou, N., Demopoulou, G., Pierrakeas, C., Koutsonikos, I., & Kameas, A. (2015). Developing a Computer Programming MOOC. *Procedia Computer Science, 65*, 182-191.

Stewart, F. (1977). Technology and underdevelopment. *Development Policy Review, 10*(1), 92-105.

Warschauer, M. (2003). Dissecting the" digital divide": A case study in Egypt. *The information society, 19*(4), 297-304.

Woruba, R., & Abedin, B. (2015). *Investigating Massive Open Online Courses (MOOCS) Opportunities for Developing Countries: Case of Papua New Guinea.* Paper presented at the Pacific Asia Conference on Information Systems (PACIS).

Yiga, M., Githeko, J., Ugen, M., Adipala, E., Tusiime, G., & Majaliwa, J. (2010). *Use of information and communication technology in the dissemination of agricultural information in Public Agricultural Research Institutes in Uganda.* Paper presented at the Second RUFORUM Biennial Regional Conference on" Building capacity for food security in Africa", Entebbe, Uganda, 20-24 September 2010.

Younos, A. (2012). Online education for developing contexts. *ACM Crossroads, 19*(2), 27-29.