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Adapting to technology tools in a learning environment: A case study of first-year students at a traditional African university

Abstract

The introduction of technology to teaching and learning has brought about modernisation of academic activities. The drastic paradigm shift faced by the education sector is inevitable, especially as the impact of the much-touted Fourth Industrial Revolution is being felt in key sectors of the economy. This reality imposes the need for technology-enhanced learning for tertiary students as it represents the future of the workplace for which they are being prepared at university. For effective learning to take place, institutions need to incorporate technological tools in their teaching and learning. Adapting to a myriad of technology tools can be challenging, especially for less privileged learners who might be adjusting to tertiary life and previously have not been exposed to the basics of computers and other technology tools. This challenge is further compounded by the fact that most of these learners are experiencing the independence of tertiary education for the first time and are still struggling to balance their academic workload with the anxieties of social blending. This paper investigated how first-year students at a traditional, previously disadvantaged university in the Eastern Cape province, South Africa, adapted to Blackboard Learn (also referred to as WiseUP), the learning management system (LMS) adapted for blended learning at the university. The paper explored the challenges faced by the new students and thereafter employed a combination of the Theory of Planned Behaviour and the Technology Acceptance Model to build a new model, which reveals the critical factors that influence students to embrace technology. This model will assist lecturers, faculty and student support structures to understand the underpinning factors that influence first-year students to embrace the technology tool, namely, the university's LMS. Quantitative data collection and analysis were used in the case study, which was conducted with two groups of first-year students in management and information technology courses. Results show the significant factors that influence students' attitudes positively towards the use of technology for learning.

Keywords: *Technology tools, learner adoption, Blackboard, blended learning*

1. Introduction

All spheres of society have experienced dependency on technology because of technological progression. Hence the utilisation of technology in teaching and learning has become a major priority for public institutions in facilitating innovation and transformation in learning within the sector (Coleman & Mtshazi, 2017; Groff, 2013). The COVID-19 pandemic with the resultant safety measures such as social distancing, as well as hard and soft lockdowns, has further forced universities to fully embrace remote teaching and learning, which is enabled by technology tools. Traditional teaching and learning practices are gradually becoming obsolete and inadequate in successfully preparing and equipping the current generation of learners with the creativity, collaborative problem-solving skills and academic capabilities required in the modern world (Groff, 2013). Additionally, technology-infused learning has greatly expanded in popularity due to its ability to provide flexibility among students (Ouadoud, Chkouri, & Nejjari, 2018). It is imperative that technology tools are prioritised and more resources are made available for providing such tools so that dynamic learning environments are created and maintained (Al-alak & Alnawas, 2011). The integration of technology has been one of the key concerns in education; however, in this digital era, swift action needs to be taken to ensure that the education sector does not lag behind during the global digital transformation into the Fourth Industrial Revolution (4IR) (Murray & Pérez, 2015). This technological integration is crucial in the context of traditional African universities as the majority of first time new entrants (FTENs) are previously unable to access technology for learning.

Technology brings about new opportunities for re-imagining, reconsidering and re-inventing the learning environment in preparation for a more innovative and effective learning experience for students (Hassan, Abiddin & Yew, 2014; Kumar, 2018). The potential gains of innovative technologies go beyond changing pedagogical processes to also transform the entire learning environment (de Villiers & Cronje, 2005; Kumar, 2018). Technology promises revolutionary results if leveraged with a precise and premediated strategic vision and compact change management plan (Groff, 2013). Various digital technologies can be utilised to facilitate better learning that removes some of the limitations and challenges of traditional teaching and learning (Fatimah & Santiana, 2017). Educators must transform their teaching practices radically so that learners can become part of the 21st-century citizenship (Mayisela, 2014). The commonly cited blended learning approach has been introduced in most institutions; however, authors are still investigating the effectiveness and perceptions of the approach (Mayisela, 2014).

Teaching in the 21st century is not merely based on delivering content and assessing the learners' ability; it involves encouraging creativity and active involvement of students in activities provided (Fatimah & Santiana, 2017). The technologies being employed for teaching and learning at the university encourages student engagement and participatory learning. There is a realisation that more has to be done in providing proper skills and knowledge on technology utilisation and that providing access to technology is not enough, regardless of students being deemed as technology savvy (Eady & Lockyer, 2013).

Eady and Lockyer (2013) highlighted that evidence in literature has shown that, even though students were born in the digital era, they may not automatically be avid and highly skilled technology users, especially in the sphere of higher education teaching and learning tools. This is important, as generalisations may be made when it comes to young people and their access and utilisation of technology. This finding resonates with students at the university, where they are able to engage on smart phones and social media, but have been found deficient with the use of educational technologies. The research problem addressed in this paper is motivated by societal generalisations on technology awareness, as well as the known digital divide, which is more pronounced in previously disadvantaged institutions of higher learning.

The research question is thus "What are the challenges faced by first-year students in adapting to a learning technology tool adopted for blended learning in a traditional university?" The paper addressed the research problem through a quantitative data survey of 90 students, with a view to collecting data based on their first-year experience with Blackboard Learn (used interchangeably with WiseUP and hereafter referred to as Blackboard), the LMS at the institution, and thereafter investigated factors that may encourage better use of the technology tool.

2. Literature review

The use of educational technologies for supporting teaching and learning has become common practice in higher institutions throughout South Africa, in line with the rest of the world (Heirdsfield *et al.,* 2011). As the world finds itself amid radical change based on technological advances, it has become imperative for tertiary institutions to prepare their students for the workplace by equipping them with the requisite tools to be relevant in the knowledge economy. Studies show compelling evidence that using technology tools to aid traditional teaching and learning can be effective in driving home pedagogical and technical knowledge (Adedoja *et al.,* 2013). The evolution and accessibility of technology devices, such as laptops, smartphones and on-campus lecture hall computers, has positively impacted the ability of higher education institutions to bring these technology tools closer to their students (Mantri, 2015). Some of the benefits of harnessing educational technologies include the promotion of collaboration among students, the ease of information sharing across a group of students on a common platform, the ability to conduct teaching and learning with students in various, diverse locations, discussion panels and interactive sessions, information retrieval that is not bound by time or space and flexible learning time (Adedoja *et al.,* 2013). To this end, most tertiary institutions have adapted, procured or adopted a technological tool for facilitating blended learning (Nortvig, Petersen & Balle, 2018). The thrust of universities embracing digital learning goes beyond ensuring students achieve their course learning outcomes. Students are encouraged to become creative thinkers who can assist with offering solutions to societal challenges with their thought processes and skills (Mantri, 2015). The use of technology tools is, therefore, not just for the sake of passing on pedagogical instructions but also for equipping the students to become independent thinkers and innovators.

2.1 Traditional universities and teaching methods

The purpose of higher learning institutions is to ensure that their academic goals and objectives are responsive to societal needs, resources are utilised effectively and efficiently, responsibility is taken for spending funds acquired, and the quality of academic programmes, including teaching, learning and research, is maintained (McDonald & Van Der Horst, 2007).

Technology in education has afforded educators the opportunity to come up with meaningful and significant learning experiences for learners by embedding technology (de Villiers & Cronje, 2005). Lecturers must not just use technology for the mere fact of using it, but rather, it must be appropriately embedded in their teaching and learning (Mayisela, 2014). The university's Learning management system (LMS) serves to manage students' asynchronous and synchronous learning. Innovative communication tools and methods to keep learning happening, regardless of the location and time, must be promoted actively (Rajasekaran & Kalyani, 2018). Higher education is mandated to develop self-reliance among learners by creating an environment that forges resourceful thinking (Hassan *et al*., 2014).

Eady and Lockyer (2013) emphasised the importance of learnt technological skills to combat a phenomenon known as second-level digital divide. This is described as the drastic differentiation of skills that will influence how people participate in society. Research shows that the benefits of adopting technology include increased learner engagement, motivation, and critical and innovative thinking (Coleman & Mtshazi, 2017; Eady & Lockyer, 2013). Preparation of students for the competitive, technological workforce helps institutions to keep pace with society (Rajasekaran & Kalyani, 2018). For learners to be actively involved in their own learning, it is important to generate a creative, flexible and innovative learning environment. This can be achieved through redefining the entire classroom approach. Lecturers who use active teaching methods capture students' attention and accommodate diverse learning styles (Coleman & Mtshazi, 2017). Lalima and Dangwal (2017) highlight the benefits of incorporating technology in learning. These include the broadening of collaborative, constructive and computer-aided learning scopes. Technologies such as computers, the internet, smartboards, smartphones and simulations can reshape traditional learning (Baytak, Tarman & Ayas, 2011).

2.2 Challenges associated with adaptation

When introducing technology, it is vital to know and understand the adaptation behaviours and challenges students are likely to experience. This awareness will help in driving the migration of processes and implementation of proper change management techniques needed to ensure maximal use of educational technology tools (Tularam & Machisella, 2018). People do not instantly change and adapt to new procedures, situations or environments, and this should be taken into consideration when dealing with technological changes (Oztemel & Ayhan, 2008). McDonald and Van Der Horst (2007) stated that traditional teaching is teacher controlled, teacher dominated and teacher directed. The teacher, who is deemed the expert, pours out absolute knowledge to passive students who simply wait to be filled up with knowledge. The learner is the recipient, and the teacher is the source of knowledge. The use of technology tools in teaching and learning, on the other hand, encourages blended and student-centred learning (Alenezi, 2020).

2.3 Technology tools for blended learning

Blended learning is defined as the deliberate integration of contact, face-to-face learning with online learning experiences (Nortvig *et al*., 2018). There are varying degrees and models of blended learning, but the important factor is that it integrates the strength of synchronous (face-to-face) with asynchronous (internet, text-based) learning activities (Mantri, 2015). In the current era of globalisation, students need new, significant and reliable learning practices so that they have a more enjoyable and effective learning experience (Fatimah & Santiana, 2017). Twenty-first-century education needs to be enhanced to create refined learning immersion, skills development and produce high-quality graduates who will be assets to the international workforce.

There are various types of technologies that enable this form of learning, such as Moodle and Blackboard (Bagarukayo & Kalema, 2015). Blackboard is arguably the most deployed LMS in South African public universities. With Blackboard technology, lecturers can post course content, including videos and audio. Additionally, there is a collaborative tool on Blackboard that enables online live classes. Assessments can be done and graded in real-time on the tool, with the student having access to the rubric or criteria with which the assessments are graded. Students also have access to numerous interactive tools on the platform. There are discussion forums, and students can work in groups and submit assignments. Some of the features of Blackboard are: the announcement feature, which enables the lecturer to communicate effectively but remotely with students; an email facility, which is an easy way to access the students and provide the students with a platform to communicate with the lecturer at a physical distance (Heirdsfield *et al.,* 2011); and asynchronous online discussions, which enable students to interact with each another, share ideas, insight and understand the course (Adedoja *et al.,* 2013). Globally, institutions of higher learning have adopted the policy of blended learning and encourage the inculcation of interactive, online and technology-based learning for students (Barajas, 2003). The rationale for this approach of student-centred learning is two-fold: (a) The 4IR is already impacting major industries such as the automobile, manufacturing and banking sectors in South Africa, and graduates need to be prepared for careers in these fields; (b) higher education is under immense pressure to respond to the increasingly diverse and multicultural nature of enrolled students, placing a challenge on the traditional learning paradigm (Mantri, 2015). Online learning, which is the essential feature of blended learning, therefore emerges as an unavoidable complement to traditional ways of contact teaching at universities. The combination of the two approaches creates a rich learning experience for the student and better prepares the student for the world of work (Cloete, 2017). Although the blended learning system is intended to create a much richer learning experience for lecturers and students, many studies have showcased several difficulties with the practical use of the Blackboard (Heirdsfield *et al.,* 2011).

2.4 The case study context

Although the advantages of technology tools are much touted, the reality is that the students and resources at tertiary institutions in South Africa are as diverse as the nation itself (Hall, 2015). The case study was situated in the Eastern Cape province of South Africa. Although the province has a rich history in the South African polity, it is one of the poorest provinces in the country. An estimated 60% of households in the province have at least one family member dependent on a social grant (Fin24, 2019). The university offers various programmes on four campuses across the province. The enrolment statistics has evidenced a gross predominance of students from the historically disadvantaged group. This fact is attributed to many factors that do not fall under the scope of this paper. However, it is noteworthy to mention that a huge percentage of the 26 000 registered students of the institution are from underprivileged or disadvantaged households.

The implication of this is that most of the first-year students have had no access to computers or any sort of technology learning tool before joining the university. This category of students finds it challenging to quickly adapt to technologies used in tertiary institutions. This deficit can be understood in the context of the digital divide in the larger communities the students come from (Kponou, 2017). According to Kponou (2017), the evidence presented by studies into the relationship between inequality and the diffusion of technology in most African countries clearly shows that rather than decreasing the inequality gap, technology actually widens the gap. This is because the complexities around what enables an individual from a disadvantaged community to successfully adopt a given technology are always oversimplified.

In light of the background of most first-year students at the university, the majority of them are unfamiliar with computers, technology and the associated functionalities. Although most of the students possess smartphones, studies have shown that dexterity with cell phone applications does not make an individual a digital native (EDCL, 2014). A survey of young people between the ages of 10 and 29 in Australia, Canada and parts of the United States revealed that exposure to technology cannot be equated with the ability to use it meaningfully. Research shows that not all young people are tech-savvy or have the interest to learn more than the basic functionalities (Almaiah, Al-Khasawneh, Althunibat, 2020; Thompson, 2013). An Australian study found that only 15% of the student population are advanced users of ICT, while 45% of all students could be described as rudimentary digital technology users. Similarly, a survey carried out in Austria indicates that only seven per cent of 15- to 29-year-olds have very good computer skills (EDCL, 2014). The assumption that new students at the university are familiar with technology simply because they use the applications on their phones is thus considered misleading.

Additionally, many of the students are from rural communities where there is virtually no internet connectivity. Therefore, it becomes a significant challenge when these students are expected to align with the required skills for digital, blended learning tools (Alenezi, 2020; Oluyinka & Endozo, 2019). Research shows that students are versatile in the use of the devices for social media and other recreational purposes but are not as dexterous when it comes to technical know-how in accessing study materials and engaging in online activities provided by Blackboard, such as blogs or discussion forums to aid their studies (Thompson, 2013). This paper investigated the challenges faced by first-year students in adapting to Blackboard, the technology tool adopted for blended learning at Walter Sisulu University (WSU), and the factors that are responsible for these challenges. Identification of the causal factors will assist in taking steps to alleviate the problems.

3. Theoretical framework

The paper employed a combination of the Theory of Planned Behaviour (TPB) (Ajzen, 1991), and the Technology Acceptance Model (TAM) to investigate the research problem. The four combined core constructs found relevant to the research problem are: (a) perceived usefulness; (b) perceived ease of use; (c) subjective norms; and (d) perceived behavioural control.

Davis (1986) developed TAM, which has been widely used to predict the use and acceptance of technology. TAM establishes causal relationships between perceived usefulness, perceived ease of use, attitude towards use and current use of technology. The two constructs of perceived usefulness and perceived ease of use are variables that can be used to investigate the attitude to and acceptance of technology by first-year students. Perceived usefulness is the subjective probability that a user has in believing that a particular application will enhance their desired outcome (Davis, 1986). In the case of first-year students, it is believed that students will adopt technology tools as they perceive the relevance of such tools to their academic achievement. On the other hand, perceived ease of use is the degree to which the prospective user expects that using the tool will not involve great effort. This implies that first-year students will be willing and eager to use technology tools to the degree to which the use is considered effortless. These two constructs are considered the most important determinants of actual use of technologies. The two constructs are influenced by external variables such as social and cultural factors. In the case of first-year students in the context of this research, issues around social factors, which include language and skills, are the prevalent relevant external variables. The third construct, which is attitude to use, was culled from the TPB. Attitude refers to the user's evaluation of how desirable a particular information system is. The fourth construct is behavioural intent, which is also a construct from the TPB theory. The construct measures the individual's likelihood to employ technology tools. Although the TPB is a general theory that seeks to explain almost any human behaviour, the TAM's focus is exclusively on the use of technological innovations and proposes constructs for analysing this type of behaviour (Davis, 1989). Constructs from the two theories were combined as a way of robustly investigating how students perceived the ease of use, and their own attitude towards these tolls that were previously unfamiliar but had now been "forced" upon them as a result of becoming university students. It was believed that a combination of the two theories would further enrich the findings of this study.

While we note that many studies have been undertaken to understand the concept of online and other technology-based learning platforms with the aid of the TPB and TAM, this study contributes to the body of knowledge in this field in two ways: we examine a group of students, which is peculiar in how it mirrors the inequalities and attendant challenges in the nation of South Africa; and we propose a model, which educators and decision-makers can use to further understand, and possibly increase interest in online learning among students from a disadvantaged group in the context of a developing economy. The study lends its voice to the growing awareness of how traditional universities should be supported in a way that capacitates the peculiar needs of most of its student body. The paper also sought to argue for the critical role of understanding student perception and subsequent adaptation of suitable teaching models, which are based on a constructivist view of learning, where the flow of knowledge in the classroom is increasingly multidirectional (Gomez-Ramirez, Valentia-Arias & Duque, 2019). The study proceeds by presenting four hypotheses based on the TAM and TPB constructs.

H1: Students' perceptions of the usefulness of Blackboard will positively influence them towards using the technology.

H2: Students' perceptions of ease of use will positively influence their attitude towards the technology.

H3: Students' perceptions of the social factors will positively influence their subjective norms for using Blackboard.

H4: Students' perceived behavioural control toward Blackboard positively influences their intention to adopt the technology.

4. Methodology

The paper employed a quantitative process of data collection and analysis. Web-based questionnaires were sent to 90 first-year students. The survey was hosted online through Google Forms because of the social distance order as part of the preventive strategies to curtail the pandemic. The population size for this study was 700. Ninety students consisting of male and female students were randomly selected from the total population of 700. The online survey creation software package by Google was used to export data to a statistical software package (SPSS) for analysis. Informed consent was obtained from the participants. The result of the analysis and the resultant model are presented below.

4.1 Proportional odds and logistic regression

One of the assumptions underlying ordered logistic regression is that the relationship between each pair of outcome groups is the same. The ordered categories in all the variables were transformed to scale data to prepare them for the possible use of least square regression for data modelling. Since the assumption of normality was violated and the method of least square could not be used, we resorted to transforming the variables by taking the logarithm of all the variables. The last alternative was to reduce the dimension of the factors. We used the principal component analysis. Of the 30 factors considered, only nine scaled through by having a minimum eigenvalue of at least one. The correlation matrix and the scree plot reveal this using IBM® SPSS® Statistics 25.0. The following formulae are used to predict probabilities for each level of the outcome:

$$P(Y=5) = \left[\frac{1}{1+e^{-(a5+b1x1+b2x2+b3x3+b4x4+b5x5)}}\right]$$

$$P(Y=4) = \left[\frac{1}{1+e^{-(a4+b1x1+b2x2+b3x3+b4x4+b5x5)}}\right] - \mathrm{P}(\mathrm{Y}=5)$$

$$P(Y=3) = \left[\frac{1}{1+e^{-(a3+b1x1+b2x2+b3x3+b4x4+b5x5)}}\right] - \mathrm{P}(\mathrm{Y}=4) - \mathrm{P}(\mathrm{Y}=5)$$

$$P(Y=2) = \left[\frac{1}{1+e^{-(a2+b1x1+b2x2+b3x3+b4x4+b5x5)}}\right] - P(Y=3) - \mathrm{P}(\mathrm{Y}=4) - \mathrm{P}(\mathrm{Y}=5)$$

$$P(Y=1) = \left[\frac{1}{1+e^{-(a1+b1x1+b2x2+b3x3+b4x4+b5x5)}}\right] - \mathrm{P}(\mathrm{Y}=2) - \mathrm{P}(\mathrm{Y}=3) - \mathrm{P}(\mathrm{Y}=4) - \mathrm{P}(\mathrm{Y}=5)$$

$$P(Y=0) = 1 - \mathrm{P}(\mathrm{Y}=1) - \mathrm{P}(\mathrm{Y}=2) - \mathrm{P}(\mathrm{Y}=3) - \mathrm{P}(\mathrm{Y}=4) - \mathrm{P}(\mathrm{Y}=5)$$

5. Results

Table 1: Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.585
Bartlett's Test of Sphericity	Approx. Chi-Square	1164.462
	df	528
	p-value	0.001

Table 1 shows the output of measure of sampling adequacy of the method of factor reduction. The p-value of 0.001 indicates the acceptability of the method.

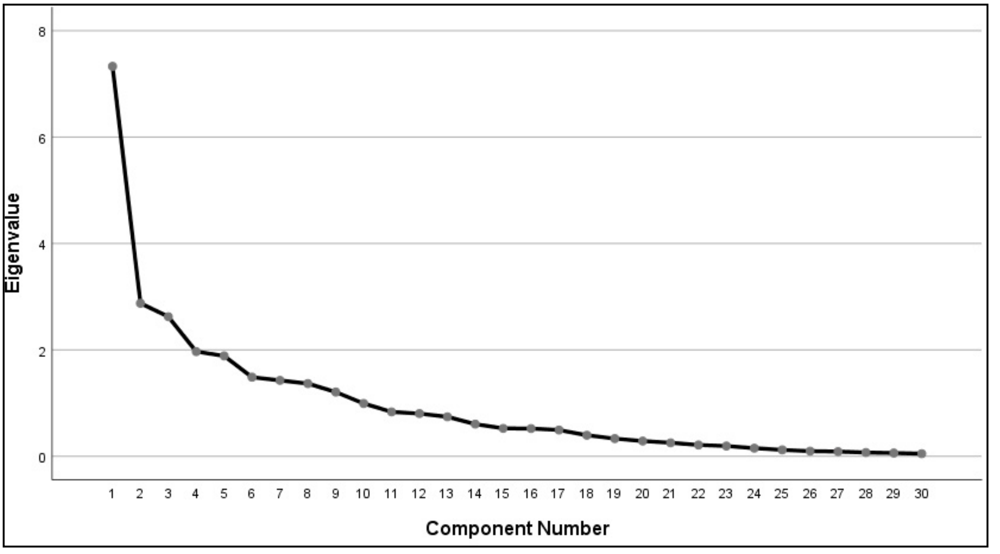

Figure 1: Scree plot showing the eigenvalues against the components

The scree plot in Figure 1 reveals the components and the eigenvalues. It can be noticed that only nine components have eigenvalues greater than one. These are the components that were used in determining the predictors of the response variables.

5.1 Results using multinomial ordinal logistic regression

The ordinal logistic regression is a probability model used with an ordered response variable (Agresti, 2000; Lawal, 2003).

Table 2: Categorical variable information

			N	Percent
Dependent variable	TPB_TN	2.00	1	1.7%
		2.67	2	3.4%
		3.00	1	1.7%
		3.33	9	15.5%
		3.67	2	3.4%
		4.00	18	31.0%
		4.33	7	12.1%
		4.67	7	12.1%
		5.00	11	19.0%
		Total	58	100.0%

			N	Percent
Factor	GENDER	Male	24	41.4%
		Female	34	58.6%
		Total	58	100.0%
	MDEVICE	Smart phone	47	81.0%
		Tablet	2	3.4%
		Laptop	1	1.7%
		Basic phone / Non-smart phone	4	6.9%
		2 or 3 devices	4	6.9%
		Total	58	100.0%

The rows in Table 2 show the percentage of agreement in favour of intention to use technology for learning. More than 70% of students intended to start using technology to learn.

Table 3: Continuous variable information

		N	Minimum	Maximum	Mean	Std. Deviation
Covariate	x1	58	2.17	5.00	4.1494	.59538
	x2	58	1.00	5.00	1.7414	.94702
	x3	58	1.00	5.00	2.0345	.91700
	x4	58	1.00	5.00	3.8103	1.11539
	x5	58	3.00	5.00	4.7069	.53010
	x6	58	1.00	5.00	2.4310	1.48811
	x7	58	1.00	5.00	4.2759	.83336
	x8	58	1.00	5.00	2.6207	1.02303
	x9	58	3.00	5.00	4.4483	.65353

Where the covariates x1, x2, x9 are TAM_CB3, TPB_AT4, TPB_SN3, TPB_TPB5, TPB_PBC6, TPB_PBC7, the means of these formulated x1. TAM_CB2, TPB_SN2, TPB_PBC3, TAM_OE2, TAM_MA2, TAM_MA1, TPB_PBC2 and TAM_CB3 formed x2 to x9 respectively (Table 3;).

Table 4: Measures of Goodness of Fit

	Value	df	p-value
Deviance	164.550	434	.379
Scaled Deviance	164.550	434	
Pearson Chi-Square	380.620	434	.877
Scaled Pearson Chi-Square	380.620	434	
Log-Likelihood	-82.275		
Akaike's Information Criterion (AIC)	208.550		
Finite Sample Corrected AIC	237.465		
Bayesian Information Criterion (BIC)	253.880		
Consistent AIC	275.880		

The non-significance shown by the p-values indicate a well-fitted model. The Pearson Chi-Square test shows that 87.7% of the variation in the response variable TPB_TN is explained by the model (Table 4). The information criteria (AIC, BIC) could be used to pick the best model, that is, if various models are employed.

Table 5: Omnibus test

Likelihood Ratio Chi-Square	df	p-value
50.073	14	0.001

The omnibus test compares the fitted model against the thresholds-only (intercept) model. The p-value shows that the fitted model is significant at a 5% level (Table 5).

Table 6: Tests of model effects

	Likelihood Ratio Chi-Square	df	p-value
GENDER	2.470	1	.116
MDEVICE	.383	4	.984
x1	19.050	1	.000
x2	.029	1	.864
x3	2.561	1	.110
x4	3.545	1	.060
x5	.001	1	1.000
x6	7.572	1	.006
x7	1.855	1	.173
x8	.433	1	.511
x9	1.554	1	.212

Table 6 is the summary of the effects of each of the factors on the response variable, that is, respondents' intention to learn using technology: x1 and x6 are the most significant factors determining the response variable.

Table 7: Non-parametric correlation on categorical factors

			TPB_TN	GENDER	MDEVICE
Spearman's Rho	TPB_TN	Correlation coefficient	1.000	.042	-.099
		Sig. (2-tailed)	.	.756	.458
		N	58	58	58
	GENDER	Correlation coefficient	.042	1.000	-.385**
		Sig. (2-tailed)	.756	.	.003
		N	58	58	58
	MDEVICE	Correlation coefficient	-.099	-.385**	1.000
		Sig. (2-tailed)	.458	.003	.
		N	58	58	58

Gender and mdevice do not have a significant correlation with respondents' intention to learn using technology (p-value = 0.756 and p-value = 0.458, respectively; Table 7). But it is noticed that gender and mdevice have a significant relationship (p-value = 0.003), which means the use of mobile devices can be influenced by the gender of the respondents.

Table 8: Parameter estimates

Parameter		B	p-value	Exp(B)	95% Wald Confidence Interval for Exp(B)	
					Lower	Upper
Threshold	[TPB_ TN=2.00]	9.446	0.038	12662.620	1.681	95359890.123
	[TPB_ TN=2.67]	11.638	0.008	113325.688	20.243	634413557.335
	[TPB_ TN=3.00]	12.149	0.006	188831.273	33.918	1051272819.520
	[TPB_ TN=3.33]	14.099	0.001	1327912.717	232.161	7595393122.616
	[TPB_ TN=3.67]	14.377	0.001	1752944.007	299.729	10251982871.616
	[TPB_ TN=4.00]	16.497	0.000	14599536.880	1991.575	107024052494.921
	[TPB_ TN=4.33]	17.401	0.000	36056101.653	4576.192	284088257173.162
	[TPB_ TN=4.67]	18.629	0.000	123130638.464	13174.862	1150763806703.480
[GENDER=1.00]		-0.962	0.120	0.382	0.114	1.285
[GENDER=2.00]		0		1		
[MDEVICE=1.00]		0.492	0.653	1.635	0.191	13.967
[MDEVICE=2.00]		0.297	0.872	1.345	0.037	49.262
[MDEVICE=3.00]		1.306	0.557	3.690	0.047	287.972
[MDEVICE=5.00]		0.580	0.739	1.786	0.059	54.187
[MDEVICE=7.00]		0		1		
x1		3.369	0.000	29.059	6.184	136.553
x2		0.056	0.864	1.057	0.560	1.997
x3		-0.582	0.110	0.559	0.274	1.140
x4		0.556	0.060	1.743	0.977	3.112
x5		0.000	1.000	1.000	0.316	3.166
x6		0.562	0.009	1.754	1.148	2.680
x7		0.540	0.167	1.716	0.798	3.690
x8		0.196	0.512	1.216	0.678	2.181
x9		-0.712	0.218	0.491	0.158	1.522
(Scale)		1				

Table 8 presents detailed information about the individual level contributions of the factors in the model. The parameter estimates (B), standard error, and the p-values are represented in the table.

5.2 Interpretation of the model and summary of results

From Table 8, x1, which contains TAM_CB3, TPB_AT4, TPB_SN3, TPB_TPB5, TPB_PBC6, TPB_PBC7, have a positive significant effect on TPB_TN, that is, students' intention to use technology for learning. The positive coefficient value of 3.369 shows that for every one-unit increase in x1, there is a predicted increase of 3.369 in the log odds of being on a higher level on TPB_TN.

Further, x3 is a negative non-significant predictor of TPB_TN. The negative value of -0.582 indicates that for every one-unit increase in x3, there is a corresponding decrease of 0.582 in the log odds of being on the higher level on TPB_TN.

Additionally, x6 has a positive significant effect on TPB_TN; the positive coefficient value of 0.562 shows that for every one-unit increase in x6, there is a predicted increase of 0.562 in the log odds of being on a higher level on TPB_TN.

Using the odds ratios reflects the multiplicative change in the odds of being in a higher category on the dependent variable for every one-unit increase on the independent variable, holding the remaining independent variables constant.

The odds ratios (exp(B)) indicates that the odds of being in a higher level on students' intention to use technology for learning increases by a factor of 29.059 for every one-unit increase on x1. It decreases by a factor of 0.559 for every one-unit increase on x3 and increases by 1.743 for every unit increase on x4, increases by 1.754 for every unit increase on x6 and so on.

According to the rule of thumb, since the odds ratios of most of the independent variables are greater than one, this suggests that there is an increasing probability of being on a higher level on the dependent variable as values on an independent variable increase. The categorical variables and covariates having B=0 indicate the redundancy of such variables; it means they do not contribute to the model.

In summary, it can be concluded that the most obvious determining covariate for students' intention to use technology for learning is x1, which comprises TAM_CB3, TPB_AT4, TPB_SN3, TPB_PBC5, TPB_PBC6 and TPB_PBC7. The corresponding items of these variables in the questionnaire come under the categories of control belief, attitude, subjective norm and perceived behavioural control, respectively. The least contributing covariate is x9 that is learning environment of the respondent, having an odds ratio of 0.491.

6. Limitations and recommendations for future study

Our investigation was limited to two of the university's four campuses. Our sample size was also limited to students in technology-related courses. It is recommended that the investigation be conducted across all the campuses, with respondents chosen from other non-technology courses to test if the same outcome will be obtained. It is important for stakeholders in education to understand and modify the factors that modulate students' affect concerning technology tools. Further research is required to determine exactly how to motivate students towards the use of these tools.

7. Conclusion

Based on the model, we conclude that the variables above are critical to understanding students' intention to use the technology tools available at the university. The model is confirmatory of three out of the four hypotheses drawn to investigate the research problem. These are H1, H3 and H4. The analysis shows no significant correlation between H2 and students' intention to use available technology tools. The results confirm that a student's perception of the importance of technology tools, acceptance or approval of peers and significant others, and the perception of themselves as being capable of mastering the technology tools in place for learning are the strongest motivators for students to engage actively with the technology tools at the university. The model also revealed that the learning environment does not play a significant part in the students' intention to use technology tools.

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