Investigating the influence of the most commonly used external variables of TAM on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios

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Abstract

Engagement with e-portfolios has been shown to improve students' learning. However, what influences students to accept e-portfolios is a question that needs careful study. The purpose of this study is to investigate the influence of Self-Efficacy, Subjective Norm, Enjoyment, Computer Anxiety and Experience on students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of an e-portfolio system and their Behavioural Intention (BI) to use the system for learning. To do this, the study tested and used the General Extended Technology Acceptance Model for E-Learning (GETAMEL) in the context of e-portfolios. Valid data were collected from 242 UK undergraduate students who had been introduced to e-portfolios. The data set was analysed using SPSS software. Results showed that the best predictor of student's Perceived Ease of Use of the e-portfolio is Experience, followed by Enjoyment, Self-Efficacy and Subjective Norm. The best predictor of student's Perceived Usefulness of the e-portfolio is Perceived Ease of Use followed by Enjoyment. Both Perceived Ease of Use and Perceived Usefulness predict student's Behavioural Intention to Use the e-portfolio. The findings improve understanding regarding acceptance of e-portfolio systems and this work is therefore of particular interest to researchers, developers and practitioners of e-portfolios.

Keywords: E-portfolios; E-Learning; Technology Adoption; Technology Acceptance Model.

1 Introduction

Computers and the Internet has unavoidably changed the way in which people work, communicate, shop and learn. Education in particular has benefited greatly from these new technologies. Being economical, flexible and accessible without constraints of time and distance, technologies such as electronic learning (e-learning) systems are becoming increasingly relevant in Higher Education (Lin, Lu & Liu, 2013). An e-learning system is defined by Lee, Hsieh and Ma (2011, p.355) as "an information system that can integrate a wide variety of instructional material (via audio, video, and text mediums) conveyed through e-mail, live chat sessions, online discussions, forums, quizzes and assignments". E-learning systems such as Moodle and Blackboard have become an important part of delivering the modern university curriculum (Paechter, Maier & Macher, 2010, p.222, Lin, Persada & Nadlifatin, 2014, p.457), supporting teaching and learning in higher education through delivering information and instructions to learners via the Internet (Lee, Hsieh & Chen, 2013, p.173).

Alongside these e-learning systems, e-portfolios are becoming popular and used in universities to support students' learning (Kahn, 2014, p.4; Tzeng & Chen, 2012, p.163).

1.1 E-portfolios

E-portfolios evolved from paper-based student portfolios in the mid-1980s (Lorenzo & Ittelson, 2005, p.3) and have attracted significant interest from educators (Chen, Chang, Chen, Huang & Chen, 2012; Gerbic, Lewis & Northover, 2009). An e-portfolio is defined as "a collection of digital artefacts that demonstrates what a person knows and can do. It is used in academic assessment, career planning, and for documenting and demonstrating students' learning and growth over time" (Xuesong, Olfman & Firpo, 2011, p.1).

The Dearing Report (Dearing, 1997) and the Leitch Report (Leitch, 2006) are the two leading reports after which e-portfolio gained value in UK higher education. These reports emphasized the need to facilitate extended learning experiences for students, through personal development, and to provide students with a platform to record their skills and achievements for accreditation and job applications. This lead to a significant increase in interest in e-portfolios amongst higher education institutions in terms of providing a platform for students to engage with their personal development, and to support their graduate employability. Now many universities use e-portfolio systems, and it is predicted that most educational institutions will use them in the near future (Gerbic *et al*., 2009, p.327; Tzeng & Chen, 2012, p.163).

1.1.1 Benefit of e-portfolio use in education

Abrami and Barrett (2005) categorised e-portfolios into three main types: progress, showcase and assessment. The purpose of a progress e-portfolio is to demonstrate a student's learning and growth over a period of time (Xuesong *et al*., 2011; Beresford & Cobham, 2010), enabling learners to see their own progress clearly, and identify areas where they need to develop. It also provide visible and tangible evidence of how students are progressing, allowing others to monitor student learning and provide feedback accordingly (Driessen, 2008, p.9). The purpose of a showcase e-portfolio is to present a student's competencies and achievements, assisting students with academic accreditation and job applications (Papp, 2014). The purpose of an assessment e-portfolio is to evaluate student's achievements. It emphasises the process of change or development, at multiple points in time. Assessment e-portfolios are particularly useful in evaluating programmes that have flexible or individualised goals or outcomes, as it allows for the possibility of assessing complex and difficult-to-understand constructs that are often impossible in conventional assessments (McDonald, 2012, p.345). These different types of e-portfolios can be combined together to facilitate student learning and personal development.

If e-portfolios are accepted and used by students they can have many positive impacts on their learning, including the following:

E-portfolios facilitate self-directed learning through critical reflection. E-portfolios persuade students to reflect on their learning needs, errors, interests, challenges and goals so that they can improve and correct them accordingly (Wade, Abrami & Sclater, 2005). They encourage learners to think critically and become active, independent and self-regulated learners (Meyer, Abrami, Wade, Aslan & Deault, 2010, p.85; McDonald, 2012, p.337).

E-portfolios enable communication and feedback anytime/anywhere between the e-portfolio users and those who have access to the e-portfolio. E-portfolios provide remote access and therefore overcome the time-space limitations (Hwang, Tsai, Yu & Lin, 2011, p.247), allowing students to share their work with others such as peers, teachers, parents and employers remotely and asynchronously via the internet (Papp, 2014; Wade *et al*., 2005). E-portfolios can therefore facilitate a student-centred and personalised approach to learning in a connected world (Beresford & Cobham, 2011, p.273).

E-portfolios provide an effective means of storing, organizing and showcasing evidence of learning. E-portfolios enable students to digitally produce a more enriched learning experience (Lopez-Fernandez & Rodriguez-Illera, 2009, p.609), giving e-portfolio users the power to integrate multimedia materials such as images, videos and sounds (Meyer *et al*., 2010, p.84). This is very

important, as it allows students to better demonstrate the process and evidence of their learning and achievement (Quynh, 2012, p.54).

E-portfolios can demonstrate a student's learning and growth over time (Xuesong *et al*., 2011, p.1; Beresford & Cobham, 2010, p.2, Barrett, 2005, p.2). They provide visible and tangible evidence of how students are progressing and allow others to monitor, discuss and assess student learning (Driessen, 2008, p.9).

E-portfolios are considered an important tool for student learning and personal development (Joint Information Systems Committee, 2008; Hsieh, Chen & Hung, 2015, p.838), for professional development in vocational higher education (Winberg and Pallitt, 2016; Lim, Lee and Jia, 2016) and for student assessments (Contreras-Higuera, Martinez-Olmo, Rubio-Hurtado & Vila-Banos, 2016; Buyarski & Landis, 2014). Studies such as Attwell (2007), Barrett and Garrett (2009), Meyer *et al*. (2010), Posey *et al*. (2015) and Trevitt, Macduff and Steed (2014) also have shown that positive benefits can be derived from the use of e-portfolios in education both as multimedia containers and as tools to support learning and personal development. E-portfolios enable students to become independent, self-directed and reflective learners (Meyer *et al*., 2010, p.85; Beresford & Cobham, 2011, p.273), and therefore it is important that universities understand how e-portfolios may be of value.

1.2 The purpose of the study

Because of the potential advantages of e-portfolios, e-portfolio implementation in higher education is growing (Gerbic *et al*., 2009, p.327; Tzeng & Chen, 2012, p.163). The increase in the use of e-portfolios in education has raised the importance of e-portfolio acceptance issues. E-portfolio systems cannot enhance student learning and development if students do not accept they should use the systems (Tosh, Light, Fleming & Haywood, 2005). Current literature on e-portfolios has mainly focused on the potential benefit of e-portfolios in education (Becta, 2007; Attwell, 2007; Barrett & Garrett, 2009; Lim *et al*., 2016; Meyer *et al*., 2010; Wakimoto & Lewis, 2014), which helps with understanding the importance of e-portfolios for teaching and learning. However, little current literature studies the factors that affect undergraduate student acceptance or rejection of e-portfolios. To ensure e-portfolios are effective teaching and learning tools in education, they need to be accepted by students. More investigation is therefore required to both identify and better understand the factors that affect student acceptance or rejection of e-portfolios.

The purpose of this study is to investigate the factors that might influence students' Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) of e-portfolios and their Behavioural Intention to Use (BI) e-portfolios for learning and personal development.

Based on 107 e-learning adoption studies Abdullah and Ward (2016) have developed a General Extended Technology Acceptance Model for E-Learning (GETAMEL), which hypothesises relationship between the most commonly used external variables (Self-Efficacy, Subjective Norm, Enjoyment, Computer Anxiety and Experience) of Technology Acceptance Model (TAM) and PEOU and PU of e-learning. This study validates and uses the GETAMEL to identify the relationships between the most commonly used external variables of TAM and PEOU and PU of e-portfolios. It adopts a positivist approach in testing the research hypotheses, using a deductive survey-based research approach (testing hypotheses) and quantitative methods of statistical analysis to support or reject the hypothesised links between the factors. The study involved a survey of existing questions, distributed to 292 undergraduate students who had been introduced to the e-portfolio. Valid data collected from 242 students (205 males and 37 females) were examined using Structural Equation Modelling (SEM) within SPSS.

In summary, this study uses the GETAMEL to investigate the relationships between the external variables and students' PEOU and PU of e-portfolios to identify what external variables should be considered in enhancing undergraduate students' e-portfolio adoption.

2 Theoretical framework

In order to identify and explain the factors that affect acceptance of e-learning, researchers have used a number of different technology adoption theories, including Theory of Reasoned Action (TRA), Theory of Planned Behaviour (TPB), Task Technology Fit (TTF), Unified Theory of Acceptance and Use of Technology (UTAUT) and Technology Acceptance Model (TAM). Among these theories, "TAM is the most common ground theory in e-learning acceptance literature" (Šumak, Heričko & Pušnik, 2011, p.2068).

2.1 Technology Acceptance Model

TAM, shown in Figure 1, was developed by Davis in 1986. Its purpose is to explain technology adoption behaviour. The arrows in the model show the effect of one variable on another. External variables affect both PEOU and PU of technology. PEOU influences PU and Attitude Towards Using (AT) technology. PU affects AT and BI. AT affects BI. BI then influences Actual Use.

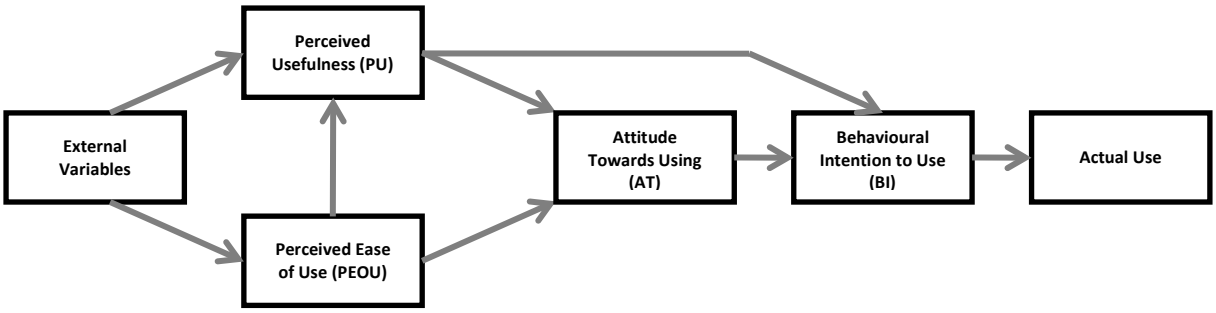

Fig. 1. Technology Acceptance Model (Davis, Bagozzi & Warshaw, 1989, p.985)

Previous research has confirmed that TAM is a valid model that represents an important theoretical framework to explain and predict technology acceptance behaviour (Al-Gahtani, 2016; Hidayanto, Febriawan, Sucahyo & Purwandari, 2014; Hsia, Chang & Tseng, 2014; Lee, Hsiao & Purnomo, 2014; Tarhini, Hone & Liu, 2014; Wu & Zhang, 2014).

In a meta-analysis study, King and He (2006) reported some good results of using TAM, their analysis confirmed "TAM to be a valid and robust model" (p.740). A recent meta-analysis of 42 e-learning acceptance studies by Šumak *et al*. (2011) also showed that 36 out of the 42 studies (86% of the 42 studies) used TAM as a ground theory (p.2069). In regards to TAM's explanatory power some recent e-learning studies that have extended and used TAM have reported 'Total Variance Explained' ranging from 52% - 70% (including Lee *et al*., 2014, p.572; Lee *et al*., 2013, p.182; Shen & Chuang, 2010, p.205), providing strong justifications for using an extended TAM in this study. For example Lee *et al*. (2014) have extended TAM with Computer Self-Efficacy, Internet Self-Efficacy, Instructor's Attitude Toward Students, Learning Content and Technology Accessibility to empirically examine the influence of individual and system characteristics on student acceptance of e-learning systems. Their study showed that these factors played an important role in influencing students' perception and intention to use the e-learning systems, with their proposed model explaining 63% of the variance in intention to use the system (p.572). Lee *et al*. (2013) also extended TAM with Task Equivocality, Prior Experiences, Computer Self-Efficacy and Organisational Support to examine the effects of these factors on employees' use of e-learning systems in organisations. In their study PU was affected by Organisation Support, Prior Experience and Task Equivocality. PEOU on the other hand was affected by Organisation Support, Computer Self-Efficacy and Prior Experience. Their resulting model explained 52% of the variance in employees' Behavioural Intention to Use the system (p.182). Shen and Chuang (2010, p.205) extended TAM with Interactivity and Self-Efficacy to examine students' Attitude and Behavioural Intention to Use an interactive whiteboard technology. Their extended model demonstrated that students' Attitude and Behavioural Intention to Use the system were influenced by Interactivity, Perceived Self-Efficacy, Perceived Ease of Use and Perceived Usefulness.

Overall their extended model explained 70% of variance in Behavioural Intention to Use the e-learning system (p.205).

2.1.1 Excluding Attitude construct from TAM

Originally, the Attitude factor was included in TAM as a mediator between user perceptions (PEOU and PU) and BI (Davis, 1986) but recent studies have excluded Attitude from the model, because of its weak role between the constructs (Bhatiasevi, 2011, p.514; Chen, Lin, Yeh & Lou, 2013, p.113; Giovanis, Binioris & Polychronopoulos, 2012, p.28; Hussein, Aditiawarman & Mohamed, 2007, p.4; Lee, 2006, p.518; Liu, 2010, p.54; Macharia & Nyakwende, 2009, p.9; Tobing, Hamzah, Sura & Amin, 2008, p.4; Yi & Hwang, 2003, p.433). Davis *et al*. (1989, p.997) found a weak relationship between Perceived Usefulness and Attitude but a strong relationship between Perceived Usefulness and Behavioural Intention and therefore removed Attitude from the original TAM model. Wang and Wang (2009, p.765) also excluded Attitude from their proposed research model because of its weak relationship with BI. Venkatesh, Morris, Davis & Davis (2003, p.461) also found that Attitude did not have any direct effect on intention. Further, according to Liu (2010, p.54) removing Attitudes from TAM can provide better understanding of the effects of PEOU and PU on the BI construct. Therefore, Attitude is not considered in this study.

2.1.2 The most important constructs of TAM

The most important constructs in TAM are Perceived Ease of Use and Perceived Usefulness (Chen *et al*., 2013, p.112). This is because users' acceptance or rejection of technologies is mainly influenced by these two constructs (Davis, 1989). Perceived Ease of Use is defined as “the degree to which a person believes that using a particular system would be free of effort” and Perceived Usefulness is refers to “the degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989). Both these factors directly affect learners' intention to use e-learning (Al-Gahtani, 2016, p.32; Calisir, AltinGumussoy, Bayraktaroglu & Karaali, 2014, p.526; Hsia *et al*., 2014, p.59; Lee *et al*., 2014, p.572; Tarhini *et al*., 2014, p.159). However, PEOU and PU are both affected by external variables (Al-Ammary, Al-Sherooqi & Al-Sherooqi, 2014, p.212; Farahat, 2012, p.100; Motaghian, Hassanzadeh & Moghadam, 2013, p.166; Zare & Yazdanparast, 2013, p.48). Therefore in order to be able to explain user's technology adoption behaviour, it is important to understand the external variables of PEOU and PU (Al-Gahtani, 2016; Brown, Stothers, Thorp & Ingram, 2006; Emmett, 2011; Liu, Chen, Sun, Wible & Kuo, 2010; Tajudeen, Basha, Michael & Mukthar, 2012; Venkatesh & Davis, 1996). Adding external variables to TAM not only allows researchers to explain technology adoption behaviour but also to pinpoint the particular reasons for which the technology may not be adopted, so that researchers and practitioners "pursue

appropriate corrective steps" (Davis *et al*., 1989, p.985), providing strong justifications for validating and using an extended TAM (the GETAME, shown in figure 2) in this study.

Because of its creditability TAM has been extended and used extensively in education to explain users' intention to use different types of e-learning technologies and systems, including the use of Web Course Tools (Ngai, Poon & Chan, 2007; Sanchez-Franco, 2010), Educational Wikis (Liu, 2010), Moodle (Hsu & Chang, 2013; Sánchez & Hueros, 2010), use of iPads for Learning (Wu, Kuo & Wu, 2013), use of Clickers in student learning (Wu & Gao, 2011), Multimedia e-learning (Lin, Chen & Yeh, 2010; Lau & Woods, 2008), use of virtual world Second Life for learning (Ali, Ahmed, Tariq & Safdar, 2013; Chow, Herold, Choo & Chan, 2012; Bhatiasevi, 2011; Shen & Eder, 2009), Social Networking as Learning Tools (Al-Ammary *et al*., 2014), Google Applications for collaborative learning (Cheung & Vogel, 2013), Learning Management systems (De Smet, Bourgonjon, De Wever, Schellens & Valcke, 2012), E-Class systems (Hidayanto *et al*., 2014) and Mobile phones for Learning (Chang, Yan & Tseng, 2012; Park, Nam & Cha, 2012; Fadare, Babatunde, Akomolafe & Lawal, 2011; Liu *et al*., 2010; Tajudeen *et al*., 2012; Hei & Hu, 2011). However TAM has not been properly extended and sufficiently used in the context of e-portfolio adoption.

2.2 TAM in e-portfolio acceptance research

Some recent studies have studied acceptance of e-portfolios using different methods to TAM and suggested several variables that might affect users' adoption of e-portfolios. For example, Tzeng, Kuo, Talley, Chen and Wang (2015) used Information Systems Success Model to study the factors that affects nursing staffs' adoption of e-portfolios and the results of their study demonstrated that System Quality, Information Quality, and User Satisfaction are important variables in successful e-portfolio usage. Chen, Yang and Huang (2015) used a modified Information Systems Success Model to determine the factors that affect readers' satisfaction of an e-portfolio-based integrated learning environment supported by library resources. The results of their study showed that Reader-Perceived Benefits, Information Quality and System Quality are important factors for the reader's satisfaction with the system. Lin and Taralynn (2015) used qualitative research methods to identify the factors that associated with pre-service teachers' adoption of e-portfolios. Their study suggested that factors affecting pre-service teachers' adoption of e-portfolio include School Requirements, Social Pressures, Time Constraints, Previous Experiences, Family Consciousness, and Personality. Contreras-Higuera *et al*. (2016) used a two-step cluster analysis method to investigate university students' perceptions of e-portfolios and rubrics as combined assessment tools and found that Greater Teacher Experience in Using the E-portfolio, Continuous Technical Support, Greater Weight in Assessment and Smaller Class Sizes affected students' perceptions.

In regards to using TAM in the context of e-portfolio adoption, we found only 2 quantitative studies. However these studies have some limitations, including insufficient or absent external variables and ill-defined constructs as discussed below.

Shroff, Deneen and Ng (2011) used TAM to examine undergraduate students' intentions to use an e-portfolio system. Seventy two participants completed their study survey. The findings of their study showed that PEOU affected PU ($\beta = 0.71$; $p < 0.001$) and Attitude Towards Usage ($\beta = 0.30$; $p < 0.05$). Their study suggested that "TAM is a solid theoretical model where its validity can extend to an e-portfolio context". However, their study had not extended TAM with any external variables. In regard to using TAM, Venkatesh and Davis (1996, p. 473) argued that in order to be able to explain user acceptance and use it is important to understand the external variables of TAM. This is because TAM without external variables provides only broad information on user's opinions about a system but does not offer ‘‘specific information that can better guide system development’’ (Mathieson, 1991, p.173). In order to increase the theoretical and practical values of an e-portfolio acceptance model, the model should therefore be extended with a range of specific external factors that affect users' acceptance of e-portfolios.

Chen *et al*. (2012) combined Technology Acceptance Model (TAM) and Information System Success Model (ISSM) and extended their combined model with Motivation and Computer Self-Efficacy to investigate users Attitude, Degree of Satisfaction and Acceptance of an e-portfolio system. In regards to the effects of the external variables on TAM's constructs, their findings revealed that Motivation was significantly associated with PEOU ($\beta = 0.303$, $p < 0.001$) and PU ($\beta = 0.588$, $p < 0.001$). Their study also showed that Computer Self-Efficacy was also associated with PEOU ($\beta = 0.446$, $p < 0.001$) and PU ($\beta = 0.156$, $p < 0.001$). However their study had the following two major weaknesses.

First, they have used only Computer Self-Efficacy and Motivation as external variables. Existing literature (see Abdullah & Ward, 2016; Šumak *et al*., 2011) show that there are other important external variables that can influence acceptance of e-learning systems, including Subjective Norm (Farahat, 2012, p.100), Perceived Enjoyment (Wu & Gao, 2011, p.47), Computer Anxiety (Alenezi, Abdul Karim & Veloo, 2010, p.29) and Experience (Martin, 2012, p.501). Chen *et al* (2012, p.124) have themselves acknowledged that "there are still other factors affecting intention to use and actual use that have not been taken into consideration" in their study.

Second, e-learning adoption studies normally categorise the User Motivation construct into two main types, extrinsic motivation (such as Perceived Usefulness) and intrinsic motivation (such as Enjoyment) (Davis, Bagozzi & Warshaw, 1992) and specify the Motivation type that their study

investigates. Inconsistent with previous research, Chen *et al* (2012) have not specified the type of Motivation that they have studied. Because of this the causal affects that they have found between the Motivation construct and other constructs (PEOU and PU) in their study can be attributed to either intrinsic motivation or extrinsic motivation or both. In order to increase the theoretical and practical values of an e-portfolio adoption model, the model should pinpoint specific factors that affect the use of e-portfolio. More investigation for identifying and better understanding the factors that affect students' acceptance or rejection of e-portfolio is therefore needed, and the research reported here will address this gap by validating and using the GETAMEL for this purpose.

2.3 General Extended Technology Acceptance Model for e-learning (GETAMEL)

Based on the principals of TAM, recently Abdullah and Ward (2016) have developed a General Extended Technology Acceptance Model for e-learning (GETAMEL) (shown in figure 2). They developed this model through a meta-analysis of 107 recent studies that had extended and used TAM in the context of e-learning adoption. Their study revealed that Self-efficacy, Subjective Norm, Enjoyment, Computer Anxiety and Experience were the most commonly used and confirmed external variables of TAM among 152 different external variables studied in the 107 studies. They used these five commonly used and confirmed external variables as external variables of their proposed GETAMEL (shown in figure 2).

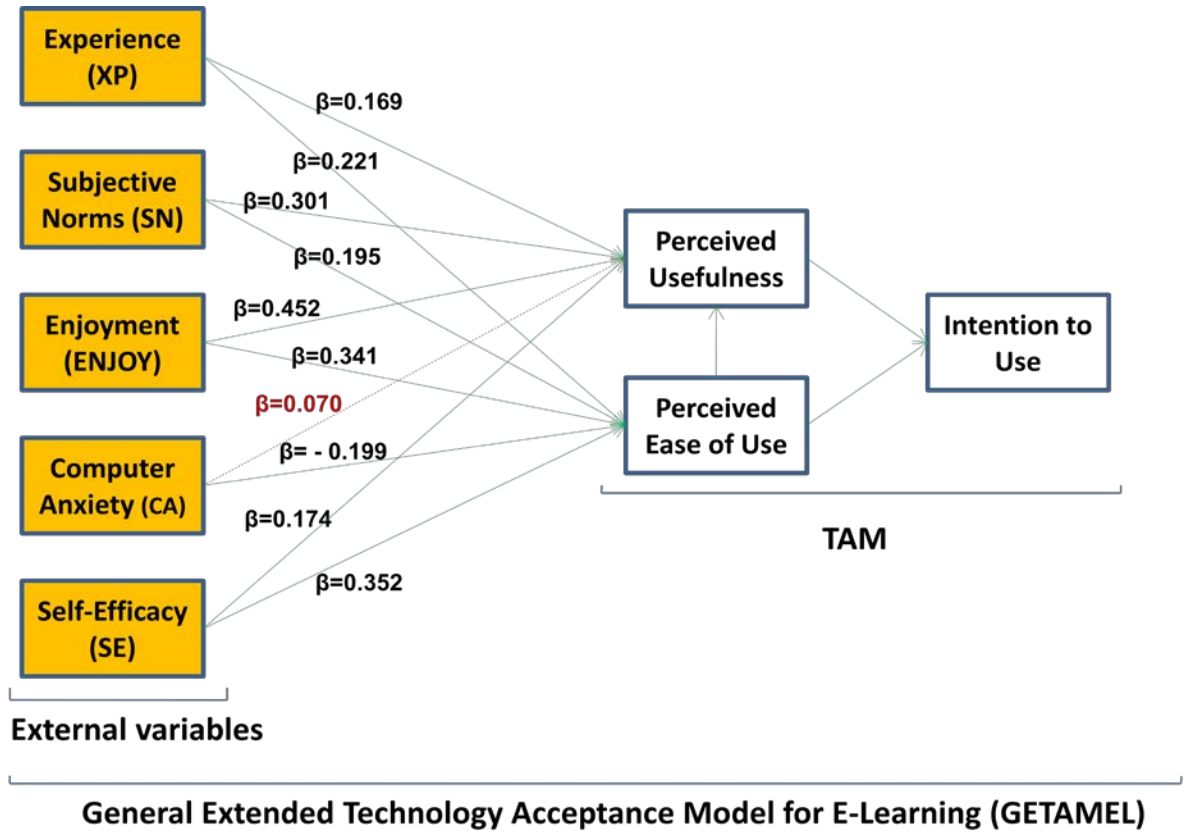

Fig. 2. GETAMEL with the average path coefficients (β) between the 5 most commonly used external variables and students' Perceived Ease of Use and Perceived Usefulness of e-learning systems developed by Abdullah and Ward (2016, p.246).

This study empirically tests and uses the GETAMEL in the context of e-portfolio use, investigating the effects of the five external variables (Self-Efficacy, Subjective Norm, Enjoyment, Computer Anxiety and Prior Experience) on students' Perceived Ease of Use and Perceived Usefulness of an e-portfolio system, and determines how learners' perceptions may influence their Behavioural Intention to Use the system for learning and personal development.

2.3.1 External variables and the research hypotheses

2.3.1.1 Self-Efficacy

Previous studies show that Self-Efficacy (SE) played a vital role in explaining adoption of e-learning technologies or systems (Bhatiasevi, 2011; Brown *et al*., 2006; Park, Nam *et al*., 2012). Self-Efficacy is defined as an individual's judgment of his or her own capability to perform specific tasks (Bandura, 1982, p.391). In regards to computer usage, Computer Self-Efficacy (CSE) refers to one's beliefs about his/her ability to accomplish a particular task using a computer (Shen & Eder, 2009, p.226). CSE profoundly affects user behaviour towards using computers, as individuals with high levels of CSE will be confident in their capability to overcome any difficulties when using computers.

Therefore, "the higher the individual's computer Self-Efficacy, the higher his/her use of computers" (Compeau & Higgins, 1995, p.196). On the other hand, individuals who is not confident to use computers my not use them (Igbaria & Iivari, 1995, p.590). Similarly, previous studies (including Hsia & Tseng, 2008, p.42; Moghadam & Bairamzadeh, 2009, p.1660; Yuen & Ma, 2008, p.233) showed that students with high levels of e-learning Self-Efficacy are more likely to use e-learning and students with lower e-learning Self-Efficacy may avoid using it.

In their meta-analysis Abdullah and Ward (2016) reported 41 recent studies (including Al-Gahtani, 2016; Ali *et al*., 2013; Lee *et al*., 2014) that have investigated the effect of SE on users PEOU of e-learning, 33 of these studies showed that SE significantly and positively affected PEOU. In addition to this, Chen *et al*. (2012) found that Computer Self-Efficacy was also associated with Perceived Ease of Use ($\beta = 0.446$, $p < 0.001$) of e-portfolios. In accordance with previous studies and the GETAMEL (shown in figure 2), this study proposes the following research hypothesis.

Hypothesis 1: SE positively affects students' PEOU of the e-portfolio.

In regards to the relationship between SE and PU literature reports various results. Although several studies (including Abbad, Morris & de Nahlik, 2009; Bhatiasevi, 2011; Lee *et al*., 2013; Ma, Chao & Cheng, 2013; Mohamed & Abdul Karim, 2012; Purnomo & Lee, 2013) have indicated lack of significant association between the two constructs (SE and PU), some studies (including Al-Ammari & Hamad, 2008; Al-Ammary *et al*., 2014; Al-Mushasha, 2013; Chow *et al*., 2012; Hussein *et al*., 2007; Park, 2009) in fact have found significant positive relationship between SE and students' PU of e-learning. Interestingly Aypay, Çelik, Aypay and Sever (2012) have found significant negative relationship between SE and students PU of computers. In context of e-portfolios Chen *et al*. (2012) also found that Computer Self-Efficacy was associated with Perceived Usefulness ($\beta = 0.156$, $p < 0.001$). In line with the GETAMEL (shown in figure 2) and to determine whether SE affects students' decisions to use e-portfolios in this study, we also propose the following research hypothesis.

Hypothesis 2: SE positively affects students' PU of the e-portfolio.

2.3.1.2 Subjective Norm

The results of many empirical studies have demonstrated that Subjective Norm (SN) is important in determining students acceptance of e-learning systems (Al-Gahtani, 2016; Farahat, 2012; Park, 2009). Subjective Norm is defined by Venkatesh *et al*. (2003, p.452) as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question". In the context of e-learning usage Subjective Norm refers to "the extent to which a student perceives a pressure from members in his or her environment to use e-learning systems"

(Agudo-Peregrina, Hernández-García, & Pascual-Miguel, 2014, p.303). It is argued that if a person believes that his peers or teachers think that she or he should use an e-learning system, then the person incorporates their beliefs into his/her own beliefs system and therefore perceives the e-learning more useful in its purpose (Cheng, 2011, p.277; Van Raaij & Schepers, 2008, p.482).

The influence of SN on learners' Perceived Usefulness of e-learning have been studied widely in previous research. In their meta-analysis Abdullah and Ward (2016) showed 19 out of 22 studies (including Al-Ammari & Hamad, 2008; Karaali, Gumussoy & Calisir, 2011; Rejón-Guardia, Sánchez-Fernández & Muñoz-Leiva, 2013) that have investigated the relationship between SN and PU, found significant positive association between the two constructs. In line with the GETAMEL (shown in figure 2), this study proposes the following research hypothesis.

Hypothesis 3: SN positively affects students' PU of the e-portfolio.

Previous studies also show that SN positively and significantly affected learners' PEOU of e-learning (Farahat, 2012; Lee *et al*., 2011; Motaghian *et al*., 2013; Yuen & Ma, 2008). This study includes the links between SN and both PEOU and PU to determine whether social influence affects students' decision to use e-portfolios. In accordance with the GETAMEL (shown in figure 2), this study proposes the following research hypothesis.

Hypothesis 4: SN positively affects students' PEOU of the e-portfolio.

2.3.1.3 Enjoyment

Enjoyment has been studied extensively in the context of e-learning adoption (e.g., Al-Ammary *et al*., 2014; Al-Gahtani, 2016; Chen *et al*., 2013; Shyu & Huang, 2011; Zare & Yazdanparast, 2013), with the results showing that higher levels of e-learning enjoyment lead to better e-learning acceptance. In the context of technology usage Enjoyment is defined as "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" (Park, Son & Kim, 2012, p.379). Previous research suggests that if a student find an e-learning system enjoyable to use, then he / she is more likely to have positive perception about the ease of use and usefulness of the system (Al-Aulamie, Mansour, Daly & Adjei, 2012; Chen *et al*., 2013) and higher degree of intention to use the system (Cheng, 2011, p.289; Cheng, 2012, p.380; Yang & Lin, 2011, p.9020). Many studies reported that Enjoyment significantly and positively affected students' PEOU (including Al-Aulamie *et al*., 2012; Shyu & Huang, 2011; Zare & Yazdanparast, 2013) and PU (including Chen, Chen, Lin & Yeh, 2007; Wu & Gao, 2011; Zhang, Guo & Chen, 2007) of e-learning systems. Because of this and in accordance with the GETAMEL (shown in figure 2), this study proposes the following research hypotheses:

Hypothesis 5: Enjoyment positively affects students' PEOU of the e-portfolio.

Hypothesis 6: Enjoyment positively affects students' PU of the e-portfolio.

2.3.1.4 Computer Anxiety

There is a significant body of theoretical and empirical evidence suggesting that Computer Anxiety (CA) is associated with avoidance or lesser use of e-learning (Al-alak, & Alnawas, 2011; Al-Gahtani, 2016; Ali *et al*., 2013; Calisir *et al*., 2014; Chen & Tseng , 2012; Karaali *et al*., 2011; Lefievre, 2012; Park, Son *et al*., 2012; Saadé & Kira, 2006; van Raaij & Schepers, 2008). CA is defined as "the tendency of an individual to be uneasy, apprehensive, or fearful about the current or future use of computers in general" (Igbaria & Parasuraman, 1989, p.375). It is an important factor to be considered in e-learning adoption studies (Alenezi *et al*., 2010), because CA negatively and significantly affects students' intention to use e-learning systems (Alenezi *et al*., 2010, p.32; Rezaei, Mohammadi, Asadi & Kalantary, 2008, p.91). Also lecturers who are anxious or uncomfortable with using computers will be more likely to be reluctant to use e-learning systems (Al-alak & Alnawas, 2011, p.208).

Previous studies show that CA negatively and significantly affected students' Perceived Ease of Use of e-learning systems (Al-Gahtani, 2016; Ali *et al*., 2013; Lefievre, 2012; Saadé & Kira, 2006). Because of this and in accordance with the GETAMEL (shown in figure 2), this study proposes the following research hypothesis:

Hypothesis 7: CA negatively affects students' PEOU of the e-portfolio.

In regards to the relationship between CA and PU, Abdullah and Ward (2016) reported 7 studies that have examined the effects of CA on PU of e-learning, five of these studies (Chen & Tseng, 2012; Ifinedo, 2006; Liu, 2010; Mohamed & Abdul Karim, 2012; Saadé & Kira, 2006) have indicated a lack of significant relationship between the two constructs. Therefore in accordance with the GETAMEL (shown in figure 2), this link will be excluded in this study.

2.3.1.5 Experience

Computer related experience is defined as "the amount and type of computer skills a person acquires over time" (Smith, Caputi, Crittenden, Jayasuriya & Rawstorne, 1999, p.227). Experience considered an important factor affecting students' adoption of e-learning (Premchaiswadi, Porouhan & Premchaiswadi, 2012, p.336; Williams & Williams, 2009, p.65). According to King and He (2006, p.747) Experience is "the best-studied moderator variable in TAM". Previous research showed that computer related experience positively and significantly affected individuals'

Behavioural Intention to Use learning systems or technologies (Al-alak, & Alnawas, 2011, p.213; De Smet *et al*., 2012, p.694; Premchaiswadi *et al*., 2012, p.336; Williams & Williams, 2009, p.65).

E-learning acceptance literature confirmed that Experience affected both learners' Perceived Ease of Use (De Smet *et al*., 2012; Lee *et al*., 2013; Lee *et al*., 2011; Purnomo & Lee, 2013) and Perceived Usefulness (Lee *et al*, 2013; Martin, 2012; Purnomo & Lee, 2013; Rezaei *et al*., 2008) of e-learning. Because of this and in accordance with the GETAMEL (shown in figure 2), this study proposes the following research hypotheses:

Hypothesis 8: Experience positively affects students' PEOU of the e-portfolio.

Hypothesis 9: Experience positively affects students' PU of the e-portfolio.

2.3.1.6 Summary of Hypotheses

Based on extensive literature review on extended TAM in the context of e-learning, and in accordance with the GETAMEL developed by Abdullah and Ward (2016) (shown in figure 2), this study proposed the following research hypotheses:

Hypothesis 1: SE positively affects students' PEOU of the e-portfolio.

Hypothesis 2: SE positively affects students' PU of the e-portfolio.

Hypothesis 3: SN positively affects students' PU of the e-portfolio.

Hypothesis 4: SN positively affects students' PEOU of the e-portfolio.

Hypothesis 5: Enjoyment positively affects students' PEOU of the e-portfolio.

Hypothesis 6: Enjoyment positively affects students' PU of the e-portfolio.

Hypothesis 7: CA negatively affects students' PEOU of the e-portfolio.

Hypothesis 8: Experience positively affects students' PEOU of the e-portfolio.

Hypothesis 9: Experience positively affects students' PU of the e-portfolio.

Based on TAM's theory we also propose the following research hypotheses:

Hypothesis 10: PEOU positively affects students' PU of the e-portfolio.

Hypothesis 11: PEOU positively affects students' Behavioural Intention to Use the e-portfolio.

Hypothesis 12: PU positively affects students' Behavioural Intention to Use the e-portfolio.

3 Methods

3.1 Instrument construction

In order to test the research hypotheses, an online survey instrument was developed based on existing literature. The survey items and references are listed in Appendix 1. In conjunction with five demographic questions (shown in Table 1) and two e-portfolio usage questions the survey consists of thirty eight items.

We developed multi-item Likert scales which have been widely used in technology acceptance studies (Lee *et al*., 2013; Motaghian *et al*., 2013; Park, Nam *et al*., 2012). The Self-Efficacy items were measured on the 7-point Likert scale, where 1= Totally Confident; 2= Moderately Confident; 3= Slightly Confident; 4= Neutral; 5= Slightly Unconfident; 6= Moderately Unconfident; and 7= Not Confident at all. The other variables (Subjective Norm, Enjoyment, Computer Anxiety, Experience, PEOU, PU and BI) were measured using the seven-point Likert Scale, where 1= Strongly Agree, 2= Moderately Agree,3= Slightly Agree, 4= Neutral, 5=Slightly Disagree, 6= Moderately Disagree and 7= Strongly Disagree. The e-portfolio usage question 1 ("On average I use the e-portfolio"), had the following available pre-coded answers: Don't use at all, Use less than once a week, Use about once a week, Use several times a week, Use about once a day, and Use several times a day. The e-portfolio usage question 2 ("On average, how many hours do you normally spend each week using the e-portfolio?"), had the following available pre-coded answers: None, Less than 1 hour, 1 to 2 hours, 2 to 4 hours, and More than 4 hours.

3.2 Data collection

This research was carried out within a computing department at a mid-ranked large UK university in the north of England. The computing department delivers commonly studied computing courses to a socially and ethnically diverse student population, with the majority of students having previously completed either A Level or BTEC Level 3 Diploma qualifications.

The students get introduced to the e-portfolio in one of their modules during the early weeks of their first year of study as part of their regular classes by their teachers. Within the module students are required to reflect on their skills through personal skills SWOT analysis (strengths, weaknesses, opportunities and threats analysis) and personal development planning, and the e-portfolio is used

to support this. The students are encouraged to use the e-portfolio for learning and personal development during and after their undergraduate study.

The survey was carried out within the computing department from November 2014 to February 2015. In order to ensure anonymity and improve the speed of data collection, this study used an online survey questionnaire, rather than paper-based, to collect empirical data. The total sample size used in this study was 292 computing undergraduate students, with data collected from 259 respondents. After discarding 17 incomplete questionnaires, 242 valid surveys remained for analysis, yielding a response rate of 82.9%. Demographics details are shown in Table 1.

Table 1

Demographics of the surveyed students

	Frequency	**Percentage**
Gender		
Female	37	15.3
Male	205	84.7
Age		
18-21	201	83.1
22-25	21	8.7
26-35	17	7
36-44	2	0.8
45+	1	0.4
Year of study		
Year 1	170	70.2
Year 2	61	25.2
Final year	11	4.5
Experience in using computers		
Less than 1 year	5	2.1
1 to 3 years	12	5
3 to 6 years	35	14.5
6 to 9 years	54	22.3
More than 9 years	136	56.2
Study subject		
Computing Course 1	66	27.3
Computing Course 2	34	14
Computing Course 3	30	12.4
Computing Course 4	30	12.4
Computing Course 5	21	8.7
Computing Course 6	20	8.3
Computing Course 7	17	7
Computing Course 8	13	5.4
Computing Course 9	11	4.5

4 Data analysis

SPSS and Amos version 22 were used to analyse the collected data. Following the two-stage analytical procedure suggested by Hair, Anderson, Tatham and Black (1998), we first assessed the measurement model and then the structural model. The reason for this is to ensure that the relationships we find between the constructs of the GETAMEL are based on a measurement instrument that has the desired psychometric properties.

4.1 Measurement model

The measurement model was tested for convergent validity and discriminant validity using Confirmatory Factor Analysis.

4.1.1 Convergent validity

Convergent validity tests whether items of a construct, that are expected to be related, are highly correlated (Martinez-Torres, Marin, Garcia, Vazquez, Oliva & Torres, 2008, p.500). Composite Reliability (CR) of greater than 0.7 (Lee, Cheung & Chen, 2005, p.1100) and Average Variance Extracted (AVE) greater than 0.5 (Fornell & Larcker, 1981, p.46; Lee *et al*., 2005, p.1100; Wu, Chen & Lin, 2007, p.170) are suggested for convergent validity. Table 2 shows the mean score of each variable, factor loading, Cronbach's Alpha, CR and AVE of this study's measurement model. All the measures exceeded the minimum levels, with CR ranging from 0.803 to 0.961, and AVE from 0.580 to 0.801, indicating a good convergent validity.

Table 2
Convergent validity of this study's measurement model

Factor	Item	Mean score of each item	Factor Loading [a]	Cronbach's Alpha [b]	Composite Reliability	Average Variance Extracted
Self-Efficacy	SE3	2.669	0.845	0.908	0.910	0.771
	SE2	2.847	0.898			
	SE1	2.698	0.891			
Enjoyment	ENJOY3	3.963	0.885	0.920	0.922	0.797
	ENJOY2	3.471	0.868			
	ENJOY1	3.645	0.925			
Computer Anxiety	CA4neg	1.355	0.752	0.788	0.803	0.580
	CA3neg	1.331	0.883			
	CA2neg	1.504	0.629			
Subjective Norm	SN2	3.310	0.865	0.844	0.844	0.730
	SN1	3.306	0.844			
Experience	XP2	1.120	0.901	0.821	0.842	0.728
	XP1	1.223	0.803			
Perceived Usefulness	PU2	3.211	0.910	0.963	0.961	0.831
	PU1	3.194	0.862			
	PU4	3.347	0.934			
	PU5	3.446	0.929			
	PU6	3.227	0.920			
Perceived Ease of Use	PEOU3	2.583	0.848	0.921	0.916	0.687
	PEOU2	2.674	0.786			
	PEOU4	2.839	0.894			
	PEOU5	2.500	0.797			
	PEOU6	2.529	0.814			

Intention to Use	BI3	3.008	0.873	0.922	0.924	0.801
	BI2	3.149	0.910			
	BI1	3.103	0.902			

[a] Factor Loading of >0.5 is suggested by Hair, Black, Babin and Anderson (2010, p.117). [b] Cronbach's Alpha of ≥0.7 is suggested by Hair *et al*. (2010, p.126).

4.1.2 Discriminant validity

Discriminant validity tests whether the measure is not a reflection of some other variables (Martinez-Torres *et al*., 2008, p.500). It is indicated by a low relationship between the measure of a specified construct and the measures of other constructs (Lee *et al*., 2005, p.1100; Martinez-Torres *et al*., 2008, p.500). Discriminant validity can be demonstrated if the square root of the AVE for a construct is greater than the relationship between the construct and all other constructs in a measurement model (Fornell & Larcker, 1981, p.41). For this study, the discriminant validity of the measurement model is shown in Table 3, which shows the square root of the AVE for each construct is greater than the relationship between the construct and all other constructs in the model, indicating a good discriminant validity.

Table 3

Showing Discriminant Validity of this study's measurement model

	AVE	BI	SE	Enjoyment	AN	SN	Experience	PU	PEOU
BI	0.801	**0.895**							
SE	0.771	0.157	**0.878**						
Enjoyment	0.797	0.603	0.406	**0.893**					
AN	0.580	0.045	0.174	0.058	**0.762**				
SN	0.730	0.557	0.260	0.600	0.050	**0.855**			
Experience	0.728	0.088	0.258	0.095	0.697	0.114	**0.853**		
PU	0.831	0.748	0.273	0.691	0.007	0.521	0.090	**0.911**	
PEOU	0.687	0.608	0.503	0.603	0.176	0.480	0.283	0.692	**0.829**

Note. Diagonal elements are square roots of the AVE.

4.2 Structural model

4.2.1 Model validation

In order to validate the structural model, we performed model fit analysis. The results (shown in Table 4) indicate the research model has a good fit (Hair *et al*., 2010). All the indicator results (X2/df= 1.747, RMSEA = 0.056, SRMR= 0.0447, TLI = 0.955, CFI = 0.962) surpassed the minimum values, showing that the research model is robust and can explain students' perceptions and acceptance of e-portfolio through its factors.

Table 4

Model fit results

	Chi-square(X^2)	Absolute Fit Measures				Incremental Fit / Goodness-of-fit	
		DF	*X^2/df*	*RMSEA*	*SRMR*	*TLI*	*CFI*
The research Model	*478.623*	*274*	*1.747*	*0.056*	*0.0447*	*0.955*	*0.962*
Recommended values [a]			*<3.00*	*<0.08*	*<0.09*	*≥0.92*	*≥0.92*

Note. DF = degree of freedom; Normed chi-square or ratio of likelihood (χ2) to degrees of freedom= χ2/df; RMSEA = Root mean square error of approximation; TLI= Tucker–Lewis Index; CFI = Comparative fit index. [a] Recommended values for sample size <250 and Variables > 30 (Hair *et al*., 2010).

5 Hypotheses testing

The summary of the hypotheses testing is shown in Table 5. Self-Efficacy (β= 0.196, p<0.001), Subjective Norm (β= 0.157, p<0.05), Enjoyment (β= 0.286, p<0.001), and Experience (β= 0.421, p=0.051) positively and significantly associated with students' PEOU of the e-portfolio, supporting hypotheses 1, 4, 5 and 8.

We found no significant negative relationship between Computer Anxiety (β= -0.017, p=0.903) and students' PEOU of the e-portfolio. Thus, hypothesis 7 is rejected.

Unexpectedly we found a negative significant association between Self-Efficacy (β= -0.141, p<0.01) and PU, rejecting Hypothesis 2.

Enjoyment (β= 0.365, p<0.001) and PEOU (β= 0.602, p<0.001) positively and significantly associated with students' PU of the e-portfolio, supporting hypotheses 6 and 10.

Expected significant relationships were not found between Subjective Norm (β= 0.123, p=0.076), Experience (β= -0.191, p=0.189) and students' PU of the e-portfolio, rejecting hypotheses 3 and 9.

Both PEOU (β= 0.208, p<0.05) and PU (β= 0.689, p<0.001) positively and significantly associated with students' Behavioural Intention to Use the e-portfolio as hypothesised, supporting hypotheses 11 and 12.

Table 5
Hypotheses Testing Results.

Variables			Beta (β)	P-value
SE	--->	PEOU of the e-portfolio	0.196	***
Enjoyment	--->	PEOU of the e-portfolio	0.286	***
CA	--->	PEOU of the e-portfolio	-0.038	0.781
SN	--->	PEOU of the e-portfolio	0.157	0.018
Experience	--->	PEOU of the e-portfolio	0.421	0.051
SE	--->	PU of the e-portfolio	-0.141	0.006
Enjoyment	--->	PU of the e-portfolio	0.365	***
SN	--->	PU of the e-portfolio	0.123	0.076
Experience	--->	PU of the e-portfolio	-0.191	0.189
PEOU	--->	PU of the e-portfolio	0.602	***
PU	--->	Behavioural Intention to Use the e-portfolio	0.689	***
PEOU	--->	Behavioural Intention to Use the e-portfolio	0.208	0.026

*** p< 0.001

5.1 Final model

The final model is shown in Figure 3. The R-Square (R2) indicate that the predictor variables (the external variables) explained 63% of PU and 49% of PEOU's variance. In turn, PU and PEOU explained 58% of Behavioural Intention to Use variance. The other remaining variance (37% of PU, 51% of PEOU and 42% of Behavioural Intention to Use variances) may be explained by other unknown factors.

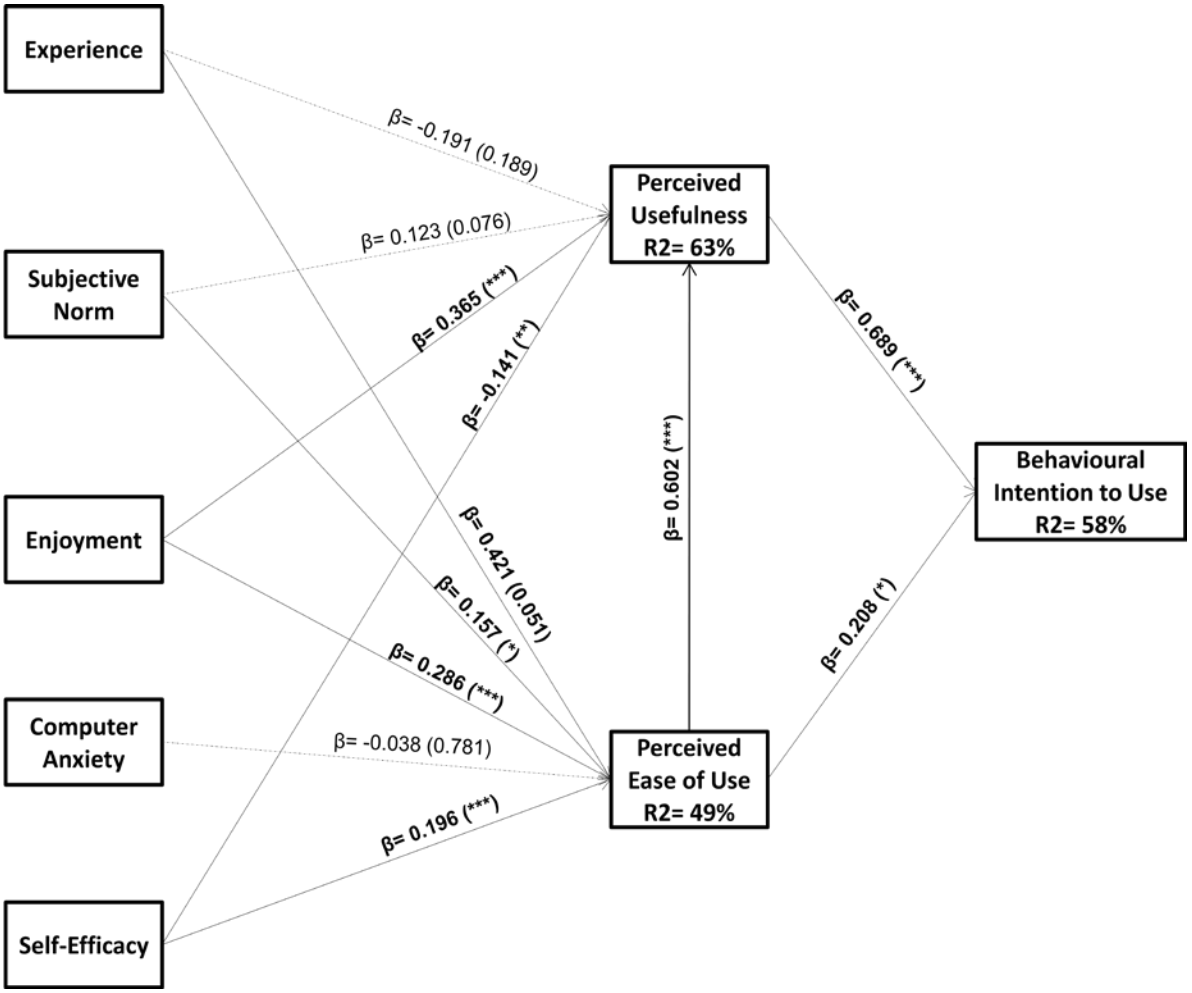

Fig. 3. Correlation Analysis of the Research Model

Note. The P-Values are presented in the parentheses (*p< 0.05; **p< 0.01; ***p< 0.001). R2 (R-Square) shows the percentages of variance explained by the predictor variables.

6 Discussion and implications

This study tested the GETAMEL in the context of e-portfolios. The results of the goodness of fit test indicated that the GETAMEL was robust and represented the collected data very well.

The hypothesis testing results demonstrated that the model explained students' perceptions and Behavioural Intention to Use the e-portfolio through the proposed factors.

A positive significant relationship between Experience and PEOU was found as hypothesised. This finding is consistent with previous studies (Abbad *et al.*, 2009; De Smet *et al.*, 2012; Lee *et al.*, 2013; Lee *et al.*, 2011; Purnomo & Lee, 2013). The results also indicated that SN, Enjoyment and SE

significantly correlated with PEOU. The correlation found between SN and PEOU is consistent with previous studies (e.g. Farahat, 2012; Lee *et al*., 2011; Motaghian *et al*., 2013; Yuen & Ma, 2008). The correlation found between Enjoyment and PEOU is consistent with previous studies (e.g. Al-Ammary *et al*., 2014; Al-Aulamie *et al*., 2012; Al-Gahtani, 2016; Arenas-Gaitan, Rondan-Cataluna & Ramirez-Correa, 2010; Chen *et al*., 2013; Martinez-Torres *et al*., 2008; Shyu & Huang, 2011; Zare & Yazdanparast, 2013). The correlation found between SE and PEOU is also consistent with previous studies (e.g. Al-Ammary *et al*., 2014; Al-Gahtani, 2016; Ali *et al*., 2013; Al-Mushasha, 2013; Hsia *et al*., 2014; Lee *et al*., 2014; Lee *et al*., 2013; Motaghian *et al*., 2013; Wu *et al*., 2013). Thus, these four factors (Experience, SN, Enjoyment and SE) should be considered as enhancing students' PEOU of e-portfolios.

The link between CA and PEOU however was insignificant. This is contrary with many e-learning studies (including Al-Gahtani, 2016; Ali *et al*., 2013; Calisir *et al*., 2014; Chen & Tseng, 2012; Karaali *et al*., 2011; Lefievre, 2012; Park, Son *et al*., 2012) and in line with some other studies (including Liu, 2010; Mohamed & Abdul Karim, 2012; Purnomo & Lee, 2013; Rezaei *et al*., 2008; Shen & Eder, 2009). Therefore it is recommended that further research should be carried out to explore what lies behind this inconsistency. In this study, such a result might be related to low CA among the surveyed students in terms of computer usage, as they were all studying computer-related courses. This finding was unexpected, but as this result has also been found in other e-learning acceptance studies, it can be explained by the increasing use of computer technology in every aspect of daily life, and particularly within the computer science student population participating in this study. With negative perceptions associated with computers reducing, the effects of computer anxiety on PEOU are increasingly not significant (Shen & Eder, 2009, p.231).

The relationship between Experience and PU was also insignificant in this study. This finding is inconsistent with some previous studies (such as: Lee *et al*., 2013; Martin, 2012; Purnomo & Lee, 2013; Rezaei *et al*., 2008) and consistent with a number of previous studies (such as: Abbad *et al*., 2009; Lau & Woods, 2008; Lee *et al*., 2011; Pituch & Lee, 2006). Because of this, the relationship between these two constructs (Experience and PU) is also a clear avenue for future research. The insignificant relationship between these two constructs in this study indicates that computer related Experience is not associated with students' PU of e-portfolios. From an e-portfolio developer's point of view, this is a desirable result, as it suggests that the perceived usefulness of a well-designed e-portfolio system may not depend on previous computer related experience.

The beta value found between SN and PU was 0.123, which is a small effect size according to guidelines proposed by Cohen (1992), but the P-Value found (p=0.076) is not significant to the 95%

confidence interval level (the P-Value threshold of <0.05). Thus, there is no strong evidence in this study to show that peer pressure influences PU of e-portfolio. According to Abbad *et al*. (2009) "If there is no great expectation that an e-learning system will be used for communication purposes then there will be little peer pressure to use the system". Hence a possible reason for the insignificant relationship between SN and PU might be that students use social networking sites (such as Facebook) for communication purposes rather than e-portfolios. As there is a limited number of studies that investigate the factors that affect students PU of e-portfolios, further research involving the SN examined here will be needed to confirm this finding.

We found a negative significant correlation between SE (β= -0.141, p<0.01) and PU. This means students who are confident in using the e-portfolio do not find the e-portfolio useful. This finding is similar to a previous study carried out by Aypay *et al*. (2012), who also found significant negative correlation between Computer Self-Efficacy and students' PU of computers. However this finding is different from what other studies have found (including: Al-Ammary *et al*., 2014; Al-Mushasha, 2013; Chow *et al*., 2012; Hussein *et al*., 2007; Ifinedo, 2006; Park, 2009). For this reason, there is a need for carrying out further studies exploring what lies behind this discrepancy. In this study, such a result might be related to high SE among the surveyed students in terms of technology usage, as all the surveyed students were studying computer-related courses. As computer science students, the participants might have used other technologies with more functionalities than the e-portfolio can offer. In other words, students' negative perception about the usefulness of the e-portfolio in this study can be related to the functionality of the e-portfolio. To confirm this, further studies need to investigate variables related to the quality and functionality of the e-portfolio.

This study also found a significant positive relationship (β=0.365, p<0.001) between Enjoyment and PU. This finding is consistent with many previous studies (including: Al-Aulamie *et al*., 2012; Chen *et al*., 2007; Chen *et al*., 2013; Park, Son *et al*., 2012; Wu & Gao, 2011; Zare & Yazdanparast, 2013; Zhang *et al*., 2007). This means students who enjoy using an e-portfolio find the e-portfolio useful in its purpose.

Additionally, similar to earlier studies (including Lin, *et al*., 2014, p.461; Park, 2009, p.158), this study confirmed TAM to be a useful theoretical model in understanding and explaining University students' intention to use e-learning. The results of the hypotheses testing supported the hypothesised significant correlation between the constructs of TAM used in this study.

6.1 Frequency of e-portfolio usage

The participants of this research were from three different study years. 170 respondents were in the first year of their study, 61 in their second year and 11 in their final year. Since all the students were introduced to the e-portfolio in the beginning of their first year at the university, student from different study years indicated different current e-portfolio usage. 31.76% of the first year students said that they do not use the e-portfolio at all (shown in Table 5). This percentage increased to 47.54% among the 61 second year students and to 54.55% among the 11 final year students (shown in Table 5). However the majority of the first year and second year students have indicated that they use the e-portfolio.

There may be two possible reasons behind the reduction in using the e-portfolio among the second and final year students. First, it can be because of the fact that students get introduced to the e-portfolio and encouraged to use it in the first year of their study and therefore they use it more often in that year. Second, it may be that "individuals' perceptions can change over time as they gain more experience" (Lee *et al.*, 2013, p.185). Hence, encouraging students to use an e-portfolio and supporting them to gain more positive experience in using it, maybe two key factors that can affect students' e-portfolio usage.

In this research, changes or reductions in using the e-portfolio can be seen between the first, second and final year students. However, it must be noted that this study was cross-sectional and investigated students' perception at one point of time. Therefore, longitudinal research should be conducted in order to better understand and trend the changes in students' behaviour regarding e-portfolio usage over a period of time.

Table 5

Average current e-portfolio usage

		170 First year students		61 Second year students		11 Final Year students	
Usage Question 1	**Pre-coded answers**	**Number of students**	**%**	**Number of students**	**%**	**Number of students**	**%**
On average I use the e-portfolio (pick most accurate answer):	Don't use at all	54	31.76	29	47.54	6	54.55
	Use less than once a week	33	19.41	17	27.87	2	18.18
	Use about once a week	72	42.35	9	14.75	2	18.18
	Use several times a week	9	5.29	4	6.56	1	9.09
	Use about once a day	2	1.18	1	1.64	0	0.00
	Use several times a day	0	0.00	1	1.64	0	0.00
Total		**170**	**100**	**61**	**100**	**11**	**100**

Average current e-portfolio usage in hours

		170 First year students		61 Second year students		11 Final Year students	
Usage Question 2	**Pre-coded answers**	**Number of students**	**%**	**Number of students**	**%**	**Number of students**	**%**
On average, how many hours do you normally spend each week using the e-portfolio?	None	56	32.94	30	49.18	6	54.55
	Less than 1 hour	64	37.65	17	27.87	3	27.27
	1 to 2 hours	44	25.88	11	18.03	1	9.09
	2 to 4 hours	5	2.94	3	4.92	0	0.00
	More than 4 hours	1	0.59	0	0.00	1	9.09
Total		**170**	**100**	**61**	**100**	**11**	**100**

6.2 Practical implications

When planning a new e-portfolio system for education, education providers should have the ability to predict whether the new system will be acceptable to learners, investigate reasons why a planned system may not be fully acceptable, and then take corrective action to increase acceptability. This action would also help to improve educators' investment in time and money (Davis *et al*., 1989). The results of this study show that Perceived Usefulness of the e-portfolio is the key determinant of students' Behavioural Intention to Use the e-portfolio (β= 0.689, $p<0.001$). Hence, prior to introducing a new e-portfolio system to computer science student populations, education providers can increase the acceptability of the system by having the students involved in the implementation process assessing students' perceptions (perceived usefulness, ease of use, enjoyment etc.) about the e-portfolio, and taking corrective actions accordingly. Education sessions should be also provided to emphasize the effectiveness and usefulness of the e-portfolio. The information and training sessions should primarily focus on how the e-portfolio can help improve students' learning and employability.

The present study also shows that the factors that influence students' Perceived Usefulness of the e-portfolio were Perceived Ease of Use and Enjoyment. Perceived Ease of Use is a key factor to increase students' Perceived Usefulness (β= 0.602, $p<0.001$) and it directly affects (β= 0.208, $p<0.05$) students Behavioural Intention to Use the e-portfolio. Therefore, education providers should foster this factor by having on-campus user training and reassure the students that they will have personal support at the campus. E-portfolio system designers on the other hand, have to enhance the system's ease of use through good design and by providing clear instructions to users.

Enjoyment affected both students' PU (β=0.365, $p<0.001$) and PEOU (β= 0.286, $p<0.001$) of the e-portfolio. This suggests that students who would enjoy using the e-portfolio system have positive perceptions about the ease of use and usefulness of the system. This substantiates the importance of the e-portfolio to be intrinsically perceived as enjoyable and stimulating, in order to promote a strong positive BI. E-portfolio developers and providers need to focus more on making the use of e-portfolios enjoyable to guarantee student acceptance.

Subjective Norm was a significant predictor (β= 0.157, $p<0.05$) for how easy students thought the e-portfolio was to use. Educators should consider ways to encourage the use of e-portfolios within potential users. This can be done, for example, through incentivising students to use forums and discussion boards related to e-portfolios, and to identify other ways to maintain and increase the positive effects of Subjective Norm on students' PEOU of e-portfolios.

The study also found that computer related Experience (β= 0.421, p=0.051) and Self-Efficacy (β= 0.196, p<0.001) have substantial impacts on students' Perceived Ease of Use of the e-portfolio. This shows that students who have computer related experience and believe in their own ability to use the e-portfolio, perceive the e-portfolio as an easy system to use. These finding have important implications for both education program managers and e-learning system designers. In order to increase students computer related experience and belief in their own ability (i.e. Self-Efficacy), education program managers need to provide training and assure the availability of mentoring and technical support. System designers need to design e-learning systems in a consistent way, so that students' experience and confidence in using one e-learning system can be transferred to using another.

According to this study Experience and Subjective Norm were not important determinants of PU of the e-portfolio. From an e-portfolio designer's perspective this is a desired finding, as it suggests that students' Perceived Usefulness of e-portfolio systems does not depend on either computer related experience nor social influences.

6.3 Theoretical implications

This research study demonstrates the effectiveness of GETAMEL in explaining and identifying factors that influence students' perceptions and Behavioural Intention to Use the e-portfolio system.

The study found a significant positive relationship between the following constructs as hypothesised:

- Experience and PEOU
- Subjective Norm and PEOU
- Enjoyment and PEOU
- Self-Efficacy and PEOU
- Enjoyment and PU
- PEOU and PU
- PU and BI
- PEOU and BI

Substantiating the importance of these factors in influencing e-portfolio adoption, future research should consider the positive impact of these factors when investigating e-learning systems adoption, specifically e-portfolios.

Inconsistent with many previous research studies, this study found no significant positive relationship between the following constructs:

- Experience and PU
- Subjective Norm and PU
- Self-Efficacy and PU

- Computer Anxiety and PEOU

Therefore it is recommended that further research should be carried out to explore what lies behind this inconsistency.

This study contributes to the field of e-learning and e-portfolio adoption research as the GETAMEL, and its psychometric properties validated in this study, can be used as a research framework to understand the adoption of e-portfolios, specifically in computer science undergraduate student populations. The model can also be used for future research in e-portfolio practice in different contexts. The fact that 58% of the variance (R2 = 0.58) in Behavioural Intention to Use the e-portfolio is explained by the theoretical model in this study, suggests that the GETAMEL has applicability across disciplines and across settings in identifying, explaining and predicting students' Behavioural Intention to Use e-portfolios. Therefore the replication of this study across disciplines and settings is highly recommended to generalize the findings across different domains.

Nevertheless, further exploration of alternative factors that might influence e-portfolio adoption are also warranted. The four external variables (Experience, Subjective Norm, Enjoyment and Self-Efficacy) were the primary factors that influenced the two key determinants (PEOU and PU). In the higher education setting, there might have been more than four factors that influenced those two key determinants specified in the GETAMEL. More investigation on external variables, such as e-portfolio experience, system quality, technical support and participation in the e-portfolio developing process may be needed.

6.4 Limitations of the study and suggestions for future research

Rigorous research procedures are used, but this research has some limitations that could be addressed in future studies. First, this study only investigated the role of five external variables in affecting the two key determinants (PEOU and PU). There might have been more than four factors that influenced those two key determinants specified in the GETAMEL. Future studies should test the possible inclusion of other external variables that are unexplored in this research. Second, this study was cross-sectional and measured perceptions and intentions to use at a single point of time. It must be noted that students' perceptions about the ease of use and usefulness of e-portfolios can change over time as they gain more experience. Because of this, longitudinal research should be carried out to evaluate the validity of the GETAMEL and our findings, taking into account the changes in users' perception and behaviour over a period of time. Despite its limitations, this study has value as the findings provided several important implications for educators and e-portfolio developers.

7 Conclusion

In summary, the findings of this study suggests that the best predictor of students' Perceived Ease of Use of e-portfolios is (computer-related) Experience (β= 0.421, p=0.051 to a 94.9% confidence interval), followed by Enjoyment (β= 0.286, p<0.001), Self-Efficacy (β= 0.196, p<0.001) and Subjective Norm (β= 0.157, p<0.05). The best predictor of students' Perceived Usefulness of e-portfolios is Perceived Ease of Use (β= 0.602, p<0.001) followed by Enjoyment (β= 0.365, p<0.001). Both Perceived Ease of Use (β= 0.208, p<0.05) and Perceived Usefulness (β= 0.689, p<0.001) of e-portfolios predict students' Behavioural Intention to Use e-portfolios. Thus four external variables (Self-efficacy, Subjective Norm, Enjoyment and Experience), as well as Perceived Ease of Use, Perceived Usefulness and Behavioural Intention to Use, should be considered as important factors when designing, implementing and using e-portfolios in Higher Education in order to ensure e-portfolios are widely used by students and are effective as teaching and learning tools.

In order to enhance students' acceptance of e-portfolios, educators are required to foster the above influential factors by providing students with training and support including mentoring and technical support. E-portfolio developers on the other hand have to enhance the system's ease of use and usefulness through good design, system functionalities and by providing clear instructions to users.

This study tested the GETAMEL in the context of e-portfolio acceptance. It validated a valuable model for predicting acceptance of e-portfolios with computer science students in higher education. The fact that 58% of the variance (R2 = 0.58) in Behavioural Intention to Use the e-portfolio is explained by the theoretical model in this study, suggests that the GETAMEL has applicability across disciplines and across settings in identifying, explaining and predicting students' Behavioural Intention to Use e-portfolios. Thus the replication of this study across different domains is highly recommended.

8 Appendix 1

Table A1
Instrument

Constructs	Items	Measures	Adopted from
Self-Efficacy	SE1	I am confident of using the e-portfolio even if there is no one around to show me how to do it.	(Compeau& Higgins, 1995, p.211; Strong, Dishaw & Bandy, 2006, p.105; Tan & Teo, 2000; Pituch & Lee, 2006, pp.240-1; Venkatesh & Davis, 1996, p.479)
	SE2	I am confident of using the e-portfolio even if I have never used such a system before.	
	SE3	I am confident of using the e-portfolio even if I have only the software manuals for reference.	

Computer Anxiety [b]	CA1 [a]	Computers do not scare me at all.	(Venkatesh & Bala, 2008, p.313)
	CA2	Working with a computer makes me nervous.	
	CA3	Computers make me feel uncomfortable.	
	CA4	Computers make me feel uneasy.	
Experience	XP1	I enjoy using computers.	(Lee *et al*., 2013, p.180; Purnomo & Lee, 2013, p.149)
	XP2	I am comfortable using the Internet.	
	XP3 [a]	I am comfortable saving and locating files.	
	XP4 [a]	I enjoy using e-mail.	
Enjoyment	ENJOY1	I find using the e-portfolio enjoyable.	(Davis *et al*., 1992, p.1116; Venkatesh *et al*., 2003, p.456; Cheng, 2011, p.282; Lefievre, 2012, p.13; Park, Son *et al*., 2012, p.383; Cheng, 2012, p.37; Zhang, Zhao & Tan, 2008, p.314; Lin *et al*., 2010, p.491)
	ENJOY2	The actual process of using the e-portfolio is pleasant.	
	ENJOY3	I have fun using the e-portfolio.	
Subjective Norm	SN1	People who influence my behaviour would think that I should use the e-portfolio.	(Yoo, Han & Huang, 2012, p.949; Venkatesh *et al*., 2003, p.460)
	SN2	People who are important to me would think that I should use the e-portfolio.	
Perceived Ease of Use	PEOU1 [a]	Learning to use the e-portfolio would be easy for me.	(Davis 1989, p.340)
	PEOU2	I would find it easy to get the e-portfolio to do what I want it to do.	
	PEOU3	My interaction with the e-portfolio would be clear and understandable.	
	PEOU4	I would find the e-portfolio to be flexible to interact with.	
	PEOU5	It would be easy for me to become skillful at using the e-portfolio.	
	PEOU6	I would find the e-portfolio easy to use.	
Perceived Usefulness	PU1	Using the e-portfolio would allow me to accomplish learning tasks more quickly.	(Davis 1989, p.340)
	PU2	Using the e-portfolio would improve my learning performance.	
	PU3 [a]	Using the e-portfolio would increase my productivity in learning.	
	PU4	Using the e-portfolio would enhance my effectiveness in learning.	
	PU5	Using the e-portfolio would make learning easier.	
	PU6	I would find the e-portfolio useful in my learning.	
Behavioural Intention to Use	BI1	Assuming I had access to the e-portfolio, I intend to use it.	(Venkatesh & Bala, 2008, p.314; Venkatesh & Davis, 2000)
	BI2	Given that I had access to the e-portfolio, I predict that I would use it.	
	BI3	I plan to use the e-portfolio in the future.	

Average e-portfolio usage	Usage1	On average I use the e-portfolio (pick most accurate answer): Don't use at all, Use less than once a week, Use about once a week, Use several times a week, Use about once a day, Use several times a day	Self developed
	Usage2	On average, how many hours do you normally spend each week using the e-portfolio? None, Less than 1 hour, 1 to 2 hours, 2 to 4 hours, More than 4 hours	

Note. Apart from the average e-portfolio usage questions, all other items were measured on a seven-point Likert scale.
[a] Deleted because of a low factor loading.
[b] The negative items for Computer Anxiety were converted to positive in data analysis.

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