International Journal of Education and Development using Information and Communication Technology (IJEDICT), 2021, Vol. 17, Issue 1, pp. 21-33

Level of integration of mobile device technology in teaching and learning in universities in Botswana

Norman Rudhumbu & Daimond Dziva
Bindura University of Science Education, Zimbabwe

Elize Plessis
University of South Africa, Pretoria, South Africa

ABSTRACT

The study investigated the level of integration of mobile device technology in teaching and learning in Botswana universities. Botswana is one of the few African countries with a strong and stable economy and a high prevalence of technological gadgets that include mobile phones, tablets, and laptops, among others, in use in the population. Despite the prevalence of these technological gadgets, not much is known about the level of integration of technology in teaching and learning in universities in Botswana. A quantitative approach that employed a structured questionnaire for data collection was used in a study that included a sample of 360 lecturers from five out of eight selected universities in Botswana. The results of the study showed that negative attitudes of lecturers towards the integration of technology continue to be one of the major contributory factors in the low levels of technology integration in teaching and learning in universities in Botswana. The study also revealed that high Internet costs, as well as slow Internet connectivity are some of the main challenges contributing to the slow pace of technology integration in universities in Botswana. Results further showed that despite the high prevalence of mobile devices, desktops remain the main technological gadgets used during teaching and learning at universities in Botswana.

Keywords: *Technology; integration; constructivism; universities; enablers; barriers*

INTRODUCTION

The world has been experiencing an upsurge in the proliferation of mobile devices (m-devices) with capabilities comparable to computers. M-devices "put powerful, user-owned computing devices into the pockets of students and academic staff" (Baah, 2018, p. 66). A 2019 GSMA report by a body representing the interests of mobile operators worldwide revealed that the mobile market in sub-Saharan Africa is growing at a rate that is 50% higher than the global average (Kaliisa & Picard, 2019). The emergence of m-devices has come at an opportune time when the education sector is grappling with making learning ubiquitous through digital technologies (Pedro, et al., 2018) which enable inclusive and equitable access to higher education (Kaliisa & Picard, 2019). The m-devices frame the emergence of the new learning modality - mobile-learning (m-learning), which facilitates knowing through dialogue across multiple contexts among students and their educators, using personal interactive technologies (Pedro, et al., 2018). Dunwill (2016) noted that it is naïve for us to discuss the classroom of the future as if it is something that exists in some faraway time and space, yet it is something that is happening here and now as technology is expanding the horizons of knowledge and transforming teaching and learning as we know them. Cortey (2017) also posited that the advent of technology has been one of the most critical innovations in the current transformations happening in universities. M-learning should not be considered as a replacement for traditional learning but rather be embraced due to its different pedagogical benefits when integrated as a teaching, learning and assessment tool (Warnich & Gordon, 2015). The above assertions therefore point to the fact that universities can enrich teaching and learning and can become agents of transformation if technology is integrated in teaching and learning. Integration is

considered in this study as an act or process or an instance of incorporating the m-devices in teaching and learning. The integration of technology in universities has several benefits. Thomas (2012) argues that some of the major benefits of integrating technology in universities include enabling access by many people to quality higher education, increased student engagement, robust and authentic problem-solving activities anywhere and anytime, interactive learning, and creation of better opportunities for collaborative social learning among students. In his study of ICT challenges in higher education in Botswana, Matyokureva (2013) argued that ICT has become an important driver of quality education and is now a catalyst to enhancing the quality of teaching and learning.

This study aimed at evaluating the level of integration of m-device technology hereby referred to as 'technology' in teaching and learning in universities in Botswana. M-device technology integration is viewed in this study as a process in which m-devices are used as tools to support students as they construct their own knowledge at university level. As part of the research, the study sought to establish the attitudes of lecturers towards integrating the technology in teaching and learning in Botswana universities, identify barriers to effective integration of the technology in Botswana universities, establish enablers of effective integration of m-devices technology in universities in Botswana, and propose strategies for enhancing m-device technology integration in Botswana universities.

LITERATURE REVIEW – THE BOTSWANA LANDSCAPE

Enablers of successful integration of technology in Higher Education in Botswana

Botswana has a conducive legal and regulatory framework which provides fertile ground for effective and successful integration of technology in HEIs. Other enablers for technology integration include advocacy leadership, ICT infrastructure and access, collaborating mechanisms, fiscal resources, and attitudes, motivation, interactivity, usefulness and ease of use (Wright 2014; Mtebe & Raisano 2014; Manyi 2015; Dolawattha, et al., 2019). The government of Botswana, through the Ministry of Education and Skills Development has dedicated personnel that deal with all matters of ICT in education to ensure the smooth integration of technology in education. As a result of its historical and economic ties with South Africa, Botswana has a well-developed and robust ICT infrastructure that makes integrating technology into education smooth.

Besides other national pro-technology policies which the government of Botswana enacted; the other most critical policy is the National ICT Policy that is coordinated by a steering committee across different ministries to oversee the implementation of e-learning programmes in schools. Another critical enabler of successful integration of technology in the education system in Botswana is fiscal resources. The government of Botswana through the Ministry of Education and Skills Development has dedicated financial resources to support ICT in schools across the education system. The Botswana government has also established partnerships with the private sector to ensure ICT in general and the integration of technology in schools is well funded. Also, by coming up with numerous pro-technology policies and other initiatives since 2005, the government and the private sector in Botswana continue to show positive attitudes towards the integration of technology in the education sector.

Barriers to effective integration of technology in Higher Education in Botswana

While the enablers alluded to above demonstrate the level of potential towards successful integration of technology in the education system in general and in HEIs in Botswana, there are also a few issues that have the potential to affect the effectiveness of such integration (Parr 2015; Asino 2015; Wright 2014). Such issues include erratic electrical power, slow Internet connectivity, high costs of Internet and a lack of ICT technical skills in the country. In many parts of Botswana,

electrical power is not available, and where available, is either not very reliable or affordable. In some African countries, up to 70% of the population has no access to electrical power making the issue of introducing technology difficult. However, in Botswana about 75% of schools have electricity which leaves the other 25% without any source of electricity thus affecting their access to Internet connectivity. Delivering adequate and affordable internet connectivity continues to be the Achilles heel for effective integration of technology in HE in Botswana. According to Elletson & Burgess (2015), 500mb per month was the minimum requirement to access 2 or 3 educational videos through the Internet and in Africa, of the 14% who had access to the Internet, only 3% of the population could afford this. On the issue of technical skills, Elletson & Burgess (2015) argued that a lack of technical skills among some of the teaching staff in higher education continued to be a major challenge affecting the integration of technology in universities. This view was earlier supported by Aker & Mbiti (2010). Asino (2015), noted that while there is general agreement on the importance of technology in facilitating teaching in higher education, the lack of skills by the implementing staff is a cause for concern.

Introduction of m-learning in Higher Education in Botswana

One of the major technological innovations in HE in Botswana is the integration of m-learning. Increasingly, there has been a common feeling and understanding in Botswana that mobile devices that include smart phones, tablets, and laptop, all of which are compact and portable to allow a user technical capability on the go anywhere and anytime, can play a significant role in enabling effective integration of technology in higher education in Botswana (Asino 2015; Searson 2014; Aker & Mbiti 2010). Studies show that despite economic and infrastructural challenges developing countries such as Botswana face, the country boasts of a mobile network that covers 90% of the country. Such coverage has contributed to the spread of mobile technology to 99% of the population (Asino 2015). Due to their ready availability to both lecturers and students in Botswana, mobile devices are helping to provide both access to quality-on-demand information that is both location and time-based, which make them important in the efforts to integrate technology in higher education institutions (Agbatogun 2013; Semali & Asino 2013; Wilson-Strydom & Fongwa 2012).

M-learning is therefore defined as the study of how to harness personal and portable technologies for effective education across learning contexts, that is, inside and outside classrooms (Sharples & Roschelle 2010). M-learning is therefore an extension of e-learning as it includes the issue of portability to e-learning (Ally 2009; Song 2014; Dennen & Hao 2014; Alrasheed, Capretz & Raza 2015). Since most staff and students have these m-devices, m-learning has become one of the most widely used technological innovations in classrooms in Botswana.

Studies in higher education have demonstrated the importance of m-devices in supporting learning. A study by Mafenya (2014) showed that m-devices can be successfully used to deliver flexible, interactive, and quality HE and that female lecturers tend to use technology more as a teaching tool when compared to their male counterparts. Another study by Mtebe and Raisamo (2014) found that m-devices are critical to enabling students to effectively learn concepts faster and with better understanding due to the interactive nature of the learning process facilitated by these devices and hence should form an important component of the technology integration equation in higher education institutions.

Barriers to effective use of m-devices for m-learning in Higher Education in Botswana

Despite their overwhelming prominence, m-devices continue to be surrounded by controversy as to their relevance and need in HEIs. Barriers to m-learning have been grouped into four main areas: resourcing, equity, epistemological, and institutional barriers (Kaliisa & Picard, 2019). Asino (2015) in his study found that while mobile devices are prevalent among staff and students in universities the world over, the universities, including those in Botswana, do not offer technical support for m-

devices when compared to the support they offer for desktop computers, thus affecting technology integration in higher education. This then implies that any staff or student with a technical problem with his/her mobile device in terms of accessing learning materials, may not get support. Wilson-Strydom & Fongwa (2012) found that there is a general fear or feeling in HEIs that m-devices disturb learning in classrooms as students may spend most of their time on social activities in the classrooms instead of on actual learning, and this significantly affects effective integration of technology in these institutions. An earlier study by Jairak, Praneetpolgrang & Mekhabunchaky (2009) also found that in most African universities, including Botswana, m-devices are not considered computing hardware leading Chipangura (2013) to conclude that in these African countries access to learning materials in HEIs has remained PC-centric even though PCs are limited in flexibility and portability.

MATERIALS AND METHODS

Research design and sampling

The study employed a quantitative approach that used a descriptive survey research design. Respondents (N = 360 lecturers) from five universities were selected using stratified random sampling strategy to ensure each university had a sample of lecturers proportionately represented in the study sample.

Instrumentation

A structured questionnaire that employed a 5-point Likert scale was used for data collection. Scales ranged from Strongly Agree (SA = 5), Agree (A = 4), Neutral (N = 3), Disagree (D = 2) and Strongly Disagree (1). Before it was administered, the questionnaire was tested for internal consistency reliability and content validity. Using the Cronbach's alpha test for internal consistency, results showed $\alpha = 0.85$ and hence the instrument was considered reliable. With regard to content validity, the questionnaire was subjected to review by experts whose opinions and recommendations were incorporated into the final instrument before administration. 360 questionnaires were administered and 312 were returned for a return rate of 86.7%.

Data analysis methods

For analysis of descriptive data, a criterion mean (CM) of 3.0 calculated as the average of the Likert scale points was used to demonstrate general agreement by lecturers with assertions in the study. Criterion mean = (5+4+3+2+1)/5 = 3.0. Using the criterion mean, any mean score below 3 represented a disagreement with a given assertion while any mean above a score of 3 to 5 represented an agreement to strong agreement with a given assertion. Hypothesis testing was done using One-way ANOVA and Mann Whitney U-test.

RESULTS

Analysis of demographic variables of participating lecturers

Table 1 shows that most of the staff (55%) are aged 35 years and below which means higher education institutions in Botswana have a fair share of younger lecturers which is a good sign in the long run. With regards to years of teaching experience, the data shows that most of the lecturers (73%), have between 11 and 21 or more years of experience. With regard to gender, 60% of staff in higher education institutions in Botswana are male, and 40% are female. With regard to educational qualifications, the results in Table 1 show that most of the staff (66%) have either a professional qualification or a master's degree in their areas of specialisation while 34% have

Doctor of Philosophy (PhDs) degrees. These results therefore show that staff are also fairly well qualified to be able to effectively teach in these universities.

Table 1: *Demographic variables (N = 312)*

Item	Age group	Response Frequency (f)	Response %
Age (yrs)	20-25	6	2
	26-30	72	23
	31-35	94	30
	35-40	56	18
	40+	84	27
Years of experience	0-5	34	11
	6-10	50	16
	11-15	87	28
	15-20	66	21
	21+	75	24
Gender	Male	187	60
	Female	125	40
Educational qualification	Professional Qualification	61	20
	Master's Degree	144	46
	PhD	107	34

Perceptions of lecturers towards technology integration

Using the criterion mean for interpretation of the results, any mean score below 3 represented a disagreement with a given assertion while any mean above a score of 3 to 5 represented an agreement to strong agreement with a given assertion. The results in Table 2 suggest that among lecturers the level of integration of technology in higher education (M = 3.05; SD = 1.13) needs more to be done to ensure widespread use. Regarding the technological environment in Botswana most respondents believe that the environment is conducive enough for effective integration of technology in higher education (M = 3.08; SD = 1.21) while there most respondents did not think that the Botswana government through the Ministry of Education had enough policies and effective structures in place to promote effective integration of technology in higher education (M = 2.7; SD = 1.14) and (M = 2.3; SD = 0.9) respectively. The data in Table 2 further shows that there is general agreement among respondents that integrating technology in higher education can make teaching more interesting (M = 3.3; SD = 1.12) and also that integrating technology in higher education can enhance the quality of teaching (M = 4.2; SD = 1.07). It also emerged from the study that the quality of education in general can be enhanced by integrating technology in higher education (M = 3.1; SD = 1.22). In addition, the criterion mean values suggest that effective integration of technology in higher education can improve classroom management (M = 3.0; SD = 1.11).

The major challenges slowing down effective integration of technology in higher education included slow Internet connectivity coupled with high Internet costs (M = 3.2; SD = 1.03) and (M = 4.5; SD = 1.17) respectively. Further, power outages are considered another major challenge in Botswana when integrating technology in higher education (M = 3.9; SD = 1.15). Lack of IT skills among lecturers is also viewed as one of the major barriers to effective integration of technology in higher education (M = 3.4; SD = 1.07).

It was further shown in the study that smart-phones, tablets and laptops are not widely used as tools for learning during the integration of technology in higher education (M = 2.5; SD = 1.26). The study also noted agreement with the view that both lecturers and students have negative attitudes towards the integration of technology in higher education (M = 3.7; SD = 1.05) and (M = 3.2; SD = 0.83) respectively. This suggests that both students and lecturers continue to prefer traditional modes of learning and teaching respectively thus affecting effective integration of technology in universities.

Table 2: *Lecturer perceptions (N = 312)*

Statement	Mean score (M)	Standard Dev (SD)
The level of technology integration is very high	3.05	1.13
The technological environment in Botswana is conducive for the integration of technology in higher education	3.08	1.21
The Botswana government has adequate policies that promotes the integration of technology in higher education	2.7	1.14
The Botswana government has effective structures that promote the integration of technology in higher education	2.3	0.97
Integrating technology in higher education can make teaching more interesting	3.3	1.12
Integrating technology in higher education can enhance teaching by making it more effective	4.2	1.07
Integrating technology in higher education has improved the quality of education	3.1	1.22
Integrating technology in higher education can be effectively managed to reduce classroom management problems	3.0	1.11
Desktops are still the most-widely used gadgets when integrating technology in higher education	3.9	1.09
Smart phones, laptops and tablets (mobile devices) are the most widely used gadgets when integrating technology in higher education	2.5	1.26
Electric power outages are a major challenge to the integration of technology in higher education in Botswana	3.9	1.15
Slow internet is a challenge to effective integration of technology in Botswana.	3.2	1.03
High Internet costs are a challenge to effective integration of technology in higher education in Botswana	4.5	1.17
Lack of information technology (IT) skills by lecturers is a challenge towards effective integration of technology in higher education institutions.	3.4	1.07
Negative attitudes by students towards technology as a learning tool is a major challenge towards effective integration of technology in higher education institutions	3.2	0.83
Negative attitudes by lecturers towards integrating technology in higher education is a major barrier to effective integration of technology in higher education	3.7	1.05

CM = 3.00

Regarding the significance of some of the identified factors as an influence on the level of technology integration in universities in Botswana, five hypotheses were tested using One-Way ANOVA and Mann-Whitney U-test.

H_{01}: There is no significant statistical relationship between the level of integration of technology in universities and the type of institution (private and public).

After conducting a normality test using the Shapiro-Wilk test, the data was found to be not normally distributed hence the Mann-Whitney test was used for analysis. The data in Table 3 shows that there is a significant relationship between lecturers' perception of technology integration in higher education and the type of institution they come from (Mann-Whitney = 692, p = 0.03, p < 0.05) with private institutions scoring a median of 3.15 and mean rank of 74.85 while public institution scored a median of 3.01 and a mean rank of 63.17. These results show that there is very little difference between private and public universities in terms of the levels of integration of technology in teaching and learning. This is supported by the results shown in Table 2 which indicate agreement that university lecturers have a negative attitude towards the integration of technology in teaching and learning. Lecturers from both public and private universities hold similar attitudes towards technology integration in teaching and learning in universities in Botswana.

Table 3: *Mann-Whitney U-test between level of technology integration and institution type*

	Type of institution	N	Median	Range	Mean Rank	Mann-Whitney	p
Score_B	Private	143	3.15	3.10-3.15	74.85	692.00	0.03
	Public	169	3.01	2.94-3.15	63.17		

Significant p<0.05

H_{02}: There is no significant statistical relationship between the level of integration of technology in universities and gender of the lecturers.

The results in Table 4 show that there is a significant relationship between the level of technology integration in higher education and the gender of a lecturer (Mann-Whitney = 841, p = 0.00, p < 0.05) with males scoring a median of 2.86 and mean rank of 52.19 while females scored a median of 3.24 and a mean rank of 80.33. These results suggest that female lecturers in the universities are more likely to integrate technology in teaching and learning when compared to their male counterparts.

Table 4: *Mann-Whitney U-test between level of technology integration and lectures gender*

	Type of institution	N	Median	Range	Mean Rank	Mann-Whitney	p
Score_B	Male	178	2.86	2.61-3.20	52.19	841.00	0.00
	Female	134	3.24	3.20-3.74	80.33		

Significant p<0.05

H_{03}: There is no significant statistical relationship between the level of integration of technology in universities and power cuts experienced in Botswana.

Table 5 shows that results were not statistically significant as F (7, 299 = 4.773; p = 0.08; p > 0.05), hence it was therefore concluded that there was no significant relationship between power outage

and the perception of technology integration in Botswana. This means that power cuts is not an issue with regard to how technology is integrated in universities in Botswana despite sporadic power outages that sometimes occur in Botswana.

Table 5: *Relationship between power outage and level of technology integration*

ANOVA	Sum of squares	df	Mean of squares	F	Sig
Between Groups	1027.41	7	146.773	4.733	0.08
Within Groups	9271.88	299	31.010		
Total	10299.29	306			

Significant p< 0.05

H_{04}: There is no significant statistical relationship between the level of integration of technology in universities and Internet costs.

The results in Table 6 suggest a significant relationship between Internet costs and the level of technology integration in Botswana: F (7, 301 = 29.262; p = 0.00; p < 0.05). Internet costs in Botswana are therefore a major barrier affecting the level of integration of technology in universities in Botswana.

Table 6: *Relationship between Internet costs and level of technology integration*

ANOVA	Sum of squares	df	Mean of squares	F	Sig
Between Groups	848.618	7	121.231	29.262	0.00
Within Groups	1246.920	301	4.143		
Total	13317.538	308			

Significant p < 0.05

H_{05}: There is no significant statistical relationship between Internet connectivity and level of technology integration.

The results shown in Table 7 suggests the relationship was not statistically significant as F (7, 298) = 1.802; p = 0.07; p > 0.05), hence the null hypothesis was accepted. It was therefore concluded that there was no significant statistical relationship between Internet connectivity and lecturers' perception of the level of technology integration in the Botswana universities.

Table 7: *Relationship between Internet connectivity and level of technology integration*

ANOVA	Sum of squares	df	Mean of squares	F	Sig
Between Groups	307.299	7	43.900	1.802	0.07
Within Groups	7261.532	298	24.368		
Total	7568.831	305			

Significant p< 0.05

DISCUSSION OF FINDINGS

The results of this study point to several issues surrounding the level of integration of technology in universities in Botswana. The results showed that m-device technology integration in Botswana is still a work in progress owing to specific challenges affecting the integration process. Included among some of the challenges were a lack of essential skills by lecturers to be able to effectively use technology as a teaching tool in universities; Internet costs that are very high while at the same time Internet connectivity is very slow; and the inability of most of the universities to migrate from desktops to mobile technology (especially smartphones) to make education available to everybody from anywhere and at any time. These challenges were compounded by negative attitudes of lecturers which pose a serious challenge to the process of effectively integrating technology in Botswana universities. The findings are in line with extant literature and earlier studies. Earlier studies and literature showed that a lack of technical skills by the implementing staff is one of the major challenges towards effective integration of technology in higher education (Aker & Mbiti, 2010; Asino, 2015), high Internet costs have also been shown as one of the challenges facing technology integration in higher education (Elletson & Burgess 2015) suggesting that groups in the population, including university staff and students in Botswana, cannot afford the costs of Internet hence leading to the slow pace of technology integration.

A lack of technical capacity amongst the implementing staff was also viewed in the study as another major challenge slowing down the integration of technology in Botswana. The issue of technical skills according to Asino (2015) as supported by Elletson & Burgess (2015) and Aker and Mbiti (2010) is one of the greatest challenges affecting the integration of technology in universities. If the lecturers lack the technical skills, it therefore becomes very difficult for them to use current and emerging technologies as teaching tools in the universities. Lack of technical skills will then lead to loss of confidence and ultimately negative attitudes towards the integration process. Therefore, in the context of universities in Botswana both staff and students still prefer desktops as tools of choice during teaching and learning indicating a failure to migrate from desktop technology to mobile-learning (m-learning) technology. M-learning as stated earlier, which includes use of gadgets such as smart phones, tablets, and laptop, all of which are compact and portable to allow a user technical capability on the go anywhere and anytime, can play a significant role in enabling effective integration of technology in higher education in Botswana (Asino, 2015; Searson, 2014; Aker & Mbiti, 2010). The ubiquitous nature of m-learning technology makes the integration of technology more effective since students and lecturers can access quality-on-demand information that is both location and time-based.

Regarding policies, the study showed that the Botswana government has several pro-technology policies that act as enablers for integration of technology in universities. Such major policies include “Vision 2016”, “Vision 2036” and the Tertiary Education Policy of 2008 which clearly articulate the government’s vision on the integration of technology in universities and colleges. Such policies are therefore indicative of the effort which policy makers in Botswana are putting in place to ensure access to technology by all in universities and colleges. Other enablers of the integration of technology in universities include advocacy efforts by government through the Ministry of Education, provision of infrastructure and access as Botswana, due to its historical and economic ties with South Africa, has a well-developed and robust ICT infrastructure that makes integrating technology into education smooth, dedication of fiscal resources to technology in learning institutions, as well as the general positive attitudes by the Botswana government towards the integration of technology in the education sector (Wright, 2014; Mtebe & Raisano, 2014; Manyi, 2015, Dolawattha, et al., 2019). All these factors point to an enabling environment for the effective integration of technology in universities in the long run and need to be supported on the ground by positive attitudes by both staff and students as well as investment in new and emerging technology and in staff development for capacity building. These enablers are also critical to inclusive and equitable access to higher education (Pedro, et al., 2018, Kaliisa & Picard, 2019).

CONCLUSIONS

Several conclusions were drawn from the above results. First, the integration of m-device technology in teaching and learning in Botswana universities is still a work in progress owing to a number of major challenges identified that include slow Internet connectivity, high Internet costs, negative attitudes by both staff and students among others, that affect the integration process. Second, due to lack of technical skills, universities in Botswana still have difficulties migrating from desktop technology to mobile-technology and this is slowing down the integration process. Third, the Botswana government, is very supportive of the integration of technology in education as evidenced by pro-technology policies enacted, dedicated financial resources, advocacy, and collaborative efforts with its partners. Fourth, there is no difference in the level of integration of technology between private and public universities. Fifth, power cuts do not significantly affect the integration of m-device technology in teaching and learning in Botswana universities.

REFERENCES

Agbatogun, A. O., 2013. Interactive digital technologies' use in Southwest Nigeria Universities. *Educational Technology Research and Development,* vol. 61, no. 2, pp. 333-357.

Aker, J. C. & Mbiti, I. M., 2010. *Mobile phones and economic development in Africa. Center for Global Development. Working Paper No. 211.* [Online]
Available at: http://dx.doi.org/10.2139/ssrn.1693963.
[Accessed 15 March 2018].

Ally, M., 2009. *Mobile learning: Transforming the delivery of education and training.* Athabasca: University Press.

Alrasheedi, M., Capretz, L. F. & Raza, A., 2015. A Systematic Review of the Critical Factors for Success of Mobile Learning in Higher Education (University Students' Perspective). *Journal of Educational Computing Research,* vol. 52, no. 2, pp. 257-276.

Anon., 2010. *World telcommunication/ICT development Report 2010: monitoring the WSIS targets, a mid-term review,* Geneva: s.n.

Asino, T. I., 2015. *Factors that influence the diffusion process of mobile divices in higher education in Botswana and Namibia. Unpublished dissertation.* Pennsylvania: Pennsylvania State University.

Baah, K., 2018. Integration of Smart Phones in Teaching and Learning in Second Cycle Educational Institutions. *International Journal of Advances in Scientific Research and Engineering (ijasre),* vol. 4, no. 2, pp. 65-73.

Briceño-Garmendia, C. & Pushak, N., 2011. *Botswana's infrastructure: A continental perspective. World Bank Policy Research. Working Series #5887.* [Online]
Available at: https://wdronline.worldbank.com/handle/10986/3655License
[Accessed 4 October 2017].

Chipangura, B., 2013. *Categorizing the provision of mobile centric information access and interaction for higher educational institutions.* Port Elizabeth, s.n., pp. 101-110.

Cortey, M. B., 2017. *3 Ways to leverage technology to help nontraditional students.* [Online] Available at: www.edtechmagazine.com [Accessed 21 November 2017].

Dennen, V. & Hao, S., 2014. Paradigms of use, learning theory, and app design. In: C. Millar & A. Doering, eds. *The New Landscape of mobile Learning: Redesgning Education in an App World.* London: Rotledge, pp. 20-41.

Dolawattha, D. D., Pramadasa, S. H. & Jayaweera, P. M., 2019. The Impact Model: Teachers' Mobile Learning Adoption in Higher Education. *International Journal of Education and Development using Information and Communication Technology (IJEDICT),* vol. 15, no. 4, pp. 71-88.

Dunwill, E., 2016. *4 Changes that will shape the classroom of the future: Making education fully technological.* [Online] Available at: https://eleraningindstry.com [Accessed 12 May 2017].

Dutta, S., Bilbao-Osorio, B. & Geiger, T., 2012. *The networked readiness index 2012: Benchmarking ICT progress and impacts for the next decade,* s.l.: s.n.

Elletson, H. & Burgess, A., 2015. *The eLearning Africa Report 2015,* Berlin: ICWEGmBH.

Ghavifekr, S. & Rosdy, W. A., 2015. Teaching and Learning with Technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science,* vol. 1, no. 2, pp. 175-191.

Isaacs, S., 2007. *ICT in education in Botswana. Survey of ICT and Education in Africa: Botswana Country Report,* s.l.: s.n.

Jairak, K., Praneetpolgrang, P. & Mekhabunchakij, K., 2009. An acceptance of mobile learning for higher education in Thailand. *Special Issue of the International Journal of the Computer, the Internet and Management,* vol. 17, no. SP3, pp. 36.1-36.8.

Kaliisa, R. & Picard, M., 2019. Mobile learning policy and practice in Africa: Towards inclusive and equitable access to higher education. *Australasian Journal of Educational Technology,* vol. 35, no. 6, pp. 1-14.

Li, Y., 2012. Development strategy for the requirements of ICT in learning of comprehensive regional higher education institutions: Comparing Undergraduates belonging to different schools. *Procedia,* vol.12, pp. 1005-1009.

Mafenya, P. N., 2014.). Increasing undergraduate throughput and success rate through mobile technologies: A South African distance learning case study. *Mediterranean Journal of Social Sciences,* vol. 5, no. 14, p. 428.

Matyokureva, K., 2013. Challenges faced in implementing ICT in higher education: A Baotswana perspective. *International Journal of Informonomics,* vol. 6, no. 1/2, pp. 708-712.

Molwane, O. B., Ruele, V. & Mwendapole, C., 2008. *Future directions for technology in Botswana. Challenges and implications.* Barcelona, Universitat Politecnica de Cataluny.

Mtebe, J. S. & Raisamo, R., 2014. Investigating students' behavioural intention to adopt and use mobile learning in higher education in East Africa. *The International Journal of Education and Development using Information and Communication Technology,* vol. 10, no. 3, pp. 4-20.

Obasi, I. N., 2010. A policy shift in Botswana higher education landscape. *International Journal of Higher Education,* vol. 4, pp. 20-21.

Parr, C., 2015. *6 significant challenges impeding technology adoption in higher education.* [Online]
Available at: www.times higher education.com/news
[Accessed 16 August 2018].

Pedro, L. F. M. G., Barbosa, C. M. M. d. O. & Santos, C. M. d. N., 2018. A critical review of mobile learning integration in formal educational contexts. *International Journal of Educational Technology in Higher Education,* vol. 15, no. 10, pp. 1-15.

Population Stat, 2.-2., 2020. *Botswana Population.* [Online]
Available at: https://populationstat.com/botswana/
[Accessed 29 02 2020].

Radijeng, K., 2010. *Open access in institutions of higher learning in Botswana. Meeting: 138.* Gothenburg, s.n.

Searson, M., 2014. Forward: The failure of education's first mobile device. In: C. Miller & A. Doering, eds. *The new landscape of mobile learning: Redesigning education in an app-based world.* London: Routledge.

Semali, L. & Asino, T., 2013. Postliteracy in the digital age: Use of mobile phones to support literacy practices in Namibia and Tanzania. *PROSPECTS-Quarterly Review of Comparative Education. Prospects,* vol. 44, no. 1, pp. 23-30.

Sharples, M. & Roschelle, J., 2010. Guest editorial: Special issue on mobile and ubiquitous Technologies for learning. *IEEE Transactions on Learning Technologies,* vol. 3, no. 1 pp. 4-6.

Song, D., 2014. A framework for mobile learning app design: DCALE. In: C. Miller & A. Doering, eds. *The new landscape of mobile learning: Redesigning education in an app-based world.* London: Routledge, pp. 120-137.

Tertiary Education Council 2013, 2013. *Annual Report 2011/2012.* [Online]
Available at: www.tec.org.b
[Accessed 10 May 2017].

Tertiary Education Council, 2005. *Tertiary Education Policy for Botswana: Challenges and Choices. Consultation paper.* [Online]
Available at: www.tec.gov.bw
[Accessed 15 August 2017].

Thomas, P. Y., 2012. Harnessing the potential of cloud computing to transform higher education. In: L. Chao, ed. *Cloud computing for teaching and learning: Strategies for design and implementation.* s.l.:IGI Global, p. 147.

Warnich, P. & Gordon, C., 2015. The integration of cell phone technology and poll everywhere as teaching and learning tools into the school History classroom. *Yesterday & Today,* July, vol.13, pp. 4-66.

Wlson-Strydom, M. & Fongwa, S. M., 2012. *A profile of higher education in Southern Africa. Volume 1: A regional perspective.* [Online]
Available at: www.sarua.org/files/publications/SARUA
[Accessed 29 June 2017].

Wright, C. R., 2014. *5 Key barriers to educational technology adoption in the developing world.* [Online]
Available at: www.educause.edu/members
[Accessed 5 January 2018].
