Research Article

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Comparative analysis of learning management systems usage among tertiary students in Ghana

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ARTICLE INFO	ABSTRACT
	The objective of this study was to employ the unified theory of acceptance and use of technology (UTAUT) model to compare the differences in learning management systems (LMSs) usage by age, gender, and institution type among tertiary students in Ghana. The research used a survey design to collect quantitative data for the study. Multi-stage sampling was used to sample 476 tertiary students from three categories of tertiary institutions: public universities, technical universities, and colleges of education. Questionnaires were employed as a means of data collection and the data were analyzed using ANOVA, independent sample t-test, and post-hoc analysis. The results indicate that there is a statistically significant difference in performance expectancy, effort expectancy, and behavioral intention between the groups of tertiary institution users of LMS. The study concluded that the usage and acceptance rate of LMS among tertiary students was moderate. This work is a valuable contribution to the existing body of knowledge. Thus, providing empirical data on the comparative analysis of LMS usage among Ghanaian tertiary students that has implication for policy and practice. The study recommends that tertiary institutions should develop policies governing the usage of LMS across their various campuses. **Keywords:** learning management system, unified theory of acceptance and use of technology, tertiary institutions, public universities, technical universities, colleges of education

INTRODUCTION

Ghana is often regarded as one of the top-performing nations in sub-Saharan regarding online education, despite the fact that the method is still in its infancy (Kotoua et al., 2015; Tagoe, 2012). However, according to a report by UNESCO (Kenya, 2007), online education in Ghanaian tertiary institutions is deemed imperfect, since most students still exhibit a preference to traditional learning methods over online platforms.

There has been improvement in online education in Ghana due to improvement in infrastructure and network connectivity in most tertiary institutions (Tagoe, 2012). Yet, there is no national policy regulating the use of online learning in Ghana (Tanye, 2017). This has made tertiary institutions take decisions without coordinated guidelines. As we speak, there has not been any accreditation process to regulate the online activities of tertiary institutions.

Most tertiary institutions in Ghana preferred the face-to-face mode of delivering learning to their students. This was characterized by lecturers and students meeting on campuses on semester bases. A few tertiary institutions engaged students through learning management system (LMS) but the emergence of COVID-19 necessitated the spread of its use across the country. This pandemic provided an opportunity for stakeholders to make policies to regulate LMS usage, but this is also yet to be done.

Limited attention has been given to the examination of educational institutions or instructors in Ghana who neglect the needs of their students in the context of online teaching and learning (Gyampoh et al., 2020; Tanye, 2017). A number of studies also found out that LMS are the most often utilized technology in education and are the most generally used instrument for facilitating e-learning (Swart, 2016; Zanjani et al., 2017).

This research therefore seeks to fill this gap created by comparing the usage of LMS among tertiary institutions in Ghana. Specifically, this study hopes to use the unified theory of acceptance and use of technology (UTAUT) to compare the differences in LMS usage by age, gender, and institution type among tertiary students in Ghana.
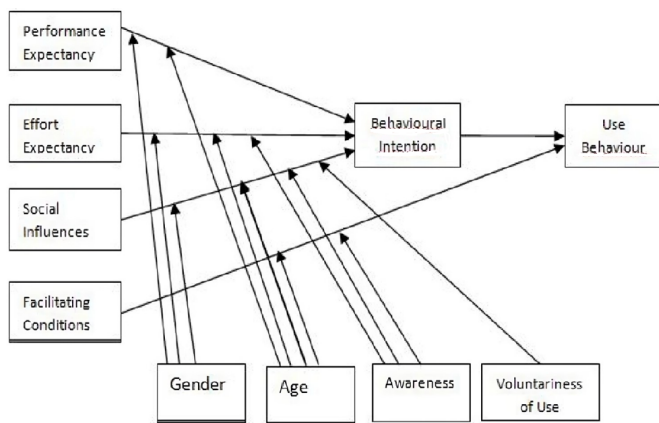
Figure 1. UTAUT conceptual model (Venkatesh et al., 2003)

LITERATURE REVIEW

Theoretical Framework

The foundation underlining this research is based on technology acceptance models (TAMs) used to find out information system acceptance among users. Specifically, UTAUT is the theory that forms the backbone of this research. UTAUT model was created by modifying TAM and several other models and has become one of the successful models over the years. According to Venkatesh et al. (2003), UTAUT model has four fundamental constructs, namely performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FCs). These four primary factors of UTAUT model influence the following four determinants directly: gender, age, experience, and voluntariness of usage, as shown in **Figure 1**. UTAUT framework utilized a total of eight prominent models to examine the adoption of information technology by users. These models (not in any particular order) include TAM, motivational model, theory of planned behavior, theory of reasoned action, innovation diffusion theory, social cognitive theory, combined technology acceptance model and theory of planned behavior, and model of PC utilization. The variation found with UTAUT was greater than those found in eight separate models, where 70% of it could be explained by user intention (Venkatesh et al., 2003).

Components of UTAUT Model

This section of the study presents the various components of UTAUT model.

Performance Expectancy (PE)

PE is described as the expectation that using a system will boost users' job performance and assist users in achieving their goals. PE refers to the anticipation that the utilization of a system will enhance users' job performance and facilitate the accomplishment of their objectives. According to Venkatesh et al. (2003), the four primary constructs that exert an influence on PE include perceived usefulness, extrinsic motivation, work fit, relative advantage, and outcome expectations. PE is similarly associated with the perceived usefulness construct in TAM. The positive association between PE and behavioral intention (BI) is supported in the context of technology-enhanced education (Weilage & Stumpfegger, 2022; Yeboah & Nyagorme, 2022). In their study, Wang et al. (2009) found out

that the inclusion of PE construct in the assessment of LMS usage revealed that the utilization of LMS in higher education institutions is perceived as beneficial. This perception is based on the system's capacity to offer flexible and efficient completion of learning activities, as well as its ability to enhance teaching effectiveness.

Effort Expectancy (EE)

EE can be referred to as the easiness of the system to be used, which is derived from the perceived ease of use and complexity (Venkatesh et al., 2003; Weilage & Stumpfegger, 2022). Chua et al. (2018) reported a strong relation between EE and the acceptance of information systems.

Social Influence (SI)

According to Venkatesh et al. (2012), SI refers to the mechanism by which individuals adopt the belief that they should utilize a particular system due to the influence exerted by others. SI is an important factor in the adoption of new information systems. Wut et al. (2022) suggest that SI affects the intention of learners to use learning platforms like LMS as part of the learning process with their teachers.

Facilitating Conditions (FC)

Venkatesh et al. (2003) posit that the concept of FC pertains to the extent to which an individual holds the belief that there is an organizational and technological infrastructure in place to support and enable the utilization of a system. The concept of FCs is in sync with perceived behavioral control, FCs, and compatibility.

Most research on tertiary institutions' use of LMS has centered on the effectiveness of conditions like; lectures' attitude, administrative support, availability and access to internet and computing devices (Perera & Abeysekera 2022; Tetteh et al., 2023; Wang et al., 2013). This study tends to compare the difference in LMS usage among demographics of Ghanaian tertiary students in terms of age, institution, and gender, using UTAUT.

Age & Gender Difference

There are mixed research findings on the effect of age on the adoption of technology. Research by Hwu (2011) and Kamal (2013) found no significant effect between age and technology adoption. The study discovered that age plays a role in the usage of LMS. Many of the older people were not interested in learning about LMS or using it to its full potential.

Much research has also been conducted to investigate the gender differences in LMS usage, but the results differ in terms of the significance of variables in the use of LMS. Several Studies investigating the usage of LMS among gender had found that there were no statistical differences (Alshorman & Bawaneh, 2018; Celikoz & Erdogan, 2017; Yalman et al., 2016). However, in other studies, male students were found to use a course management system at a considerably higher rate than female students (Li et al., 2015).

There has been similar study on the use of UTAUT to ascertain the rate of acceptance of virtual learning. In their study, Ozlem and Ozhan (2017) investigated the utilization of virtual learning environment (VLE) among students enrolled at Sakarya University and Leeds University.

The research findings revealed notable disparities in the learners' Use behavior and their BI towards VLE, as observed between the respondents from the United Kingdom (UK) and Turkey. Their study further showed that learners in the UK shown a greater degree of intention to use and frequency of use compared to learners in Turkey. This showed that there is difference in the use of VLE and that is exactly one of the things this research seeks to find out among various tertiary institutions in Ghana with the use of LMS.

UTAUT Model & E-Learning

Abbad's (2021) recent study tried to identify the characteristics within UTAUT framework that influence the adoption of e-learning systems in the context of higher education. The study's results show that UTAUT can explain how students behave when they use the e-learning system. Also, it was seen that all but one of the links suggested in UTAUT, received empirical support. The absence of SI in impacting BIs aligns with previous study in the field of technological acceptance (Jambulingam, 2013). In that research PE was the most powerful predictor of BIs to use the e-learning system. This was followed by EE as a determinant of BIs.

Although numerous research has employed UTAUT paradigm to investigate the utilization of online learning systems, such as LMSs, it is worth noting that the bulk of these studies have been undertaken in developed nations (Al-Gahtani, 2016; Jamil, 2017; Tarhini et al., 2017). In Ghana, there is not much research with regards to LMS usage. As a result, it will be out of place to extend the conclusions on factors influencing students' LMS adoption in developed countries to a developing country like Ghana (Alkharang, 2014). This is why it is relevant for this research to be conducted to specifically ascertain students' LMS usage and acceptance in tertiary institutions in Ghana. A study conducted by Tarhini (2013), on comparing students' acceptance of Blackboard in England and Lebanon, discovered that the analyzed variables are seen differently in each country. Therefore, taking the findings of these studies and applying them to Ghana may be problematic due to culture variations. This suggests that there is much more to learn about the factors that may have impact on Ghanaian students' adoption and use of LMSs. In methodology, researchers frequently fail to account for the data's heterogeneity, which determines the validity of the findings and causes incorrect conclusions to be drawn (Hair et al., 2017). Thus, recognizing the difference in student acceptance of LMS enables Ghanaian education policymakers to establish and adjust policies to a specific group of students, thereby increasing their LMS usage. This reason prompted the researchers to compare student acceptance of LMS based on three categories (age, gender, and institutions) in tertiary institutions in Ghana.

Hypothesis of the Research

Based on the literature on UTAUT constructs and the impact of gender, age, and institution on LMS usage, the study seeks to determine the difference among these demographic groups. As a result, the following hypotheses are proposed:

Hypothesis 1. There is no statistically significant difference in use of LMS by students' gender.

Hypothesis 2. There is no statistically significant difference in use of LMS by students' age.

Hypothesis 3. There is no statistically significant difference in use of LMS based students' institution.

METHODOLOGY

Research Design

The study employed survey research design to collect data on the difference in the usage of LMS among tertiary students in Ghana. Survey research is the process of gathering data from a selected group of persons by asking them questions and recording their responses (Check & Schutt, 2012). Survey research can employ quantitative research methodologies, such as utilizing questionnaires with items that are evaluated numerically, qualitative research methodologies, such as employing open-ended questions, or a combination of both methodologies, known as mixed methods. This study employed a quantitative approach using questionnaire with numerically rated items to collect data for the research.

Population, Samples, & Sampling Procedure

The research focused on Ghanaian tertiary students as the target population. Multi-stage sampling was employed to select the respondents for the study. First, tertiary institutions in Ghana were stratified into three strata: public universities, technical universities, and colleges of education. Random sampling was then used to select one institution each from the strata, public university (University of Cape Coast), technical university (Wa Technical University), and colleges of education (Komenda College of Education). Second, random sampling was used to sample 476 students from the three institutions selected for the research (University of Cape Coast, n=167, Wa Technical University, n=156, and Komenda College of Education, n=153). The students were randomly sampled at their various campuses when they came for the second semester face to face sessions in 2021-2022.

Data Collection Procedure

The instrument was developed by the researchers in accordance with the stated research objectives and literature review. A researcher-made questionnaire is a survey tool created by a researcher with the purpose of gathering data that is pertinent to their research subject (Piňosová, 2020). The establishment of content validity was achieved through the administration of a pilot test of the instrument at Kibi Presbyterian College of Education. After that ethical consideration was taken care of by presenting letters to appropriate quarters to seek permission to undertake the research. The following is the breakdown of the components of the questionnaire. Section 1 of the questionnaires consisted of items to collect demographic information of the participants. The second section of the questionnaires also consisted of 19 questions with five-point Likert scale to measure the acceptance of LMS usage by students based on the survey instrument of UTAUT constructs validated in Davis (1989), which was adapted to suit this research. PE (4), EE (4), SI (4),

Table 1. An independent sample t-test to compare LMS usage between gender (Field Survey, 2022)

Variables		F	Sig.	T	df	Sig. (2-tailed)	Mean difference	Standard error difference
PE	Equal variances assumed	14.903	.000	-2.329	470.000	.020	-.25934	.11134
	Equal variances not assumed			-2.427	373.366	.016	-.25934	.10685
EE	Equal variances assumed	10.691	.001	-3.874	470.000	.000	-.37847	.09770
	Equal variances not assumed			-3.984	346.338	.000	-.37847	.09500
SI	Equal variances assumed	2.847	.092	-3.725	474.000	.000	-.34584	.09285
	Equal variances not assumed			-3.790	347.815	.000	-.34584	.09126
FC	Equal variances assumed	7.674	.006	-1.459	474.000	.145	-.13568	.09302
	Equal variances not assumed			-1.389	289.402	.166	-.13568	.09770
BI	Equal variances assumed	52.143	.000	3.645	474.000	.000	.38920	.10678
	Equal variances not assumed			4.028	430.374	.000	.38920	.09663

Table 2. ANOVA result comparing difference in use of LMS by age (Field Survey, 2022)

Variables		Sum of squares	df	Mean square	F	Sig.
PE	Between groups	3.907	2	1.953	1.462	.233
	Within groups	626.782	469	1.336		
	Total	630.689	471			
EE	Between groups	7.857	2	3.929	3.824	.023
	Within groups	481.798	469	1.027		
	Total	489.655	471			
SI	Between groups	2.019	2	1.009	1.061	.347
	Within groups	450.070	473	.952		
	Total	452.088	475			
FC	Between groups	1.507	2	.754	.808	.447
	Within groups	441.367	473	.933		
	Total	442.874	475			
BI	Between groups	.594	2	.297	.235	.790
	Within groups	596.680	473	1.261		
	Total	597.274	475			

FC (4), and BI (3). The 5-point Likert scale were strongly disagree (1), disagree (2), neutral (3), agree (4), and strongly agree (5). Students were met at their various campuses and hardcopy (paper) questionnaire handed to them to fill. The filled-out questionnaires were collected, cleaned, and coded for the analysis.

Data Analysis

To test the hypothesis of the research; ANOVA, independent sample t-test, and post-hoc analysis (SPSS version 25) was used to compare the difference in the use and acceptance of LMS among the students based on gender, age, and institution. The independent sample t-test was used to analyze the significance of the difference in gender usage and acceptance of LMS. While ANOVA and post-hoc analysis was used to analyze the difference in age and institutional usage and acceptance of LMS. The analysis of data collected is presented based on the hypothesis of the study and displayed in tables.

RESULTS

The analysis of data collected is displayed in this session based on the hypothesis of the study.

Hypothesis 1. There Is No Statistically Significant Difference in Use of LMS by Students' Gender

From **Table 1**, all UTAUT components showed a significant difference in the gender responses except for FC, which

Table 3. Post-hoc test on age difference (Field Survey, 2022)

Age of students	n	Subset for alpha=0.05	
		1	2
36-45	12	2.4167	
18-25	332	2.9247	2.9247
26-35	128		3.1354

showed no significant difference between the gender responses with the p-value of 0.166.

Hypothesis 2. There Is No Statistically Significant Difference in Use of LMS by Students' Age

To compare LMS usage among respondents' age, an ANOVA test and a post-hoc test was conducted to ascertain the difference in the use of LMS among the age and institutions. The results are displayed in **Table 2** and **Table 3**.

Concerning UTAUT component, **Table 2** results showed that there is no significant difference in the age groups PE with the significant value of 0.233. However, there was a significant difference in EE of the age groups with a significant value of 0.023.

There was no significant difference in SI of the age groups with the significant value of 0.347. Again, there was no significant difference in FC and BI among the age groups with the significant values of 0.447 and 0.790, respectively. Where there is a significant difference, it shows that there is a significant difference between at least two of the groups. A post-hoc test was conducted to show which of the groups accounted for the differences. **Table 3** depicts post-hoc test results on difference in age groups. From the post-hoc test in

Table 4. ANOVA results comparing difference in use of LMS by tertiary institutions (Field Survey, 2022)

Variables		Sum of squares	df	Mean square	F	Sig.
PE	Between groups	18.583	2	9.291	7.119	.001
	Within groups	612.106	469	1.305		
	Total	630.689	471			
EE	Between groups	12.920	2	6.460	6.355	.002
	Within groups	476.735	469	1.016		
	Total	489.655	471			
SI	Between groups	2.037	2	1.019	1.070	.344
	Within groups	450.051	473	.951		
	Total	452.088	475			
FC	Between groups	2.141	2	1.071	1.149	.318
	Within groups	440.733	473	.932		
	Total	442.874	475			
BI	Between groups	12.025	2	6.013	4.859	.008
	Within groups	585.248	473	1.237		
	Total	597.274	475			

Table 5. Post-hoc test on difference in tertiary institutions (Field Survey, 2022)

Tertiary institutions	n	Subset for alpha=0.05	
		1	2
PE			
College of education	153	2.6405	
Public university	167		2.9731
Technical university	152		3.1217
EE			
College of education	153	2.7614	
Public university	163	2.9709	2.9709
Technical university	156		3.1704
BI			
College of education	153	2.7582	
Public university	156		3.0876
Technical university	167		3.1078

Table 3, the result shows that there is a significant difference between group age 36-45 and 26-35 in terms of EE.

However, there is no significant difference between the age groups of 36-45 and 18-25 as well as 18-25 and 26-35.

Hypothesis 3. There Is No Statistically Significant Difference in Use of LMS Based Students' Institution

To compare LMS usage among participants' institutions, an ANOVA test and a post-hoc test was conducted to ascertain the difference in the use of LMS among the age and institutions. The results are displayed in **Table 4** and **Table 5**.

From **Table 4**, there is a substantial difference in the category of institutions in PE (0.001), EE (0.002), and BI among the institutions with significant values of 0.008. However, SI (0.344) and FC (0.318), showed no significant difference in the category of institution. A post-hoc test was performed to determine which of the groups is responsible for the differences. The result is displayed in **Table 5**. From the post-hoc test on PE in **Table 5**, the result shows that there is a significant difference between colleges of education and public universities. Also, there is a significant difference between colleges of education and technical universities. However, there is no significant difference between public university and technical university.

On the post-hoc test on EE the data shows that there is no significant difference between colleges of education and public

universities as well as public universities and technical universities. However, there is a significant difference between colleges of education and technical universities.

Post-hoc analysis on BI indicates that there is a significant difference between colleges of education and public universities. Also, there is a significant difference between colleges of education and technical university. But there is no significant difference between technical and public university.

DISCUSSION

When a comparative analysis was made on students' use of LMS based on gender, the results showed that there was a statistically significant difference between males' and females' use of LMS in all UTAUT components except FC. A couple of research projects into e-learning had similar findings, showing that there is significant difference between female and male students' interest in using LMS (Raman et al., 2014; Ramírez-Correa et al. 2015). Conversely, this conclusion contradicts prior studies on e-learning systems (Alshorman & Bawaneh, 2018; Celikoz & Erdogan, 2017; Yalman et al., 2016), which assert that both males and females exhibit different levels of acceptance to utilize LMSs. In terms of age comparison, the results revealed a statistically significant difference in LMS usage PE (0.023), and EE (0.023). This finding is similar with (Tarhini et al., 2014a, 2014b; Venkatesh et al, 2003) that age has been established in literature to be an essential element in technology and adoption study. Findings however contradict earlier research that examined the rate of e-learning adoption in underdeveloped nations (Altawallbeh et al., 2015). Anecdotal evidence showed that effects of age on e-learning systems could not be mediated by independent variables.

Conversely, there was no significant difference in LMS usage by age characteristics in terms of SI, FCs and BI. This finding supports previous research (Altawallbeh et al., 2015), but contradicts with (Venkatesh & Davis, 2000; Vankesh et al., 2003) whose study suggests that age has a moderating effect on BI and technology use. Finally, in terms of comparing institutional characteristics in LMS usage, the results of the study revealed that there was a statistically significant difference between tertiary institutions' use of LMS in PE

(0.001), EE (0.002), and BI (0.008). However, there was no significant difference in SI (0.344) and FC (0.318).

CONCLUSIONS & RECOMMENDATIONS

The study concludes that there is a significant difference between the tertiary students' usage and acceptance of LMS. Gender had the highest significant difference, followed by age and institutional category, respectively. However, this acceptance and usage of LMS is moderate. These findings give an indication that demographic consideration has a significant effect in the usage of information systems. Based on the research findings, it will be recommended that the tertiary institutions should have policies regarding the use of LMS that will take into consideration demographic issues in the various tertiary institutions. Again, students must be given adequate training on the use of LMS so that they can effectively benefit from its use. The cost and speed of the Internet has been established in this research to be one of the challenges tertiary students face in accessing LMS. Tertiary institutions should liaise with the appropriate governmental agencies to help improve internet access while reducing the cost of internet data for students.

The study contributes to the field of study in numerous ways: Firstly, most UTAUT model studies are conducted in developed countries, reflecting the educational culture of those countries. New perspectives on ICT adoption and integration in the context of higher education have been provided by this study, which focuses on tertiary education in a developing nation like Ghana. As a result of these findings, researchers will be able to evaluate the model's validity and resilience across cultures. As a result of this research, UTAUT has been validated in the context of Ghanaian higher education. For policy makers and managers of tertiary education, the research provides a practical guidance on how to incorporate LMS into the Ghanaian educational system. It is envisaged that this study will lead to reforms and policies that are expected to increase LMS's acceptance and utilization in higher education. The widespread acceptance and use of LMS could help mitigate some of the challenges in terms of the closure of tertiary institution during pandemics like the COVID-19 since the use of LMS will ensure continuity of teaching and learning regardless of any pandemic.

One of the limitations of the study is that the sample is too small, considering the number of tertiary institutions in Ghana. The research selected only three tertiary institutions out of the total of 71 tertiary institutions in the stratified category of tertiary institution. This may influence the generalization of the study. Future research can be carried out to cover other categories of tertiary institutions, especially private tertiary institutions to widen the example size. The research also, only dealt with difference in the use of LMS among the demographic characteristics (age, gender, and institutions) of the respondents leaving the relationship and impact of UTAUT constructs on LMS usage in the tertiary institution. This can be considered in subsequent research.

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