AN INVESTIGATION OF THE ADOPTION OF EDUCATIONAL TECHNOLOGY IN IRAQI HIGHER EDUCATION: EVIDENCE FROM SALAHADDIN UNIVERSITY

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Abstract

This paper investigates the use of e-learning systems in universities in Iraq as part of the UNESCO Avicenna Virtual Campus Project. In addition, it identifies the factors that can affect Iraqi students' acceptance and use of e-learning. Semi-structured interviews were conducted with the management of Salahaddin Avicenna E-Learning Centre. In addition, a questionnaire was developed based on extending the Technology Acceptance Model. A total of 300 questionnaires were distributed to students. Partial Least Squares (PLS) was used to analyse the data. The findings indicated that e-learning has a potential in being used successfully in Iraqi universities. However, the training on the use of the system needs to be improved. In addition, the findings indicated that perceived usefulness, perceived ease of use, subjective norms and self efficacy have significant effects on behaviour intention and behaviour intention, experience, information quality and technical support have significant direct effects on actual use of the e-learning system.

Keywords: E-learning adoption, Technology Acceptance Model, Iraqi universities, Salahaddin University, Partial Least Squares

1.0 Introduction

E-learning is defined as "*Learning facilitated and supported through the utilization of information and communication technology (ICTs)*" (Masrom, 2007, p.1). The use of e-learning proved to be effective in both developed countries for example the United Kingdom (Finlayson et al., 2006) and in developing countries for example China (Wang et al., 2010). Furthermore, the use of e-learning proved to be effective in some of the Arab countries where it was successfully implemented for example; United Arab Emirates (Afari et al., 2012) and Jordan (Al-Adwan et al., 2013). However, it is still behind in many other Arab countries for example; Libya, Syria, Oman, Sudan, Yemen and Iraq. The importance of e-learning was acknowledged in previous studies (e.g Saade and Kira, 2009;Al-Alak and Alnawas, 2011). E-learning enables students to access course materials and communicate their learning activities more effectively. A high number of universities are integrating face-to-face teaching with a virtual learning environment to provide further support to the students' learning experience. According to Algahtani (2011), e-learning can be used in many different ways including the 'adjunct, blended e-learning and online'. The adjunct e-learning refers to the use of e-learning

to support the traditional ways of teaching in classrooms. Blended e-learning refers to the online delivery of some parts of the course while the other parts are delivered using the traditional ways (face-to-face). The third way is online teaching in which the entire teaching and learning process is carried out online. Some worldwide universities have used the virtual learning environment solely without any face-to-face teaching which is known as distance learning for example The Arab Open University (Mirza and Abdulkareem, 2011) which proved to be effective in many countries. Universities were able to utilise modern ICTs for learning purposes using various media for instance audio, video and lecture presentations and creating a virtual environment which students can access and use different materials. This has transformed the traditional ways of teaching and learning in higher education.

Despite the wide use and acknowledged effectiveness of e-learning, universities in Iraq are still behind in using e-learning programmes in comparison to the developed as well as some of the developing countries. In 2010, the United Nations Educational Scientific and Cultural Organisation (UNESCO) collaborated with the Iraqi Ministry of Higher Education to develop the Avicenna Virtual Campus in Iraq (AVCI) to improve the quality of learning by integrating online learning in Iraqi universities. This project has been implemented in many other developed and developing countries including; the United Kingdom, France, Spain, Turkey, Malta, Italy, Cyprus, Algeria, Egypt, Jordan, Morocco, Lebanon, Tunisia and Palestine (Su.edu.krd, 2016). However, Iraqi universities only joined in 2015 when the project was launched and the training of both instructors and some students began. Three Iraqi universities were part of this project including Baghdad, Basrah and Salahaddin universities. This paper is based on a case study of Salahaddin University-Erbil.The rationale for this is that it was the first university in Kurdistan region-Iraq to use the e-learning system in collaboration with the UNESCO and the Iraqi Ministry of Higher Education and the system is new as it has been introduced to students in 2015. The project has both great potential and challenges which need to be investigated as it is implemented in Kurdistan region in Iraq for the first time. Furthermore, there is a lack of research on how to enhance e-learning in Iraqi universities from the Iraqi students' perspective. Therefore, conducting research that investigates how the project has been implemented in Iraq and the factors that can affect the adoption of the e-learning system by Iraqi students is important.The main aim of this research, through the case study, is to investigate the use of e-learning systems in Iraqi universities. The key objectives are;

1. To investigate the use of e-learning systems in Iraqi higher education
2. To evaluate the training programme introduced by Salahaddin University to its students
3. To identify the factors that can affect the adoption of e-learning systems among university students in Iraq

This research aims towards filling the gap in the literature in respect to the limited number of studies on e-learning in Iraq. This is the first study to investigate the new e-learning system developed in Salahaddin University. The results have both theoretical and practical contributions. The study proposes a new model for e-learning acceptance in Iraq by testing and extending the original Technology Acceptance Model (TAM) developed by Davis (1989). In terms of the practical contributions, the research is of importance specifically to Salahaddin University and, generally, to all universities in Iraq, as the results will help in promoting the use of ICTs in teaching and learning in Iraqi higher education. The study therefore enriches the understanding of the factors that can influence e-learning acceptance in Iraq. In addition, the results of this research are useful for identifying how the UNESCO new project 'Avicenna Virtual Campus' can be implemented successfully in Iraq.

The next section provides a background on how e-learning has been used in Iraqi universities in the past. This is followed by a literature review on theories of Technology Acceptance (TA) that have been widely used within the context of e-learning. The fourth section includes a more in-depth analysis of the literature and factors related to e-learning in order to build the conceptual framework for the acceptance and use of e-learning in Iraq. This is followed by an outline of the research methods adopted in this study. The sixth section includes the results of the interviews conducted with the management of the e-learning centre at Salahaddin University in order to obtain information on the e-learning system at the university. The seventh section includes the results of the analysis of the data collected via questionnaires distributed to students at the university. This is followed by the discussion, limitations and future work and conclusions of the study.

2.0Background on the use of e-learning in Iraq

Some universities in Iraq have started using the e-learning system but they are at the very early stages (Elameer and Idrus, 2010a; Elameer and Idrus, 2010b). Unlike other Arab countries, where online degrees and courses are acceptable and certified by the ministries of higher education, online learning has not been adopted in Iraq and the certificates obtained when completing online courses in Iraq or in other countries cannot be certified and accredited by the Iraqi Ministry of Higher Education (Mohamadamin and Shabila, 2009; Elameer and Idrus, 2010a). Therefore, the use of e-learning is limited to the hybrid approach and the majority of courses are provided via face-to-face on campus teaching. Mohamadamin and Shabila (2009) investigated the possibility of introducing online learning in Hawler University-Erbil and Salahaddin University-Erbil in 2009. The sample included students from Hawler University and Salahaddin University. The results of their research showed that the main advantages of using the e-learning system included; reduced costs, the ability of having a degree from a foreign university and having a better interaction with instructors. The main obstacles facing the adoption of e-learning were that online courses are not accredited and the lack of training and limited access to computers and internet (Mohamadamin and Shabila, 2009).

Within the context of e-learning in Iraq, previous studies emphasised the importance of the overall e-learning system infrastructure (Elameer and Idrus, 2011; Fahad et al., 2015) and usability aspects, for example, page and site design, context design, navigation, accessibility and usability which were part of Elmeer and Idrus' (2011) framework for the University of Mustansiriyah. However, the framework developed by the authors is general and it covers the entire e-learning system, rather than moving towards a more in-depth understanding of what students need. Anter et al., (2014) proposed a new e-learning model for students in Iraq. The model was holistic, as it included the entire process required to have an efficient e-learning system namely, student activities, teacher activities and the administration team. The model was technical, based on three main factors including services and information availability and accessibility, flexibility of updating model components (i.e services and materials) and services and infrastructure management using a central web server. The reason behind the high attention allocated to the technical aspect of the e-learning system was that the ICT infrastructure in Iraq in general is considered low (Heshmati et al., 2013). This made it unrealistic to investigate and analyse the factors that can encourage students to adopt the e-learning system without investigating system quality and ICT infrastructure.

3.0Literature review

The acceptance and use of technologies have been widely investigated in previous studies. One of the first theories used in technology acceptance was the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1980),which was primarily developed to understand and predict human's social behaviour (decision making). The main constructs of the theory were personal attitude towards behaviour intention defined by Fishbein and Ajzen (1980) as "*The person's belief that the behaviour leads to certain outcomes and his/her evaluations of these outcomes*" and subjective norm was defined as "*The person's beliefs that specific individuals or groups think he/she should or should not perform the behaviour and his/her motivation to comply with he specific referents*" (Fishbein and Ajzen, 1980, p.8). Fishbein and Ajzen (1980) stated that both constructs constitute the individual's intention to perform certain behaviour. The attitude towards objects is demonstrated through the individual's evaluation of the belief and the outcomes. Both attitude towards the act of behaviour and subjective norm were found to affect behavioural intention which, in turn, affects actual behaviour. Behavioural intention is an indication that the person is ready to conduct certain behaviour. In fact, intention was also found a major determinant of behaviour in subsequent theories related to technology acceptance, which streamed from TRA. Behavioural intention was one of main constructs in the Technology Acceptance Model developed later by Davis (1989).

The TAM (Davis, 1989) is one of the most well-known models of technology acceptance. The model was developed to explain the reasons that make a user accept new technologies. The model was based on the Theory of Reasoned Action model. The model used two main antecedents that can predict behaviour intention and actual use of computers in an organisational setting. The two main constructs were Perceived Ease of Use (how easy the system is to use) and Perceived Usefulness (the outcomes gained from using the system) as shown in figure (1) below. Perceived usefulness was found the most significant predictor of attitude and behaviour intention to use information technology (Davis, 1989; Davis *et al*., 1989). TAM was able to predict 40-50% of user acceptance.

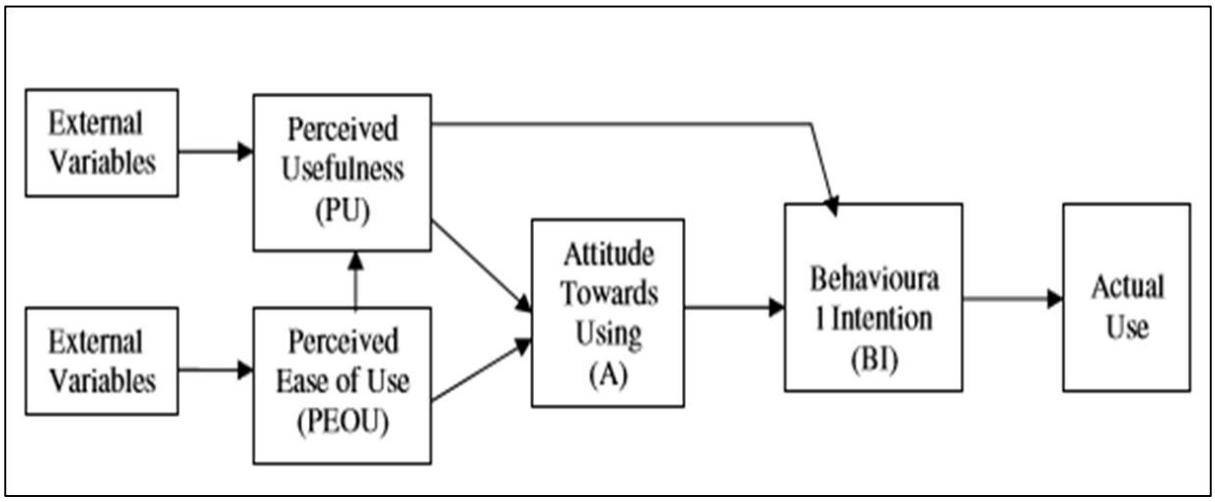

Figure 1. Technology Acceptance Model, Davis *et al*., (1989)

Venkatesh and Davis (2000) further developed TAM to create TAM2, which was also purely developed for an organisational setting (for employees). The authors added subjective norm as one of the main constructs of the model. The rationale for this was that whilst subjective norm did not prove to be significant in Davis' (1989) research, the authors explained that subjective norm is not important in voluntary settings but it had a direct significant effect on intention in mandatory settings. Taylor and Todd (1995a) found that the inclusion of subjective norm, attitude towards behaviour and perceived behaviour control (the elements that are part of the behaviour but cannot be controlled) is better than using the constructs from TAM on their own. Also, subjective norm plays an important role as a predictor of intention for inexperienced users.

TAM is one of the most well-known models and it has been used extensively in the existing body of literature when explaining and predicting technology acceptance (Park, 2009). It has been used as a theoretical base extensively in the existing literature related to e-learning in the Arab countries. Sharma and Chandel (2013) used it as the theoretical base of their framework for e-learning adoption in Oman. The authors further extended the model by including self-efficacy and website quality. Both of these factors were found significant in their study. Al-Adwan et al., (2013) tested the applicability of the model amongst university students in Jordan. The model was able to explain e-learning adoption among Jordanian students. The authors recommended testing the model using a different sample and adding the 'actual usage' construct. Chokri (2012) also extended it for Saudi students by adding the constructs 'experience of learners in ICTs' and 'design of the e-learning process'. Both constructs included several items linked to the efforts made by students to use the e-learning system.

Previous studies showed that there are external factors that can affect e-learning adoption especially in the Arab countries. For example, the high cost of internet connection and the inefficiency in launching successful e-learning systems due to the lack of expertise in this area (Mirza and Abdulkareem, 2011), which severely affect the system quality and accessibility. These factors may be equally important for the adoption of e-learning as well as the original factors proposed. The following section provides the theoretical basis and the constructs of the model developed in this study.

4.0Research Model and Hypotheses Development

The present study uses TAM as a theoretical base for the conceptual framework. As stated, TAM has been successfully applied within the context of e-learning adoption (in both developed and developing countries) making it suitable to study the factors that can influence students' adoption of e-learning in Iraq. The study further extends the model by adding a number of constructs developed specifically to explain e-learning adoption by students in Iraq (see figure (2) below).

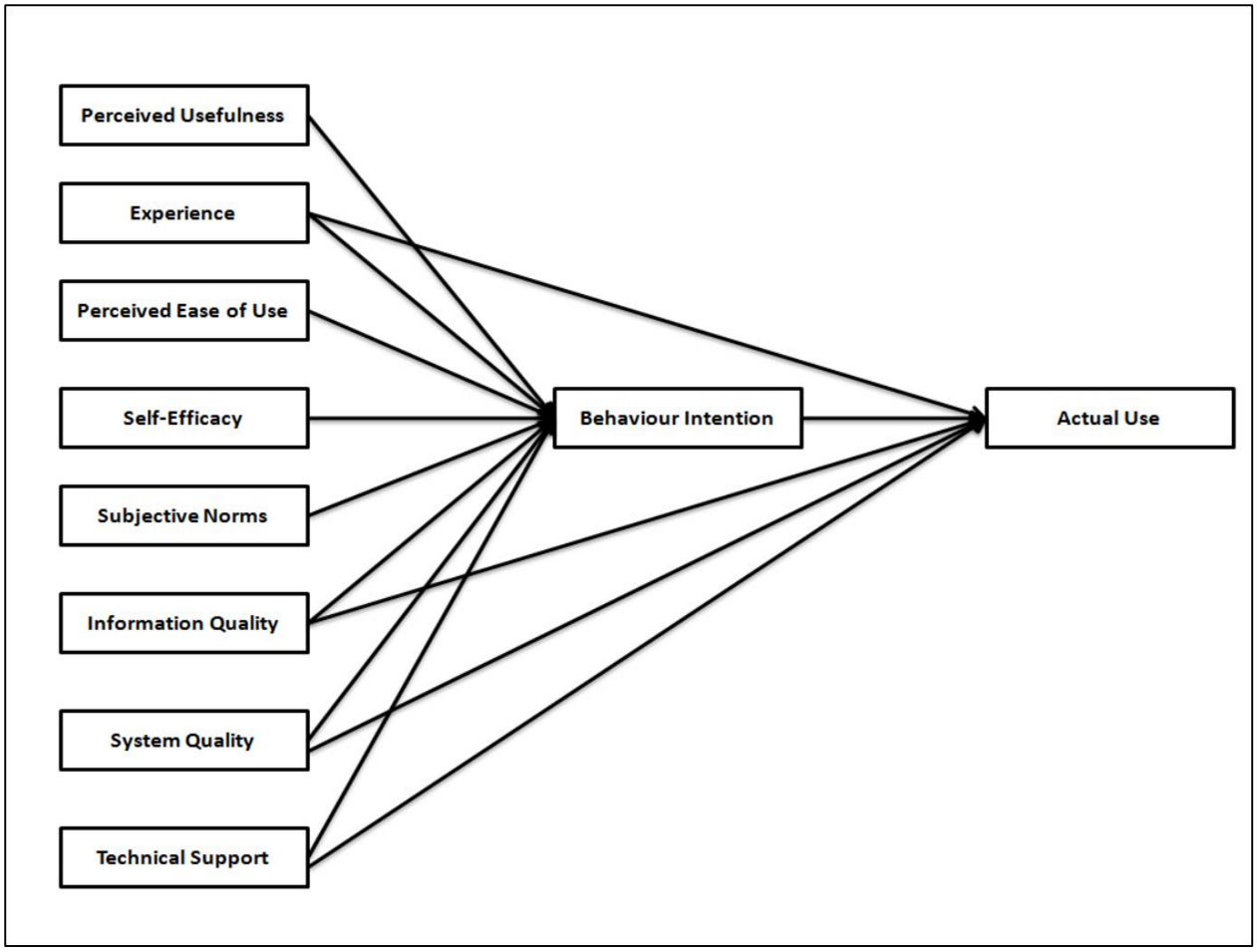

Figure 2. The research model

The following sub-sections illustrate the main constructs of the conceptual framework developed in this study.

4.1 Perceived Usefulness

Perceived Usefulness (PU) is defined as the degree to which a person believes that using a particular system would enhance his/her performance (Davis, 1989; Davis *et al*., 1989).Perceived Usefulness was found a highly significant predictor of the individual user's behaviour intention towards using technology (e.g. Davis et al., 1992; Legris et al., 2003). An individual who thinks that a certain system or technology will be useful is more likely to adopt this technology. The usefulness of using e-learning as part of the learning process in higher education from the students' perspective can be in terms of constant access to different resources and lecture slides, time saving, increased flexibility and having greater control over work which enhance productivity in learning. Therefore, the following hypothesis was developed;

H1: Perceived Usefulness (PU) significantly affects the Behaviour Intention (BI) of students towards usage

4.2 Perceived Ease Of Use

Perceived Ease Of Use (PEOU) is defined as the degree to which a person believes that using a particular system would be free of effort (Davis, 1989; Davis et al., 1989). When a system is easy to use, individuals are more likely to adopt it (Igbaria and Livari, 1995; Wang et al., 2003). PEOU is particularly important for individuals with no experience in using the system or at the early stages of using the system (Davis et al., 1989). PEOU was found important within the context of e-learning adoption in previous studies (e.g. Ndubisi, 2004; Abbad et al., 2009; Al-Alak and Alnawas, 2011; Claar et al., 2014). Thus,

H2: Perceived Ease Of Use (PEOU) significantly affects the Behaviour Intention (BI) of students towards usage

4.3 Subjective Norm

Subjective Norm (SN) is defined as "*The person's beliefs that specific individuals or groups think he/she should or should not perform the behaviour and his/her motivation to comply with the specific referents*" (Fishbein and Ajzen, 1980). Taylor and Todd (1995b) explained that subjective norm represents the social pressure on the person to perform the behaviour. Venkatesh and Davis (2000) found that subjective norm is significant in mandatory settings (whether an educational or an organisational setting). This construct was also found significant in other previous studies such as Tarhini et al., (2013). Within the context of e-learning in an educational setting, it is important to explore the role of subjective norm. Students can be influenced by their instructors or their peers towards the use of e-learning. Therefore, the following is hypothesised;

H3: Subjective Norm (SN) significantly affects the Behaviour Intention (BI) of students towards usage

4.4 Self-Efficacy

Self-Efficacy (SE) was an important concept in the Social Cognitive Theory (Bandura, 1986). Self-efficacy is defined as "*An individual's self-confidence in his or her ability to perform tasks across multiple computer applications domains*" (Monsuwe et al., 2004). It was also found significant in previous studies which investigated the factors affecting the adoption of e-learning in some of the Arab countries (Behl et al., 2007; Abbad et al., 2009; Afari et al., 2012; Alenezi, 2012; Sharma and Chandel, 2013). The self-efficacy construct is related to the students' ability to use the e-learning platform. Individuals with low e-learning self-efficacy cannot handle the system if it is complex and they will not persist with their efforts. As a result, they are less likely to overcome any challenges they may face when using a system (Compeau and Higgins, 1995). Thus,

H4: Self-Efficacy (SE) significantly affects the Behaviour Intention (BI) of students towards usage

4.5 Experience

Previous studies show that there are significant differences between experienced and inexperienced users when adopting a system (Taylor and Todd, 1995a; Taylor and Todd, 1995b). Experience (Exp) was also found important within the context of e-learning adoption (Ndubisi, 2004; Abbad et al., 2009; Punnoose, 2012). More experienced students are more likely to be more confident in using the system and struggle less than inexperienced students. Here, experience refers to students' experience in dealing with computers and the internet in

general.Behaviour Intention was found to have a stronger effect on use when the individual has less experience in using technology (Venkatesh *et al*., 2012). It can be contended that the higher the experience of an individual in using the system, the more he or she will be using it. Accordingly, experience can have a significant effect on both behaviour intention and actual use. Thus, the following hypotheses are proposed;

H5a: Experience (Exp) significantly affects the Behaviour Intention (BI) of students towards usage

H5b: Experience (Exp) significantly affects the students' Actual Use (AU) of the system

4.6 Technical Support

The presence of Technical Support (TS) was found significant to encourage users to adopt technology (Venkatesh, 1999). A previous study conducted by Abbad et al., (2009) investigated the factors affecting students' adoption of e-learning in Jordan. The authors found that the technical support provided by the university to students using the e-learning system has a significant effect on technology adoption, consistent with previous studies conducted by Ngai *et al*., (2007) and Almarabeh et al., (2014). The availability of an efficient technical support and advice team that can operate efficiently can encourage students to use the e-learning system by increasing their intentions towards using e-learning systems as well as increasing their actual use of the system. Accordingly, Technical Support (TS) can affect both behaviour intention and actual use of the system. Thus,

H6a: Technical Support (TS) significantly affects the Behaviour Intention (BI) of students towards usage

H6b: Technical Support (TS) significantly affects the students' Actual Use (AU) of the system

4.7 E-Learning Information Quality

Information Quality (IQ) is an important factor that can contribute towards the adoption of e-learning. If students do not find the information on the electronic platform from their university as important and of a high quality up-to-date as well as being related to the modules they are studying, they are unlikely to use the e-learning system. Information quality was found an important determinant of e-learning adoption in Alkhattabi et al., (2010) and Lwoga's (2014) studies. The quality of the information provided in the e-learning system contributes towards the quality of the entire process of quality assurance towards learning in universities. Therefore, Information Quality (IQ) can have a significant effect on both behaviour intention and actual use of the e-learning system.

H7a: Information Quality (IQ) significantly affects the Behaviour Intention (BI) of students towards usage

H7b: Information Quality (IQ) significantly affects the students' Actual Use (AU) of the system

4.8 E-Learning System Quality

System Quality (SQ) was a significant predictor of e-learning system adoption in previous studies (Lwoga, 2014). Developing countries are considered behind in terms of Information and Communication Technologies (ICTs) in general in comparison to the developed countries (GSMA, 2012). Furthermore, the concept of using e-learning is still new to universities in Iraq. This makes investigating system quality and its effect on behaviour intention important for the case of university students in Iraq. According to Lwoga (2014), system quality includes five main sub-factors; responsiveness, usability, availability, reliability and adaptability. The author hypothesised that system quality is related to perceived usefulness and user satisfaction towards e-learning. The quality of the e-learning system was found important in previous studies conducted in Iraqi universities (Fahad *et al*., 2015). In the present study, the quality of the e-learning system is hypothesised to have a significant effect on behaviour intention, following the previous study conducted by Xu and He (2013). In addition, we propose that system quality has a significant direct effect on actual use since students may have high intentions towards using the e-learning system but the low quality of the system interface design and response time can affect how it is used.

H8a: System Quality (SQ) significantly affects the Behaviour Intention (BI) of students towards usage

H8b: System Quality (SQ) significantly affects the students' Actual Use (AU) of the system

4.9 Behaviour Intention

The Theory of Reasoned Action stated that intention and believes have a critical effect on actual use. The theory proved to be effective (Godin, 1994). Behaviour Intention (BI) was found a significant factor that can predict the actual use of a technology system (Taylor and Todd, 1995b; Venkatesh and Davis, 2000). This construct was part of many of the well-known technology acceptance theories and models including the Theory of Reasoned Action and the Technology Acceptance Model. Behavioural Intention (BI) is an indication that the person is ready to conduct a behaviour. Behaviour Intention (BI) was an important factor in e-learning adoption in previous studies (e.g. Li et al., 2011; Liaw, 2008).

H9: Behaviour Intention (BI) significantly affects the students' Actual Use (AU) of the e-learning system

5.0Research methods

The first stage of the research was conducting interviews with the management of the e-learning centre in Salahaddin University. The main reason for conducting the interviews prior to the distribution of the questionnaires to students was the lack of information on the e-learning system mainly in the university as well as other universities in Iraq and the Avicenna Virtual Project in Iraq. It was mandatory to obtain a background and information on the system and its scope as well as investigating what the university was planning to achieve prior to the analysis of the main factors that can contribute towards the acceptance and use of e-learning by the university students. Therefore, semi-structured interviews were conducted with the director of the e-learning centre in the university and the technical team manager. The qualitative data were analysed using simple coding.

The quantitative approach has been used widely in previous studies on technology acceptance and use (e.g. Davis, 1989; Davis et al., 1989; Tarhini et al., 2015). The second stage of the

research included the distribution of questionnaires to 300 students in Salahaddin University using convenience sampling. The use of convenience sampling can be justified in the case of this research as it allowed us to collect data from students based on whether they are available or not. The data was collected from students in different departments. These students were postgraduate students who have undertaken the training programme with the university since the e-learning system has not been used by all the university's students yet. Collecting data from these students allowed us to understand how effective the training programme of the e-learning system is and find new ways to improve it. Also, it allowed us to measure the actual use of the system. The questionnaire was distributed in both Arabic and English languages.

The questionnaire included questions regarding students' demographic profiles including age, gender and faculty. The questionnaires included questions to evaluate the training programme and the e-learning system from the students' perspective. The measurement items for each of the constructs outlined in the previous section and the studies they were adopted from are illustrated in table (1) in the appendix. These items were measured using a seven-point likert scale in the questionnaire.

The analysis of the data was conducted using Partial Least Squares-Structural Equation Modelling (PLS-SEM). PLS-SEM allows the analysis of data with small sample sizes (Hair et al., 2014). Also, it is a non-parametric approach which means that it is not necessary for the data to be normally distributed (Henseler et al. 2009). Furthermore, this method of analysis allows testing the effect of constructs with a low number of items (one or two items) (Ringle et al., 2012) which is the case for the constructs 'Experience' and 'Actual Use' in this research. We conducted the analysis of the quantitative data over two stages including testing the measurement model stage, followed by testing the structural model stage.

6.0E-learning in Salahaddin University

The data collected from the interviews with the director of Salahaddin Avicenna E-learning Centre and the technical team manager revealed information on the e-learning system at the university. The e-learning programme (the electronic portal) was launched in July 2015. The programme is being administrated by Salahaddin Avicenna E-learning Centre (SUE AVC E-learning). Salahaddin University-Erbil (www.su.edu.krd) is the first university in Kurdistan region in Iraq to use the e-learning system. The plan to start using the e-learning system was initiated in 2010 as part of the UNESCO Avicenna Virtual Campus project in cooperation with the ministry of higher education Kurdistan and Iraq. The use of the e-learning system follows specific policies and regulations planned by the ministry of higher education and the UNESCO office in Iraq under the supervision of the presidency of Salahaddin University and Salahaddin Avicenna E-Learning Centre at the university.

In the management's view, the main advantages the e-learning system will bring to students include the following;

- Supporting the online learner.
- Offering time saving and mobility (anytime and anywhere), cost and availability of e-courses.
- Developing team skills and accomplishing team projects online.
- Reducing teaching costs.
- The students' learning experience will be improved through obtaining new skills on how to use the e-learning portal and how to upload their papers, projects, articles and topics.

- Students will have access to different resources including; e-library, e-courses from the university portal, e-books and online tutors.
- Students will be able to submit their coursework (assignments) via the electronic portal.
- Students' interaction with faculty and other students will be facilitated in a variety of ways.
- Faculty and students will agree on expectations about times for student assignment completion and faculty response.
- Students will have access to appropriate support services without having to come to the physical campus.
- Questions directed to student support service personnel can be answered accurately and quickly, and structured systems are in place to address students' complaints.
- Distance students will be demonstrably part of the academic community.

The e-learning system has not been fully introduced and used by all students yet. It is currently at the training stage. The university has conducted the training for a number of postgraduate students (working towards MSc and PhD) and a number of seminars to the university students in 2015.The centre has a plan to provide further training and perform a number of seminars and workshops in the near future. Also, the training was provided to 1000 lecturers from private and public universities in the region to enable them to transfer their experience to students. The Salahaddin Avecinna E-Learning Centre has uploaded around 30 e-courses (based on coursework) and they are ready for the students to enrol on and use. The management of the SUE AVC E-Learning centre think that the students who have been through the training are using the system effectively and frequently under the supervision of qualified experts in each department. From the perspective of the management of the centre, students can be encouraged towards e-learning by increasing and improving the students' culture towards e-learning using new technologies to move from the traditional classroom learning to the e-learning process. In addition, students can be encouraged by putting a plan for performing seminars, workshops, debating, chat and video conference. Thereis an absence of a technical support team that can help the university students with no experience to use the e-learning system. The university is relying on the instructors who took the training to reinforce the ability and performance of the students who lack the experience and IT skills.

7.0Results

7.1 Descriptive statistics

The participants were students from different faculties in Salahaddin University-Erbil including science, business and computing engineering. The total number of completed questionnaire was 181 questionnaires.43% of the respondents were males and 56.9% were females. The participants were between the ages of 18 to 37 years old. Most of the participants were undergraduates (89.5%). The remaining were postgraduates (10.5%). 60.8% of them found that the training was useful while 39.2% of them did not find it useful. The participants were asked to identify ways in which the training could be improved using an open-ended question. 68% of the respondents stated that there is a need for more experienced trainers and a higher quality training. 12% indicated that the training needs to be provided during the lectures sometimes in order for them to apply the knowledge in using the e-learning system in real-life situations. 20% of them recommended that during the training sessions, it is important to explain the benefits of using the system and the benefits it can

provide. Only 43.1% of them thought that they were using the e-learning system effectively. When students were asked whether they find the use of e-learning systems important, 79.6% of them agreed while the rest of them do not find them important for their learning.

7.2 Analysis of the measurement model- examination of reliability and validity

The first stage of the PLS-SEM analysis was assessing the measurement model by testing the validity, reliability and loadings of the items and constructs in the model. Table (2) in the appendix shows the descriptive statistics including the mean and standard deviation of each construct, along with Cronbach's Alpha and the Average Variance Extracted (AVE) and the Fornell-Larcker Criterion. According to Hair et al., (2014), the Cronbach's Alpha (CR) should be 0.70 or greater. Cronbach's Alpha was greater than 0.70 in all cases, suggesting good reliability. Convergent validity is assessed using the Average Variance Extracted (AVE). AVE should be 0.5 or greater (Hair et al., 2014). The AVE values of all constructs were higher than 0.5, indicating that convergent validity was present. Discriminant validity was assessed by examining the cross-loadings of each construct as they should load higher on their own indicators than they load on the other indicators of the other constructs (Chin, 1998). This was the case in this sample as shown in table (3) in the appendix. Fornell-Larcker Criterion was assessed to examine discriminant validity. In Fornell-Larcker Criterion, a construct should share more variance with its own indicators than it shares with the other constructs. AVE was greater than 0.5 in all cases and greater than the square of the correlations, thus suggesting discriminant validity is present. We also assessed factor loadings. The minimum value for factor loadings should be 0.70 (Hair et al., 2014). Two items were removed due to their low loadings including SE6 and SQ6. When we analysed the responses to SQ6 using descriptive statistics, we found that most of the students responded negatively to the items. The mean value for this item was 3.41 and the mode was 1. This indicates that there is a problem with the speed of the internet. The remaining items in the model were well above the threshold value of 0.70 as shown in table (4) in the appendix.

Podsakoff et al., (2003) indicated that Common Method Variance (CMV) is considered as a threat to construct validity in self-reported studies. Harman's test can be used to test whether CMV is an issue. When one variable does not account for the majority of the variance in the model, researchers can conclude that CMV is not an issue (Gefen et al., 2011). The results showed that with the un-rotated factor analysis, the first factor accounted for a small variance in the model. This showed that CMV was not an issue. Therefore, no further tests were required.

The results of assessing the measurement model showed that the model is satisfactory. Therefore, we proceeded with assessment of the structural model.

7.3 Analysis of the structural model and hypotheses testing

The structural model was assessed by examining the explanatory power of the structural model and the significance of the paths between the constructs. The structural model was assessed using the bootstrapping procedure (500 samples) in SmartPLS V3.0.

In order to ensure that there were no collinearity issues in the formative constructs, the Variance Inflation Factor (VIF) was assessed. VIF measures the degree of multicolleanirity between latent variables. The VIF value should be below 5 (Kock, 2011) and the tolerance value should be less than 0.20 (Hair et al., 2014). All VIF values were less than 5 and tolerance values higher than 0.20, suggesting that multicolleanirity was not a major issue in the sample.

The path coefficients between the latent variables were assessed and evaluated based on their magnitude and significance, using the path coefficients, the *t* values and the significance level (*p* value), using the bootstrapping procedure (500 samples). The results obtained from testing the path coefficients were accompanied by the effect size values (f^2). By convention, f^2square effect sizes of 0.02, 0.15, and 0.35 are termed small, medium and large respectively as indicated by Cohn (1988).

Table (5) in the appendix and figure (3) show the path coefficients and their significance between the constructs in the model. Five factors had insignificant effects including Exp (p value= 0.998 and f^2=0.000), TS (p value= 0.450 and f^2=0.009), IQ (p value= 0.740 and f^2= 0.001), SQ (p value= 0.344 and f^2=0.007) on BI and SQ on AU (p value= 0.554 and f^2= 0.000). Thus, H5a, H6a, H7a, H8a and H8b were rejected. All the other hypothesised relationships were supported. PU was the most significant predictor of BI in the model (p value= 0.000, f^2= 0.109) so H1 was supported. PEOU was the second most significant predictor of BI in the model (p value= 0.008 and f^2= 0.046) so H2 was supported, followed by SE (p value= 0.039 and f^2= 0.041), thus H4 was supported. SN had a significant effect on BI with a small effect size (p value= 0.030 and f^2= 0.031) so H3 was supported. Exp had a significant effect on AU with a medium effect size (p value= 0.000, f^2 0.171). However, it did not have a significant effect on BI (p value= 0.998 and f^2= 0.000) so only H5b was supported and its effect size was medium. In fact, Exp had the most significant effect on AU, even more significant than the effect of BI on AU (for BI, p value= 0.000 with a small effect size f^2=0.075) where H9 was supported. While TS and IQ did not have any significant effect on BI, they both had significant effects on AU. Thus, H6b and H7b were supported. TS (p value= 0.028 and a small effect size f^2= 0.034) and IQ had a significant effect on AU (p value= 0.020 and f^2= 0.018) with no effect size. The R^2 value for BI was 0.478, suggesting that the model explained (48%) of the variance of BI and the R^2 value for AU was 0.348, suggesting that the model explained (35%) of the variance of AU.

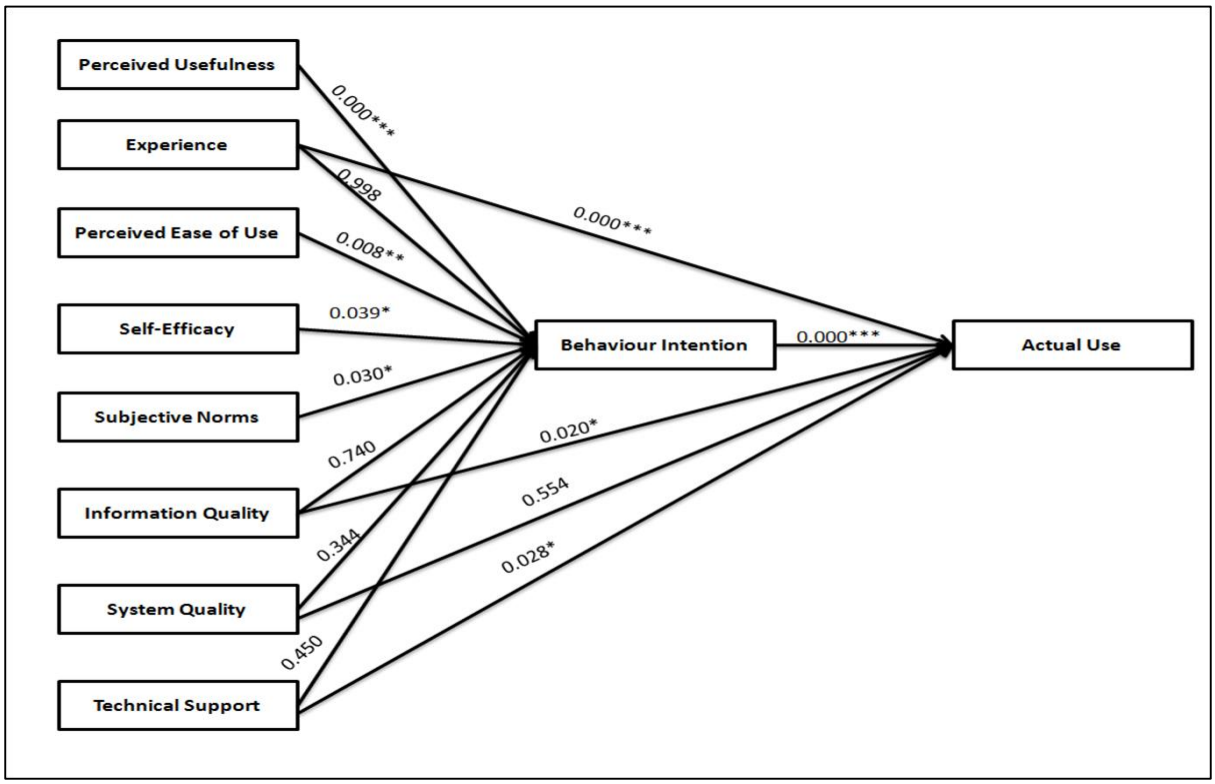

Figure 3. Results of the structural model

8.0Discussion

The main aim of this study was to investigate the use of e-learning systems in Iraqi universities, using a case study of Salahaddin University-Erbil. The results showed that Iraqi universities are certainly still at the early stages of implementing e-learning systems in higher education. However, the UNESCO Avicenna Virtual Project has a good potential and can be successful if implemented efficiently. The management of Salahaddin Avicenna E-Learning Centre is aware of the benefits and the importance of the use of the e-learning system. The system offers a good number of courses that can be accessed through the online system. A number of training sessions mainly for instructors and some for students to start using the system effectively have taken place. The training provided by the e-learning centre and Salahaddin University is mainly targeted towards lecturers rather than students. This shows that the management is relying on instructors to promote the use of the e-learning system and teach students how to use it. While the management of the e-learning centre thinks that students who went through the training are using the e-learning system effectively, a large number of students who completed the training think that they were not using the e-learning system effectively and some of them did not find the training useful. From the students' perspective, the training needs to be improved in order to be effective. The areas of improvement were namely having more experienced trainers to provide the training in order to be more effective, providing training during the lectures as well as the other training seminars and emphasising the importance of using the e-learning system and the benefits it can provide. Less than half of the participants thought that they were using the e-learning system effectively which means that the system needs to be improved further in order for it to be used effectively. It is also important to note that the descriptive statistics showed that the majority of participants thought that the speed of the internet is not acceptable in order to be able use the system. This is a major issue that needs further investigation as good internet connectivity is crucial to access and use the e-learning system.

The investigation of the factors that can affect the adoption of the e-learning system showed that there are several important factors including PU, PEOU, Exp, SE, SN, IQ and TS. Similar to earlier studies (Chokri, 2012; Adwan et al., 2013; Sharma and Chandel, 2013; Tarhini et al., 2015), our results support theoretically and empirically the validity of TAM to be a useful theoretical framework for understanding how students can accept e-learning technology. The results support and provide evidence of the importance of PU for the acceptance of e-learning technologies, consistent with previous studies (Davis et al., 1992; Legris et al., 2003). This was followed by PEOU. This is consistent with the findings of Davis et al., (1989) who stated that PEOU is specifically important at the early stages of the system's use. Mainly, PU, PEOU, SN and SE had significant effects on BI while Exp, TS and IQ had a significant direct effect on AU. Surprisingly, SQ did not have any significant effect on neither BI nor AU while IQ had a direct significant effect on AU. This shows that students are mainly concerned with the quality and type of the information they obtain from using the system more than the layout of the system interface and its response time. The other reason may be that the students have not fully used the e-learning system yet as they only went through the training stage which did not allow them to fully explore the system's quality. The results also showed that the speed of the internet is slow. This is a major issue that can affect the use of the system.

The results showed that SN had a significant effect on BI. This shows that students can be influenced by the opinions of their instructors and other students. This also shows that

instructors can play a vital role in motivating students to accept and successfully use the e-learning system. The training provided to the instructors and emphasising their significant role in convincing students to adopt the e-learning system is vital.

SE had a significant effect on BI. Therefore, the presence of outstanding quality training and a technical support team which includes a number of experts in using the e-learning system is vital especially that TS had a significant direct effect on AU too. This will help to increase students' self-confidence in using the system. IQ had a significant direct effect on AU. Therefore, the management of the e-learning centre is required to ensure that the system provides high quality materials which are relevant to the modules the students are studying and can be obtained easily through the system. This can be another area for future training where students can attend training sessions to guide them on how to obtain high quality information through online journals, articles and books. Also, providing guidance for translating information written in languages other than Arabic and Kurdish (e.g. English) is required.

Overall, the proposed model for the acceptance of the e-learning system among Iraqi students was acceptable in terms of its fit. It was able to explain 48% of the variance of BI and 35% of the variance of AU. In this context, all of the significant factors in the model should be considered in order for the UNESCO Avicenna Virtual Project to be successful in Iraq. This study provided evidence of the applicability of the extended TAM in explaining e-learning acceptance and use in Iraqi universities. The study also revealed the current gaps in the implementation the e-learning system as part of the UNESCO project in Iraq.

9.0 Limitations and future work

The area of e-learning adoption in Iraq and finding ways to improve it certainly needs further investigation. This study used convenience sampling for collecting data from students. This sampling technique has its own limitations. Therefore, the data may not be representative of the entire population. It is important to conduct further studies on the successful use of technology in education in Iraq from the students' perspective since they are the end-users of the e-learning system. In addition, this study was conducted when students were at the early stages of adopting the system. Future studies can collect data at the later stages of the system use and compare the results to the results of this research to see whether the significance of the factors (for example SQ) may change.

Data could have been collected from the University of Baghdad and the University of Basrah too as they are also part of the UNESCO Avicenna Virtual Project in Iraq which would have extended the validity of the model and thereby the factors that can influence students to adopt the e-learning system. However, we were unable to travel to the southern parts of the country due to unstable situation. Future studies can obtain information from these two universities and compare the results to the results of this study.

Future studies can also analyse other barriers which the country as a whole is suffering from and can also affect the adoption of e-learning systems for example the lack of electricity, high prices of the internet and the lack of access to computers in comparison to other technological products such as mobile phones. Also, the findings of this research revealed that the speed of the internet connection is not considered acceptable by the students. These are certainly some areas that need further investigation possibly by collecting qualitative data from students to understand the problems that may hinder them from using the system.

10.0 Conclusions and recommendations

The use of technology has certainly revolutionised teaching and learning in higher education. Iraq is still behind in comparison to both developed and developing countries. The use of e-learning can bring vital benefits for both Iraqi students and Iraqi universities. The results of this study have several implications for universities and policy makers in Iraq. There are several important factors that have to be considered in order for the UNESCO Avicenna Virtual Campus Project to be successful. Providing a strong technical support team along with a strong and effective training is required for improving students' self-confidence and concentrate on training students rather than mainly concentrating on training instructors and relying heavily on them to teach students. Universities, including the University of Salahaddin, need to improve the training provided to students. Training sessions have to be provided by experts in using the system who can fully explain the different features of the e-learning system and what each feature can help students to achieve. Since, the usefulness of the system is important, trainers and instructors need to emphasise the importance and benefits of using the e-learning system. Also, up-to-date, high quality information that can be translated have to be provided. Assessing the quality of the information provided through the e-learning system and how it complements the face-face part of the students' learning is important.Thus, policy makers should carefully plan their strategies related to the contents students can access through the system. Since ease of use of the system was found an important factor, policy makers need to find and provide the right facilities to students in order for the system to be easy to use. Cultures that are focused on oral traditions in teaching and learning can find interacting with e-learning systems a challenge. Subjective norms were found an important factor affecting behaviour intention. Since universities in Iraq are mainly relying on the traditional ways of teaching and learning and students have not experienced the full benefits of using technology in their studies, building a culture that is supportive for the use of e-learning through subjective norms is important. Iraqi students need to be prepared to accept and embrace modern strategies in their learning. This study provided valuable contributions within the context of e-learning adoption in Iraq and the successful implementation of the UNESCO Avicenna Virtual Campus Project which will enable Iraqi students to join eighteen other countries that have implemented this project successfully. However, there is still a requirement to conduct more research in this area. Therefore, researchers are encouraged to conduct more research in this context.

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Appendix

Previous studies	**Items**	**Perceived Usefulness (PU)**
Davis (1986) Abbad et al., (2009)	PU1	Using the e-learning system would allow me to accomplish learning tasks more quickly
	PU2	Using the electronic portal would enhance my effectiveness in learning
	PU3	Using the electronic portal would increase my productivity in learning
Davis (1986) Abbad et al., (2009)		**Perceived Ease Of Use (PEOU)**
	PEOU1	My interaction with the electronic portal is clear and understandable
	PEOU2	Getting the information from the electronic portal is easy
	PEOU3	Overall, I find the electronic portal easy to use
Davis (1986) Abbad et al., (2009)		**Behaviour Intention (BI)**
	BI1	I intend to use the electronic portal to study
	BI2	I intend to study other subjects through the electronic portal
	BI3	I intend to increase my use of the electronic portal in the future
	BI4	Having used the electronic portal, I would recommend it to my colleagues to use it for study purposes
Liaw (2008) Tan and Teo (2000) Abbad et al., (2009)		**Self-Efficacy (SE)**
	SE1	I feel confident using the e-learning system (electronic portal)
	SE2	I feel confident operating e-learning functions
	SE3	I feel confident using online learning content
	SE4	I am confident in using the university's electronic portal even if there is no one around to show me how to do it
	SE5	I am confident in using the electronic portal even if I have never used such a system before
	SE6	I am confident in using the electronic portal as long as someone shows me how to do it
Venkatesh (1999)		**Technical Support (TS)**

Abbad et al., (2009) (TS3 was created by the authors)	TS1	A hotline is available when there is a technical problem in the e-learning system
	TS2	E-mail enquiries can be made when there is a technical problem
	TS3	The technical support team solves technical problems quickly and efficiently
Tan and Teo (2000) Abbad et al., (2009)		**Experience (Exp)**
	Exp1	I spend many hours using the Internet via a computer
	Exp2	I frequently use the Internet via a computer
Lwoga (2014) One of the items in the study was dropped as it did not apply to the studied case since the system has not been used yet for communication between instructors and students		**E-learning System Quality (SQ)**
	SQ1	The e-learning system can give means for taking tests and submitting assignments
	SQ2	The response time of the e-learning system is consistent
	SQ3	The response time of the e-learning system is reasonable
	SQ4	The layout of the e-learning system is user-friendly
	SQ5	The layout of the e-learning system is in good structure
	SQ6	The speed of the Internet connection is acceptable
Lwoga (2014) One of the items in the study was dropped as it did not apply to the studied case since the system has not been used yet for communication between instructors and students		**Information Quality (IQ)**
	IQ1	The electronic portal tool provides important and helpful knowledge and information for my study
	IQ2	Overall knowledge and information provided by the electronic portal is satisfactory
	IQ3	The knowledge or information provided from the electronic portal is available at a time suitable for its use
	IQ4	The information provided by the electronic portal appears readable, clear and well-formatted
Ajzen (1991) Venkatesh and Davis (2000) Venkatesh et al., (2003) Tarhini et al., (2013)		**Subjective Norm (SN)**
	SN1	My instructor thinks I should use the electronic portal
	SN2	Other students think I should use the electronic portal
	SN3	People who influence my behaviour think I should use the electronic portal
	SN4	Generally speaking, I do what my instructor thinks I should do
		Actual Use
	AU1	I use the e-learning system regularly
	AU2	I use the Internet for educational purposes regularly

Table 1. Survey items used in the research model

	Mean	SD	CR	AVE	AU	BI	Exp	IQ	PEOU	PU	SE	SN	SQ	TS
AU	4,010	1.940	0.782	0.820	0.906									
BI	4.600	1.860	0.826	0.657	0.393	0.810								
Exp	4.040	1.970	0.777	0.818	0.433	0.197	0.904							
IQ	5.040	1.600	0.743	0.545	0.377	0.396	0.184	0.738						
PEOU	4.810	1.650	0.749	0.663	0.363	0.575	0.200	0.544	0.814					
PU	5.320	1.540	0.717	0.640	0.175	0.497	0.097	0.407	0.424	0.800				
SE	4.610	1.750	0.816	0.574	0.492	0.542	0.272	0.502	0.670	0.273	0.758			
SN	4.170	1.770	0.815	0.641	0.665	0.452	0.443	0.331	0.365	0.321	0.515	0.800		
SQ	4.740	1.660	0.811	0.569	0.270	0.465	0.088	0.588	0.639	0.309	0.589	0.339	0.754	
TS	4.140	1.930	0.776	0.674	0.290	0.128	0.084	0.448	0.311	0.108	0.195	0.110	0.330	0.821

Table 2. Descriptive statistics, construct reliability (Cronbach's alpha), convergent validity (AVEs) and discriminant validity (Fornell-Larcker Criterion)

	AU	BI	Exp	IQ	PEOU	PU	SE	SN	SQ	TS
AU1	**0.916**	0.339	0.393	0.408	0.381	0.199	0.460	0.564	0.276	0.322
AU2	**0.896**	0.378	0.393	0.264	0.281	0.111	0.430	0.649	0.208	0.194
BI1	0.327	**0.832**	0.189	0.298	0.494	0.410	0.465	0.378	0.46	0.109
BI2	0.245	**0.763**	0.137	0.279	0.473	0.299	0.391	0.278	0.365	0.051
BI3	0.408	**0.832**	0.229	0.319	0.423	0.395	0.456	0.429	0.305	0.109
BI4	0.284	**0.812**	0.077	0.385	0.467	0.494	0.440	0.365	0.378	0.137
Exp1	0.393	0.180	**0.904**	0.192	0.180	0.124	0.251	0.414	0.098	0.095
Exp2	0.391	0.177	**0.905**	0.141	0.189	0.050	0.241	0.387	0.061	0.056
IQ1	0.371	0.364	0.154	**0.793**	0.346	0.343	0.338	0.287	0.349	0.301
IQ2	0.292	0.319	0.212	**0.796**	0.474	0.304	0.482	0.285	0.482	0.256
IQ3	0.074	0.147	0.045	**0.673**	0.420	0.330	0.248	0.116	0.483	0.402
IQ4	0.232	0.245	0.066	**0.683**	0.423	0.244	0.372	0.209	0.524	0.472
PEOU1	0.216	0.532	0.108	0.458	**0.818**	0.470	0.601	0.273	0.578	0.306
PEOU2	0.268	0.470	0.159	0.440	**0.825**	0.311	0.470	0.332	0.516	0.223
PEOU3	0.439	0.381	0.246	0.428	**0.803**	0.216	0.566	0.291	0.449	0.219

PU1	0.009	0.316	0.174	0.215	0.303	**0.702**	0.146	0.078	0.186	0.083
PU2	0.239	0.426	0.062	0.350	0.362	**0.814**	0.285	0.424	0.275	0.095
PU3	0.137	0.438	0.023	0.388	0.336	**0.874**	0.210	0.229	0.269	0.081
SE1	0.366	0.483	0.308	0.395	0.654	0.303	**0.817**	0.424	0.509	0.144
SE2	0.439	0.456	0.149	0.337	0.434	0.205	**0.757**	0.465	0.416	0.037
SE3	0.313	0.301	0.262	0.407	0.472	0.269	**0.728**	0.326	0.391	0.126
SE4	0.401	0.403	0.222	0.377	0.483	0.173	**0.750**	0.371	0.403	0.186
SE5	0.328	0.370	0.087	0.408	0.476	0.076	**0.733**	0.337	0.505	0.270
SN1	0.528	0.444	0.386	0.266	0.369	0.220	0.489	**0.842**	0.320	0.094
SN2	0.517	0.293	0.421	0.225	0.243	0.226	0.331	**0.787**	0.292	0.085
SN3	0.548	0.329	0.364	0.268	0.293	0.271	0.404	**0.805**	0.297	0.109
SN4	0.549	0.349	0.256	0.296	0.241	0.320	0.396	**0.765**	0.173	0.065
SQ1	0.212	0.407	0.108	0.372	0.522	0.288	0.428	0.241	**0.754**	0.271
SQ2	0.229	0.364	0.018	0.511	0.521	0.219	0.495	0.308	**0.816**	0.23
SQ3	0.190	0.283	0.019	0.384	0.476	0.062	0.439	0.200	**0.750**	0.344
SQ4	0.202	0.271	0.085	0.505	0.397	0.280	0.438	0.250	**0.673**	0.199
SQ5	0.182	0.398	0.094	0.461	0.470	0.291	0.427	0.273	**0.773**	0.212
TS1	0.322	0.144	0.084	0.442	0.313	0.090	0.218	0.175	0.355	**0.905**
TS2	0.160	0.110	0.000	0.328	0.264	0.064	0.117	-0.010	0.247	**0.811**
TS3	0.165	0.024	0.126	0.293	0.142	0.123	0.100	0.033	0.143	**0.738**

Table 3. Cross loadings

	AU	**BI**	**Exp**	**IQ**	**PEOU**	**PU**	**SE**	**SN**	**SQ**	**TS**
AU1	0.922									
AU2	0.889									
BI1		0.832								
BI2		0.763								
BI3		0.831								
BI4		0.813								
Exp1			0.906							
Exp2			0.903							
IQ1				0.793						
IQ2				0.796						
IQ3				0.701						

IQ4				0.712						
PEOU1					0.830					
PEOU2					0.824					
PEOU3					0.787					
PU1						0.702				
PU2						0.814				
PU3						0.874				
SE1							0.817			
SE2							0.757			
SE3							0.728			
SE4							0.750			
SE5							0.733			
SN1								0.842		
SN2								0.787		
SN3								0.805		
SN4								0.765		
SQ1									0.754	
SQ2									0.816	
SQ3									0.750	
SQ4									0.702	
SQ5									0.773	
TS1										0.905
TS2										0.811
TS3										0.739

Table 4. Factor loadings

Hypothesis	**Proposed Relationship**	**P Values**	**f^2 Value**	**Study Results**
H1	**PU → BI**	0.000***	0.109	Supported
H2	**PEOU → BI**	0.008***	0.046	Supported
H3	**SN → BI**	0.030*	0.031	Supported
H4	**SE → BI**	0.039*	0.041	Supported
H5a	**Exp → BI**	0.998	0.000	Not Supported
H5b	**Exp → AU**	0.000***	0.171	Supported
H6a	**TS → BI**	0.450	0.009	Not Supported
H6b	**TS → AU**	0.028*	0.034	Supported
H7a	**IQ → BI**	0.740	0.001	Not Supported
H7b	**IQ → AU**	0.020*	0.018	Supported
H8a	**SQ → BI**	0.344	0.007	Not Supported
H8b	**SQ → AU**	0.554	0.000	Not Supported
H9	**BI → AU**	0.000***	0.075	Supported

Table 5. The summary of the hypothesised relationships of the sample