The two perfect scorers for technology acceptance

Pritika Reddy[1] (iD) · Kaylash Chaudhary[2] · Bibhya Sharma[2] · Ronil Chand[1]

Abstract

This research paper examines the acceptance of technology for learning by senior secondary school students and university newcomers. The objectives of the study are to measure the computer competency, computer self-efficacy of selected student cohorts on the acceptance of technology for learning. The study uses the extended Technology Acceptance Model (TAM) with two additional attributes, computer competencies and computer self-efficacies to examine students' behavior towards learning with technology. Two sets of data were collected; one was from Year 12 and Year 13 students from 33 secondary schools in Fiji, and the other from newcomers of a regional university in the South Pacific. The cohorts were surveyed with a unipolar Likert scale 1–5 questionnaire. The results were analysed using the "Statistical Package for the Social Sciences" – SPSS software and the proposed extended TAM model was analysed using the Smart Partial least squares (SmartPLS) software. The results from the regression analysis confirmed that the two attributes had a significant positive impact on the acceptance of the technology, that is, computer competency and computer self – efficacy were significant predictors of students' intention to continue using technology for learning. Therefore, a new model incorporating the two perfect scorers is designed and presented in this paper. The high values for Cronbach's alpha also show that the results were reliable and valid. Finally, the study shows that computer competencies and computer self-efficacies are essential contributors to the continuous use of technology for learning.

Keywords Technology acceptance · Higher education · Extended TAM · Computer self-efficacy · Computer competency

1 Introduction

The rapid evolution of technology continues to permeate into every aspect of human livelihood, evolving and enhancing the associated systems and processes, and

✉ Pritika Reddy
   pritikareddy26@gmail.com

Extended author information available on the last page of the article

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improving the quality of human lives. The new digital technologies have interconnected the Internet, the resources and the people worldwide. Also, new forms of knowledge accumulation have been developed, and the new computer-based learning systems have opened ways to innovative modes of instructions and learning (Sakarji et al. 2019; Sharma et al. 2019a; Gokcearslan 2017; Sharma and Reddy 2015; Park et al. 2012). Such developments have provided the higher education institutes multiple significant opportunities to seek new and better approaches to learning and teaching to meet the demand of lifelong learning, self-management and development of human potential (Sakarji et al. 2019; Sharma et al. 2018). There has been an accelerated growth in adoption and adaptation of technology by the education institutes in this digital age (Reddy et al. 2020c; Reddy et al. 2016; Sharma and Reddy 2015; Nassuora 2013) therefore it becomes crucial to identify user acceptance of technology and student's computer competencies and self- efficacies in using these technologies for learning (Cacciamani et al. 2018; Park et al. 2012).

The education institutes have integrated technology within the learning environment to take advantage of the benefits technology brings with it such as improving classroom facilitation and delivery, and enhancing student's learning (Nassuora 2013), data-driven interventions, reaching non-traditional students, creation of new teaching models and deliveries (Sharma et al. 2019a; Sharma et al. 2019b; Sharma et al. 2018). According to (Cacciamani et al. 2018), the acceptance of technology in education is necessary for its successful implementation. Identifying the user acceptance of technology can help the management personnel of education institutes to derive new and innovative methods to improve services provided to the students (Sakarji et al. 2019). In parallel, there should be a depth understanding of student's competencies and self-efficacies of these technologies.

User acceptance is the ability of users to adapt to innovation, an individual's intention to use the present technology (Cacciamani et al. 2018; Gokcearslan 2017). In research, the Technology Acceptance Model (TAM), the extended version of TAM, the Unified Theory of Acceptance and Use Technology (UTAUT) are the best models to explore the acceptance of technology (Sakarji et al. 2019; Joo et al. 2018; Lai 2017). From the models mentioned above, the most popular and widely used model is TAM because of its effectiveness and ability to explain the acceptance behaviour with few predictor variables (Tao et al. 2019; Cacciamani et al. 2018). Researchers are also using the extended TAM to predict user behaviour to the continuous use of technology with the external variables varying for each case study. For example, system quality, perceived self-efficacy and facilitating conditions used as external variables for a case study in Jordon (Fathema et al. 2015), self-efficacy, enjoyment, experience, computer anxiety and subjective norm as external variables in a study conducted by (Abdullah 2016), quality of work-life; social norm; facilitating conditions and self-efficacy as external variables for a study conducted on eLearning acceptance (Ali et al. 2016), user awareness as an external variable in a study on user acceptance of social learning systems in higher education (Akman and Turhan 2017), computer self-efficacy, subjective/social norm, perceived enjoyment, system quality, information quality, content quality, accessibility, and computer playfulness as external variables in a study conducted in UAE (Salloum et al. 2019), and computer self-efficacy and perceived enjoyment as external variables for a study conducted in Nepal (Teo et al. 2019). These

examples are few of the many case studies that have been conducted using the extended TAM for predicting user intention and user behaviour.

Although TAM is a recognised model and has been used in various aspects, including education or eLearning acceptance all over the world, very few research has been done on technology acceptance using the TAM in the South Pacific. Therefore, this paper attempts to bridge the gap in the knowledge that TAM can be used to evaluate learners intention and willingness to accept online learning systems. This study adopted the extended version of the Technology Accepted Model (TAM) with computer competency and computer self-efficacy, *the two perfect scorers*, as the external variables to determine the continuous use of technology by the students who are about to enter universities and students who are into their first year of courses at the university. To the best of the authors' knowledge, this is the first paper that uses computer competency and computer self- efficacy together as external variables of TAM to address the issue of the continuous use of technology for learning particularly in the South Pacific, particularly in Fiji. The model uses Perceived Ease of Use (PEU) and Perceived Usefulness (PU) to describe the intention to use a given tool (Gokcearslan 2017; Park et al. 2012). The term computer self-efficacy has been defined by (Malliari et al. 2012; Kurbanoglu, 2003a, b) as a combination of one's ability to do a given task plus degree of confidence one has in the task. Since computer self-efficacy affects the attitude and perception of individuals towards technology, researchers consider it as an important construct in the academic learning environment. On the other hand, computer competency is a set of knowledge and skills that students possess to allow them to perform their task ethically, securely and responsibly (Gonzalo et al. 2018; Baturay et al. 2017). Since technology is permeating into and significantly penetrating the education system, for its successful and maximum utilisation, the acceptance of technology, student's computer competencies and self-efficacies need to be known before its implementation and usage.

Since the two prefect scorers are playing a pivotal role in the learning processes in the technology-driven era, the authors decided to use these as external variables for TAM to evaluate their impact on the continuous usage of technology for learning. The study was piloted to the Year 12 and Year 13 students of high school and the freshmen at an HEI as these students are new to the technology-driven education system. Their feedback is utmost important so that the relevant stakeholders can improve the teaching and learning process to suit the students need (Ali et al. 2016). Since researchers have interlinked the terms technology acceptance, computer competency and computer self-efficacy, a regression analysis has also been carried out to see impact factor of computer competency and computer self-efficacy on the technology acceptance.

1.1 Literature review

The acceptance of technology is an area where several models provide explanations about the acceptance of technological innovations. In research on the acceptance of technology, TAM, UTAUT and modified UTAUT were some of the most famous models used. According to (Tao et al. 2019; Cacciamani et al. 2018; Adwan et al. 2013; Shroff et al. 2011) one of the most influential amongst the models specifically designed for computer acceptance is the TAM. Davis initially developed the Technology Acceptance Model (TAM) in 1989 from the Theory of Reasoned Action (TRA) which

was developed by Fishben and Ajzen in 1975 (Tao et al. 2019; Cacciamani et al. 2018; Rabaa 2016; Teo 2016; Adwan et al. 2013). The TRA model explained the general human behaviour, which was driven by behavioural intention- one of the functions of an individual's attitudes and subjective norms (Adwan et al. 2013). Researchers have also posted that TRA model suggested that intention is the main determinant of an individual's behaviour whereas intention to behave is determined by an individual's attitude towards the behaviour and their perception about the subject (Tao et al. 2019; Cacciamani et al. 2018; Rabaa 2016; Teo 2016; Kulviwat et al. 2013; Al-Haderi 2013). On the other hand, TAM explained the determinants of computer acceptance that played a pivotal role in explaining user behaviour (Rabaa 2016). The TAM claims that the actual use of technology depends on the person's intention to use it, which is influenced by the attitude towards usage. Two factors determine this attitude; perceived usefulness (PU) and perceived ease of use (PEU) (Kumar and Mohite 2017). According to (Sakarji et al. 2019) PU refers to the degree to which the user believes using the technology will improve his/her performance while PEU refers to how effortlessly he/she perceives using the technology will be. The factors PEU and PU represent the attributes or characteristics of the system, such as the users' beliefs and attitude towards the system (Shroff et al. 2011). These authors also state that PU and PEOU can be manipulated so that the system developers can have better control over the users' beliefs about the system. Attitude refers to the behaviour, beliefs and perception about the system or technology (Akman and Turhan 2017; Adwan et al. 2013; Shroff et al. 2011). Prior research shows that if students have a positive attitude towards the use of technology, then they will have the intention to continue using technology or the new system (Gonzalo et al. 2018; Baturay et al. 2017; Akman and Turhan 2017; Rabaa 2016; Malliari et al. 2012). Since TAM was more popular than other models due to its ability to explain user acceptance more clearly, it was applied into many contexts such as World Wide Web (WWW), mobile banking, multimedia, health care and recently widely used in the education sector to investigate the user acceptance of technology (Teo 2016; Adwan et al. 2013). However, there have been criticisms of and arguments against the TAM, the notion that the model excluded some important resources, does not consider challenges such as time and money that can be constraints to individuals and fails to provide meaningful information about user acceptance (Teeroovengadum et al. 2017; Rabaa 2016; Teo 2016; Yeou 2016). As such, researchers suggested the addition of external variables to TAM as including more variables or dimensions to the model would have enhanced the specificity and explanatory utility of the model (Tao et al. 2019; Rabaa 2016; Teo 2016). To make the TAM more robust, the researchers, Venkatesh and Davis (1996), proposed a modified TAM which included the external variables (Sakarji et al. 2019; Tao et al. 2019) which is shown in Fig. 1.

   In recent years, TAM has been applied to study student's attitude towards computers in education institutes. Some of the major studies that have been conducted using TAM include; examining ICT adoption in education using the extended TAM (Teeroovengadum et al. 2017), acceptance of mobile learning (Yu and Xiaozhi 2019), expanding the TAM to examine faculty use of learning management systems in HEIs (Fathema et al. 2015), analysis of the use of social media HEIs using the TAM (Dumpit and Fernandez 2017), determinants of eLearning acceptance in higher education environment based on extended TAM (Mushasha 2013), predictors of faculty acceptance of online education (Stewart et al. 2010), decision to adopt online
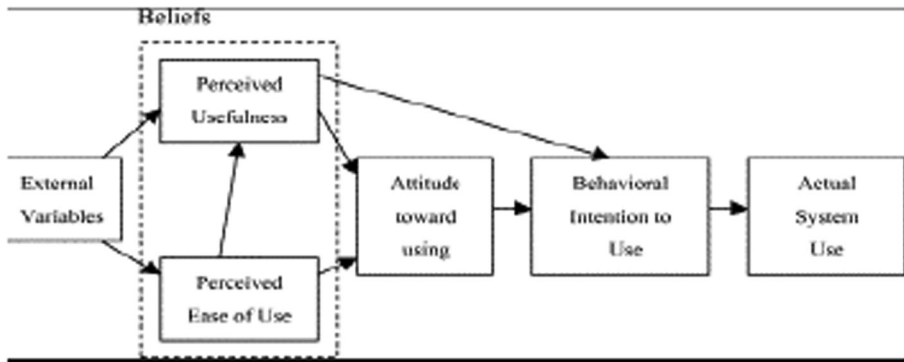
Fig. 1 The extended TAM developed by Venkatash and Davis (1986). Adopted from (Hsu and Lu 2004)

collaborative learning tools in higher education of top Malaysian universities (Yadegaridehkordi et al. 2019), and an empirical study on the identification of driving factors of satisfaction with online learning based on TAM (Shao 2020). All these studies were conducted using the extended TAM where the external variables for each study differed. The extended TAM was modified based on the following claims; researchers were closely linking technology acceptance with computer competency and computer self-efficacy (Elstad and Christophersen 2017; Kurbangolu 2003a), the extensive use of new digital devices by the people and the need for individuals to have relevant literacies to use the new digital devices. Since computer competency and computer self-efficacy were playing a pivotal role in the technology-oriented higher education system, the authors propose to test the extended TAM model given in Fig. 2. Since this study forms the foundation of using the extended TAM to evaluate the acceptance of technology in the South Pacific context, the authors agreed to use only two predictors. Further studies are recommended to add more constructs to predict learner intentions to continue using technology for learning.

The term self- efficacy has been defined as an individual's belief in one's capabilities to organise and execute the course of action required to attain a goal (Elsatd, 2017; Alshammari et al. 2016; Hatlevik 2016). Therefore, computer self-efficacy has been defined as an individual's perception or feelings of their capabilities in performing computer-related tasks (Loar 2018; Howard 2014). The higher levels of computer self-efficacy are associated with higher levels of self-awareness and consequently, an increased ability and willingness to learn with the use of computers (Rohatgi et al. 2016). Hence, computer self-efficacy plays a vital role in self – motivation because it
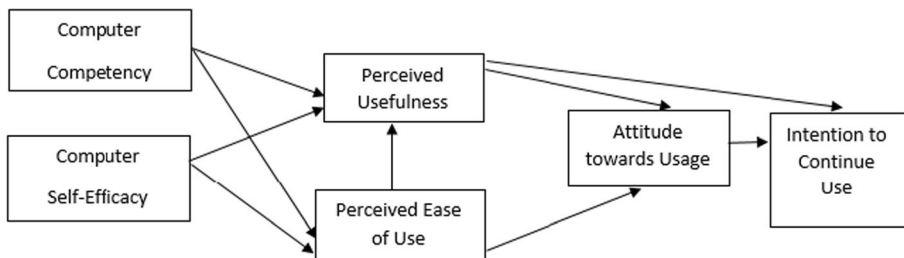

Fig. 2 A new extended TAM proposed for the current study

can influence decisions about what behaviours to undertake. Kulviwat et al. (2013) postulate that self – efficacy holds an important factor of the TAM as it influences the PU and PEU. This was confirmed by the authors (Joo et al. 2018; Baturay et al. 2017; Zheng et al. 2017; Chang and Tseng 2012) who in their research stated that computer self-efficacy influences PU and PEU. However, Latikka et al. (2019); Al-Haderi (2013) believe that computer self- efficacy has no significant effect on PU and PEU. Literature shows that computer self-efficacy is vital for online learning environments. Alqurashi (2016) stated that computer self-efficacy is a significant predictor of student satisfaction and intention to use technology in the future. A study conducted by Dar et al. (2018) also showed that computer self-efficacy had a significant effect on PU, PEOU and attitude towards technology usage. The authors mentioned above also stated that studies that were conducted on technology acceptance about a decade ago showed that computer self-efficacy did not have significant effects on the continuous use of technology. Since the use of technology in the education field has shown an exponential increase in the last ten years, computer self-efficacy now hugely impacts students attitude and intention to use technology for learning (Dar et al. 2018; Elsatd, 2017; Alshammari et al. 2016; Al-Haderi 2013). Moreover (Bai 2017), added that computer self-efficacy is needed so that students become confident in using the digital technologies embedded for learning purposes and as a result, become competent professionals in the digital era. Research also showed that students with higher computer self-efficacy are more likely to have positive learning experiences, better control of learning pace, better time management and better content understanding, and are less likely to be at risk of failing.

On the other hand, students with lower computer self-efficacy are more likely to find the topics difficult and fail the course as they are not able to cope with learning with computers (Joo et al. 2018; Baturay et al. 2017; Elsatd, 2017; Alshammari et al. 2016). Hence, computer self-efficacy becomes one of the external variables to the extended TAM model. To the authors' knowledge, computer self-efficacy is needed and very important for today's technology-driven education system, hence must significantly contribute to the extended TAM model.

The other important factor highlighted in the literature for technology acceptance is computer competency. According to (Wei et al. 2016), the decision to accept and use new technology is related to the skills and knowledge one has regarding how to operate that technology appropriately. This set of skills and knowledge is termed as computer competency (Baturay et al. 2017; Malliari et al. 2012). The individuals are active agents in shaping their careers; therefore, it is assumed that when people are confident about being able to complete a task, there is more willingness to direct their attention to the task (Hatlevik 2016). Ifinedo (2019) states that an individual's computer competency is the most important constructs that are related to the use and acceptance of the technology. The students need to be computer competent so that they can enjoy using the technologies and hence have a positive attitude towards the given technology (Elsatd, 2017; Alshammari et. al 2016; Ifinedo 2019). In the digital era, computer competency also plays an important role for the students to complete their higher education learning journey because today, almost all the higher education institutes around the globe have adopted the eLearning system. The students with high computer competency tend to be more satisfied with the eLearning system and are more creative in the ways they use technology for learning and achieving tasks assigned to them

(Reddy et al. 2020b; Reddy et al. 2020c; Alshammari et al. 2016; Du 2004). There are many studies which have included computer self-efficacy as a construct of the TAM. However, the construct computer competency as part of TAM has been studied only by a few researchers. The authors perceive that computer competency also plays a pivotal role in this digital era and must be considered when students intend to continue using technology for learning is being studied. Hence, for the current study, computer competency has been added as the second external variable to TAM.

Studies from the recent past conducted on computer self- efficacy and computer competency showing their importance for the continual usage of technology for learning are:

i.   a study conducted by Alharbi and Drew (2019) showed that computer self-efficacy is a vital component in accessing students continuous use of technology or eLearning (Alharbi and Drew 2019).
ii. a study conducted by (Ibrahim et al. 2017) showed that computer self-efficacy has effects on the ease of use and is one of the success factors for eLearning.
iii. a study conducted by (Zainab et al. 2017) showed that computer self-efficacy is an important attribute in eLearning adoption.
iv. a study conducted by (Mastuti and Handoyo 2019) showed that computer competency impacts an individual when it comes to performing computer-based tasks and also affects one's anxiety.
v.   a study conducted by (Ajayi et al. 2017) used self-efficacy and other variables to construct a new model for TAM to evaluate technology acceptance.

The authors of the current paper note from the studies as mentioned earlier that the attributes-computer competency and computer self-efficacy have been used individually but not together to evaluate technology acceptance. The authors believe that both variables play an important role in evaluating technology acceptance. Therefore, the extended TAM was modified in this paper by adding computer competency and computer self-efficacy as the external variables to the model, hence proposing a new extended TAM model.

In this digital era education institutes are increasingly integrating technologies for effective and efficient learning and teaching, highlighting the fact that students need to be competent and have self-efficacy towards the use of these technologies (Reddy et al. 2020c; Sharma et al. 2019b; Baturay et al. 2017; Malliari et al. 2012). Research on student perception, student readiness, technology acceptance in education, measurement of student's ICT competencies has been ongoing worldwide. Prior research conducted on technology acceptance using varied models mentioned in this paper shows that student attitude influences acceptance of technology (Cacciamani et al. 2018; Joo et al. 2018; Baturay et al. 2017; Nassuora 2013). The studies conducted by (Latikka et al. 2019; Gokcearslan 2017; Hatlevik 2016; Kulviwat et al. 2013; Al-Haderi 2013) show that self-efficacy is an important determinant in technology acceptance. In the South Pacific, studies have also been conducted on student's readiness and perception to eLearning and mLearning (Reddy et al. 2020a;Reddy et al. 2020c, Reddy et al. 2017a, Reddy et al. 2016, Sharma and Reddy 2015) and the use of technology for learning (Sharma et al. 2019a; Sharma et al. 2019b; Raturi 2018; Reddy et al. 2017b). There is no baseline study conducted on the two most important constructs – computer competency and computer self-efficacy, which play an important role in retaining students at higher education. The

study outlines and describes each construct- computer competency and computer self-efficacy and acceptance of technology in detail as these were missing in the previous studies conducted. Therefore, the present study becomes a baseline study on the contributions of computer competency and computer self-efficacy towards the acceptance of learning with technology in the South Pacific.

1.2 Research objectives

The specific objectives of the current study are as follows:

i.   to assess computer competency, computer self-efficacy and acceptance of technology of the chosen sample.
ii. to evaluate if computer competency and computer self-efficacy have any impact on the acceptance of the technology.

1.3 Research hypothesis

According to literature, an individual's computer competency and computer self-efficacy has a significant impact on the acceptance of a given tool or technology. Therefore, the hypothesis for this study is:

H: Computer competency and computer self-efficacy have a positive impact on the acceptance of given technology and its continuous use.

1.4 Methodology

For the present study, a case study methodology and a quantitative research design were used to collect data from the high school and the first-year university students-USP Freshmen. We used the extended TAM model which was developed by Venkatesh and Davis (1996) whereby PEU and PU were used to determine the acceptance of technology for learning with computer competency and computer self-efficacy as external variables. The high school sample was from Year 12 and Year 13 students from 33 secondary school in Fiji while the sample of the university students was from a regional university- The University of the South Pacific (USP). The USP is owned by the governments of 12 countries in the South Pacific region: Cook Islands, Fiji, Kiribati, Marshall Islands, Nauru, Niue, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu and Samoa with its main campus based in Laucala, Suva. The USP provides higher education to more than 29,000 students studying from 14 campuses and ten centres spread in an area of 30 million square kilometres in the Pacific Ocean (Sharma et al. 2018). The hub of the university is located in Suva, Fiji. A survey methodology was used whereby a unipolar Likert scale 1–5 questionnaire was used to collect the data. According to the Information system literature review and prior studies that have been conducted, the best type of questionnaire that can be used to collect data on PEU and PU is a 5 point Likert scale questionnaire ranging from strongly disagree to strongly agree (Dar et al. 2018; Bai 2017; Elsatd, 2017; Alshammari et al. 2016).

The questionnaire for the current paper was pre-tested with a sample of 120 students for validity and reliability. The Cronbach alpha value of 0.89 indicated that the

questionnaire was valid and reliable. A total of 1385 university students and 1281 high school students participated in the survey. The "Statistical Package for the Social Sciences" – SPSS software was used for the analysis. The standard deviation and mean ($\overline{x}$) for computer competency and computer self-efficacy were calculated and compared. The TAM model was used to define the factors for acceptance and mean, and standard deviation for acceptance was calculated. A Cronbach's alpha test was carried out to test the validity and reliability of the results. A simple linear regression analysis was conducted to test the hypothesis of this research, that is if the computer competencies and self-efficacies had any effect on the accepted notion of technology. For this analysis, acceptance of technology was the dependent variable, and computer competency and computer self-efficacy were the independent variables. Also, a Structural Equation Modeling (SME) was used to test the relationship in the hypothesises theoretical model using the Smart Partial least squares (SmartPLS) software. The PLS-SME analysis was used to evaluate the path coefficients through multiple regression, and this showed the influence of each variable on one another.

1.5 Data set

The dataset consisted of 1385 rows and 48 variables for university students and 1281 rows and 48 variables for the high school students. There were a total of 28 questions for computer competency, seven questions for computer self-efficacy and 13 questions for technology acceptance. The questions on computer competency and computer self-efficacy were adopted from the previous studies done by the researchers (Latikka et al. 2019; Baturay et al. 2017; Gokcearslan 2017; Hatlevik 2016; Rohatgi et al. 2016; Malliari et al. 2012). Computer competency and computer self-efficacy were chosen as external variables of the proposed new extended TAM because, in this growing world of the technology-oriented living, one needs to be computer literate- have relevant skills to use the available technology and the Internet (Reddy et al. 2020a; Reddy et al. 2020b). Computer competency, therefore, becomes a necessity for the learners as they are part of the technology-oriented teaching and learning environment. Together, with the fact that one needs to be computer literate, computer self-efficacy is also equally important. According to the literature, an individual needs to believe that he/she can use computers to complete a given task (Loar 2018; Rohatgi et al. 2016; Howard 2014). The authors of this paper strongly believe that an individual will only continue to use technology if he/she knows how to use it and believe that he/she has relevant skills to use technology to complete the chosen tasks. Therefore, computer competency and computer self-efficacy become the two perfect scorers for technology acceptance. The above claims are also supported in the literature. However, the two perfect scorers have been used independently not together to evaluate students' attitude towards technology-supported learning (Reddy et al. 2020c; Baturay et al. 2017; Wei et al. 2016; Malliari et al. 2012). The current paper has used the two perfect scorers as external variables, meaning the two attributes effectively contribute or are the deciding factors towards the acceptance and continued use of technology.

The questions on the acceptance of technology based on PU and PEU that is, from A1- A13 were also adopted from the previous studies conducted on PU and PEU (Cacciamani et al. 2018; Gokcearslan 2017; Alshammari et al. 2016; Fathema et al. 2015; Mushasha 2013). The section on technology acceptance was divided into

Perceived Ease of Use (PEU) which consisted of 6 variables and Perceived Usefulness (PU), which consisted of 7 variables. The description of the variables used in this study is tabulated in Table 1, where 'SC' = Computer Competency, 'E' = Self-Efficacy, 'A' = Attitude, 'PU' = Perceived Usage, 'PEU' = Perceived Ease of Use (Table 2).

2 Results and discussion

Table 3 shows the descriptive statistics for the construct computer self- efficacy of the Year 12 and Year 13 students and the USP Freshmen. The variables E1- E7 represents items based on the computer self- efficacy of the students. It included questions on student's perception of how confident they were in performing computer-related tasks. The Likert scale used was 1–5 where 1 = 'Strongly disagree', 2 = 'Disagree', 3 = 'Neutral', 4 = 'Agree' and 5 = 'Strongly Agree'. The calculated mean values ($\overline{x}$) are from 1 to 5 – "1" being the lowest, "3" being average and "5" being the highest.

Looking at the values for $\overline{x}$ for both the groups, it can be stated that the USP Freshman had a higher computer self- efficacy than the Year 12 and Year 13 students. The reason behind better mean values for the USP Freshman could be the fact that USP Freshmen are introduced to technology literacy within their first year learning journey (Sharma et al. 2019a; Sharma et al. 2018; Reddy et al. 2017a). Since the Freshmen's at the university from the commencement of their higher education have to use technology for learning, they tend to be more technology-dependent and have a greater computer self-efficacy (Shroff et al. 2011). The SD values are greater than 0.6 and closer to 1, it means that the data is distributed over a wide range of values and are spread out. Rumsey (2019) stated that greater SD values indicate a large number of variations. Therefore, it can be concluded that for this study, the values of each item tested for computer self-efficacy for the two cohorts have variations. It means that each student's response differed significantly from the overall mean that has been gathered from the data, either they have disagreed or had average competency or low to very low competency in the attributes for computer self-efficacy.

Table 4 shows the mean and SD for computer competency of the two cohorts. The variables SC1 to SC28 include items on computer competency. The questions on computer competency were divided into technical aspects of using computers and finding and evaluating information. Each item used in this study had score from 1 to 5, meaning very low competency to very high competency. From the results, it can be observed that both cohorts had mean values mainly appearing between 3 and 4 which indicates that the students had average to high self-competencies. The results are similar to prior studies which showed that computer competencies of senior secondary students and university freshmen fall in the range average to high, as this group of students is mostly involved in the use and experimentation of new technology (Gonzalo et al. 2018; Elstad and Christophersen 2017; Hatlevik 2016). The SD values for the Year 12 and Year 13 students are greater than 0.7 and closer to 1. Therefore the computer competency for this cohort is distributed over a wide range.. On the other hand, the SD values for USP Freshmen are highly varied, some values are lower therefore these responses are closer to the mean values calculated "average to high competency". The SD values closer to the mean indicate that the responses to the computer competency attributes ranged from "very low competency to very high competency".

Table 1 Description of variables for Data Set

#	Attribute Name	Description
1	SC1	Turning on a computer
2	SC2	Customizing desktop environment
3	SC3	Opening a file
4	SC4	Copying and Deleting a file
5	SC5	Organizing and managing files
6	SC6	Connecting to the Internet
7	SC7	Installing a printer
8	SC8	Printing a document
9	SC9	Placing an image on a document
10	SC10	Using Microsoft word/excel and PowerPoint
11	SC11	Downloading files
12	SC12	Saving image from the web
13	SC13	Emailing
14	SC14	Creating web pages
15	SC15	Sending attachments
16	SC16	Able to use search engine
17	SC17	Using keywords to find information
18	SC18	Using the given URL to look for information
19	SC19	Using bookmark
20	SC20	Using advanced search
21	SC21	Navigating through web pages
22	SC22	Navigating through files
23	SC23	Internet browsing
24	SC24	Presentation tools
25	SC25	Participating in social networks
26	SC26	Using the Internet safely
27	SC27	Using information from the Internet without plagiarising
28	SC28	Judging the reliability of the information on the Internet
29	E1	Feel confident in using computers
30	E2	Feel confident using the computer organizing tools
31	E3	Feel confident in organizing and managing files
32	E4	Feel confident in troubleshooting computer problems
33	E5	Feel confident to complete the required task using the learning tools if the manual is present for reference
34	E6	Feel confident to complete the required task using the learning tools if the inbuilt facility is present for assistance
35	E7	Feel confident to complete the required task using the learning tools if someone showed me how to do it first
36	A1	Enjoying using ICT for my studies
37	A2	Technology allows me to acquire new knowledge
38	A3	Technology enhances my learning experience
39	A4	Learning with technology makes me satisfied with the learning content

Table 1 (continued)

#	Attribute Name	Description
40	A5	Interested in studying courses that use technology
41	PEU1	Technology increases the quality of learning
42	PEU2	Technology keeps one connected to the courses
43	PEU3	Technology helps in the production of quality work
44	PEU4	Technology enables one to take control of learning
45	PU1	Technology gives access to a wide range of learning materials
46	PU2	Technology enables in faster completion of work
47	PU3	Technology connects peers and facilitators
48	PU4	Technology makes learning creative

Table 5 shows the $\overline{x}$ and SD for the acceptance of technology-based on PEU and PU. The variables A1 to A13 represent the items on perceived usefulness and perceive ease of use of technology. The students were asked questions on how easy it was for them to use technology for learning if they thought technology would make their learning easier. For this section, once again 1–5 point score was used, ranging from strongly disagree to strongly disagree. The $\overline{x}$ values for each variable were calculated. Since the mean values for both the cohorts fall between 4 and 4.5, it implies that student agreed that they accepted technology for learning because using technology made learning more comfortable as it provided easy access to learning materials, kept them connected with their facilitators, peers and the course, and enabled them to complete their work on time. Also, technology was useful as it enabled in the production of quality work, made learning more creative and enable them to take control of their learning. These benefits of technology were also the reasons for students to accept technology for learning purposes in the literature (Baturay et al. 2017; Reddy et al. 2017b; Reddy et al. 2016; Al- Haderi 2013). Hence, both the cohorts accepted technology due to its usefulness and ease of use. According to Dar et al. 2018; Bai 2017; Elsatd, 2017; Alshammari et al. 2016), technology usefulness and ease of use are two major attributes for students to accept technology-oriented learning.

Tests were also conducted to ensure that the above results for Table 2, Table 3 and Table 4 were valid and reliable. A Cronbach alpha value was calculated for each of the constructs, and the results are tabulated in Table 6:

According to (StatisticsHowTo 2019; Statstutor 2019) the alpha value >0.7 is acceptable, the alpha value between 0.8 and 0.9 is good, and anything above 0.9 is

Table 2 Demographics Information

Variables	Year 12 and Year 13 Students	Freshmen
Sample size	1281	1385
Age group	16–20 years	18–45 years
Percentage of individuals with no ICT devices	24%	9%
Most commonly owned device	Smartphones and Laptop	Smartphones and Laptop
The most common type of Internet connection	Mobile Internet	Mobile Internet and Wi-Fi

Table 3 Mean and standard deviation of the sample for computer self- efficacy

Variables	Year 12 and Year 13 Students		Freshmen	
Self- Efficacy	$\overline{x}$	SD	$\overline{x}$	SD
E1	4.27	.805	4.55	.640
E2	3.91	.904	4.28	.737
E3	3.94	.963	4.37	.743
E4	3.36	1.058	3.73	.928
E5	3.86	1.017	4.20	.795
E6	3.92	.963	4.21	.779
E7	4.24	.872	4.41	.742

excellent. From the results in Table 6, the alpha values are above 0.85; therefore, the results for both the groups were highly reliable and valid.

Furthermore, a simple linear regression analysis was carried out to test the hypothesis for this study where acceptance of the technology was the dependent variable, and computer competency and computer self-efficacy were the independent variables. According to (Aggarwal and Ranganathan 2017), a regression analysis predicts the relationship between the dependent and one or two independent variables. In this case, the dependent variable was the acceptance of technology, and the independent variables were computer competency and computer self-efficacy. Tables 7 and 8 show the results for both the groups.

From the results in Table 7, the value for beta (β) is 0.276 (27.6%) for computer competency and 0.349 (34.9%) for computer self- efficacy. Since the β values are less than 0.5 (50%), it can be concluded that there is a low influence in the predictive power of the independent variables. The element of the predictive power of variables was referenced from literature which explained β - the high or low influence of variables (Sakarji et al. 2019; Teeroorengadum et al. 2017; Zheng et al. 2017).

However, as the P value is <0.05, it supports the hypothesis for this study that the constructs computer competency and computer self-efficacy have significant effects on the acceptance of technology by the freshmen. Also, Table 7 shows that the R^2 value is 0.367, meaning R^2 explains 36.7% of the variance related to the continuous use of technology, and therefore supports the hypothesis that computer competency and computer self-efficacy have a positive impact on the acceptance of given technology and its continuous use. The results are similar to prior studies conducted but using the two scorers as a separate external variable to the extended TAM (Salloum et al. 2019; Gonzalo et al. 2018; Bai 2017; Alshammari et al. 2016).

From the results in Table 8, the value for beta (β) is 0.112 (11.2%) for computer competency and 0.539 (53.9%) for computer self- efficacy. Since the β value are less than 0.5 (50%) for computer competency, it can be said that there is a profound influence in the predictive power of the independent variables. However, the β value for computer self-efficacy is 0.539 (53.9%). Hence it can be stated that there is a high influence in the predictive power of this construct. From the values obtained from the regression analysis, it can be said that the student's self-efficacy plays a vital role in the acceptance of the technology. The P value obtained is <0.05, and the R^2 value is 0.374,

Table 4 Mean and standard deviation of the sample for computer competency

Variables	Year 12 and Year 13 Students		Freshmen	
Self-Competency	x̄	SD	x̄	SD
Use of Computers (Technical)				
SC1	3.62	.726	3.85	.434
SC2	3.17	.981	3.45	.780
SC3	3.52	.805	3.83	.422
SC4	3.48	.886	3.85	.425
SC5	3.23	.993	3.60	.685
SC6	3.50	.828	3.71	.586
SC7	3.05	1.037	3.01	1.109
SC8	3.06	1.031	3.46	.864
SC9	3.16	1.044	3.60	.755
SC10	3.17	1.013	3.43	.763
Information Literacy (Finding and Evaluating Information)				
SC11	3.36	.904	3.68	.630
SC12	3.45	.897	3.70	.633
SC13	3.05	1.100	3.69	.588
SC14	2.16	1.281	2.35	1.265
SC15	2.63	1.207	3.41	.939
SC16	3.16	1.058	3.39	.872
SC17	3.20	.913	3.39	.825
SC18	3.10	1.016	3.42	.848
SC19	2.70	1.085	2.91	1.084
SC20	2.84	1.091	3.25	.890
SC21	2.72	1.132	3.19	.917
SC22	2.74	1.134	3.58	.718
SC23	3.26	.958	3.08	.948
SC24	2.86	1.042	3.20	.959
SC25	3.02	1.049	3.29	.859
SC26	3.17	.972	3.11	.923
SC27	2.72	1.115	3.00	.941
SC28	2.60	1.097	3.11	0.91

meaning R^2 explains 37.4% of the variance related to the continuous use of technology, therefore supports the hypothesis that computer competency and computer self-efficacy have a positive impact on the acceptance of given technology and its continuous use.

Looking at the results for the freshmen and the Year 12 and Year 13 students, the constructs – computer competency and computer self-efficacy have a significant impact on technology acceptance. However, computer self-efficacy shows a more substantial impact on technology compared to computer competency. This corresponds to prior research that has shown that self-efficacy influences the use and acceptance of computers for learning (Baturay et al. 2017; Hatlevik 2016; Howard 2014).

Table 5 Acceptance of technology based on PU and PEU

Variables	Year 12 and Year 13 Students		Freshmen	
Perceived Ease of Use (PEU)	$\overline{x}$	SD	$\overline{x}$	SD
A1	4.24	.911	4.56	.658
A2	4.38	.833	4.60	.640
A3	4.39	.828	4.59	.655
A4	4.31	.826	4.51	.686
A5	4.19	.860	4.39	.728
A6	4.23	.877	4.40	.745
Perceived Usefulness (PU)				
A7	4.46	.795	4.80	.442
A8	4.38	.826	4.80	.448
A9	4.36	.870	4.67	.557
A10	4.47	.779	4.70	.556
A11	4.37	.821	4.65	.595
A12	4.45	.817	4.66	.584
A13	4.14	.973	4.45	.745

A multiple regression analysis was carried out using the Smart Partial least squares (SmartPLS) software to test the model in this study. According to literature, the Partial least squares (PLS) structural equation modelling (SEM) is used to examine the parameters among latent variables and relationships between measured variables and latent variables simultaneously (Akma et al., 2017; Lai 2017; Ali et al. 2016; Abdullah 2016, Rabaa 2016). The use of PLS-SEM shows the relationships amongst the latent variables and the predictability of the external TAM used in this paper. The PLS-SEM analysis was also performed to examine the path coefficients, the t values and the p values to test the hypothesis for this study and examine the relationship between each variable. Figure 3 shows the results for PLS structural equation modelling analysis.

According to Fig. 3, the R^2 values for Perceived Usefulness, Perceived Ease of Use and Attitude of Students are relatively good as these explain 78.1% of the variance for Perceived Usefulness, 40.5% of the variance for Perceived Ease of Use and 64.9% of the variance for the attitude of students. The path coefficients show that computer competency with the coefficient value of 0.109 has a positive influence on Perceived Usefulness; however, it has a feeble influence on the variable Perceived Ease of Use with coefficient value is −0.021. The variable self-efficacy has a positive and strong

Table 6 Cronbach's alpha for the three constructs

Constructs	Year 12 and Year 13 Students	Freshmen
Computer Self-Efficacy	0.852	0.864
Computer Competency	0.921	0.939
Acceptance	0.923	0.918

Table 7 Regression results for the freshmen

	β	The standard error of β	R²	P value
Computer Competency	0.276	0.027	0.367	<0.05
Computer Self-Efficacy	0.349	0.024	0.367	<0.05

influence on both Perceived Usefulness with the path coefficient of 0.564 and a positive influence on Perceived Ease of Use with a path coefficient value of 0.070. The variable Perceived Ease of Use has a strong and positive influence of Perceived usefulness since the path coefficient value is 0.848, whereas a positive influence on the Attitude of Students with a path coefficient of 0.167. The path coefficient value between Perceived Usefulness and Attitude of Student is 0.655; therefore, this means that Perceived Usefulness has a positive and strong influence on the Attitude of Students. Looking at the results of PLE-SEM, it can be stated that the hypothesis of this paper is valid that computer competency and computer self-efficacy have a positive influence on the acceptance of given technology and its continuous use since there is a positive and strong influence of the variable of the attitude of the students in the model given in Fig. 3. It can also be stated that the positive attitude of students means acceptance and continuous usage of technology by the students. The influence of the variables was referenced from (Hair et al. 2019; Akma et al., 2017; Lai 2017; Ali et al. 2016; Abdullah 2016, Rabaa 2016). These authors used a similar approached to test the models for their studies.

A Smartpls bootstrapping test was also carried out to check the structural path significance of the inner and outer model. The t-values and the *p* values for the significance testing of the structural path were generated. According to literature (Hair et al. 2019; Akma et al., 2017; Lai 2017; Ali et al. 2016; Abdullah 2016, Rabaa 2016) for significant loadings, the t-values must be higher than 1.96 and p value <0.05. For the current study, the results showed that all the paths in the model had a p value <0.05 and the t-value >1.96 except the path between computer competency and perceived Ease of Use. Therefore, it can be concluded that the outer and inner loadings were significant.

3 Conclusion

In this digital age, technology-driven education is fast becoming a widely accepted norm, therefore presenting the opportunity to the research community the need for studies on technology acceptance. Such studies will shed light on factors such as the

Table 8 Regression results for Year 12 and Year 13 students

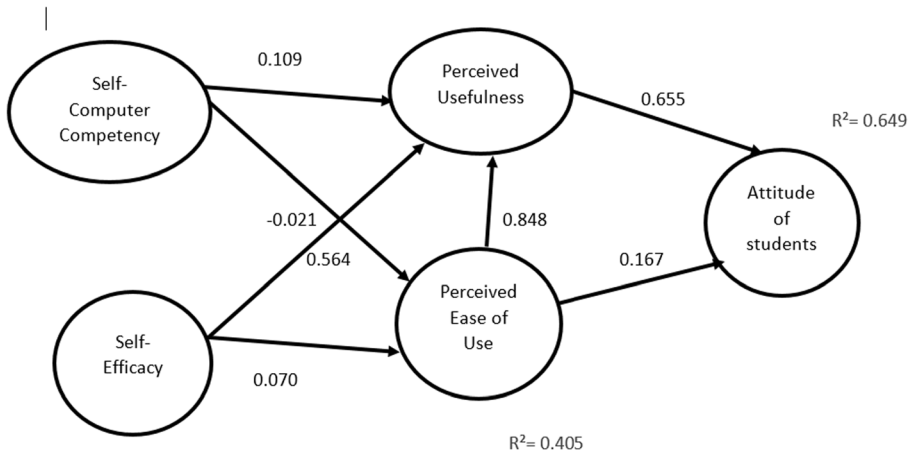|	β	The standard error of β	R²	P value
Computer Competency	0.112	0.028	0.374	<0.05
Computer Self-Efficacy	0.539	0.028	0.374	<0.05

Fig. 3 Structural Equation Model Analysis

effectiveness of technology on students' learning, teachers' facilitation, and highlight important challenges and further opportunities. These research studies such as the current one also provide a deep insight and present opportunities to the stakeholders or the implementers of technology-based projects in the education sector on ways how technology can be integrated to curriculum and pedagogies and successfully implemented. The stakeholders can implement policies, derive strategies that can improve the ICT- driven education. While research in this area in the South Pacific is minimal, there is some evidence of current and upcoming research that involve a more depth analysis of technology-driven education. The onus is on the educators to actively address technology-driven education issues in the region through comprehensive research.

The paper contributes inter alia as a baseline study in the adoption of technology by the students in the South Pacific region. A new model is also proposed for the current study using the extended TAM whereby two external variables- computer competency and computer self-efficacy have been observed for their combined contributions to technology-based learning. The literature shows that the two variables have been used independently with other external variables to the extended TAM. The authors of this paper propose a new model that only consists of computer competency and computer self-efficacy as external variables to the extended TAM.

The results of this research confirm that there was no significant difference in the computer competency and computer self-efficacy between Year 12 and Year 13 students and the USP Freshmen. The deduced $\bar{x}$ values for both the cohorts fall between the range -average to high, making the competencies and self efficacies similar. For technology acceptance, the $\bar{x}$ for PEU and PU was calculated. Since the values for PEU and PU fall between 4 and 4.5, it can be concluded both the Year 12 and Year 13 students, and the USP Freshmen accepted technology for learning. The reasons are clearly outlined in the results sections; in summary, it is due to the usefulness and ease of use of technology. Also, the Cronbach alpha test was conducted for the validity and reliability of the $\bar{x}$ values obtained for computer competency, computer self-efficacy and PU and PEU. The Cronbach alpha values of the four constructs: computer

competency, computer self-efficacy, PU and PEU was above 0.85. Therefore the results obtained for the constructs for this study are valid and reliable.

A linear regression analysis was also carried out using the SPSS software to test the hypothesis of this study, that is, computer competency and computer self-efficacy have a significant impact on the acceptance of the technology. The results obtained show that for the USP Freshmen, the constructs computer competency and computer self-efficacy have a low impact on the acceptance of the technology. However, for the Year 12 and Year 13 students, the results obtained showed that computer competency has a low impact on the acceptance of technology while computer self-efficacy has a high impact on the acceptance of the technology. Since the P value for both the groups is <0.05, we accept that computer competency and computer self-efficacy have a significant impact on the acceptance of the technology.

Also, a PLS-SEM analysis using the SmartPLS was carried out to evaluate the relationships between the variables of the model used in this study. The path coefficients were calculated to test the hypothesis for this study. The results showed that computer competency had a positive impact on PU. However, there was a weak influence on PEU. On the other hand, there was a strong influence of computer self-efficacy on PU and PEU. The variables PU and PEU had a significant influence on attitude. Therefore, it can be stated that computer competency and computer self-efficacy have a positive influence on the attitude of students towards accepting technology and using it continuously. The tested model showed that the two variables computer competency and computer self-efficacy, the two perfect scorers, had a positive impact on the acceptance of technology.

The results from this study can be used by educational institutions to develop strategies that can improve computer self-efficacies and computer competencies of their students. Improving computer competencies and computer self-efficacies would mean reducing computer anxiety of students and enhancing the use of computers. Since the current study obtained data from only 33 secondary schools and one regional university, future research can include other secondary schools and universities in the South Pacific. The results obtained from this will give a clearer indication of the impact of the two scorers chosen for the current study. Also, further research can include other factors such as educational background, setting, gender, behavioural intention and social influence together with computer competency and computer self-efficacy as external variables to the extended TAM.

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Affiliations

Pritika Reddy[1] · Kaylash Chaudhary[2] · Bibhya Sharma[2] · Ronil Chand[1]

> Kaylash Chaudhary
> kaylash.chaudhary@usp.ac.fj

> Bibhya Sharma
> bibhya.sharma@usp.ac.fj

> Ronil Chand
> ronil.chand@fnu.ac.fj

[1]   Department of Computing Science and Information Systems, Fiji National University, Suva, Fiji

[2]   School of Computing, Information and Mathematical Sciences, The University of the South Pacific,
      Suva, Fiji