Investigating Zoom Continuance Use by Ghanaian University Students in Blended Learning Arrangements in the Post-Covid Era

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ABSTRACT

The study sought to determine factors that significantly influence university students' continuance use of Zoom in blended learning arrangements in the post-Covid era. Zoom Cloud Meetings is a proprietary video teleconferencing software program developed by Zoom Video Communications. Zoom became one of the e-learning platforms that gained attention in the education sector in Ghana after the COVID-19 pandemic outbreak and has been widely used by educational institutions for online lectures. The research model comprises a set of relationships between constructs from the Information System (IS) success model (system quality, usage intention, and user satisfaction), Expectation Confirmation Model (ECM) of IS (perceived usefulness and usage continuance), and two constructs identified from empirical review (instructional quality and computer self-efficacy). Three hundred and thirty-five (335) students from selected universities in Ghana who partake in Zoom-based lectures completed an online survey via Google forms. Survey data were analysed using partial least squares structural equation modelling (PLS-SEM). Lecturers and management of universities will find the study useful for the improvement of teaching and learning via Zoom-based lectures.

CCS CONCEPTS

• **CCS Description:**; • **Information systems** → World Wide Web; Web applications; Internet communications tools; Web conferencing;

KEYWORDS

Zoom, Covid-19, blended learning, usage continuance, Ghana

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1 INTRODUCTION

There has been a paradigm shift in university education from the traditional classroom approach to the use of information and communication technologies (ICTs) to support teaching and learning [25]. As a result, the traditional classroom approach, e-learning, and blended learning techniques are currently used for teaching in educational institutes [20].

On 11th March 2020, the World Health Organization WHO declared COVID-19

a pandemic and people were advised to prevent close contact with others [41]. Universities across the globe, therefore, had to close down [43]. To reduce the impact of closures, several universities made provisions for online classes for their students through e-learning platforms [6]. Zoom, Skype, Google Meet, etc. are examples of e-learning platforms mostly used in the Covid-19 pandemic.

Zoom Cloud Meetings is a proprietary video teleconferencing software program developed by Zoom Video Communications. The Zoom software program has been widely used by educational institutions for online lectures after the COVID-19 pandemic outbreak.

Several tertiary educational institutions in Ghana adopted a blended mode of lecture delivery to students in the post-COVID era. This blended mode of delivery is a combination of face-to-face classroom teaching and online teaching (mostly hosted on Zoom). Several of these institutions continue to adopt this blended mode of lecture delivery. Some lecturers in these institutions have reported (during teacher association meetings) unsatisfactory participation rates in Zoom-based lectures by students. The negative trend is of concern because of the importance of lecture attendance to both students and faculty. The current study seeks to ascertain the factors that influence Zoom usage continuance by students in blended learning arrangements in the post-Covid era.

Arguably, few studies have investigated students' continuous use of Zoom in blended learning arrangements in the post-COVID-19 era. The studies on e-learning have focused on the use of virtual learning environments such as Moodle [17, 37], Blackboard [23],

and Sakai [50, 51]. Very few studies have been conducted on Zoom. Given the very few studies on Zoom, the current study aims to conduct a study on Zoom to fill the gap in the literature. A research model is proposed based on Delone and McLean IS success model, Expectation Confirmation Model (ECM) of IS, and constructs from empirical review (Instructional Quality and Computer self-efficacy) to examine Ghanaian university students' continuance participation in Zoom-based lectures in the post-COVID era. The proposed model comprises a set of relationships between constructs from the IS success model (system quality, usage intention, and user satisfaction) and ECM (perceived usefulness and usage continuance) that are rare in most models used in e-learning studies.

2 LITERATURE REVIEW

2.1 Theoretical background

2.1.1 Expectation Confirmation Model. The Expectation Confirmation Theory (ECT) was propounded by Oliver [46] and built on by Bhattacherjee [10] as the Expectation Confirmation Model (ECM). The difference between ECM and ECT is the change in the variations between pre-use expectation and actual performance into a pure post-acceptance model for continued use of Information System (IS) or Information Technology /IT [13]. In the fields of IS, ECM is considered one of the solid theories that explain users' post-adoption behavior concerning use and intention to use [39]. The dynamic cognitive processes that people encounter during choices of IT continuance use are based on four variables as described by ECM. The variables are the user's level of satisfaction with the IT; the extent of the user's confirmation of expectations; perceived usefulness (PU) and continuance intention [10]. In ECM, confirmation is defined as the users' level of the appropriateness between their expectation of the IS/IT use and its actual performance [33]. Satisfaction represents the user's post-evaluation of their overall experience towards a specific IS/IT [10]. PU is the degree to which a person believes that using a particular system would enhance his/her job performance [10]. Lastly, continuance intention explains the user's intention to continue using IS/IT artefact.

2.1.2 DeLone and McLean IS Success Model. The DeLone and McLean IS success model has been used to understand the user acceptance of various IS models (Sharma et al, 2017). The initial IS success model developed by DeLone and McLean in included six theoretical constructs namely, information quality, system quality, use, user satisfaction, individual and organizational impact as the dependent variable [19]. After a decade, the authors updated the model by including service quality and combining individual impacts with organizational impacts, naming it net benefits based on a review of success measures found in previous empirical works [35]. DeLone and McLean [18] also proposed usage intention as a replacement for "use" in their updated IS success model under certain conditions. System quality is the anticipated technical features (e.g., ease of use and user-friendliness), while information quality takes into consideration the issue of content (e.g., complete, up-to-date, and precise). Service quality refers to the total service support that the service providers give to users through IS (e.g., customer support and service) [18]. Again, information quality explains the required features of the system outputs including relevance, understandability, accuracy, conciseness, completeness, currency, timeliness, and usability [49]. Use is a success measure and links to the total effective use of a system. User satisfaction is the perceived level of amicability toward the entire system [15]. Net benefits are the perceived individual and organizational impacts on job performance and efficiency [18].

The study proposes a model based on constructs from the DeLone and McLean IS Success Model (System Quality, Usage Intention, User Satisfaction), ECM (Perceived Usefulness and Usage Continuance), and constructs from empirical review (Instructional Quality and Computer self-efficacy).

2.2 Empirical Review and Hypotheses

Table 1 shows a summary of the empirical review as well as the hypotheses.

3 METHODOLOGY

3.1 Research Design

The study used a quantitative research design. The quantitative research design was chosen because the researchers wanted to statistically test the influence of independent latent constructs on mediating latent constructs and dependent latent constructs via path analysis.

3.2 Sampling

The population comprises students from selected universities in Ghana who partake in blended learning arrangements using Zoom. The researchers had a challenge calculating the exact population size because of the inconsistencies in the implementation of the blended learning arrangements across the educational institutions. A minimum sample size was calculated, thereafter, a purposive sampling method was adopted.

The minimum sample size was calculated based on the "ten times rule of thumb" [9, 30] which recommends a minimum sample size of ten times the maximum number of independent variables in the outer model and inner model. This approach is equivalent to using a sample size of ten times the largest number of formative indicators used to measure any construct in the outer model or ten times the largest number of structural paths directed at a particular latent construct in the inner model [9, 30]. The largest number of formative indicators used to measure any construct in the outer model (of the current research model) is 6, while the largest number of structural paths directed at a particular latent construct in the inner model is 6. Based on the "ten times rule of thumb", the minimum sample size is 60. Generally, a sample size of 300 is regarded as "good" [32] , thus, a sample size of 300 was chosen. This ensured that the sample size chosen was larger than the minimum sample size.

3.3 Data Collection

An online survey was created via Google forms. Investigations conducted by the researchers showed that twenty-one (21) universities had blended learning arrangements. Lecturers from twenty-one (21) selected universities were given a link to the online survey; they subsequently shared the links with their respective students to

Table 1: Summary of the empirical review and hypotheses

Hypothesisnumber	Hypothesized path	Supporting Empirical Studies
H1	Instructional Quality -> Usage Intention	[26, 27, 38, 56]
H2	Computer Self-Efficacy -> Usage Intention	[52, 55]
H3	Perceived Usefulness -> Usage Intention	[4, 36, 40]
H4	Perceived Usefulness -> User Satisfaction	[4, 36, 40]
H5	System Quality -> Usage Intention	[2, 5, 15]
H6	System Quality -> User Satisfaction	[2, 5, 15]
H7	Usage Intention -> Usage Continuance	[12, 13, 42]
H8	User Satisfaction -> Usage Continuance	[12, 13, 31, 44, 57]

Table 2: Construct Reliability and Validity

	Cronbach'sAlpha	rho_A	CompositeReliability	Average Variance Extracted (AVE)
Computer Self-Efficacy	0.897	0.899	0.894	0.585
Instructional Quality	0.910	0.911	0.910	0.717
Perceived Usefulness	0.836	0.856	0.838	0.514
System Quality	0.937	0.938	0.937	0.714
Usage Continuance	0.709	0.840	0.737	0.517
Usage Intention	0.942	0.943	0.942	0.845
User Satisfaction	0.887	0.895	0.889	0.728

complete the survey. Three hundred and thirty-five (335) responses were received.

4 DATA ANALYSIS AND RESULTS

Data analysis was done using the partial least squares-structural equation modelling (PLS-SEM) technique via SmartPLS 3. PLS-SEM is appropriate for the non-parametric modelling of complex cause–effect relationships between latent variables [9]. The two-step approach to PLS-SEM proposed by Chin [14] is used. The measurement model (outer model) was initially assessed, followed by the assessment of the structural model (inner model). Data cleaning was done before PLS-SEM. The data was checked for missing values and outliers; 331 responses were retained after data cleaning.

The measurement model was assessed using reliability, convergent validity, and discriminant validity tests. Reliability was assessed using Cronbach's alpha, composite reliability, and Dijkstra–Henseler's rho. A construct exhibits reliability if Cronbach's alpha, composite reliability, and Dijkstra–Henseler's rho values are 0.7 and above [9].

Convergent validity was assessed using the average variance extracted (AVE). A construct exhibits convergent validity if the AVE value is 0.5 and above [9]. Table 2 shows that all the constructs exhibit reliability and convergent validity.

Discriminant validity was assessed using the heterotrait-monotrait ratio of correlations ($HTMT^{0.90}$). If the HTMT value is below 0.90, discriminant validity has been established between two constructs [29, 30]. Table 3 shows that all the constructs exhibit discriminant validity.

A bootstrapping procedure was used to assess the structural model to determine the significance of each estimated path. Bootstrapping is the process of drawing a large number of re-samples with replacement from the original sample and then estimating the model parameters for each bootstrap re-sample. The results of the bootstrapping procedure are shown in Table 4. Constructs with p values equal to or less than 0.05 are significant, while constructs with p values greater than 0.05 are not significant. Table 4 shows that seven of the hypotheses were supported, that is, H1, H3, H4, H5, H6, H7, and H8, while one hypothesis was not supported, that is, H2.

The proposed model explained 74.5% of the variance in Zoom usage continuance, 67.0% of the variance in Zoom usage intention, and 70.3% of the variance in user satisfaction. The R square values are shown in Table 4. The standardized root mean square residual (SRMR) was used to assess model fit in SmartPLS. Hu and Bentler [34] proposed that models that have SRMR values less than 0.08 have good model fit. Table 4 shows SRMR value of 0.050 which implies the model has good fit.

5 DISCUSSION OF RESULTS

The results of the study show that instructional quality, perceived usefulness, and system quality have a significant positive effect on usage intention. Perceived usefulness and system quality were found to have a significant positive effect on user satisfaction. Usage intention and user satisfaction were found to have a significant positive effect on usage continuance. However, computer self-efficacy was found not to have a significant influence on usage intention. Seven out of the eight hypotheses stated were supported, which, to a large extent supports our research model.

Our study provides support for studies conducted by Wu and Wang [56], Fianu et al. [27], Farhan et al. [26], and Larmuseau et al. [38] which show that instructional quality influences students' usage of e-learning systems. It points to the fact that lecturers

Table 3: Heterotrait-monotrait ratio of correlations (HTMT)

	Computer Self-Efficacy	Instructional Quality	Perceived Usefulness	System Quality	Usage Continuance	Usage Intention	User Satisfaction
Computer Self-Efficacy							
Instructional Quality	0.678						
Perceived Usefulness	0.557	0.777					
System Quality	0.697	0.748	0.652				
Usage Continuance	0.566	0.741	0.818	0.759			
Usage Intention	0.529	0.765	0.773	0.648	0.800		
User Satisfaction	0.540	0.677	0.789	0.731	0.776	0.618	

Table 4: Hypothesis testing results

Hypothesisnumber	Hypothesized path	Pathcoefficient	Tstatistics	pvalues	Results
H1	Instructional Quality -> Usage Intention	0.356	4.534	0.000*	Supported
H2	Computer Self-Efficacy -> Usage Intention	-0.007	0.144	0.885	Not supported
H3	Perceived Usefulness -> Usage Intention	0.360	7.419	0.000*	Supported
H4	Perceived Usefulness -> User Satisfaction	0.459	6.916	0.000*	Supported
H5	System Quality -> Usage Intention	0.158	1.975	0.048*	Supported
H6	System Quality -> User Satisfaction	0.399	5.506	0.000*	Supported
H7	Usage Intention -> Usage Continuance	0.474	8.256	0.000*	Supported
H8	User Satisfaction -> Usage Continuance	0.392	6.846	0.000*	Supported
	R^2 (Usage Continuance) = 0.745				
	R^2 (Usage Intention) = 0.670				
	R^2 (User Satisfaction) = 0.703				
	SRMR = 0.050				

* Significant at the 0.05 level

need to have the relevant skills in the use of the Zoom platform to effectively teach students. Lecturers need to know how to use all the features of the Zoom platform that can facilitate teaching and learning, especially their configuration settings. The use of features such as screen sharing, the whiteboard, polls, chat, breakout rooms, and apps can be optimized for students to have a very good learning experience. The use of correct audio and video settings are also critical for a good learning experience. University management should organize periodic training of lecturers on the effective use of the Zoom application.

Contrary to expectation, computer self-efficacy was found to have a slightly negative and insignificant influence on usage intention. This finding is inconsistent with the majority of e-learning studies, for instance, Thongsri et al. [52] and Fianu et al. [27]. It is however consistent with studies conducted by Turan and Cetintas [53], Xu et al. [58], and Zhang and Dang [59]. Zhang and Dang [59] report that students' computer self-efficacy doesn't play any significant role in influencing their perceptions of either the learning climate, task-technology fit, or the level of flexibility associated with learning. Zhang and Dang [59] mention that students' own motivation to learn could significantly influence their perceptions of the learning climate and task-technology fit, thus, their level of proficiency in using the computer and information technology does not seem to matter that much. Turan and Cetintas [53] found that computer self-efficacy did not have any significant influence on students' use of online video lessons; however, they did not attempt to rationalise this finding but suggested a more detailed enquiry into it. Based on the high mean score of the CSE construct (4.02) in the current study, we argue that it is most likely that the majority of students with high computer self-efficacy perceptions may not view their level of proficiency in using the computer and information technology as a significant influencer of the use of e-learning systems. Our argument is supported by Xu et al. [58] who reported a high average CSE score for respondents and proposed that the negative effect of CSE on students technology adaptation may be due to the confidence they have in the use of mobile devices.

As was the case with studies conducted by Amsal et al. [4], Liaw and Huang [40], and Keržič et al. [36]), perceived usefulness (PU)

was found to have a significant influence on usage intention and user satisfaction. This points to the fact that generally, when students perceive the Zoom application as being useful for lectures, they will participate. The scale items for PU of Zoom suggest that PU is driven by increased efficiency in the use of the app to discuss more topics (compared to face-to-face lectures), better academic performance, and ease of attending classes/lectures. While lecturers cannot directly influence the core technology of the Zoom application concerning ease of access, they can make effective use of the time spent on Zoom lectures to discuss more topics (compared to face-to-face lectures) and apply teaching techniques that will lead to improved academic performance. Management of universities should generally promote positive perceptions of Zoom as a useful tool for online teaching and learning.

Consistent with studies conducted by Cidral et al. [15], Aparicio et al. [5], and Al-Fraihat [2], system quality was found to have a significant positive effect on usage intention and user satisfaction. While lecturers cannot control the system quality of the Zoom application in general, it is expected that quality features such as ease of access, ease of use, usefulness of features, flexibility, reliability, and efficiency will be present in the app. Lecturers should encourage students to complete the service quality feedback pop-up pages (after the Zoom sessions) to inform the service provider of system quality issues. Our study showed a significant positive influence of usage intention and user satisfaction on usage continuance. These results are consistent with Haryaka et al. [31], Chang [12], and Effendy et al. [21]. The effect of these mediating variables (as dependent variables) on usage continuance largely depends on the strengths of their independent variables namely instructional quality, perceived usefulness, and system quality.

6 CONCLUSION

In order to improve on the effectiveness and participation rates of Zoom for online teaching and learning in Ghanaian universities, we propose that lecturers need to have the relevant skills in the use of the Zoom platform to effectively teach students. Lecturers need to know how to use all the features of the Zoom platform that can facilitate teaching and learning, especially their configuration settings. University management should organize periodic training of lecturers on the effective use of the Zoom application. We further propose that lectures should make effective use of the time spent on Zoom to teach a lot more topics (compared to face-to-face lectures) and apply teaching techniques that will lead to improved academic performance. Management of universities should generally promote positive perceptions of Zoom as a useful tool for online teaching and learning. Lecturers should also encourage students to complete the service quality feedback pop-up pages (after the Zoom sessions) to inform the service provider of system quality issues.

7 DIRECTIONS FOR FUTURE RESEARCH

A quantitative study may be conducted to further probe the insignificant influence of computer self-efficacy on usage intention as this finding requires an empirical explanation.

8 LIMITATIONS OF THE STUDY

The study employed a non-probability sampling technique which imposes limitations on the generalizability of the findings. Additionally, the study was conducted in 3 out of the 10 geographical and administrative regions of Ghana; this also imposes limitations on the generalizability of the findings.

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