Determinants of E-Learning Adoption and Use in Tertiary Education of Ghana

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Abstract
This paper was to examine the adoption and use of e-learning among university lectures in Ghana. The study employed online survey and an explanatory design. The study targeted 322 lecturers. The data was analyzed with the use of frequencies, percentages, means, standard deviations as well as multiple regression. The study found that there was a moderate level of adoption and use of e-learning platform among lecturers of tertiary education in Ghana. Lectures have adopted and used e-learning platforms for the purpose of social interaction, convenience, larger community, geographical limitless, and collaboration. Nevertheless, there were some differences between demographic characteristics such as sex, age, rank or position, number of children and computer literacy rate while there were no differences between marital status, religion and adoption and use of e-learning platforms. Moreover, personal factors, technological factors and organizational factors motivate the adoption and use e-learning platform. ICT competence/computer literacy, inadequate ICT infrastructures/educational resources, and inadequate ICT training by management for lectures and staff were some challenges of adoption and using e-learning platform. Therefore, the study recommended that the management of the various universities continue to motivate lecturers and staff to adopt and use e-learning platforms due to the benefits accrued to it. Management in collaboration with the quality assurance unit should monitor and evaluate the system for effective and efficient delivery of lessons.
Keywords: *E-learning, lecturers, tertiary education, adoption*

Introduction

It is clear that the learning process has become more interactive, interesting, and ubiquitous with the incorporation of modern technology. The use of Information Communication Technology (ICT) to enhance or support the teaching and learning, generally termed e-learning has also boosted with proliferation of Internet providers and facilities (OECD, 2005). The concept of e-learning encompasses the delivery of electronic learning materials via a computer network. An e-learning system which is also defined as a Learning Management System (LMS) is a platform which facilitates the trainer to populate learning materials, provide access for the learners, carry out user management, learner evaluation and testing and other academic related activities. The concept of e-learning must be taken in to consideration for implementation in tertiary education since the effective and efficient use of it will add a significant value to an educational institution by enhancing the teaching quality (Dongsong, Leon, Lina, Jay, 2004).

E-learning is viewed as an essential component for any modern education institution in learning as well as teaching, and it has also challenged HLIs to redefine their teaching and research practices (Guri-Rosenblit 2009; Castillo-Merino & Serradell-Lopez 2014). Some significant advantages of e-learning include improved access to quality educational materials (Ally, 2008); learning possibilities through simulations, multi-media presentations as well as electronic communication and collaboration (Sife *et al.*, 2007; Guri-Rosenblit 2009); and learning flexibility such that learners can have control over the content, learning sequence, and pace of learning (Hill 2003; Bhuasiri *et al.*, 2012).

E-learning provides virtual classrooms which permits students and lecturers to communicate synchronously using features such as audio, video, text chat, interactive whiteboard, and application sharing. Synchronous technologies is part of e-learning platform that enable instructors to interact with students in real time. There are many forms of synchronous interactions, such as video conferencing, instant messaging, and web conferencing. Web conferencing in particular is used by synchronous virtual classrooms to enhance interactivity and build a sense of community in both online and blended courses (Parker & Martin, 2010). It is a cost-effective solution

that allows students to interact with instructors and classmates in real time. Synchronous virtual classrooms via web conferencing systems are increasingly being used in higher education.

Martin, Parker, and Deale (2012) studied the importance of interaction within a synchronous virtual classroom. Their results suggested that live communication in a synchronous virtual classroom definitively enhanced interaction. Most virtual classroom technologies have a content frame to share the instructor's files, an electronic/interactive whiteboard for instructors and students to write or draw, breakout rooms for group activities, text chat to interact using words and emoticons, and audio chat to talk via a microphone or telephone with the instructor and other students. Instructors can administer student polls, share their desktop, or have the students share their own desktops through application sharing. Websites can be displayed for students, and, with stable Internet bandwidth, webcams can be used so students and instructors can see each other. The entire virtual classroom session can be archived for later use. In recent versions, students can also download archived class sessions. In some cases, students with audio difficulties can dial in using pre-established telephone numbers. Instructors can even call on students to use the electronic/interactive whiteboard, share their webcam, or speak via the microphone. Cook, Annetta, Dickerson, and Minogue (2011) supported the use of synchronous audio chat and text chat in their study. LaPointe, Greysen, and Barrett (2004) found that audio and visual components in synchronous systems help to bridge cultural differences and create communities of practice.

The use of e-learning environments enables students to learn from anywhere, without having to physically travel to a traditional classroom (Morrow, Phillips, & Bethume, 2007). A voice component, when added into synchronous online classes, provides increased student–student and student–instructor interaction (Martin et al., 2012). Kock (2005) predicted that synchronous communication increases psychological arousal in the learner. Hrastinski (2008) compared asynchronous and synchronous e-learning and found that in synchronous communication, it was possible to monitor the receiver's reaction to a message, which therefore increases arousal and motivation in the learner. He concluded that synchronous e-learning better supported learners by providing them with social support.

Additionally, synchronous virtual classrooms have an advantage over traditional courses during lecturing. During an interactive synchronous lecture, students can type questions and comments without interrupting the presenter. These questions benefit the students asking them as well as the entire class because every student can see the questions. This builds critical thinking skills by causing them to reflect on the questions and posit answers to them for themselves. It can also draw their attention to material they missed and provide information when the question is answered. Text comments additionally allow students to see the learning status of their peers and gauge their learning comparatively (Marjanovic, 1999). However, this does require the instructor to multitask by monitoring the text chat or being present in the virtual classroom; not every instructor may be capable of multitasking in this manner. According to Marjanovic (1999), students involved in virtual classrooms improved their problem solving skills, critical thinking, and written communication skills. Synchronous virtual classrooms seem as effective as traditional F2F classrooms in meeting the needs of varying levels and types of students, making them a viable and logical choice for the future of education.

Faculty using synchronous virtual classrooms employ a variety of techniques to motivate and instruct students. Clark (2005) posits four routes to engaging online learners: maintain a lively pace, visualize the content, incorporate frequent participant responses, and use small group break-out rooms. His research also proved that shorter time lengths for classes, such as 60 to 90 minutes, yielded better student perceptions and engagement in material than multiple hour-length sessions.

Despite the benefits e-learning can offer, the adoption of e-learning in the tertiary institutions faces a number of challenges (Rolfe et al., 2008; Nagunwa & Lwoga 2012). Similar studies available revealed many challenges to e-learning adoption process, however, most of them had used teachers and/or students of secondary schools as sources of data to arrive at their conclusions and recommendations. In contrast, this study involved experts and lecturers of e-learning technologies from the various public universities in Ghana that engage in the activities of e-learning platform to examine barriers of adopting e-learning and best strategies used to achieve e-learning. The researchers believe that data generated from the voice of professionals will represent the entire universities in Ghana. Also, the outcome could influence policy making regarding the adoption and use of e-learning in the

various tertiary institutions. Moreover, lecturers and students could appreciate the benefits of e-learning programmes despite its challenges for it will propel management to come out with appropriate strategies or mitigations for effective and efficient enrollment of e-learning programmes in the various universities in Ghana.

Research Objectives

The main purpose of this paper was to examine the adoption and use of e-learning among universities lectures in Ghana. Specifically, the study sought to;

1. identify the adoption rate of e-learning platforms among lecturers
2. examine reasons for adopting and using e-learning platforms
3. compare the differences between demographic characteristics of lecturers and factors that determine the adoption and use of e-learning
4. analyse the determinants (organizational, social, personal and technological factors) of e-learning platforms

Research Questions

1. What is the adoption rate of e-learning platforms among lecturers?
2. What are the reasons for adopting and using e-learning platforms?
3. What are the differences between demographic characteristics of lecturers and factors that determine the adoption and use of e-learning if any?
4. What are the determinants (organizational, social, personal and technological factors) of e-learning platforms?

Research Methodology

Matters of ontological and epistemological assumptions as well as research philosophy that shaped or underpinned this study was positivist. Therefore, the study used explanatory design. This help the study to analyzed the determinants and adoption of e-learning. The study targeted the lecturers or faculty members of the tertiary education in Ghana. Therefore, stratified sampling technique was adopted to select respondents from respective educational institutions (University of Ghana, Legon, University of Cape Coast, University of Education, Winneba, Kwame Nkrumah University of Science and Technology, University of Mines, University of Developmental Studies). In all, 322 respondents were selected based on the total population (over 2000) of the various lecturers or faculty members with the aid of Krechie and Morgan (1970) sample size calculated table to derived it. Data collection instrument that were used for the study was a questionnaire. The Ethical issues were assured by ensuring free consent, anonymity and confidentiality. Data that were gathered through the questionnaire were edited, coded and entered into the statistical Product for Service Solution (SPSS) software version 21.0 for further processing and analysis. The descriptive statistics such as means, standard deviations, frequencies and percentages (objective 1 and 3) as well as inferential statistics such as Chi-square test for objective 2 and Pearson correlation as well as regression were used to analyse the objectives (4).

Results and Discussions

This section presents on the data and analysis of the study based on the research objectives. The study was to investigate into the adoption and use of e-learning among lectures of the universities of Ghana. The presentation of the results was categorized into two: demographic characteristics of the respondents as well as the specific objectives of the study.

Demographic characteristics

The study was carried out for 322 respondents, however, due to online fatigue in answering questionnaire, 280 (86.95%) respondents partook in the study. Out of the 280, 208 (74.3%) was males while 72 (25.7%) was females. On age, 49 of the respondents were found to be within 25-34 years while most of the respondents was

found from 45 years and above. This is due to the fact there is longer period in attaining senior lecturer position or rank in their profession. Christians dominated among the respondents, followed by Muslims with few being other religions. On the rank or position of the respondents, more of the respondents were senior lecturers, followed by junior lecturers and research assistants. This shows that views or perception of the various ranks or position were considered in the study. Regarding the marital status, majority (192) of the respondents were married, followed by single while 12 of the respondents were widowed. This may be due to the ages of the respondents.

On procreation, it was found that most (155) of the respondents had only a child, followed by 54 respondents who do not have a child and 43 respondents have more than 2 children. In the academic environment, most of the scholars do not like giving birth to many children so that they can give them maximum time and proper care. On computer literacy, it was found that most (113) of the respondents have low level of knowledge regarding computing and its related issues. Nevertheless, the rest either had moderate (92) or high (69) knowledge regarding computing. This may be due to the fact that most of the respondents were older and most of them were employed at their time without much concentration on computing. Currently, university management employ based on the computing skills of the employees. This may be among the reasons why younger lecturers have high or moderate computing skills.

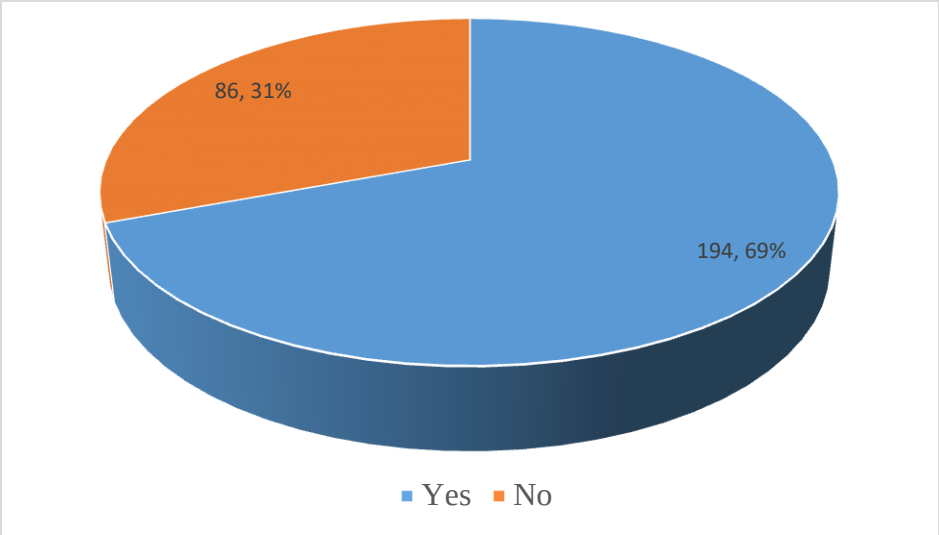

Figure 1: Adoption and use of e-learning platforms

Figure 1 shows that most of the respondents (69%) have adopted and use e-learning in delivery of lessons to students while 31 percent have not. This indicates that despite a larger number of respondents using the e-learning platform for teaching and learning, a sizeable number of respondents (86) have not. This was in line with that of Baia (2009) who found that lecturers are committed to acquiring, maintaining and changing their knowledge as they continue to teach and as new instructional technologies surface. Table 1 presents on the various platforms used online for delivery of lessons to students.

Table 1: E-learning platforms used by the respondents

Platforms	Frequency	Percent
Institutional online platform	153	54.6
Email	15	5.4
Zoomla	54	19.3
Google classroom	31	11.1
GoToWebinar	10	3.6
Slide share	6	2.1
Skillshare	5	1.8
Alison	6	2.1
Total	280	100

Table 1 shows that most of the respondents (153, 54.6%) identified "institutional online platform such as Shakai (Legon) and University of Cape Coast virtual classroom as the main e-learning platform used for teaching and learning. These were official online platforms created by the various universities to facilitates teaching and learning. Moreover, 54 of the respondents agreed that Zoomla is used as an e-learning platform. This is one of the few e-learning platforms used for presentation, sharing of files and information. E-mail is normally used to exchange information and files. In addition, google classroom was endorsed by 31 respondents as an e-learning platform. Lastly, Alison is online platform introduced by University of Cape Coast to teach level 100 students Microsoft suite (Microsoft Word, Microsoft Excel, Microsoft PowerPoint, and Microsoft Access).
Cook et al. (2011) supported the use of audio chat and text chat. In some instances, text chat is recommended over audio chat for student learning. Text chat and audio chat are helpful for students to receive immediate feedback from the instructor and their classmates. Pattillo (2007) found that audio conferencing increased communication between instructor and students. Studies have also reported that audio quality is the most critical factor for virtual conferencing (Jennings & Bronack, 2001).

Table 2: Reasons for using e-learning

Reason	Frequency	Percent
Social interaction	119	42.5
Convenience	42	15
Larger community	65	23.2
Geographical limitlessness	32	11.4
Collaboration	12	4.3
Adaptation	10	3.6
Total	280	100

A number of reasons were given by the respondents on the reasons for adopting and using e-learning platforms for teaching and learning. According to Table 2, more of the respondents identified social interaction as the main reason for using it. To them, these platforms helped them to interact, discuss, and debate some concepts and issues with students and co lecturers without them being physically present. Also, 42 respondents agreed that e-learning platforms is meant for convenience sake. E-learning platform permit lecturers to easily facilitate class, share information easily and retrieve information with ease among others. Moreover, with e-learning platforms, 65 respondents believed that it helped them to reach out to larger group of students that under traditional setting it would not be possible to meet them in one place or at a glance. To add up to this, 32 respondents agreed that the use of e-learning promotes geographical limitlessness. This means that students could access information from their lecturers from any geographical region without necessary being present.

Table 3: Differences between demographic characteristics of lecturers and adoption and use of e-learning

To

Socio-demographic characteristics	N	Yes	No	χ^2	P- value
Sex				8.142	0.015
Male	208	163	45		
Female	72	31	41		
Age				5.357	0.004
25-34	49	42	7		
35-44	89	62	27		
45 and above	142	65	77		
Religion				1.149	0.120
Christian	208	168	40		
Muslim	47	26	21		
Others	25	14	11		
Rank/Position				18.298	0.000
Research Assistants	45	40	5		
Junior lecturer	97	77	20		
Senior Lecturer	138	65	73		
Marital status				2.767	0.429
Married	192	167	25		
Single	47	37	10		
Widowed	12	10	2		
Divorced	29	19	10		
Number of children				10.84	0.013
None	54	44	10		
1	155	108	47		
2	28	17	11		
More than 2	43	23	20		
Computer literacy				8.07	0.021
Low	113	65	48		
Medium	92	71	21		
High	69	65	4		

examine the differences among the demographical characteristics of the respondents and adoption and use of e-learning platform, the chi-square test was used and the results are presented in Table 3. Regarding the sex of the respondents, Table 3 shows that males were more willing to adopt and use e-learning platform in teaching and learning as compared to females. This difference was proved to be statistically significant as shown by the result of the Chi-square test ($\chi^2 = 8.142$, $p<0.005$).

On age of the respondents, it was found that more of the respondents within 25-34 years and 35-44 years will adopt and use e-learning platforms in teaching and learning. Thus, the younger staff were more familiar with computing and were willing to adopt and use e-learning in their teaching and learning activities as compared to respondents of 45 years and above ($\chi^2 = 5.357$, $p<0.234$).

There were no significant differences between religion of the respondents and the adoption and use of e-learning in teaching and learning. Thus, though, there were more Christians willing to adopt it than Muslims and others. However, these differences were statistically not significant ($\chi^2 = 1.149$, $p>0.05$) (Table 3).

On rank or position of the respondents, Table 3 shows that more of the respondents who were research assistants and junior lecturers were highly decisive to adopt and use e-learning in teaching and learning activities as compared to some senior lecturers. This may be due to the fact that currently, computing literacy is part of the requirement for employing new staff or lecturers of the various universities as compared to most of the senior staff who are of age and were just employed without necessary having the computing skills. These differences were statistically significant ($\chi^2 = 18.298$, $p<0.05$).

On marital status of the respondents, it was found that more of the respondents who were either single or widowed were more willing to adopt and use e-learning in teaching and learning activities as compared to most respondents who were married or divorced. Mostly, respondents who are married are distracted by their wives and children when operating their machines at home which prevents them from using their computer devices or laptops at some places aside the office. However, this was statistically not significant ($\chi^2 = 2.767$, $p>0.05$).

With regards to the number of children of the respondents, most of the respondents who had no child wish to adopt and use e-learning as compared to respondents who children. This means that number of children

influence respondents' decision to adopt and use e-learning platform or not. These difference were statistically significant ($\chi^2 = 10.84$, $p<0.05$) (Table 3).

Concerning computer literacy, Table 3 shows that respondents with high computer literacy rate were more willing to adopt and use e-learning platforms as compared to respondents with low or medium level of computer literacy. These difference were statistically significant ($\chi^2 = 8.07$, $p<0.05$). The Technology Adoption Model (TAM1) posits that high literacy push respondents to adopt and use technological related devices.

Table 4: Features use on e-learning medium or platforms that influence respondents' adoption

Feature	Frequency	Percent
Archiving the session	28	10
Viewing the webcam	73	26.1
Text chart	54	19.3
Audio chart	34	12.1
Sharing web links	21	7.5
Downloading the archive	16	5.7
Hand-raising	9	3.2
Break out rooms	25	8.9
Sharing screens	20	7.1
Total	280	100

Table 4 shows the various features found on most of the e-learning platforms. According to Table 4, out of the 280 respondents, 73 (26.1%) indicated that the features of the e-learning platform influenced their adoption of the technology. Of the 280, 54 respondents said that text chart (19.3%), audio chat (12.1%), and downloading the archive (16, 5.7%) were the features that most influenced their adoption. Break out rooms (25, 8.9%) were reported as having the least influence on faculty adoption of e-learning platform. Break out rooms help lecturers to divide students online into groups to share information.

Table 5: Descriptive of the factors that influence adoption and use of e-learning platforms

	% of agreement	Means	Std Dev
Organizational	64.8	4.32	0.753
Personal	81.12	4.62	0.741
Social	52.7	4.11	0.681
Technological	77.2	4.20	0.512

According to Table 5, majority (81.1%, M=4.62) of the respondents agreed that personal factors influence their decision to adopt and use e-learning platforms for teaching and learning. This was followed by technological factors such as presence of computers and accessories as well as internet facilities (77.2%, M=4.20) and others also saw organizational factors such as motivation by management, provision of adequate training and support to lecturers and staff among others as the main factor that influence their decision to adopt and use e-learning platform or services in teaching and learning. This means that most of the respondents perceived that their personal factor such as age, computer literacy level or rate, attitude towards computing among others highly influence their decision on whether to adopt and use e-learning platforms or not. However, the significant effect of these factors on the adoption and use of e-learning platforms were tested by using multiple regression and the result is presented in Table 6.

Table 6: Factors that determine the adoption and use of e-learning platforms

Predictor	Unstad. Coefficient	SE Coefficient	t-statistics	*Prob.*
Constant	5.581		14.153	0.000
Organizational factors	2.403	0.271	-7.198	0.011
Social factors	1.852	0.154	3.951	0.024
Personal factors	3.841	0.441	5.184	0.032
Technological factors	4.015	0.327	12.07	0.017

$R2 = 0.72$, Adjusted $R^2 = 0.68$, $F= 12.87$, $p<0.05$

The F-statistic explains whether variations in the dependent variable can be explained by the regression model or equation. The sig value of the F-stat of 12.87 is $p<0.05$ as a result, we fail to reject the null hypothesis (Table 6). This means that variations in the adoption and use of e-learning is explained by that independent factors such as personal, social, organizational and technological. Also, the Adjusted R^2-value of 0.68 indicates that there is about 68% variation in adoption and use of e-learning among lecturers and staff due to the presence of independent variables.

From Table 6, the result shows that organizational factors (β=-0.271, t=-7.198, $p<0.05$), social factors (β=0.154, t=3.951 $p<0.05$), personal factors (β=0.441, t=5.184, $p<0.05$) and technological factors (β=0.327, t=12.07 $p<0.05$) significantly affect respondents' decision to adopt and use of e-learning positively. Nevertheless, among these factors, personal factor highly affects respondents' decision to adopt and use e-learning, followed by technological factors, organizational factors and then social factors being the least considered factor. According to Yen et al (2010), factors that influence adoption and use of e-learning platforms included; organizational factors, social factors, personal factors as well as technological factors.

Table 7: Challenges of adoption of e-learning by the respondents

Barrier	Frequency	Percent
ICT competence/computer literacy	61	21.8
Inadequate ICT infrastructures/ educational resources	52	18.6
Limited bandwidth (low internet speed)	35	12.5
Lack of maintenance culture	28	10
High cost of bandwidth and internet access	21	7.5
Resistance to change	18	6.4
Poor delivery mode (learning style)	17	6.1
Lack of institutional e-learning policy	14	5
Inadequate technical and managerial support	13	4.6
Unreliable electricity power ("Dum so")	10	3.6
Inadequate ICT training for lecturers and staff	10	3.6
Total	280	100

Challenges of e-learning adoption among the respondents were also examined and the result is presented in Table 7. It shows that more of the respondents identified "ICT competence/computer literacy" as the main contributing factor regarding the barriers of the adoption of e-learning. Also, 52 respondents agreed that inadequate ICT infrastructures/educational resources is a challenge to the adoption of e-learning. It is believed that though e-learning are of infringe benefits but the resources are not enough to cater for its needs. Nevertheless, few respondents identified inadequate ICT training by management for lectures and staff as a key challenge of adopting and using e-learning.

Conclusion and Recommendations

The study employed online survey and an explanatory design was appropriate followed. Based on the set objectives of the study, the following conclusions were drawn out from the findings of the study. There was a moderate level of adoption and use of e-learning platform among lecturers of tertiary education in Ghana. Thus, lecturers have adopted and used some features such as audio, webcam, text, break out among others on online platforms such as institutional online software or platforms, zoomla, google classroom, email, skillshare and Alison. Lectures have adopted and used e-learning platforms for the purpose of social interaction, convenience, larger community, geographical limitless, and collaboration. Nevertheless, there were some differences among the demographic characteristics of the lecturers and the adoption and use of e-learning platforms. Such demographic characteristics included sex, age, rank or position, number of children and computer literacy rate while there were no differences between marital status, religion and adoption and use of e-learning platforms. Moreover, personal factors, technological factors and organizational factors motivate the adoption and use e-learning platform. Despite the numerous benefits of the adoption and use of e-learning platforms, it was entangled with issues such as ICT competence/computer literacy, inadequate ICT infrastructures/educational resources, and inadequate ICT training by management for lectures and staff. Therefore, the study

recommended that the management of the various universities continue to motivate lecturers and staff (especially females and old lecturers) to adopt and use e-learning platforms due to the benefits accrued to it. Management in collaboration with the quality assurance unit should monitor and evaluate the system for effective and efficient delivery of lessons.

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