Determinants of e-learning adoption among students of developing countries

Richard Boateng  
Department of Management Information Systems,  
University of Ghana Business School, Accra, Ghana

Alfred Sekyere Mbrokoh  
Department of Operations and Management Information Systems,  
University of Ghana Business School, Accra, Ghana

Lovia Boateng  
Department of Marketing and Entrepreneurship,  
University of Ghana Business School, Accra, Ghana, and  
Prince Kwame Senyo and Eric Ansong  
Department of Operations and Management Information Systems,  
University of Ghana Business School, Accra, Ghana

Abstract

Purpose – The purpose of this paper is to investigate the determinants of e-learning adoption (ELA) among students in the University of Ghana.

Design/methodology/approach – A quantitative research approach comprising of a survey of 337 students was adopted. Data were collected using questionnaires designed in conjunction with 13 factors (computer self-efficacy (CSE), perceived ease of use (PEOU), perceived usefulness (PU) and attitude towards use (ATTU)) in the conceptual model of the study. Data analysis was conducted using structural equation modelling.

Findings – The result revealed that PU and ATTU had a direct effect on ELA whilst, PU and PEOU also had a direct relationship on ATTU. Other variables such as CSE and PEOU had an indirect relationship on ELA though they were found to have an insignificant direct relationship on ELA.

Practical implications – The level of significance of each construct identified in the study provide practical guidance to school administrators and instructors as to which factors to pay close attention to when implementing e-learning projects within their respective institutions.

Originality/value – This study provides insight into ELA from the students’ perspective, through an extension of the TAM model in a developing country context given the existence of cultural differences and societal idiosyncrasies which exist in different contexts, particularly in Africa.

Keywords Determinants, Ghana, E-learning, Developing countries, Adoption, Structural equation modelling (SEM)

Paper type Research paper

1. Introduction

Teaching and learning has evolved over time; and the current situation being experienced in academic institutions is the use of information technology as a mediator. This new shift provides another perspective on education, with an emphasis on the use of electronically mediated tools to facilitate the learning process (Piccoli et al., 2001).

This study was sponsored by the University of Ghana Building Stronger Universities (BSU) e-leaning and Problem-Based Learning (PBL) project.
This evolutionary change is referred to as electronic learning or e-learning, which refers to the use of information and communication technologies to facilitate access to resources that enhance teaching and learning. E-learning comes not as a substitute to traditional teaching and learning, but rather to strengthen and expand the reach of learning (Islam and Azad, 2015). Examples of e-learning tools include Moodle, Blackboard, WebCT, Sakai and Web 2.0 platforms (Akeroyd, 2005).

E-learning adoption (ELA) research has garnered some empirical investigations over the years, with constructive insights provided by a number of studies including Ondago et al. (2012), Sánchez et al. (2013), Tarhini et al. (2013b) and Wang and Huang (2013). For instance, Sánchez et al. (2013) studied the factors that determine the acceptance of WebCT learning, an e-learning platform, among students of the faculties of Business and Education Sciences at the University of Huelva in order to verify the direct and indirect effects of these factors through the lens of the technology acceptance model (TAM). The study considered six factors, namely, technical support, computer self-efficacy (CSE), perceived ease of use (PEOU), perceived usefulness (PU), attitude towards use (ATTU) and system usage as determinants of ELA. However, the findings pointed out that, technical support has a direct effect on PEOU and PU; while PU and PEOU affect WebCT use and acceptance directly and indirectly, respectively.

Similarly, Tarhini et al. (2013b), investigated e-learning from a developed country (UK) perspective and revealed that PEOU, PU, social norms, quality of work life, CSE and facilitating conditions have positive effects on the use of e-learning platforms. Other ELA studies have pointed out respective factors in relation to its adoption from individual, organizational and national perspectives, but all these adoption studies have no general consensus on the determinants of e-learning, an indication that more studies on ELA are required so as to consolidate these differences.

ELA has been studied extensively in developed countries (Akeroyd, 2005; Duan et al., 2010; Hardaker and Singh, 2011; Islam, 2013) and it can be argued that the findings from these studies can be adapted in developing countries. However, a direct transfer of technological experiences from developed to developing countries has been questioned and opposed by authors like Avgerou (2001) and Heeks (2002) due to contextual differences and social idiosyncrasies.

Hence, findings from developed countries on ELA cannot be used as a basis for developing countries. A study from the perspective of a developing country is thus essential to understanding the determinants of ELA from a developing country perspective. Consequently, calls have been made by authors such as Bhuasiri et al. (2012) and Sánchez et al. (2013) for complimentary or comparative studies in different universities to verify earlier findings on ELA. This study responds to these calls for further research by considering ELA in Ghana. A review of the extant literature revealed a dearth of enquiries into Ghana’s higher educational systems, with the limited literature available failing to investigate ELA thereby creating a significant gap in knowledge.

Therefore, this study adopts a strong theoretical stance, coupled with unique technological developments in order to investigate the determinants of ELA from the perspective of a developing country. The study is organized as follows: Section 1 presented an introduction to the study. Section 2 provides a critical review of pertinent literature on e-learning by discussing a general overview of e-learning, followed by a review of extant studies on ELA. Next, the research framework, model and hypotheses of the study are considered. Section 4 covers the research methodology, where emphasis is laid on the data collection and analysis methods.
The findings and discussion are presented in Section 5; while the conclusion, limitations and contributions to research, practice and policy are explicated in the concluding section.

## 2. Literature review

### 2.1 ELA

Extant studies have investigated e-learning from different perspectives, including individual (Abdullah, 2011; Tarhini et al., 2013a) and organizational perspectives (Cegarra-Navarro and Sabater-Sánchez, 2005; Georgouli et al., 2008). Different factors have been enumerated as possible determinants of individual ELA, since adoption in itself is multifaceted and cannot be studied using a single factor. Table I illustrates selected studies on ELA detailing the authors, the adoption factors investigated, the context of the study and the underpinning research frameworks used.

ELA has been studied from different perspectives and contexts, using various research frameworks. Even though e-learning is an innovation backed by technology,

<table>
<thead>
<tr>
<th>Article</th>
<th>Theory</th>
<th>Country</th>
<th>Sample and methodology</th>
<th>Adoption determinants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motaghian et al. (2013)</td>
<td>Technology acceptance model and IS success model</td>
<td>Iran</td>
<td>Survey of 115 university instructors</td>
<td>Perceived usefulness&lt;br&gt;Perceived ease of use&lt;br&gt;System quality</td>
</tr>
<tr>
<td>Tagoe (2012)</td>
<td>The basic technology acceptance model</td>
<td>Ghana</td>
<td>Longitudinal survey of 534 university students</td>
<td>Perceived usefulness&lt;br&gt;Perceived ease of use&lt;br&gt;Attitude towards use&lt;br&gt;Behavioural intention</td>
</tr>
<tr>
<td>Amirkhanpour et al. (2014)</td>
<td>Conceptual framework</td>
<td>Cyprus</td>
<td>Online questionnaire distributed to all the public and private universities</td>
<td>Integration of social learning elements such as various social media tools</td>
</tr>
<tr>
<td>Hassanzadeh et al. (2012)</td>
<td>Delone and McLean model measuring e-learning</td>
<td>Iran</td>
<td>Questionnaires completed by 369 instructors, Students and alumni of 5 universities</td>
<td>Technical system quality&lt;br&gt;Educational system quality&lt;br&gt;Content and information quality&lt;br&gt;User satisfaction&lt;br&gt;Benefits of usage&lt;br&gt;Goal achievement</td>
</tr>
<tr>
<td></td>
<td>systems success (MELSS) model</td>
<td></td>
<td>Structural equation modelling</td>
<td>IS expertise&lt;br&gt;Expected benefits&lt;br&gt;IT infrastructure&lt;br&gt;Competitive pressure&lt;br&gt;Educational partners&lt;br&gt;Availability of ICT infrastructure&lt;br&gt;E-learning curriculum&lt;br&gt;Performance expectancy&lt;br&gt;Perceived usefulness&lt;br&gt;Perceived ease of use&lt;br&gt;Competitive pressure</td>
</tr>
<tr>
<td>Raouf et al. (2012)</td>
<td>TOE framework</td>
<td>Iraq</td>
<td>Questionnaires completed by 120 faculty members</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Structural equation modelling</td>
<td></td>
</tr>
<tr>
<td>Namisiko et al. (2014)</td>
<td>TAM and TOE</td>
<td>Kenya</td>
<td>Online Questionnaires submitted to a total of 500 participants which included instructors, students and administrators</td>
<td>Both descriptive and inferential statistics&lt;br&gt;Perceived usefulness&lt;br&gt;Perceived ease of use&lt;br&gt;Competitive pressure</td>
</tr>
</tbody>
</table>
it is applicable in all spheres of education hence, the multiplicity of studies. Some of the studies from a developing country context on ELA have revealed that the perceived influence and PEOU variable of the TAM are important factors that influence the adoption of e-learning (Al-Adwan et al., 2013; AlAmmary and Hamd, 2008; Elkaseh et al., 2016). For instance, in using the quantitative survey approach to research, Elkaseh et al. (2016) discovered the PEOU and the PU were important factors that predicted teachers and student behavioural intention to use e-learning in Libyan higher education. AlAmmary and Hamd (2008) have also stated that, though PU and PEOU have a positively direct influence on behavioural intention to use e-learning, PEOU has an indirect influence on behavioural intention to use e-learning. As a result of this, other studies have sought to explore other antecedents of PU and PEOU to examine the influence of these antecedent on the PU and PEOU variables in examining ELA (Chang et al., 2012; Hasan, 2007; Teo et al., 2008). However, these studies have showed several discrepancies in terms of the factors that determine the adoption of the technology. As a result, further studies are needed in order to validate and consolidate the various determinants which have been identified in earlier studies. Additionally, a cross-section of the literature on e-learning indicates a paucity of studies from developing countries, especially in Africa. In some cases, arguments have been made for a direct transfer of knowledge from studies in developed countries to developing countries; however, issues of social idiosyncrasies, computer infrastructure and culture may hinder this transfer. Therefore, there is a need for more studies on ELA, primarily from a developing country perspective.

3. Research framework

Technology adoption has been studied using different theories and frameworks such as the technology, organization and environment (TOE) framework, the theory of reasoned action (TRA), the diffusion of innovation model, the TAM, the theory of planned behaviour (TPB), institutional theory among others (Ondago et al., 2012). The abundance of theories increases the amount of difficulty in selecting an appropriate theory; however, the level of analysis of the theory is one criterion that clearly distinguishes the respective theories. Some theories are developed to study individual adoption (Davis, 1989) while others are developed to study organizational adoption (Tornatzky and Klein, 1982). But, a review of the literature revealed an overwhelming support for the TAM (Al-Hawari and Mouakket, 2010; Chokri, 2012; Motaghian et al., 2013; Persico et al., 2014) as an appropriate model to investigate ELA; hence the theoretical foundations of this study.

The TAM was developed by Davis (1989), based on the TRA, to test user acceptance and use of information systems. This theory was developed after the TRA and the TPB were criticized for having limitations in measuring attitude towards behaviour, subjective norm and perceived behavioural intentions. Further, the time gap between the assessment of a behaviour and the actual behaviour was a contributing factor that led to the development of TAM. Also, external variables were believed to influence behaviour, which were not included in the two theories. Thus, the TAM model comprised two main factors, PEOU and PU. PEOU measures the degree to which an individual conceives minimal effort to be able to use a technology, while PU measures the degree to which their performance on a job is enhanced by technology (Davis, 1989). TAM accepts the influence of external variables on an individual, hence their inclusion in the model. The model further suggests that, the intention of an individual to adopt a technology is determined collectively by PU and PEOU, which in turn influence
attitude and subsequently an actual behaviour. Notwithstanding, Taylor and Todd (1995) have criticized the model for providing only a limited guidance of how design and implementation can be used to anticipate technology usage. Hence, there have been attempts by some authors to extend TAM which has led to the development of TAM2 and TAM3. This has been done through the introduction of factors from other related models; the introduction of additional or alternative belief factors; and the examination of the antecedent and moderators of PU and perceived ease of use (Wixom and Todd, 2005). However, most of the studies that have used TAM to study technology adoption in a developing country context have either used it in its original form (Al-Ajam and Nor, 2013) or in extended form by adding on certain constructs (Abbad et al., 2009; Alharbi and Drew, 2014; Elkaseh et al., 2016).

3.1 Research model and hypothesis
Using the TAM as a guiding lens, this study seeks to investigate the determinants of ELA from the perspective of a developing country. TAM has been used extensively to understand technology adoption in the domain of information systems, and it has been accepted as a reliable model to determine individual adoption of a technology. This study, however, proposes an extended version of TAM to address the research purpose. It examines four factors as determinants of ELA from the developing country perspective. These factors are CSE, PU, and PEOU and ATTU as shown in Figure 1.

E-learning largely involves the use of electronic devices and technological platforms, therefore the ability of the individual to use devices and technology is important to its adoption; hence CSE. According to Bandura (1977), self-efficacy refers to an individual’s confidence to perform a task successfully. CSE examines the ability of a student to use computers to access resources on learning management systems, which invariably has a significant effect on the use and adoption of e-learning from the students’ perspective. Based on these statements, extant researchers have pointed out that, with regards to the influence of CSE on ATTU of computer technologies, Sam et al. (2005) and Zhang and Espinoza (1998) have established that, students CSE has a positive influence on their ATTU of e-learning systems. Furthermore, CSE has also been argued as having a significant influence on PEOU (Al-Haderi, 2013; Igbaria and Iivari, 1995; Saadé and Kira, 2009). Al-Haderi (2013) have therefore revealed that, students’ CSE has a positive influence on the ease of operability of e-learning systems. CSE has also been established as having a positive influence on PU (Al-Haderi, 2013; Igbaria and Iivari, 1995; Saadé and Kira, 2009). In light of this, several authors have also examined its influence on PU and have revealed that, CSE has a positive significant

![Figure 1. Research model](https://example.com/figure1.png)
influence on PU (Hasan, 2007). Based on the revelation that CSE has a positive effect on PEU, PU and ATTU, the current study seeks to include CSE in the research model as an extension to the TAM model. Thus the proposition of the following hypothesis:

H1. CSE directly and significantly influences PEU.

H2. CSE directly and significantly influences attitude towards ELA.

H3. CSE directly and significantly influences PU.

According to Davis (1989) PEU is “the degree to which a person believes that using a particular system would be free from effort”. In view of this, PEU has been theorized as having a direct influence on ATTU by many researchers (Chang et al., 2012; Okazaki and dos Santos, 2012; Park, 2009). Okazaki and dos Santos (2012) have posited that when users feel that e-learning is easy to use and does not require much effort, they will have a positively high attitude towards using the system. Further analysis of previous studies also revealed that, PEU has a positively direct influence on behavioural intention (AlAmmary and Hamd, 2008; Ong and Lai, 2006). Hence, it is clear that the easy of operability of an e-learning system has a significant influence on behavioural intention of the user. PEU has also been found to directly affect the PU of an innovation, as the decision of whether an innovation is useful to the individual or not is influenced by the perception of how easy a person perceives the innovation to be (Segars and Grover, 1993; Suki and Ramayah, 2010). Therefore, the following hypotheses:

H4. PEU directly and significantly influences PU.

H5. PEU directly and significantly influences attitude towards ELA.

H6. PEU directly and significantly influences behavioural intention to adopt e-learning.

PU measures the degree to which an individual believes a system is up to the performance of a task. In view of this, Davis (1989) proposes that, PU influences the use and ATTU of an innovation since, the usefulness of an innovation will inform an individual’s interest and actual use of that innovation. Hence, Teo et al. (2008) have revealed that a high level of PU would result in a more positive ATTU. The relationship between PU and ATTU have enjoyed strong empirical support in existing studies on individual adoption of an innovation (Tung et al., 2008; Suki and Ramayah, 2010). Furthermore, PU has also been consistently identified by extant studies as having a direct influence on behavioural intention to adopt e-learning (Al-Adwan et al., 2013). Thus, PU is considered an important factor in investigating the determinants of ELA from a students’ perspective in developing countries. Thus, it is hypothesized that:

H7. PU directly influences attitude towards ELA.

H8. PU directly influences behavioural intention to adopt e-learning.

Attitude refers to the degree of a person’s favourable or unfavourable evaluation or appraisal of the behaviour in question (Ajzen, 1991). In light of this, Davis (1989) has demonstrated that, attitude has an effect on behavioural intention to use a technology. This has led to the definition of attitude by Bajaj and Nidumolu (1998) as the degree to which an individual is interested in a specific system. As argued by the TPB, attitude has a significant influence on human behaviour. This therefore implies that, when individuals form a positive attitude towards e-learning, they will have a strong
intention towards adopting it. This result has been replicated by some other studies that have sort to investigate the influence of attitude on behavioural intention to use e-learning systems (Lee et al., 2005). Hence, it is hypothesized that:

\[ H9. \text{ Attitude directly influences behavioural intention to adopt e-learning.} \]

4. Methodology

The study is quantitative, using the survey technique as the data collection method. The model that was tested is made up of five constructs, each having multiple items that are measured using a five-point Likert scale ranging from 1 = strongly disagree and 5 = strongly agree.

The survey instrument was divided into two sections. Section 1 covered the demographic details and e-learning experiences of the participants, whereas Section 2 contained statements evaluating the five constructs of the proposed research model, namely, CSE, PEOU, PU, ATTU and ELA. In all, 357 responses were collected, of which 339 were deemed valid for further analysis. The data analysis was conducted using a two-step approach for structural equation modelling (SEM), a multivariate data analysis technique widely used in information systems research for construct validation and testing linkages between constructs (Gefen et al., 2000). Confirmatory factor analysis (CFA) was first used to validate the measurement model; after which a path analysis of the structural model was conducted in order to explore the causal relationships between the independent and the dependent variables. IBM’s Amos version 22 and SPSS version 20 were used in the analysis of both the measurement and structural models.

5. Findings

5.1 Demographic analysis

The demographic characteristics of the respondents used for the study covered issues relating to age group, gender, programme of study and the e-learning experiences of the participants. The age distribution of the participants showed that individuals between the ages of 21-25 dominated the sample with 67.33 per cent, followed by individuals with ages between 26-30 (10.15 per cent) while age groups 16-20, 31-35 and 36-40 recorded percentages of 9.71, 6.84 and 5.96 per cent, respectively. In relation to gender distribution, the male participants were more than the females with percentages of 55.19 and 44.91 per cent, respectively. The levels of study of the participants are distributed as follows: undergraduate (71.71 per cent), masters (27.15 per cent) and doctorate (1.10 per cent). Lastly, on the e-learning experiences of participants, 95.14 per cent asserted that they have used e-learning in their studies, while 4.86 per cent responded in the negative. Platforms such as Sakai Learning Management System, Facebook, WhatsApp, class e-mails and course websites were identified as the platforms used in delivering e-learning, as asserted by the participants who had experienced e-learning.

5.2 Measurement model

With the aid of Amos 22, a CFA was conducted with maximum likelihood estimate to test the measurement model. As revealed in Table II, the initial yielded fix indices reported that the measurement model has a poor fit due to CMIN/df being 2.896 (\( \leq 3.000 \)), GIF = 85.4 per cent (\( \geq 90 \) per cent), AGFI = 68.1 per cent (\( \geq 80 \) per cent), NFI = 87.6 per cent (\( \geq 90 \) per cent), CFI = 91.5 per cent (\( \geq 90 \) per cent), PNFI = 76.2 per cent
Therefore, this necessitated purification and re-analysis of the measurements used for the study (Anderson and Gerbing, 1988). By looking at the modification indices, standardized regression weight (factor loadings), square multiple correlation and standardized residual covariance as listed in the AMOS output, this study was able to identify the problematic items that decreased the model fit. In view of this, four items of CSE, two items of PU and one item in e-learning intention behaviour (ELIB) were found to be redundant items, and were subsequently removed. After the removal of the redundant items, a re-run of the measurement model was conducted and all the produced fit indices were found within their required threshold values as follows: CMIN/df being 2.200 (≤ 3.000), GIF = 93.4 per cent (≥ 90 per cent), AGFI = 90.2 per cent (≥ 80 per cent), NFI = 94.7 per cent (≥ 90 per cent), CFI = 97.0 per cent (≥ 90 per cent), PNFI = 72.2 per cent (≥ 50 per cent), PCFI = 73.9 per cent (≥ 50 per cent) and RMSEA = 0.060 per cent (≤ 0.08). On the basis of these fitness indices, further modification is not needed, this is because the modified model has a good fit with observed data. Below is a summary of the measurement model fit indices.

<table>
<thead>
<tr>
<th>Fit indices</th>
<th>Cut of point</th>
<th>Initial measurement model</th>
<th>Modified measurement model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMIN/df</td>
<td>≤ 3.000</td>
<td>2.896</td>
<td>2.200</td>
</tr>
<tr>
<td>RMSEA</td>
<td>≤ 0.08</td>
<td>0.075</td>
<td>0.060</td>
</tr>
<tr>
<td>GIF</td>
<td>≥ 90%</td>
<td>0.854</td>
<td>0.934</td>
</tr>
<tr>
<td>Incremental fit measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>≥ 90%</td>
<td>0.876</td>
<td>0.947</td>
</tr>
<tr>
<td>CFI</td>
<td>≥ 90%</td>
<td>0.915</td>
<td>0.970</td>
</tr>
<tr>
<td>IFI</td>
<td>≥ 90%</td>
<td>0.915</td>
<td>0.971</td>
</tr>
<tr>
<td>Parsimony fit measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNFI</td>
<td>≥ 50%</td>
<td>0.762</td>
<td>0.722</td>
</tr>
<tr>
<td>PCFI</td>
<td>≥ 50%</td>
<td>0.795</td>
<td>0.739</td>
</tr>
<tr>
<td>AGIF</td>
<td>≥ 80%</td>
<td>0.681</td>
<td>0.902</td>
</tr>
</tbody>
</table>

Nevertheless, the psychometric properties of the measurement model in terms of reliability and validity were also evaluated. The result revealed that the latent variables had factor loadings above the cut off value of 0.50 with a critical ratio as low as 1.96 at p-value less than 0.001 (Byrne, 2010). Therefore, in evaluating the construct validity, two indicators were used: composite reliability (CR) and Cronbach α (CA). The CA and the CR for all the constructs reached their recommended threshold with values up to 0.7; for the CA ranging from 0.752 to 0.897 and CR ranging as low as 0.767 and as high as 0.898. Convergent validity was also assessed by using the average variance estimate (AVE). As depicted in Table III, the result of the AVE was also above the expected threshold 0.50 for each of the constructs. This implies that the scale measurement model had satisfactory validity and reliability (Bagozzi and Yi, 1988).

### 5.3 Structural model

After the assessment of the measurement model fit, the next stage was to subject the data to further analyses by examining the hypothesized relationship that exist between the endogenous and exogenous variables of the framework used for the study. The result revealed that except for the relationship between CSE and ATTU, CSE and PU and the relationship between PEOU and ELIB all the other relationships tested were

<table>
<thead>
<tr>
<th>Fit indices</th>
<th>Cut of point</th>
<th>Initial measurement model</th>
<th>Modified measurement model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolute measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMIN/df</td>
<td>≤ 3.000</td>
<td>2.896</td>
<td>2.200</td>
</tr>
<tr>
<td>RMSEA</td>
<td>≤ 0.08</td>
<td>0.075</td>
<td>0.060</td>
</tr>
<tr>
<td>GIF</td>
<td>≥ 90%</td>
<td>0.854</td>
<td>0.934</td>
</tr>
<tr>
<td>Incremental fit measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NFI</td>
<td>≥ 90%</td>
<td>0.876</td>
<td>0.947</td>
</tr>
<tr>
<td>CFI</td>
<td>≥ 90%</td>
<td>0.915</td>
<td>0.970</td>
</tr>
<tr>
<td>IFI</td>
<td>≥ 90%</td>
<td>0.915</td>
<td>0.971</td>
</tr>
<tr>
<td>Parsimony fit measure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PNFI</td>
<td>≥ 50%</td>
<td>0.762</td>
<td>0.722</td>
</tr>
<tr>
<td>PCFI</td>
<td>≥ 50%</td>
<td>0.795</td>
<td>0.739</td>
</tr>
<tr>
<td>AGIF</td>
<td>≥ 80%</td>
<td>0.681</td>
<td>0.902</td>
</tr>
</tbody>
</table>
found to be significant. This implies that except for $H_2$, $H_3$ and $H_8$, $H_1$, $H_4$-$H_7$ and $H_9$ were significant. The analysis also revealed that with regards to the direct relationship of the constructs to ATTU the PEOU construct had the highest variance that influence ATTU whilst, with regards to ELIB, ATTU was also found to have recorded the highest variance that influence ELIB (Table IV).

6. Discussion
Considering that the study sought to investigate the determinants of ELA among students, through the lens of an extended TAM, the researchers proposed additional constructs to TAM to measure the adoption of e-learning. These constructs include: CSE, and ATTU. The study confirmed the initial proposition by previous authors that TAM is a useful theoretical model that helps in the understanding and explanation of ELA. As presented by the goodness of fit test, the model well represented the collected data. The study tested a total of nine hypotheses, out of which three were rejected, and thus, nullifying the initial hypothesized paths between PEOU and ELIB, CSE and ATTU and CSE and PU.

Previous researches have provided support for CSE as an important factor that influences the adoption of e-learning by students (Park, 2009; Sánchez et al., 2013). Consistent with these authors, the current study revealed that CSE had a direct

<table>
<thead>
<tr>
<th>Hypothesized path</th>
<th>Standardized estimate</th>
<th>SE</th>
<th>CR</th>
<th>p-value</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H_1$ CSE → PEOU</td>
<td>0.572</td>
<td>0.082</td>
<td>2.264</td>
<td>0.024</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_2$ CSE → ATTU</td>
<td>0.004</td>
<td>0.104</td>
<td>−0.017</td>
<td>0.987</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_3$ CSE → PU</td>
<td>0.183</td>
<td>0.105</td>
<td>1.312</td>
<td>0.190</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_4$ PEOU → PU</td>
<td>0.416</td>
<td>0.098</td>
<td>7.605</td>
<td>***</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_5$ PEOU → ATTU</td>
<td>0.442</td>
<td>0.103</td>
<td>7.295</td>
<td>***</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_6$ PU → ATTU</td>
<td>0.307</td>
<td>0.084</td>
<td>3.554</td>
<td>***</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_7$ ATTU → ELIB</td>
<td>0.461</td>
<td>0.108</td>
<td>5.108</td>
<td>***</td>
<td>Supported</td>
</tr>
<tr>
<td>$H_8$ PEOU → ELIB</td>
<td>0.018</td>
<td>0.098</td>
<td>0.620</td>
<td>0.536</td>
<td>Rejected</td>
</tr>
<tr>
<td>$H_9$ PU → ELIB</td>
<td>0.239</td>
<td>0.095</td>
<td>5.108</td>
<td>***</td>
<td>Supported</td>
</tr>
</tbody>
</table>

Table IV. Structural model
Note: $p=0.000$ indicating a significant relationship
effect on PEOU. However, a test conducted between CSE and ATTU was found not to be significant. This result is therefore in contrast with previous writers who have argued that self-efficacy has a positively direct influence on ATTU (Sam et al., 2005; Zhang and Espinoza, 1998). Further test conducted to validate the hypothesized relationship between CSE and PU revealed that an individual’s confidence to perform a task successfully would not significantly influence the individuals’ perception of usefulness. This result, though consistent with the result of Shih and Fang (2006), is in contrast with the assertion that CSE would exert a significant influence on an individuals’ expectation of an outcome (Al-Haderi, 2013; Compeau and Higgins, 1995; Saadé and Kira, 2009).

Extant researchers, including Hu et al. (1999) and Ngai et al. (2007) have opined that, with regards to behavioural intention, a person’s attitude and perception of usefulness of an e-learning system is based on the easy operability of the e-learning platform. In view of this, the result of the study showed that PEOU had a direct influence on PU and attitude towards the behavioural intention to use e-learning. Conversely, the direct relationship between ease of use and intention behaviour was found to be insignificant. In essence, a students’ easy operability of an e-learning system does not have a direct influence on intention behaviour. These findings is in contrast with previous studies (Al’Ammary and Hamd, 2008; Ong and Lai, 2006).

Notwithstanding, the study supported the argument that PU have a direct relationship with both ATTU and ELIB. Thus, the ability of students to use the computer and its related technology is important when considering the institutionalization of e-learning. This result is consistent with previous literature which provide support for the proposition that PU directly influences attitude and the behavioural intention to adopt a technology (Davis, 1989; Al-Adwan et al., 2013). Hence, this position presents a unique challenge to instructors and school administrators to present e-learning as a more useful tool to students so that they will find it attractive to adopt.

Finally, this study also established that, the hypothesized path between ATTU and ELIB had a direct relationship. However, this position has received mixed reactions in literature, as some authors do not support the direct influence of attitude on adoption of a technology (Al-Hawari and Mouakket, 2010). For instance, Davis (1989) admitted that users without a positive attitude towards a technology can also use it if the benefits of the technology are clearly visible through ease of use and simplicity. Therefore, the role of attitude towards usage turns out to be modest in predicting technology acceptance.

7. Conclusion
This study investigated the determinants of ELA among students through the lens of an extended TAM. The conceptual model was empirically tested using SEM in IBM’s Amos programme. Out of nine hypotheses proposed, six were supported, while three were rejected. Hypothesized relationships such as $H2-H4$ was found to be insignificant whilst, $H1$, $H4-H7$ and $H9$ were significant. The result of the study demonstrated that some of the constructs used had either a direct or indirect effect on university students’ ELIB. On the basis of this, there is the need for practical application of the result of the study in the development and management of e-learning in universities.

First, since ATTU recorded the highest variance in explaining the determinate of ELIB among students, educators and managers should make a conscious effort in boosting university students’ ATTU by focusing more on its antecedents. In essence, the organization of trial services to student and the education of the benefit associated with the use of the e-learning platform should be a prioritized issue for both educators and managers of the system.
Second, the next most important construct that had an influence on behavioural intention was PU. In view of this, it is also necessary to consider the antecedent of PU and its effect on behavioural intention. For instance, though PEOU was found not to have any direct relationship with behavioural intention, it is important to state that, with regards to its effect on PU, it recorded the highest variance, with CSE also having a direct effect on the PEOU. Therefore, both PEOU and CSE have an indirect influence on ELIB. PU also has an indirect relationship on behavioural intention through ATTU. In light of this, it is important for educators and managers to focus more on educating students on the benefits of adopting e-learning.

This study has made some contributions to research and practice. With regard to research, this study contributes to the body of knowledge on e-learning by validating the extended TAM model from an African perspective. This is an important contribution given the existence of cultural differences and societal idiosyncrasies which exist in different contexts, particularly Africa. Second, the level of significance of each construct identified in the study will provide practical guidance to school administrators and instructors as to which factors to pay close attention to when implementing e-learning projects within their respective institutions.

Nevertheless, some limitations were acknowledged. Therefore, future research could consider these recommendations. First, the study focused on students in the University of Ghana, a public institution where there is government support for developing e-learning capabilities. Thus, there may be some interesting insights if a similar study was conducted in private universities which have little to no government support. Second, the study adopted the quantitative approach to conducting the research. Thus, future research could consider adopting a qualitative research approach which is likely to yield more in-depth findings with regard to the determinants of e-learning adoption. Lastly, the extended TAM model should also be tested in other contexts to provide further support for the modified constructs.

References


**Further reading**


**Corresponding author**

Richard Boateng can be contacted at: richard.boateng@gmail.com

For instructions on how to order reprints of this article, please visit our website: www.emeraldgrouppublishing.com/licensing/reprints.htm

Or contact us for further details: permissions@emeraldinsight.com
This article has been cited by:

1. UkutIdorenyin Idorenyin Thomas, Idorenyin Idorenyin Thomas Ukut, KrairitDonyaprueh, Donyaprueh Krairit. 2019. Justifying students' performance. Interactive Technology and Smart Education 16:1, 18-35. [Abstract] [Full Text] [PDF]