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Determinants of High School Learners' Continuous Use of Mobile Learning during the Covid-19 Pandemic

Admire Chibisa 

Department of Mathematics, Science and Technology Education,
University of Zululand, Faculty of Education

David Mutambara 

Department of Mathematics, Science and Technology Education,
University of Zululand, Faculty of Education

Abstract. Every child has a right to education and attending school is a must in South Africa. However, school attendance was severely disrupted by the Covid-19 pandemic outbreak. Regardless, the academic process has to continue, hence the use of mobile devices as pedagogical tools for learning. The aim of this study therefore is to explore the determinants of high school learners' continuous use of mobile learning in order that the academic project may continue. The study employed a survey design in which quantitative data were collected using a seven-point Likert-type scale questionnaire developed by the researchers. A stratified sample of 500 high school learners participated in the survey of which 419 of them successfully completed the survey, giving a success rate of 83.8%. The remaining 16.2% submissions were spoilt and hence discarded. The study combined three models, namely the technology acceptance model (TAM), self-determination theory (SDT), and the expectation-confirmation model (ECT) in its analysis of the developed seven-construct model which used partial least squares structural equation modelling (PLS-SEM). SmartPLS v 3.0 was used to validate the measurement and structural models of the study. Results showed that all six variables identified for the model were good predictors of high school learners' continuous use of mobile learning with 68% explained variance for satisfaction and 39.1% for continuous use. The study developed and validated a robust mobile learning model which is recommended to stakeholders for continuous use of mobile learning. Future researchers are encouraged to search for more determinants of continuous use of mobile learning that have not been identified in this study.

Keywords: high school learners; continuous use; user satisfaction; mobile learning

1. Introduction

Thousands of people died in China in 2003 as a result of a kind of upper respiratory tract pneumonia known as severe acute respiratory syndrome (SARS) (Tang et al., 2021). An even deadlier new coronavirus (COVID-19) that possibly originated in Wuhan (Yang et al., 2020) has spread throughout China and around the world with catastrophic effects (Guan et al., 2020). By the end of October 2020, the coronavirus pandemic had killed over one million people and infected over 42 million individuals (UNESCO, 2020).

The coronavirus has had a negative impact on the world economy and human social activities, including the school system (Duan et al., 2020). Owing to the overwhelming spread of COVID-19, South Africa, as the other 190 countries of the world, implemented a national lockdown on 26 March, 2020 (Shrotri et al., 2021). COVID-19 affected about 1500 million students world-wide (UNESCO, 2020).

The Department of Basic Education (DBE) in South Africa encouraged schools to use mobile learning (Mutambara & Bayaga, 2021). The DBE argued that mobile learning enables teaching and learning to continue while observing the lockdown restrictions and encouraging social distancing. The DBE also stated that mobile learning can help learners to have access to learning material anytime and anywhere (Mutambara & Bayaga, 2021). Mobile learning also helps learners learn at their own pace. Furthermore, the DBE argued that mobile learning provides learners with opportunities to carry out self-regulated learning.

However, there are several obstacles to implementing mobile learning. On the learners' side, many communities, particularly in rural areas, lack electricity, have a sluggish Internet connection at home, or do not have a mobile device capable of supporting mobile learning (Mutambara & Bayaga, 2021). As a result, a shift to mobile learning could exacerbate long-standing equality issues. Teachers are concerned about what to teach, how to teach, and how to meet each learner's learning needs (Kim, 2020). Despite these challenges, schools switched to mobile learning in order to save the academic process.

Many scholars and online educators believe that the mobile learning that took place during the coronavirus pandemic can be used to address the shortcomings of traditional face-to-face education in developed countries (Mutambara & Bayaga, 2021; Wang et al., 2021). Mobile learning can assist learners and schools in crisis situations by providing unique opportunities. It has several advantages, including the ability for educators and learners to continue teaching and learning in any location without interruption. Mobile learning can also assist learners take charge of their education. Furthermore, it can be used to alleviate school textbook shortages. Mobile learning can also be used to help students understand concepts because the technology can mentally stimulate learners (Mutambara & Bayaga, 2021).

Although mobile learning provides flexible activities and abundant learning resources (Luo et al., 2021), the value of mobile learning may not be realised if learners are unable to use it on a continuous basis (Tang et al., 2021; Wang et al., 2021). "The nature of technology empowers learners with the necessary 'possibilities,' not with 'ready to use' resources," (Wang et al., 2021, p. 10). In the

realm of information systems (ISs), the success of an IS such as mobile learning is ultimately determined by its continued use rather than its initial use (Albelali & Alaulamie, 2019; Bhattacharjee, 2001). If learners are unable to use mobile learning on a regular basis or after the pandemic, the value of mobile learning will be lost. This means that mobile learning has become an integral part of the school system's pedagogy which should be perpetuated at all costs (Mutambara & Bayaga, 2021). This calls for the continuous use of this mobile learning. However, very little is known about high school learners' continuous use of this technology.

This study aims to explore the determinants of high school learners' continuous use of mobile learning. The focus is more on continuous use of mobile learning, an area of which very little is known. Most research studies have focussed on the pre-acceptance of mobile learning (Albelali & Alaulamie, 2019; Amzaourou & Oubaha, 2018; Cheng & Yuen, 2020; Shao, 2018). It also aims to investigate whether social moderators have an influence on high school learners' continuous use of mobile learning. Therefore, the motivations for the present research are as follows:

1. To investigate the determinants of high school learners' continuous use of mobile learning; and
2. To investigate the effect of social moderators (gender, geographical area, and educational level) on high school learners' continued use of mobile learning.

2. Literature Review

2.1 Mobile learning

In the body of knowledge, there are numerous definitions of mobile learning. According to Albelali and Alaulamie (2019), mobile learning is defined as learning that takes place through wireless devices such as iPods, laptops, smartphones, USBs, cameras, and personal digital assistants (PDAs). In terms of mobility, mobile learning is defined as the provision of education and training utilising devices that are convenient to carry and use anywhere, at any time, such as cellphones, PDAs, and palmtops (Mutambara & Bayaga, 2020). Mutambara and Bayaga (2021) described mobile learning as an extension of e-learning supported by wireless mobile devices and communication for teaching and learning. In the current study, mobile learning is defined as the use of wireless mobile devices such as cellphones, tablets, iPods, laptops, and USBs by high school learners' learning.

2.2 Social moderators

The enterprise content management (ECM) to assess users' continued usage of an information system was used by Venkatesh et al. (2011) who recommended that future research focus on the influence of social moderators on continuous use. The assessment of educational technology continuous research revealed that the effects of social moderators on educational technology continuous use have not been adequately explored (Lee, 2010). Geographical area, age, gender and level of education are the commonly studied social moderators of educational technology acceptance and continuous use (Almahamid & Rub, 2011). However, the moderating effects of these moderators on the continuous use of educational technology need to be further understood (Lee, 2010).

There are contradictory results of the social moderators on the continuous use of educational technologies. Existing research also supports social moderators' moderating effects on technological acceptance (Albelali & Alaulamie, 2019; Amzaourou & Oubaha, 2018; Cheng & Yuen, 2020; Shao, 2018). Cheng and Yuen (2020) studied the effects of gender, experience, and socioeconomic position on secondary students' acceptance and continued usage of e-learning systems. They measured the experience using the students' grades. In this case, the grade of the student is used to determine the learner's level of education. Gender and level of education were found to be significant moderators. Amzaourou and Oubaha (2018) investigated the moderating effect of gender, educational level, and geographical area on university students' use of online learning. Geographical area and gender were found to be good moderators of students' use of online learning but not educational level. Shao (2018) noted that gender plays an important moderating role on university students' continuous use of massive open online courses. Female students' continuous use of mobile learning was reported to be weaker than that of their male counterparts (Albelali & Alaulamie, 2019).

Contrary to the findings of these studies (Amzaourou & Oubaha, 2018; Cheng & Yuen, 2020), a study by Almahamid and Rub (2011) indicated that there is no significant difference in the assessment of continuous desire to utilise e-learning systems by research participants based on demographic variables such as gender, age, and level of education. These findings were confirmed by Tarhini et al. (2015), who noted that only socioeconomic difference was a good moderator. Considering the results of these studies (Almahamid & Rub, 2011; Amzaourou & Oubaha, 2018; Cheng & Yuen, 2020; Tarhini et al., 2015), one can learn that more studies that focus on the effects of social moderators are needed to help to understand their effects on the continuous use of educational technologies.

2.3 Theoretical framework

There have been very few studies conducted to investigate the factors that influence users' continuous use of educational technologies (Luo et al., 2021; Ramadiani et al., 2019; Wu & Chen, 2017). Ramadiani et al. (2019) extended the unified theory of acceptance and use of technology (UTAUT) to predict students' continued use of Wiki. On the other hand, Wu and Chen (2017) extended the TAM to explain users' continued use of online learning. The SDT was used by Luo et al. (2021) to describe students' motivation and continued use of online learning. However, the transferability of the findings of these to high school learners' continuous use of mobile learning, especially in developing countries, might be limited. The TAM and the UTAUT were developed to predict initial acceptance of technology (Venkatesh et al., 2011); therefore, their applicability to predict continuous use of mobile learning might be limited (Mutambara & Bayaga, 2021). Additionally, since most of these studies were carried out in institutions of higher learning of developed countries, the generalisation of these findings to high schools of developing nations in particular might be limited as well.

Amzaourou and Oubaha (2018) emphasised the importance of developing countries' conducting their own technology acceptance and usage studies rather than blindly following developed-country examples. To that end, it is critical to

establish the determinants of high school learners in developing nations' continuous use of mobile learning. In doing so, three models were used in this study: the TAM, the SDT, and the ECM). TAM and SDT models have been widely used to predict mobile learning acceptance (Al-Emran et al., 2018). In contrast, ECM has rarely been utilised to investigate students' intentions to use educational technologies. The ECM, proposed by Bhattacharjee (2001), developed a theoretical psychological framework in consumer behaviour that gives a clear approach of explaining how customer intention to purchase a product is influenced by comparing both early (pre-purchase) and later (post-purchase) anticipation. According to Lin et al. (2005), such a model is critical to employ when analysing a consumer's continuous intent to use mobile learning. Combining these three models will add value to the body of knowledge because the TAM and SDT have been tried and tested in the context of mobile learning, while the ECM brings post-acceptance and the continuous use.

Information systems (IS) research on continuous use behaviour is split into three distinct but slightly overlapping groups (Larsen et al., 2009). This is also the case for mobile learning continuity. The first category includes studies that use information system adoption characteristics as antecedents to explain the continuous use of mobile learning (Limayem & Cheung, 2008; Roca & Gagné, 2008). As their basic variables, these articles typically incorporate variables from the originally suggested ECM (Bhattacharjee, 2001). In the second group, are studies that seek to break down the originally postulated ECM variables and evaluate them as antecedents for explaining the continuous use of mobile learning (Chiu et al., 2007; Sørenbø et al., 2009). The third and last category of works attempts to connect the IS-continuance theory with complementary theoretical approaches (Liu et al., 2009).

This research falls within the third category. Following the studies of Liu et al. (2009) and Sørenbø et al. (2009), the starting point is Bhattacharjee's (2001) ECM and the added viewpoint is the self-determination theory by Gagné and Deci (2005). Liu et al. (2009) and Sørenbø et al. (2009) established that SDT is complimentary to ECM in understanding continuance intentions to use educational technologies. This study also added perceived ease of use, which is one of the pillars of the TAM. ECM's strength is that it stresses high school learners' mobile learning pre-adoption expectations as well as post-adoption usefulness and ease-of-use views. The latter of these, namely utility and ease-of-use beliefs, were characterised as extrinsic motivators of the TAM by Davis et al. (1992). In contrast, the self-determination theory emphasises basic need fulfilment and the development of real inner motivation, despite extrinsic incentive still being significant.

2.4 Hypotheses formulation and the conceptual framework

2.4.1 Satisfaction (SAT)

According to Zhou (2017), satisfaction is a mental state that embodies the sum of a user's material and emotional responses to a specific activity, such as mobile learning. When the outcomes meet the user's needs, expectations, task orientation, and goal determination, they will be emotionally satisfied. User's satisfaction is considered to be an important substitution for an information system's success. According to the Chong (2013), the user information system's continuation

intention is mostly defined by satisfaction with that information system's use. Bhattacharjee (2001) argued that satisfaction generated after actual use is the primary determinant of continuance intention. A high level of satisfaction leads to a high level of continuance intention. Chong (2013) found that satisfaction is commonly regarded as a moderator variable of post-purchase behaviour. Zho (2017) confirmed that consumer satisfaction, promotes future behavioural intention. Based on the assessments of Zhou (2017), Chong (2013) and Bhattacharjee (2001) one can conclude that users will be materially satisfied as a result of their system usage experience. The current study proposes that high school learners who are satisfied with a mobile learning system may continue to use it and suggest it to others. Therefore, the hypothesis, namely

H1: High school learners' satisfaction has positive influence on continuous use of mobile learning.

2.4.2 Confirmation (CONF)

In the context of information systems, confirmation is defined as the evaluation of users' ability to meet expectations, confirmation being proportional to satisfaction (Tang et al., 2021). Bhattacharjee (2001) stated that confirmation and perceived usefulness (PU) have a positive relationship. According to the cognitive dissonance theory, when a user's pre-acceptance perception of PU is contradicted, they may experience cognitive inconsistency or worry (Chong, 2013). Users frequently attempt to change their perception of pre-acceptance usefulness so that it corresponds to post-acceptance reality (Chong, 2013). That is, confirmation increases PU while decreasing the likelihood of disconfirmation. Chong (2013) found that perceived usefulness influences confirmation, which in turn influences satisfaction. Additionally, Tang et al. (2021) noted that user confirmation is a critical requirement for satisfaction. This study posits that high school learners' perceived influence will influence their confirmation, and confirmation will predict their satisfaction. Therefore, the hypothesis, namely

H2: High school learners' confirmation has a positive impact on their satisfaction.

2.4.3 Perceived usefulness (PU)

Mutambara and Bayaga (2021) define perceived usefulness in the context of mobile learning as an individual's perception that utilizing mobile learning will enhance his or her teaching and learning. One of the most typical constructs of extrinsic incentive for IS use is PU (Wang et al., 2021). Over the past few decades, PU has continuously been verified as the major factor of continuous IS use (Bhattacharjee, 2001; Mutambara & Bayaga, 2020). Wang et al. (2021) confirmed the effect of PU on continuous use. Luo et al. (2021) noted that PU influences not only learners' continuing use, but also their satisfaction. Based on the findings of Luo et al. (2021) and Tang et al. (2021), it can be concluded that the belief that mobile learning can enhance learners' performance influences their satisfaction which in turn reinforces their continued use of mobile learning. Therefore, the hypotheses, namely

H3: High school learners' perceived usefulness has a positive influence on confirmation.

H4: High school learners' perceived usefulness has a positive influence on continued use.

H5: High school learners' perceived usefulness has a positive influence on satisfaction.

2.4.4 Perceived autonomy (PA)

Supporting students' perceived autonomy entails assisting and encouraging them to pursue their personal objectives (Sierens et al., 2009). Mobile learning provides teachers with several tools that can be used to meet diverse learners' needs. These tools enhance learners' perceived autonomy by allowing them to take charge of their education without being controlled by teachers. Supporting students' perceived autonomy entails assisting and encouraging them to pursue their personal objectives. Several studies have found a link between autonomy-supportive teaching and educational benefits, such as increased intrinsic motivation, which lead to improved learners' performance and satisfaction (Luo et al., 2021). Perceived autonomy was shown to have a significant positive impact on perceived enjoyment but not on perceived usefulness. This study postulates that learners' perceived autonomy will influence their perceived usefulness and satisfaction. Therefore, the hypotheses, namely

H6: High school learners' perceived autonomy will influence their perceived usefulness.

H7: High school learners' perceived autonomy will influence their satisfaction.

2.4.5 Perceived competence (PC)

This study defines perceived competence as learners' perceptions of their skills to manage and execute learning tasks in order to improve their performance. Luo et al. (2021) showed that perceived competence influences learners' perceived usefulness. Extrinsic motivation (perceived usefulness) and learners' satisfaction have been shown to be influenced by computer competence (Yang & Brown, 2015). Learners who perceive themselves as computer competent are likely to perceive mobile learning to be easy to use and satisfying. Therefore, the hypotheses, namely

H8: High school learners' perceived competence influences their perceived ease of use.

H9: High school learners' perceived competence will influence their satisfaction.

2.4.6 Perceived ease of use (EoU)

Perceived ease of use was defined as the extent to which users believe that adopting mobile learning would be free from effort (Mutambara & Bayaga, 2020). Pratama (2021) confirmed the positive effect of learners' EoU on perceived usefulness and behavioural intentions. However, the effect of EoU on continuous use needs to be more clearly understood. In this study, the belief that using mobile learning would be effort free will influence high school learners' continuous use. Therefore, the hypotheses, namely

H10: High school learners' perceived ease of use influences their perceived usefulness.

H11: High school learners' perceived ease of use will influence their continued use.

According to the proposed conceptual model in Figure 1, EoU predicts PU as well as continuous use. The PC predicts EoU and Sat. PA predicts PU and SAT, which are both factors influencing continuous use. PU is a predictor of COMF, which is a predictor of SAT.

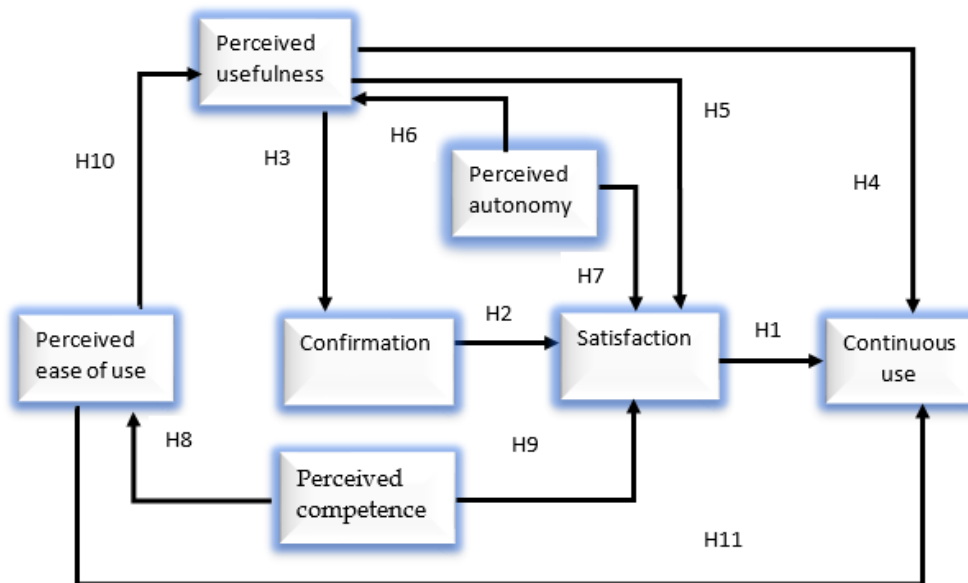


Figure 1: Conceptual model

3. Research Methodology and Procedure

A survey design was used in this investigation. A survey design investigates a subset of the population in order to generate a quantitative assessment of the population's opinions (Creswell & Poth, 2016). In this study, a survey was conducted to obtain a quantitative picture of how high school learners felt about the continuous use of mobile learning. A survey was chosen because it enabled the collection of a large dataset from high school learners in a short period of time and at a reasonable cost. In this study, a survey was employed to collect opinion-related data from high school learners by means of a questionnaire. Initially, descriptive statistics were employed to examine demographic data from high school students. Subsequently, the conceptual model was tested using PLS-SEM.

3.1 Participants

To collect data, stratified sampling was used. All high schools in South Africa's King Cetshwayo District were classified according to their quintiles. A stratum was formed by grouping schools in the same quintile. Placing schools in the same quintile in a stratum ensures that homogeneous elements are placed in the same stratum, reducing any estimation error (Creswell & Poth, 2016). There were five strata altogether. Using simple random sampling, only one school was chosen from each stratum. Learners in the five selected schools were also classified according to their educational phase. In high school, there are two phases: General Education and Training (GET) (grades 8 and 9) and Further Education and Training (FET) (grades 10 to 12). Simple random sampling was utilised to choose 50 pupils from each phase from the selected schools. There were 500 people chosen in all.

Out of 500 questionnaires administered, 435 (87%) were collected. However, only 83.8 % (419 responses) were used in this study, with the remaining 16 responses being eliminated during data screening. A total of 59.9 % (251) of respondents were in the GET phase, while 40.1 % (168) were in the FET phase. In terms of

gender, 246 (58.7 %) of the 419 respondents in this study were females, while the remaining 173 (41.3 %) were males. There were 176 (42.0 %) learners from rural areas, 109 (26.0 %) from semi-urban areas, and 137 (32.0 %) from urban areas.

Each of the three latent variables (CUSE, PA, and PC) had five indicators. These latent variables had the most indicators in the model. Using the advice of Sarstedt et al. (2017), namely that a sample size must be ten times larger than the number of indicators on the latent variable with the most indicators being used, the required minimum sample size was 50. The sample size for this study exceeded this stated limit by far.

3.2 Research instrument

There were two sections to the research instrument. The first component asked for biographical information from respondents. On a seven-point Likert-type scale, respondents were asked to choose one of seven answers ranging from 'strongly disagree' to 'strongly agree' in the second phase. The research instrument utilized in this study was derived from previous research. Furthermore, in order to have the range of questions required for each construct, several questionnaire items had to be changed and updated. Because of the large number of items required in the research instrument, questions from different surveys had to be adapted and modified. The research instrument contained 44 items in total. Additionally, the conceptual model was developed using constructs from different models. As a result, it was anticipated that simply adopting and changing one questionnaire would be inadequate. The questionnaire items were developed from prior studies (Cheng & Yuen, 2020; Lu et al., 2019; Sørebo et al., 2009) and modified to meet the objectives of this investigation.

3.3 Analysis procedure

The Software Package for Social Sciences (SPSS) was used to screen the data. The SPSS was also used for analysing descriptive statistics. The data was then exported to the SmartPLS software, which was used for analysing the data by means of PLS-SEM. According to Sarstedt et al. (2017), the primary objective of PLS-SEM is to forecast the target variable, in this case, the continuous use of mobile learning by high school learners. The PLS-SEM methodology was also used to determine the moderation effects of demographics (gender, geographic area, and educational level) on high school learners' continuous use of mobile learning.

The two-stage model analysis approach proposed by Sarstedt et al. (2017) was followed in current study. The quality of the measurement model was evaluated by checking the reliability and validity of model variables and their indicators. The measurement model establishes the relationship between the constructs and their respective indicators. In the second stage, the structural model's linkages were evaluated by examining the significance of the path coefficients, explained variance of endogenous variables, and predictive capacity of distinct variables (Hair Jr. et al., 2021).

4. Presentation of results

4.1 Measurement model

The measurement model is validated to ensure the appropriateness of the constructs added to the model. This is performed by evaluating the convergent validity, internal consistency, and discriminant validity of the measurement model (Hair et al., 2021). Internal consistency reliability was determined using the composite reliability (CR) and Cronbach's alpha (CA) tests. Results in Table 1 show that all the CR and CA values were greater than 0.7, thereby confirming indicator reliability (Hair Jr. et al., 2021). The outer loadings and average extracted variance (AVE) were used to assess the convergent validity. Results in Table 1 show that all the AVE values were greater than 0.5. The results in Table 1 also show that, with the exception of CUSE5 (0.604), all the other outer loadings were greater than 0.7. The construct CUSE5 was retained owing to its contribution to content validity (Hair Jr. et al., 2021). The results of the outer loadings and AVE confirmed the convergent validity of the proposed model (Hair Jr. et al., 2021).

Table 1: Measurement model

Construct	Item	Loadings	CA	CR	AVE
Conformation	CONF1	0.740	0.830	0.887	0.663
	CONF2	0.811			
	CONF3	0.800			
	CONF4	0.899			
Continuous use	CUSE1	0.805	0.828	0.879	0.594
	CUSE2	0.804			
	CUSE3	0.846			
	CUSE4	0.772			
	CUSE5	0.604			
Perceived ease of use	EoU1	0.829	0.810	0.887	0.725
	EoU2	0.818			
	EoU3	0.904			
Perceived autonomy	PA1	0.744	0.871	0.907	0.663
	PA2	0.777			
	PA3	0.838			
	PA4	0.883			
	PA5	0.820			
Perceived competence	PC1	0.889	0.915	0.937	0.749
	PC2	0.778			
	PC3	0.873			
	PC4	0.868			
	PC5	0.912			
Perceived usefulness	PU1	0.810	0.857	0.903	0.700
	PU2	0.852			
	PU3	0.865			

	PU4	0.817			
Satisfaction	SAT1	0.826			
	SAT2	0.902	0.914	0.940	0.796
	SAT3	0.914			
	SAT4	0.924			

The Heterotrait-Monotrait ratio (HTMT) was utilised in the study to assess discriminant validity. Hair Jr. et al. (2021) proposed that the HTMT correlation ratio delivers more accurate discriminant validity results than cross-loading and the Fornell-Larcker criterion. The HTMT values in Figure 2 were all less than 0.85, indicating that the results supported discriminant validity (Hair Jr. et al., 2021). The structural model was evaluated after establishing the suitability of the constructs in the measurement model.

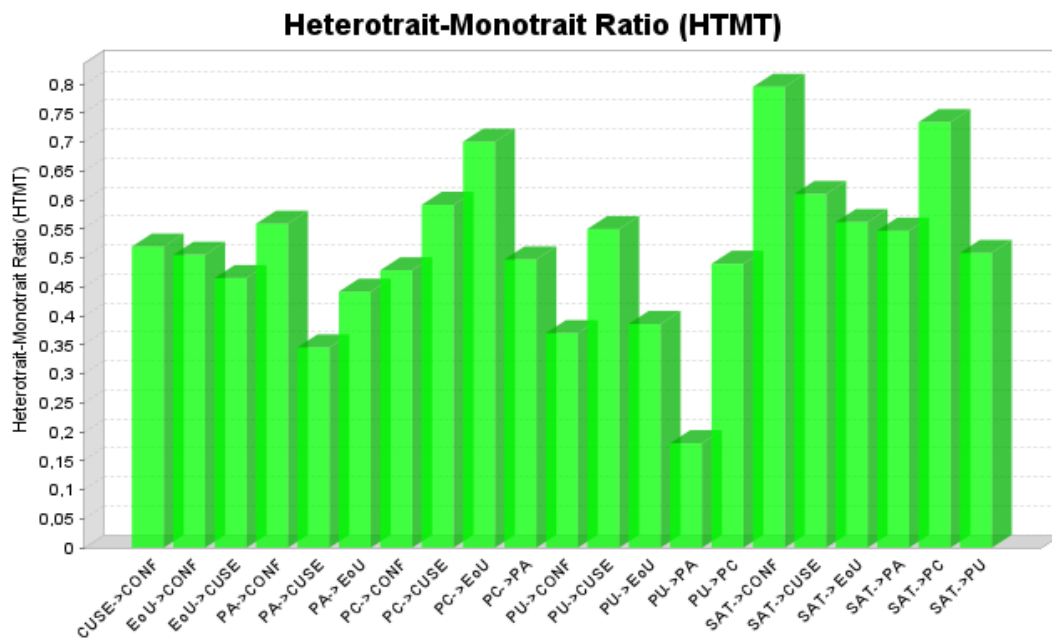


Figure 2: The HTMT

4.2 Structural model

The variance inflation factor values (VIF) were utilized to evaluate the model's collinearity issues. The VIF values ranged from 1.000 to 2.354, as shown in Table 2. All of the predictors' VIF values were less than 4 (Hair Jr. et al., 2021), demonstrating that the model was not affected by collinearity issues.

Bootstrapping (with 5000 subsamples) was performed to examine the statistical significance of each hypothesis (Hair Jr. et al., 2021). The results are summarised in Table 2. Only three of the 13 hypotheses examined were not statistically significant. The hypotheses which were not statistically significant were EoU to CUSE ($\beta = -0.022$, $t = 0.755$ $p > 0.05$), PA to CUSE ($\beta = 0.028$, $t = 0.608$ $p > 0.05$), and PA to PU ($\beta = 0.041$, $t = 0.567$ $p > 0.05$).

Table 2: Path coefficients

Path	Std Beta	T-Statistics	P Values	Decision	f-squared	VIF Values
CONF -> SAT	0.466	8.317	0.000	Accepted	0.470	1.447
EoU -> CUSE	0.022	0.313	0.755	Rejected	0.000	1.650
EoU -> PU	0.314	4.988	0.000	Accepted	0.095	1.161
PA -> CUSE	0.028	0.513	0.608	Rejected	0.001	1.398
PA -> PU	0.041	0.573	0.567	Rejected	0.002	1.161
PA -> SAT	0.077	1.999	0.050	Accepted	0.030	1.440
PC -> CUSE	0.226	2.875	0.004	Accepted	0.036	2.354
PC -> EoU	0.610	12.320	0.000	Accepted	0.594	1.000
PC -> SAT	0.388	6.400	0.000	Accepted	0.303	1.551
PU -> CONF	0.325	5.084	0.000	Accepted	0.118	1.000
PU -> CUSE	0.245	3.525	0.000	Accepted	0.074	1.335
PU -> SAT	0.119	2.630	0.009	Accepted	0.034	1.288
SAT -> CUSE	0.257	3.315	0.001	Accepted	0.051	2.138

CUSE -- continuous use, PU – perceived usefulness, EoU – perceived ease of use, PA – perceived autonomy, PC – perceived competence, CONF – conformation, and SAT – satisfaction

The f-squared statistic was used to determine how much each exogenous construct contributed to the explained variance of its endogenous counterpart. The results are shown in Table 2. Cohen (2003) specifies acceptable effect sizes as 0.02, 0.15, and 0.35, to mean small, medium, and substantial, respectively. The effect size of CONF to SAT (0.470) and PC to EoU (0.594) were deemed substantial by Cohen's standard (Cohen, 2003). The effect size of PC to SAT (0.303) was medium, while the rest had a small effect size.

The R-squared value is the sum of all the predictors' contributions to the explained variance of the exogenous variable (Hair Jr. et al., 2021). The R-squared value of the model was 0.391, as shown in Figure 3. According to the findings, all model predictors account for 39.1% of the continuous use of mobile learning by high school learners. According to Hair Jr. et al. (2021), the exogenous variable has a moderate influence on the endogenous variable, which is very respectable.

The predictive relevance of the model was evaluated using a cross-validated redundancy predictor Q-squared. Results show that all Q-squared values ranged from 0.064 to 0.533. All the Q-squared values were greater than zero, meaning that the model could be used to explain and forecast high school learners' acceptance of mobile learning. The results also mean that the factors PU, SAT, CONF, EoU, PC, and PA are good predictors of CUSE. These constructs (PU, SAT, CONF, EoU, PC, PA, and CUSE) made up the structural model.

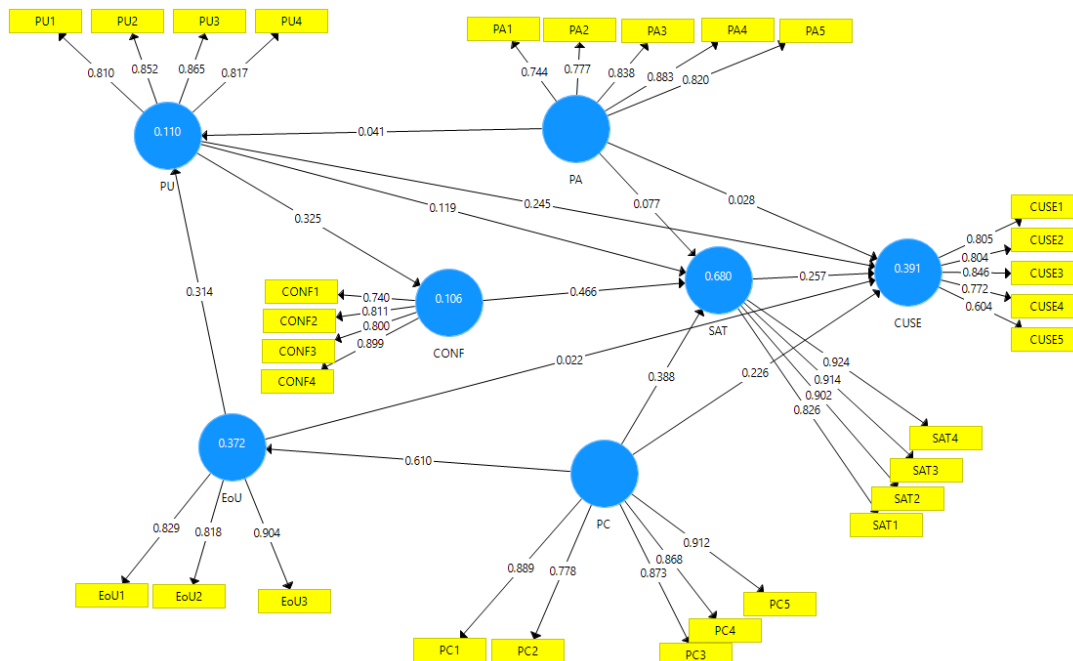


Figure 3: Structural model

Note: CUSE - continuous use, PU - perceived usefulness, EoU - perceived ease of use, PA - perceived autonomy, PC - perceived competence, CONF - conformation, and SAT - satisfaction

4.3 Moderation effect

The moderating effects of gender, level of education, and location were assessed and the results are shown in Table 3. These results show that the moderating effects of gender, level of education, and location on high school learners' continuous use of mobile learning were not statistically significant since their *t*-values are less than 1.96. Hence, they were rejected.

Table 3: Moderating effect

Path	Std Beta	T Statistics	P Values	Decision
Gender -> CUSE	-0.014	0.245	0.806	Rejected
Gender Moderating Effect -> CUSE	-0.076	1.149	0.251	Rejected
Level -> CUSE	0.002	0.040	0.968	Rejected
Level Moderating Effect -> CUSE	-0.042	0.647	0.518	Rejected
Location -> CUSE	0.143	2.796	0.005	Accepted
Location Moderating Effect -> CUSE	0.050	0.468	0.640	Rejected

CUSE- continuous use

5. Discussion

Research objective 1: The primary objective of this study was to assess determinants of high school learners' continuous use of mobile learning. Six variables were identified and evaluated using PLS-SEM. Findings in Table 2 show that satisfaction, perceived competence, and perceived usefulness all had favourable effects on high school learners' continuous use of mobile learning. Although perceived ease of use and perceived autonomy had no direct effect on

continuous use, they did have an indirect effect through perceived usefulness and satisfaction, respectively. High school learners' confirmation had an indirect effect on their continuous use by means of the mediating effect of satisfaction. According to these results, perceived autonomy, satisfaction, perceived ease of use, perceived competence, and confirmation are all good predictors of high school learners' continuous use of mobile learning.

According to the findings Pratama (2021), EoU had a positive effect on PU but had no direct effect on high school learners' continuous use of mobile learning. These results imply that effort needed to learn to use mobile learning reinforces its usefulness, which in turn influences their continuous use of mobile learning. Effort required to learn to use mobile learning, on the other hand, has no direct effect on learners' continuous use of mobile learning. There are two possible explanations for this outcome. Firstly, high school students are 'digital natives,' or adept users of mobile devices. Secondly, the high school students in these studies have used mobile learning for the entire year, indicating that they are now proficient users of mobile learning. Mutambara and Bayaga (2020) noted that the effect of perceived ease of use on actual use attenuates with learners' experience with mobile learning.

Contrary to the findings of Alraimi et al. (2015) and Kim (2020), the findings of this study revealed that high school learners' perceived usefulness had a direct positive effect on their continued use of mobile learning. The ability of mobile learning to provide learning materials anywhere, at any time, encourages high school learners to continue using it. This interpretation emphasises the importance of extrinsic motivation in the use of mobile learning. After using mobile learning for the entire year, high school students have realised that mobile learning can improve their performance. It is this realisation that possibly influences their intention to continue using mobile learning.

This study also found that high school learners' realisation that mobile learning can improve their performance influences their satisfaction with it, which is consistent with the findings of Luo et al. (2021). Because mobile learning was more advantageous to high school students who did not have access to face-to-face learning owing to the coronavirus pandemic restrictions (Shrotri et al., 2021), the students may regard this benefit as the primary driver of satisfaction formation. The ability of mobile learning to satisfy high school learners' requirements, expectations, task orientation, and goal determination gratified them both emotionally and materially. According to the findings, the usefulness of mobile learning influences a key surrogate indicator of mobile learning success (Santosa et al., 2005).

Congruent to the findings of Luo et al. (2021), high school learners' perceived autonomy had a positive significant effect on their satisfaction. A possible explanation for this is that, after using mobile learning for the whole year, high school learners realised that they can study at their own pace, anytime, and anywhere. This ability of mobile learning of allowing high school learners to take charge of their learning leads to their satisfaction with it.

Perceived competence was meant to be a good determinant of perceived ease of use, satisfaction and continuous use. These results were confirmed by the findings in prior studies (Luo et al., 2021; Sørenbø et al., 2009). When it comes to the extent to which high school learners' pre-acceptance expectations are verified, perceived competence appears to be the most crucial factor. The explanation for this might be that competency has the ability to make pre-acceptance expectations more reasonable and post-acceptance usage more efficient. When reasonable expectations meet efficient use, a high degree of satisfaction is achieved. The satisfaction of high school students had a positive effect on their continuous use. The findings are consistent with those of Chong (2013) and Lu (2019), who found that users will continue to use a system if it meets their material and emotional needs. One possible explanation for this finding is that high school students used mobile learning for an entire year and found it to be materially and emotionally satisfying, resulting in their intention to continue using it. Satisfaction also serves as an important moderator between high school students' perceived usefulness, perceived competence and confirmation, and their continuous use.

Research objective 2: This was to investigate the mediating effect of social moderators on the relationship between learners' satisfaction and their continued use of mobile learning. Results in Figure 3 show that the R-squared value of SAT was 0.680. This result implies that the total contribution of PA, PC, PU, EoU, and COMF in the explained variance of SAT was 68%. This coefficient of determination is considered substantial (Cohen et al., 2003). The effect of satisfaction on continued use is a result of its own indicators and the 68% contribution of its exogenous variables (PA, PC, PU, EoU, and COMF).

The moderating effect of social moderators (gender, educational level, and geographical area) on the path satisfaction to continuous use was assessed, and the results are displayed in Table 3. Contrary to the finding of Amzaourou and Oubaha (2018) and Cheng and Yuen (2020), gender does not moderate the path satisfaction to continuous use. These results imply that male and female learners had similar continuous use of mobile learning. This means that both male and female learners have the same perceptions on mobile learning and they intend to continue using it.

Educational level does not moderate the satisfaction to continuous use relationship. This result is in line with the findings of Amzaourou and Oubaha (2018), who also noted that university students' educational level does not moderate the relationship with satisfaction and continuous use. The results imply that learners in the general education and training phase and those in the further education and training phase have similar continuous use of mobile learning intentions.

Tarhini et al. (2015) and Cheng and Yuen (2020) found that geographical area does not moderate the relationship between satisfaction and continuous use. Our results confirmed the findings of Tarhini et al. (2015) and Cheng and Yuen (2020). These results mean that rural, semi-urban, and urban high school learners have similar continuous use of mobile learning intentions. A possible reason for this finding could be the influence of connectivity developments taking place in both rural and semi-urban areas. The difference between rural areas and urban areas is

narrowing because cellular network providers have invested heavily in cell phone boosters in rural areas, thereby making Internet access available (Chibisa et al., 2021). This access to connectivity in all areas causes geographical areas to be statistically insignificant moderators of satisfaction versus continuous use.

6. Conclusions and Recommendations

This study aimed to assess the determinants of high school learners' continuous use of mobile learning and to investigate the moderation effects of respondent's social moderators. Six latent variables were identified and evaluated using PLS-SEM. These variables were perceived autonomy, satisfaction, perceived ease of use, satisfaction, perceived competence, and confirmation. They were all found to be statistically significant and hence good determinants of high school learners' continuous use of mobile learning. A model for predicting high school learners' continuous use of mobile learning was developed using these variables. It was found to be statistically valid and robust with a moderate coefficient of determination of 39.1%.

With a successful model of continuous use of mobile learning such as this one, stakeholders are encouraged to continue using mobile learning because high school learners have shown intentions to continue using it in order to alleviate the restrictive and devastating effects of the Covid-19 pandemic. It has also been shown that there are so many advantages of using mobile learning, such as learning at one's own pace, anytime, anywhere that enhance high school learners' intentions to continue using mobile learning. Although the explained variance of this study was statistically significant, a coefficient of determination of 39.1% means that 61.8% of the factors that explain the continued use of mobile learning were not captured in this model. It is therefore recommended that future studies should focus on finding these 'missing' variables.

7. References

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Appendix 1

Determinants of high school learners' continuous use of mobile learning during the Covid-19 pandemic

The purpose of this questionnaire is to collect data that will be used to find the **determinants of high school learners' continuous use of mobile learning during the Covid-19 pandemic**. Any information provided will be treated with utmost confidentiality and will not be used for any purpose other than this. Your participation in this survey will be highly appreciated. All data obtained from participants and their personal details will be treated with utmost confidentiality. You are free to withdraw from this survey any time you feel like doing so, without any consequences. You need approximately 5-10 minutes to complete this survey.

DEMOGRAPHIC DATA

(Please tick the appropriate box)

Gender	Male	Female
	1	2

Phase	GET	FET
	1	2

Geographical Location	Rural	Semi-urban
	1	2

CONSTRUCTS AND INDICATORS

Continuance intention	
CUSE1	I intend to continue using the mobile learning, rather than discontinue its use.
CUSE2	My intentions are to extend my use of the mobile learning rather than using any alternative means.
CUSE3	I would never discontinue my use of the mobile learning.
CUSE4	I intend to continue using mobile learning for the rest of my high school learning.
CUSE5	I will encourage my teacher to keep on using mobile learning so that I keep on using it.
Satisfaction	
SAT1	After using mobile learning I felt satisfied.
SAT2	After using mobile learning I felt contented.
SAT3	After using mobile learning I felt pleased.
SAT4	After using mobile learning I felt delighted.
SAT5	After using mobile learning I felt terrible.
Perceived usefulness	
PU1	Using mobile learning improves the quality of my school work
PU2	Using mobile learning increases my productivity as a learner.
PU3	Using mobile learning enhances my effectiveness in my school work.
PU4	Overall, mobile learning is useful in my school work.
PU5	Using mobile learning would make it easier for me to learn.
PU6	I would find mobile learning useful in learning.
Confirmation	

CONF1	My experience with using mobile learning was better than what I expected.
CONF2	The service level provided by mobile learning was better than what I expected.
CONF3	Overall, most of my expectations from using mobile learning were confirmed.
CONF4	My experience with using mobile learning at home was better than what I expected.
CONF5	My experience with using mobile learning at school was better than what I expected.
Perceived competence	
PC1	I do not feel very competent when I use mobile learning in my school work.
PC2	The other learners tell me I am good at using mobile learning in my school work.
PC3	I have been able to learn interesting new skills in mobile learning.
PC4	Most days I feel a sense of accomplishment from working with mobile learning.
PC5	In school work I do not get much of a chance to show how capable I am in mobile learning.
PC6	When I am using mobile learning I often do not feel very capable.
PC7	My feelings toward mobile learning are taken into consideration in class.
PC8	I feel like I can pretty much use mobile learning as I do my school work.
PC9	There is not much opportunity for me to decide for myself how to use mobile learning in my educational work.
Perceived autonomy	
PA1	I feel like I can make a lot of inputs to deciding how I use mobile learning in my school work.
PA2	I feel pressured at using mobile learning in my school work.
PA3	I am free to express my ideas and opinions on using mobile learning in my school work.
PA4	When I am using mobile learning, I have to do what I am told.
PA5	My feelings toward mobile learning are taken into consideration at school.
PA6	There is not much opportunity for me to decide for myself how to use mobile learning in my school work
Perceived ease of use	
EoU1	It will be easy to learn how to use mobile learning to learn.
EoU2	I will find it easy to use mobile learning to share information with others.
EoU3	I will find mobile learning easy to use in class.
EoU4	I would find mobile learning to be flexible to interact with.
EoU5	It will be easy for me to become skilful in using mobile learning.
EoU6	I will find mobile learning easy to use at home.