

Determinants of students' e-learning acceptance in developing countries: An approach based on Structural Equation Modeling (SEM)

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ABSTRACT

Several studies have shown that apart from the mechanics of specific technologies involved in such educational solutions, successful implementation of e-learning is also based on behavioral and social factors. However, no substantial studies have been conducted to understand the importance of these factors in developing countries as it relates to the acceptance and use of e-learning. This study validates the extended technology acceptance model by incorporating two intrinsic motivation attributes, namely, quality of life and social influence in developing countries such as Liberia. This quantitative study used an online survey to collect data from 269 secondary and post-secondary students in Liberia (N=269). Responses from the survey were analyzed using the structural equation modeling. The results indicated that student's behavioral intention to accept and use e-learning developing countries was significantly affected by their perceived usefulness, perceived ease of use, quality of life and social influence. Both theoretical and practical implications are discussed.

Keywords: Developing Countries, E-learning, Liberia, Technology Acceptance.

INTRODUCTION

Technology plays a significant role in how we learn and how we conduct our daily lives. In recent years, e-learning technology has changed the methods by which instructors teach and by which students learn. For example, technology allows instructors and students to share course materials in multiple ways, such as slideshows and videos. It also allows instructors to conduct live online classes and foster student-to-student and instructor-to-student communication via chat and message forums. So termed *e-learning* is the process of utilizing electronic technologies to access educational materials in non-traditional ways. It has the potential to improve instructional effectiveness for all students by providing individualized, in-the-moment interactions among students, their peers, and their instructors. The efficiency of e-learning technologies should be locally measured, since users are normally subjected to local norms (Lopez-Fernandez, 2017; Rufin et al., 2018). This is especially important in developing countries, for example, Liberia, where higher education institutions continue to support traditional (face-to-face) learning due to limited financial resources, (Tigabu, 2017; El-Masri & Tarhini, 2017).

Apart from the mechanics of specific technologies involved in such educational solutions, successful implementation of e-learning is also based on behavioral and social factors. Several studies have shown that these factors affect users' technology acceptance (Nikou & Economides, 2017; Oruç & Tatar, 2017). Technology acceptance model (TAM) which includes the domain of how and why users accept and use a technological system (Davis, 1989), has been widely-used in information systems research due to its usefulness in explaining user's acceptance of technology (Marangunić & Granić, 2015). Yet, the applicability of TAM in developing countries as it relates to e-learning is particularly under-studied. The reliability, validity, and generalizability of TAM have been criticized for its culture-bias mainly when tested in non-western nations (Tarhini et al., 2015). This study extends TAM to include other factors such as quality of life and social influence in developing countries, particularly in Liberia.

THEORETICAL FRAMEWORK

The technology acceptance model (TAM) refers to perceived usefulness (PU) and perceived ease of use (PEOU) as important factor that impact the usage of technological systems (Davis, 1989). Behavioral intention (BI) refers to the likelihood of a user engaging in the intended behavior (Ajzen, 1991).

TAM proposes that a user's BI to adopt a technology is controlled by their beliefs of PU and PEOU. TAM is premised on two cognitive notions: perceived usefulness (PU) and perceived ease of use (PEOU). Furthermore, the model found a significant relationship between beliefs about the usefulness of a technological system and the BI to use such technology, although, PU showed a stronger relationship with usage compared to other variables (Davis, 1989; Venkatesh et al., 2000).

TAM has been widely used in technology acceptance research. For example, based on TAM, Cheon et al. (2012) revealed that e-learning provides a platform for flexible learning, supports students' learning styles, and promotes acceptance of modern technology. As does this study, the literature review showed that TAM is relevant to elucidating student users' acceptance of e-learning and aid educators and administrators in initiating e-learning environments (Ruffin et al. 2018; Lee, 2010).

Based on TAM, this quantitative study proposes and tests a theoretical model drawing from active literature. Figure 1 presents the conceptual model.

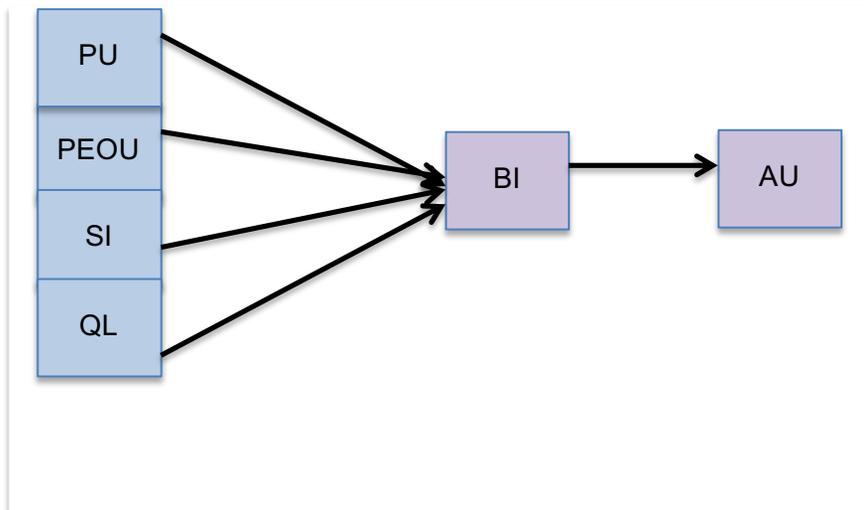


Figure 1. Research Model

Perceived Usefulness

The construct perceived usefulness (PU) originated with technology acceptance model and, in this study, is defined as the degree to which students believe that using an e-learning system will improve their academic performance (Davis, 1989). Users would believe in the presence of a confident use performance relationship if they viewed such a system as high in perceived

usefulness (Davis, 1989). Perceived usefulness in e-learning has been demonstrated as useful in providing resourceful information at the right time and place for the support and improvement of students' university life (Chen & Tseng, 2012). Davis (1989) referred to perceived usefulness as a belief by users that using a technology would enhance their performance, which has been supported by later studies (Guritno & Siringoringo, 2013).

The strength of PU has been acknowledged in several studies to be an influential factor in determining users' intentions to accept a technology (Davis, 1989; Guritno & Siringoringo, 2013; Venkatesh et al., 2003; Chen & Tseng, 2012; Davis, 1989). Al-Adwan and Smedley (2012) carried out a study on 107 college students. The study explored factors that influenced the electronic learning at two Jordanian Universities with only full-time students and staff as participants. The study considered general attitude towards adopting e-learning. The results indicated that training and development was required prior to e-learning initiatives in order to support learning transition. The study also revealed that PU significantly influenced student intentions toward the adoption of technology-related learning. Likewise, Tan et al. (2012) applied TAM to explore the determinants of e-learning adoption. The study employed self-reported questionnaire and was tested on 401 participants. Using multiple regression analysis, findings shows that perceived usefulness is associated with BI to adopt e-learning.

Based on TAM, Alalwan et al. (2016) conceptualized a model to analyze determinants of the adoption of online commerce. This was extended by the addition of perceived risk as external factor. Data was collected through survey questionnaire using a convenience sample of Jordanian banking customers. Using SEM, PU was shown to predict the frequency of use of e-commerce adoption. Lee (2010) used an expectation confirmation model, TAM, and TPB to explain users' intention to using e-learning among university students. A sample was collected consisting of 822 students enrolled in online classes. Analysis employed SEM, and independent t-test. Findings indicated that PU significantly influenced the acceptance of e-learning systems.

Research has indicated the PU is a strong factor of user acceptance and users' intentions toward a technology (Davis, 1989). These studies showed significant relationship between PU and BI. The authors showed that PU is user perception that using a technology would improve his/her performance. According to Davis, 1989, the PU of a system is perhaps the key consideration in making a decision to accept a technology. Usually, potential users make this determination based on the perceived technology's promise for achieving intended outcomes (Lee, 2010; Tan et al., 2012). Davis (1989) examined an IBM Canada file-editor system and found the PU and PEOU were correlated with self-reported survey of the systems. However, when examining both PU and PEOU using linear regression, PU had significant effect. Davis further conducted a study on 40 MBA students to investigate two graphics systems with which they had no familiarity. The study found that PU significantly determined their intention to accept the technology.

Perceived Ease of Use

Perceived ease of use (PEOU) concerns students' motivation and is the result of the students' assessment of an essential aspect of using a technology, such as the interfaces and the processes involved in its use (Davis, 1989). The PEOU construct originated with TAM, and studies have used it to measure users' acceptance of innovative technology (Elkaseh et al., 2016). Chang, Yan, and Tseng (2012), for example, found that PEOU positively motivated the intention to use a technology. Relatedly, Elkaseh et al. (2016) found that PEOU significantly influenced the intention to use a technology. TAM posits PEOU influences PU, where the increase of PEOU leads to enhanced performance. Consequently, PU is directly influence by PEOU.

Social Influence Impact on Usage Behavior

The researcher adopted the social influence (SI) construct and included in the TAM model. Social influence (SI) is an individual's opinions, or behaviors that are affected by others (Mazman et al., 2009). In this study, SI is the extent to which students perceive that their use of e-learning is motivated by extended factors such as their peers, or instructors.

The influence of SI is complex despite the substantial amount of research (Venkatesh et al., 2003; Venkatesh et al., 2003). Literature review shows inconsistency about the extent to which SI influence user's behaviors to accept and use new technology. For example, SI was shown to have significant influence on behavioral intention (Venkatesh et al., 2003), however, Lewis et al (2003) findings was contrary. Predicated on the study of Venkatesh and Davis (2000), in this study, social influence was measured by the influence of factors such as instructors and others on users' perception to use the technology.

Quality of Life

To extend TAM, quality of life (QL) was included in this study due to its importance in the acceptance of technology based on literature review (e.g. Tarhini et al. 2015). In this study, QL is the extent to which students' belief that the use of e-learning will improve their quality of life such as saving expenses on their access to online courses, online assignment submission or e-library access, and electronic communications between students-to-students, and students-to-teacher.

Behavioral Intentions

Behavioral intention (BI) deals with the likelihood that a user will engage in an intended behavior, which for this study, is a student's willingness to pursue a task involving e-learning (Ajzen, 1991). Intention indicates the degree to which a person is willing make an effort to carry out a task or the amount of effort an individual would apply to execute an intended behavior (Ajzen, 1991). Fishbein and Ajzen established BI as the key of an individual's intention to execute a task (p.288).

Several studies have explored e-learning in developing countries to determine various theme-specific issues, such as financial support and students' acceptance and use (Chen & Tseng, 2012; Elkaseh et al., 2016). Chen and Tseng (2012) used a quantitative approach to explore the effects of PEOU, PU towards use of e-learning in Iran. They collected survey data and analyzed them via structural equations modeling (SEM). The results revealed that intention has positive effects on the acceptance and use of e-learning. Perceived usefulness mediated the relationship between ease of use and users' intentions.

Furthermore, Jairak et al.'s (2009) research study established a significantly positive correlation between BI and facilitating conditions. Moreover, Al-Harbi (2011) investigated determinants of electronic learning acceptance. The article discussed determinants of electronic learning in Saudi Arabian universities by analyzing students' perceptions and attitudes (n=531). Data was collected through a self-reported approach from which findings indicated factors that influence behavioral intention inclusive of facilitating conditions. These factors had significant influence on behavioral intention. On the list was internet self-efficacy, which also significantly influences BI.

This study tested the following hypotheses:

- H1:** PU will have a direct positive influence on students' intention to use e-learning in Liberia.
- H2:** PEOU will have a direct positive influence on students' intention to use e-learning in Liberia.

- H3:** SI will have a direct positive influence on students' intention to accept and use e-learning in Liberia.
- H4:** QL will have a direct positive influence on students' intention to use e-Learning in Liberia.
- H5:** Students' BI will have a direct positive effect on their actual use of e-learning systems.

RESEARCH METHODOLOGY

This quantitative study sampled and surveyed students from two secondary and post-secondary institutions in Liberia. In order to ensure that participants were qualified to participate in this study, a mandatory agree/disagree question was placed at the beginning of the survey questionnaire: Are you enrolled as secondary or post-secondary student in Liberia? A positive response meant that the participant was qualified to move forward with the survey; a negative response immediately disqualified a participant. For qualified participants, the next screen was a consent form to ensure that participants were voluntarily agreeing to be included in the study.

The researcher collected data through use of a questionnaire (24 items) as created by Davis, (1989); Venkatesh et al. (2003). Email link to the survey was sent to participants. The questionnaire was closed-ended, and subjects entered questionnaire responses with an ordinal 5-point Likert scale. The items used in this study (see Appendix A) have been shown to be reliable and valid. To assist in maintaining a logical and focused flow in the questionnaire, the researcher grouped together questions that fell under particular constructs (e.g., questions about PU were grouped together). A cross-sectional sampling technique was used based on the time-frame and budget allowed for this research study.

The use of a quantitative methodology was essential since the study would deal with measurable relationships. Furthermore, this study utilized a non-probability convenience sampling as it enabled data collection from participations based on their availability.

RESULTS

Table 1. Participants Data

Demographic statistics	Data	Freq	Percentage
Gender	Male	163	60.5
	Female	106	39.4
Age	<=24 years	189	70.3
	>25 years	80	29.7
Educational Level	Secondary	103	38.3
	Post-secondary	166	61.7
Computer Experience	Low Skill	88	32.7
	Moderate Skill	133	49.4
	Very Skill	48	17.8

Table 1 presents basic participant data for the 269 participants. Of the two respondents, 60.5% (163) were male and 39.4% (106) were female. The ranges sampled for age showed 103 participants ages 18-55 (38.3%) at the secondary level and 166 participants ages 18-55 (61.7%) at the post-secondary level.

Table 2 shows the calculations of means and standard deviations. The means for the independent variables (PU, PEOU, SI, and QL) were above 5, and were above 4 for the dependent variables (BI and AU). Cronbach's alpha was used to assess the reliability of the instrument

Table 2. Descriptive Statistics

Construct	Mean	std. Deviation
PU	5.31	1.06439
PEOU	5.03	1.089
SI	5.02	1.16888
QL	5.10	.00151
BI	4.67	1.13233
AU	4.118	1.01527

This study's statistical calculations involved use of the partial least square model (SEM). The SEM approach can conceptually be used to answer research questions involving the direct or indirect observation of one or more independent or dependent variables, therefore justifying the use of SEM in this instance.

Table 3. Hypothesis Test Results

Hypothesis	Proposed Relationship	Effects Type	(β)	Results
H1	PU→BI	Direct effect	0.133**	Supported
H2	PEOU→BI	Direct effect	0.191***	Supported
H3	SI→BI	Direct effect	0.111***	Supported
H4	QL→BI	Direct effect	0.412***	Supported
H5	BI→AU	Direct effect	0.552***	Supported

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

All the direct hypotheses were supported as presented in Table 3. PU ($\beta=0.133$, $p<0.01$) and PEOU ($\beta=0.191$, $p<0.01$) have a significant positive influence on students' behavioral intention to accept and use e-learning, supporting H1 and H2. Students, instructors, and peers had a significant effect on their perceptions to accept and use e-learning ($\beta=0.111$, $p<0.01$), supporting H3. Furthermore, BI was influenced by QL ($\beta=0.412$, $p<0.01$), which supports H4. Finally, the results further indicated that Actual Usage (AU) is influenced by BI ($\beta=0.552$, $p<0.01$), supporting H5.

IMPLICATIONS

This study's findings reveal both theoretical and practice implications. Theoretically, this study further supports the applicability of the extended TAM in developing countries, for example, Liberia, as it relates to e-based learning. Practically, the results presented in this study assist and help motivate institutions of higher education in developing countries to apply successful e-learning applications.

LIMITATIONS OF THE RESEARCH AND FUTURE DIRECTION

The study has certain limitations. First, it reflects a cross-sectional design, which means that the researcher could not manipulate the variables and that data was collected only once. The results, therefore, do not include any findings regarding changes over time, a limitation that future research may address. Second, the data collected for this study was derived through an online questionnaire and may, therefore, have been subject to common method variance and the concomitant inflation of the true associations between variables. Third, to measure the constructs, the questionnaire was limited to 24 items.

DISCUSSION AND CONCLUSION

This study validates the extended technology acceptance model (TAM) by incorporating two intrinsic motivation attributes, namely, quality of life and social influence in developing countries such as Liberia. Based on TAM, this quantitative study proposes and tests a theoretical model drawing from active literature.

The results of this study indicate that PU, PEOU, SI, and QL significantly explain students' acceptance of e-learning, accounting for 42.37% of the variation in BI, and BI with AU were supported. The findings suggest that students can more readily accept an e-learning system once they have high PU, PEOU, SI, and QL. The result of PU suggests that e-learning is actually useful, and that students do intend to accept and use the technology for learning. This finding is as well supported by previous literature (Davis 1989).

The result of PEOU suggests that students will accept e-learning if they believe that using the technology would be effort free. In other words, students' motivation to accept and use e-learning is the result of their assessment of an essential aspect of using the technology, such as the interfaces and the processes involved in its use.

The result of SI suggests that student's acceptance of e-learning depends on the positive view from their peers, or instructors. In other words, SI plays a significant role in students' BI to accept and use e-learning. Colleagues, friends, and instructors significantly impact their acceptance of e-learning.

The results of QL suggests that students acceptance of e-learning depends on their belief that the use of the technology will improve their communication with their instructor and peers as well as assignment submissions. Therefore, educators should make available the necessary resources to facilitate students' acceptance of the technology.

In General, the results of this study indicate that the acceptance and use of e-learning in Liberia will be popular among students despite limiting issues previously discussed. This study results also showed that apart from the mechanics of specific technologies involved in such educational solutions, successful implementation of e-learning is also based on behavioral and social factors.

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APPENDIX
Variables and Questionnaire

Construct	Item	Question	Source
PU	PU1	using the system can improve my performance.	Davis (1989)
	PU2	using the system enables me to accomplish tasks more quickly.	
	PU3	using the system increases my productivity.	
	PU4	using the system can enhance my effectiveness.	
	PU5	Using the system makes it easier to learn course content.	
PEOU	PEOU1	Learning to operate the system is easy for me.	Davis (1989)
	PEOU2	I find it easy to get the system to do what I want it to do.	
	PEOU3	My interaction with system is clear and understandable.	
	PEOU4	It is easy for me to become skillful at using the system.	
	PEOU5	I find the learning system easy to use.	
SI	SI1	My Instructors thinks that I should participate in the e-learning activities.	Venkatesh et al. (2003)
	SI2	My peers think that I should participate in the e-learning activities.	
	SI3	Management of my university thinks that I should use the e-learning activities.	
	SI4	Generally speaking, I would do what my instructor thinks I should do.	
QL	QL1	Flexibility in getting my course info will helps me creatively.	Venkatesh et al. (2003)
	QL2	The use of e-based learning system saves me money and time.	
	QL3	The use of e-based learning system provides more opportunities to participate in the class.	
	QL4	Flexibility communication channel with others saves me expense and effort. Overall, using the e-based learning help improving my quality of life.	
BI	BI1	I intend to use the system in the next <n> months.	Venkatesh et al. (2003)
	BI2	I predict I would use the system in the next <n> months.	
	BI3	Given the chance, I intend to use the Web-based learning system to do different things, from downloading lecture notes and participating in chat rooms to learning on the Web.	
AU	AU1	On average, I use e-learning less than two times a week.	Davis (1989)
	AU2	On the average school day, spend more than 2 hours on e-learning systems.	

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