Investigating Factors Influencing Students' Behavioral Intentions Towards Mobile Learning Devices in Higher Educational Institutions

Gopolang Ditlhokwa [1,2]*

[1] Communication University of China, Beijing, CHINA
[2] University of Botswana, Gaborone, BOTSWANA
*Corresponding Author: ditlhokwag@ub.ac.bw

ABSTRACT

This study adopted two key variables of the technology acceptance model, thus perceived usefulness, self-efficacy, and (gratification) variable of uses and gratification theory to understand how the three variables predict students' behavioral intentions towards the use of mobile learning devices (MLDs). The sample was drawn from 447 selected participants from four private universities in Gaborone, Botswana. The researcher analyzed the data and presented the findings by testing the suggested research model and the hypotheses through structural equation modeling. Regression analysis was carried out with SmartPLS to assess the path coefficient of the data collected for the model. The findings suggest that two of the key variables tested, thus self-efficacy and perceived usefulness of MLDs positively influenced students' gratification and were statistically significant. However, two out of the three of the determinant variables of perceived usefulness (information seeking, and social connections) all had positive relations with students' perceptions of gratification, and behavioral intentions towards MLDs. This study concludes that, information seeking, and social connections variables of the perceived usefulness, connote the positive relationships with students' perceptions of gratification with MLDs. Furthermore, the findings suggest that students could improve behavioral intentions concerning the relevance of MLDs application in institutions of higher learning by applying varied MLDs at their disposal.

Keywords: smartphones, mobile learning, higher education, Botswana

Received: 12 Jun. 2022 ◆ Accepted: 30 Sep. 2022

INTRODUCTION

The achievement of an outcome-based education is increasingly being extended by the massive adoption of mobile learning devices (MLDs) in education, which involves the incorporation of mobile digital devices in teaching and learning activities to aid knowledge acquisition (Al-Hunaiyyan et al., 2017; Idrus & Ismail, 2010; Romero-Rodríguez et al., 2020). Although it started as a computer-based kind of learning in higher educational institutions, the notion of portable MLDs has evenly blurred the physical classroom walls between students and teachers. Edumadze et al. (2022), Okoye et al. (2021), and Ontiveros and Pazos (2013) further underscored the efficacy of combining technology-aided innovations with traditional learning methods, citing rejuvenated learning, and teaching experiences from both learners and their instructors.

In developing countries like Botswana, the adoption of MLDs (smartphones and tablet usage) in higher learning institutions for educational purposes, however, has not yet reached its full scale, considering several discrepancies such as a slowing interest by some lecturers to fully utilize it and equal access to resources among other things. Nevertheless, the uptake is considerably gaining momentum (Rudhumbu et al., 2021). Evidenced by efforts that continue to make way for full-scale adoption and understanding of MLD usage, Botswana's largest public tertiary institute, the University of Botswana has made breakthroughs in enhancing knowledge using ICTs in the teaching and learning activities over the years, ahead of other public institutions in the country (Kadimo et al., 2018, 2022; Moakofhi et al., 2017; Mutula, 2002; Ntshwarang et al., 2021; Thomas, 2010). On the other hand, private institutions have not been left behind in this exploration exercise (Lekopanye & Mogwe, 2014) although academic attention is still limited in that regard. Despite it not being fully utilized across all the institutions of higher learning in Botswana, motivations behind students' behavioral intentions and the possible impact of MLDs thereafter, still need to be widely explored especially in private institutions. According to Criollo-C et al. (2018), MLDs are now a common feature in teaching and learning activities. Furthermore, the adoption of these technologies promotes networking, sharing of expertise, and collaboration (Edumadze et al., 2022; Peters, 2007),

ultimately increasing the chances of students sharing academic opportunities even outside the classroom environment (Chand & Arora, 2008; Sharma et al., 2016). Therefore, this study is aimed at investigating factors that influence students' behavioral intentions toward MLDs from the perspectives of students from four sampled private universities in Botswana.

REVIEW OF RELATED LITERATURE

From the popularization of e-learning to the adoption of portable devices (MLDs) for educational purposes, many academic predictions and considerations have helped carve the state and usage of MLDs both by the teachers and students globally, and the extent to which their incorporation into higher education differs per geographical area. Most studies had long envisaged a significant inconsistency between the traditional teaching methods and the incorporation of MLDs, while others viewed MLDs as a needed enhancement to the traditional and physical classroom setups than a total replacement (Looi & Toh, 2014). These contrasting views birthed the structure of this literature review to be explored through the various ways that MLDs have been applied to instruction and facilitation in higher educational institutions, especially with language learning among others.

Language Learning Through MLDs in Higher Educational Institutions

Using MLDs to modernize learning in higher educational institutions of has made great strides. Nowadays, language learning is also becoming a central feature in the adoption of MLDs. According to Wang and Lei (2021), the use of MLDs to teach English vocabulary to college students can be more effective when combined with mobile terminals-an integration of various MLDs in one space, allowing for the convenience of access to the learning material. In that context, Wang and Lei (2021) further submit that external sound enhancement devices like speakers could be installed to reinforce spoken word learning and enhance listening skills, which even extends to other relevant online content that comes in form of edutainment.

When examining how MLDs impact language learning, Kukulska-Hulme (2009) argued that mobile learning is a revolving aspect in the convergence between formal and informal learning. Thus, the researcher further echoed that rethinking home learning as a potential method to speed up language learning using mobile devices cannot be undermined by restricting it only to the physical classroom. This also resonates with Alzaza and Yaakub (2011), Mohammadi et al. (2020), and Okoye et al.'s (2021) observations that the Internet has become the greatest enabler for applying technology-aided 21st century learning skills, igniting a growing interest in its adoption from both high income and low-income countries, leading to coherence in language skills sharing and acquisition. However, in their studies, Dintoe (2018) and Mehdipour and Zerehkafi (2013) found that in some cases, the skills acquisition leading to the success of implementing MLDs in higher education contexts also differs based on the compatibility complexities between the technological devices and the end-users. Furthermore, the availability of resources, infrastructure, and policies that support such initiatives are often cited as the foundational basis of MLDs. Barrett et al.'s (2021) exploration of the English oral presentation application of MLDs, revealed that to a certain degree, students face multiple difficulties in the convenience of using MLDs and their ease of understanding the material, especially since their learner intentions and

motivations vary per subject, yielding some social challenges such as anxiety and the lack of motivation to collaborate with others. Other features of MLDs include self-directed language learning that does not involve instructors, especially those who focused more on refining their language translation skills than the traditional aspects of listening, speaking, reading, and writing (Lai et al., 2022).

Self-Paced Individualized Learning Using MLDs Versus Classroom-Based Instruction

Yu et al. (2022) compared the usage of MLDs with social media applications to determine the variations in behavioral influences and attitudes towards learning. With modernized learning environments gaining momentum in higher education institutions, there is evidence of inconsistencies in both individualized and collaborative online academic interactions that promote research, self-paced learning, and soft skills acquisition. Given the autonomy in learning that comes with MLDs with little facilitation from teachers or instructors, Marquina (2018) suggests that well-informed decision-making is fundamental to career-building while at the same time adding up on the already acquired knowledge. This partly self-driven approach further abets students towards multitasking skills when they switch from one subject to another at their convenience (Alpert, 2016; Coman et al., 2020; Criollo-C et al., 2021) as compared to a well-coordinated classroom that takes a formal approach, with some researchers further indicating that even outside the formal learning setups, MLDs have now become a hub for exchanging knowledge amongst the peers belonging to higher educational institutions, who only need a portable mobile phone or tablet to access subjects of their choice (Ally & Prieto-Blázquez, 2014; Castro et al., 2016; Demuyakor, 2021).

Chen et al. (2021) view MLDs as an all-inclusive platform for higher learning that aids learners to break away from the classroom environment and enjoy their own space without being specific to a particular subject continues to yield results in facilitating education and development of skills, although in some cases, a few numbers of learners still prefer the traditional teaching methods. Emerging views from a wider scholarship further suggest an inquiry into the value that comes with the presence and the way instructors interact with students during online learning activities, although some researchers noted the lack of digital knowledge and skills necessary for a successful transition from traditional to online teaching methods (Ntereke et al., 2021). Another perspective emerges from the need to give feedback and opening to discussions as a fundamental aspect of the instructor-learner online relationship (Lucas et al., 2021). This even goes to suggest a better learner experience with the instructor's virtual presence than the physical, capitalizing on the cost-effectiveness of learning via MLDs beyond the traditional classroom instruction, giving learners space to choose their desired content formats (Brame, 2015; Ragusa & Crampton, 2017).

RESEARCH HYPOTHESES AND PROPOSED MODEL

Self-Efficacy Influencer: Mobile Learning Devices

One factor that has been discovered as a great influencer to the users' behavioral intentions toward technology is self-efficacy (Chao, 2019). When the user of any technology acquires special skills and abilities, their intentions and interests towards that technology are
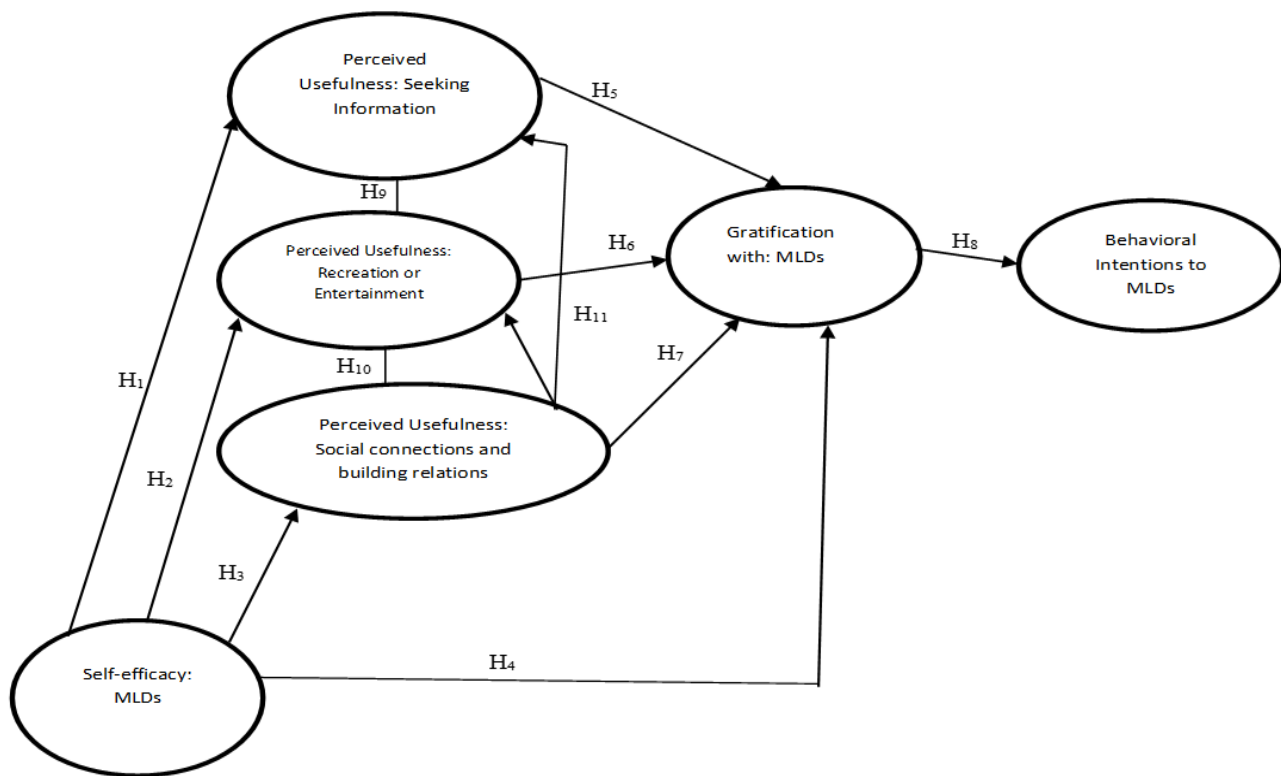
Figure 1. Theoretical model: perceived usefulness, gratification, and behavioral intentions of students

enhanced (Edumadze et al., 2022). It is therefore imminent that the self-efficacy of MLDs has a great tendency to influence users' perceptions of how useful the MLD is, as well as the gratification they derive from its usage. The perceived usefulness of any technology, therefore, has the possibility of influencing users, hence its adoption (Distler et al., 2020).

For this study, the researcher conceptualized the perceived usefulness of MLDs deriving from the following three perspectives:

1. MLDs to seek information,
2. MLDs for recreation or entertainment, and
3. MLDs for establishing social connections and building relations.

Firstly, as part of their learning and interactivity, students in higher educational institutions may become accustomed to the application of MLDs to search for academic-related information from various online libraries. MLDs are used to assist students to search for useful educational materials online for improved academic outcomes. MLDs also have functions for entertainment and fun. Secondly, the pleasure students get from MLDs might also influence their usefulness. The third dimensions of perceived usefulness are the social relations and support functions of MLDs. MLDs are used by the students to build social relations and interactions among peers. This faction of MLDs is cited by Al-Mashhadani and Al-Rawe (2018) as the most important reason users adopt the technology (MLDs). This study explores the three dimensions of the perceived usefulness from the angle of MLDs use among students form four private universities in Botswana.

Figure 1 depicts the suggested model for this study, as well as the research hypotheses. For further explanations, the measure and each hypothesis are elaborated. The research hypotheses indicated in **Figure 1** are, as follows:

1. **H1**: The self-efficacy: MLDs have a significant relation to students' perceived usefulness and (seeking information).
2. **H2**: The self-efficacy of students' MLDs perceived usefulness has a significant relation to the gratification they get from the information.
3. **H3**: The self-efficacy of MLDs has a significant relation to students' perceived usefulness for social connections and building relations.
4. **H4**: The self-efficacy: MLDs have a significant relation to students' perceived usefulness (gratification with MLDs).

Determinants of Perceived Usefulness

MLDs are of different varieties and are used by millions of people from all sectors of the economy across the globe. The application of such devices in higher educational institutions helps both students and faculty members to carry out teaching and learning with little effort. Besides educational purposes, MLDs are also used for the recreation and entertainment industry. Another use of MLDs is for social relations, building, and connecting with friends and families. The perceived usefulness of MLDs/technology is believed to have some significant positive relations with a variable such as the gratification levels of students (Pan, 2020).

Based on the three conceptual definitions and measures of the MLD's perceived usefulness by students as well as ascendancy on gratification, this study postulates the following hypotheses:

5. **H5**: Perceived usefulness: The information-seeking function of the MLDs has a significant relation to students' gratification levels.
6. **H6**: Perceived usefulness: Using MLDs for recreation or entertainment have a significant relation to students' gratification levels.

7. **H₇**: Perceived usefulness: Using MLDs for social connections and building relationships have a significant relation to students' gratification levels.

Determinants of Gratification of MLDs Use

The levels of gratification or satisfaction acquired from the use of any technology (MLDs) by students lead to acceptance and continued use. If students get the desired gratifications from the use or application of MLDs, then there is a tendency for such satisfactions to influence the behavioral intentions of students (Pan, 2020). The following hypothesis is postulated:

8. **H₈**: Gratification levels of students have a significant relation to students' behavioral intentions of using MLDs.

Measures of Perceived Usefulness and Related Influences

For this study, the researcher opted to conceptualize and measure of perceived usefulness in three-dimensions. This measure ensures a logical presentation of the constructs in the research model. Hypotheses 9 and 10 depict the corrections between the three measures and influencers stipulated in this study:

9. **H₉**: Perceived usefulness and information seeking (recreation or entertainment) have significant corrections.

10. **H₁₀**: Perceived usefulness: The social connection and building relationships function of applying MLDs have a positive and significant correlation.

11. **H₁₁**: The perceived usefulness of applying MLDs for building social relations, and information seeking have a positive and significant correlation.

MATERIALS AND METHODS

Research Sample

This study was conducted in Botswana's capital city Gaborone on students from four conveniently sampled private universities. Out of the total sample of 447 students (n=447), 13% of the students (n=59) were from ABM University College, while 23% (n=103) were from BA ISAGO University, and 37% (n=166) were from Botho University and lastly, 27% (n=119) were from Limkokwing University of Creative Technology. The motivation behind the selection of private universities was informed by the lack of empirical studies on the adoption of MLDs dedicated to private universities in Botswana, evidenced by many years of research that repeatedly drew samples from mostly public universities for example in Dintoe (2018), Moremi (2018), etc., yet education in private universities continues to grow significantly (Baliyan & Moorad, 2018), hence the need to explore it further by adopting questions that are more relevant to the 21st century learning such as the use of MLDs. The comparative analysis of the demographic characteristics of respondents is reported in condensed **Table 1**, and the universities are arranged alphabetically.

Participants' Recruitment and Procedures

The researcher recruited participants by first identifying contact persons in each university, thereafter, setting a Zoom meeting with all of them to explain the intention, scope, and the required sample of participants for this study. This was followed by the wider recruitment process conducted by contact persons in their universities, under the guidance of the researcher to offer clarity along the way. After all the

Table 1. Descriptive statistics of participants from four selected universities

Variables	Subgroups	Frequency	Percentage (%)
ABM University College (n=59)			
Age (years)	18-30	59	100.0
	31-40	0	0.0
	41-50	0	0.0
Gender	Male	25	42.0
	Female	34	58.0
	Others	0	0.0
Education	Master's degree (or higher)	0	0.0
	Bachelor's degree	0	0.0
	Diploma	51	86.0
	Others	8	14.0
BA ISAGO University (n=103)			
Age (years)	18-30	77	75.0
	31-40	26	25.0
	41-50	0	0.0
Gender	Male	59	57.0
	Female	44	43.0
	Others	0	0.0
Education	Master's degree (or higher)	0	0.0
	Bachelor's degree	93	90.0
	Diploma	8	8.0
	Others	2	2.0
Botho University (n=166)			
Age (years)	18-30	120	72.0
	31-40	46	28.0
	41-50	0	0.0
Gender	Male	76	46.0
	Female	90	54.0
	Others	0	0.0
Education	Master's degree (or higher)	2	1.0
	Bachelor's degree	132	80.0
	Diploma	4	2.0
	Others	28	17.0
Limkokwing University of Creative Technology (n=119)			
Age (years)	18-30	117	98.0
	31-40	2	2.0
	41-50	0	0.0
Gender	Male	89	75.0
	Female	30	25.0
	Others	0	0.0
Education	Master's degree (or higher)	0	0.0
	Bachelor's degree	37	31.0
	Diploma	53	45.0
	Others	29	24.0

agreements were reached between the researcher, contact persons, and the potential participants, the questionnaire for the study was sent to the participants through the designated contact persons via WhatsApp and Facebook Messenger. The study had initially targeted 500 participants, but only 447 were able to respond to the questionnaire, which was designed using the QuestionPro survey. Before answering the questionnaire, all the participants were briefed about the purpose of this study and that their identities would be kept anonymous, with further assurance that the collected data was going to be used for academic purposes only. The entire data collection process, including participant recruitment and questionnaire administration, took place between January and March 2022.

Instruments for Data Collection, Validity, and Reliability

Using a QuestionPro survey tool, the data-gathering instrument comprised a 15-item online questionnaire survey consisting of five sections. The first section was dedicated to participants' demographic information (age, gender, and educational levels). Section 2 sought to gather students' perceived usefulness (seeking information, building social relationships, and entrainment/recreation) of MLDs used among respondents. As for sections three, four, and five, the questions were designed to address issues of self-efficacy, gratification, and intentions of MLDs.

The measurement variables of these sections are explained in the measurement section, where the researcher adopted a five-point Likert scale (*1=strongly disagree to 5=strongly agree*). O'Connor and Joffe (2020) proposed that to guarantee credibility, and improve the reliability of the research findings, the researcher must take the necessary steps to perfect the integrity of the study. Firstly, to assess the validity and reliability of the instruments, the data-collection tool was pre-tested with a randomly selected sample of 200 participants from Botho University and Limkokwing University of Creative Technology (100 respondents selected from each).

The researcher then used this test sample to conduct a factor analysis like Kaiser-Meyer-Olkin (KMO) index, Bartlett test of sphericity, and Cronbach's alpha coefficient using SPSS to test the responses for validity and reliability. 30 items from the questionnaire yielded results that ranged from 0.50 to 0.98 with a p-value of the significance at 0.01 for validity, when the sphericity for KMO index and Bartlett test was applied. Conversely, Cronbach's alpha coefficient for 28 items was 0.76, which was slightly above the acceptable threshold of 0.73 (Thorsen & Bjorner, 2010). The findings of the study were done by testing the suggested research hypotheses through structural equation modeling. The regression analysis was carried out with the help of SmartPLS to assess the path coefficient of the data collected for the model.

Measures

The six key items (perceived usefulness: seeking information; perceived usefulness: entrainment/recreation; perceived usefulness: building social relationships; self-efficiency influencer: MLDs; the gratification of MLDs uses; behavioral intentions of MLDs) of the hypotheses were measured based on the scale proposed by Pan (2020), which was used to conceptualize the hypothesis of perceived usefulness in three distinct measures. Thus, the perceived usefulness of MLDs used by students is either for *seeking information(academic), entertainment, or recreation* and *for building social relations*. For this study, each of the dimensions was investigated from the perspective of MLDs applied for behavior intentions. The research items, therefore, centered basically on how MLDs benefit students academically. Students perceived usefulness of the MLDs is anchored on what these MLDs can offer to them. For gratification and behavior intentions, a scale proposed by Pan (2020) was used. **Figure 2** depicts a summary of constructs used in measuring the questionnaire items.
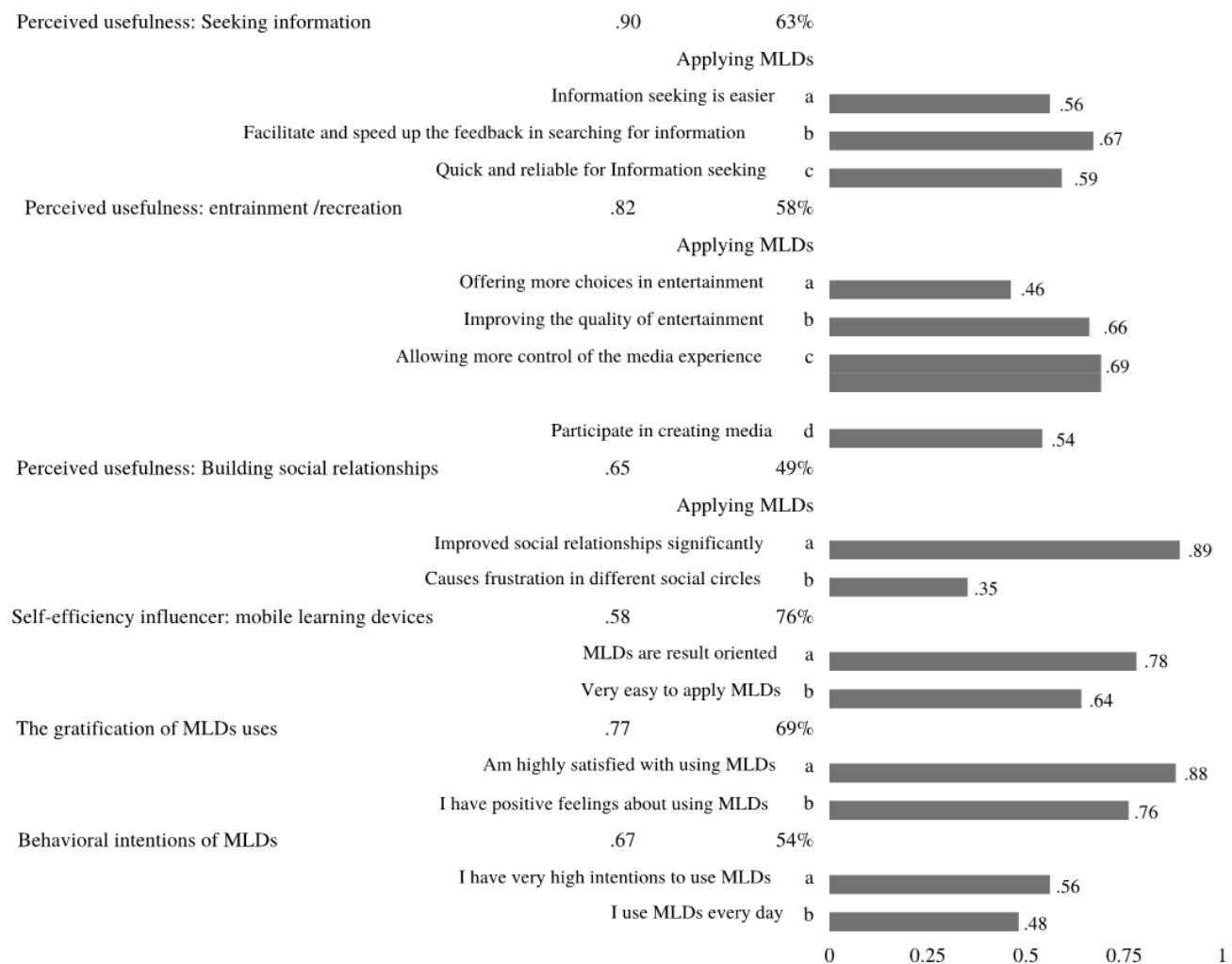

Figure 2. Constructs and measures psychometric properties applying standard path coefficients

The researcher used SSPS version 25 for the assessment of the factor analysis. This was done to measure psychometric characteristics. The questionnaire constructs ensured that every measure was included to represent the pairwise correlations. The result from this methodological approach was zero for the cross-construct indicant loading. Shadfar and Malekmohammadi (2013) observed that to project an acceptable model fit, then the statistical data quality of the fit must be carefully estimated. For this study, the fit measure recorded was .90, which enabled further adjustments to .89 for the degree of freedom, while the parsimonious goodness fit score was reported as .76. Further analysis recorded .02 and .04 scores for root mean square for the residual and standard versions respectively. The Chi-square was statistically insignificant with a score was 76.3, and the degree of freedom was .65. The study also recorded 2.12 for the normed Chi-square. The error of approximation for the root means is calculated as .4 (87%), while the confidence interval .00 to .05. and .89 score was recorded for comparative fit indices proposed by Bentler (1990). The non-normed and normed indices suggested by Bentler and Bonnett (1980) as well as normed and non-normed indices proposed by Bollen (1989) are mostly described as the incremental fit indices .77 to .96.

To evaluate psychometric measures, and the standardized path coefficients, the factor analysis scores for the confirmatory were also calculated. For the perceived usefulness measure, the standardized path coefficient for information seeking is .56, .67, and .59. For scores of the composite reliability statistics, coefficients are .90, and the variance extracted is 63%. The path coefficients for perceived usefulness (entertainment/recreation measure) had scores of .46, .66, .69, and .54. The analysis of the percentage of the variance extracted for the composite reliability coefficient had a figure of .82 and 58%. The measure for the standardized path coefficient, composite reliability coefficient shares of the variance extracted for perceived usefulness and social connections and building relationships is .65 and 49% respectively. The analysis for the self-efficacy and MLDs estimated two items and the standardized path coefficients are .78 and .64. The percentage for the shared variance extracted for the composite reliability measure is .58 and 76% accordingly.

Two research questionnaires *(I am highly satisfied with using MLDs", and "I have positive feelings about using MLDs)* were used to measure the gratification of students toward MLDs. The path coefficients for the gratification of MLDs were measured and recorded the score of .88 and .76 respectively while the shared variance extracted for the composite reliability was recorded .45. Students' behavioral intentions for MLDs application also reported .67 for the path coefficients, and its shared variance extracted of the composite reliability is estimated as 54%. It could be concluded from the analysis that due to the range of score outcome of the standardized path coefficients .56 to .48, the research item reliability is acceptable (Brunner & SÜβ, 2005). It is also important to note that, the standardized path coefficients for the other three measures, recreation or entertainment as perceived usefulness, and perceived usefulness from the perspective of social connections and building relationships were less than .70, hence will demand further refinement as prescribed by Brunner and SÜβ (2005). Again, the percentage for the variance extracted is beyond 50%. The base of the forgone analyses, the convergent validity, and the measure is well satisfied (Brunner & SÜβ, 2005). For the composite reliability measure, as well as the reliability coefficient values .78 and .56, the scores indicate acceptability.

Item by item comparison of each pair measure of both the shared variance extracted, and the square correlations were analyzed to ensure discriminant validity. For the discriminant validity to be rightfully satisfied, the greater common variation between two or more shared measures must agree within. dos Santos and Cirillo (2021) and Rigdon (1998) proposed that to further examine this, the shared variance extracted is expected to be more than the square correlations of the different measure pairs. To arrive at the correlations, confirmatory factor analysis, and the squares of the corrections were carried out (see **Figure 3**), as well as the shared variance extracted percentages in **Figure 2**. The analyses carried out show that, discriminant validity and measures were all satisfied. The least estimated percentage for shared variance extracted, measures and the single calculated square correlations were greater than .52 for students' gratification and the behavioral intentions with MLDs. The recorded square correlations for the two measures of shared variance extracted were 69% and 54%. dos Santos and Cirillo (2021) suggested that when the square correlations of the shared variance extracted percentages, and measures are more than the related measures, then the discriminant validity is achieved. The measures, correlations, and square correlations of the hypotheses are illustrated in **Figure 3**.
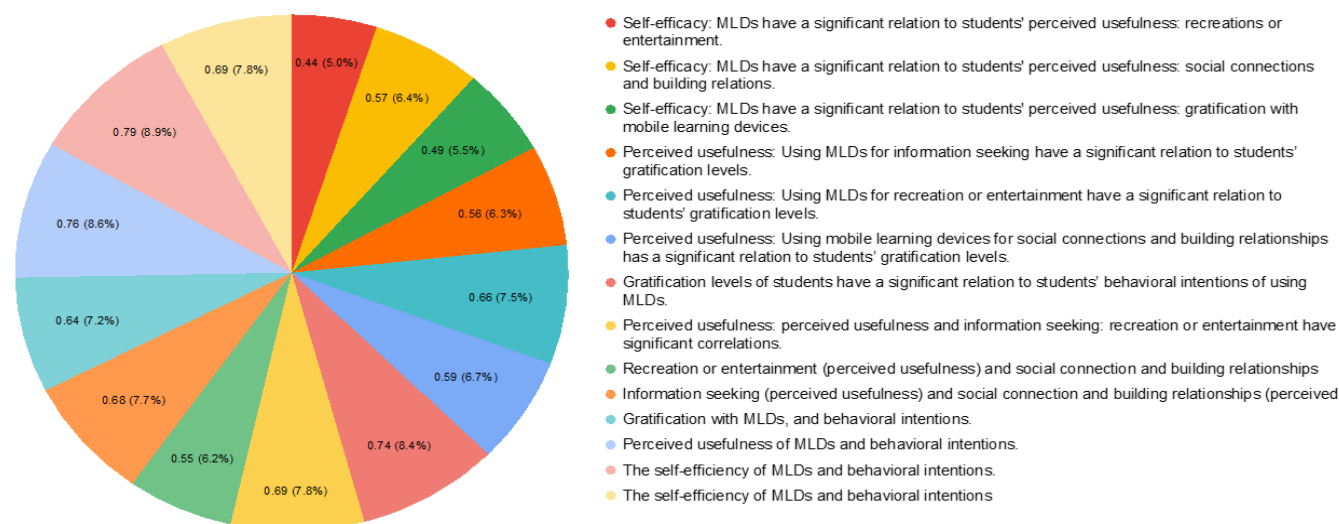

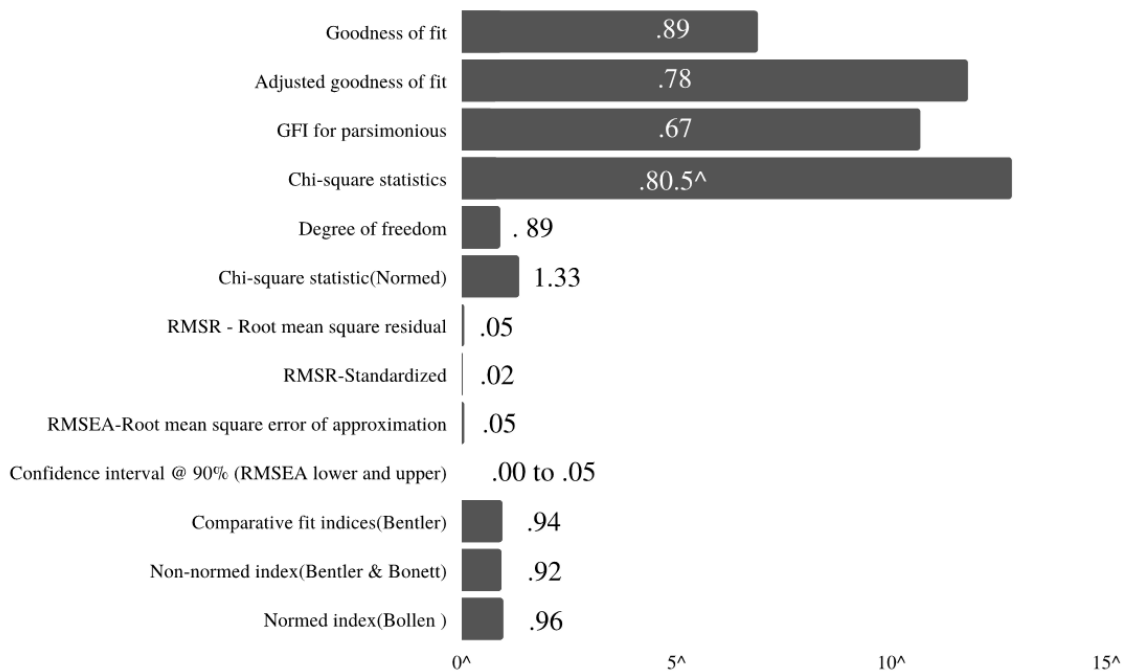**Figure 3.** Measures, correlations, and square correlations

Figure 4. Statistics summary (the study model and fit for data, where ***significant level at 1% and ^statistically insignificant at more than 10%

THE PROPOSED STUDY MODEL ESTIMATION

As depicted in **Figure 1**, the model proposed for this study was calculated with the help of the structural equation model, and Cali's maximum likelihood. The questionnaire item and specific measures were the guides for the latent constructs. For the endogenous and exogenous measures, and to ensure equal indicants, standard deviations were adopted as the scale for paths.

Figure 4 depicts all calculated models, the quality of fit, and other related statistics. After the analysis, parsimonious goodness fit indices, adjusted goodness fit indices, and the goodness fit itself were .89, .78, and .67, respectively. The estimation of the degree of freedom and the Chi-square score was 89 and 80.5, respectively. Deducing from the analysis, the Chi-square scores were above the 10% level, which means it is statistically insignificant. The normed Chi-square had 1.33, while the root means for the residual recorded .40, translating to a standardized counterpart at .05. The analysis resulted in the range for the confidence interval being .00 to .05 (90%), while the root means square estimation is .03. For the Bentler (1990), comparative fit indices recorded .94, and the fit indices incremental also ranged .92 to .96. Per the classification of Rigdon (1998), the above statistics are considered a good fit within the data and the study model. **Figure 4** illustrates the summary of fit models.

Figure 5 shows how standard path coefficients are used to analyze the structural model estimations as well as the measurement. The paths, measurement models, as well as related indicants, had a statistical level of 1%, and make it statistically significant. The endogenous measures, thus the variance are as follows; information seeking variable of the perceived usefulness is 11%, recreation and entertainment measure of perceived usefulness is 5%, social connections and building relationships being 6%, while the gratification is 89%. The behavioral intentions to MLDs are 56%. Apart from perceived usefulness (recreation or entertainment) (H_6), the structural paths analysis indicated that all measures had positive relations, hence at a 1% level concluded to be statistically significant to gratification. The study

denoted all paths that are significant with hypotheses symbols. A further assessment of the pair-wise correlations between all three variables of the perceived usefulness measures recorded a positive relationship and became statistically accepted (thus H_1 to H_5; H_7 to H_{11}).

DISCUSSION

This study aimed to probe students' behavioral intentions, perceived usefulness, and gratifications toward the application of MLDs from four sampled private universities in Gaborone, Botswana. The study developed the study model by applying the technology acceptance model (TAM) and uses and gratification theory, which are recognized as some of the utmost parsimonious technological and behavioral theories. The study also hypothesized the impact of variables to attain a study model drawing on the tenants of the TAM proposed by Blumler and Katz (1974) and Davis (1989). Comprehensive, and empirical findings from this study, indicated that self-efficacy, building social connections, and information-seeking variables of the perceived usefulness had a positive relationship with students' levels of gratification. Students' gratification relationship and variations with the application of MLDs are associated with over 60% score for gratification towards MLDs. These findings on the significant influence of self-efficiency and perceived usefulness measure on students' gratification are in line with a previous study by Blumler and Katz (1974) and Davis (1989). The context-specific model adopted by this study, on the usefulness, gratification, and behavior intentions of MLDs has demonstrated how TAM variables significantly influence students' behavior intention towards applying MLDs in higher education in a developing country context. The relationship between the correlation results and the previously stated hypothesis is positive, suggesting that the study hypothesis is valid and can be applied in the same context as the one for this study. Furthermore, this signals the relevance of study constructs toward students' attitudes on accepting the usage of technology for academic purposes and how they can shape their behavioral intentions towards MLDs.
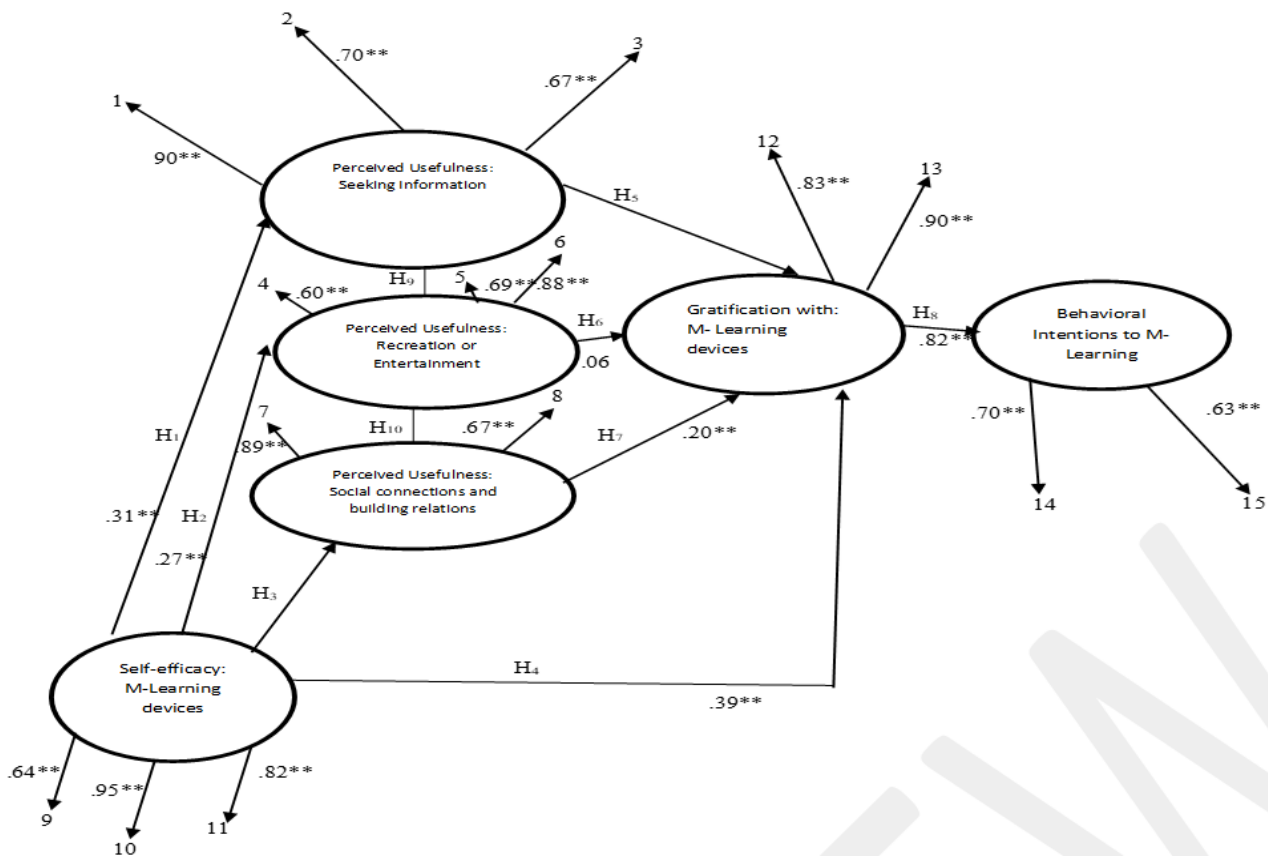
Figure 5. The standardized coefficient for perceived usefulness, self-efficacy, gratification, and behavioral intentions

The users' or students' behavior intentions can, therefore, be affected by both the internal and external factors as per the individual student's situation at the time of interacting with MLDs (Castro et al., 2016; Edumadze et al.,2022). For students' behavioral intentions towards MLDs, the analysis of the result reported an overall statistically significant outcome, thus accounting for over 71% of students' behavioral intentions. Students have thousands of choices and options when it comes to selecting which MLDs to use, and for what purpose, hence it is very easy for students to switch to MLDs if they are unable to find the required gratification. The gratification of using MLDs is a prime concern of many developers of these devices, in terms of influencing users' intentions.

The findings from this study recognized two important variables that influence students' gratification toward MLDs. The two variables of perceived usefulness influencing gratifications (information seeking and building social connections) were recognized as reasons for the high levels of gratifications of students towards MLDs. The variations of the findings are however insignificant (6%, to 11%) for the measure involving perceived usefulness. The outcome of these findings could be partly explained by the reason that, the perceived usefulness measure antecedent of the study model is self-efficiency. Per this study, students sampled for this study were expected to own MLDs, and regular users of the devices to be able to critically under the self-efficacy variable. Also, the perceived usefulness measure of recreation and entertainment determined students' gratification and had a negative outcome (thus H6 was statistically insignificant). This finding could be due to the user intentions to which students assign these devices. Since most of the devices are acquired for different reasons including for academic purposes, students' motivations might vary between applying MLDs for entertainment/recreation and educational purposes. Conversely, the

findings of this study relate to previous studies by Mohammadi et al. (2020) and Wang and Lei (2021) who concluded that one reason students or users might use or apply MLDs is for recreational purposes, education, or a combination of both (edutainment) or even for gratification to circumvent boredom.

Implications for Theory and Practice

This study is relevant in the context of Botswana and other developing countries where MLDs have not yet reached their full-scale application across all the institutions of higher learning, especially private universities (for academic purposes). This further refers to the application of MLDs by devices that are provided by the universities instead of students brining their own. Therefore, this paper contributes to the implications of MLDs specific to private universities, extending the research to the usage of MLDs not only being restricted to classrooms under the teacher or instructors' guidance but also its application by students at their own time, regardless of whether they are at school, home or even traveling, where they can access academic material and collaborate by sharing research findings, and perform other necessary educational activities. This was done by applying the proposed research model and TAM to test the key variables of the proposed study model to understand how such variables influence students' behavioral intentions towards MLDs in private institutions of higher education. Based on the results and further expanding on the TAM through responses on variables such as perceived usefulness, self-efficiency, and gratification influence students' behavior intentions toward MLDs for learning, it can be argued that, despite their different fields of relevance (study interests), students prefer using MLDs to complement their learning at private higher educational institutions for varied reasons, including their levels of gratification.

The outcome of the study gives practitioners some important understanding of how to employ MLDs in higher education across the globe and Botswana in particular. The findings from this study suggest that the merits of MLDs should be promoted and communicated within higher educational settings. Managers of higher educational institutions in Botswana can also promote the positive effects of MLDs for higher education, especially with the evident interest shown by students in private universities that are usually excluded in literature. This can be done by inviting experienced practitioners and successful students who share their successful application of MLDs' to motivate individuals on intentions toward MLDs. Similarly, different short videos and infographics can be used for demonstrating the benefits linked to MLDs usage for students and lecturers. The academic institutions must formulate groups for answering students' queries related to MLDs usage. Accordingly, different seminars could be arranged for the students where different materials, benefits, and optimum use of MLDs can be communicated.

CONCLUSION, LIMITATIONS, AND FUTURE RESEARCH

The primary objective of this study is to investigate the factors that influence students' behavioral intentions towards the application of MLDs in higher institutions of learning. To understand the drivers of behavioral intentions of the students toward MLDs, the researcher adopted three key variables (perceives usefulness, self-efficacy, and gratification) from the TAM proposed by Davis (1989). The study also predicted the positive relationships that existed between the two variables and students' behavioral intentions towards MLDs. The study used structural equation modeling to test the proposed study model and the research hypotheses related to perceived usefulness, self-efficacy, gratification, and behavioral intentions of students towards MLDs in four private universities in Botswana. Two major variables thus, self-efficacy and perceived usefulness positively influenced students' gratification and were statistically significant. On the other hand, information seeking, and social connections variables of the perceived usefulness, also predicted positive relationships with students' perceptions of gratification with MLDs. The findings of the study suggest that students could improve behavioral intentions concerning the relevance of MLDs application in institutions of higher learning by applying varied MLDs at their disposal. The results further direct future researchers could explore how students define the real gratification derived from the application of MLDs at the individual levels. Future studies could also explore how MLDs assist students in their learning while analyzing the factors that promote their engagement. It also suggests using other media effects and behavioral theories to identify the new variables that might affect or influence the use of MLDs among the participants.

A key limitation of this research work is that it was only carried out in four private universities in Botswana. Due to constraints beyond the reach of the researcher, all the private universities in Botswana could not be covered, hence only a few students were randomly selected from these universities. To understand the dynamics among students in the use of MLDs in higher education, the researcher proposes that future studies can conduct a comparative study on the perceived usefulness, gratification, and behavioral intentions of students towards MLDs from balanced perspectives of both the public and private universities, engaging in a large-scale inquiry which even extends to other cities (apart from the national capital Gaborone), to understand other factors that may lead to or impede MLDs acceptance and their usage. Also, future researchers could extend the theories related to technology acceptance and behavior intentions with other variables or constructs to create a better indulgence of MLDs for learning and teaching.

REFERENCES

Al-Hunaiyyan, A., T Bimba, A., Idris, N., & Al-Sharhan, S. (2017). A cognitive knowledge-based framework for social and metacognitive support in mobile learning. *Interdisciplinary Journal of Information, Knowledge, and Management, 12*, 075-098. https://doi.org/10.28945/3670

Ally, M., & Prieto-Blázquez, J. (2014). Quin és el futur de l'aprenentatge mòbil en l'educació? [What is the future of mobile learning in education?] *RUSC. Revista de Universidad y Sociedad Del Conocimiento [RUSC. Journal of University and Knowledge Society], 11*(1), 142. https://doi.org/10.7238/rusc.v11i1.2033

Al-Mashhadani, M. A., & Al-Rawe, M. F. (2018). The future role of mobile learning and smartphone applications in the Iraqi private universities. *Smart Learning Environments, 5*(1), 28. https://doi.org/10.1186/s40561-018-0077-7

Alpert, F. (2016). Revitalizing the live lecture class with instructor-created videos. *SAGE Open, 6*(4), 215824401668068. https://doi.org/10.1177/2158244016680686

Alzaza, N. S., Yaakub, A. R. (2011). Students' awareness and requirements of mobile learning services in the higher education environment. *American Journal of Economics and Business Administration, 3*(1), 95-100. https://doi.org/10.3844/ajebasp.2011.95.100

Baliyan, S. P., & Moorad, F. R. (2018). Teaching effectiveness in private higher education institutions in Botswana: Analysis of students' perceptions. *International Journal of Higher Education, 7*(3), 143. https://doi.org/10.5430/ijhe.v7n3p143

Barrett, N. E., Liu, G.-Z., & Wang, H.-C. (2021). Student perceptions of a mobile learning application for English oral presentations: The case of EOPA. *Computer Assisted Language Learning.* https://doi.org/10.1080/09588221.2021.1881975

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*(2), 238-246. https://doi.org/10.1037/0033-2909.107.2.238

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*(3), 588-606. https://doi.org/10.1037/0033-2909.88.3.588

Blumler, J. G., & Katz, E. (Eds.). (1974). *The uses of mass communications: Current perspectives on gratifications research.* SAGE.

Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research, 17*(3), 303-316. https://doi.org/10.1177/0049124189017003004

Brame, C. J. (2015). Effective educational videos. *Vanderbilt University*. https://cft.vanderbilt.edu/guides-sub-pages/effective-educational-videos

Brunner, M., & SÜβ, H.-M. (2005). Analyzing the reliability of multidimensional measures: An example from intelligence research. *Educational and Psychological Measurement, 65*(2), 227-240. https://doi.org/10.1177/0013164404268669

Castro, J., Yamada, G., & Arias, O. (2016). Higher education decisions in Peru: On the role of financial constraints, skills, and family background. *Higher Education, 72*(4), 457-486. https://doi.org/10.1007/s10734-016-0040-x

Chand, P., & Arora, J. (2008). Access to scholarly communication in higher education in India: Trends in usage statistics via INFLIBNET. *The Program, 42*(4), 382-390. https://doi.org/10.1108/00330330810912061

Chao, C.-M. (2019). Factors determining the behavioral intention to use mobile learning: An application and extension of the utaut model. *Frontiers in Psychology, 10*, 1652. https://doi.org/10.3389/fpsyg.2019.01652

Chen, B., Wang, Y., Xiao, L., Xu, C., Shen, Y., Qin, Q., Li, C., Chen, F., Leng, Y., Yang, T., & Sun, Z. (2021). Effects of mobile learning for nursing students in clinical education: A meta-analysis. *Nurse Education Today, 97*, 104706. https://doi.org/10.1016/j.nedt.2020.104706

Coman, C., Țîru, L. G., Meseșan-Schmitz, L., Stanciu, C., & Bularca, M. C. (2020). Online teaching and learning in higher education during the coronavirus pandemic: Students' perspective. *Sustainability, 12*(24), 10367. https://doi.org/10.3390/su122410367

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021). Mobile learning technologies for education: Benefits and pending issues. *Applied Sciences, 11*(9), 4111. https://doi.org/10.3390/app11094111

Criollo-C, S., Lujan-Mora, S., & Jaramillo-Alcazar, A. (2018). Advantages and disadvantages of m-learning in current education. In *Proceedings of the 2018 IEEE World Engineering Education Conference* (pp. 1-6). https://doi.org/10.1109/EDUNINE.2018.8450979

Davis, F. D. (1989). *A technology acceptance model for empirically testing new end-user information systems: Theory and results* [PhD thesis, Massachusetts Institute of Technology].

Demuyakor, J. (2021). COVID-19 pandemic and higher education: Leveraging on digital technologies and mobile applications for online learning in Ghana. *Shanlax International Journal of Education, 9*(3), 26-38. https://doi.org/10.34293/education.v9i3.3904

Dintoe, S. S. (2018). Educational technology adopters: A case study in the University of Botswana. *International Journal of Education and Development using Information and Communication Technology, 14*(1), 52-90.

Distler, V., Lallemand, C., & Koenig, V. (2020). How acceptable is this? How user experience factors can broaden our understanding of the acceptance of privacy trade-offs. *Computers in Human Behavior, 106*, 106227. https://doi.org/10.1016/j.chb.2019.106227

dos Santos, P. M., & Cirillo, M. Â. (2021). Construction of the average variance extracted index for construct validation in structural equation models with adaptive regressions. *Communications in Statistics-Simulation and Computation*, 1-13. https://doi.org/10.1080/03610918.2021.1888122

Edumadze, J., Ditlhokwa, G., & Demuyakor, J. (2022). Students' acceptance and perceptions of perceived usefulness of mobile learning devices in higher educational institutions. *Online Journal of Communication and Media Technologies, 12*(2), e202209. https://doi.org/10.30935/ojcmt/11539

Idrus, R. M., & Ismail, I. (2010). Role of institutions of higher learning towards a knowledge-based community utilizing mobile devices. *Procedia-Social and Behavioral Sciences, 2*(2), 2766-2770. https://doi.org/10.1016/j.sbspro.2010.03.412

Kadimo, K., Kebaetse, M. B., Ketshogileng, D., Seru, L. E., Sebina, K. B., Kovarik, C., & Balotlegi, K. (2018). Bring-your-own-device in medical schools and healthcare facilities: A review of the literature. *International Journal of Medical Informatics, 119*, 94-102. https://doi.org/10.1016/j.ijmedinf.2018.09.013

Kadimo, K., Mutshewa, A., & Kebaetse, M. B. (2022). Understanding the role of the bring-your-own-device policy in medical education and healthcare delivery at the University of Botswana's Faculty of Medicine. *Information and Learning Sciences, 123*(3/4), 199-213. https://doi.org/10.1108/ILS-09-2021-0077

Kukulska-Hulme, A. (2009). Will mobile learning change language learning? *ReCALL, 21*(2), 157-165. https://doi.org/10.1017/S0958344009000202

Lai, Y., Saab, N., & Admiraal, W. (2022). University students' use of mobile technology in self-directed language learning: Using the integrative model of behavior prediction. *Computers & Education, 179*, 104413. https://doi.org/10.1016/j.compedu.2021.104413

Lekopanye, C. M., & Mogwe, A. (2014). Information communication technology adoption in higher education sector of Botswana: A case of Botho University. *International Journal of Advanced Computer Science and Applications, 5*(8), 145-148. https://doi.org/10.14569/IJACSA.2014.050822

Looi, C.-K., & Toh, Y. (2014). Orchestrating the flexible mobile learning classroom. In M. Ally, & A. Tsinakos (Eds.), *Increasing access through mobile learning* (pp. 161-174). Commonwealth of Learning and Athabasca University.

Lucas, G., Cao, G., Waltemeyer, S., Mandernach, B. J., & Hammond, H. G. (2021). *The value of instructor interactivity in the online classroom.* https://doi.org/10.26077/62F4-21AA

Marquina, P. F. (2018). Developing world-class students in Peru. *GlobalFocus.* https://www.globalfocusmagazine.com/developing-world-class-students-in-peru/

Mehdipour, Y., & Zerehkafi, H. (2013). Mobile learning for education: Benefits and challenges. *International Journal of Computational Engineering Research, 3*(6), 93-101.

Moakofhi, M., Leteane, O., Phiri, T., Pholele, T., & Sebalatlheng, P. (2017). Challenges of introducing e-learning at the Botswana University of Agriculture and Natural Resources: Lecturers' perspective. *International Journal of Education and Development using Information and Communication Technology, 13*(2), 4-20.

Mohammadi, M., Sarvestani, M. S., & Nouroozi, S. (2020). Mobile phone use in education and learning by faculty members of technical-engineering groups: Concurrent mixed methods design. *Frontiers in Education, 5*, 16. https://doi.org/10.3389/feduc.2020.00016

Moremi, M. (2018). Factors shaping higher education in Botswana: A recipe for policy formulation and implementation? *International Journal of Learning and Teaching,* 64-69. https://doi.org/10.18178/ijlt.4.1.64-69

Mutula, S. M. (2002). E-learning initiative at the University of Botswana: Challenges and opportunities. *Campus-Wide Information Systems, 19*(3), 99-109. https://doi.org/10.1108/10650740210431916

Ntereke, B. B., Conteh, B. G., Ramoroka, B. T., & Tlhobogang, K. B. (2021). Teaching and learning online during the pandemic: lecturers' perceptions and experiences, *MOSENODI: International Journal of the Educational Studies, 24*(2), 22-47.

Ntshwarang, P. N., Malinga, T., & Losike-Sedimo, N. (2021). eLearning tools at the University of Botswana: Relevance and use under COVID-19 crisis. *Higher Education for the Future, 8*(1), 142-154. https://doi.org/10.1177/2347631120986281

O'Connor, C., & Joffe, H. (2020). Intercoder reliability in qualitative research: Debates and practical guidelines. *International Journal of Qualitative Methods, 19*, 160940691989922. https://doi.org/10.1177/1609406919899220

Okoye, K., Rodriguez-Tort, J. A., Escamilla, J., & Hosseini, S. (2021). Technology-mediated teaching and learning process: A conceptual study of educators' response amidst the COVID-19 pandemic. *Education and Information Technologies, 26*, 7225-7257. https://doi.org/10.1007/s10639-021-10527-x

Ontiveros, M., & Pazos, J. R. C. (2013). Education and technology in Mexico and Latin America: Outlook and challenges. *RUSC. Universities and Knowledge Society Journal, 10*(2), 163-169 | 407-413. https://doi.org/10.7238/rusc.v10i2.1848

Pan, X. (2020). Technology acceptance, technological self-efficacy, and attitude toward technology-based self-directed learning: Learning motivation as a mediator. *Frontiers in Psychology, 11*, 564294. https://doi.org/10.3389/fpsyg.2020.564294

Peters, K. (2007). M-learning: Positioning educators for a mobile, connected future. *The International Review of Research in Open and Distributed Learning, 8*(2). https://doi.org/10.19173/irrodl.v8i2.350

Ragusa, A. T., & Crampton, A. (2017). Online learning: Cheap degrees or educational pluralization?: Cheap degrees or educational pluralization? *British Journal of Educational Technology, 48*(6), 1208-1216. https://doi.org/10.1111/bjet.12489

Rigdon, E. E. (1998). The equal correlation baseline model for comparative fit assessment in structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal, 5*(1), 63-77. https://doi.org/10.1080/10705519809540089

Romero-Rodríguez, J.-M., Aznar-Díaz, I., Hinojo-Lucena, F.-J., & Cáceres-Reche, M.-P. (2020). Models of good teaching practices for mobile learning in higher education. *Palgrave Communications, 6*(1), 80. https://doi.org/10.1057/s41599-020-0468-6

Rudhumbu, N., Dziva, D., & Plessis, E. (2021). Level of integration of mobile device technology in teaching and learning in universities in Botswana. *International Journal of Education and Development using Information and Communication Technology, 17*(1), 21-33.

Rudhumbu, N., Dziva, D., & Plessis, E. (2021). Level of integration of mobile device technology in teaching and learning in universities in Botswana. *International Journal of Education and Development using Information and Communication Technology, 17*(1), 21-33.

Shadfar, S., & Malekmohammadi, I. (2013). Application of structural equation modeling (SEM) in restructuring state intervention strategies toward paddy production development. *International Journal of Academic Research in Business and Social Sciences, 3*(12), 576-618. https://doi.org/10.6007/IJARBSS/v3-i12/472

Sharma, S. K., Joshi, A., & Sharma, H. (2016). A multi-analytical approach to predict Facebook usage in higher education. *Computers in Human Behavior, 55*, 340-353. https://doi.org/10.1016/j.chb.2015.09.020

Thomas, P. Y. (2010). *Towards developing a web-based blended learning environment at the University of Botswana.* http://hdl.handle.net/10500/4245

Thorsen, S. V., & Bjorner, J. B. (2010). Reliability of the Copenhagen psychosocial questionnaire. *Scandinavian Journal of Public Health, 38*(3_suppl), 25-32. https://doi.org/10.1177/1403494809349859

Wang, J., & Lei, L. (2021). Construction of college English mobile learning model based on distributed terminal. *Scientific Programming, 2021*, 1-7. https://doi.org/10.1155/2021/2220096

Yu, Z., Yu, L., Xu, Q., Xu, W., & Wu, P. (2022). Effects of mobile learning technologies and social media tools on student engagement and learning outcomes of English learning. *Technology, Pedagogy, and Education,* 1-18. https://doi.org/10.1080/1475939X.2022.2045215