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CULTURAL AND REGIONAL PERSPECTIVES

Exploring the drivers of technology acceptance: a study of Nepali school students

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Abstract
The question of what drives learners to adopt and use certain technologies over others, generally referred to as technology acceptance in the literature, is of interest to educational technology researchers, to policymakers, and developers in educational institutions. Technology acceptance models can inform adoption and implementation decisions. Despite the growing literature on technology acceptance, there is less evidence from countries with the lowest economic development indicators such as Nepal. The present study investigates the factors motivating technology use in the Nepali context. The study is grounded in an extended technology acceptance model (TAM) applied to using the internet for learning (not limited to online learning environments). The data were collected from 126 school students in Nepal ($M_{age} = 15.19$). We found empirical support for our proposed research model. There were strong relationships between computer self-efficacy and perceived enjoyment, and perceived enjoyment and behavioral intention. We found no influence of perceived usefulness or attitude on behavioral intention, contrary to theorized relationships and the empirical literature. Our findings show that the extended TAM translates to under-studied populations such as Nepali secondary school students and suggests that it is sensitive to local situational differences that influence technology acceptance behaviors.

Keywords Technology acceptance · Antecedents to use · Nepal · Underdeveloped perspective

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Introduction

Among the central question in the field of information systems research is: Why do users adopt technology? This question relates to what educational technology and information systems researchers commonly refer to as technology acceptance (Davis et al. 1989; King and He 2006; Legris et al. 2003; Venkatesh 2006). To promote the use of a technology, users must first accept the technology, which is defined as the extent to which technology is used for what it was designed to do. Understanding the factors that motivate people to use technology is at the heart of technology acceptance research (Marangunić and Granić 2014; Williams et al. 2015). The field of educational technology has widely acknowledged the importance of technology acceptance, recognizing that the affordances of technology cannot be maximized if teachers and students do not accept the technology under consideration (Teo 2012; Davis et al. 1989; Park 2009). While a plethora of studies have been published on the technology acceptance process in the context of developed countries, there has been a dearth of studies focused on less developed countries and contexts. In recent years, there have been increased calls to broaden the scope of investigations beyond the more traditional study contexts of developed countries (e.g., Arnett 2008).

In the past three decades, researchers have developed a growing panoply of explanatory frameworks to explain the technology acceptance process. In the technology acceptance literature, the most common frameworks include: Innovation Diffusion Theory (IDT; Rogers 1983), Technology Acceptance Model (TAM; Davis 1989), Theory of Planned Behavior (TPB; Ajzen 1991), Theory of Reasoned Action (TRA; Fishbein and Ajzen 1975), and Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al. 2003). These models provide a convenient vehicle for empirical analysis as they focus on the salient factors that affect the acceptance process. However, their multiple formulations and the large number of posited antecedent factors complicate the study of technology acceptance (King and He 2006; Sun and Zhang 2006).

The present article draws on the seminal theoretical model (TAM), presented in Davis (1989), to explicate the technology acceptance process in the context of an underdeveloped country, namely, Nepal, where the level of information technology infrastructure penetration remains quite low. We take a situated perspective (Doleck et al. 2017a, b) that seeks to integrate situational factors into the technology acceptance model. We argue that this approach captures the contextual specificity of technology acceptance and provides a systematic means to explore the variable influence of antecedent factors across technology adoption contexts.

Context of this study

Nepal has a population of about 29 million comprised of 125 different ethnic groups, 123 languages, and 10 religions. It is considered one of the poorest and least developed nations (Ministry of Education 2016; The World Bank 2017). According to the recent Human Development Report 2016, Nepal ranked 144th out of 188 countries in the Human Development Index with a gross national income per capita of 2337$ (Jahan 2016). Nepal has undergone "significant political changes since 1951 marked by conflicts, referendum and elections" (UNESCO 2015, p. 2), which have been punctuated by the long-running (1996–2006) 'People's War' (Pherali 2011), and continues to face many challenges with about one fourth of the population living below the poverty line (UNESCO 2015). Nepal has a remarkably long history; however, formal education is a recent development (Stash and Hannum 2001). For a country that has been plagued by major internal turmoil and continues to face socioeconomic and political woes in recent years, reforming education in Nepal remains a key challenge. Whereas educational development has been on the rise in Nepal, deficiencies persist. With an adult literacy rate of 64.7%, government expenditure on education remains at 4.7% of GDP. Mean years of schooling persist at 4.1 years (Jahan 2016), and disparity between male (75.1%) and female (57.4%) literacy rates remains very high (Ministry of Education 2016). Nepal faces a multitude of challenges that impede the development of education, chief among them are significant disparities in: educational access, participation, retention, and attainment; infrastructure and resources; financing; quantity and quality of education; teaching and learning practices; and learning achievements (Ministry of Education 2016; Pherali 2011; Shields 2011; Stash and Hannum 2001; UNESCO 2015).

Notwithstanding these contemporary challenges, "education in Nepal is overwhelmingly seen and valued for its 'positive' and therefore, 'unquestionable' impact on the social and economic well-being of people and the nation" (Pherali 2011, p. 138). Information and communications technology (ICT) in Nepal is still in its infancy, ranking 118 out of 139 nations in the Networked Readiness Index (NRI) index which measures the capacity of countries to use ICT (Baller et al. 2016). However, ICT development in Nepal has been spurred by rising mobile phone penetration and proliferation of internet access (Dawadi and Shakya 2016). In recent years, there has been increased recognition of the importance of ICT in improving the landscape and quality of education in Nepal (Shields 2011; UNESCO 2015). One of the key action points identified by the School Sector Reform Programme, implemented by the government of Nepal, concerns the introduction of ICT-based education at the basic and primary level (UNESCO 2015). Recent measures show an uptake in technology in education (Center for Education Innovations 2015; Wodon 2015). Given these developments, it is timely to consider the technology acceptance and use in the Nepali context to better understand students' perspectives, as they have an essential role in the acceptance and use of educational technologies, and how the context of low levels of ICT penetration might influence core TAM factor relationships of perceived ease of use and perceived usefulness. While technology use may be promoted by teachers and school administrators, the use that is made of the technology for learning is motivated by the student's perceptions and beliefs about the technology used for learning. Perceptions of ease of use and usefulness influence how students may exploit it effectively or not in their learning activities. More concretely, learning to use the Internet as a tool of learning requires appropriating certain notions of Internet search and abilities for making effective use of search engines. These learned abilities, in turn, influence perceptions of usefulness as users become more proficient in the technology. It is regularly argued that technology enhances teaching and learning (Kirkwood and Price 2013) and a growing body of research concerns the need for introducing and integrating technology in education (Inan and Lowther 2009). However, technology acceptance in the context of low ICT infrastructure has not been sufficiently explored, because much research in developing countries has focused on countries with high levels of ICT penetration including Lebanon (Tarhini et al. 2013; Tarhini et al. 2017), Egypt (Abbas 2016), and multiple countries in Africa, Asia, and Central America (Park et al. 2009).

Much of the technology acceptance literature is centered on more developed countries, with higher levels of ICT infrastructure penetration. Little is known about the topic of technology acceptance in less developed countries such as Nepal. The paucity of literature in this context is perhaps unsurprising, echoing the digital divide. The ubiquity of technology in more developed nations does not mirror the conditions and situation in less developed nations. Given the many differences that prevail between countries at differing levels of economic development, it stands to reason that different situational determinants of technology use may prevail in the context of less developed countries compared to developed countries. However, this conjecture has not been subjected to sufficient empirical scrutiny. Therefore, the present article, sought to address this issue by investigating the drivers of technology adoption and use in the context of Nepali secondary school students.

Aims of this research study and research questions

The aim of the present study is to examine Nepali school students' technology acceptance. More specifically, we investigate students' intentions to use the Internet for learning purposes. We conduct a partial least squares analysis to examine and assess the research model. The following question guided the study:

1. Is the extended TAM a valid model for explaining intentions to use the Internet for learning in the context of Nepali school students?

Literature review

Technology acceptance model

In developing the TAM (Fig. 1), Davis (1989, 1993) argued that at the core of technology acceptance behaviors were two personal beliefs—perceived ease of use (PEU) and perceived usefulness (PUS)—that determine a user's behavioral intention to use the technology. These two beliefs were also intertwined with perceived ease of use influencing perceived usefulness. These two antecedent beliefs influence a user's attitude (ATT) toward technology use and behavioral intention exerts an influence on the actual use of the technology.

The original formulation of the TAM led to the following hypotheses:

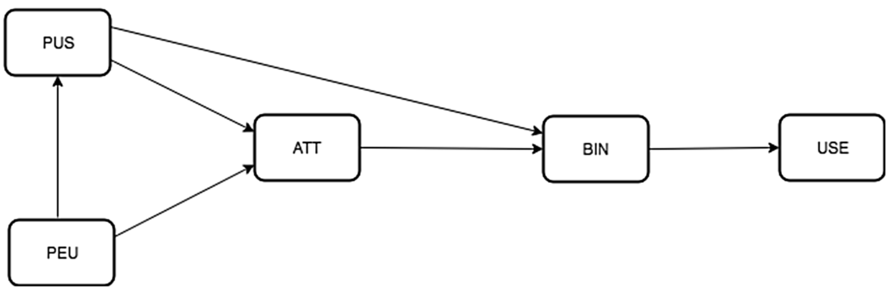

Fig. 1 TAM Model Adapted with permission from "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," by F. Davis, R. Bagozzi, and P. Warshaw, 1989, *Management Science, 35*(8), 982–1003. Copyright 1989 INFORMS, the Institute for Operations Research and the Management Sciences, 5521 Research Park Drive, Suite 200, Catonsville, Maryland 21228, USA

H1 PUS has a significant relationship with ATT.

H2 PUS has a significant relationship with BIN.

H3 PEU has a significant relationship with ATT.

H4 PEU has a significant relationship with PUS.

H5 ATT has a significant relationship with BIN.

The TAM is a prominent framework in the educational technology literature; though it is not without its detractors. Whereas the TAM has been commonly applied and there is accumulating evidence for its theoretical and empirical validity (King and He 2006; Sun and Zhang 2006), researchers advocate for broadening the scope of the model by considering and incorporating additional salient constructs to the model to mitigate the limited explanatory power of the more parsimonious core model and yield more reliable and better predictions of technology use (Venkatesh and Davis 1996). Thus, additional constructs have been proposed to better explain the technology acceptance process in varied contexts. Rather than being a limitation, TAM's parsimonious character has made it suitable to adapt to a variety of contexts by considering the salient factors presented by the specific technology acceptance situation.

Building on the seminal work by Davis (1989), the educational technology literature has proposed a variety of extensions (Bazelais et al. 2018; Cheung and Huang, 2005; Doleck et al. 2017a, b; Lemay et al. 2018; Lu et al. 2003; Park, 2009; Sang et al. 2010; Teo et al. 2017). We use the TAM model in the current study as the extensive empirical literature provides strong evidence for the validity of the TAM (King and He 2006; Marangunić and Granić 2014; Schepers and Wetzels 2007). Further, the ease of extending the model to specific contexts makes it appropriate for application to the novel context in this study. Additionally, we extend the model using factors from other previously validated models: Innovation Diffusion Theory (Rogers 1983), and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al. 2003).

Research model

In addition to the factors native to the original TAM, other factors are also likely to affect the technology acceptance process (Doleck et al. 2017a; Lemay et al. 2017). Augmenting the TAM to investigate the drivers of technology use can reveal a more comprehensive picture of the salient constructs in the technology acceptance mechanism and help mitigate the issue of unaccounted variance (Legris et al. 2003). In the present study, we extend the TAM in the context of students' use of Internet for learning. From the constellation of readily applied constructs as specific drivers of technology use, the present study relied on the following additional constructs (Fig. 2) which have been related to the core constructs in the original TAM in prior literature on technology acceptance.

Computer self-efficacy

Computer self-efficacy (CSE), according to Venkatesh and Bala (2008), refers to "the degree to which an individual believes that he or she has the ability to perform a specific task/job using the computer" (p. 279). CSE has a direct influence on both PEU (Teo 2008; Venkatesh and Bala 2008) and BIN (Sang et al. 2010). This leads to the following hypotheses.

H6 CSE has a significant relationship with PEU.

H7 CSE has a significant relationship with BIN.

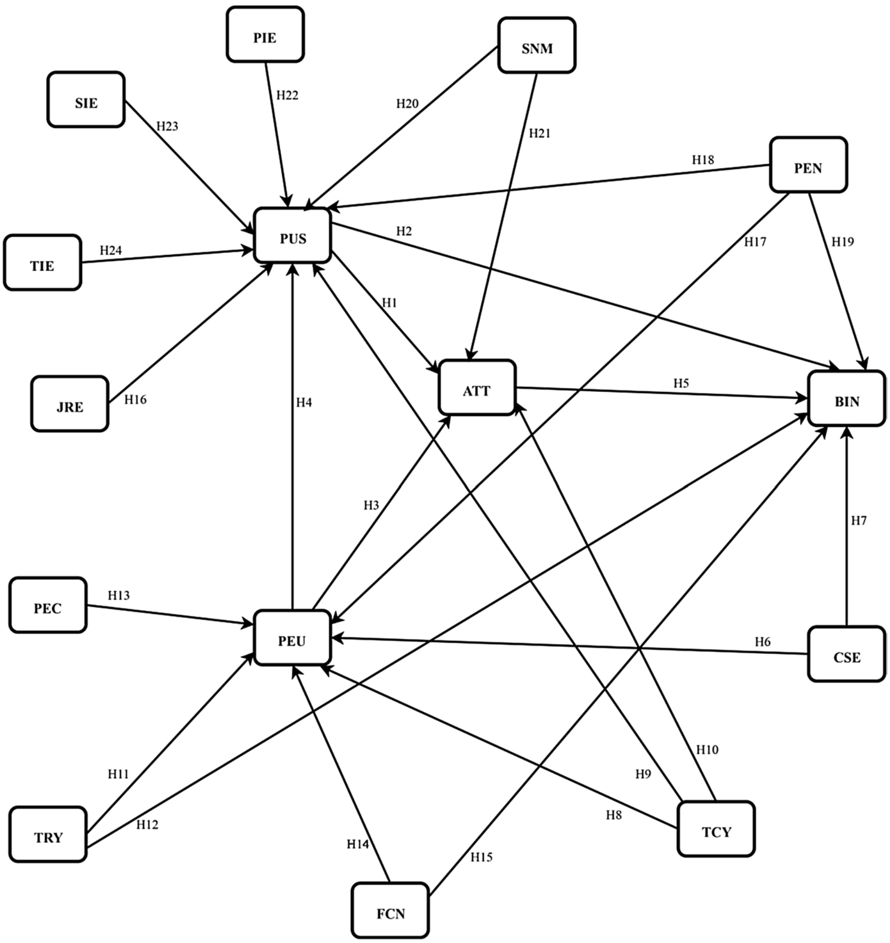

Fig. 2 Proposed research model

Technology complexity

Technology complexity (TCY), according to Rogers (1983), is the "degree to which an innovation is perceived as difficult to understand and use." (p. 15). TCY is a construct from the Innovation Diffusion Theory (IDT; Rogers 1983). Research has shown TCY to have a direct influence on individual's PEU (Cheung and Huang 2005), PUS (Lu et al. 2003), and ATT (Teo 2012). This leads to the following hypotheses.

H8 TCY has a significant relationship with PEU.

H9 TCY has a significant relationship with PUS.

H10 TCY has a significant relationship with ATT.

Trialability

Trialability (TRY), according to Rogers (1983), is the "degree to which an innovation may be experimented with on a limited basis" (p. 15). TRY is also a construct from the Innovation Diffusion Theory (IDT; Rogers 1983). TRY has a direct influence on both PEU and BIN (Lee et al. 2011). This leads to the following hypotheses.

H11 TRY has a significant relationship with PEU.

H12 TRY has a significant relationship with BIN.

Perception of external control

Perception of external control (PEC), according to Venkatesh and Bala (2008), refers to "the degree to which an individual believes that organizational and technical resources exist to support the use of the system" (p. 279). PEC is a construct that comes from the TAM3 and has been shown to have a direct influence on PEU (Venkatesh and Bala 2008). This leads to the following hypothesis.

H13 PEC has a significant relationship with PEU.

Facilitating condition

Facilitating conditions (FCN), according to Venkatesh et al. (2003), refers to "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (p. 453). FCN is one of the key antecedent factors in the Unified Theory of Acceptance and Use of Technology model (UTAUT; Venkatesh et al. 2003). FCN has a direct influence on both PEU and BIN (Teo and Van Schalk 2009). This leads to the following hypotheses.

H14 FCN has a significant relationship with PEU.

H15 FCN has a significant relationship with BIN.

Job relevance

Job relevance, according to Venkatesh and Bala (2008), refers to "the degree to which an individual believes that the target system is applicable to his or her job" (p. 277). JRE has a direct influence on PUS (Venkatesh and Bala 2008). This leads to the following hypothesis.

H16 JRE has a significant relationship with PUS.

Perceived enjoyment

Perceived enjoyment, according to Venkatesh (2000), refers to "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use" (p. 351). PEN has a direct influence on individual's PEU, PUS, and BIN (Teo and Noyes 2011).

H17 PEN has a significant relationship with PEU.

H18 PEN has a significant relationship with PUS.

H19 PEN has a significant relationship with BIN.

Subjective norm

Subjective norm, according to Venkatesh and Bala (2008), refers to "the degree to which an individual perceives that most people who are important to him think he should or should not use the system" (p. 277). SNM has a direct influence on both PUS and ATT (Park 2009). This leads to the following hypotheses.

H20 SNM has a significant relationship with PUS.

H21 SNM has a significant relationship with ATT.

School influence, teacher influence, and peer influence

In the context of social influences, referent others can come in many forms, for example, peers, teachers, schools, supervisors, etc. We also consider specific forms of social influence variables, namely, school influence, teacher influence, and peer influence (Lai and Chen 2011), and hypothesize that such specific forms of social influence variables will have an influence on perceived usefulness (Doleck et al. 2017c). This leads to the following hypotheses.

H22 PIE has a significant relationship with PUS.

H23 SIE has a significant relationship with PUS.

H24 TIE has a significant relationship with PUS.

Methodology

Instruments

A survey questionnaire using validated items from the educational technology literature (Davis 1989, 1993; Davis et al. 1989; Lai and Chen 2011; Lee et al. 2011; Taylor and Todd 1995; Teo and Noyes 2011; Teo 2012; Teo and Van Schalk 2009; Venkatesh 2000; Venkatesh et al. 2003; Venkatesh and Bala 2008) was employed to empirically assess the research hypotheses. The questionnaire consisted of 70 items (see Appendix A) to measure the 15 constructs in the proposed model (Fig. 1). The items of the constructs were measured on a seven-point Likert scale, with answer choices ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Additionally, the questionnaire included items regarding demographic factors such as age and gender and questions related to participants' technology ownership.

Participant profile and procedure

Participants were volunteers drawn from students at several secondary schools ($N = 11$) in the capital city of Kathmandu in Nepal. The recruitment for this study was conducted by asking for volunteers to complete a survey about the use of technology. Respondents were emailed invitations to participate and the questionnaire was completed online. Students did not receive any compensation for their participation in the study by completing an online questionnaire. A total of 126 completed questionnaires were received from the convenience sample. Of the 126 participants, 48 were female and 78 were male. The average age of participants was 15.19 (SD 1.66). Students were enrolled in grades 6 through 12.

Analysis and results

Assumptions and analysis background

The descriptive statistics revealed that the mean values of the 70 items ranged from 2.37 to 6.25, with most mean values above the midpoint value of 4.00, and that the standard deviations of the items ranged from 1.13 to 2.22. A measure of skewness and kurtosis for the data items revealed ranges between − 1.95 and 0.123 for skewness and between − 1.346 and 4.50 for kurtosis. Tests of normality indicated that the data were not normal, thus, the assumption of normality was not met for this sample. Given that the data were non-normally distributed, PLS-SEM (Hair et al. 2011) is a suitable approach for the present analysis. The suitability of the sample size for conducting PLS-SEM was assessed using the guidelines suggested by Hair et al. (2011): "(1) ten times the largest number of formative indicators used to measure one constructor (2) ten times the largest number of structural" (p. 144). The sample size (N = 126) in this study meets the general aforementioned guidelines.

The PLS analyses were conducted with the WarpPLS software (Kock 2015a, b). We followed the standard two-step approach to PLS modeling, that is, the measurement model was first estimated and assessed, followed by evaluating the structural model (Hair et al. 2011; Henseler et al. 2016; Kock 2015b). The psychometric properties of the research model were evaluated using guidelines from the literature on PLS (Hair et al. 2011; Kock 2015b).

Measurement model

The model provided a good fit (see Table 1) to the data (Kock 2015b). The psychometric properties of the measurement scales were first assessed to ensure the validity and reliability of the measurements, which we detail below. All constructs in the model were operationalized as reflective constructs.

Items with loadings below 0.70 were dropped (Kock 2015b) resulting in 61 being retained for further analysis. Those meeting the 0.70 threshold are presented in Table 2. In addition, the use of composite reliability in favor of the Cronbach alpha was used because it was prone to violate key assumptions when used with a multidimensional and multi-item scale such as the one used in the present study (Teo and Fan 2013). Table 2 shows that the composite reliability coefficients of the different measures, ranging from 0.805 to 0.945, all exceeded the threshold value of 0.70 (Kock 2015b). These results established the reliability of the constructs. Convergent validity was assessed through the average variance extracted (AVE) test on the variables. The values in Table 2 supported convergent validity as all AVEs, ranging from 0.579 to 0.799, exceeded the recommended threshold value 0.50 (Henseler et al. 2016).

Discriminant validity was assessed using the Fornell–Larcker criterion (Fornell and Larcker 1981). In Table 3, all the diagonal values (square roots of AVEs) are greater than the off-diagonal numbers in the corresponding rows and columns (correlations between constructs), and demonstrate discriminant validity. Having established the acceptability of the psychometric properties of the measurement model, we turn our attention to the structural model.

Table 1 Model fit statistics and quality indices

Measure	Values	Recommended criterion
Average path coefficient (APC)	0.160, $p=0.016$	Acceptable if $p<0.05$
Average R-squared (ARS)	0.577, $p<0.001$	Acceptable if $p<0.05$
Average adjusted R-squared (AARS)	0.555, $p<0.001$	Acceptable if $p<0.05$
Average block VIF (AVIF)	2.090	Acceptable if <=5
Average full collinearity VIF (AFVIF)	2.786	Acceptable if <=5
Tenenhaus GoF (GoF)	0.632	Small ≥ 0.1, medium ≥ 0.25, large ≥ 0.36
Sympson's paradox ratio (SPR)	0.958	Acceptable if ≥ 0.7
R-squared contribution ratio (RSCR)	0.994	Acceptable if ≥ 0.9
Statistical suppression ratio (SSR)	1.000	Acceptable if ≥ 0.7
Nonlinear bivariate causality direction ratio (NLBCDR)	1.000	Acceptable if ≥ 0.7

Table 2 Measurement scale characteristics

Construct	Indicators	Loadings	Composite reliability (CR)	Average variance extracted (AVE)
PUS	PUS1	0.821	0.926	0.677
	PUS2	0.878		
	PUS3	0.829		
	PUS4	0.894		
	PUS5	0.839		
	PUS7	0.652		
JRE	JRE1	0.892	0.869	0.689
	JRE2	0.825		
	JRE3	0.768		
TIE	TIE1	0.865	0.852	0.659
	TIE2	0.786		
	TIE4	0.780		
SIE	SIE1	0.834	0.932	0.775
	SIE2	0.904		
	SIE3	0.929		
	SIE4	0.851		
PIE	PIE1	0.783	0.805	0.579
	PIE2	0.772		
	PIE3	0.728		
SNM	SNM1	0.805	0.842	0.641
	SNM2	0.871		
	SNM3	0.717		
PEN	PEN1	0.744	0.945	0.682
	PEN2	0.801		
	PEN3	0.851		
	PEN4	0.789		
	PEN5	0.835		
	PEN6	0.844		
	PEN7	0.866		
	PEN8	0.868		
PEU	PEU2	0.683	0.943	0.736
	PEU3	0.925		
	PEU4	0.863		
	PEU5	0.840		
	PEU6	0.911		
	PEU7	0.903		
PEC	PEC2	0.874	0.868	0.689
	PEC3	0.878		
	PEC4	0.729		
TRY	TRY1	0.837	0.859	0.672
	TRY2	0.727		
	TRY3	0.887		
ATT	ATT2	0.817	0.904	0.702
	ATT3	0.869		

Table 2 (continued)

Construct	Indicators	Loadings	Composite reliability (CR)	Average variance extracted (AVE)
	ATT4	0.840		
	ATT5	0.824		
BIN	BIN1	0.863	0.941	0.799
	BIN2	0.921		
	BIN3	0.875		
	BIN4	0.916		
FCN	FCN1	0.721	0.891	0.621
	FCN2	0.843		
	FCN3	0.824		
	FCN4	0.748		
	FCN5	0.796		
TCY	TCY2	0.872	0.894	0.738
	TCY3	0.876		
	TCY4	0.829		
CSE	CSE1	0.827	0.898	0.746
	CSE2	0.867		
	CSE3	0.895		

Structural model

Given the adequacy of the measurement model, as presented in the aforementioned section, we now turn our attention to the second stage of the modeling process: evaluation of the structural model. The predictive relevance (Q^2) coefficient values were all higher than the threshold value of zero; thus, denoting an acceptable level of predictive relevance (Kock 2015b). The final path estimation (to test the statistical significance of the proposed relationships between constructs) results are presented in Fig. 3. Coefficient of determination (R^2) values of 0.75, 0.50, and 0.25 are considered substantial, moderate, and weak, respectively (Hair et al. 2011). With an R^2 of 0.662 (moderate) for BIN, the antecedent constructs (ATT, CSE, FCN, PEN, PUS, TRY) explain 66.2% of the variance in BIN. Effect sizes (f^2) were assessed as follows: 0.35 (large), 0.15 (medium), and 0.02 (small) (Cohen 1988). The hypotheses testing results are summarized in Table 4.

Discussion

In the present study we explored the drivers of technology acceptance among an understudied sample, that is, Nepali school students. Ten out of 24 hypotheses were supported. Of the original TAM constructs, two (H2: PUS → BIN and H5: ATT → BIN) were not supported. We found support for the expected links between PUS → ATT ($\beta = 0.289$, $p < 0.001$) and PEU → ATT ($\beta = 0.212$, $p = 0.007$), as well as support for the contested link between PEU → PUS ($\beta = 0.378$, $p < 0.001$). These relationships are at the core of the TAM, and the absence of the links between PUS and BIN, and ATT and BIN presents an interesting

Table 3 Discriminant validity check

	PUS	JRE	TIE	SIE	PIE	SNM	PEN	PEU	PEC	TRY	ATT	BIN	FCN	TCY	CSE
PUS	**0.823**	0.469	0.120	0.258	0.383	0.344	0.580	0.612	0.494	0.456	0.505	0.456	0.279	−0.156	0.590
JRE	0.469	**0.830**	0.010	0.135	0.331	0.265	0.634	0.556	0.655	0.482	0.613	0.489	0.436	−0.234	0.394
TIE	0.120	0.010	**0.812**	0.758	0.445	0.362	0.219	0.135	−0.041	0.020	0.305	0.123	0.237	0.129	0.234
SIE	0.258	0.135	0.758	**0.880**	0.426	0.363	0.248	0.201	−0.019	0.180	0.307	0.156	0.277	0.090	0.302
PIE	0.383	0.331	0.445	0.426	**0.761**	0.415	0.566	0.397	0.257	0.444	0.447	0.525	0.363	0.008	0.318
SNM	0.344	0.265	0.362	0.363	0.415	**0.800**	0.412	0.357	0.363	0.289	0.349	0.243	0.374	0.162	0.374
PEN	0.580	0.634	0.219	0.248	0.566	0.412	**0.826**	0.667	0.633	0.679	0.734	0.748	0.320	−0.264	0.599
PEU	0.612	0.556	0.135	0.201	0.397	0.357	0.667	**0.858**	0.687	0.482	0.521	0.568	0.400	−0.333	0.779
PEC	0.494	0.655	−0.041	−0.019	0.257	0.363	0.633	0.687	**0.830**	0.489	0.466	0.478	0.464	−0.249	0.512
TRY	0.456	0.482	0.020	0.180	0.444	0.289	0.679	0.482	0.489	**0.820**	0.422	0.454	0.197	−0.091	0.375
ATT	0.505	0.613	0.305	0.307	0.447	0.349	0.734	0.521	0.466	0.422	**0.838**	0.578	0.369	−0.244	0.498
BIN	0.456	0.489	0.123	0.156	0.525	0.243	0.748	0.568	0.478	0.454	0.578	**0.894**	0.288	−0.256	0.493
FCN	0.279	0.436	0.237	0.277	0.363	0.374	0.320	0.400	0.464	0.197	0.369	0.288	**0.788**	−0.039	0.322
TCY	−0.156	−0.234	0.129	0.090	0.008	0.162	−0.264	−0.333	−0.249	−0.091	−0.244	−0.256	−0.039	**0.859**	−0.237
CSE	0.590	0.394	0.234	0.302	0.318	0.374	0.599	0.779	0.512	0.375	0.498	0.493	0.322	−0.237	**0.864**

The square root of the AVEs are highlighted in bold along the diagonal

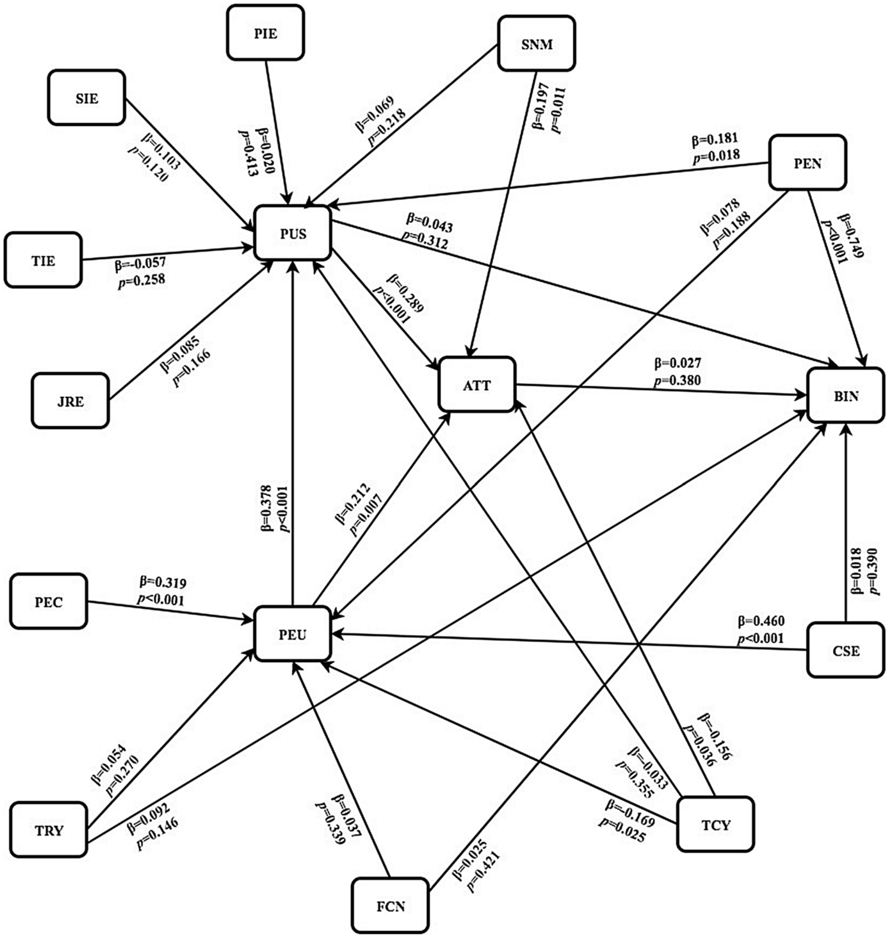

Fig. 3 PLS results

dilemma. If neither perceived usefulness nor attitude (towards the technology in question) are related to behavioral intention, then we must wonder what links drive behavioral intentions to use the internet for learning in the context low ICT penetration, offered by the specific Nepali context. In the original formulation of the TAM, these links are presented as central to the acceptance of new technologies. However, they do not appear salient in the present sample. This suggests that other factors are driving students' use of the Internet for learning.

Contrary to the original TAM formulation, we found that Nepali high school students' use of the Internet for learning appears motivated by perceived enjoyment rather than perceived usefulness. This is contrary to findings about the use of computers for learning in more developed countries (Doleck et al. 2017b) where it has been found that attitudes are more strongly influenced by perceived usefulness compared to perceived ease of use, where perceived usefulness, but not perceived ease of use, influences behavioral intention.

The picture that is presented by the remaining significant relationships describe a situation where using the internet for learning by Nepali high school students is moderated

Table 4 Hypotheses testing

Hypothesis	Path	Path coefficient (β)	p value	Effect size (f^2)	Result
H1	PUS → ATT	0.289	$p<0.001$	0.158	Supported
H2	PUS → BIN	0.043	$p=0.312$	0.021	Not supported
H3	PEU → ATT	0.212	$p=0.007$	0.116	Supported
H4	PEU → PUS	0.378	$p<0.001$	0.243	Supported
H5	ATT → BIN	0.027	$p=0.380$	0.016	Not supported
H6	CSE → PEU	0.460	$p<0.001$	0.359	Supported
H7	CSE → BIN	0.018	$p=0.390$	0.009	Not supported
H8	TCY → PEU	−0.169	$p=0.025$	0.075	Supported
H9	TCY → PUS	−0.033	$p=0.355$	0.007	Not supported
H10	TCY → ATT	−0.156	$p=0.036$	0.063	Supported
H11	TRY → PEU	0.054	$p=0.270$	0.027	Not supported
H12	TRY → BIN	0.092	$p=0.146$	0.043	Not supported
H13	PEC → PEU	0.319	$p<0.001$	0.231	Supported
H14	FCN → PEU	0.037	$p=0.339$	0.015	Not supported
H15	FCN → BIN	0.025	$p=0.421$	0.008	Not supported
H16	JRE → PUS	0.085	$p=0.166$	0.046	Not supported
H17	PEN → PEU	0.078	$p=0.188$	0.056	Not supported
H18	PEN → PUS	0.181	$p=0.018$	0.110	Supported
H19	PEN → BIN	0.749	$p<0.001$	0.565	Supported
H20	SNM → PUS	0.069	$p=0.218$	0.025	Not supported
H21	SNM → ATT	0.197	$p=0.011$	0.083	Supported
H22	PIE → PUS	0.020	$p=0.413$	0.009	Not supported
H23	SIE → PUS	0.103	$p=0.120$	0.034	Not supported
H24	TIE → PSU	−0.057	$p=0.258$	0.014	Not supported

by a sense of personal fluency and institutional norms. Specifically, we found that computer self-efficacy, technological complexity and perceived external control influences perceived ease of use (CSE → PEU, $\beta=0.460$, $p<0.001$; TCY → PEU, $\beta=-0.169$, $p=0.025$; PEC → PEU, $\beta=0.319$, $p<0.001$). Technological complexity and subjective norm are related to attitudes (TCY → ATT, $\beta=-0.156$, $p=0.036$; SNM → ATT, $\beta=0.197$, $p=0.011$). Further, we found that perceived enjoyment was related to perceived usefulness and behavioral intention (PEN → PUS, $\beta=0.181$, $p=0.018$; PEN → BIN, $\beta=0.749$, $p<0.001$). Thus, feeling fluent enough in the use of the internet for learning—not finding it too complex—is related to perceptions of ease of use and positive attitudes, and perceived enjoyment is related to attitudes and behavioral intention. However, we note that perceptions of external control and subjective norm still moderate perceptions of ease of use and attitudes. This is expected in an institutional environment where use of technology is often constrained by external administrative and instructional decisions. Most of the effects are relatively small but for the link between perceived enjoyment and behavioral intention ($f^2=0.565$) and computer self-efficacy and perceived enjoyment ($f^2=0.359$) which suggests that perceived enjoyment may be a strong driver of using the internet for learning in contexts of low penetration of ICT infrastructure.

Keeping in mind that CBLEs can be radically different from using the internet for learning purposes, it is noteworthy that the central relationships are so starkly different; the link from perceived enjoyment to behavioral intention presents the strongest effect in the Nepali context, whereas the link from perceived usefulness to behavioral intention appears strongest in the North-American context. This suggests that level of ICT infrastructure development may influence the relative importance of perceived ease of use and perceived usefulness and moderate the relationship on attitude and behavioral intention. This is similar to other recent findings that have explored the uptake of technological innovations in developing countries, where perceived ease of use appears as a strong determinant of behavioral intention (Park et al. 2009) and external, interpersonal, socio-economic influences have an important effect on perceived ease of use and behavioral intention (Abbas 2016; Hamner and Qasi 2009; Musa, 2006; Tarhini et al. 2013, 2017).

In this respect, we evoke the contextual sensitivity of the TAM to understand the varying relationships that prevail (Doleck et al. 2017a, b; Bhuasiri et al. 2012; Musa 2006). In previous studies (Doleck et al. 2017c; Lemay et al. 2017), it has been argued that situational factors can moderate core TAM relationships by influencing the modalities of the underlying beliefs such that one's technology acceptance behavior will be determined by beliefs exhibiting a variety of modalities, including necessities or affective beliefs (i.e., needs), beliefs exhibiting a degree of certainty (i.e., conditions of use), or beliefs about probabilities or likelihoods (i.e., expectancies). Thus, given the contextual sensitivity and the diversity of external factors shown to influence the core TAM relationships (King and He 2006), such as subjective norm, perceived external control, or facilitating conditions (Venkatesh and Bala 2008; Venkatesh et al. 2003), it is expected that different technology acceptance situations have differential effects on the model. Hence, we can ask what factors are different between the two situations presented by the North American and Nepali contexts, such that the present differential effects are observed? We argue that situations vary at least in one important way, that is, in terms of the degree of voluntariness (i.e., awareness) of the proposed technology use. The students in the present sample report a degree of institutional influence on their perceptions of the ease of use of the internet for learning and behavioral intention is strongly influenced by perceived enjoyment. The findings suggest that Nepali students can benefit from training in exploiting internet resources for learning. In the North American study (Doleck et al. 2017b), students were surveyed on their voluntary use of CBLEs for learning. Their concerns were related to perceived usefulness, and not perceived ease of use, which suggests at least a passing familiarity with the technology. In terms of situational differences, the Nepali sample suggests that using the internet for learning is driven by institutional motives affecting perceptions of ease of use and enjoyment over usefulness, whereas voluntary use of CBLEs in the North-American sample was driven by personal perceptions of usefulness over ease of use. One way to interpret the difference is that Nepali high school students are developing fluency in using the internet for learning and are not yet being influenced by perceptions of usefulness. Thus, contrasting links between perceived ease of use, enjoyment, and usefulness appear to be modulated by degree of adoption of technologies which influence students' acceptance behaviors in terms of their agency, or their potential for intentional use of the technology. It will be interesting to revisit these differences as the field of ICT matures in Nepal and internet-based education technologies become prevalent in Nepali classrooms. A more longitudinal perspective may shed light on how relationships between antecedent factors to technology acceptance evolve over time and between contexts.

Contributions of this study

This study makes contributions to both theory and practice. The present study adds to our understanding of technology acceptance by providing support for the situated perspective. It also reinforces the cross-cultural generalizability of TAM (King and He 2006) as it captures interesting differences relating to the relative importance of perceived usefulness, perceived ease of use and perceived enjoyment in different contexts of ICT infrastructure development. In practice, the findings of this and similar studies could inform stakeholders in making decisions about technology acceptance, specifically how to support implementations of educational technology, both in Nepal and internationally.

Limitations of the study

There are some limitations that must be acknowledged. The study was conducted with a small and specific sample, and thus, issues of generalizability are a natural concern. Future studies ought to use different sampling methods. It is desirable to augment the TAM and to investigate other salient constructs across different contexts. It should be noted that we studied a specific case of technology use, that is, internet for learning. Future work ought to investigate acceptance of a variety of technologies, systematically varying situational factors, including but not limited to infrastructure support for ICT. Further, using self-reported data is known to have limitations as it is inherently subject to rater bias which can impact results. Thus, the findings must be interpreted cautiously. Another limitation is our use of a cross-sectional design, which precludes any conclusions beyond interpretations of general relatedness among constructs in the conceptual model. Finally, we did not survey actual use, and while behavioral intention and reported use are correlated, there can be quite a bit of variability between an intention to use and actual reported use. We do not make claims regarding actual incidence of usage, only examine the relationships between antecedent beliefs informing attitudes and behavioral intentions. Recent work has called for comparing different acceptance contexts to better understanding the influence of situational factors on other antecedents of use in investigating technology acceptance (Doleck et al. 2017c, 2018). Future work ought to use more longitudinal, randomized, quasi-experimental, and experimental designs to capture the situational and contextual variability of the TAM along temporal trajectories of technology acceptance to generalize the findings to a larger population.

Conclusion

This study documented the antecedent factors of Nepali school students' use of internet for learning. The results provide strong empirical support for the proposed model. Overall, the research model helped explain 66.2% (R^2 of BIN was 0.662) of variance in intentions to use the internet for learning. Yet, we did not find support for nearly half of the hypothesized relationships in the research model. The strongest relationships were observed between computer self-efficacy and perceived enjoyment ($f^2 = 0.359$) and perceived enjoyment and behavioral intention ($f^2 = 0.565$). In this context, perceptions of enjoyment appear more salient than perceptions of usefulness on behavioral intentions, though not necessarily on attitudes. This is interpreted as arising from situational factors distinguishing the context, namely in terms of the penetration of ICT in Nepal and the integration of computer-based online educational technologies in Nepali schools.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Appendix A

Perceived usefulness
Using Internet would enable me to accomplish my homework more quickly
Using Internet will improve my performance
Using Internet will increase my productivity
Using Internet will enhance my effectiveness
Internet is useful to my learning
Compared to previous practices, using Internet improves the quality of my learning
Compared to previous practices, using Internet enhances my effectiveness in doing my homework
Compared to previous practices, using Internet increases my productivity
Perceived ease of use
I can use Internet to learn easily
I can learn to use new Internet easily
Learning to use Internet is easy for me
I find it easy to use Internet to do what I want
My interaction with Internet does not require much effort
It is easy for me to become skillful at using Internet
I find Internet easy to use
Compared to previous practices, using Internet makes it easier for me to do my homework
Computer self-efficacy
I can use Internet even if there is no one to teach me
I can use Internet with minimal help
I can figure out (learn) how to use Internet on my own
Technology complexity
Using Internet takes up too much of my time
Learning with Internet is so complicated that it is difficult to understand what is going on
It takes too long to learn how to use Internet such that it is not worth the effort
Using Internet is a complex activity
Subjective norm
People who influence my behavior think that I should learn with Internet
People who are important to me think that I should learn with Internet
The people whose views I respect support learning with Internet

Perception of external control
I have control over my use of Internet
I have the knowledge necessary to use Internet
Given the resources, opportunities and knowledge, it is easy for me to use Internet
Using Internet is compatible with the values I hold about my learning process
Facilitating conditions
When I encounter difficulties in using Internet, guidance is available to me inselecting a website to use
When I encounter difficulties in using Internet, specialized instruction concerning Internet is available to me
When I encounter difficulties in using Internet, a specific person is available to provide assistance
When I encounter difficulties in using Internet, I know where to seek assistance
When I encounter difficulties in using Internet, I am given timely assistance
Job relevance
Using Internet matches the way I learn
Using Internet is consistent with my beliefs about learning
Using Internet does not significantly change my existing learning routine
Attitude
Once I start using Internet, I find it hard to stop
I look forward to those aspects of learning that require the use of Internet
I like learning with Internet
I have positive feelings towards the use of Internet
I think it is a good idea to use Internet
Perceived enjoyment
Using Internet makes learning more interesting
Using Internet for learning is fun
I have fun using Internet
Using Internet is pleasant
I find using Internet to be enjoyable
I find learning with Internet to be enjoyable
The actual process of learning with Internet is pleasant
I have fun learning with Internet
Triability
If I heard about a new technology, I would look for ways to experiment with it
Among my peers, I am usually the first to try out new technology
I like to experiment with new technology
School influence
The school is committed to a vision of using Internet in learning
The school is committed to supporting my efforts in using Internet for learning
The school strongly encourages the use of Internet for learning
The school will recognize my efforts in using Internet for learning
The use of Internet for learning is important to the school
Teacher influence
My class teacher thinks that using Internet is valuable for learning
My class teacher’s opinions are important to me
If my class teacher has started to use Internet support his/her teaching, I would be encouraged to use Internet to learn
The teachers in my school support the learning with Internet

Peer influence	
My classmates think that using Internet is valuable for learning	
My classmate's opinions are important to me	
If most of my classmates have started to use Internet to support their learning, this fact would press me to do the same	
Behavorial intention	
I intend to learn using the Internet in the future	
I expect that I would learn with the Internet in the future	
I expect that I would learn with the Internet in the future	
I plan to learn with the Internet in the future	

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