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An integrated model for measuring the impacts of e-learning on students' achievement in developing countries

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ABSTRACT

Information and Communication Technologies have influenced the landscape of education sector by changing the way various education activities are being conducted. From the perspectives of Tanzania, this paper provides an integrated model for measuring the impact of e-learning on students' achievements in universities. A Mixed method research methodology involving survey questionnaires and interviews was employed in the collection of quantitative and qualitative data respectively for building the integrated model. Confirmatory factor analysis was used to evaluate the construct validity and internal reliability. Multiple regressions technique was used to analyse the hypothesised relationships conceptualised in the research model. The model was built and validated using structural equation modeling and Delphi technique respectively. Indicators such as student engagement, student cognitive, performance expectancy, students' control, student satisfaction, continue using, student enjoyment, students' self esteem, students' confidence on e-learning system have positive significance relationship with students' achievement. The integrated model has the potential to policy makers, universities and other stakeholder to understand the impacts of e-learning after implementation in order to justify the total investment based on that technology. The novelty of this research lies in the extension of the findings in literature with new integrated variables including frequency use and intention to use e-learning.

Keywords: *E-learning, learning process, students, ICTs, E-learning impact, model*

INTRODUCTION

Information and Communication Technologies (ICTs) have influenced the landscape of education sector by changing the way various education activities are being conducted. Rapid developments of ICTs have improved access to and efficiency of teaching and learning processes in universities (Lwoga and Komba, 2015), thereby leading to improved students' achievements. This associated academic career achievement provides the promise for meaningful employment of graduates as well as movement towards a knowledge-based economy and rapid national economic growth (Olson *et al*., 2011). Based on this reason, most governments and universities in developed countries have invested in ICTs, e-learning systems in particular. As such, electronic learning systems (e-learning systems) have become a major phenomenon in recent years (Tossy, 2012) as they transform teacher-centered teaching and learning system into a student-centered one (Truncano, 2005). Further, this transformation enables students to develop their problem-solving abilities; information reasoning and communication skills; improves creativity and other higher orderly-thinking skills (Rosenblit *et al*., 2005). The system indeed changes the way in which teaching, learning, and administration of education activities are conducted (Tossy, 2012; Lwoga and Komba, 2015); offers efficient use of

time and ease sharing of educational materials between students and staff (Shivaraji *et al*., 2013) and improves the quality of teaching and learning (Kahiigi *et al*., 2008; Jones, 2011).

Despite these notable attributes of utilisation of e-learning in teaching and learning, its impact on student's achievements remain difficult to measure and open to debate as there are few conclusive statements (Truncano, 2005; Rosenblit and Gros, 2011). Others further argue that there is a contradiction on the conclusion on the impacts of e-learning systems on student's achievement (Hilz *et al*., 2001; Trancore, 2005). It is also argued that data to support the perceived impact from e-learning technologies are limited and evidence of effectiveness, motivation, usefulness, innovativeness and performance impact are elusive (Eurydice, 2011; Bocconi *et al*., 2013; Pandolfini, 2016). In developing countries, there is paucity of information about the relationship between e-learning technologies and student's achievement (Rosenblit *et al*., 2011). There is thus a need to carry out more research, notably to develop useful indicators and methodologies that need to be used in measuring the impact of e-learning in teaching and learning in developing countries including Tanzania in order to guide policy formulation. This is important because developing countries including Tanzania are still at a very basic stage of e-learning technology adoption. Tanzania needs to tap into experiences of universities in developed countries that have long experience of using e-learning so as to formulate innovative corrective measures.

E-LEARNING CONCEPT

Wentling *et al*. (2000:5) define e-learning as: ""The acquisition and use of knowledge distributed and facilitated primarily by electronic means. This form of learning currently depends on networks and computers but will likely evolve into systems consisting of a variety of channels (e.g. Wireless, satellite), and technologies (e.g. Cellular phones, etc.) as they are developed and adopted. E-learning can take the form of courses as well as modules and smaller learning objects. E-learning may incorporate synchronous or asynchronous access and may be distributed geographically with varied limits of time." (Wentling *et al*., 2000:5).

E-learning captures a wide range of terms (Albert & Mori, 2001) referred to as 'labels' which have been used to describe the concept of e-learning. These labels include, but are not limited to Web Based Learning (WBL), Web Based Instruction (WBI), Web Based Training (WBT), Internet Based Training (IBT), Online Resource Based Learning (ORBL), Advanced Distributed Learning (ADL), Tele-Learning (T-L), Computer-Supported Collaborative Learning (CSCL), Mobile Learning (M-learning or ML), Nomadic Learning, Off-Site Learning (Collis 1996; Khan, 2005; Yieke, 2005; Bates, 2009; Dam, 2004; Goodear *et al*., 2001; Pegler & Littlejohn, 2007; Dabbagh *et al*., 2000; Barbara, 2002,; Cramer *et al*., 2000; Salzbert & Polyson, 1995; Schreiber *et al*., 1998; Schank, 2001; Howel, 2003; and Singh, 2003). The e-learning term is used interchangeably with other related terms such as online learning, virtual learning, and web-based learning (Twaakyondo, 2004). While the use of e-learning has the added value of flexibility (anywhere, anytime, anyplace), E-learning facilitates both learner engagement and the engaging of experiences (Uys, 2004; Meyen, 2000). Meyen (2002) demonstrate how e-learning helps to overcome the traditional barriers to education delivery. These barriers include lack of physical infrastructure, lack of qualified teaching staff, absence of adequate education budgets, and the failure of traditional pedagogy and curricula. East African countries are characterised by these barriers (Ndume *et al*, 2008). The failure of the government's efforts in building physical classrooms has created an opportunity for innovative education delivery via e-learning (Yieke, 2005). As Alavi and Leidner (2001) argues that e-learning's importance will grow right across the educational spectrum from primary to HEIs, the e-learning implementation in Tanzania HEIs is taking place despite the various outlined barriers. The e-learning implementation differs from one HEI to another. This different implementation level is noted to be a cause of lack of unified

justification of its benefit. The benefits of e-learning are accounted mainly the cost efficiency, accessibility and flexibility in terms of time and place. Other benefits include is that, it allows learning to take place when the lecturer and the learner are separated both in time and space (Uys, 2003). It offers convenience for both tutor and the learner (learning anytime or anywhere). Despite the numerous benefits of e-learning it has, its impact specifically on student's achievement is not well known in developing countries particularly in Tanzania context.

Tanzania Higher Education Status

According to TCU (2010), the education sector in Tanzania has grown drastically for the past fifty (50) years; this has been due to an increase in the number of Higher Education Institutions (HEIs). The students' enrolment has increased tremendously since independency. As MoEVT (2011) states that the number of students enrolled in HEIs increased drastically. In 1961, Tanzania had 1,737 students enrolled in 4 HEIs, while in 2011 a total of 244,045 students in 358 HEIs (MoEVT, 2011). This emanated from free markets which encourages establishment of both private and public HEIs, backed by various government policies on education sector such as Vision 2025, ICT Policy and Higher Education Master Plan (HEMP), which enhance the establishment of both private and public HEIs (Maliyamkono, 2006:396-445). Despite the fact that the number of HEIs has increased since 1961, the pace of increase of students compared to overall national population growth doesn't match the enrolment offered by these institutions (Maliyamkono, 2006). This is due to limitation on enrolment capacity, geographical constraints, cost of education, lack of enough infrastructures, lack of qualified personnel and lack of innovative ideas. In the light of those challenges, e-learning is sought to be the ultimate solution in which the enrolment does neither depend on the infrastructure nor geographical locations (Noe, 2005). As MoEVT (2011) argues that the HEIs should deploy e-learning for their day to day training activities, in order to minimize training cost and to remain competitive in the market. Furthermore, while MoCT (2003) articulates the need for harnessing ICT opportunities to meet the vision 2025 goals by blending strategic ICT leadership; ICT infrastructure; ICT Industry through Human Capital, MoEVT (2007) stipulates that Tanzania needs national e-learning sensitization by stressing the effort on applications such as e-learning, m-learning and blended learning in campus education and distance education.

E-LEARNING STATUS AT HLIS IN TANZANIA

Dr. Gajaraj Dhanarajan (2001:9), President of the Commonwealth of Learning, argued that: "One would be foolish to question the importance of the internet and www for education in this new decade; at worst it has the ability to connect communities of learners and teachers and at its best it could very well be the tool that education has been waiting for these past thousands of years; its promise is only limited by the imagination and capacity of the people who can apply and benefit from it".

This kind of vision of a future electronically driven and inclusive education has been a driving force for higher education institutions (HEIs) in Tanzania and has provided the spur to implement e-learning. As is the case with other African countries, the rate of implementation of e-learning platforms in Tanzania is still very slow despite the potential opportunities provided by open source technology and the conducive environments created by the respective governments. There have been some initiatives on the part of governments to develop ICT policies as a way forward in the implementation of e-learning. In addition, there have been different round table conferences and the formation of the Tanzania Commission of Universities (TCU) has fostered a debate on a common education delivery. For example, Tanzania has abolished all taxes related to computers and related equipment and reduced license fees and royalties payable by the telecommunication operators (Morrison & Khan, 2003 and McPherson & Nunes, 2005). The more established public

and private HEIs have managed to implement e-learning platforms in Tanzania. They are implementing these using either open source or customized platforms such as WEBCT, Blackboard, Moodle, Joomla, etc. Other universities in the Tanzania have started the basic process of ICT infrastructure expansion to include local area network implementation, Internet, computer labs and other facilities, as a way forward to the establishment of e-learning (Sife *et al*., 2007). Generally e-learning in Tanzania HEIs is at the very basic stage. This has been forced the e-learning stakeholder to adopt and use the blended learning mode in teaching and learning. The blended learning mode is normally employed to the practice of using both online and face to face (f2f) learning experiences when teaching students in Tanzania HEIs. For instance, in a blended-learning course, students attend a class taught by a teacher in a traditional classroom setting, while also independently completing online components of the course outside of the classroom (Tarus and Gichayo, 2015).

Theoretical foundation of the Conceptual Model

While e-learning is not a new phenomenon in the developed world, it may be new to some developing countries. Its market is rapidly increasing globally. While Tyechia (2014) argues that the e-learning is the fastest growing sector in the developed countries, many developing countries (including Tanzania) are striving to implement e-learning in HEIs. Doughty *et al*. (2001) has documented the rise of the virtual university in Africa (including Tanzania). There are many e-learning initiatives in progress in Tanzania, such as Schoolnet, e-learning centres, and African Virtual University (Ndume *et al*., 2008; Sife *et al*., 2007). The increase in the demand for higher education is one of the driving forces for implementing e-learning. Higher population growth, lower education costs, increased access to education, and higher participation rates in higher education changes the way firms organize work and cost-effectiveness and are factors driving the implementing of e-learning in Tanzania (Ndume *et al*., 2008). Despite these drivers, the impact of e-learning on students' achievement is the issue that has not taken care clearly particularly in developing countries.

In the last few years various studies have been conducted all over the world on e-learning impact (Rogers 2004: Ruiz *et al*., 2006; Rosenblit *et al*., 2011; O'Donnell 2012). In these studies, Rogers (2004) revealed students' opinions on the use of e-learning and how it had impacted on their learning. His findings on students' perceptions of e-learning were positive, with 79% responding that e-learning positively impacted on their study. O'Donnell (2012) indicates that students are of the opinion that the use of e-learning in higher education can beneficially transform learning. Ruiz *et al*. (2006) conducted a study on the impact of e-learning in medical university and concluded that e-learning real offer learners a great flexibility in their learning. Churchill (2005) recommended that the use of e-learning to effectively enhance the students' learning through acquisition of knowledge and skills, students' development as autonomous learner as well as students' motivation. The subsequent section provides brief discussion on the findings from various studies based on the variables outlined below.

Students' acquisition of knowledge and skills (SACKS)

Oslon (2011) contends that students' effectiveness is closely related to how the e-learning is used as an educational tool. Olson further claim that students learn best with e-learning when interactively engaged in the content to acquire knowledge and skills as well as experience. Providing e-learning on its own without matching with curriculums which engage students on using e-learning has little impact in acquisition of knowledge and skills. Ruiz *et al* (2006) insists that setting a minimum requirement for student engagement with the e-learning resources positively impacts student's achievement in terms of acquisition of knowledge and skills. For instance Wilson and Christopher (2008) argued based on their study that over 75% agreed that e-learning improved student engagement with course material.

With regard to performance expectance students learn more if they expect that the technology may change their academic performance. However, Broad *et al* (2004) tentatively concluded that the use of an e-learning can facilitate student learning but their measurements of improved student performance were less conclusive. Venkantesh *et al*. (2003) using UTAUT, postulates that performance expectance have relationship with intention to use the technology with 70% significance. In this case performance expectancy have indirect relationship with students achievement (Chiu and Wang, 2008; Islam, 2011). Lwoga and Komba (2015) argue the same that performance expectancy was a strong predictor of continued usage intention of LMS, but had no effects on actual use of the system. In such situation little finding has been revealed in literature showing the positive direct relationship between students performance and e-learning usage. Coming to cognitive learning using e-learning, a question regarding critical thinking skills was distributed to respondents, 41% of Trinity College Dublin's students and 54% of Dublin Institute of Technology's students agreed that the use cognive learning using e-learning in higher education improves students' critical thinking skills (Ruiz *et al*., 2006: Olson, 2011). In this regard cognitive learnig through e-learning have positive impact on student's achievements through increasing their knowledge and skills in learning. Based on the literature, the following hypotheses are proposed:

H1. Students' engagement on using the system has a significant positive relationship with their achievements
H2. Students' performance expectancy has a significant positive relationship with students' achievement
H3. Cognitive learning using e-learning system has a significant positive relationship with students' achievement

Students' development maturity as autonomous learner (SDMAL)

The study conducted by Ruiz *et al*. (2006) indicated positive impact that the use of e-learning give students control over learning contents, learning sequence pace of learning, time and experience to meet their personal learning objectives. Mason and Rennie (2006) suggest that enabling learners some control over their pace and learning style can provide a richly stimulating learning experience for the student. Base on DeLone and McLean (1992) IS success model it is concluded that e-learning impact on students achievement is positively depend on user satisfaction on using e-learning in learning. Overbaugh and ShinYi (2006) argue that students' satisfaction on learning can be influenced positively by the use of e-learning contents that accommodate various learner's/student's characteristics/learning orientations. For instance, the study by Wilson and Christopher (2008) and O'Donnell. (2012) concluded from their study more than 80% of students agreed that the use of technology effectively enhances the learning experience and increases user satisfaction with their course of study.

Indeed, the most important aspects that influence students to continue using e-learning and in turn influence positively students achievement in learning includes: it is useful for learning, enables to accomplish tasks more quickly, increases productivity and increase chances of getting raise (Al-Alak & Alnawas, 2011; Macharia & Nyakwende, 2010; Venkatesh *et al*., 2003). Similarly, according to DeLone (2003) increased "user satisfaction" will lead to increased "intention to use," and thus "use. He further postulates as a result of this "use" and "user satisfaction," certain "impact on student's achievement" will occur. Thus, definitely show that there is a significance relationship between continue using e-learning and the impact of students achievement in learning. Based on the literature, the following hypotheses were proposed:

H4. Students control on using e-learning system has positive relationship with students' achievement

H5. Students' continued use of e-learning system has relationship with students' achievement
H6. Students' satisfaction on e-learning system has positive relationship with students' achievement.

Students Motivation (SM)

According to a theory of human motivation (Hertzberg, 1950), motivation includes intrinsic and extrinsic factors. In this study motivation is an extrinsic concerned with self-esteem, confidence, enjoyment and willingness to partake an activity. Based on this definition, Harrison *et al*. (2001) explain that e-learning use creates a learner-centered environment such as motivating learners by combining text, sound, color, and moving images that enhance content for easier learning. Using technology can motivate students, particularly under-achieving students to learn. Jelfs and Colbourn (2002) concluded that there were positive correlations between how comfortable students motivated, self esteemed and more confident while taking part in virtual seminars and the value of the learning experience. It has been also noted by Mtebe and Raisamo (2014) that self esteem, motivation and confidence aspect predicts the impact on students' achievement in continued usage of e-learning significantly. Based on the literature and theory of human motivation, the following hypotheses were proposed:

H7. Student's enjoyment on using e-learning system has positive relationship with students' achievement
H8. Students self esteemed on e-learning system has positive relationship with students achievement
H9. Students' confidence on e-learning system has positive relationship with students' achievement

CONCEPTUAL MODEL DEVELOPMENT

The conceptual research model for this study was formulated based on the integration of concept from various theories and models. Such theories and models include, information system (IS) success model adapted from DeLone (2003), Unified Theory of Acceptance and Use of Technology (UTAUT) model adapted from Venkatesh (2003) and Theory of human motivation developed by Maslow (1943). DeLone model was used because of its contribution in measuring individual and organisation impact on using information system. Further, the dependent variable(s) (Individual Impacts on e-leaning) of this study is within the context of DeLone & McLean. Other reason is that, the model is widely popular which strong evidence of the need for a comprehensive model in order to integrate research findings. The UTAUT was chosen among other theories because of its comprehensiveness and higher explanatory power than other similar theories and models in technology acceptance (Venkatesh *et al*., 2003) which contributes variable such as effort expectancy and performance expectancy of the use of e-learning. On the other hand, the theory of human motivation was used in this study to supplement other variables in relation to human behavior as the study dealt with students with behavioral towards using e-learning in learning context. Variable such as self esteem, confidence and enjoyment were derived from the theory of human motivation.

The model in this study consists of independent and dependent variables. The independent variables are in three constructs each consists of three observed variables. While dependent variable has effectiveness, performance, usefulness, innovation and motivation on learning of e-learning indicators as illustrated in Figure 1. This paper therefore uses this conceptual model to underpin the measurement of the impact of e-learning system on student's achievement.

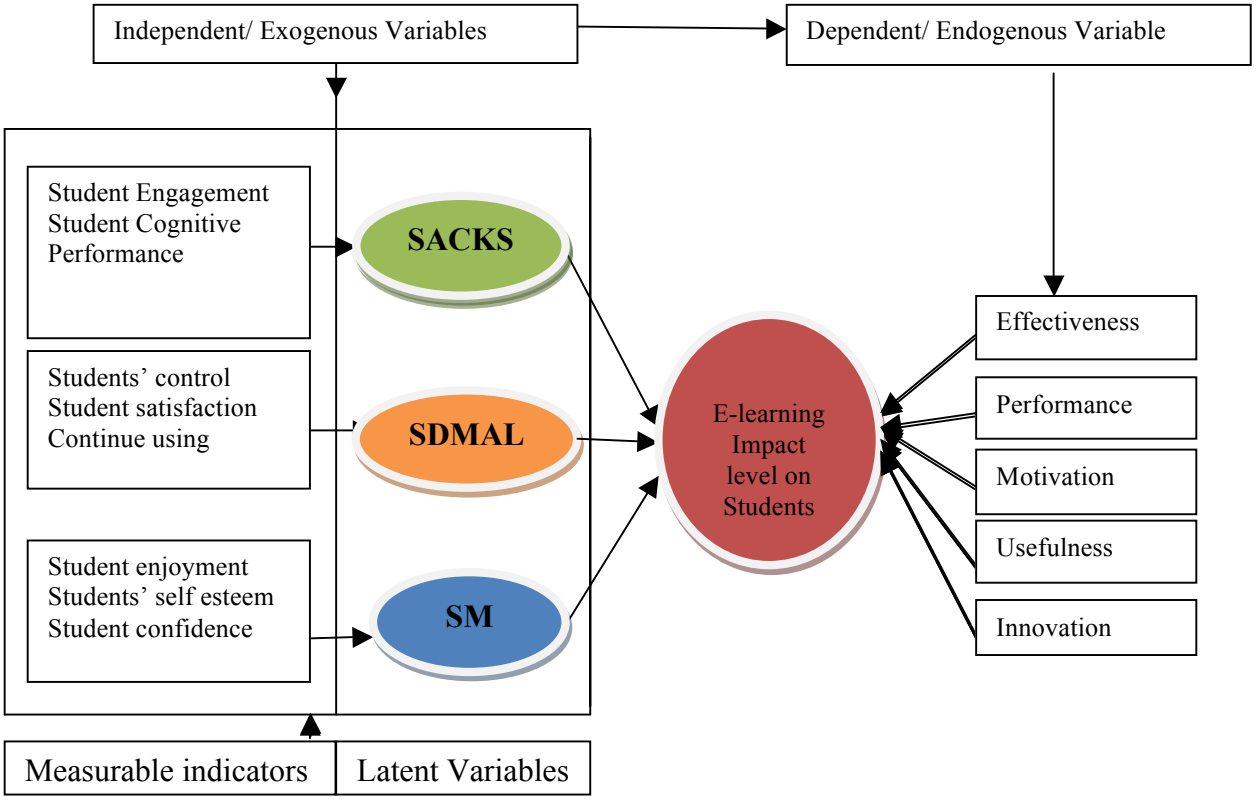

Figure 1: *Integrated Conceptual Model Adapted from DeLone and McLean (2003) and UTAUT (Venkatesh et., 2003)*

Based on the conceptual model depicted in Figure 1 and the hypothesis developed in the previous section, Table 1 indicates exemplary measure of student's impact on using e-learning as an dependent variable.

Table 1: *Exemplary measure of students Impact*

Item	**Reference**
Effectiveness	Davis (1989), Iivari (2005)
Motivation	Sedera and Gable (2004), Gable et (2008)
Usefulness	Davis (1989), Iivari (2005)
Innovation	Torkzadah and Doll (1999)
Performance	Davis (1989), Iivari (2005)

Source: (Researcher, 2017)

Table 2: *Summarised Operationalisation of Variables used in this study*

Variable	Definitions	Reference
Engagement	Refers to the degree of attention, curiosity, interest, optimism, and passion shown in learning	Ruiz *et al*. (2006) and Churchill (2005)
Performance Expectancy	Refers to the degree to which students perceive that the system will enable them to perform better in their course programmes	Dwivedi *et al*., 2011; Pušnik *et al*., 2011; Venkatesh *et al*., 2003
Cognitive learning	Ability to process information, reason, remembers, and relate. It is about knowledgeable and aware about what you think	Olson (2011),
Students Control	Refers to a situation in which mange to use the technology through learning contents, learning sequence pace of learning, time and experience to meet their personal learning objectives	Ruiz *et al*. (2006) and Olson (2011)
Continue using	Refers to a process by which student continue using a particular technology in turn enables to accomplish tasks more quickly, increases productivity and increase chances of getting raise	Al-Alak & Al-nawas, 2011; Macharia & Nyakwende, 2010; Venkatesh *et al*., 2003
Satisfaction	It is a measure of how technology and its services meet or surpass student's expectation. Or degree to which the system in question enhances productivity	DeLone and McLean (2003), Cyert and March (1963)
Motivation	Motivation refers to "the reasons underlying behaviour such as enjoyment, interest, or pleasure.	Guay *et al*. (2010), Deci *et al*. (1999)
Self esteem	Refers to self appreciation over a certain technology through its usefulness	Mtebe & Raisamo (2014) and Al-Alak & Al-nawas, 2011;
Confidence	Refers to self believe towards a particular technology driven by motivations	and Al-Alak & Al-nawas, 2011

Source: (Researcher, 2017)

METHODOLOGY

The study used a survey design, involving four (4) public HEIs. These were thus purposively selected amongst 30 HEIs in Tanzania because these universities are public universities. The criterion such as experience (in using e-learning), mode of delivery (distance learning), nature of HEI (comprehensive-science and art courses) and geographical location were used in selection process. Stratified proportionate sampling technique was employed to group up students who were using e-learning from each of the four HEIs. Three hundred and fifty (350) respondents used in this study, thereby 306 respondents equal to 87.5% representing the planned respondent

pool. Proportionate stratification was used to determine the number of students from their groups. The survey questionnaire consisted of five point Likert scales (Likert, 1932) was employed.

The in-depth interview was employed to supplement the questionnaire by collecting qualitative data from ICT experts during model validation. Before SEM analysis, Confirmatory Factor Analysis (CFA) was employed to evaluate construct validity and reliability of this study as the sample size is at least 300 as suggested by Hair *et al*. (2003) and Isaga (2012).

The data collected from questionnaire was analysed quantitatively by categorising and coding. After coding, SPSS statistical analysis software version 20 was used to analyse the data. The data was then analysed quantitatively to identify different indicators and aspects relating to the measure of the impact of using e-learning systems on students' achievements. The empirical data were analysed using multiple regressions and structural equation modeling (SEM) using Statistical Package for Social Science (SPSS) version 20. The multiple regressions were used in analysing hypothesised relationships conceptualised in the research model. Qualitative data collected from interviews during model validation was organised into relevant themes and concepts, then descriptions and discussions given were used to re-build the model. The Delphi technique is a group communication method where a panel of ICT experts from four (4) HEIs arrived at a consensus over a series of questions and discussions based on the features of developed model (Harold and Murray, 1975) and (Rowe and Wright, 1999). The questions and discussions were about to forecast the applicability of the model in Tanzanian HEIs context. The consensus information was collected by the researcher for improving the model developed and tested by SEM.

The study adhered to the research ethics by doing the following: First, the researcher asked for permission from the four HEIs where the study was going to take place. Second, the research also adhered to the respondent's privacy and security. Good language was used, respondents were requested to join the study willingly, no force was used in soliciting data from the respondents and any respondent was free to withdraw from the study at any stage that she/he wished to do so. Also, the purpose of research was well explained, respondents were assured of high level of confidentiality and were told that the information provided was for academic purposes only and not otherwise.

PRESENTATION OF RESULTS

E-learning experience

The study revealed that 75% of the respondents were very high experience in using e-learning systems in learning; (9.5%) have revealed with high experience and have attended a course on e-learning; while (2%) of respondents have noted with moderate e-learning experience in using it (2%). It was further evident that 79% of students were aware of the use of e-learning frequently in their day-to-day learning activities, while 65% were found to have intention of using e-learning methods in their academic career.

Construct validity and reliability of the study

The analysis of model was done by assessing convergent validity, internal reliability, and model of fit analyses using Confirmatory Factor Analysis (CFA). The results for each construct were presented in Tables 3, 4 and 5.

Table 3: *Model fit for SACKS construct*

Cronbach Alpha 0.815					
Model of Fit	**NFI Delta1**	**RFI rho1**	**IFI Delta2**	**TLI rho2**	**CFI**
Default model	.922	.894	.876	.900	.850
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000
Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan & Nullen, 2008; Kline, 2005)					

Of the three items loaded above 0.5 the results indicates that the items are good measures of SACKS construct as they provide good convergent validity. The items include; SE was loaded by 0.65, SC loaded by 0.63 and PE was loaded by 0.69. In assessing the internal reliability; a Cronbach's alpha of 0.815 was obtained. *The value indicates good internal reliability and consistence of the SACKS*. The mode of fit for the technological construct was assessed by using several indices as presented in Table 3. *From the findings, it was noted that the fit of the construct is good as all indices are within the suggested values close to 1*.

Table 4: *Model fit for SDMAL construct*

Cronbach alpha 0.783					
Model of fit	**NFI Delta1**	**RFI rho1**	**IFI Delta2**	**TLI rho2**	**CFI**
Default model	.853	.589	.909	.785	.899
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000
Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan & Nullen, 2008; Kline, 2005)					

Source: (Analysis of field data, 2017)

Of the three items loaded above 0.5 were used to measure user construct, the result indicates that the *items are good measures of user SDMAL as they provide good convergent validity*. The items measured with their loading weight include; SCU was loaded by 0.51, SCOU was loaded by 0.68 and SS was loaded by 0.50. In assessing the internal reliability; a Cronbach's alpha of 0.783 was obtained. *The value indicates good internal reliability and consistence of the user construct*. In this case the mode fit for the SDMAL construct was assessed by using several indices as presented in Table 4. *From the findings, it was noted that the fit of the construct is good as all indices are within the suggested values close to 1*.

Of the three items loaded above 0.6 were used to measure SMT construct, *the result indicates that the items are good measures of SMT construct as they provide good convergent validity*. The items measured with their loading weighs include; SCON was loaded by 0.690, SSE was loaded by 0.687, MT loaded by 0.747. While in assessing the internal reliability; a Cronbach's alpha of was acceptable level of 0.912. The value indicates acceptable internal reliability and consistence of the MT construct. The mode fit for the MT construct was assessed by using several indices as presented in Table 5. *From the findings, it was noted that the fit of the construct is good as all indices are within the suggested values close to 1*.

Table 5: *Model fit for MT construct*

Cronbach alpha 0.912					
Model	**NFI Delta1**	**RFI rho1**	**IFI Delta2**	**TLI rho2**	**CFI**
Default model	.945	.835	.951	.850	.950
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000
Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan & Nullen, 2008; Kline, 2005)					

Source: (Analysis of field data, 2017)

Regression results on indicators and students' achievements

The relationship between the e-learning and students achievement has been described using various hypotheses in the methodology section. The regression analysis was done to reveal the relationships. Nine hypotheses have been developed and analyses from three unobserved indicators including Students' acquisition of knowledge and skills (SACKS), Students' development maturity as autonomous learner (SDMAL) and Students Motivation (SM). Table 6, 7 and Table 8 show the results from SACKS, SDMAL and SMT respectively.

Table 6: *Regression results on SACKS and Students' achievements*

Coefficients[a]							
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	R^2
		B	Std. Error	Beta			
SACKS	(Constant)	10.810	1.293		8.357	.000	0.693
	Performance expectancy (PE)	3.021	.264	.414	11.436	.000	
	Cognitive learning (CO)	1.796	.238	.276	7.561	.000	
	Engagement on using e-learning (EU)	3.101	.284	.401	10.928	.000	

a. Dependent Variable: Students Achievement

Source: (Analysis of field data, 2017)

"Students' acquisition of knowledge and skills (SACKS)" is the first hypothesis tested. As seen in the previous section, three sub-hypotheses were developed. To test these sub-hypotheses, regressions is performed. The results of the study are shown in Table 6. From this table, it is clear that all three hypotheses tested indicated that there was significantly positive impact on student's achievement. Based on this finding, all hypotheses were fully accepted. Thus, the students' acquisition of knowledge and skills (SACKS) is a good measure of e-learning impact on student's achievement and the regression model fit as $R^2 > 0.693$.

Table 7: *Regression results on SDMAL and Students' achievements*

Coefficients[a]							
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	R^2
		B	Std. Error	Beta			
SDMAL	(Constant)	12.306	1.069		11.516	.000	0.752
	satisfactions on using e-learning (SE)	2.252	.200	.351	11.279	.000	
	Control on using e-learning (CE)	3.056	.225	.431	13.553	.000	
	Continue Using (CoU)	2.764	.224	.401	12.323	.000	

a. Dependent Variable: Students' achievement
Source: (Analysis of field data, 2017)

"Students' development maturity as autonomous learner (SDMAL)" is the second hypothesis tested. As seen in the previous section, three sub-hypotheses were developed. To test these sub-hypotheses, linear regressions is performed. The results of the regression are shown in Table 7. From this table, it is clear that all three hypotheses tested indicated that there was significant and positive impact on student's achievement. Based on this finding, all hypotheses were fully accepted. Thus, the students' development maturity as autonomous learner (SDMAL) is a good measure of e-learning impact on student's achievement and the regression model fit as $R^2 > 0.752$.

Table 8: *Regression results on SDMAL and Students' achievements*

Coefficients[a]							
Model		Unstandardised Coefficients		Standardised Coefficients	t	Sig.	R^2
		B	Std. Error	Beta			
SM	(Constant)	12.910	1.116		11.568	.000	0.733
	Enjoyment on using e-learning (MU)	2.838	.217	.436	13.064	.000	
	Self esteem on using e-learning (SEU)	2.637	.244	.372	10.821	.000	
	confidence on using (CON)	2.255	.212	.346	10.614	.000	

a. Dependent Variable: Students' achievement
Source: (Analysis of field data, 2017)

"Students' motivation (SM)" is the first hypothesis tested. As seen in previous section, three sub-hypotheses were developed. To test these sub-hypotheses, linear regressions is performed. The results of the linear regression are shown in Table 8. From this table, it is clear that all three hypotheses tested indicated that there was significant and positive impact on student's achievement. Based on this finding, all hypotheses were fully accepted. Thus, the Students' development maturity as autonomous learner (SM) is a good measure of e-learning impact on student's achievement and the regression model fit as $R^2 > 0.733$.

The previously hypotheses were tested using SEM. Of the nine relationships, eight were statistically significant (Table 9). These were student's engagement (SS) ($\beta = .401$, $p < .01$); performance expectance ($\beta = .414$, $p < .01$); student cognitive learning (SC) ($\beta = .276$, $p < .01$) control on using e-learning ($\beta = .431$, $p < .01$); continued use of methods ($\beta = .401$, $p < .01$); satisfactions ($\beta = .351$, $p < .01$); enjoyment ($\beta = .436$, $p < .01$); self-esteem ($\beta = .372$, $p < .01$) and confidence on e-learning ($\beta = .346$, $p < .01$). Only students' confidence in using e-learning in learning context was not supported.

Table 9: *Summary of hypotheses tested*

	Hypotheses	Accepted / Rejected	β, p < .01
H1	Students' engagement on using the system has a significant positive relationship with their achievements	Accepted	.401
H2	Students' performance expectancy has a significant positive relationship with students' achievement	Accepted	.414
H3	Cognitive learning using e-learning system has a significant positive relationship with students' achievement	Accepted	.276
H4	H4**.** Students control on using e-learning system has positive relationship with students' achievement	Accepted	.431
H5	H5. Students' continued use of e-learning system has relationship with students' achievement	Accepted	.401
H6	Students' satisfaction on e-learning system has positive relationship with students' achievement	Accepted	.351
H7	Student's enjoyment on using e-learning system has positive relationship on students' achievement	Accepted	.436
H8	Students self-esteemed on e-learning system has positive relationship students' achievement	Accepted	.372
H7	Students' confidence on e-learning system has positive relationship on students' achievement	Accepted	.346

Source: (Analysis of field data, 2017)

Modeling the Impact of E-learning on students' achievement

With the latent variables presented in the conceptual model, Structural Equation Modeling (SEM) approach (Bollen, 1998; Hoyle and Panter, 1995) was used to determine the cause-effect relationships among the latent variables with their indicators and the e-learning on students' achievement in education. Figure 2 was developed using SEM and tested using analysis result and used to determine the value of dependent variables. The models were developed for Students' acquisition of knowledge and skills (SACKS); Students' development maturity as an autonomous learner (SDMAL) and Motivation (SM). SACKS indicators were student engagement (SE); cognitive capacity (SCO) and Performance expectancy (PE). It was further apparent that SDMAL measurable indicators were students' control (SCOU); satisfaction (SS); continued use (SCU) and the measurable indicators for SM were student enjoyment (SEJ); self-esteem (SSE) and confidence (SCON).

From Figure 2, the factor loadings for SE, SC and PE indicators are above 0.3. This indicates that the items are good measures of SACKS construct. Furthermore, it was deduced that the factor loadings for SCU, SCOU and SS indicators are above 0.3. Similarly, the factor loadings for SCON, SSE and SM indicators are above 0.3. This indicates that the items are good measures of SMT construct. This indicates also that the items are good measures of SMT. From findings the SACKS construct can only predict direct impact of students' achievement (1 standard deviation of SACKS predict 1.16 standard deviation of students' achievement). Likewise the SDMAL construct can only predict direct impact of students' achievement (1 standard deviation of SDMAL predict 0.79 standard deviation of students' achievement).

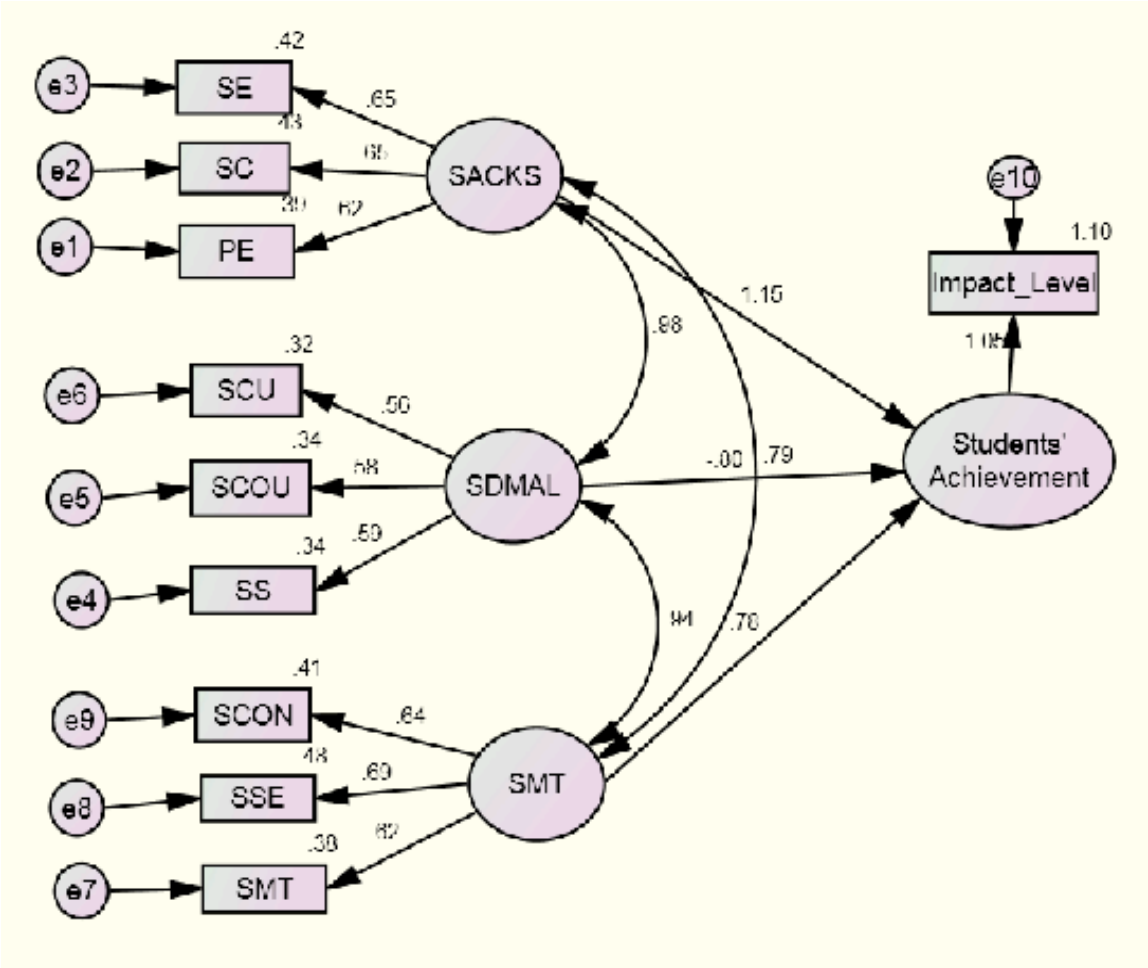

Figure 2: *A SEM for measuring e-learning impact on students' achievement (Analysis of field data, 2017)*

Where:
PE = Performance expectancy: SC = Student Cognitive: SE = Student Engagement: SS =Student satisfaction: SCO = Students' control: SCU = Student Continued Use: SEJ = Student Enjoyment: SSE = Students' self-esteem: SCON= Confidence

Also from Figure 2, the SMT construct can only predict direct impact of students' achievement (1 standard deviation of SMT predict 0.78 standard deviation of students' achievement) in addition to that the entire model was found to have a significant fit for the study as shown in Table 10 (Hoyle and Panter, 1995).

From the Table 10, it was revealed that the goodness of fit of the model is very good. The model fit is very good because all the indexes are close to 1 and that of RMSEA fall in the recommended range (Hooper, Coughlan & Nullen, 2008; Kline, 2005). Further, the p-values from the table indicates significance at .000 smaller than 0.001. Therefore, results indicate that there were insignificant errors in measuring the endogenous constructs of the model.

***Table 10**: Goodness of fit of model*

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	P-VALUES	CFI	RMSEA
Default model	.957	.936	.974	.961	0.000	.974	0.071
Saturated model	1.000		1.000		0.000	1.000	
Independence model	.000	.000	.000	.000	0.000	.000	0.339
Recommended values: NFI, RFI, IFI, TLI and CFI should be close to 1 and 0 ≤ RMSEA ≤ 0.1 (Hooper, Coughlan & Nullen, 2008; Kline, 2005)							

Source: (Analysis of field data, 2017)

Delphi Technique for Validating the Model

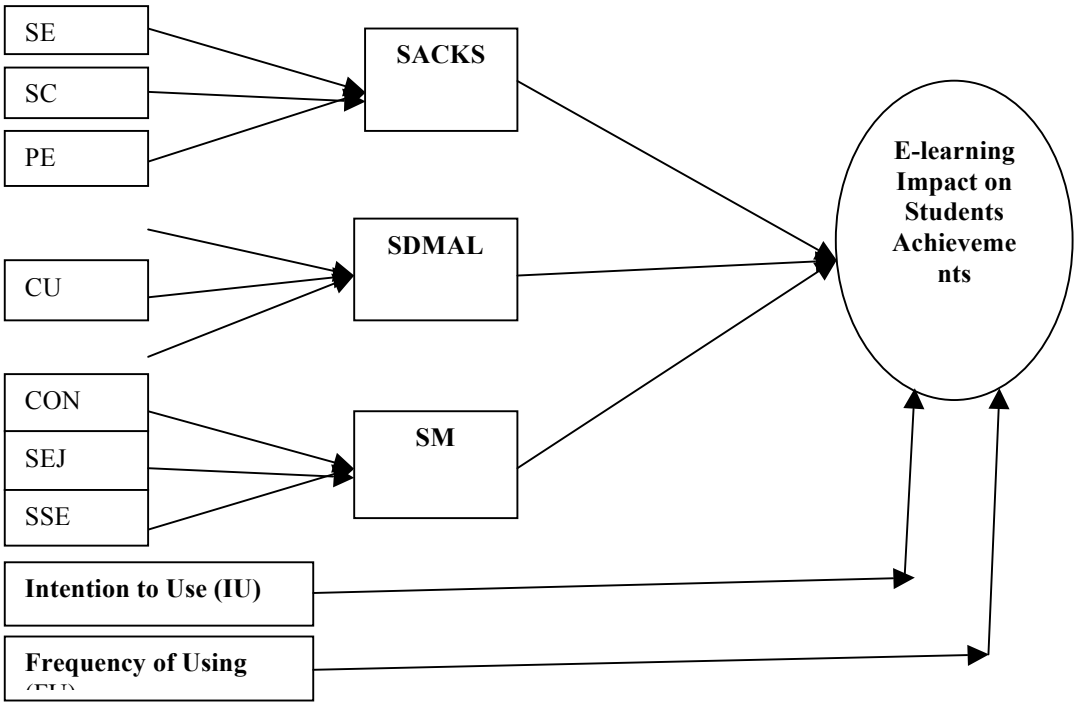

***Figure 3:** A final model for Measuring the Impact of e-learning on Students Achievement*

DISCUSSION

Following the presentation of results and findings in the previous sections, this section discusses the results based on the measuring the impact of e-learning on students' achievements. The discussion is centered at discussing the significance of various indicators of e-learning impacts students' achievement. The results and findings were discussed in relation to previous similar studies.

The study revealed that 75% of the respondents were very high experience in using e-learning systems in learning; (9.5%) have revealed with high experience and have attended a course on e-learning; while (2%) of respondents have noted with moderate e-learning experience in using it (2%). It was further evident that 79% of students were aware of the use of e-learning frequently in their day-to-day learning activities, while 65% were found to have intention of using e-learning methods in their academic career. These results match with those of previous studies (Alexander, 2008: Mazman and Usluel, 2009: Lwoga and Komba, 2015) which found that the more a person is involved in Internet or Web activities, the more they are likely to use e-learning. It is therefore more likely that, in developing countries particularly Tanzania, usage rate of e-learning methods is likely to increase if university can afford to embrace them in institutional operations.

The findings of this study revealed that students' acquisition knowledge and skills (SACKS) has found to be predictor of impact of e-learning on students' achievements. The evidence suggests that students find e-learning useful in increasing knowledge and skills for effectiveness, productivity in their learning, and accomplishing their course tasks quickly (Lwoga and Komba, 2015). In line with this, Olson (2011) contends that students' effectiveness is closely related to how the e-learning is used as an educational tool. The findings of this study further resembles with other findings from the study by (Ruiz *et al*., 2007: Olson, 2011). For instance, a questionnaire regarding critical thinking skills was distributed to respondents, 41% of Trinity College Dublin's students and 54% of Dublin Institute of Technology's students agreed that the use cognive learning using e-learning in higher education improves students' critical thinking skills. The findings further agree with the cognitive learning of theory that explains thinking and differing mental processes and how they are influenced by internal and external factors in order to produce learning in individuals as an impact.

With regarding to students' development maturity as autonomous learner (SDMAL), the study findings revealed that all variables were good measure of e-learning impact on students' achievement. The study conducted by Ruiz *et al*. (2007) and Mason and Rennie (2006) supported the same, indicating positive impact that the use of e-learning give students control over learning contents, learning sequence pace of learning, time and experience. Likewise they suggest that enabling learners some control over their pace and learning style can provide a richly stimulating learning experience for the student. Base on the user satisfactions the findings of this study revealed to be positive indicator to measure e-learning impact to students achievement which in line with the findings of the study by DeLone and McLean (1992), Overbought & ShinYi, 2006). The study by Wilson and Christopher (2008) and O'Donnell. (2012) concluded the same from their study that, more than 80% of students agreed that the use of technology effectively enhances the learning experience and increases user satisfaction with their course of study. Indeed, continue using e-learning influence positively students achievement in learning includes (Al-Alak & Alnawas, 2011; Macharia & Nyakwende, 2010; Venkatesh *et al*., 2003) which is also supports the findings of this study.

From the findings of this study, all indicators from student's motivation have positive relationship with e-learning impact towards students' achievement. Jelfs and Colbourn (2002) supported with evidence that there were positive correlations between how comfortable students motivated, self esteemed and more confident while taking part in virtual seminars and the value of the learning

experience. Other evidence to support this findings have been given by Olson *et al*. (2011) who agree that e-learning use creates a learner-centered environment such as motivating learners by combining text, sound, color, and moving images that enhance content for easier learning. It has been also noted by Mtebe & Raisamo (2014) that self esteem, motivation and confidence aspect predicts the impact on students' achievement in continued usage of e-learning significantly. The findings further agree with the theory of human motivation (Hertzberg, 1950).

CONCLUSION AND RECOMMENDATIONS

This study shows that developed an integrated model (Figure 7.2) has the potential to be used in measuring the impact of e-learning on students' achievements in universities and other institutions. Results obtained through a mixed research method approach revealed that Student Engagement, Cognitive capacity, Performance expectancy, Control, Continued use, satisfaction, Confidence, Enjoyment, and Self-esteem are important measurable indicators of the model. In particular, intention to use and the Frequency of using e-learning are measurable variables from behavioral intention which is of particular importance in evaluating its impact on students' achievement. These are novel additional indicators to measure e-learning technology utilisation impacts using the developed model. These results call for more research that focuses on evaluating the impact of e-learning academic staff achievement in teaching and learning using the developed model in this study. The developed model as a result of this paper is important as it helps policy makers, university managements and other stakeholders to measure the impact of e-learning in order to understand the status of e-learning for justifying the total investment in learning context.

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