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RESEARCH ARTICLE

EFFECTIVENESS OF MAKERERE UNIVERSITY E-LEARNING ENVIRONMENT (MUELE) IN THE LENS OF DELONE AND MCLEAN'S MODEL: A CONCEPT PAPER

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ABSTRACT

Ascertaining the effectiveness of learning management systems (LMSs)is of great importance for managers and policy makers in institutions of higher education to make investment decisions basing on evidence rather than rhetorical claims about the advantage of ICT. However, the effectiveness of ICT tools in teaching and learning has remained unclear with studies giving inconsistent findings. In this paper, we base on the De Lone and McLean's (2003) information systems success model as our lens to propose a study on effectiveness of Makerere University E-Learning Environment (MUELE) as a specific ICT tool used in teaching and learning. We hence, propose six interdependent variables as measures of effectiveness of MUELE, namely, *net benefits of MUELE, use of MUELE, user satisfaction with MUELE, quality of information uploaded on MUELE, quality of performance of MUELE* and *quality of technical support received by a user of MUELE.* Weposit that the overall dependent variable are the *net benefits of MUELE* while both *use of MUELE* and *user satisfaction with MUELE* are intermediate variables. We also posit that *quality of information uploaded on MUELE, quality of performance of MUELE* and *quality of technical support received by a user of MUELE* are the dependent variables. In this paper we give an introduction to our proposed study, statement of the problem, our study objectives and significance, theoretical review, related literature, the hypotheses and methodology of our proposed study.

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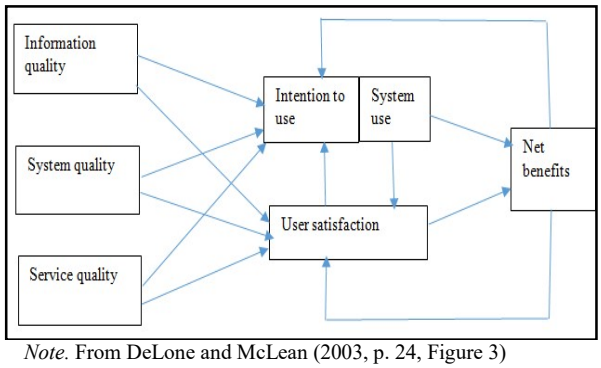
INTRODUCTION

The concept of effectiveness of ICT in teaching and learning has long been and still remains a contentious issue among practitioners and researchers. We are citing two conceptual papers (Aviram, 2009; Kirkwood & Price, 2013) which illustrate such unresolved conclusions. Aviram (2009) observes that from early 1960s to mid-1980s was a period in which the computer was regarded, "as a miraculous teaching machine" (p. 593) that could replace the teacher. He, however, points out that these hopes were false. According to Aviram, the period from the mid-1980s to 1990s brought new hopes that use of, "improved graphical capabilities and user interface technologies" (p. 594) of the computer could enhance the motivation of students to learn. He, however, still notes that such, "expected revolution did not take place" (p. 594). According to him, the third wave was a period from 1990s to 2000s, which saw the introduction of internet in the teaching and learning. This wave brought hopes that, "online interaction… [would] dramatically increase teachers' availability" (p. 594). However, at the end of these three stages, Aviram notes that it could not be established whether the expected results had been achieved and if so how such results could be attributed to the use of ICT. Such uncertainty of the results provided us a strong basis to propose an inquiry into the effectiveness of ICT in teaching and learning. Kirkwood and Price (2013) reflect on studies concerning the actual use of technology in universities. Hence they point out that, "despite much talk about the potential of technology to transform teaching and learning in higher education, the reality [had been] different with much… teaching remaining fundamentally unchanged" (p. 333). To them, "while technology was involved, it [was] difficult to estimate the extent to which any enhancement achieved… was the product of changes in the syllabus and learning design rather than the application of technology" (p. 334). These two conceptual papers reveal that despite the expectations that ICT can enhance the teaching and learning, its evidence of effectiveness remains questionable hence suggesting a need for us to suggest further investigations. Apart from conceptual papers, empirical studies have been carried out on the effectiveness of ICT in teaching and learning. Four literature review papers (Alomari

et al, 2019; Jeong *et al*., 2019; Nagendrababu *et al*., 2018; Yuwono & Sujono, 2018) give a summary of research findings from such previous empirical studies. Nagendrababu *et al*. (2018) carried out a systematic review of 13 studies on effectiveness of technology enhanced learning (TEL) and, "revealed no difference between TEL and traditional learning methods" (p. 10). In a meta-analysis of 15 articles on effectiveness of e-learning, Yuwono and Sujono (2018) reported a positive effect of e-learning compared to the traditional method of teaching. Alomari *et al* (2019) reviewed 40 empirical studies and reported that gamification techniques had the potential of, "promoting learners' motivation, engagement and performance" (p. 402). Jeong *et al*. (2019) conducted a review of 143 and found a moderate positive size effect of computer supported collaborative learning (CSCL) in science, technology, engineering and mathematics (STEM) education. These literature review papers indicate contradictions on the overall effect of use of ICT in teaching and learning, with one (i.e., Nagendrababu *et al*., 2018) indicating no difference while the others (i.e., Alomari, *et al*., 2019; Jeong *et al*., 2018; Yuwono & Sujono, 2018) indicated a positive effect. Such contradicting results suggested a need for more studies on the effectiveness of ICT in teaching and learning. In Uganda, different researchers have made efforts to evaluate effectiveness of ICT in teaching and learning. For example, from 2015 to 2021, dissertations or theses (e.g., Batiibwe, 2017; Kabugo, 2017; Namirembe, 2019; Shopi, 2020) have been done at doctoral level. In addition, researchers (e.g., Bakkabulindi, Barigayomwe *et al*., 2016; Bakkabulindi & Ndibuuza, 2015; Bakkabulindi, Ssempebwa *et al*., 2016; Kabugo, 2015; Kabugo, Masagazi, & Mugagga, 2015; Kabugo, Muyinda, & Masagazi, 2015; Kabugo, Muyinda *et al*., 2015, 2016; Kalagala *et al*., 2017) have been published journal articles or book chapters. Other researchers (e.g., Muyinda Siminyu *et al*., 2019; Nabushawo *et al*., 2018; Namirembe & Kyobe, 2021; Sebbowa & Muyinda, 2018; Walimbwa & Muyinda, 2015) have as well made publications in this field. However, these gave partial results on the effectiveness of ICT hence, suggesting a need for more studies to be conducted in this field.

The DeLone and McLean's (2003) Information Systems Success Model: Ourproposed study will be guided by the DeLone and McLean's (2003) model of information systems success (Figure 1).

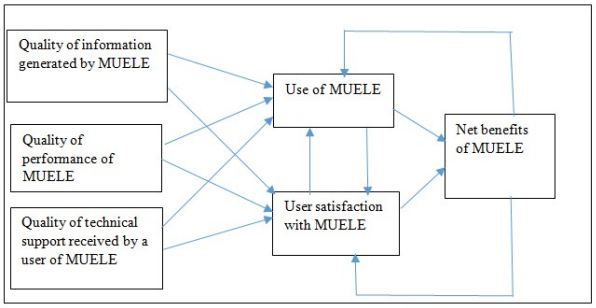


Note. From DeLone and McLean (2003, p. 24, Figure 3)

Figure 1. DeLone and McLean's (2003) Information Systems Success Model

Delone and McLean (2003) suggest that information systems success has six dimensions or variables as indicated in the model (Figure 1). The overall dependent variable in this model are the *net benefits* of the information system. According to DeLone and McLean,*net benefits* are measures of the impact which an information system has on its users. They point out that*net benefits* are measured in terms of cost and time saving, expansion in service consumption, increased production and reduced search costs. In Figure 1, DeLone and McLean (2003) suggest that the*net benefits* of an information system are dependent on the *intention to use/system use* and *user satisfaction* with the information system respectively. According to them (DeLone and McLean), the *intention to use* an information system is an alternative measure of *system use.* For purposes of clear operationalization, they advise a researcher toprioritize *system use* in case of systems that are already in actual use. In this study therefore, we will ignore *intention to use* an information system and remain with *system use*. They regard *system use* as the manner and extent to which a user can utilize the capabilities of an information system. According to them, *system use* can be measured in terms of, "the nature, extent, quality, and appropriateness of the system use" (DeLone & McLean 2003, p. 16). They define*user satisfaction* as a measure of theopinion of a user about the usefulness of an information system. According to them, *user satisfaction* is measured in terms repeated use of the information system, repeated visits to the information systems, and surveys of the information system made by the user. In Figure 1,Delone and McLean (2003) suggest that *system use* and *user satisfaction* with the information system respectively are each dependent on the *net benefits* of the information system. From the samefigure (Figure 1),each of *system use*and user satisfaction is dependent on *information quality*,*system quality* and *service quality* of the information system. According to DeLone and McLean (2003) *information quality* is a measure of the quality of the content provided by an information system as valued or judged by the user. They point out that *information quality* can be measured in terms of how the content provided by the information system is, "personalised, complete, relevant, easy to understand and secure" (p. 25). According to them, *system quality*measures the performance of an information system itself as desired by the user. They point out that *system quality* can be expressed in terms of the, "usability, availability, reliability, adaptability, and response time" (p. 24) of the information system. DeLone and McLean define*service quality* as the, "overall support delivered by the service provider" (p. 25) to the user of an information system. To them, the measures of *service quality* include assurance, empathy and responsiveness.

Our Conceptual model: Basing on the DeLone and McLean's (2003) information systems success model (Figure 1), we developed our conceptual model (Figure 2):



Notes.(1)Adapted from Figure 1

Figure 2. Conceptual Model Relating the Dimensions of Effectiveness of MUELE

MUELE is Makerere University E-Learning Environment

In our conceptual model(Figure 2),*net benefits*of [Makerere University E-Learning Environment] *MUELE* replaces*net benefits* of the information system (Figure 1). MUELE is a learning management system (LMS) which is customized by Makerere University. Sharma and Votta (2013) define an LMS as a, "server-based or cloud-based software program containing information about users, course and content which provides a place to learn and teach without dependency on time and space" (p. 1). In another way, an LMS is an internet-based platform which provides lecturers and students with functionalities that can be used to support online teaching and learning (Firat, 2016). According to Al-Azawei (2019), LMSs are, "the most frequently adopted e-learning technologies in higher education" (p. 256). Makerere University uses Modular Object Oriented Dynamic Learning Environment (Moodle), which is an open source LMS. An open source LMS is one where the copyright holder grants a user permission to configure and run his or her own customized version of the LMS without any license fee.The user, however, must meet the cost of the necessary infrastructure (e.g., the platform) and training of the technical team required to maintain the customised system.
Makerere University customised and rebranded Moodle as Makerere University E-learning Environment (MUELE). Still in our model,*use of MUELE*replaces*intention to use/system use* (Figure 1) basing on the argument that MUELE as a system is already in actual use while *user satisfaction with MUELE* to replaces*user satisfaction* with the information system (Figure 1). In the same conceptual model(Figure 2),*quality of information uploaded on MUELE*, *quality of performance of MUELE* and *quality of technical support received by a user of MUELE* respectively replace *information quality, system quality*and*service quality* (Figure 1) of the information system.

Statement of the Problem: For informed decisions to invest in the use of ICT tools for teaching and learning to be taken, their effectiveness must be well understood by decision and policy makers (Price & Oliver, 2007). Despite this, the effectiveness of learning management systems (LMSs) as ICT tools in teaching and learning in universities in Uganda remains unclear (Kabarungi *et al*., 2016). In Uganda, previous researchers (e.g., Lubale, 2021; Mayende *et al*., 2015; Mayende *et al*., 2017; Muyinda, 2015, 2016; Muyinda *et al*., 2017a, b; Muyinda, Mayende *et al*., 2019) have made efforts to evaluate the effectiveness of ICT in teaching and learning. However, these researchers have looked at *use of ICT* which is only one of the six dimensions *of effectiveness of ICT* in teaching and learning (Figure 1.2). In other words, researchers in this field have hardly used all the six dimensions of the Delone and McLean's (2003) information systems success model (Figure 1) and, hence, these (researchers) have reported partial results on the effectiveness of ICT in teaching and learning. Implied in this situation, is that managers and policy makers in universities in Uganda stand at a high risk of making partially informed decisions to invest in the use of ICT in teaching and learning which may lead to financial loses. Ourproposed study will therefore investigate the effectiveness of Makerere University E-learning Environment (MUELE) as a specific ICT tool based on the six dimensions of the DeLone and McLean's (2003) information systems success model (Figure 1).

Objectives and Significance: The general objective of our study will be to investigate into the effectiveness of Makerere University E-Learning Environment (MUELE) using the DeLone and McLean's (2003) model of information systems success (Figure 1) as a lens. Hence our specific objectives will be;

- To determine the extent to which the *net benefits of MUELE* are influenced by the *use of MUELE* and the *user satisfaction with MUELE.*
- To determine the extent to which *net benefits of MUELE* influence the *use of MUELE* and the *user satisfaction with MUELE* respectively.
- To determine the extent to which the *use of MUELE* and the *user satisfaction with MUELE* influence each other.
- To determine the extent to which the *use of MUELE* is influenced by the *quality of information uploaded on MUELE,quality of performance of MUELE* and *quality of technical support received by a user of MUELE.*
- To determine the extent to which *user satisfaction with MUELE* is influenced by the*quality of information uploaded MUELE,quality of performance of MUELE* and *quality of technical support received by a user of MUELE*.

Our proposed study hastheoretical/academic and practical/policysignificances. In terms of theoretical/academic significance, we shall make an advancement of the DeLone and McLean's (2003) information systems success model in the context of e-learning. Conceptually, our study will suggest operational definitions and hence items for measuring the dimensions of effectiveness of MUELE. From the operational definitions, we will suggest an instrument that could be used to measure effectiveness of Makerere University E-Learning Environment (MUELE). Our proposed study will furtheridentify the relationships between the constructs of the conceptual framework (Figure 2) by testing the hypotheses, findings of which shall be used by other researchers in this field hence making a theoretical and an academic contribution. Lastly, we will be the first to test the applicability of DeLone and McLean's (2003) information systems success model in the context of e-learning in the Makerere University and in Uganda.

As a Practical/Policy significance, findings of our study shall give guidance to policy documents at national level such as "Uganda Vision 2040" (Republic of Uganda [RoU], 2013), "National Development Plan" (NDP) III (National Planning Authority [NPA], 2020) and the "National ICT Policy" (Ministry of Information and Communication Technology [MICT], 2014) on how to draw strategies of planning and monitoring the use of ICT in teaching and learning. At the level of Makerere University as an institution, the policy shall guide policy documents such as the "Information and Communications Technology Policy Framework 2016/17-2020/2021" (Makerere University [Mak], 2015a), the "Open, Distance and e-Learning (ODeL) Policy"(Makerere University [Mak]. (2015b) on the direction(s) of drawing plans to implement the use of ICT in teaching and learning. Findings of this study shall help policy makers at national and institutional levels to monitor and evaluate the progress of integration in of ICT in the teaching and learning process.

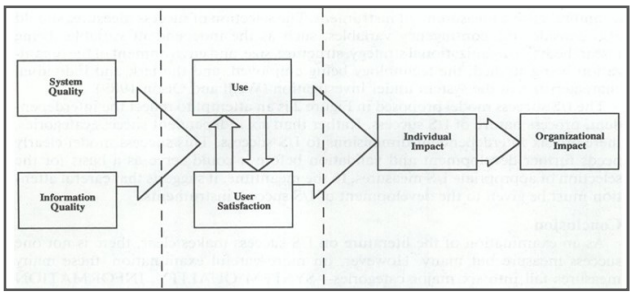
Theoretical Review

The development of the DeLone and McLean's (2003) information systems success model (Figure 1) originated from the questions raised by Keen (1980) that had to be resolved if the field of management information systems (MIS) was to become a classical area of research. Keen raised the following questions regarding research in management information systems:

- What are the reference disciplines for MIS?
- What is the dependent variable in measuring impact of information systems?
- How do we build a cumulative tradition?
- What is the relationship of MIS research to computer technology?
- Where should MIS researchers publish their findings?

According to Keen, a reflection to these questions was more important than simply finding their specific answers. Regarding the question about the dependent variable, Keen pointed out that, "when we discuss the impacts of change in information systems, on organizational or individual processes, we have little to measure" (p. 12). Given its importance to the measurements of impact of information system, Keen argued that, "the search for the dependent variable… in management of information systems seem[ed] to be a critical issue" (p. 12).

4.1DeLone and McLean's (1992) Model of Information Systems Success. W. H. DeLone and E. R. McLean developed their first model (Figure 3) in 1992 in response to the call raised by Keen (1980) in question ii, for the critical need to identify the dependent variable in the measurement of impact of information systems success. W. H. DeLone and E. R. McLean proposed the information systems success model so as to provide a basis of organising research in management of information systems into a more coherent body of knowledge. As a process of developing their theory, DeLone and McLean (1992) reviewed literature which covered what they termed as a 'formative period' from 1981 to 1987 for, "empirical studies that [had] attempted to measure some aspects of MIS success and which [had] appeared in one of the seven leading publications in information systems field" (p. 61). In addition, they reviewed articles dating back to 1949 but which had theoretical or conceptual contributions. From a review of 180 references, DeLone and McLean (1992) noted that there were many measures of information systems success as indicated in the studies. In order to organise such diverse measures and resulting research findings, DeLone and McLean (1992) identified six distinct categories of measures of information systems success from which they proposed the information system success model (Figure 3).



Note. From DeLone and McLean (1992, p. 87, Figure 2)

Figure 3. DeLone and McLean's (1992) Model of Information System Success

These were namely *organizational impact, individual impact, use, user satisfaction, system quality,* and *information quality.*

According to Figure 3, the main variable in the model is *organisational impact* of an information system.DeLone and McLean defined (1992) defined the *organisational impact* as a success dimension which measures the impact of information on the organisational performance. InFigure 3, *organizational impact* depends on *individual impact.* DeLone and McLean (1992) defined *individual impact* of an information system as a success dimension which measures the effect of information system on the behavior of the recipient. The figure (Figure 3), indicates the *individual impact* is dependent on the *system use* and *user satisfaction.*DeLone and McLean (1992) defined *system use* as a success dimension which measures the ability of the recipient to consume the information generated by the information system. They defined *user satisfaction* as a success dimension which measures the response to the use of the output of the information system. In Figure 3, each of the*system use* and *user satisfaction* is dependent on *system quality* and *information quality.* DeLone and McLean (1992) defined *system quality* as a success dimension which measures the quality of performance of the system. They also defined *information quality* as a success dimension which measures the quality of information uploaded the system.

According to theinformation systems successis a multidimensional construct whose measurement requires a careful combination of thedimensions indicated in their model (Figure 3). They recommend that in applying their model, the selection of these dimensions should be in the context of the study. DeLone and McLean (1992) called for further studies that could build on their work to be carried out so as to achieve a "cumulative tradition" in the field of information systems. They pointed out that their, "success model clearly need[ed] further development and validation before it could serve as a basis for the selection of appropriate I/S [information system] measure" (p. 88). *4.2 DeLone and McLean's (2003) Model of Information Systems Success.* In 2003, W. H. DeLone and E. R. McLean updated their original information systems success model (Figure 3) based on the research contributions from studies which attempted to apply, validate or challenge it. As Turner *et al.* (2018) suggest, the original information systems success model (Figure 3) was at a stage of an informal theory/model, which required to be tested, validated and critically analyzed in order to have it transformed into a formal theory. On this account, W. H. DeLone and E. R. McLean noted that over 300 articles had referred to their original model, which provided evidence for the need to further develop a comprehensive framework that could be used to integrate research findings in the field of information systems research. They accordingly reviewed more than 100 articles which guided them to update their original model. From the analysis of studies which had employed their original model (Figure 3) in the measurement of information systems success, Delone and Mclean (2003) noted that there had been lack of adherence to the cautions they gave regarding the use of the model. They pointed out that some of the studies wherethe model (Figure 3) had been employed overlooked, the caution that "information system success was a,"multidimensional and interdependent construct - and that it [was] therefore necessary to study the interrelationships among… those dimensions" (p. 12).

Table 1. Variables in the Instrument, their Construct Sources and Reliabilities

Variables	Constructs	Source of Instrument and Reliabilities
Net benefits of MUELE	Improvement of academic performance Ability to solve problems in studies Delivery of better services Cost saving Usefulness	Al-Azawei (2019): α = 0.792 (p. 263, Table 4 on the Moodle Survey)
Use of MUELE	Frequency of use Level of dependency Ability to utilize the functions	Al-Azawei (2019): α not reported Yakubu& Dasuki (2018): α not applicable
User satisfaction with MUELE	Efficiency Dependability Accuracy of the system usefulness of output format Adequacy of system to meet the needs Attitude towards the functions Perceived utility	Tella (2011): α = 0.61 (p. 69, Table 5b under Reliability)
Quality of information uploaded on MUELE	Accuracy of information (INFQ1) Relevancy (INFQ2) Timeliness (INFQ3) Regularity of update of information (INFQ4) Ability to improve learning (INFQ5) Sufficiency (INFQ6) Comprehensiveness (INFQ7)	Shagari et al. (2017): If C = Composite reliability CR (INFQ1 & INFQ2) = 0.89; CR (INFQ3-INFQ5) = 0.798; CR (INQ6 & INFQ7) = 0.821 (p. 322, Table 3)
Quality of performance of MUELE	Availability User friendliness Interactivity Attractiveness of features Speed of access	Kurt (2019): α ≥ 0.844 (p. 1179)
Quality of technical support received by a user of MUELE	Assurance of availability Assurance of usability Promptness of response to requests Having knowledge to support requests Empathy with a user	Yakubu& Dasuki (2018): α = 0.896 (p. 191, Table 2)

They also noted that some ofthe studies had tested and validated their original modehence giving suggestions to enhance it. DeLone and McLean (2003) noted that some researchers suggested to have*service quality* as an additional measure of information systems success and also to have an increase in the number of impact measures. Hence, they added a third dimension *service quality*to the two original system characteristics *system quality* and *information quality*. However, contrary to having additional measures of impact as suggested by some of the researchers, and in their efforts to maintain the simplicity of the model, DeLone and McLean (2003) combined all the measures of impact into a single dimension namely *net benefits*. They suggested *intention to use*as an alternative to *system use* in some context due to the hardships encountered in the interpretation of the multidimensional nature of measurement of information systems success. These modifications in their original model (Figure 3) of information systems success provide the Delone and McLean's (2003) model (Figure 1), which guide will guide our study. As Turner *et al*. (2018) further suggest, DeLone and McLean (2003) called for a continuous testing and challenging of their model as a process of a continued growth and reinforcement of a theory.

RELATED LITERATURE

Many empirical studies have been conducted on effectiveness of ICT in teaching and learning. Four recent literature review papers give a summary of findings from such studies. Nagendrababu *et al*. (2018) conducted a review of literature, "to evaluate the effectiveness of technology-enhanced learning (TEL)… compared to traditional learning methods" (p. 1). Using literature which they searched from two data bases namely PubMed and Scopus, Nagendrababu *et al*. identified 13 studies dated up to May 2018, on which they performed a meta-analysis. Hence they, "revealed no difference between TEL and traditional learning methods in knowledge gain and performance" (p. 10). As a weakness, Nagendrababu reported that most of the studies reviewed had not reported on the allocation concealment which affected the randomization process. They also pointed out that post-intervention knowledge assessment was done at varying periods which could have affected the results. Nagendrababu *et al*. pointed to a limitation of their review in which they excluded studies with no abstracts for which they could have left out relevant studies. Yuwono and Sujono (2018) reviewed literature on effectiveness of e-learning with the aim of establishing, "the effect size of the research findings under… the effects of e-learning on the students' learning outcomes" (p. 1), and as well to, "investigate the combined effect sizes" (p. 1). They sourced for 15 articles published from 2000 to 2013 from six data bases, which articles they subjected to meta-analysis. Regarding the testing of the effect size, Yuwono and Sujono reported that, "13 studies [had] positive effects, meaning that e-learning [was] better than conventional learning" (p. 5). Yuwono and Sujono reported a combined effect size of, "0.67 with a confidence interval of 0.42 - 0.91 and [at] a significance of 95%" (p. 6). They pointed to a gap that many of the studies which they included in their review had reported incomplete results. As a limitation on their review, Yuwono and Sujono mentioned that, "the results of the study [could not] be generalized" (p. 8) since the research data were not

homogeneous. Alomari *et al*. (2019) conducted a systematic review of literature to determine the, "role of gamification techniques in promoting students' learning" (p. 395). They identified 40 empirical studies that had been published during 2016 to 2018 from five databases. By using the, "preferred reporting items for systematic reviews and meta-analyses (PRISMA) protocol" (p. 397), they obtained results that showed, "the potential of using gamification techniques in promoting learners' motivation, engagement, and performance" (p. 402). As a weakness, Alomari *et al*. reported that previous studies might have provided,"poor guidance to future researchers about the suitability of gamification techniques for achieving a certain learning objectives" (p. 402), which knowledge could have been vital in understanding the role of gamification.

Jeong *et al*. (2019) conducted a review of studies with the aim of reporting on the effects of computer-supported collaborative learning (CSCL) in science, technology, engineering and mathematics (STEM) education. They selected a total of 143 studies which they search from Web of Science and ERIC, having been published between 2005 and 2014. By using what they referred to as a, "comprehensive meta-analysis" (p. 4), Jeong *et al*. reported that, "in general, CSCL produces positive outcomes in STEM with the overall effect size of 0.51" (p. 14). According to Jeong *et al*., the effect size they obtained was moderate basing on Cohen's guideline, although it could be considered as quite substantive for educational research.

They however pointed out that the studies reviewed had a, "tendency to under report negative outcomes" (p. 14). They also noted that the studies reviewed had ambiguities in describing the interventions of computer-supported collaborative learning. As a limitation on their review, Jeong *et al*. revealed that their review could not examine, "all moderators that are potentially important to the success of CSCL" (p. 14).

Hypotheses

From Figure 2, the objectives (Section 3.0) and the gaps from previous studies (Section 5.0), this study will test the following hypotheses:

H1: *Net benefits ofMUELE* are positively influenced by the *use of MUELE* and *user satisfaction with MUELE.*

H2: *Net benefits of MUELE* positively influencethe *use of MUELE* and*user satisfaction with MUELE.*

H3:*Use of MUELE* and *user satisfaction with MUELE* positively influence each other.

H4:*Use of MUELE* is positively influenced by the *quality of information uploaded on MUELE, quality of performance of MUELE*and*quality of technical support received by user MUELE.*

H5:*User satisfaction with MUELE* is positively influenced by the *quality of information uploaded on MUELE, quality of performance of MUELE* and*quality of technical support received by users of MUELE.*

METHODOLOGY

Paradigms: In our proposed study we will adopt a positivist paradigm of research. According to Park *et al*. (2020), this paradigm is based on the ontological assumption that, "a single tangible reality exists – one that can understood, identified and measured" (p. 691). In other words, positivism considers reality to be objective and quantifiable. In pursuit of this view, we shall collect the datain a quantifiable manner in order to measure the variables of the study (Figure 2). Epistemologically, Park *et al*. (2020) assert that for a positivist paradigm to, "develop truth, absolute separation must exist between the research participants and the researcher" (p. 691). Hencethis study, we will use a self-administered questionnaire (SAQ) so as to keep both the researcher andthe respondent distant.

Park *et al*. further contend that positivism relies on an axiological assumption which, "dismisses the importance of individual subjective experiences and values – be they the experiences of research participants or of the researchers" (p. 692). Hence in our data collection and reporting of the findings we shall avoid external influence due to the researcher. Methodologically, Park *et al*. contend that, "positivist methodology emphasises engaging in research settings where variables can be controlled and manipulates" (p. 692). To them, a positivist study examines the causal relationships between the variables in the study. In this regard, the proposed study will measure the relationships between the variables (Figure 2).

Design: Our study will be a survey in that we shall collect data from a large pool of respondents so as to generalize results to the population. We shall employ a cross-sectional survey in that we shall collect data within a short period of time and hence, reduce on the costs involved. It will be a correlationalstudyin that we shall investigate the relationships between variablesin our conceptual model (Figure2).

Data Collection Instrument*:* We shall collect data using a self-administered questionnaire (SAQ) that we have developed basing on previously used instruments whose validities and reliabilities have been tested (see table 1):

We shall measure the main variable of our study, namely, *net benefits of MUELE*in terms of improvement of academic performance, ability to solve problems in studies, reception of better education services, cost saving and usefulness. Our first mediating variable is *use of MUELE* which we shall measure in terms frequency of use, level of dependency and ability to utilise the functions. The second mediating variable in our study is *user satisfaction with MUELE* and we measure this variable in terms of efficiency, dependability, accuracy of the system, usefulness of output format, adequacy, attitude towards and perceived utility. Our first independent variable is *quality of information uploaded on MUELE* and we shall measure this in terms of accuracy, relevancy, timeliness, regularity of update of information, ability to improve learning, sufficiency and comprehensiveness. The second independent variable in our proposed study is *quality of performance of MUELE* and this consists of five measures namely; availability, user friendliness, interactivity and

system, attractiveness of features and speed of access. The third independent variable is *quality of technical support received by a user of MUELE* and this consists of four measures namely; assurance of availability and usability, promptness of response to requests, having knowledge to support requests and empathy to a user. We shall scale all these variables using a five-point Likert

Data Analysis: In our study, we shall analyze the data by means of statistical methods with the help of IBM SPSS Statistics. Specifically we shall employ inferential statistics to test the hypotheses against which we shall make generalization of the results. By letting *net benefit of use of MUELE* = NBM, *use of MUELE* = UM and *user satisfaction with MUELE* = USM, then the mathematical expressions (7.1) - (7.3) can respectively represent hypotheses H1-H3 as derived from Figure 2:

H1: NBM = f (UM, USM) (7.1)

H2: UM, USM = f (NBM) (7.2)

H3: UM = f (USM), USM = f (UM) (7.3)

Hence, we shall test our first hypothesis (H1) by using multiple linear regression in which we shall regress the variable NBMon the variables UM and USM. We shall test our second hypothesis (H2) using two simple linear regression analyses by regressing each of the variables UM and USM on NBM. We shall further test our third hypothesis (H3) using two simple linear regression analyses by regressingthe variables UMand USM on each other. By letting *quality of information uploaded on MUELE* = QIM, *quality of performance of MUELE* = QPM, and *quality of technical support received by a user of MUELE* = QTM, the mathematical expressions (7.4) and (7.5) can respectively represent hypotheses H4 and H5:

H4:UM = f (QIM, QPM, QTM) (7.4)

H5:USM= f (QIM, QPM, QTM) (7.5)

Hence we shall test both hypotheses (H4) and (H5)using multiple linear regression by regressing each of the variables UM and UMS on variables QIM, QPM, and QTM.

REFERENCES

Al-Azawei, A. (2019). What drives successful social media in education and e-learning? A comparative study on Facebook and Moodle. *Journal of Information Technology Education: Research, 18,* 253-274. https://doi.org/10.28945/4360

Alomari, I., Al-Samarraie, H., & Yousef, H. (2019). The role of gamification techniques in promoting student learning: A review and synthesis. *Journal of Information and Technology Education: Research, 18,* 395-417. https://doi.org/10.2895/4417

Aviram, A. (2009). The need for strategic thinking on ICT and education. *PolicyFutures in Education, 7*(6), 592-600. http://dx.doi.org/10.2304/pfie.2009.7.6.592

Bakkabulindi, F. E. K., Barigayomwe, R. B., Omurwon, J., Ongia, J. F., & Bashasha, A. T. (2016). Personal attributes as correlates of the use of the internet by doctoral students in Kampala International University, Uganda. In U. I. Ogbonnaya, & S. Simelane-Mnisi (Eds.), *South Africa International Conference on Educational Technologies* (pp. 107-121). African Academic Research Forum (AARF).

Bakkabulindi, F. E. K., & Ndibuuza, F. (2015). Scholars of the dotcom era? The use of ICT by undergraduate students in Uganda Martyrs University, Uganda. In D. Nwaozuzu, & S. Mnisi (Eds.), *South Africa International Conference on Educational Technologies* (pp. 77-86). African Academic Research Forum (AARF).

Bakkabulindi, F. E. K., Ssempebwa, J., Teferra, D., & Nalugya, S.(2016). ICT change agents as a correlate of education: The case of internet use among professors at Makerere University. *Lagos Education Review, 16*(1), 40-54.

Batiibwe, M. S. K. (2017). *Application of the technological content knowledge framework on the use of ICT in pedagogy by teachers of mathematical/quantitative disciplines in universities in Uganda* [Doctoral thesis, Makerere University].

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95. 10.1287/isre.3.1.60

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Information Management System, 9*(4), 9-30. 10.1080/07421222.2003.11045748

Firat, M. (2016). Determining the effects of LMS learning behaviors on academic achievement in a learning analytic perspective. *Journal of Information Technology Education: Research, 15,* 75-87. http://www.jite.org/documents/Vol15/JITEv15ResearchP075-087Firat1928.pdf

Jeong, H., Hmelo-Silver, C. E., & Jo, K. (2019). Ten years of computer-supported collaborative learning: A meta-analysis of CSCL in STEM education during 2005-2014. *Educational Research Review.* https://doi.org/10.1016/j.edurev.2019.100284

Kabarungi, M., Musiimenta, A., & Atuhe, A. (2016). Impact of e-learning management system adoption at Mbarara University of Science and Technology. *International Journal of Emerging Trends & Technology in Computer Science, 49*(2), 62-65.
10.14445/22312803/IJCTT-V39P111

Kabugo, D. (2015). *Cultivating teacher-trainees' experiences of utilizing emerging technologies to effectively teach Luganda language to the net-generation.*Makerere University.

Kabugo, D. (2017). *A model for cultivating teacher-trainees' knowledge for integrating emerging technologies into Luganda teaching* [Doctoral thesis, Makerere University].

Kabugo, D., Masagazi, F. M., & Mugagga, A. M. (2015). Learning to utilise emerging technologies to effectively teaching indigenous languages to the net-generation: A discourse analysis of Luganda teacher-trainees' feelings of concrete experience. In C. L. Gomezi, M. A., & T. I. Candel (Eds.), *EDULEARN15 proceedings* (pp. 7015-7029). IATED Academy.

Kabugo, D., Muyinda, P. B., & Masagazi, M. F. (2015). Scaffolding teacher-trainees' reflective observations about utilizing emerging technologies in teaching Luganda language. In C. L. Gomezi, M. A. Lopez, & C. I. Toreres (Eds.), *Education Research and Innovation* (pp. 838-851). IATED Academy.

Kabugo, D., Muyinda, P. B., Masagazi, F. M., Mugagga, A. M., & Mulumba, M. B. (2015). Tracking students' eye movements when reading educational information on mobile phones: A case of a Luganda literary text. In M. Dichaba, & D. Nwaozuzu (Eds.), *Proceedings of the International Conference on Education 2015* (pp. 37-51). African Academic Research Forum (AARF).

Kabugo, D., Muyinda, P. B., Masagazi, F. M., Mugagga, A. M., & Mulumba, M. B. (2016). Tracking students' eye-movements when reading learning objects on mobile phones: A discourse analysis of Luganda language teacher-trainees' reflective observations. *Journal of Learning for Development, 3*(1), 51-65.

Kalagala, J., Kabugo, D. & Muyinda P. B. (2017, May 22).*Assessing the quality of knowledge management and risk response planning in an open distance and e-learning project* [workshop presentation]. The DELP 2017 Annual Research Workshop, Makerere University.

Keen, P. G. W. (1980). Management of information systems: Reference disciplines and a cumulative tradition. Association for Information System Electronic Library, 9-18. http://aisel.aisnet.org/icis1980/9

Kirkwood, A. & Price, L. (2013). Missing: Evidence of a scholarly approach to teaching and learning with technology in higher education. *Teaching in Higher Education, 18*(3), 327-337. http://dx.doi.org/10.1080/13562517.2013.773419

Kurt, O. E. (2019). Examining an e-learning system through the lens of the information system success model: Empirical evidence from Italy. *Education and Information Technologies, 24,* 1173-1184. https://doi.org/10.1007/s10639-018-9821-4

Lubale, G. (2021). Information communication technology implementation and application in higher education of Uganda: The case study of Kyambogo University. *Journal of Education and Training Studies, 8*(6), 29-43. https://doi.org/10.11114/jets.V8i6.4842

Makerere University [Mak]. (2015a). *Information and communications technology policy framework 2016/17-2020/2021*. Directorate of ICT Support [DICTS]

Makerere University [Mak]. (2015b). *Open distance and e-learning (ODeL) policy*. Institute of Open Distance and E-learning [IODEL].

Mayende, G., Muyinda, P. B., Prinz, A., Isabwe, G. M. N., & Nampijja, D. (2015). Online learning needs assessment in Uganda. In F. D. Conway, S. Hillen, M. Landis, T. M. Schlegelmilch, & P. Wolcott (Eds.), *Digital media in teaching and its added value* (pp.).Waxmann.

Mayende, G., Prinz, A., Isabwe, G. M. N., &Muyinda, P. B. (2017). Learning groups in MOOCs lessons for online learning in higher education. *International Journal of Engineering Pedagogy*, *7*(2), 109–124. 10.3991/ijep.v7i2.6925

Ministry of Information and Communication Technology [MICT]. (2014). *National ICT policy for Uganda.*

Muyinda, P. B. (2015, January, 20). *Online supervision* [Workshop presentation]. The Online Supervision and Graduate Mentorship Workshop, College of Computing and Information Sciences, Kampala, Uganda.

Muyinda, P. B. (2016, May). *Converging south-north online education pedagogy at Makerere University: The emerging lessons* [Workshop presentation]. DELP 2016 Annual Research Workshop, Uganda.

Muyinda, P. B., Bananuka T., Okot A. & Bateeze J. (2017a, May 22*).Leapfrogging graduate training at Makerere University from conventional to blended learning pedagogy* [Workshop presentation]. The DELP 2017 Annual Research Workshop, Makerere University.

Muyinda, P. B., Bananuka, T., Okot, A. & Bateeze, J. (2017b, June). *Leapfrogging graduate training at Makerere University from conventional to blended learning pedagogy* [Conference session]. International Conference on Education, Stockholm Sweden.

Muyinda, P. B., Mayende, G., Maiga, G., & Oyo, B. (2019). Widely acclaimed but lowly utilized: Congruencing ODL utilization with its wide acclaim. *Universal Journal of Educational Research*, *7*(2), 400-412. 10.13189/ujer.2019.070213

Muyinda, P. B., Siminyu, N. S., Aguti, N. J., Mayende, G., Nampijja, D., Kajumbula, R., Mayanja, J. Kyagaba, S. D., Nabushawo, H., Kabugo, D., Walimbwa, M., Shopi, M. J., Turyakira, N. & Isabwe, M. G. N. (2019). Lived experience of developing a blended learning academic programme in a traditionally presential university. *Proceedings of the Pan-African Commonwealth Forum, 9,* 9-12.

Nabushawo, H. M., Muyinda, P. B., Isabwe, G. M. N., Prinz, A., & Mayende, G. (2018). Improving online interaction among blended distance learners at Makerere University. In M. E. Auer, D. Guralnick, & I. Simonics (Eds.), *Advances in intelligent systems and computing* (pp. 63-69). Springer.

Nagendrababu, V., Pulikkotil, S. J., Sultan, O. S., Jayaraman, J., Soh, J. A., & Dummer, P. M. H. (2018). Effectiveness of technology-enhanced learning in endodontic education: A systematic review and meta-analysis. *International Endodontic Journal.* 10.1111/iej.12995

Namirembe, E. (2019). *Elearning in universities in Uganda: Predictors of successful adoption* [Doctoral thesis, University of Cape Town].

Namirembe, E., & Kyobe, M. (2021). Predictors of successful adoption of technology supported learning in Uganda: A students' perspective. *The African Journal of Information Systems, 13*(2), 183-198.

National Planning Authority [NPA]. (2020). *The national development plan III* [*of Uganda*].

Park, Y. S., Konge, L., & Artino, A. R. (2020). The positivist paradigm of research. *Academic Medicine, 95*(5), 690-695. 10.1097/ACM.0000000000003093

Price, S., & Oliver, M. (2007). A framework for conceptualizing the impact of technology on teaching and learning. *Educational Technology and Society, 10*(1), 16-27. https://www.jstor.org/stable/jeductechsoci.10.1.16

Republic of Uganda [RoU]. (2013). *The Uganda vision 2040.* National Planning Authority (NPA)

Sebbowa, D. K., & Muyinda, P. B. (2018). The utilisation of a mobile phone forum on the Wink site application in the teaching and learning of history: A case study of pre-service teachers at Makerere University. *Yesterday and*

Today, 124-147.http://dx.doi.org/10.17159/2223-0386/2018/n19a6

Shagari, S. L., Abdullah, A., & Saat, R. M. (2017). Accounting information systems effectiveness: Evidence from the Nigerian banking sector. *Interdisciplinary Journal of Information, Knowledge, and Management, 12,* 309-335. https://doi.org/10.28945/3891

Sharma, A., & Vatta, S. (2013). Role of learning management systems in education. *International Journal of Advanced Research in Computer Science and Software Engineering, 3*(6), 997-1002.

Shopi, M. J. (2020). *The role of pre-service teacher training on integration of ICT in pedagogy by trainees of National Teachers' College-Kaliro* [Doctoral thesis, Makerere University].

Tella, A. (2011). Reliability and factor analysis of blackboard course management system success: A scale development and validation in an educational context. *Journal of Information Technology Education, 10*, 55-80. 10.28945/1368

Turner, R. J., Baker, R., & Kelner, F. (2018). Theoretical literature review: Tracing the life cycle of a theory and its verified and falsified statements. *Human Resource Development Review, 17*(1), 34-61. 10.1177/1534484317749680

Walimbwa, M., & Muyinda B. P. (2015, August 31-September 3). *Emerging technologies redesigning the distance learning environment at Makerere University* [Conference session]. Emerging Technologies and Authentic Learning in Higher Vocational Education Conference,South Africa.

Yakubu, M. N., & Dasuki, S. I. (2018) Assessing e-learning systems success in Nigeria: An application of the DeLone and McLean's information systems success model. *Journal of Information Technology Education: Research, 17,* 182-202. https://doi.org/10.28945/4077

Yuwono, K. T., & Sujono, H. D. (2018). The effectiveness of e-learning: A meta-analysis. *Journal of Physics.* 10.10881742-6596/1140/1/012024

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