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Exploring STEM High School Learners' Continuous Use of Zoom Platform

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Due to international lockdowns caused by the SARS-CoV-2 virus, high schools were forced to change from face-to-face instruction to online instruction on the Zoom platform. The benefits of this will be fully realized if learners continue using Zoom. By extending the expectation-confirmation model (ECM), this study proposed the continuous use of Zoom model (CUZM), to identify the determinants of Science, Technology, Engineering, and Mathematics (STEM) high school learners' continuous use of Zoom. The study took a quantitative approach, with data gathered using a 7-point Likert scale questionnaire. Using stratified random sampling, 253 learners were chosen to participate in the survey, and a total of 206 valid questionnaires (81.4%) were received. The data were analysed using partial least squares structural equation modeling. Perceived usefulness, perceived enjoyment, and satisfaction were discovered to have a direct effect on continuous use, whereas perceived ease of use, STEM content, and confirmation were discovered to have an indirect effect. The CUZM accounted for 67.8% of the variance in STEM learners' satisfaction and 76.4% of continuous use of Zoom. The empirical findings indicate that STEM learners were satisfied and would want to continue using Zoom. The CUZM is also effective in explaining perceived usefulness (55.8%) and perceived ease of use (45.4%) of Zoom.

Keywords: *Continuous use; Zoom platform; SARS-COV-2; Expectation-Confirmation Model; High school learners.*

1. INTRODUCTION

The SARS-CoV-2 virus of 2019 was extremely disruptive of all sectors, and education, especially in developing countries, was not spared. Governments worldwide encouraged schools to use mobile learning (Mutambara & Bayaga, 2021a). Schools had varying degrees of success in transitioning from face-to-face to mobile learning (Mulenga & Marbán, 2020), with varying levels of access to the resources required to support mobile learning (Mulenga & Marbán, 2020; Mutambara & Bayaga, 2021a). Furthermore, while some subjects, such as languages, can transition smoothly (Alfadda & Mahdi, 2021), subjects such as Science, Technology, Engineering, and Mathematics (STEM), that are practical and dependant on engaged learning approaches were not as easy to change to online (West, Sansom, Nielson, Wright, Turley, Jensen, & Johnson, 2021).

In STEM disciplines, learner-centred teaching approaches should be used for the content and the skills to be effectively learned (West et al., 2021). Zayapragassarazan (2020, p. 1) noted that mobile learning "can be effective only if it promotes active learning by providing opportunities to read, write, discuss, think, ask questions, solve problems, analyse and create new things depending on the learning content". The challenge for STEM teachers was to find a mobile platform that could be used to deliver STEM content effectively. The platform should closely resemble a traditional classroom, where a teacher can check for learner's presence, chat with learners to get feedback, allow learners to interact with one another, and allow learners to visually see what the teacher is demonstrating in real time (Mu'awanah, Sumardi, & Suparno, 2021; Zayapragassarazan, 2020).

STEM teachers used the Zoom platform to solve this challenge. Zoom is the most popular video conferencing platform being used for STEM teaching and learning in developing countries during the pandemic period to support discussions and lessons via video conference (Mpungose, 2021; Mu'awanah et al., 2021). The STEM teacher can use Zoom to divide students into small groups where they can easily collaborate in the online classroom (Mpungose, 2021). Zoom also allows teachers to record lessons and send them to students, which can be very useful if a student is unable to attend a class due to a network outage or other unforeseen circumstances (Alfadda & Mahdi, 2021). Recorded lessons can also help students learn at their own pace because they can go through the material without being directed by the teacher (Zayapragassarazan, 2020). Zoom allows teachers to share their screen, which is useful when delivering science experiments or simulations to enhance learners' understanding (West et al., 2021).

Given its benefits in STEM education, Zoom is an essential tool that should continue to be used for STEM teaching and learning. However, the benefit of online learning can only be realised if the users continue to use it (Hossain, Talukder, Khayer, & Bao, 2020). Based on the assessment of Hossain et al. (2020), the success of the Zoom platform for STEM teaching and learning can only be realised if STEM teachers and learners continue to use it. Additionally, Mpungose (2021) stated that the continuous use of Zoom depends on teachers' and learners' attitudes towards it.

A plethora of studies were conducted to find factors that influence teachers' and learners' adoption of the Zoom platform (Alfadda & Mahdi, 2021; Mpungose, 2021; Mu'awanah et al., 2021; Mutambara & Bayaga, 2020a), yet very little is known about STEM teachers' and learners' intention to continue using the Zoom platform for STEM teaching and learning (Al-Emran, Arpaci, & Salloum, 2020), particularly in developing countries. Furthermore, Hossain et al. (2020) and Chandradasa and Galhena (2021) emphasised the importance of understanding and paying attention to factors that learners believe are important for them to continue using Zoom, as these factors influence its continuous use. As a result, the purpose of this research is to identify the factors that influence STEM learners' intention to continue using Zoom for STEM education.

2. LITERATURE REVIEW

The reviewed literature focuses on the use of Zoom for educational purposes. Furthermore, the literature explores the factors that affect the continuous use of Zoom by teachers and learners. The theoretical framework used in this paper was also discussed, including the conceptual framework.

2.1 USE OF THE ZOOM PLATFORM FOR EDUCATIONAL PURPOSES

Several studies were conducted to assess the use of the Zoom platform in educational contexts (Alfadda & Mahdi, 2021; Chandradasa & Galhena, 2021; Menggo, 2021; Setiawan, Farid, & Fatimah, 2021). Menggo (2021) investigated the effectiveness of Zoom on learners' performance in English. The results showed that the use of Zoom can improve learners' performance. The technology acceptance model (TAM) was used by Alfadda and Mahdi (2021) to explain learners' acceptance of Zoom for English learning. The results indicated that learners' behavioural intention and perceived attitude towards (PTT) had a direct effect on continuous use (CUZ), whereas perceived usefulness (PU) and perceived ease of use (PEOU) had an indirect effect.

In another study, the unified theory of acceptance and use of technology (UTAUT) model was used by Chandradasa and Galhena (2021) to predict university students' continuous use of Zoom. The results indicated that performance expectancy, effort expectancy, and social influence are good indicators of university students' continuous use of Zoom. Perceived usefulness was found to be a predictor of continuous use of Zoom for learning Islamic Law (Setiawan et al., 2021).

2.2 FACTORS AFFECTING CONTINUOUS USE OF THE ZOOM PLATFORM

Most studies used TAM (Al-Emran et al., 2020; Pituch & Lee, 2006; Rahmayanti, Widagda, Yasa, Giantari, Martaleni, Sakti, Suwitho, & Anggreni, 2021) to explain users' CUZ of educational technologies. Rahmayanti et al. (2021) combined the TAM and theory of reasoned action to find the factors that affect CUZ. Concurring with the findings of Al-Emran et al. (2020), PTT played a significant mediating role between the predictors PU, PEOU, and CUZ

(Rahmayanti et al., 2021). However, the studies found contradictory results when it came to the direct effect of PU on CU. Al-Emran et al. (2020) found a significant effect of PU on CU, whereas Rahmayanti et al. (2021) did not. Pituch and Lee (2006) found that PEOU influences PU. Perceived enjoyment (PEN) had an indirect influence on CUZ through PU (Sarrab, Al Shibli, & Badursha, 2016).

The TAM was also extended by Terzis and Economides (2011) to explain factors that influence learners' continued use of computer-based assessment. The results showed that PU and PEOU have direct effect on CUZ, while computer self-efficacy, social influence, facilitating conditions and perceived playfulness (also called PEN), content and goal expectancy had indirect effects (Terzis & Economides, 2011). Terzis, Moridis, Economides, and Mendez (2013) found that CUZ, PU, and PEOU were influenced by content. The Expectation-Confirmation Model (ECM) was used by Terzis et al., (2013) to predict students' CUZ on computer based assessment. The results revealed that PEOU, satisfaction, and playfulness (PEN) influenced learners' CUZ directly. Conformation and PU were indirect determinants of CUZ.

2.3 THEORETICAL FRAMEWORK

Suzianti and Paramadini (2021) criticised the use of a pre-adoption model, such as the TAM, to explain the CUZ of educational technologies. The authors advocated for models that assess post-acceptance (Suzianti & Paramadini, 2021). Furthermore, CUZ considers user expectations as well as the evolution of user perceptions over time, which are not captured by pre-adoption models (Terzis et al., 2013).

Prior research has indicated that there are distinct motivating factors for pre-adopters and post-adopters (Suzianti & Paramadini, 2021; Terzis et a., 2013). Liao, Palvia, and Chen (2009) noted that the pre-adoption models' main constructs are users' attitude and pre-expectations (what they are expecting from the system), whereas post acceptance models' main construct is the extent to which the system meets their pre-expectations. Users will continue to use the system if they are satisfied by the system.

This study is guided by a post-acceptance model called the expectation-confirmation model (ECM) developed by Bhattacherjee (2001a). The ECM postulates that users' intentions to continue using the system are determined by satisfaction, confirmation, and perceived usefulness (PU). Architects of the ECM believe that satisfaction is the most important single determinant of a system's or product's re-use (Bhattacherjee, 2001a). Terzis et al. (2013) noted that the construct satisfaction examines discrepancy between pre-expectations and post-expectations. According to the ECM, a person's CUZ is a set of phases that include acceptance, experience, verification, and continued use (Bhattacherjee, 2001a; Bhattacherjee & Premkumar, 2004).

First, pre-adoption factors lead individuals to believe in the use of the system expecting it to produce specific results (Liao et al., 2009; Noviyasari, Ibrahim, & Kasiran, 2021). Second, if individuals uses the system, the outcome expectations affect their actual acceptance by inciting

good or bad emotions regarding system usage (Noviyasari et al., 2021; Suzianti & Paramadini, 2021). Third, the system's perceived performance is compared to pre-acceptance expectations after using it for some time (Bhattacherjee, 2001a). The results of this comparison lead to confirmation or disconfirmation, which causes individuals' level of satisfaction to change (Bhattacherjee & Premkumar, 2004; Liao et al., 2009). Finally, the level of satisfaction either increases or decreases the intention to continue using the system (Suzianti & Paramadini, 2021). Users will be satisfied and want to continue to use the system if it meets or does more than their initial expectations. The level of satisfaction either increases or decreases the intention to continue using the information system (Almahamid & Rub, 2011; Liao et al., 2009). Confirmation predicts both PU, and they are both determinants of satisfaction (STN). STN and PU predict CUZ.

Prior studies extended the ECM to improve the explanatory power of users' continuous intention to use (Almahamid & Rub, 2011; Bhattacherjee, 2001a; Bhattacherjee & Premkumar, 2004; Brahmasrene & Lee, 2012). Bhattacherjee and Premkumar (2004) extended the ECM with the attitude construct, and the results showed that attitude influences CUZ. Brahmasrene and Lee (2012) added perceived social ability and perceived online readiness to the ECM. The results revealed that perceived social ability and perceived online readiness were good predictors of CUZ. Perceived internet self-efficacy and PEN significantly influence the ECM's satisfaction and conformation (Almahamid & Rub, 2011). The ECM's satisfaction was found to be highly correlated with system quality and information quality (Suzianti & Paramadini, 2021).

2.4 CONCEPTUAL MODEL

The literature consulted identifies seven constructs as critical determinants of continuous use of Zoom for teaching and learning purposes. These factors were used to construct the conceptual model for the high school learners' continuous use of the Zoom platform. Each of these constructs is discussed herewith.

Perceived Enjoyment (PEN)

People perform a particular behaviour because it is pleasurable to them (Huang, 2014). Mutambara and Bayaga (2021a) described PEN as the extent to which the behaviour of using technology is regarded as pleasurable in and of itself, independent of any long-term benefits that may be anticipated. Since students have been using Zoom for STEM learning for a considerable amount of time, PEN in this study refers to the degree to which a student found the engagement with Zoom for STEM learning intrinsically pleasurable.

PEN has a direct effect on PEOU (Mutambara & Bayaga, 2021). Liao et al. (2009) found that both CUZ and satisfaction are predicted by PEN. This study proposes that making learning activities more enjoyable can increase CUZ among high school STEM learners. Therefore, the following hypotheses for the PEN construct are proposed:

H1: High school learners' PEN influences their PEOU.

H2: High school learners' PEN influences their STN.

H3: High school learners' PEN influences their CUZ.

STEM Content (SCON)

Content is a critical variable in determining learner satisfaction (Terzis & Economides, 2011; Terzis et al., 2013). As a result, Zoom should enable teachers to deliver beneficial and adequate subject content and skills (Terzis et al., 2013). The construct STEM content (SCON) is described to include subject content, experiments, and questions. SCON is determined by the learners' assessment of the subject's difficulty, usefulness, or interest (Terzis & Economides, 2011; Terzis et al., 2013). Terzis et al. (2013) reported that SCON influences PU, but not CUZ and satisfaction.

This study suggests that the way some STEM skills are transferred from teachers to learners may influence learners' perceptions of how Zoom simplifies the learning of STEM subjects. Furthermore, some aspects of the questions, such as clarity, comprehension, and relevance, may influence the learners' perception of the usefulness and satisfaction, thereby influencing the learners' continued use of Zoom.

H4: High school learners' SCON influences their PEOU.

H5: High school learners' SCON influences their STN.

H6: High school learners' SCON influences their PU.

Perceived Ease of Use (PEOU)

In this study, PEOU is defined as the difference between the learners' expectations of the effort required to learn to use the Zoom platform and the actual effort they put in. Previous research has shown that PEOU has a positive effect on PU and satisfaction (Al-Emran et al., 2020; Chandradasa & Galhena, 2021; Terzis et al., 2013). Learners have been using the Zoom platform for a considerable amount of time, and their experiences have influenced their satisfaction and perception of Zoom's utility for STEM learning. As a result, the following hypotheses were investigated:

H7: High school learners' PEOU influences their STN.

H8: High school learners' PEOU influences their PU.

Perceived Usefulness (PU)

In this context, PU differs from perceived usefulness *prior* to acceptance. Unlike in previous studies, where PU was the expectation that a system would improve learners' performance (Mutambara & Bayaga, 2020a, 2021b), PU in this study is the belief STEM learners have that using Zoom has met their pre-acceptance expectations of improving their performance. Previous research has shown that PU has a direct influence on CUZ (Kumar, Adlakaha, & Mukherjee, 2018; Noviyasari et al., 2021). Satisfaction was also strongly influenced by PU (Kumar et al., 2018). Therefore, the hypotheses for the PU construct were as follows:

H9: High school learners' PU influences their STN.

H10: High school learners' PU influences their CUZ.

Confirmation

In this study, the latent variable confirmation is defined as the learners' perception of Zoom's suitability for STEM learning based on its actual performance. This variable describes technology pre-acceptance under the assumption that expectations change over time (Kumar et al., 2018). This modification also has an impact on user satisfaction. Several studies have found that confirmation has a positive effect on long-term satisfaction (Bhattacherjee, 2001a; Joo, Kim, & Kim, 2016; Kumar et al., 2018) and PU (Al-Emran et al., 2020; Bhattacherjee, 2001a; Chandradasa & Galhena, 2021).

H11: High school learners' CONF influences their STN.

H12: High school learners' CONF influences their PU.

Satisfaction (STN)

In this study, satisfaction is an overall feeling STEM learners have after using Zoom for some time. Users may halt use if they are dissatisfied with the service or product (Al-Emran et al., 2020). According to prior research, satisfaction is the best predictor of continuous use (Bhattacherjee, 2001a; Chandradasa & Galhena, 2021; Suzianti & Paramadini, 2021). However, Al-Emran et al. (2020) reported that satisfaction is not a predictor of continuous use. As a result, the following hypothesis was forwarded:

H13: High school learners' STN influences their PU.

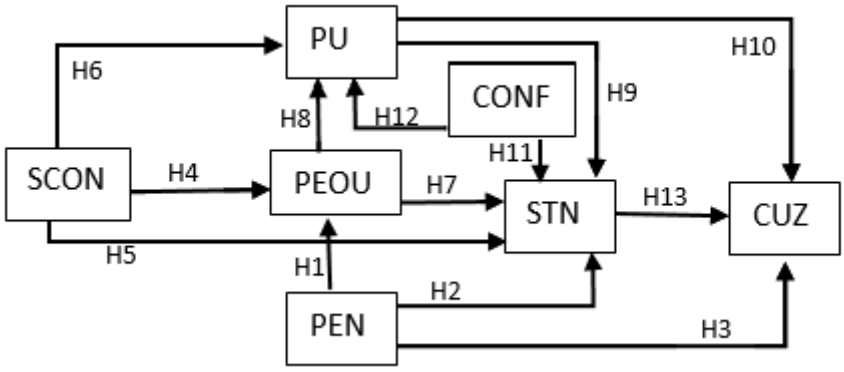

Figure 1: Conceptual Model for the Continuous Use of Zoom

3. METHODOLOGY

3.1 RESEARCH DESIGN

In this study, a cross-sectional survey design was used (Creswell, 2015). This survey design provided a precise description of the population's views by analysing a subset of the high school learners' population. In this study, the survey was used to give a quantitative description of STEM learners' opinions toward the continuous use of the Zoom platform for STEM learning. A questionnaire was selected because it can collect a huge amount of data from STEM learners in a short time and at a low cost. Descriptive statistics were used to interrogate the data from the STEM students. The hypothesised model was then tested using partial least squares–structural equation modelling (PLS-SEM).

3.2 PARTICIPANTS

When schools were closed due to the lockdown, only five schools in the district studied used the Zoom platform for STEM learning. All STEM learners from these five schools were invited to take part in this study. All 253 learners were given questionnaires to complete in their free time. After one week, 206 valid questionnaires were collected. Of the 206 respondents, 34 (17%) were in grade 10, 89 (43%) were in grade 11, and 83 (40%) were in grade 12. There were 87 (42 %) girls and 119 (42 %) boys (58%). The students ranged from 15 to 21 years of age.

3.3 MEASURES

First, the respondents answered questions about their demographics. Second, STEM students completed the main part of questionnaire, which included 28 indicators for measuring the model's seven latent variables. The questionnaire was adapted from other published research (Suzianti & Paramadini, 2021; Terzis et al., 2013) and adapted to suit the current study. The indicators were all directly defined in the context of STEM education. For example, one of the survey's satisfaction items was "I am satisfied with my decision to use Zoom for STEM learning". The questionnaire employed a 7-point Likert scale, with responses ranging from strongly disagree to strongly agree.

3.4 ANALYSIS TECHNIQUE

A partial least squares–structural equation model was used to predict STEM learners' continuous use of Zoom with the help of the SmartPLS 3 software. The study's model analysis was carried out in two stages as suggested by Hair Jr, Hult, Ringle, and Sarstedt (2021). The first step was to assess the reliability and validity of the construct measures. The f-squared statistic was then used to assess the significance of the relationships within the structural model (Hair Jr, Sarstedt, Ringle, & Gudergan, 2017). The R-squared and Q-squared statistics were also used to assess the explained variance in STEM learners' continuous use of Zoom (Hair Jr et al., 2021).

4. DATA ANALYSIS RESULTS

4.1 MEASUREMENT MODEL

The measurement model explains the correlation between the latent variables and their items (Hair Jr et al., 2017). To determine the measurement model's accuracy, the convergent and discriminant validity must be assessed (Hair Jr et al., 2021). Convergent validity assesses how closely the indicators of the same latent variable are related, whereas discriminant validity assesses how much a latent variable differs from others (Hair Jr et al., 2021). With the exception of SCON1 (0.649), all indicators have loadings larger than the cut-off value of 0.7, according to the results (see Table 1) (Hair Jr et al., 2017). Due to the exploratory nature of the study, SCON1 (0.649) was retained (Hair Jr et al., 2021). Cronbach alpha (CA), rho A, and composite reliability (CR) values were all greater than 0.7, and the average variance extracted (AVE) values were also greater than 0.5 (Hair Jr et al., 2021). The results confirmed the model's convergent validity (Hair Jr et al., 2021).

Table 1: Measurement model results

Construct	Indicator	Loadings	CA	rho_A	CR	AVE
CONF	CONF1	0.815	0.874	0.875	0.914	0.726
	CONF2	0.871				
	CONF3	0.890				
	CONF4	0.831				
CUZ	CUZ1	0.933	0.930	0.941	0.949	0.788
	CUZ2	0.709				
	CUZ3	0.928				
	CUZ4	0.904				
	CUZ5	0.943				
PEN	PEN1	0.815	0.738	0.739	0.851	0.655
	PEN2	0.801				
	PEN3	0.813				
PEOU	PEOU1	0.796	0.856	0.857	0.903	0.699
	PEOU2	0.823				
	PEOU3	0.866				
	PEOU4	0.857				
PU	PU1	0.859	0.843	0.855	0.895	0.6812
	PU2	0.837				
	PU3	0.870				
	PU4	0.727				
SCON	SCON1	0.649	0.747	0.767	0.839	0.567
	SCON2	0.757				
	SCON3	0.812				
	SCON4	0.783				

STN	STN1	0.849	0.913	0.915	0.939	0.794
	STN2	0.879				
	STN3	0.920				
	STN4	0.914				

The Fornell-Larcker criterion was used to assess discriminant validity and the results are shown in Table 2. The square root of the average variance extracted value for the constructs are continuously greater than the off-diagonal correlations, indicating that the latent variables have good discriminant validity (Hair Jr et al., 2021).

Table 2: Fornell-Larcker Criterion

	CONF	CUZ	PEN	PEOU	PU	SCON	STN
CONF	**0.852**						
CUZ	0.729	**0.888**					
PEN	0.571	0.572	**0.810**				
PEOU	0.496	0.508	0.427	**0.836**			
PU	0.681	0.774	0.512	0.567	**0.825**		
SCON	0.553	0.580	0.457	0.659	0.605	**0.753**	
STN	0.725	0.836	0.523	0.590	0.744	0.632	**0.891**

4.2 STRUCTURAL MODEL

The values of the variance inflation factor (VIF) ranged from 1.264 to 2.387. All the VIF values were less than 4, showing that multicollinearity had no effect on the CUZM structural model's estimated coefficients. With the absence of multicollinearity in the CUZM's structural model, the bootstrapping approach with 5000 subsamples was performed to test the significance of the path coefficients. Table 3 summarises the findings, which show that just two of the 13 hypotheses were not statistically significant.

The hypotheses which were not statistically significant were H2 (β=0.042, $p>0.05$) and H7 (β=0.118, $p>0.05$). These results imply that the paths PEN to STN and PEOU to STN were not supported, since they were not statistically significant. CONF positively correlated with both PU (β=0.563, $p<0.05$) and STN (β=0.328, $p<0.05$), supporting H12 and H11 respectively. CUZ (β=0.135, $p<0.05$) and PEOU (β=0.159, $p<0.05$) were both positively influenced by PEN. These results support H3 and H1, respectively. PEOU was found to predict PU (β=0.191, $p<0.05$) supporting H8. SCON predicted PEOU (β=0.586, $p<0.05$), PU (β=0.223, $p<0.05$), and STN (β=0.144, $p<0.05$) supporting H4, H6, and H5, respectively. The hypothesised effects of STN on CUZ were confirmed, thereby supporting H13 (β=0.540, $p<0.001$).

Table 3 also shows the effect size (f-squared) of each path coefficient. The effect size of the hypotheses H12 (0.321), H11(0.151),H10 (0.166), H9 (0.161), H4 (0.498), and H13 (0.517) were considered large, while H3 (0.053), H1 (0.037), H8 (0.045), H6 (0.056), and H5 (0.030) were considered medium (Cohen, 2013; Hair Jr et al., 2021).

Table 3: Path Coefficients

Hypothesis	Path	Std Beta	T-Statistics	P-Values	Decision	f-squared	VIF
H12	CONF -> PU	0.463	8.036	0.000	Accepted	0.321	1.507
H11	CONF -> STN	0.328	4.609	0.000	Accepted	0.151	2.207
H3	PEN -> CUZ	0.135	2.152	0.032	Accepted	0.053	1.443
H1	PEN -> PEOU	0.159	2.549	0.011	Accepted	0.037	1.264
H2	PEN -> STN	0.042	0.599	0.550	Rejected	0.030	1.592
H8	PEOU -> PU	0.191	2.440	0.015	Accepted	0.045	1.848
H7	PEOU -> STN	0.118	1.881	0.061	Rejected	0.022	1.944
H10	PU -> CUZ	0.303	5.007	0.000	Accepted	0.166	2.351
H9	PU -> STN	0.345	4.939	0.000	Accepted	0.161	2.296
H4	SCON -> PEOU	0.586	9.320	0.000	Accepted	0.498	1.264
H6	SCON -> PU	0.223	2.759	0.006	Accepted	0.056	2.009
H5	SCON -> STN	0.144	2.467	0.014	Accepted	0.030	2.138
H13	STN -> CUZ	0.540	8.579	0.000	Accepted	0.517	2.387

Figure 2 consists of the seven constructs of this research. PU is directly predicted by CONF, SCON, and PEOU. PU, CONF, SCON, PEN, and PEOU influence STN. Three determinants PU, STN and PEN have a direct influence on CUZ.

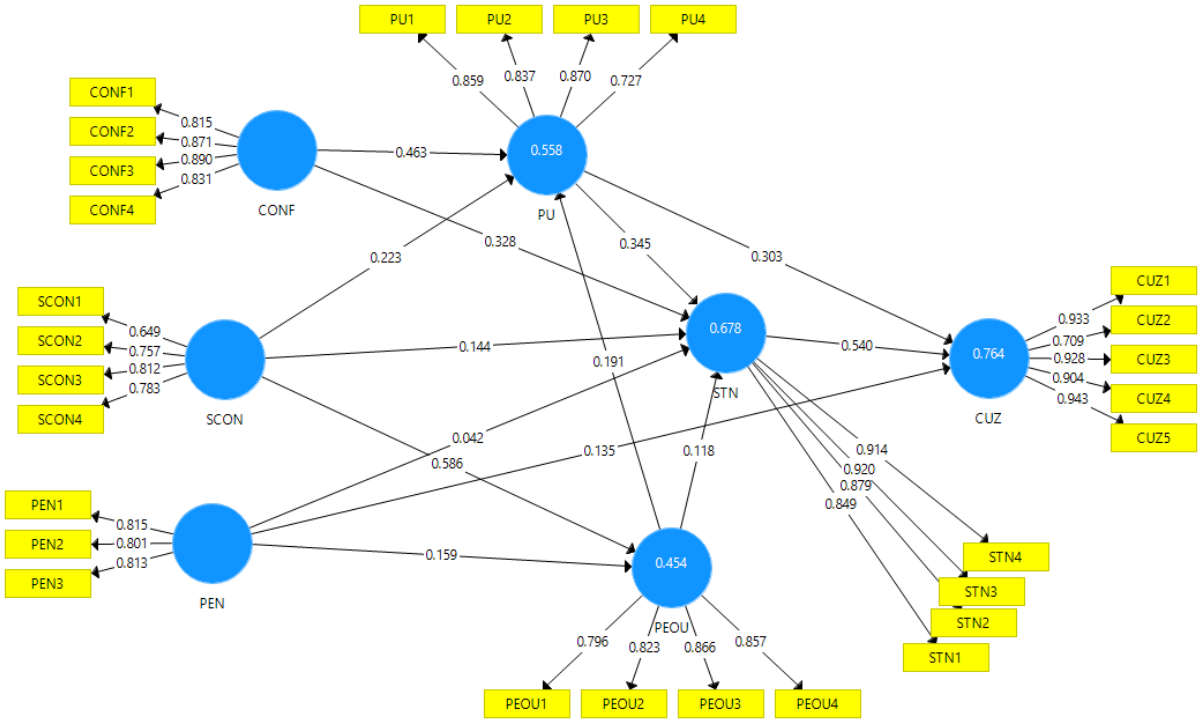

Figure 2: Continuous Use of Zoom Model

Figure 2 depicts the pathway coefficients and the coefficient of determination (R-squared). The R-squared measured the combined influence of independent variables on the dependent latent variables (Hair Jr et al., 2021). The R-squared value in this scenario assessed the combined influence of PEOU, PU, CONF, SCON, STN, and PEN on learners' CUZ of Zoom for STEM learning. Cohen (2013) defined R-squared values of 0.02, 0.13, and 0.26 as indicating weak, moderate, or substantial predictive accuracy. Figure 2 shows that the R-squared values of CUZ, STN, PU, and PEOU are 0.764, 0.678, 0.558, and 0.454, respectively. These R-squared values are regarded as substantial (Cohen, 2013). The range of the Q-squared values were from 0.312 to 0.595. All the Q-squared values were greater than zero, indicating the predictive relevance of the CUZM (Hair Jr et al., 2017).

Table 4 shows the indirect path coefficients, which revealed that STN plays a very important mediating role between CUZ and predictors CONF and SCON. PEOU has an indirect effect on CUZ through PU. These results also imply that all the model constructs were good predictors of learners' continuous use of Zoom for STEM learning.

Table 4: Indirect Path Coefficients

Path	Std Beta	T-Statistics	P-Values	Decision
CONF -> STN -> CUZ	0.177	3.778	0.000	Accepted
SCON -> STN -> CUZ	0.078	2.494	0.013	Accepted
PEOU -> PU -> CUZ	0.058	2.355	0.019	Accepted

5. DISCUSSION

The purpose of this study was to identify the factors that influence STEM high school learners' continuous use of Zoom for STEM learning. The continuous use of Zoom model was proposed and analysed in the study. The R-squared value of perceived usefulness was 0.558, indicating that the combined contribution of confirmation, STEM content, and perceived ease of use to the explained variance of perceived usefulness was 55.8%. The R-squared value of perceived ease of use was 0.454, indicating that perceived enjoyment and STEM content contributed 45.5% of the explained variance. The total contribution of perceived usefulness, perceived ease of use, STEM content, and perceived satisfaction was 67.8%. The total contributions of perceived usefulness, perceived enjoyment, STEM content, perceived ease of use, confirmation, and satisfaction on the explained variance of continuous use of Zoom for STEM learning was 76.4%. The results show that STEM high school learners are happy to continue using Zoom for STEM learning.

The results revealed that confirmation had a significant effect on satisfaction and perceived usefulness of Zoom for STEM learning. The significant effect of confirmation on satisfaction is in conformity with the results of these studies (Al-Emran et al., 2020; Bhattacherjee, 2001b; Chandradasa & Galhena, 2021; Joo et al., 2016). The result that perceived usefulness is predicted by confirmation is congruent to the results of prior studies (Al-Emran et al., 2020; Bhattacherjee, 2001a; Chandradasa & Galhena, 2021). The results also showed that confirmation had an indirect effect on continuous use of Zoom for STEM learning through the mediation effect of satisfaction. One possible reason for these findings is that when STEM high school learners' expectations of the benefits of using Zoom for STEM learning are confirmed, Zoom will undoubtedly improve their performance and satisfaction, which in turn increases their continuous use.

Perceived ease of use has a considerable positive impact on perceived usefulness, but not satisfaction. These results supported the findings of prior studies, which found a substantial link between perceived ease of use and perceived usefulness (Alfadda & Mahdi, 2021; Hernandez, 2021; Mutambara & Bayaga, 2020b, 2021a). The result contradict the results of earlier research which found that perceived ease of use has a substantial impact on satisfaction (Al-Emran et al., 2020; Chandradasa & Galhena, 2021; Terzis et al., 2013). Perceived ease of use had an indirect effect on STEM learners' continuous use of Zoom for STEM learning. These findings may be explained by the fact that when students perceive learning STEM related

subjects with Zoom to be simple, their performance will improve, which increases their continuous use of Zoom for STEM learning as well. A possible explanation of not finding a significant effect of perceived ease of use on satisfaction is that the effect of effort needed to learn to use a system attenuates with experience (Mutambara & Bayaga, 2020b; Venkatesh, Morris, Davis, & Davis, 2003).

The results of this study support the findings of Terzis and Economides (2011) and Terzis et al. (2013), who found STEM content is a good predictor of satisfaction and perceived ease of use. Perceived ease of use was also predicted by STEM content.

This study also assessed the effect of STEM content on learners' continuous use of Zoom for STEM learning, and the results revealed that it has a significant indirect effect through satisfaction. The result supported the results of prior studies (Terzis & Economides, 2011; Terzis et al., 2013).

In this study, the questions that STEM learners were asked to assess STEM content examined the adequacy of useful subject content, experiments, and questions. The results indicated that ability of Zoom to provide adequate useful STEM content undoubtably increased learners' performance and ease of use. Additionally, the ability of Zoom to allow lessons to be recorded, learners to easily interact with each other, and to see what teachers were doing influenced the learners' satisfaction, which in turn increased their continuous use.

The results showed that continuous use and satisfaction were influenced by perceived usefulness. The result that perceived usefulness is a good predictor of satisfaction contradicts the findings of Suzianti and Paramadini (2021). The positive effect of perceived usefulness on continuous use confirmed the results of prior studies (Ho, 2010; Suzianti & Paramadini, 2021). A possible explanation for these findings is that, after using the Zoom platform for a considerable amount of time now, STEM high school learners realised the benefits for STEM learning using this platform. The benefits of being able to watch a recorded lesson enable STEM high school learners to learn at their pace, anytime, and anywhere. It is these benefits that satisfy STEM high school learners and increase their continuous use of Zoom for STEM learning.

It was surprising to find that perceived enjoyment did not have a significant effect on satisfaction. This result contradicted the common belief in the body of knowledge that learners are satisfied by the pleasure they find in using mobile devices for learning (Terzis & Economides, 2011; Terzis et al., 2013). Supporting the findings of prior studies, perceived enjoyment was found to influence perceived ease of use and continuous use (Liao et al., 2009; Terzis & Economides, 2011; Terzis et al., 2013). The results imply that when STEM high school learners enjoy using Zoom for STEM learning, they consider it easy to use and this positively influences their continuous use of Zoom.

Contrary to the findings of Al-Emran et al. (2020), who did not find a positive influence of satisfaction on continuous use, the results revealed that satisfaction was the best predictor of

continuous use. The results of this study also confirm the results of prior studies (Chandradasa & Galhena, 2021; Liao et al., 2009; Terzis & Economides, 2011; Terzis et al., 2013).

The results have indicated that the STEM high school learners' needs of STEM learning were confirmed, and advantages might be much more than what they have expected, and this satisfaction leverages their intention for continuous use of the platform.

Theoretical Implications

This study makes several significant theoretical contributions. First, the study empirically validated the expectation-confirmation model in an educational setting.

Second, this study adds to the body of knowledge by developing the continuous use of Zoom model, which extends the expectation-confirmation model to predict the continued use of Zoom for STEM learning. This new model has not been found in the body of knowledge. This would be a significant contribution to the community of educational technology adoption and continuous use, as most existing research focuses on either adoption or acceptance.

Third, Mutambara and Bayaga (2021a) emphasised the need for more research on educational technology adoption in developing countries. By focusing on the continued use of Zoom for STEM learning, this study contributes to the body of knowledge in the context of developing countries.

Fourth, this study proved that extending the expectation-confirmation model by adding constructs that are context related increases its explanatory power.

Practical Implications

The findings of the study have several practical implications. First, perceived enjoyment has a significant influence on STEM high school learners' continued use of the Zoom platform. This implies that STEM teachers must ensure the enjoyment of STEM learners at all times is taken into consideration. This can be accomplished by including videos, cartoons, and simulations related to the topic. Furthermore, teachers can place students in small groups and allow them to freely discuss, which strengthens social constructivism.

Second, perceived ease of use influences STEM high school learners' continued use in an indirect way. As a result, educational technology developers should create user-friendly systems to improve their long-term use.

Third, STEM content has an indirect effect on STEM high school learners' ongoing use, whereas perceived usefulness has a direct effect. STEM content developers should provide educational technology platforms with current, relevant, useful, and sufficient STEM content to improve the continuous use of educational technologies.

Fourth, satisfaction has a direct impact on continued use. Furthermore, satisfaction was the best predictor of continued use. STEM stakeholders should focus on the factors that influence learners' satisfaction with these systems, as this leads to their continued use.

Limitations

Data were collected from one school in the district so the transferability of the findings of this study to other districts should be done with caution. The study only focused on STEM high school learners so the generalisation of this study to learners who are not doing STEM related subjects might be limited.

Future Studies

It would be interesting to conduct a similar study using a different educational technology platform such as Moodle and then compare the results. The researchers are planning to investigate the determinants of learners' satisfaction of educational technologies. This study explained 76.4% of the variance in learners' continuous use, and future studies should find the other factors that account for 23.6%.

6. CONCLUSION

The study sought to find the determinants of STEM learners' continuous use of Zoom for STEM learning. The study proposed and evaluated the continuous use of Zoom model by extending the expectation-confirmation model. The continuous use of Zoom model explained 76.4% of the variance in STEM learners' continuous use. The results of this study showed that all the expectation-confirmation model hypotheses were supported. The determinants of STEM that high school learners consider important when considering to continue using Zoom for STEM learning are perceived usefulness, perceived enjoyment, perceived ease of use, STEM content, satisfaction, and confirmation.

The results showed STEM learners' continuous use of Zoom is directly influenced by perceived enjoyment, perceived usefulness, and satisfaction. Satisfaction plays an important mediating role between STEM high school learners' continuous use the Zoom platform, and the two determinants, STEM content and confirmation. Perceived ease of use has an indirect effect on STEM learners' continuous use through perceived usefulness. The results imply that the continuous use of Zoom for STEM learning is directly influenced by the pleasure learners get when using the Zoom platform, its ability to improve their performance, and their satisfaction in its suitability for STEM learning.

The availability of current, useful, relevant STEM content influences Zoom's usefulness, ease of use and STEM learners' satisfaction. For STEM learners to continue to use Zoom for STEM learning, attention should be given to factors that influence learners' satisfaction.

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