



Predictor Factors For Actual Usage Of Online Evaluation And Assessment Systems: A Structural Equation Model (SEM) Study

Mustafa Coşkun ¹, Sona Mardikyan ²

Abstract

E-Learning has been an emerging topic for education world for two decades, and due to this fact; it has been analyzed with all of its dimensions and factors. However, the evaluation and assessment issues of e-learning can be assumed as untouched especially in students' perspective. Evaluation and assessment concepts of students' cognitive, affective and behavioral domains have a lot of variables that affect each other. In this study, predictors of students' actual usage of online education systems and their relations are designed as a new theoretical framework, and analyzed by applying Structural Equation Model (SEM) analysis. For this analysis, an online questionnaire is applied to the students who have been using a uniquely designed online evaluation and assessment system (OEAS) for five years in a governmental high school. As a result of the study, "self-efficacy" and "user interface design" are found as significantly effective on "perceived ease of use", while "self-efficacy" and "perceived ease of use" have significant influence on "perceived usefulness". In addition, it is found that actual usage of online evaluation and assessment system is directly and significantly affected from "perceived usefulness", "technical support" and "service quality". To sum up, the conclusions of the study, in students' perspective, are advisable for the educational technologists.

Keywords

E-Learning
Evaluation
Assessment
Structural equation model (SEM)

Article Info

Received: 06.05.2016
Accepted: 11.30.2016
Online Published: 12.30.2016

DOI: 10.15390/EB.2016.6579

¹ Bahçelievler Şehit Osman Yıldız Vocational High School, Information Technologies Department, Turkey, mustafa.coskun@boun.edu.tr

² Bogazici University, School of Applied Disciplines, Management Information Systems Department, Turkey, mardikya@boun.edu.tr

Introduction

E-Learning which is the fastest growing part of education and training concepts, does not only mean distance learning or online learning. It has also many components such as media sharing, student participation, assessment and evaluation.

As Gold (2014) mentioned, the internet has emerged as the most powerful medium for providing information, communication, and facilitating commerce. Thus, the huge growth of the internet provides a significant global opportunity for e-learning and there is a growing national trend by educational institutions to develop high quality internet courses. However, Learning Management Systems (LMS) and student assessment are the least analyzed parts of e-learning platforms.

Dankbaar, Storm, Teeuwen, and Schuit (2014) state that LMS is the most important section of e-learning in which the online study materials can be offered to the participants and then they can decide when to study, redo the exercises and whether to collaborate with colleagues or do them alone. In addition, Roche, Thoma, and Wingfield (2014) indicate that evaluation and assessment would be problematic limitation for LMS if the technology and assessment tool could not be combined and accepted by the participants. According to Anderson (2008), online testing or other forms of testing and assessment should be integrated into the learning sequence to check the learner's achievement level and to provide appropriate feedback.

The scope of this article is to explore the success of evaluation and assessment of e-learning. The literature shows that these issues of e-learning are the most untouched part of the instructional technology concept, while there are a lot of studies on online course design, interactive course planning and applications, technical structure of e-learning platforms etc. However, evaluation and assessment parts are very crucial for testing and analyzing the efficiency and effectiveness of e-learning. In this manner, at first glance, the predictors and factors of education and technology usage are collected from the literature. Then, by focusing on reduced factors influencing the usage of online evaluation and assessment system and analyzing the significant relations of those factors, a theoretical framework is designed. Also, some other factors which are related to traditional education methods are added to the framework. A Structural Equation Model (SEM) is applied to analyze the predictors of effective e-learning evaluation and assessment system. Using a questionnaire, data are collected from students who have been using a unique Online Evaluation and Assessment System (OEAS) for five years in a public high school.

In the following parts, literature about e-learning, evaluation and assessment and related works are reviewed for drawing a theoretical framework. Then, research methodology and analysis progress are stated consequently. Afterwards, our research model is deployed and findings are discussed. Lastly, results of the study, recommendations and future research areas are stated.

Background of The Research

When we consider "learning" concept today, we probably think a "learning object". By the effect of computer and internet era, this object is a message to transfer objects like books or training manuals, no more. On the contrary, learning is about the way or media for the learners to reach information when they need. This changing structure of learning concept caused a mutation on education world, and then, "e-learning" term appeared in our lives.

E-Learning

There are several terms used for e-learning in the literature: web-based learning, online learning, distributed learning, computer-assisted instruction or internet-based learning. As Ruiz, Mintzer, and Leipzig (2006) emphasize historically, there have been two common e-learning modes: distance learning and computer assisted instruction. Ward, Gordon, Field, and Lehmann (2001) define those terms as; distance learning uses information technologies to deliver instruction to the learners who are at remote locations from a central site. Computer assisted instruction (also called computer-based learning or computer based training) uses computers to aid in the delivery of stand-alone multimedia packages for learning and teaching.

In the literature, there are several studies based on the topic of “effects on learning or e-learning” mostly from teachers’ perspective or instruments dimensions. On the contrary, there are relatively few studies based on students’ perspective. Rosário et al. (2013) found in their study that students’ decisions about how to make the best use of instruction, regardless of the type of instruction, could play a critical role in the relationship between teaching and learning. Moreover, Surry, Ensminger, and Haab (2005) mention that many e-learning initiatives have failed to achieve the desired learning outcomes. According to Teo (2011), this is attributed to the lack of attention given to good curriculum design, management of e-learning tasks, and selection of the right technologies or the adoption of e-learning by instructors and learners. Today, students are at the center of education, and due to this fact, studies on students’ perspective are most valuable for contributing the quality of education. From this point of view, our opinion is that the factors that affect students’ actual usage rate of e-learning platforms should be examined, deeply. Since e-learning is now a broad topic as much as traditional one, we considered to focus on most untouched part of it; evaluation and assessment.

Evaluation and Assessment of E-Learning

Housego and Freeman (2000) state that technology-supported teaching is effective when based on teaching practices which motivate students to adopt a deep learning approach, not because information technology (IT) is used simply for its own sake. Also, for the evaluation and assessment of e-learning, Prior (2003) concludes that implementing a radically different approach carries a certain amount of risk. In addition, Roberts and Verbyla (2003) summarize the complaints of the students on online examination system for their case. According to this study, the duration of the exam should not be same as traditional ways, the opportunity to demonstrate competence should not be too limited, and more practice with trial examinations could be needed. Moreover, Tarouco and Hack (2000) state that technological tools, by which students’ activities can be tracked, put forward new opportunities for observing how students are learning.

On the other hand, Moore (2013) emphasizes that the problems of technical conditions in electronic exams should be solved immediately. As a contribution to this point of view, Panda (2003) indicates that the process of planning and implementation of assessment have been getting hard due to those technical problems. Tarouco and Hack (2000) also state that the usage of internet in assessment and evaluation of education causes several profits. Accordingly, Kabakçı and Karakaya (2003) lists the advantages of online evaluation and assessment systems (opportunity to create and develop question banks, speed, cost, efficiency, consistency) in their study (Kara, 2009).

Lastly, the limited literature on evaluation and assessment concept of e-learning show that effective and well-designed structure of online evaluation systems in e-learning is very important for not only testing the changes on participants’ behavioral and cognitive skills but also the quality of education systems and its elements such as instructors, materials, media etc.

Purpose of the Study and Expected Application Areas

The purpose of this study is to state the predictor factors on actual usage and success of assessment and evaluation concept of e-learning. At this point, today, when technology integrations in education and e-learning concepts frequently influence in our daily lives, it is proposed to present the factors and indicators of the most untouched dimension, evaluation and assessment, for developers and users. With the results of the study, it is aimed to guide developers and users in public or private sectors on factors and concepts that they should pay attention. Especially, it is expected to contribute the process of developing evaluation and assessment modules which are planned to be integrated to the Education Information Network (EBA) of Ministry of National Education.

Limitations of the Study

- Study is limited to the students, users of OEAS, to whom the survey is applied.
- The assessment and evaluation part of e-learning concept which is indicated in the study; is limited to the e-exam, e-project and e-homework applications of OEAS.
- Study is limited to 6 latent variables, which are proposed and tested in structural model (Figure 1), and constructs which are measured by items in the applied survey (Appendix 1).

Research Model and Hypotheses

Joo, Lim, and Kim (2012) state that the previous studies investigated either learners' characteristics and motivation or learning environment issues, rather than incorporating these two into a comprehensive model. Methodologically, correlation analysis and multiple regression analysis are most frequently adopted in the prior researches (Harroff & Valentine, 2006; Morris, Wu, & Finnegan, 2005). In our study, it is intended to provide an integrated view in terms of technological variables as well as methodological approach mainly based on Technology Acceptance Model (TAM) (Davis, 1989) with the well-known variables called "perceived ease of use", "perceived usefulness" and "actual usage". Then, "self-efficacy" is selected as *learners' individual factor*, while "perceived usefulness" and "perceived ease of use" as *learning's cognitive domain factors*. In addition to these psychological factors, "user interface design", "technical support" and "service quality (accessibility)" are chosen for mentioning *technical factors* group. To this end, "technical support" means helping students by teachers or other personnel when they need or face with a problem during the usage of system. "Service quality" includes those concepts: the accessibility of the system, its user friendly features and having attractive objects.

Hypotheses

In their study, Compeau and Higgins (1995) report that technical support has a positive influence on IT usage. In this perspective, for a web based e-learning tool, Sánchez, Hueros, and Ordaz (2013) propose that the lack of proper technical support can be a considerable obstacle to the effective use of that online learning platform. Thus, the following hypothesis is put forward:

H1. *Technical Support (TS) has a positive influence on Actual Usage (AU) of OEAS.*

Cho, Cheng, and Lai (2009) results that if the self-paced e-learning tool's screen layouts have a good structure and its instructions are explicit; thus, learners will navigate the contents and find information in an easier way, and they may perceive that such an e-learning tool is easier to use. Also, Cheng (2012) and Liu, Chen, Sun, Wible, and Kuo (2010) state that a user-friendly interface design will make learners feel more comfortable and find the online learning community easy to use. Thus, the following hypothesis is proposed:

H2. *User-Interface Design (UID) positively affects Perceived Ease of Use (PEU) of OEAS.*

Self-efficacy refers to the levels of confidence that individuals have in their ability to carry out specific courses of action (Bandura, 1997). Joo et al. (2012) indicate that self-efficacy is a significant predictor of achievement in e-learning platforms. Also, Park (2009) examined this construct in his study and states that e-learning self-efficacy is the most important construct, followed by subjective norm in explicating the causal process in the model. Thus, the following hypotheses are put forward:

H3. *Self-Efficacy (SE) has a positive effect on students' Perceived Usefulness (PU) of OEAS.*

H4. *Self-Efficacy (SE) positively affects the Perceived Ease of Use (PEU) of OEAS.*

Also, Cheng (2012) summarizes that support service quality positively affects perceived ease of use on the e-learning system. The related literature on technology usage has established that users' continued usage intention of IT is determined by usage satisfaction, which in turn is jointly influenced by perceived usability, perceived quality and usability disconfirmation (Roca, Chiu, & Martinez, 2006). DeLone and Mclean (1992) noted that system quality and information quality are directly related to user satisfaction and the use of information systems. In terms of the relationship between system quality and system use, some studies (Seddon, 1994; Teo & Wong, 1998; Wixom & Watson, 2001) confirmed a direct relationship between system quality and the individual worker's decision-making performance, job effectiveness, and quality of work. Lastly, Freeze, Alshare, Lane, and Joseph Wen (2010) and Ramayah and Lee (2012) conclude that both system quality and information quality have significantly positive effects on user satisfaction and system usage. These studies lead to the following hypotheses:

H5. *Service Quality (SQ) positively affects the Perceived Ease of Use (PEU) of OEAS.*

H6. *Service Quality (SQ) positively affects the Actual Usage (AU) of OEAS.*

TAM proposes that the behavioral intention to actual usage of users regarding technology is affected by two common variables: perceived ease of use and perceived usefulness. The causal relationship that exists between these two variables has been confirmed by a number of empirical studies. As it is stated by Saadé (2003) the goal of TAM is to explain the determinants that capture the attitude and behavior of a broad range of users to IT. Also TAM suggests that the actual use of the system is determined by the users' behavioral intention to use the system, which is in turn jointly determined by the users' attitudes towards using the system and their perceived usefulness of the system (Davis, Bagozzi, & Warshaw, 1989). Thus, the following hypotheses are proposed by the direction of TAM:

H7. *Students' Perceived Ease of Use (PEU) has a positive effect on students' Perceived Usefulness (PU) of OEAS.*

H8. *Students' Perceived Usefulness (PU) has a positive effect on Actual Usage (AU) of OEAS.*

As a result of these hypotheses based on related literature, Figure 1 shows the proposed structural model for analyzing the predictors of actual usage of online student evaluation and assessment systems.



Figure 1. Proposed Structure Model for the Usage Predictor Factors of OEAS.

Method

In this study, a quantitative design, which is appropriate to the purpose of the study, is used. The research model is tested by conducting the research instrument developed for the study, using a questionnaire (Appendix 1). The items used in this survey are based on mainly the literature review and adapted to the concept.

Sample

The questionnaire is applied to the students (respondents) who are the active users of OEAS, through a web-based structure. OEAS has been used in a public high school since 2010. 13 teachers have used OEAS for 187 exams since the first semester of 2010-2011. Hence, students from the 9th to 12th levels have been applied online exams and uploaded their homework. The number of homework created on OEAS is more than 250 from the beginning of its usage.

A link for the online form of that questionnaire is sent to the e-mail addresses of the students and shared on social media group pages. By this method, the graduates are intended to be accessed to respond the questionnaire. At the end, 413 students replied the questionnaire.

As the descriptive statistics of the respondents, there are 270 males and 143 females in the dataset, the grade levels and ages of the students are also listed in Table 1.

Table 1. Demographic Profile of Respondents

	Age		Grade Level		
	Frequency	Percent	Frequency	Percent	
13	1	0,24	9	131	31,72
14	6	1,45	10	117	28,33
15	87	21,07	11	53	12,83
16	127	30,75	12	85	20,58
17	80	19,37	Graduate	27	6,54
18	62	15,01	Total	413	100,0
19	18	4,36			
20	17	4,12			
21 and above	15	3,63			
Total	413	100,00			

Data Collection Tool

The survey of the study constitutes of the constructs and items of proposed model which is proposed for measuring the factors of actual usage of OEAS (Appendix 1). There are 29 questions for 7 constructs in the questionnaire in which all the items are measured with 7 point Likert Scale. In addition, age, gender and grade of the respondents are asked for descriptive statistics.

Environment

In this part, an Online Evaluation and Assessment System (OEAS) tool which was uniquely designed by one of the authors of this paper will be explained briefly.

OEAS is a “multiuser-multidomain” e-learning platform for student assessment and evaluation. This system has started to be used in a public school since 2010. There are three main domains of the system which are directly designed for three main user groups. Those domains can be named as “students”, “teachers” and “administrators”.

Administrators’ domain is used for defining classrooms, students, courses, semesters and main elements of the system. Also, matching the relationships of these elements is another responsibility of the administrators. For instance, assignments of teachers to courses, assignments of students to classes, defining the course credits etc. are the main issues of the administrator.

Teachers' domain is used for question, homework and project preparations and assignments of them to the students in this system. There are four types of questions; multiple choice, true-false, fill in the blanks and classical. OEAS can automatically evaluates the first three types of questions by comparing them with correct answers. But, classical questions which are answered by students writing in a text-area, are evaluated by teachers manually after the exam. In addition, teachers create exams by choosing the questions from a pool where each question can be used in more than one exam and OEAS provides teachers with the previous statistics of each question. Also, teachers assign the created exam to the students (or classes) by specifying a time interval and students can only take exam during that time interval. Additionally, students are allowed to see their papers (results) during a predefined time interval which is set by the teacher. In addition to exam development and implementation, teachers can prepare homework and projects, then students are allowed to upload their works during a period of time specified by teacher. After teacher downloads and grades the homework (or project), students can see their grades on their homepages. At this point, it should be emphasized that OEAS automatically detect plagiarism in the homework to give advices to teachers and this procedure is well-known by the students.

Students' domain is used for checking grades of the previous exams and homework, controlling and uploading the given homework, taking active exams. A screenshot for "student main page" is given in Appendix 2. Students are directed to the active exam pages at this domain. Exams can be taken in a given time interval and when a student started an exam s/he can see the remaining time, question navigation buttons and blank questions (in red color) on that page (Appendix 3). Also, students can see the details of the active homework on this domain and upload their works. If a student uploads an unfinished document or wants to change it, s/he is allowed to delete and upload again during a specified time interval.

Data Analysis

Structural equation modeling (SEM) which analyzes a set of relationships between one or more independent variables, continuous or discrete, and one or more dependent variables, continuous or discrete (Ullman & Bentler, 2003) with a combination of factor analysis and path analysis (Kaplan & Haenlein, 2000), is applied in this study. Results are obtained by using AMOS 21.0. The reason for using this model is that there are multiple dependent variables related with multiple connected independent variables and the essentiality of testing the model in the same progress as a whole. Additionally, it is important in the manner of being a unique study that there is not a recent SEM study in this concept.

The normality values for every item of all constructs were analyzed at first glance. Using the benchmark ± 2.0 for skewness and kurtosis, it can be noted that no items are outside of this range (Trochim & Donnelly, 2006; Field, 2000, 2009; Gravetter & Wallnau, 2014). Therefore, it is stated that all items obtain normality requirement.

Findings

Confirmatory Factor Analysis

Confirmatory factor analysis that is the first step of SEM is applied to the measurement model and its standardized regression weights can be seen in Appendix 4.

Table 2 summarizes the results of the measurement model goodness of fit values. Firstly, Chi-square value of measurement model is 1025.991 and degree of freedom is 356. The ratio of chi-square over degrees of freedom, which is 2.88, (≤ 3.00). The GFI value of the measurement model is 0.852 which can be assumed in acceptable and depends on the sample according to Arbuckle (2003) and Byrne (2001). Also, RMSEA value of the model is 0.068, which is between 0.05 and 0.08 and in acceptable fit interval according to Hair, Black, Babin, and Anderson (2009). Similar to GFI value, Normed Chi-Square value which is the ratio of Chi-Square to Degrees of Freedom is 2.88 and it is in good fit interval (Hair et al., 2009). As the last absolute fit index, AGFI is 0.819. Byrne (2001) and Arbuckle (2003) indicates that the closeness of this value to 1 states good fit and this value highly depends on number of respondents. Then, 0.819 is acceptable as AGFI for measurement model. As it can be seen in Table 2, the incremental fit indices of the model (NFI and CFI) are in acceptable fit interval according to Hair et al. (2009). Lastly, the parsimony-adjusted CFI value which is 0.818 is close to 1 and acceptable for the fit measure (Byrne, 2001; Arbuckle, 2003).

Table 2. Measurement Model Fit Summary

Fit Measure	Measurement Model Result	Acceptable Fit Interval	Reference
Degrees of Freedom (df)	356		
Chi-square (X^2)	1025.991		
Absolute Fit Indices			
Goodness-of-fit index (GFI)	0.852	Close to 1 good fit Depends on N	Arbuckle (2003), Byrne (2001)
Root mean square error of approximation (RMSEA)	0.068	$0.05 \leq RMSEA \leq 0.08$	Hair et al. (2009)
Normed Chi-square	2.88	$X^2 / df \leq 3$	Hair et al. (2009)
Adjusted goodness-of-fit index (AGFI)	0.819	Close to 1 good fit Depends on N	Arbuckle (2003), Byrne (2001)
Incremental Fit Indices			
Normed fit index (NFI)	0.902	$0.90 \leq NFI \leq 0.95$	Hair et al. (2009)
Comparative fit index (CFI)	0.933	$0.90 \leq CFI \leq 0.95$	Hair et al. (2009)
Parsimony Fit Indices			
Parsimony-Adjusted Comparative fit index (PCFI)	0.818	Close to 1 good fit	Arbuckle (2003), Byrne (2001)

The next step is to check the construct validity of the measurement model, which includes convergent validity, discriminant validity and face validity.

To ensure the convergent validity, first factor loadings, factor loading squared, measurement errors and p-values are analyzed (Table 3).

Table 3. Confirmatory Factor Analysis Results

Latent Variable	Indicator	Factor Loading	Factor Loading Squared	p- Value
Actual Usage of OEAS	AU1	0.714	0.510	.*
	AU2	0.791	0.626	0.001
	AU3	0.780	0.608	0.001
	AU4	0.642	0.412	0.001
	AU5	0.790	0.624	0.001
Perceived Ease of Use	PEU1	0.819	0.671	.*
	PEU2	0.872	0.760	0.001
	PEU3	0.863	0.745	0.001
	PEU4	0.796	0.634	0.001
	PEU5	0.831	0.691	0.001
Perceived Usefulness	PU1	0.799	0.638	.*
	PU2	0.861	0.741	0.001
	PU3	0.929	0.863	0.001
	PU4	0.734	0.539	0.001
Self-efficacy	SE1	0.904	0.817	.*
	SE2	0.945	0.893	0.001
	SE3	0.913	0.834	0.001
	SE4	0.888	0.789	0.001
Service Quality (Accessibility)	SQ1	0.731	0.534	.*
	SQ2	0.745	0.555	0.001
	SQ3	0.833	0.694	0.001
	SQ4	0.784	0.615	0.001
	SQ5	0.816	0.666	0.001
Technical Support	TS1	0.856	0.733	.*
	TS2	0.911	0.830	0.001
	TS3	0.740	0.548	0.001
User Interface Design	UID1	0.856	0.733	.*
	UID2	0.911	0.830	0.001
	UID3	0.740	0.548	0.001

*not estimated when loading set to fixed value of 1.0.

Hair et al. (2009) states that each factor loading must be at least 0.50 while the ideal value is 0.70 or greater. Also, squared of factor loadings should be at least 0.50, therefore, they must explain half of the variable even if factor loadings are significant. Furthermore, all of these values should be significant with related p-values. As it can be seen from Table 3, all the factor values are in good fit interval for the further analysis, except for AU4 which is unacceptable fit range.

Table 4 shows the AVE and CR values for every construct. According to Hair et al. (2009) Average of Squared Factor Loadings (AVE) value should be greater than 0.50 and Construct Reliability (CR) values should be greater than 0.70 for supporting CR. For each latent variable AVE met the recommended minimum threshold of 0.50. All composite reliability values exceeded the recommended level of .70. To sum up, these construct reliability scores show that all the indicators are defined well with those factor loadings by the related constructs.

Table 4. AVE and CR values for Constructs of the Model

Construct	AVE	CR
Actual Usage of OEAS	0.556	0.737
Perceived Ease of Use	0.700	0.886
Perceived Usefulness	0.695	0.882
Self-Efficacy	0.833	0.968
Service Quality (Accessibility)	0.613	0.803
Technical Support	0.713	0.888
User Interface Design	0.734	0.912

Convergent validity is assessed using factor loading, construct reliability, and average variance extracted (Hair et al., 2009). Therefore, all factors in the measurement model have adequate convergent validity.

As discriminant validity analysis of the model, each correlation between constructs and their AVE values were examined (Table 5). All of the AVE values of constructs are greater than the square of correlation between constructs except for “perceived ease of use” and “service quality” pair. However, these two constructs are totally different constructs and there isn’t any similarity between their indicators so it can be said that all constructs satisfy discriminant validity requirement for our study.

Lastly, face validity of the constructs was analyzed. Nevo (1985) defines “face validity” that “a test which is to be used in a practical situation should, in addition to having pragmatic or statistical validity, appear practical, pertinent and related to the purpose of the test”. In other words, it is crucial to discuss the meanings and contents of every construct in order to express them correctly. Therefore, in this study, each construct was investigated and adopted from the literature comprehensively to satisfy face validity.

Table 5. Discriminant Validity Analysis

Construct 1	Construct 2	Correlation	Square of Correlation	AVE of Construct 1	AVE of Construct 2
Actual Usage	<--> Perceived Usefulness	0.425	0.181	0.556	0.695
Actual Usage	<--> Perceived Ease of Use	0.427	0.182	0.556	0.695
Actual Usage	<--> Self Efficacy	0.423	0.179	0.556	0.695
Actual Usage	<--> Service Quality	0.454	0.206	0.556	0.700
Actual Usage	<--> Technical Support	0.447	0.200	0.556	0.700
Actual Usage	<--> User Interface Design	0.346	0.120	0.556	0.833
Perceived Usefulness	<--> Self Efficacy	0.775	0.601	0.695	0.833
Perceived Usefulness	<--> Technical Support	0.552	0.305	0.695	0.833
Perceived Usefulness	<--> User Interface Design	0.771	0.594	0.695	0.833
Perceived Ease of Use	<--> Perceived Usefulness	0.835	0.697	0.700	0.833
Perceived Ease of Use	<--> Self Efficacy	0.754	0.569	0.700	0.613
Perceived Ease of Use	<--> Technical Support	0.653	0.426	0.700	0.713

Table 5. Continue

Construct 1	Construct 2	Correlation	Square of Correlation	AVE of Construct 1	AVE of Construct 2
Percieved Ease of Use	<--> User Interface Design	0.792	0.627	0.700	0.713
Self Efficacy	<--> Technical Support	0.584	0.341	0.833	0.713
Service Quality	<--> Perceived Usefulness	0.731	0.534	0.613	0.713
Service Quality	<--> Percieved Ease of Use	0.845	0.714	0.613	0.713
Service Quality	<--> Self Efficacy	0.708	0.501	0.613	0.713
Service Quality	<--> Technical Support	0.698	0.487	0.613	0.734
Service Quality	<--> User Interface Design	0.726	0.527	0.613	0.734
User Interface Design	<--> Self Efficacy	0.708	0.501	0.734	0.734

Lastly, it should be stated here that the factor loadings of items of constructs are all greater than 0.50 cut off value. Therefore, those items are not eliminated from the measurement model. Additionally, choice of combination of the two or more constructs is not applied because of the solid literature background of the theoretical framework.

Structural Model

After a valid measurement model, the structural model which is constructed based on the literature review, is tested. The structural model is given in Appendix 5. Chi-square for structural model was found as 1047.04 and degrees of freedom are 363. The ratio of the Chi-square to the degrees of freedom (2.88) is less than 3, therefore it is in the acceptable range. As a summary for goodness of fit indices of structural model, fit measures values are listed in Table 6. It can be observed in Table 6 that, all indices are in the acceptable interval. Therefore, it can be said that structural model also satisfies model fit requirements.

Table 6. Structural Model Fit Summary

Fit Measure	Structural Model Result	Acceptable Fit Interval	Reference
Degrees of Freedom (df)	363		
Chi-square (X^2)	1047.04		
Absolute Fit Indices			
Goodness-of-fit index (GFI)	0.849	Close to 1 good fit Depends on N	Arbuckle (2003), Byrne (2001)
Root mean square error of approximation (RMSEA)	0.068	$0.05 \leq RMSEA \leq 0.08$	Hair et al. (2009)
Normed Chi-square	2.88	$X^2 / df \leq 3$	Hair et al. (2009)
Adjusted goodness-of-fit index (AGFI)	0.819	Close to 1 good fit Depends on N	Arbuckle (2003), Byrne (2001)
Incremental Fit Indices			
Normed fit index (NFI)	0.900	$0.90 \leq NFI \leq 0.95$	Hair et al. (2009)
Comparative fit index (CFI)	0.932	$0.90 \leq CFI \leq 0.95$	Hair et al. (2009)
Parsimony Fit Indices			
Parsimony-Adjusted Comparative fit index (PCFI)	0.833	Close to 1 good fit	Arbuckle (2003), Byrne (2001)

The regression weights and their p-values of structural model in terms of related hypothesis are listed in Table 7.

Table 7. Regression Weights of the Structural Model

Relationships of Constructs			Regression Weight	p-value
H1	Actual Usage of OEAS	<--- Technical Support	0.234	0.002
H2	Perceived Ease of Use	<--- User Interface Design	0.317	0.000
H3	Perceived Usefulness	<--- Self-Efficacy	0.329	0.000
H4	Perceived Ease of Use	<--- Self-Efficacy	0.190	0.000
H5	Perceived Ease of Use	<--- Service Quality	0.480	0.000
H6	Actual Usage of OEAS	<--- Service Quality	0.157	0.094
H7	Perceived Usefulness	<--- Perceived Ease of Use	0.594	0.000
H8	Actual Usage of OEAS	<--- Perceived Usefulness	0.180	0.025

It can be seen that, all regression weights are significant at the alpha level 0.05 except the hypothesis 6 which shows the effect of service quality on actual usage of OEAS. However this relationship is significant at the alpha level 0.10, and base on the theoretical background of the model and hypothesis, this relationship was not dropped from the model.

Modification indices were examined to determine whether there is a relationship that was unnoticed and can improve structural model. But the results of modification indices show that there exists no path to add the model for improving the model fit.

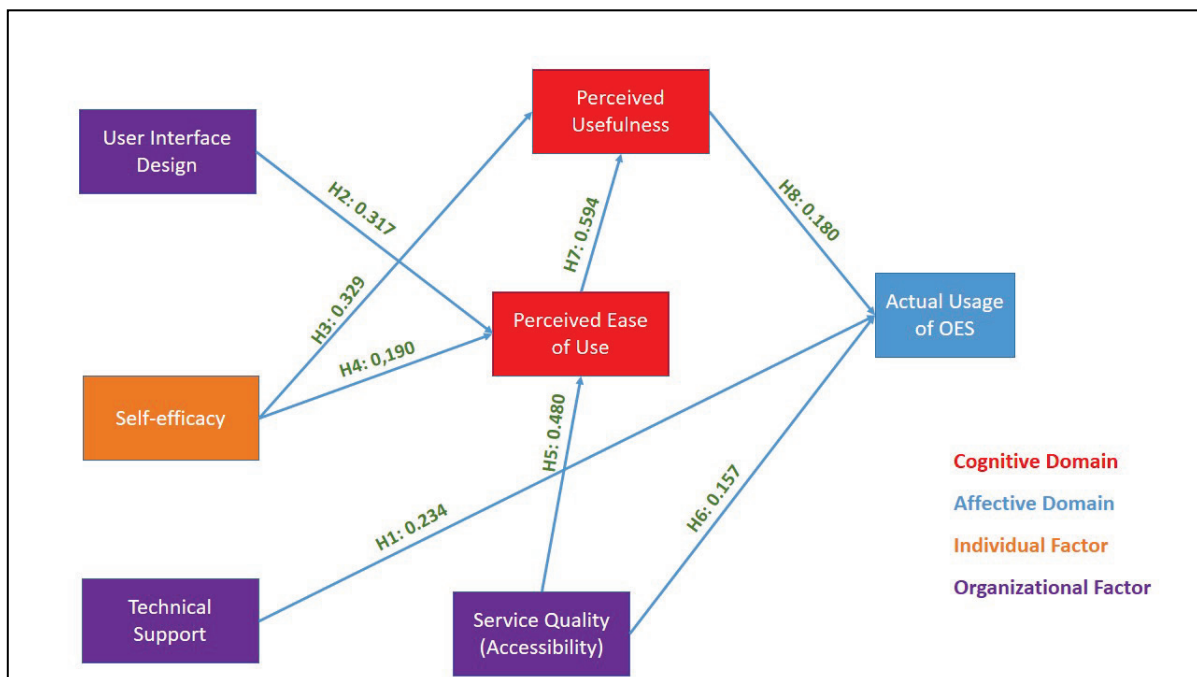


Figure 2. Standardized Path Estimates for the Structural Model for the Actual Usage Predictors of OEAS

As a conclusion, Figure 2 shows that the estimated coefficient of PU on predicting Actual Usage of OEAS is 0.180. Also, the coefficient of SQ is 0.157 and TS is 0.234. The sizes of these coefficients indicate that PU and SQ have nearly same impact on AU, whereas TS has the biggest impact size. Moreover, those variables (TS, PU and SQ) have substantial impact on AU and provide evidence of that relationship as well. Recall that regression coefficients can be used to compute predicted values for dependent variables. Thus, for any particular values of the independent variables, an estimated value for the outcome can be obtained. In this case, they would represent predicted values for endogenous constructs, or the outcome.

Discussion

The main research results are summarized as follows: “self-efficacy”, “user interface design” and “service quality” are found as significantly effective on “perceived ease of use” (Joo et al., 2012; Davis et al., 1989; Saadé, 2003), while “self-efficacy” and “perceived ease of use” have significant influences on “perceived usefulness” (DeLone & McLean, 1992; Roca et al., 2006; Cheng, 2012). In addition, the results support TAM in which “perceived usefulness” is significantly effective on “actual usage” of online evaluation and assessment system (Davis et al., 1989; Saadé, 2003); meanwhile “technical support” and “service quality” are significant predictors of “actual usage” (Freeze et al., 2010; Ramayah & Lee, 2012).

Results of this study are consistent but not limited to conclusions of other studies in the literature. Both direct and indirect effects of “perceived usefulness” on the “actual usage” of online evaluation and assessment systems are measured in this study. In addition, the other variables which are not stated in TAM, showed significant direct and indirect effects on actual usage of online evaluation and assessment systems. In detail, “technical support” is directly (and significantly) effective on actual usage at the same size of “service quality”. But the effect of “service quality” is not only direct, but also indirect (by effecting “perceived ease of use” and “perceived usefulness”). Additionally, “self-efficacy” and “user interface design” have indirect influences (over “perceived ease of use” and “perceived usefulness”) on “actual usage”.

These results show that when the concept is online evaluation and assessment system, the actual usage predictors are not limited with common TAM variables. Moreover, a multiple regression analysis is not enough to show the indirect effect of exogenous variables of actual usage on students’ perspective. Then, applying a Structural Equation Modeling analysis is successful for concluding all the direct and indirect effects and their significant weights.

Results and Recommendations

When we consider evaluation and assessment in e-learning, literature is mainly full of “evaluation of e-learning” articles from teachers’ perspective. On the other hand, there are few studies on the topic of “evaluation and assessment part of e-learning”, but, those studies are exactly about introducing tools that were designed for online examination (Tinoco, Barnette, & Fox, 1997; Zhenming, Liang, & Guohua, 2003; Thomas, Price, Petre, Carswell, & Richards, 2001; Thomas, Price, Paine, & Richards, 2002). One comparably new study (Ullah, Xiao, & Lilley, 2012) concerns the security and authentication issue of online examination. And, some electronic grading algorithms were explained in data mining studies (Thomas, 2003). Additionally, Chalmers and McAusland (2002) evaluated computer assisted assessment from teachers’ perspective in his handbook.

Consequently, examination is a fundamental and integral component of online learning environments (Ullah et al., 2012). With the development of learning technologies, assessment has also evolved. The online examinations may include questionnaires, assignments, projects, peer review, essays, quizzes, self-assessment and portfolios (Joosten-ten Brinke et al., 2007). The variety of these components of online examination caused development and testing of several tools. Experts test the effect of those tools, but the core point is the online evaluation and assessment and the predictive factors of its usage from especially students’ perspective. This study is underlying the possible significant predictors (and their weights) of actual usage of online student evaluation and assessment systems.

The impression of this study is that all features of e-learning have been analyzed and popular in literature in recent years but evaluation and assessment part of it was examined least. For this purpose, a systematic analysis is performed on literature to put forward the factors of evaluation and assessment system usage. Self-efficacy, technical support, user interface design, service quality, perceived usefulness and perceived ease of use are selected as possible significant predictors for actual usage of this system. Data for the analysis is collected via online questionnaire from students who have been using a unique online evaluation and assessment system (OEAS) developed by one of the authors of this paper and has been used in a public high school since 2010. The new model developed for evaluation and assessment systems, is tested by Structural Equation Modelling (SEM) analysis. As the first phase of SEM study, measurement model is analyzed. After a valid measurement model, structural model is designed and tested.

In the results of the analyses, "self-efficacy", "user interface design" and "service quality" are found as significantly effective on "perceived ease of use", while "self-efficacy" and "perceived ease of use" have significant influences on "perceived usefulness". In addition to supporting related literature, "service quality" and "user interface design" are very important factors in explaining "perceived ease of use" for OEAS. Moreover, "technical support" is another significant factor directly affecting the actual usage. Then, these results show the importance of external and technical factors together with the individual factors. Therefore, it is advisable for the educational technologist to focus on user interface design while developing such systems and provide strong technical support during the usage of these systems. Additionally, the results support TAM in which "perceived usefulness" is significantly effective on "actual usage" of online evaluation and assessment system. It is believed that this result not only support those common theories but also increases the validity and reliability of this study. Meanwhile, "technical support" and "service quality" are concluded as the direct significant predictors of "actual usage". These results show that the educational technologists and computer assisted assessment system analysts should directly take into consideration systems from users' perspective, while this view seems unheeded. Actually, specialists, who pay attention to technical factors of online evaluation and assessment systems, should care much more the "service quality". But the weights of effects to actual usage show that (although they both have direct effect on "actual usage") "technical support" has much more effect on "actual usage" than "service quality".

Although OEAS is a web-based system and flexible enough to be implemented on multiple type of schools, it has been used in a school and this study was done on the direction of that school and its student. As a futuristic study, the scope of the data would be enlarged by applying this system to other type of schools. Lastly, the scope of the study would be enlarged by adding variables from teachers' and administrators' perspectives.

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Appendix 1. Measurement Items Used in the Study

Construct	Item	Measure	Adopted From
Actual Usage of OEAS	AU1	How often per week do you connect to OEAS?	Sánchez et al. (2013)
	AU2	How often do you take your exams on OEAS?	
	AU3	How often do you send your homework from OEAS?	
	AU4	How often do you check your grades on OEAS?	
	AU5	How often do you check your exam papers on OEAS?	
Service Quality (Accessibility)	SQ1	I have no difficulty to access the system.	Ramayah et al. (2012), Freeze et al. (2010)
	SQ2	The system is always available.	
	SQ3	The system is user-friendly.	
	SQ4	The system has attractive features that appeal to users.	
	SQ5	The system provides high-speed information access.	
Perceived Ease of Use	PEU1	The system is comfortable to interact with.	Saadé (2003), Davis et al. (1989), Venkatesh (2001), Liu et al. (2010), Park (2009)
	PEU2	It is easy for me to do the things that I want to do by operating this system.	
	PEU3	It is easy to become skillful at using this system.	
	PEU4	In general, I feel it is easy for me to use this system	
	PEU5	It is clear and easy to understand how to use the platform.	
Perceived Usefulness	PU1	The system is useful for taking exams online.	Saadé (2003), Liu et al. (2010), Cheng (2012), Park (2009)
	PU2	The system is useful for sending homework online.	
	PU3	The system is useful for checking exam results online.	
	PU4	The system increases my exam performance in general.	
User Interface Design	UID1	The layout design of the system makes it easy to take exam.	Liu et al. (2010), Cheng (2012)
	UID2	The font style, color and layout of the interface make it comfortable for me to do my exams.	
	UID3	In general, I am satisfied with the design of the interface of the system.	
Self-efficacy	SE1	I am confident about to use the system well.	Joo et al. (2012), Sánchez et al. (2013), Park (2009)
	SE2	I think I have sufficient knowledge and ability to use the system.	
	SE3	I think I can use the system properly.	
	SE4	I could easily learn to use the system.	
Technical Support	TS1	The platform provides assistance when you have technical problems.	Ramayah et al. (2012), Sánchez et al. (2013)
	TS2	Technical support staff is available at any time.	
	TS3	When I have a technical problem during an exam, my teachers solves it immediately.	

Appendix 2. Students' Domain of OEAS

ONLINE EXAM SYSTEM									
12:19:00 - 23 June 2014									
Student Info									
Number:	396								
Name:	[REDACTED]								
Surname:	[REDACTED]								
Class:	10-A								
Email:									
Telephone:									
Address:									
Person whom will be contacted at emergency (Name Surname-Telephone):	-								
Update student info									
PROJECTS / HOMEWORKS									
Package Programs									
PROJECT/HOMERWORK NAME	PROJECT/HOMERWORK SUBJECT	DETAIL	SUBMIT						
Excel-1	26-02-2014 Excel1	click	Sent on 26/02/2014 14:38 GRADE: 85 Points						
AKTIVE EXAMS									
Fundamentals of Information Technologies 2. Semester 3. Exam									
Click to open exam page									
EXAM RESULTS									
Career Development									
EXAM NAME	GRADE				INFO				EXAM PAPER
	T	F	E	C	T	Start	Finish	Minutes	
2. Semester 1. Exam	14	6	0		70	08/04/2014 13:30	08/04/2014 14:30	60 min.	LAB1-24 Finished at 08/04/2014 22:20
2. Semester 2. Exam	16	9	0		64	27/05/2014 13:30	27/05/2014 14:30	60 min.	LAB1-22 Can be seen between 30/11/2014 0:00 and 30/11/2014 1:00
Fundamentals of Information Technologies									
EXAM NAME	GRADE				INFO				EXAM PAPER
	T	F	E	C	T	Start	Finish	Minutes	
2. Semester 1. Exam	53	30	0	12/21	62	18/03/2014 15:33	18/03/2014 16:32	59 min.	LAB1-24 Finished at 23/03/2014 23:22
2. Semester 2. Exam	68	14	0	20/20	86	30/04/2014 16:21	30/04/2014 17:20	58 min.	LAB2-24 Finished at 09/05/2014 21:00

Appendix 3. Exam Page of OEAS

Remaining Time: 3 hours 36 minutes 57 seconds

Fundamentals of Information Technologies COURSE 2. Semester 3. Exam

**PLEASE DON'T ASK QUESTION.
UNDERSTANDING THE QUESTIONS IS A PART OF THE EXAM.**

Name: [REDACTED] Surname: [REDACTED] Number:396 Class:10-A

QUESTION 30/MODULE=Hardware Units

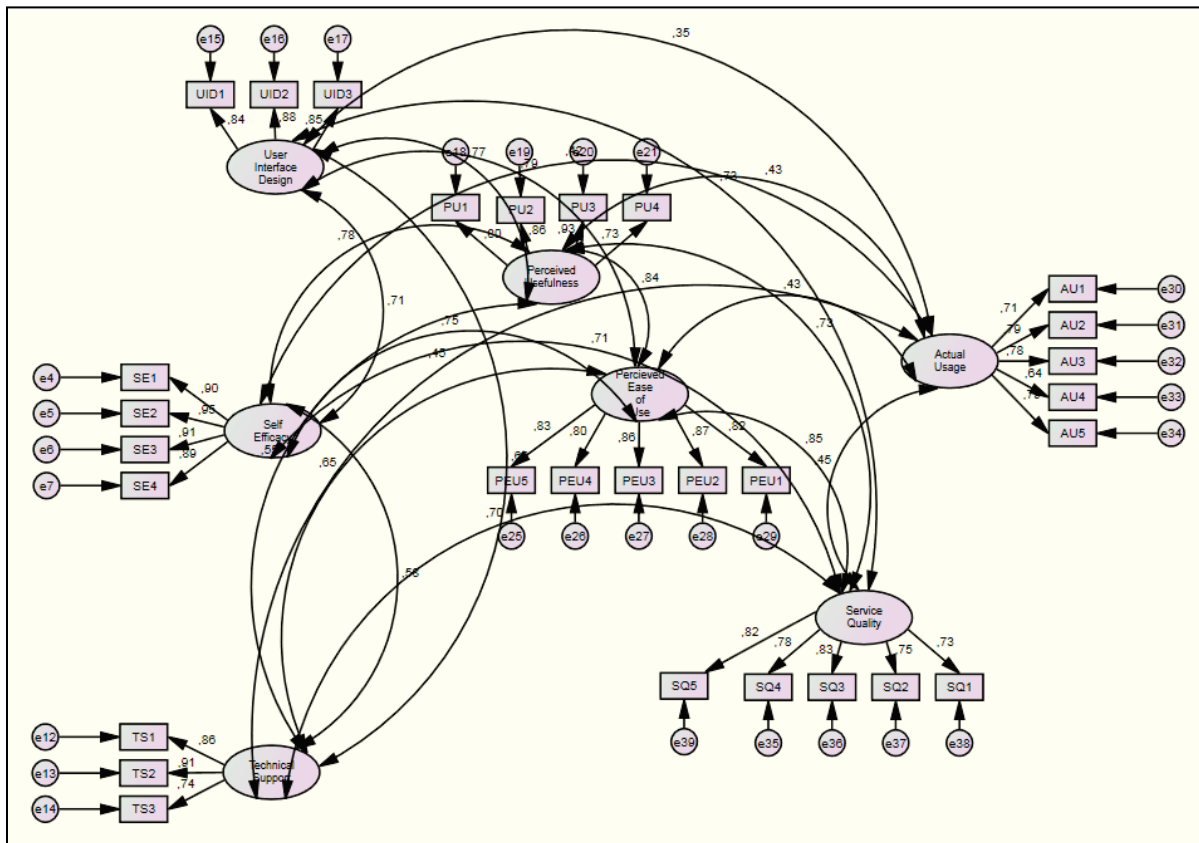
Which hardware unit is controlled first by BIOS at POST screen?

- a - Graphics Card
- b - Keyboard
- c - Mouse
- d - Memory

<--Previous Question Finish Exam Next Question-->

Multiple Choice:	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
	27	28	29	30																						
	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
	57																									
True-False:	58	59	60	61	62	63	64	65																		
Fill in the Blanks:	66	67	68	69	70	71																				
Classic:	72	73	74	75	76																					

Appendix 4. Measurement Model



Appendix 5. Structural Model

