The Application of Structural Equation Modeling Technique to Analyze Students Priorities in Using Course Management Systems

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ABSTRACT

The objective of this paper is to report on the application of Structural Equation Model (SEM) to analyze factors that influence students' priorities when selecting a Course Management System (CMS). A Conformation Factor Analysis (CFA) was performed to test the reliability and validity of the measurement model. The study is motivated by the inconsistencies, duplication and loss of integrity of data caused by simultaneous usage of two CMS-WebCT and Electronic Campus (EC) e-learning tools in the faculty of Information and Communication Technology (ICT) at Tshwane University of Technology. A composite model of Diffusion of Innovations (DOI) theory and Technology Acceptance Model (TAM) was used to predict actual selection of CMS when mediated by prioritization. Results indicated that the complexity of WebCT negatively influences students' prioritization, whereas perceived ease of use and less complexity of EC drives them towards its selection. This paper provides an insight for antecedent factors essential for planning and implementing CMSs. The developed framework is expected to act as a guide for university administrators in making informed decision about investing in e-learning tools.

Keywords: E-learning tools, Course Management Systems, Structural Equation Modeling, Technology Acceptance, Diffusion of Innovations

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1. INTRODUCTION

The increasing use of the Internet and the evolution of Information and Communication Technology (ICT) have enabled teachers to extend the classroom beyond its traditional boundaries of time and space. Facilitation of online teaching and learning has been made possible through ICT. Course Management Systems (CMS) have been extensively used to supplement or organize a conventional course experience. This has led to very many e-learning tools being developed and many implemented in institutions of learning. Learners and their instructors have been made to cope with these changing trends in their general socio-cultural, educational, economical and technological environments for a better future. In spite of the multitude abundance of e-learning tools especially those meant for effective and real time delivery means to support teaching and learning, institution administrators should focus on the most important ones that are relevant to the learners' context.

A careful consideration of e-learning granularity [Horton and Horton 2003] indicates that relevancy is a key a factor for the success of any e-learning tool. If students perceive a CMS as not appropriate or relevant to their needs, such perception may render the CMS's expected benefits to be partially, if at all, attained. Researcher [Nanayakkara 2007] noted that institutions of higher learning spend huge sums of money on IT. However, as also noted by researchers [Abrahamson and Rosenkopf 1993; Saadé and Galloway 2005] many organizations adopt an innovation because of bandwagon pressures "rather than their updated assessment of the innovation efficiency or returns". Such a poorly evaluated acquisition may in most cases lead to poor utilization of the system and, to an extent, resistance from the users.

This paper proposes a structural equation modeling method to explain factors that influence students' priorities when selecting a CMS in learning and communication. This study is expected to contribute conceptually and operationally. It is expected to provide university administrators with a basis to make informed decisions amidst strict IT budgets. It will also help them to make better choices and selections of relevant CMS in the market flooded with e-learning tools.

2. THEORETICAL FRAMEWORK

Researchers [Allen and Seman 2003]; agree that e-learning is among those educational methods that allows flexible learner-centered education. Increasing use of e-learning has helped to bridge the gap between the rural disadvantaged and the urban rich by providing improved access to education. Universities world-wide have expanded by establishing different campuses beyond their geographical locations. Therefore, apart from electronic the 'e' in e-learning may also represent; extended, everywhere, experience, eccentric, every time, engagement and enhanced delivery of learning through Internet and wireless enabled mobile electronic devices [Wexler et al. 2008]. E-learning tools on the other hand may be classified into three categories [Horton and Horton 2003]; namely course or learning management systems (CMS/LMS), synchronous collaboration applications, and all other computer tools/applications including asynchronous collaboration applications. Recent research studies [Karaali, et al. 2010; Lee et al. 2009] have added game simulation software as an emerging accepted e-learning tool.

In their review of information systems success research, Delone and Mclean [2003]; established that different researchers emphasize the importance of system usage based on empirical findings. In the same perspective they found that many theories have been postulated and developed to explain the multidimensional nature of IS/IT success. These theories have been acknowledged in information system (IS) research for the role they play in giving useful insight into the perception of users towards IT and factors enabling their perception. These theories include; Theory of Planned Behavior (TBP) [Ajzen 1991]; Technology Acceptance Model (TAM) [Davis 1989]; Diffusion of Innovation Theory (IDT) [Rogers 1962 2003]; Model Combining the Technology Acceptance Model and Theory of Planned Behavior (C-TAM-TPB) [Taylor and Todd 1995]; Model of PC Utilization (MPCU) [Thompson et al. 1991]; Task Technology Fit model [Dishaw and Strong 1997]; General System Theory [Raisinghani and Schkade 1997]; Diffusion Theory [Raisinghani and Schkade 1997; Mao 2002]; and later the Unified Theory of Acceptance and Use of Technology (UTAUT) [Venkatesh et al. 2003].

Several researchers [Ma et al. 2005; Lee et al. 2009; Karaali et al. 2010]; have studied the factors influencing adoption and acceptance of e-learning. However, this study found little literature explaining students' preferences when they are faced with a situation of simultaneously using more than one e-learning tool. In their research, Nanayakkara and Whiddett [2004]; noted that one's choice to use a system may heavily depend on his perception to see that system as relevant and reliable. Researchers [Rogers 2003; Lee et al. 2009; Park 2009]; agree that a combination of factors influences choice of using an IT system and Rogers [2003]; adds that users will be less attracted to complex systems. Basing on this argument this study decided to use a composite model figure 1 combining TAM [Davis 1989; Davis et al.1992]; and the DOI [Rogers 1962 2003]. Both TAM and DOI express the need to investigate the various factors influencing the user's choice to accept and adopt technology which two are major antecedents for actual selection to use a CMS. These two models signify that such factors should not be considered in isolation from technical aspects. TAM's constructs perceived ease of use and perceived usefulness when mediated by behavioural intention, has been found to highly influence actual usage. Studies of Park [2009]; and Lee et al. [2009]; empirically tested TAM in regard to e-learning and found it very predictive. Landry et al. [2006] and Saade and Galloway [2005]; used TAM in their studies to measure students' acceptance of web-based e-learning tools. In both studies TAM was found to perform well. Landry et al. [2006]; found usage to be determined by the two TAM's constructs perceived ease of use and perceived usefulness though actual usage varied at different levels. This study therefore, intends to find whether relative advantage and complexity when used perceived ease can explain this variation.

Perceived Ease of Use: relates to the degree a student believes that he/she will find a CMS easy to use [Davis 1989; Davis et al. 1992]. This study assumed that since students have limited time to learn how to use a new IT innovation, a system assumed to be less complicated would attract many to use. This study derived its first hypothesis from this concept.

H1: Perceived ease of use will positively influence students' priority to select a CMS

Rogers [1962, 1995, and 2003] developed the diffusion of innovations [DOI] model to explain the rate of adoption of a new innovation and the factors influencing its usage. DOI has been applied in many studies [Rogers, 2003, Miner, 2007] to explain the adoption [or non-adoption] of IT systems. Two constructs of DOI relative advantage and complexity are used in this study.

Relative advantage: is the degree to which an innovation is perceived as better than the idea it supersedes [Rogers 1995; Miner 2007]. In this study, relative advantage refers to the degree students find convenience and satisfaction from a CMS hence the higher the priority they give to the system. Rogers [1995 2003]; adds that, the greater the perceived relative advantage of an innovation, the more rapid its rate of adoption will be. From this perception this study derived its second hypothesis

H2: Relative advantage will positively influence students' priority to select a CMS

Complexity: is the degree to which an innovation is perceived as difficult to understand and use [Rogers 1995]. In this study complexity relates to students' perception of a CMS as difficult to use. The more complex a CMS is perceived the less priority it will be given. From this notion this study derived its third hypothesis.

H3: Complexity of a CMS will negatively influence students' priority to select it.

The three constructs, perceived ease of use, relative advantage and complexity are mediated by prioritization to inform choice of selection of a CMS. This lead to the fourth hypothesis

H4: The higher the priority given to a CMS the higher the chances for it to be preferred for usage by students.

Figure 1 below represents the theoretical framework of the study.

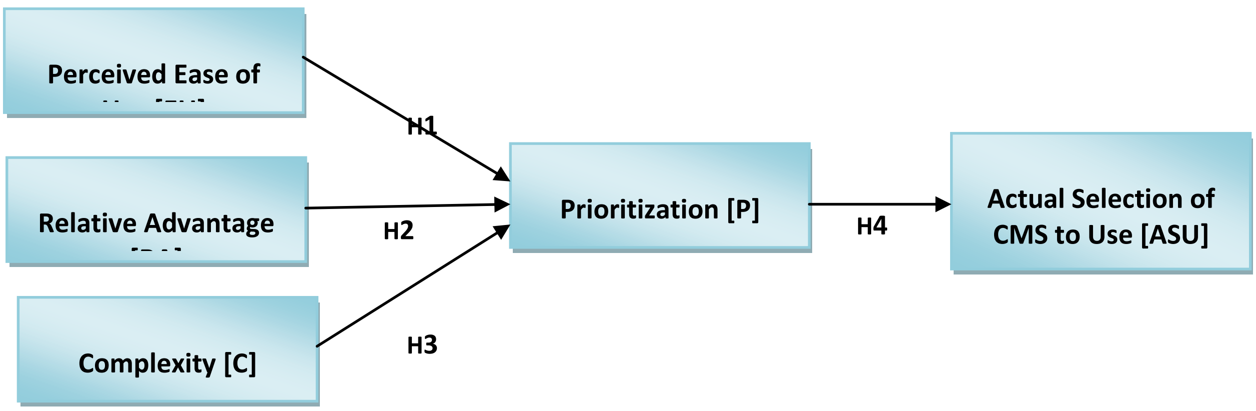

Figure 1: Theoretical Model

Researchers [e.g. Ma et al. 2005; Park 2009; Lee et al. 2009]; argue that there are several antecedents for users to perceive a system as easy to use. Nanayakkara and Whiddett [2004]; noted that these antecedents may include organisational, social, and individual factors. Several latent factors may create an impact on an individual's perception of a system. Such factors may also account for the inconsistencies in similar research studies like in the case of [Grandon et al. 2005; Ndubisi 2006]. In these two studies, one study found a factor as significant whereas the other found it insignificant. To avoid these contradictions, this study used structural equation modelling (SEM) for testing and estimating causal relations.

3. METHODOLOGY

3.1 Data Collection

Data was collected from Soshanguve and Pretoria campuses of Tshwane University of Technology using close-ended questionnaires. The questionnaire was designed based on a five point Likert scale for which (1) and (5) represented strongly agree and disagree respectively, (3) represented neutral and (2) and (4) median answers. A total of 200 questionnaires were distributed and 150 were returned registering a response rate of 75%. Out of the returned questionnaires 131 (87.3%) were usable while 19 (12.7%) had missing data which led them to be discarded. Distribution of questionnaire depended on lecturer and class representatives of the sampled classes who administered them to students before or after the lecture. Cases of non-returned questionnaires rose because some lecturers were forgetting to take them to class. A pre-test was conducted to validate the instrument with one class which the researcher was lecturing. From the feedback, it was agreed to change the layout of the questionnaire since most students had preferred to start with strongly agree rather than starting with strongly disagree. Therefore, some changes were made as deemed appropriate. Collected data was analyzed using SPSS 17.0 and AMOS 18.0 was used for SEM. The following steps of SEM analysis were followed; confirmatory factor analysis (CFA), discriminant analysis, composite reliability, and average variance extracted and finally the testing the fit for the hypothesized structural model and revised model as suggested by Hair et al. [2006].

Table 1 demonstrates the demographics of the respondents. Results shows that a big number of students (64.3%) use WebCt less or once a week whereas 57.3% of the students indicated that they use Electronic campus more than four times a week. This implies that there is a good usage of Electronic Campus as compared to WebCt. Results further indicate that students relatively have good experience of internet usage. This implies lack of experience of using web-based tools is not a hindering factor.

Table 1: Demographic Data of the Respondents (N=131)

Character		Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Male	64	48.9	48.9	48.9
	Female	67	51.1	51.1	100.0
Year of study	First year	1	.8	.8	.8
	Second year	34	26.0	26.0	26.7
	Third year	90	68.7	68.7	95.4
	Fourth year and above	6	4.6	4.6	100.0
Experience with Internet	less than a year	2	1.5	1.5	1.5
	1-3 years	68	51.9	51.9	53.4
	4-6 years	46	35.1	35.1	88.5
	more than 6years	15	11.5	11.5	100.0
Frequency of usage of Webct	Once week	81	61.8	64.3	64.3
	2-3 times a week	27	20.6	21.4	85.7
	3-4 times a week	10	7.6	7.9	93.7
	more than four times a week	8	6.1	6.3	100.0
Frequency with electronic campus	Once week	10	7.6	7.6	7.6
	2-3 times a week	21	16.0	16.0	23.7
	3-4 times a week	25	19.1	19.1	42.7
	more than four times a week	75	57.3	57.3	100.0

3.2 Reliability Analysis

Internal consistency reliabilities of the constructs of the proposed model were tested with Cronbach’s Alpha coefficient, which is recommended to be at least 0.7 being acceptable [Pallant 2005]. The testing instrument of the model reported a reliability of 0.855 and the reliability of each construct is as shown in table 2. All α coefficients show good reliability of the constructs apart from perceived ease of use in electronic campus whose reliability is 0.558 below the recommended 0.700. However, since the same construct fared well in webct with a coefficient of 0.773 it was considered to be used for further analysis.

Table 2: Cronbach's Alpha for WebCT

Construct	Cronbach's α (WebCT)	Cronbach's α of Standardized Items (WebCT)	α (Electronic Campus)	α of Standardized Items (Electronic Campus)	No. of Items
Perceived Ease of Use (EU)	.773	.772	.558	.609	4
Relative Advantage (RA)	.872	.873	.759	.759	4
Complexity (C)	.870	.871	.871	.872	4
Prioritization (P)	.860	.862	.727	.744	3

4. PRESENTATION OF RESULTS

WebCt is also known as my MyTuT or Blackboard. For the purpose of this study we shall stick to one name WebCt which we abbreviate as (W) and Electronic Campus as (EC). The constructs are abbreviated as shown in table 2 above. Their corresponding indicators are abbreviated as; EUW 1 and EUEC1 the first indicator for perceived ease of use for WebCt and Electronic Campus respectively and so on. Table 3 gives the descriptive statistics of WebCt and Electronic Campus with their corresponding indicators.

Table 3: Descriptive Statistics for WebCt Selection Indicators

Construct Indicators	Mean	Std. Deviation	Construct Indicators	Mean	Std. Deviation
EUW1	2.42	.896	EUEC1	1.31	.580
EUW2	2.32	.976	EUEC2	2.29	.988
EUW3	2.52	.916	EUEC3	1.45	.738
EUW4	2.37	.936	EUEC4	1.56	.737
RAW1	2.56	1.061	RAEC1	1.62	.728
RAW2	2.60	1.019	RAEC2	1.69	.786
RAW3	2.51	.972	RAEC3	1.68	.747
RAW4	2.62	1.037	RAEC4	1.72	.797
CW1	2.69	1.052	CEC1	1.72	.787
CW2	2.73	.985	CEC2	1.85	.881
CW3	2.49	.869	CEC3	1.76	.755
CW4	2.53	.893	CEC4	1.81	.851
PW1	2.51	1.170	PEC1	1.48	.770
PW2	2.52	1.094	PEC2	1.72	.934
PW3	2.66	1.232	PEC3	1.68	.743

The mean of the indicators of the constructs ranges between 2 to 3. This implies that students' answers to the questions were affirmatively weak. However, a comparison of results in table 3 shows that student's preference to use electronic campus is higher than that of using WebCt. The mean for Electronic Campus for the students' answers ranged between 1 and 2 implying that most of the students' responses were either strongly agree or agree hence giving a lower standard deviation. On the other hand webCt shows a lower positive skewedness registering negatives with some constructs. The descriptive results also indicate a high preference to Electronic campus than WebCt.

4.1 Analysis of the Measurement Model

It is important to note that the use of Cronbach's α, alone to test the reliability of such latent factors is limited [Kamata et al. 2003]. They put it that, composite reliability estimates the extent to which a set of latent construct's indicators share in their measurement of a construct whereas the average variance extracted is the amount of common variance among latent construct indicators. Basing on (Heir et al., 2006; Kamata et al., 2003; and Jöreskog & Sörbom, 1993), composite reliability (CR) and average variance extracted (AVE) can mathematically be derived from equations (i), (ii) and (iii) below.

Error term = E = $1- S^2$ ………………………………………………………..… (i)

Composite reliability = CR= $[\sum 1\ldots n\,(S)]^2 / ([\sum 1\ldots n\,(S)]^2 + \sum 1\ldots n\,(E))$………….. (ii)

Average variance extracted=AVE = $[\sum 1\ldots n\,(S)^2] / ([\sum 1\ldots n\,(S^2)] + \sum 1\ldots n\,(E))$……. (iii)

Where n is the number of indicators for each construct, S is the standardized loadings for the indicators and E is the corresponding error term

The above formula, do not assume a tau-equivalence among the measures; hence it is capable of providing more accurate results of the composite reliability. As suggested by researchers [e.g Park 2009; Hair et al. 2006]; for a good measure all composite reliabilities (CR) should exceed 0.7, the indicators' factor loadings [λ] should be significant and exceed 0.5 and the average variance extracted (AVE) of each construct should exceed the variance due to measurement error for the construct (e.g., AVE should exceed 0.5). This is as shown in table 4 below.

Results in Table 4 shows that, the selected constructs have a good measure with the individual indicators belonging to their specified core values. This is because all the indicators' loading factors and the construct's composite reliability and average variance extracted all above the threshold of 0.5, 0.7 and 0.5 respectively. Factor loadings also shows that indicators that give a good representation of the construct are those with higher loadings on the same construct as demonstrated in Table 4. Similarly, the factor loadings the indicators' significance shows the validity comprehension of the construct.

Table 4: Factor Loading, Composite Reliability and Average Variance Extracted for WebCt

Construct	Indictor	Factor Loading [λ]	Composite Reliability (CR)	Average Variance Extracted (AVE)	Indictor	Factor Loading [λ]	Composite Reliability (CR)	Average Variance Extracted (AVE)
Perceived Ease of Use (EU)	EUW1	.704	0.8567	0.6004	EUEC1	0.776	0.753	0.505
	EUW2	.842			EUEC2	0.662		
	EUW3	.814						
	EUW4	.731			EUEC3	0.689		
Relative Advantage (RA)	RAW1	.733	0.8571	0.6001	RAEC2	0.639	0.751	0.504
	RAW2	.751			RAEC3	0.536		
	RAW3	.804						
	RAW4	.808			RAEC4	0.743		
Complexity (C)	CW1	.841	0.8663	0.6193	CEC1	0.705	0.845	0.578
	CW2	.814			CEC2	0.734		
	CW3	.704			CEC3	0.793		
	CW4	.782			CEC4	0.804		
Prioritization (P)	PW1	.805	0.8524	0.6584	PEC1	0.752	0.752	0.504
	PW2	.845			PEC2	0.643		
	PW3	.783			PEC3	0.729		

4.2 Analysis of the Structural Model

As Heir et al. [2006]; noted it is always important to assess how well the structural model matches the observed data. The descriptive analysis carried out, it was established that students prefer Electronic campus to WebCt. Therefore this study decided to establish which factors play major role with the least used WebCT. Therefore this study's structural equations analysis is based on WebCt's parameters. The study found it paramount to assess the model fitness to establish whether the relationships are consistent with the theoretical or hypothesized expectations. In the same view, researchers [e.g. Heir et al. 2006; Jöreskog and Sörbom 1993]; recommend that, relevant model fit indices should be compared with their corresponding recommended threshold values in order to establish and recommend a good model fit. Among the most commonly used fit measures in research are; Chi-Squared test ($\chi 2$), absolute, incremental and parsimony fit measures.

Others include root mean square error of approximation (RMSEA), goodness-of-fit statistic (GFI) and the adjusted goodness-of-fit statistic (AGFI), root mean square residual (RMR) and standardized root mean square residual (SRMR). However, Jöreskog and Sörbom [1993]; further adds that the performance of Chi-Squared test ($\chi 2$), may be limited as the sample sizes increases or when there are small sample sizes that are not normally distributed. Heir et al. [2006]; recommend the use of the chi-square per degree of freedom ($\chi 2$ / d.f.) which makes the model less dependent on the sample size. In the category of absolute, incremental and, parsimony fit measures Heir et al. [2006]; observed that due to different software used by researchers to analyze their data, at least one absolute index such as RMSEA and an incremental index like the comparative fit index (CFI) may be used to determine the goodness of fit. They further suggested that, for models that include a comparison of varying complexity, a researcher should add one other fit index from a choice of parsimony normed fit index (PNFI) such as GFI and SRMR. Results of measurement of goodness of fit index shown in Table 5 indicate that, all goodness-of-fit statistics are in the acceptable ranges. Results in Table 5 imply that since the fit indices GFI, CFI > 0.90 both exceeds the threshold value and 0.06 < RMSEA < 0.08 also falls within the range, the structural model fits the data following some modifications as per the Modification Indices (MI).

Table 5: Structural Model Measurement Basing on Fit Indices

Model Goodness-Fit Indexes	**Results from this Study**	**Recommended Value**	**Recommendation of the StructuModel**
χ^2/d.f	2.862	≤ 3.000	Less than the threshold, shows model is good
RMSEA	0.068	≤ 0.060 & ≥ 0.08	Less than the threshold, shows model is good
CFI	0.984	≥ 0.950	Greater than the threshold, shows model is good
GFI	0.915	≥ 0.90	Greater than the threshold, shows model is good
χ^2/d.f = Chi-square per degrees of freedom RMSEA = root mean square error of approximation. CFI = comparative fit index GFI = goodness-of-fit index			

Figure 2 below shows the path diagrams with their respective significance levels. Results from figure 2 and Table 6 are used to prove the set hypotheses. From figure 2, it can be deduced that the proposed structural model explained 58% variance for the actual selection of a CMS to use. Of the four set hypotheses, three were found to be significant at $p < 0.05$, with the exception of perceived ease of use. Hypothesis (H4) that postulated that the higher the priority the higher the chances of actual selection of a CMS was found to be highly positive significant with a regression coefficient (β) is 0.578 with t value of t= 12.52 and p<0.05 indicating acceptance that prioritization significantly has a positive direct influence on actual selection of a CMS. This was followed by hypothesis (H3) with (β) is 0.545, t = 11.402 and p< 0.05. This implies that students will be attracted to use a system that they perceive to be less complex. On the other hand, hypothesis (H2) was found less significant with (β) is 0.149, t = 3.225 and p slightly < 0.05. This implies that students see little difference in terms of the relative advantage between the CMS. Hence relative advantage is not a strong factor for them to prioritize one. Hypothesis (H1) was found to be insignificant with (β) is 0.031, t = 1.272 and p>0.05. This supports the conclusion obtained in table 1 that, the advent of social networking sites has made the use of web-based tools easy to use. Students with such experience see little difference when using CMSs hence such a factor may not be based on for them to prioritize a given CMS. Results are summarized in Table 6 below.

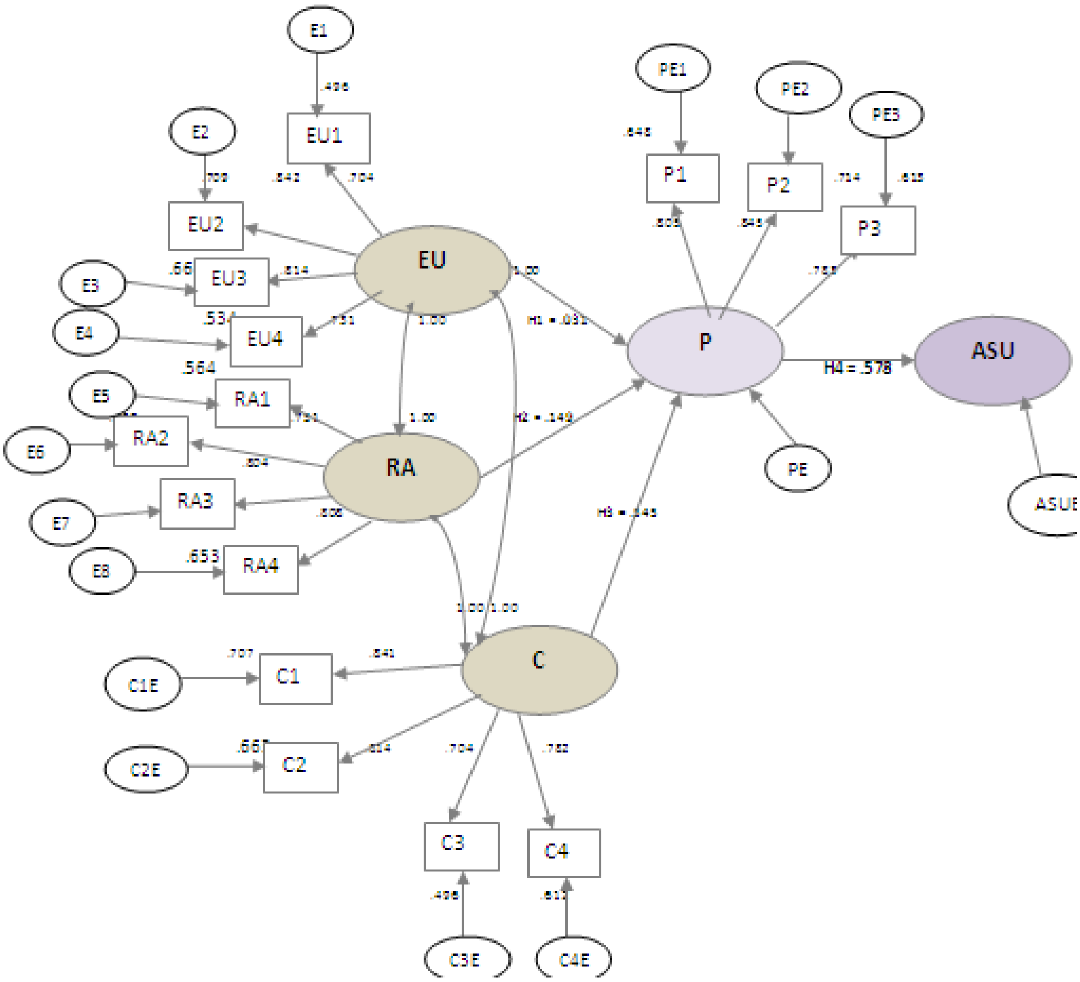

Figure 2: Path Diagram for the Structure Model of Factors influencing students' Choice

Table 6: Implication of the Hypothesis Basing on the Path Diagram Summary

Hypothesis	**Relationship**	**Path Coefficient β – value**	**t-value**	**Sig. p**	**Results implication**
H1	EU → P	0.031	1.272	.585	Not Accepted
H2	RA → P	0.149	3.225	.041	Accepted
H3	C → P	0.545	11.402	.000	Accepted
H4	P → ASU	0.578	12.523	.000	Accepted

5. DISCUSION AND CONCLUSION

In this study we used both TAM and DOI constructs to develop a model for factors influencing students' choice to select between two e-learning tools taking a case of two CMS WebCt and Electronic Campus. The findings indicate that complexity and relative advantage when mediated by prioritization are good antecedents for actual selection of a CMS to use by students. Moreover, perceived ease of use didn't show significant relationship with prioritization. This may be so because students with good experience of internet usage as shown in this study will assume every web-based tool to be easy to use. Therefore, they couldn't take perceived ease of use as a major issue. Similar to earlier studies [Lee et al. 2009; Saadé et al. 2007]; this study substantiates further evidence of the appropriateness of DOI and TAM in explaining the role played by students' latent behavioral when making choices to use e-learning tools. For instance, students may fear to use a CMS they perceive complex for several reasons like; fearing to fail their coursework, feeling socially uncomfortable to be seen falling behind other students who are using it and fearing to be called IT illiterates.

In their studies of TAM [Davis 1989; Davis et al. 1992]; perceived ease of use was found to be a major antecedent in determining users' intention to use. This study's descriptive analysis for both Electronic Campus and WebCt are in line with this finding. However, the SEM analysis has varied conclusions with perceived ease of use being very significant with Electronic Campus with 36.5% prediction and insignificant with WebCt having 3.1% at $p > 0.05$. One explanation of this is that, the advent of social computing tools like Facebook, Skype, Twitter and many others has made the use of internet to generally be perceived as easy. Another reason is that, students' demographics like level of study, course or program of study where only used in the descriptive analysis and not included in the SEM. Moreover, much as perceived ease of use was not found significant to influence university students' intention to prioritize a CMS, this constructs highly relates students' attitudes toward e-learning [Nanayakkara 2007; Lee et al. 2009] overlooking it may negatively impact on the students' acceptance of information technology.

From the goodness-of-fit test, this study led to the conclusion that the model well represented the collected data. This study therefore recommends that universities should have clear e-learning policies before e-learning implementation can take place. These policies are fundamental because of the role e-learning plays in augmenting classroom teaching and to counter balance the exponential increase of e-learning tools on the market. The implications of these findings are also important for the lecturers who use these e-learning tools to enhance classroom teaching. Students' preferences should be taken into consideration as the lecturer chooses which CMS to use for communications and teaching. This is because if a lecturer adopts one of the systems like WebCT, which is not the students' choice, he or she will end up doing double work: posting work on the two systems or doing it manually.

Future research should take into consideration students' comparison of technology on the basis of their social and cultural backgrounds. This implies research should investigate technology comparison cross-culturally. It is a fact that many students in African universities come from less privileged families, gone to poor schools and start using computers at universities.

REFERENCES

ABRAHAMSON, E. AND ROSENKOPF, L. 1993. Institutional and Competitive Bandwagons: Using Mathematical Modeling as a Tool to Explore Innovation Diffusion. *Academy of Management Review,* 18 [3]: 487-51

AJZEN, I. 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.

ALLEN, I.E. AND SEAMAN, J. 2003. Sizing the Opportunity. The Quality and Extent of Online Education in the United States, 2002 and 2003, *The Sloan Consortium.*

DAVIS, F.D. 1989. Perceived Usefulness, Perceived Easy of Use, And User Acceptance of Information Technology. *MIS Quarterly,* September 1989, 319-340.

DAVIS, F. D., BAGOZZI, R. P., AND WARSHAW, P. R. 1992. Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology*, 22 [14], p.1111−1132.

DELONE, W. H AND MCLEAN, E.R.2003. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *Journal of Management Information Systems* 19 [4], 9–30.

DISHAW, M. AND STRONG, D. 1997. Extending Technology Acceptance Model, Available at Http://hsb.baylor.edu/ramsower/ais.ac.97/papers/dishaw.htm . Accessed. 10 Oct 2010.

GRANDON, E., ALSHARE, O. AND KWAN, O. 2005. Factors influencing student intention to adopt online classes: A cross-cultural study. *Journal of Computing Sciences in Colleges*, 204, 46–56.

HAIR, J., BLACK, B., BABIN, B., ANDERSON, R. AND TATHAM, R. 2006. *Multivariate Data Analysis* 6th ed., Upper Saddle River, NJ: Prentice-Hall.

HORTON, W., AND HORTON, K. 2003. *E-learning tools and technologies: A Consumer's Guide for Trainers, Teachers, Educators, and Instructional Designers*. Indianapolis, Indiana, Wiley Publishing Inc.

JÖRESKOG, K. AND SÖRBOM, D. 1993, *LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language.* Chicago, IL: Scientific Software International Inc.

KAMATA, A., TURHAN, A. and DARANDARI, E. (2003). Estimating Reliability for Multidimensional Composite Scale Scores. *Paper Presented at the Annual Meeting of American Educational Research Association*, Chicago April 2003.

KARAALI, D., GUMUSSOY, C.A, AND CALISIR, F. 2010. Factors affecting the intention to use a web-based learning system among blue-collar workers in the automotive industry

LANDRY, B.J., GRIFFETH, R., AND HARTMAN, S. 2006. Measuring Student Perceptions of Blackboard Using the Technology Acceptance Model, Decision Sciences. *Journal of Innovative Education*, 41, 87-99.

LEE, B., YOON, J. R., AND LEE, I. 2009. Learners' Acceptance of E-Learning in South Korea: Theories and Results. *Computers and Education*, 534, 1320–1329.

MA, W. W., ANDERSSON, R., AND STREITH, K .O. 2005. Examining user acceptance of computer technology: An empirical study of student teachers. *Journal of Computer Assisted Learning*, 21, 387–395.

MAO, E. 2002. "An Investigation of IT Usage over Time". *Eight Americas Conference on Information Systems*, 1307-1312

MINER, J.B. 2007. *Organizational Behavior: From Theory to Practice* John B. M E Sharp, Inc.

NANAYAKKARA, C AND WHIDDETT, D. 2004. A Model of User Acceptance of E-learning Technologies: *A Case Study of a Polytechnic in New Zealand*

NANAYAKKARA, C. 2007. A Model of User Acceptance of Learning Management Systems: *a Study within Tertiary Institutions in New Zealand, Educause Australasia*. Available at: http://www.caudit.edu.au/educauseaustralasia07/authors_papers/Nanayakkara-361.pdf. Accessed: 10 Dec. 2010.

NDUBISI, N. O. 2006. Factors of Online Learning Adoption: A Comparative Juxtaposition of the Theory of Planned Behavior and the Technology Acceptance Model. *International Journal on E-Learning*, 54, 571–591.

PALLANT, J. 2005. *SPSS Survival Manual.* Open University Press, UK

PARK, S. Y. 2009. An Analysis of the Technology Acceptance Model in Understanding University Students' Behavioral Intention to Use e-Learning. *Educational Technology and Society*, 12 3, 150–162.

RAISINGHANI, M. S. AND SCHKADE L. 1997. Strategic Decision Making: *A Framework for Multicriteria Decision analysis of Technology Investigation and a Field Survey*, Available at http://hsb.baylor.edu/ramsower/ais.ac.97/papers/raising2.thm , Accessed. 12 Oct 2010.

ROGERS, E. M. 1962. *Diffusion of Innovations*. The Free Press. New York.

ROGERS, E. M.1995. *Diffusion of innovations 4th edition*. The Free Press. New York.

ROGERS, E. M. 2003. *Diffusion of Innovations 5th Ed*., New York: The Free Press.

SAADÉ, R.G. AND GALLOWAY I. 2005. Understanding Intention to Use Multimedia Information Systems for Learning. *The Journal of Issues in Informing Science and Information Technology,* 2: 287-296.

SAADÉ, R. G., NEBEBE, F., AND TAN, W. 2007. Viability of the technology acceptance model in multimedia learning environments: *Comparative study. Interdisciplinary Journal of Knowledge and Learning Objects*, 37, 175–184.

TAYLOR , S. AND TODD, P. A. 1995. "Assessing IT Usage: The Role of Prior Experience*," MIS Quarterly,* 19, 561-570.

THOMSON. R.L, HIGGINS, C. A., HOWELL, J. M 1991. "Personal Computing: Toward a Conceptual Model of Utilization," *MIS Quarterly*.15, 124-143

WEXLER, S., BROWN, J., METCALF, D., ROGERS, D. AND WAGNER, E. 2008. *eLearning Guild Research 360 report: Mobile Learning.* Santa Rosa, CA

VENKATESH V., MORRIS M. G, DAVIS B. G, DAVIS D. F 2003.User Acceptance of Information Technology: Towards a Unified View. *MIS Quarterly. MIS Research Center, University of Minnesota*. 27 [3], 425-478. Available: http://www.jastor.org/stable/300336540. Accessed: 15th Dec 2010