Using the personal computer utilisation model to predict students' technology user behaviour in universities in Botswana

Norman Rudhumbu*

Faculty of Science Education,
Bindura University of Science Education,
P. Bag 1020, Bindura, Zimbabwe
Email: nrudhumbu@buse.ac.zw
*Corresponding author

Elize du Plessis

College of Education,
University of South Africa,
Pretoria, South Africa
Email: dplesec@unisa.ac.za

Kanos Matyokurehwa

Faculty of Science Education,
Bindura University of Science Education,
P. Bag 1020, Bindura, Zimbabwe
and
Faculty of Science and Engineering,
Bindura University of Science Education,
P. Bag 1020, Bindura, Zimbabwe
Email: kanosmatyo@gmail.com

Cross Gombiro

Bindura University of Science Education,
P. Bag 1020, Bindura, Zimbabwe
Email: cgombiro@gmail.com

Abstract: Technological advances have reduced learning and teaching limits based on time and distance making education more accessible to students. Accordingly this study sought to establish whether the personal computer utilisation model (PCUM) could be used to predict and explain factors that influence the technology user behaviour of university students in Botswana. The PCUM is a model designed not only to predict PC utilisation but also to predict technology acceptance. A quantitative approach that employed a self-constructed structured questionnaire was used to collect data from a sample of 940 students from three public universities. Confirmatory factor analysis (CFA) was used for data validation of scale items. Results of the study showed that five out of the six dimensions of the PCUM significantly influenced the technology user behaviour of university students showing that overall, the PCUM could be used to predict and explain the technology user behaviour of university students. These results have implications on both practice and policy with regards to the integration of technology in universities.

Keywords: job-fit; affect towards technology use; technology user behaviour; TUB; personal computer utilisation model; PCUM; facilitating conditions; social factors.

Reference to this paper should be made as follows: Rudhumbu, N., du Plessis, E., Matyokurehwa, K. and Gombiro, C. (2021) 'Using the personal computer utilisation model to predict students' technology user behaviour in universities in Botswana', *Int. J. Learning Technology*, Vol. 16, No. 3, pp.225–245.

Biographical notes: Norman Rudhumbu is a PhD holder with 30 years of experience in teaching, management, research and community service in schools, colleges and universities. He has published more than 35 papers in peer-reviewed journals and author of one business management textbook and nine mathematics textbooks, a number of which have been prescribed for use in Botswana schools. His three main research interests are critical studies in curriculum and pedagogy; learning, schools and innovations; and teaching and teacher education.

Elize du Plessis holds a DEd degree and has 30 years of experience in distance teaching. She is a Full Professor in the Department of Curriculum and Instructional studies at the University of South Africa (Unisa) and involved in curriculum development in its School of Teacher Education. Her field of specialisation is curriculum development, teaching and learning and distance education. She has made contributions to several books and a variety of journals, and presented papers at both national and international conferences. She is also a national and international reviewer for several academic journals and acts as a supervisor for MEd and DEd students.

Kanos Matyokurehwa is a PhD student who is in his final year of completion. He has published a number of papers in high impact journals. His research interests include cyber security, educational technology and computer education.

Cross Gombiro is a PhD holder who has more than 20 years of teaching experience. He has also published a number of papers in high impact journals and his research interests include educational technology, information systems and cyber security.

1 Introduction

The global higher education sector has been extensively impacted by the COVID-19 pandemic which has led to the unplanned closure of universities (Flaxman et al., 2020; Hale et al., 2020). Various studies on technology show that the adoption of new and emerging technologies is now increasingly recognised as the new normal and a catalyst for the transformation of teaching and learning in universities globally. The study investigated whether the PCUM could be used to predict and explain the technology user behaviour (TUB) of university students. The PCUM comprises of six key elements namely job-fit (JF), complexity (CO), long-term consequences (LC), affect towards use (ATU), social factors (SF), and facilitating conditions (FC) that influence technology use by users (Sharma and Mishra, 2014) which can be used to measure the TUB of university students. Technology also commonly known as information communication technology (ICT) has become a buzz word and ubiquitous in education systems the world over especially during the COVID-19 pandemic. Various studies on technology show that the adoption of new and emerging technologies is now increasingly recognised as a catalyst for the transformation of teaching and learning in universities globally (Hartman et al., 2019; Steele et al., 2019). A study by Shatto and Erwin (2017) showed that the proliferation of online education has grown exponentially world-wide over the past decade owing to advances of modern technology. Dunwill (2016) also avers 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. In his study, Cortey (2017) found that the advent of technology has been one of the most critical innovations in the current transformations happening in universities whose effect on teaching and learning has been transformational. Here we argue that it has therefore become important for researchers to establish factors that influence TUB of university students as teaching and learning are now more than ever before, dependent on technology.

2 Literature review

2.1 Technology applications in universities

Technology applications provide higher education institutions (HEIs) such as universities with a competitive edge by enabling them to offer learning experiences to students with no limitations to time and location barriers (Alam, 2016). Gürkut and Nat (2017) found that, if properly used, technology can lead to a transformative shift in teaching and learning where teaching becomes more student centred. For an effective learning experience, a study by Šmýkala (2018) found that students need to develop high levels of positive TUB and also institutions need to provide facilitating conditions for students to effectively use technology for learning.

2.2 Contextualising technology adoption in universities in Botswana: the legal and regulatory context

Botswana is a landlocked country with a population of around 2 million people (Asino, 2015). It is a middle-income country that got its independence from Britain in 1966 and is described as an exceptional success story politically and economically (Obasi, 2010). As of 2013, Botswana had 276 registered and unregistered public and private HEIs with most of them being private HEIs (TEC, 2013). Of these HEIs, eight are universities while the rest are colleges. As a country that views technology as a key driver of quality education at all levels of the education system (Porter and Graham, 2016), Botswana has almost all its public tertiary institutions well equipped with internet-enabled computers to enable effective teaching and learning. Since 2005, ICT in Botswana underpinned much of transformation in higher education in the country (Radijeng, 2010). For these public tertiary institutions in Botswana, noticeable strides have been made to ensure adoption of technology with mobile technology being one of the main tools for teaching and learning. As a result of its pro-technology policies, Botswana is ranked 89th among 142 countries (and the ranking continues to improve) on the utilisation of ICT in all its economic activities including HE (Dutta et al., 2012).

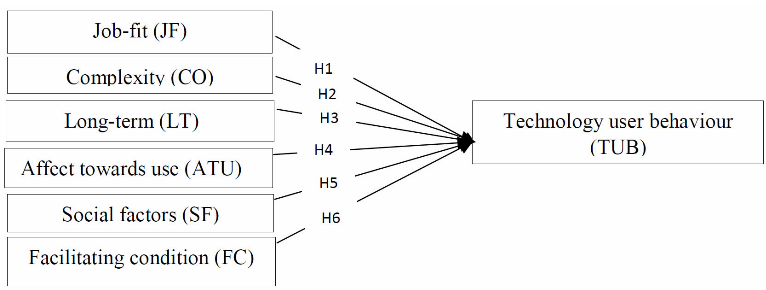
In the list of the best countries in the utilisation of technology, Botswana was ranked 7th out of 34 countries in Africa in 2011 (Briceño-Garmendia and Pushak 2011). All of these positive outlooks on the use of technology have been as a result of the Botswana government's commitment to promoting the use of technology in all spheres of life for Batswana including education through the enactment of pro-technology policies (Asino, 2015). Policy documents that act as evidence to the Botswana government's commitment to the adoption of technology in education in Botswana include the following (Asino, 2015; Radijeng, 2010):

- Vision 2016 (now replaced by Vision 2036) which emphasises the use of technology to allow students and their teachers to access information on demand
- the Revised National Policy on Education (RNPE) of 1994 that recognises the value of technology in learning
- the Tertiary Education Policy of 2008 which calls upon universities (HEIs) to take advantage of the benefits of technology in the transformation of the country into a knowledge-driven, innovative society
- the Maitlamo National Policy for ICT Development of 2005 that emphasised access to computers and improved internet connectivity in schools from primary schools to universities.

2.3 Research model and hypotheses formulation

The study utilised the PCUM developed by Thompson et al. (1991) as a guiding framework. The PCUM is a model designed not only to predict PC utilisation but also to predict technology acceptance (Thompson et al., 1991). Based on the theory of human behaviour by Triandis (1980), the PCUM posits that PC use, and in the context of the current study, technology utilisation, is a function of an individual's feelings (affect towards technology use), expected consequences of technology use, social norms within the environment in which the technology is used, individual habits concerning technology use, and environmental conditions supporting technology use (Thompson et al., 1991). Based on this characterisation, the PC utilisation model comprises of six key elements namely job-fit (JF), complexity (CO), long-term consequences (LC), affect towards use (ATU), social factors (SF), and facilitating conditions (FC) that influence technology use by users (Sharma and Mishra, 2014). Based on the literature reviewed and the PC utilisation model, the research model as shown in Figure 1 was developed.

Figure 1 Research model adapted from the PC utilisation model



Source: Thompson et al. (1991)

2.3.1 Job-fit and continued technology use

It is the extent to which an individual believes that using a technology will enhance the performance of his or her job or tasks (Khater, 2016). Thompson et al. (1991) define job-fit as related to a technology's capability in enhancing an individual's task performance. It is a concept related to perceived usefulness in the technology acceptance model (Davis, 1989; Rudhumbu, 2020). If for example students perceive the technology as meeting their learning needs, there is a high chance that they will continue to use it in their studies. An earlier study by Tornatzky and Klien (1982) found a significant relationship between technology capability and an individual's TUB. Davide et al. (2018) and Heeks (2020) found that if students feel that the technology helps them to perform their tasks better (perceived usefulness), they tend to develop positive TUB towards the technology. This is also confirmed in a study by Teeroovengadum et al. (2017) which found that if a technology's use or functions are consistent with existing classroom practices, the university students will tend to develop positive TUB towards it.

H1 Job-fit significant and positively influence continued technology use by university students.

2.3.2 Complexity and continued technology use

Complexity of a technology is related to the idea of perceived ease of use. This suggests that when students view a technology as being easy to use in their day-to-day activities, they will also find it as being useful. Put in another way, a useful technology in the view of students, is one they find simple to use. These results confirm findings of earlier studies. Separate studies by Rudhumbu (2020) and Byungura (2019) also found that ease of use influenced perceived usefulness. Results of these three studies established that when technology users that find that a technology is not complicated to use but is easy to use, they tend to want to continue using it in the performance of their tasks. An earlier study by Tornatzky and Klien (1982) also found a significant relationship between the complexity of a technology and low rates of its adoption and use.

H2 Complexity has a significant and positive influence on TUB of university students.

2.3.3 Long-term consequences and TUB

Also referred to as utility expectancy, long-term consequence of the use of technology relates to expectations that the use of technology features will lead to the achievement of tangible purposes, agenda, or performance levels in the future (Thompson et al., 1991; Chou et al., 2015). A study by Chou et al. (2015) found that technology users prefer to use a technology due to the perception that it will assist them to achieve desired consequences such as improved levels of performance, extrinsic and intrinsic motivation and other related benefits. In an earlier study, Thompson et al. (1991) also found that if users believe that they will develop achieve desired results in the future as a result of the use of technology, the desire to continue to use technology.

H3 Long-term consequences of technology use have a significant and positive influence on TUB of university students.

2.3.4 Affect towards use and TUB

Affect to use technology refers to a feeling of joy, elation, or pleasure, depression, disgust, or hate associated by an individual with a particular act (Khater, 2016). Thompson et al. (1991) also define affect to use technology as an individual's emotional disposition towards technology. Affect to use a technology is related to the attitude of the user towards a technology (Bervell and Umar, 2018). In their study, Bervell and Umar (2018) found that attitude is one of the critical personal traits that determine the level of user behaviour of a technology. In an earlier study, Thompson et al. (1991) found that the feelings of joy, elation, or pleasure, depression, disgust, or hate associated by an individual with a particular act, shape the attitudes and eventual TUB of the people concerned. A study by Heeks (2020) established that if students feel that the technology they use is consistent with their learning needs (compatibility), they tend to develop feelings of joy or pleasure that will lead to positive attitudes towards that technology. This is also confirmed in a study by Teeroovengadum et al. (2017) which found that if a technology's use or functions are consistent with existing classroom practices leading to students having pleasure in using the technology, the students will tend to develop positive attitudes towards it leading eventually to positive TUB.

H4 Affect to use technology has a significant and positive influence on TUB of university students.

2.3.5 Social factors and TUB

Social factors refer to an individual's internalisation of the reference group's subjective culture and specific interpersonal agreements that the individual has made with important others in specific social situations (Tan, 2013). Attuquayefio and Addo (2014) also defined social factors as a user's perception that important others (referees) believe that he or she should use the technology. Such referees include supervisors, faculties, peers and parents. A study by Tan (2013) found a strong relationship between social factors and TUB. A study by Vannoy and Palvia (2010) found a strong link between social factors and TUB. In their study, Attuquayefio and Addo (2014) however, found no significant relationship between social factors and TUB of users.

H5 Social factors have a significant and positive influence on TUB of university students.

2.3.6 Facilitating conditions and TUB

Defined as the degree to which technology users believe that an organisational resource and technical infrastructure exists to support use of technology (Onaolapo and Oyewole, 2018), facilitating conditions have an influence on TUB by students. Zhou (2011) argued that facilitating conditions relate to a situation where technology users have both the resources and knowledge to use the technology. A study by Venkatesh et al. (2016) found a significant relationship between facilitating conditions and technology use. In their study, Attuquayefio and Addo (2014) found that in a situation where support is consistent, facilitating conditions directly and significantly influence technology use by users. Venkatesh et al. (2012) also found a significant relationship between facilitating conditions and continued technology use by users. A study by Palau-Saumell et al. (2019) found that higher levels of facilitating conditions lead to higher levels of TUB.

H6 Facilitating conditions have a significant and positive influence on TUB of university students.

3 Materials and methods

3.1 Research design and sampling

The study employed a quantitative approach that used a descriptive survey as research design. A sample of 940 students as respondents from three public universities were selected using stratified random sampling strategy to ensure each university had a sample of students proportionately represented in the study sample (Creswell, 2015). Botswana has only three public universities. The sample size table developed by The Research Advisors (2006) was used to determine the sample size of 940 from a population of 32,045 students at the 95% confidence level and 3.5% margin of error. The distribution of 940 students among the three universities is shown in Table 1.

Table 1 Participants from the three universities

University	*Freq.*	*%*
X1	311	33.1
X2	275	29.3
X3	354	37.6

3.2 Instrumentation

A self-constructed structured questionnaire adapted from PU utilisation model, the general internet attitudes scale (GIAS) developed by Joyce and Kirakowski (2015) and the computer attitudes scale (CAS) developed Selwyn (1997) and that employed a five-point Likert scale was used for data collection. The CAS has 20 questions (Q1–Q20) that deal with why a student uses a computer, whether they feel it is easy to use a computer and their general attitudes toward computers and these questions align very well with the six dimensions of the PCUM. Based on its four dimensions namely internet affect, internet exhilaration, social benefit of the internet, and internet detriment (Joyce and Kirakowski, 2015), the GIAS also explicated the reasons why people prefer to use or adopt technology as articulated in the six dimensions of the PCUM model. The questionnaire had 31 items from six factors as follows: JF – five items, CO – four factors, LC – six items, ATU – four items, SF – five items, and FC – seven items. The purpose of the scale was to measure the TUB of students by focusing on the role of each of the six PCUM dimensions on the TUB of university students. Scales ranged from strongly agree (SA = 5), agree (A = 4), neutral (N = 3), disagree (DA = 2) and strongly disagree (SDA = 1). For ease of analysis, a criterion mean (CM) was calculated as the average of the scales as follows: CM = (1 + 2 + 3 + 4 + 5) / 5 = 3.0. Using the CM of 3.0, all responses that had mean scores of less than 3.0 were regarded as showing disagreement with given assertions while all responses with mean score above 3.0 were viewed as agreeing with given assertions. The three participating universities have a long history of collaborating in academic activities with universities of the researchers hence the granting of permission for researchers to conduct the study at the three universities was not a challenge.

A total of 940 questionnaires were distributed to the three universities through the offices of their Deans of Student Affairs who liaised with Heads of Departments (HODs) in respective academic faculties for the administration of the questionnaires to students during lecture times. The questionnaires were therefore administered through the offices of HODs in the faculties at each of the three universities. Randomly selected students from the academic departments, in line with the proportional number of participants allowed for, for each of the departments at each of the three universities, had questionnaires hand-delivered to them by the secretaries of the HODs during lecture times. Issues of informed consent and confidentiality were addressed in the study before participants completed the questionnaires. After receiving the questionnaires, the students completed them in between 10 to 15 minutes. After completing the questionnaires, the students submitted the completed questionnaires into submission boxes placed in strategic positions in their lecture rooms and respective lecturers took the boxes to their HODs from where the researchers eventually collected the completed questionnaires. All this data collection process happened during the pre-COVID-19 lockdown period. A total of 812 completed questionnaires were returned giving a return rate of 86.4%.

3.3 Data analysis methods

Data was first validated using confirmatory factor analysis (CFA) by testing item reliability, convergent validity and discriminant validity (Hair et al., 2017). For analysis of descriptive data, a criterion mean ((1 + 2 + 3 + 4 + 5) / 5) of 3.0 calculated as the average of the Likert scale points was used to demonstrate the level of agreement by students with assertions in the study. The relationship between dependent and independent variables was analysed using Pearson's correlation analysis and regression analysis that was used to determine both the effect and impact of the independent variables (JF, CO, CL, ATU, SF and FC) on the dependent variable (TUB) while descriptive statistics was used for summarising the data.

4 Results

4.1 Biographic characteristics of students

Students' biographic factors were analysed using descriptive statistics. Table 2 was used to summarise the frequencies of participants' scores based on their responses on the three biographic factors of age, gender and year of schooling. Most of the students were aged 30 years and below (71.9%). Results also showed that there was still a slight gender disparity in the recruitment of students as universities continue to recruit more male (59.2%) than female students (40.8%). Most students were in the first and second year streams (58%) as expected, with 42% in the higher streams as enrolments in universities mostly have more students in the first and second year streams than in the third and final year streams.

Table 2 Biographic characteristics

Characteristics	*Items*	*Total*
Age (years)	18–25	38.8%
	26–30	33.1%
	31–35	21%
	35–40	18.1%
	40+	10%
Gender	Male	59.2%
	Female	40.8%
Year of schooling	1st year	31.9%
	2nd year	26.1%
	3rd year	24.8%
	4th year	17.2%

4.2 Measurement model analysis

Results in Table 3 show two tests used to demonstrate the suitability of the data for structure detection, that is, for factor analysis to be done. The Kaiser-Meyer-Olkin measure of sampling adequacy of .805 satisfied the benchmark of KMO $\geq$ .05 (Hair et al., 2017), showing that a factor analysis could be conducted. A Bartlett's test of sphericity (BS) of 241.511 which was significant ($p = .000$) also satisfied the benchmark of $p < .05$ (Hair et al., 2017) which further confirmed that factor analysis could be performed to validate the data.

Table 3 KMO and Bartlett's tests

Kaiser-Meyer-Olkin measure of sampling adequacy		.805
Bartlett's test of sphericity	Approx. chi-square	241.511
	Df.	253
	Sig.	.000

Results in Table 4 showed that composite reliability values of variables ranged between .70 and .90 demonstrating high internal consistency reliability of scale items (Hair et al., 2017). The results further showed that convergent validity was confirmed by standardised factor loadings, composite reliability and average variance extracted (AVE) (Hair et al., 2014). Standardised factor loadings ranged between .66 and .87, composite reliability values that ranged between .70 and .90, as well as AVE whose variances ranged from .65 and .83 confirming the presence of discriminant validity as earlier alluded to.

Table 4 Convergent validity and reliability measurement of the model

Model constructs	*Items*	*Standardised factor loadings*	*CR*	*AVE*
JF	JF1	.74	.70	.73
	JF3	.74		
	JF4	.69		
	JF5	.75		
CO	CO1	.85	.83	.65
	CO2	.70		
	CO3	.74		
LC	LC2	.81	.75	.83
	LC3	.66		
	LC4	.71		
	LC6	.84		
ATU	ATU2	.87	.81	.80
	ATU3	.86		
	ATU4	.84		
SF	SF1	.77	.77	.80
	SF2	.76		
	SF3	.80		
	SF4	.73		
FC	FC1	.69	.90	.75
	FC2	.74		
	FC4	.76		
	FC7	.81		

Table 5 Discriminant validity of the PCUM measurement model

Variables	*JF*	*CO*	*LC*	*ATU*	*SF*	*FC*
JF	*.85*					
CO	–.505	*.81*				
LC	.439	–.414	*.91*			
ATU	.417	–.625	.283	*.89*		
SF	.398	–.208	.312	.305	*.87*	
FC	.517	–.409	.316	.492	.615	*.89*

Note: Diagonal italic values represent square roots of AVE.

Table 6 Correlations between variables

	Technology user behaviour	*Job-fit*	*Complexity*	*Long-term consequences*	*Affect to use*	*Social factors*	*Facilitating conditions*
Technology user behaviour							
Pearson's correlation	1	.724**	–.429**	.371**	.744**	.151^{ns}	.528**
Sig. (2-tailed)		.000	003	.001	.008	.213	.000
n	812	812	812	812	812	812	812
Job-fit							
Pearson's correlation	.724**	1	.440^{ns}	.715**	.525**	.343**	.609**
Sig. (2-tailed)	.000		.524	.001	.001	.001	.000
n	812	812	812	812	812	812	812
Complexity							
Pearson's correlation	–.429**	.440^{ns}	1	.417*	–.247**	.041^{ns}	.149^{ns}
Sig. (2-tailed)	.003	.524		.001	.001	.277	.316
n	812	812	812	.812	812	812	812
Long-term consequences							
Pearson's correlation	.371**	.715**	.417*	1	.485*	.317*	.712**
Sig. (2-tailed)	.001	.001	.001		.004	.000	.000
n	812	812	812	812	812	812	812
Affect to use							
Pearson's correlation	.744**	.525*	–.247**	.485*	1	.461*	.528*
Sig. (2-tailed)	.008	.000	.001	.004		.003	.005
n	812	812	812	812	812	812	812
Social factors							
Pearson's correlation	.151^{ns}	.343**	.041^{ns}	.317**	.461*	1	.618**
Sig. (2-tailed)	.213	.001	.277	.000	.003		.000
n	812	812	812	812	812	812	812
Facilitating conditions							
Pearson's correlation	.528**	.609**	.149^{ns}	.712**	.528*	.618**	1
Sig. (2-tailed)	.000	.000	.316	.000	.005	.000	
n	812	812	812	812	812	812	812

Note: Significant: *p < .05; **p < .01^{ns}p > .05.

To confirm discriminant validity of scale items, the relationship between the square roots of AVE (italic diagonal values) for each construct were compared with the vertical correlations of the constructs (Hair et al., 2014). Results in Table 5 showed that diagonal loadings are greater than their corresponding vertical loadings of each construct demonstrating the presence of discriminant validity of scale items. Results in Table 5 also showed that all constructs were positively associated with each other which meant a change in any one of the constructs positively impacted the others.

4.3 Correlation analysis

The results in Table 6 show that job-fit is significantly and positively associated with the TUB of university students ($r = .724$; $p < .01$), complexity has a significant but negative association with the TUB of students ($r = -.429$; $p < .01$), long-term consequences has a significant and positive association with the TUB of students ($r = .371$; $p < .01$), affect to use technology has a significant and positive association with the behavioural intention of students to adopt technology ($r = .744$; $p < .01$), and also facilitating conditions have a significant and positive association with the behavioural intentions to adopt technology ($r = .528$; $p < .01$). The results in Table 6 further show that social factors do not have a significant association with the TUB of university students universities ($r = .151$; $p > .05$).

4.4 Hypotheses testing

Pearson's correlation analysis was performed to test the hypotheses between the independent variables (JF, CO, LC, ATU, SF and FC) and the dependent variable TUB. Six hypotheses were proposed and tested as shown in Table 8. First a test of collinearity was done to ensure that no assumptions of multicollinearity were violated.

The results in Table 7 show that the assumptions of multicollinearity were not violated in this study as TL < 1 and VIF < 10 (Peter and Bruce, 2017; Gareth et al., 2014).

Table 7 Assessing multicollinearity

Variables	*Tolerance (TL)*	*Variance inflation factor (VIF)*
Job-fit	.316	4.716
Complexity	.408	6.442
Long-term consequences	.210	4.618
Affect to use	.629	3.773
Social factors	.513	4.869
Facilitating conditions	.371	3.119

Table 8 Model summary and regression coefficients

Multiple R	.704
R^2	.496
Adjusted R^2	.477
Standard error	.635

Variables in the equation

Model dependent variable[a]: TUB	*Unstandardised coefficients*		*Standardise d coefficients*	*t*	*95% confidence interval for B*		*Upper bound*	*Zero order*	*Collinearity statistics*	
Variables[b]	*b*	*SE b*	*Beta (β)*		*P value*	*Lower bound*			*Tolerance*	*VIF*
Constant	35.216	3.019		2.705	.154	31.11	42.30			
JF	.330	.751	.063	5.091	.000	.300	.410	.439	.371	3.47
CO	–.162	1.035	–.048	–3.774	.000	–.239	–.114	–.277	.119	2.16
LC	.119	1.118	.027	1.934	.010	.110	.124	.351	.309	1.93
ATU	.152	.449	.011	4.712	.002	.150	.164	.266	.331	3.75
SF	.108	.316	.019	5.017	.741	.105	.122	.371	.419	4.71
FC	.349	.301	047	1.516	.000	.220	.315	.413	.288	2.15

Notes: [a]Dependent variable: Continued technology use (CTU).
[b]Independent variables: Job-fit (JF), complexity (CO), long-term consequences (LC), affect towards use (ATU), social factors (SF), facilitating conditions (FC).

The results in Table 8 show that job-fit, complexity, long-term consequences, affect to use, social factors and facilitating conditions contribute 47.7% variation to the TUB of university students. The results also show that job-fit has a significant and positive relationship with the TUB of students (β = .063; t = 5.091; p = .000; p < .05), hence H1 is accepted. Complexity significantly and negatively influences the TUB of students (β = –.048; t = –3.774; p = .000; p < .05), hence H2 is accepted. The long-term consequences significantly and positively influences TUB of students (β = .027; t = 1.934; p = 010; p < .05), hence H3 is accepted. The affect to use significantly and positively influences the TUB of students (β = .011; t = 4.712; p = .002; p < .05), hence H4 is accepted. Social factors do not significantly influence the TUB of students (β = .019; t = 5.017; p = .741; p > .05), hence H5 is rejected. Also, facilitating conditions significantly and positively influence the TUB of students (β = .047; t = 1.516; p = 000; p < .05), hence H6 is accepted.

5 Discussion

In our effort to answer the two research questions, we interpreted findings emanating from the empirical data and placed the findings from this study within the existing body of knowledge. The purpose of the study was to establish whether the PCUM could be used to predict and explain the TUB of students in universities in Botswana. Based on the PCUM the following six independent variables: job-fit, complexity, long-term consequences, affect to use technology, social factors, and facilitating conditions were used to predict and explain the TUB of university students. The results of the study showed that five dimensions namely job-fit, complexity, long-term consequences, affect to use and facilitating conditions were valid measures of the TUBs of university students.

The above results suggest when students see that there is a significant and positive job-fit significantly between a particular technology in terms of meeting their learning needs, the students will develop positive TUB towards it. These results confirm outcomes of earlier studies. Separate studies by Davide et al. (2018) and Heeks (2020) found that if students feel that technology helps them to perform their tasks better (perceived usefulness), they tend to develop positive TUB. The results also showed that when a technology is complicated to use (complexity), students will not develop positive TUB towards it unlike when it is simple or effortless to use. A study by Davide et al. (2018) established that if students feel that the technology they use is simple to use (perceived ease of use), they tend to develop positive TUB. This is further supported in findings of a study by Elkaseh et al. (2016) which found that users who find a technology easy to use tend to develop positive TUB.

The results also suggest that if university students believe that use of the technology will in the future make them succeed academically in their examinations or will make them get better jobs in the future after completing their studies (long-term consequences), they will develop positive TUB towards that technology. An earlier study by Thompson et al. (1991) as well as a later study by Chou et al. (2015) found that users prefer to use a technology which they believe will help them in the future to get positive results. The results also suggested if students develop feelings of either joy or disgust after using a technology, this may have a significant effect on their attitudes towards and desire to use (affect to use) the technology and eventually on the nature of their TUB. Separate studies by Teeroovengadum et al. (2017), Heeks (2020) and Davide et al. (2018) established that if students feel that the technology they use is consistent with their learning needs (compatibility), they develop feelings of joy or pleasure (affect towards use of technology) that will lead to positive TUB.

Results of this study moreover showed that university students' technology user behavioural is not affected by social factors or by what other people say or do. This is in line with the findings of a study by Attuquayefio and Addo (2014) which found no significant relationship between social factors and TUB of users though a study by Vannoy and Palvia (2010) found a strong link between social factors and TUB. It further emerged from this study that once students see that the organisational and technical infrastructure (facilitating conditions) exists to support their technology use, they develop positive TUBs towards the technology. Such support and technical infrastructure could include the availability of a supportive institutional management that avails resources as needed, highly trained technical support staff to assist students with their technology needs, as well as the availability of modern technology. These results are in line with findings of earlier studies. Separate studies by Venkatesh et al. (2016, 2012) and Palau-Saumell et al. (2019) all found that higher levels of facilitating conditions lead to positive TUB.

6 Conclusions

This paper applied the PCUM to establish and explain the TUB of university students. Based on the results of the study, it was established that of the six factors of the PCUM, five of the factors namely: job-fit, long-term consequences, facilitating conditions, affect to use technology, and complexity significantly influenced the TUB of university students while social factors did not. It was therefore concluded that overall, the PCUM could be used to predict and explain the TUB of students in universities. This conclusion therefore showed that what motivates university students to develop positive TUB are issues related to whether the technology will help the students perform their learning tasks better, the benefits they expect to get in future by using the technology as well as the presence of adequate institutional and technological support infrastructure at their institutions.

These conclusions also showed that the TUB of university students is not influenced by views of other people with regards to technology use. Further, the conclusion highlights the fact that for students to develop positive TUB, the technology they use for learning should be easy to use and not difficulty to understand and use. Implications of this study for universities and research, therefore, are that universities need to create conducive conditions for the development of the right attitudes by students towards technology if students are to ultimately develop positive TUBs. Implications for practice are that universities need to ensure that technology being used in the institutions is ease to use or has clear user manuals that make it easy for students to apply the technology for learning particularly in these COVID-19 pandemic times, where the use of technology for learning has become the new normal.

6.1 Limitations of the study

The study used a quantitative approach that used questionnaires for data collection. This might have limited the depth of the data collected with regards to the TUB of university students.

6.2 Future studies

Future studies could utilise a mixed methods approach for data collection to enhance both the breadth and depth of data they collect with regards to the TUB of university students in Botswana.

Acknowledgements

The researchers wish to thank all students who participated in this study.

This study has implications on knowledge, practice and policy with regards to the integration of technology in universities in general and the TUB of university students in particular.

Disclaimer

The authors sort the informed consent of all participants to the study before the completing of the questionnaires.

References

Alam, M.M. (2016) 'Use of ICT in higher education', *The International Journal of Indian Psychology*, Vol. 3, No. 68, pp.1–10.

Asino, T.I. (2015) *Factors that Influence the Diffusion Process of Mobile Devices in Higher Education in Botswana and Namibia*, unpublished PhD dissertation, Pennsylvania State University, USA.

Attuquayefio, S.N. and Addo, H. (2014) 'Using the UTAUT model to analyze students' ICT adoption', *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, Vol. 10, No. 3, pp.75–86.

Bervell, B. and Umar, I.N. (2018) 'Utilization decision towards LMS for blended learning in distance education: modeling the effects of personality factors in exclusivity', *Knowledge Management & E-Learning*, Vol. 10, No. 3, pp.309–333.

Briceño-Garmendia, C. and Pushak, N. (2011) *Botswana's Infrastructure: A Continental Perspective*, Working Paper Series #5887, World Bank Policy Research, World Bank [online] https://wdronline.worldbank.com/handle/10986/3655License (accessed 4 October 2017).

Byungura, J.C. (2019) *Improving IT Integration for Higher Education Institutional Performance: Towards a Contextualised IT-Institutional Alignment Model*, Doctor of Philosophy in Computer and Systems Sciences at Stockholm University

Chou, T., Lo, Y. and Ho, T. (2015) 'The study of taekwondo athletes' behavioral tendency towards utilization of electronic protection', *The Journal of Human Resource and Adult Learning*, Vol. 11, No. 2, pp.10–19.

Cortey, M.B. (2017) *3 Ways to Leverage Technology to Help Nontraditional Students* [online] https://www.edtechmagazine.com (accessed 21 November 2017).

Creswell, J.W. (2015) *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research*, 3rd ed., Pearson, Boston, MA.

Davide, A., Marianna, G., Massimiliano, M. and Francesco, N. (2018) 'Backing environmental innovations through information technology adoption. Empirical analysis of innovation related complementarity in firms', *Technological and Economic Development of Economy*, Vol. 24, No. 1, pp.141–163.

Davis, F.D. (1989) 'Perceived usefulness, perceived ease of use, and user acceptance of information technology', *MIS Quarterly*, September, Vol. 13, No. 3, pp.319–340.

Dunwill, E. (2016) *4 Changes that will Shape the Classroom of the Future: Making Education Fully Technological* [online] https://eleraningindustry.com (accessed 12 May 2017).

Dutta, S., Bilbao-Osorio, B. and Geiger, T. (2012) 'The networked readiness index 2012: benchmarking ICT progress and impacts for the next decade', *The Global Information Technology Report 2012: Living in a Hyper-connected World* [online] http://www3.weforum.org/docs/GITR/2012/GITR_Chapter1.1_2012.pdf (accessed 15 November 2020).

Elkaseh, A.M., Wong, M.K. and Fung, C.C. (2016) 'Perceived ease of use and perceived usefulness of social media for e-learning in Libya higher education', *International Journal of Information Technology*, Vol. 6, No. 3, pp.192–199.

Flaxman, S., Mishra, S., Gandy, A., Unwin, H., Coupland, H., Mellan, T., Zhu, H., Berah, T., Eaton, J. and Guzman, P. (2020) *Report 13: Estimating the Number of Infections and the Impact of Non-Pharmaceutical Interventions on COVID-19 in 11 European Countries* [online] https://spiral.imperial.ac.uk›handle (accessed 25 December 2020).

Gareth, J., Witten, D., Hastie, T. and Tibshirani, R. (2014) *An Introduction to Statistical Learning: With Applications in R*, Springer Publishing Company, Incorporated, New York.

Gürkut, C. and Nat, M. (2017) 'Important factors affecting student information system quality and satisfaction', *Eurasia Journal of Mathematics, Science and Technology Education*, Vol. 14, No. 3, pp.923–32.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2014) *A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM)*, Sage, Thousand Oaks, CA.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2017) *A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM)*, 2nd ed., Sage, Thousand Oaks, CA.

Hale, T., Petherick, A., Phillips, T. and Webster, S. (2020) *Variation in Government Responses to COVID-19*, Blavatnik School of Government Working Paper, No. 31 [online] https://www.bsg.ox.ac.uk/research/publications/variation-government-responsescovid-19 (accessed 11 October 2020).

Hartman, R.J., Townsend, M.B. and Jackson, M. (2019) 'Educators' perceptions of technology integration into the classroom: a descriptive case study', *Journal of Research in Innovative Teaching & Learning*, Vol. 12, No. 3, pp.236–249.

Heeks, R. (2020) 'ICT4D 3.0? Part 1 – the components of an emerging "digital for development" paradigm', *The Electronic Journal of Information Systems in Developing Countries*, Vol. 86, No. 3, pp.1–15.

Joyce, M. and Kirakowski, J. (2015) 'Measuring attitudes towards the internet: the general internet attitude scale', *International Journal of Human-Computer Interaction*, Vol. 31, No. 8, pp.506–517.

Khater, A.H.O. (2016) *Customers' Acceptance of Internet Banking Service in Sudan by Using Unified Theory of Acceptance and Use of Technology (UTAUT) model*, a thesis submitted to the Sudan University of Science and technology in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Banking Studies.

Obasi, I.N. (2010) 'A policy shift in Botswana universities landscape', *International Journal of Higher Education*, Vol. 4, No. 2, pp.20–21.

Onaolapo, S. and Oyewole, O. (2018) 'Performance expectancy, effort expectancy, and facilitating conditions as factors influencing smart phones use for mobile learning by postgraduate students of the University of Ibadan, Nigeria', *Interdisciplinary Journal of E-Skills and Lifelong Learning*, Vol. 14, No. 1, pp.95–115.

Palau-Saumell, R., Forgas-Coll, S., Sánchez-García, J. and Robres, E. (2019) 'User acceptance of mobile apps for restaurants: an expanded and extended UTAUT-2', *Sustainability*, Vol. 11, No. 4, pp.1–24.

Peter, B. and Bruce, A. (2017) *Practical Statistics for Data Scientists*, O'Reilly Media, New York.

Porter, W.W. and Graham, C.R. (2016) 'Institutional drivers and barriers to faculty adoption of blended learning in higher education', *British Journal of Educational Technology*, Vol. 47, No. 4, pp.748–762.

Radijeng, K. (2010) 'Open access in institutions of higher learning in Botswana', *Meeting: 138, Africa World Library and Information Congress: 76th IFLA General Conference and Assembly*, Gothenburg, Sweden, 10–15 August [online] http://www.ifla.org/en/ifla76 (accessed 22 May 2017).

Rudhumbu, N. (2020) 'Antecedents of university lecturers' intentions to adopt information and communication technology in Zimbabwe', *Education and Information Technologies*, Vol. 25, No. 6, pp.127–143.

Selwyn, N. (1997) 'Students' attitudes toward computers: validation of a computer attitude scale for 16-19 education', *Computers and Education*, Vol. 28, No. 1, pp.35–41.

Sharma, R. and Mishra, R. (2014) 'A review of evolution of theories and models of technology adoption', *Indore Management Journal*, Vol. 6, No. 2, pp.17–29.

Shatto, B. and Erwin, K. (2017) 'Teaching millennials and Generation Z: bridging the generational divide', *Creative Nursing*, Vol. 23, No. 1, pp.24–28.

Šmýkala, M. (2018) *Evaluate Recommender System with DeLone and McLean's Model*, Masaryk University, Czechia.

Steele, P., Johnston, E., Lawlor, A., Smith, C. and Lamppa, S. (2019) 'Arts-based instructional and curricular strategies for working with virtual educational applications', *Journal for Educational Technology Systems*, Vol. 47, No. 3, pp.411–432.

Tan, P.J.B. (2013) *Applying the UTAUT to Understand Factors Affecting the Use of English E-Learning Websites in Taiwan*, pp.1–12, SAGE Open, Penghu, October–December.

Teeroovengadum, V., Heeraman, N. and Jugurnath, B. (2017) 'Examining the antecedents of ICT adoption in education using an extended technology acceptance model (TAM)', *International Journal of Education and Development using Information and Communication Technology (IJEDICT)*, Vol. 13, No. 3, pp.4–23.

Tertiary Education Council (TEC) (2013) *Annual Report 2011/2012* [online] http://www.tec.org.bw (accessed 10 May 2017).

Thompson, R.L., Higgins, C.A. and Howell, J.M. (1991) 'Personal computing: toward a conceptual model of utilization', *MIS Quarterly*, Vol. 15, No. 1, pp.124–143.

Tornatzky, L.G. and Klein, K.J. (1982) 'Innovation characteristics and innovation adoption-implementation: a meta-analysis of findings', *IEEE Transactions on Engineering Management*, February, Vol. 29, No. 1, pp.28–45.

Triandis, H.C. (1980) 'Values, attitudes, and interpersonal behavior', *Nebraska Symposium on Motivation, 1979: Beliefs, Attitudes, and Values*, University of Nebraska, Lincoln, NE.

Vannoy, S.A. and Palvia, P. (2010) 'The social influence model of technology adoption', *Communications of the ACM*, Vol. 53, No. 6, pp.149–153.

Venkatesh, V., Thong, J.Y.L. and Xin, X. (2012) 'Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology', *MIS Quarterly*, Vol. 36, No. 1, pp.157–178.

Venkatesh, V., Thong, J.Y.L., Xu, X. (2016) 'Unified theory of acceptance and use of technology: a synthesis and the road ahead', *Journal of Association for Information Systems*, Vol. 17, No. 5, pp.328–376.

Zhou, T. (2011) 'Understanding mobile internet continuance usage from the perspectives of UTAUT and flow', *Information Development*, Vol. 27, No. 3, pp.207–218.

Appendix

Student technology user behaviour scale (STUBS)

The purpose of this study is to investigate the TUB of university students. There are a few questions about you (your biographic profile) and then most of it is questions asking you for your opinions. There are no 'right' or 'wrong' answers.

Your participation in the study is completely voluntary. If you feel at any time that you would no longer like to continue, please simply just close the window. All the data is kept anonymously and we do not save anything that can be used to identify you as a person.

It should not take you more than 10 minutes to complete this questionnaire. Your help and contribution is much appreciated.

My gender?	○	Female
	○	Male
My age?	○	18–25 years
	○	26–30 years
	○	31–45 years
	○	> 40 years
My year of schooling?	○	1st year
	○	2nd year
	○	3rd year
	○	4th year

The following statements ask for your opinions about JOB-FIT with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 1–5 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
I find the technology useful in my university studies.	○	○	○	○	○
Using the technology enables me to accomplish learning tasks more quickly.	○	○	○	○	○
Using the technology increases my productivity as a student.	○	○	○	○	○
The technology makes my learning more efficient.	○	○	○	○	○
Using the technology makes it easier to do my university work.	○	○	○	○	○

The following statements ask for your opinions about COMPLEXITY with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 6–9 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
I find the technology too complicated to use.	○	○	○	○	○
My interaction with the technology is clear and understandable.	○	○	○	○	○
The technology makes me feel uncomfortable.	○	○	○	○	○
Learning to use new technology is difficult for me.	○	○	○	○	○

The following statements ask for your opinions about the LONG-TERM CONSEQUENCES with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 10–13 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
Using the technology increases my chances of getting good grades.	○	○	○	○	○
Using the technology increases my chances of getting a good job in future.	○	○	○	○	○
Using the technology helps me to be able to work with any new technologies in future.	○	○	○	○	○
Using the technology helps me develop the confidence to be able to effectively work in an environment that demands technology skills in future.	○	○	○	○	○

The following statements ask for your opinions about the AFFECT TO USE with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 14–20 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
I like to use technology frequently in my studies.	○	○	○	○	○
Using the technology for learning is a good idea.	○	○	○	○	○
Using the technology makes my studies more interesting.	○	○	○	○	○
Using the technology for learning is fun.	○	○	○	○	○
I feel intimidated by the internet.	○	○	○	○	○
The thought of using the technology in my studies is exciting to me.	○	○	○	○	○
Generally, working with technology for me is fun.	○	○	○	○	○

The following statements ask for your opinions about the SOCIAL FACTORS with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 21–25 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
People who influence my behaviour think that I should use the technology in my studies.	○	○	○	○	○
People who are important to me think that I should use the technology in my studies.	○	○	○	○	○
The senior management of my university has been helpful in my use of the technology in my studies.	○	○	○	○	○
In general, my university has supported the use of the technology for learning and teaching.	○	○	○	○	○
I use the technology in my studies because most of my classmates do.	○	○	○	○	○

The following statements ask for your opinions about FACILITATING CONDITIONS with regards to the use of technology for learning. Please remember, there are no 'right' or 'wrong' answers.

Questions 26–30 of 30	*Strongly disagree*	*Slightly disagree*	*No opinion*	*Slightly agree*	*Agree*
I have the resources at my university necessary to use the technology in my studies.	○	○	○	○	○
I have the knowledge necessary to use the technology for my studies effectively.	○	○	○	○	○
My instructors have adequate technical knowledge and skills to teach me using technology.	○	○	○	○	○
My university has a team of well-trained ICT support staff to support me in my studies using technology.	○	○	○	○	○
My university has modern state of the art technology infrastructure to support my learning.	○	○	○	○	○

Please submit completed questionnaire into the box in your lecturer room.

Thank you for taking part in the survey.