

PAPER • OPEN ACCESS

Integrated Model for E-Learning Acceptance

To cite this article: Ramadiani *et al* 2016 *IOP Conf. Ser.: Mater. Sci. Eng.* **105** 012016

View the [article online](#) for updates and enhancements.

Recent citations

- [Evaluation of E-learning Websites Using the Webqual Method and Importance Performance Analysis](#)
Muhammad Labib Jundillah *et al*
- [User Satisfaction Model for e-Learning Using Smartphone](#)
Ramadiani *et al*

Integrated Model for E-Learning Acceptance

Ramadiani¹, A Rodziah^{2,1}, S M Hasan^{2,2}, A Rusli^{2,3}, and C Noraini^{2,4}

¹Computer Science, Natural Resources and Mathematic Faculty, Mulawarman University, East Kalimantan, Indonesia.

²Information System, Computer Science and Information Technology Faculty, Universiti Putra Malaysia, Malaysia.

E-mail: mmi_ugm04@yahoo.com, rodziah@upm.edu.my, mhbselamat@gmail.com, rusli@upm.edu.my, norainip@upm.edu.my

Abstract E-learning is not going to work if the system is not used in accordance with user needs. User Interface is very important to encourage using the application. Many theories had discuss about user interface usability evaluation and technology acceptance separately, actually why we do not make it correlation between interface usability evaluation and user acceptance to enhance e-learning process. Therefore, the evaluation model for e-learning interface acceptance is considered important to investigate. The aim of this study is to propose the integrated e-learning user interface acceptance evaluation model. This model was combined some theories of e-learning interface measurement such as, user learning style, usability evaluation, and the user benefit. We formulated in constructive questionnaires which were shared at 125 English Language School (ELS) students. This research statistics used Structural Equation Model using LISREL v8.80 and MANOVA analysis.

1. Introduction

E-learning is a method of learning that is offered by many universities and educational institutions. Using e- learning is expected to improve services and educational outreach to the many remote areas. Especially for companies and institutions that have branches all over the world. They need e-learning to train employees and serve customers. E-learning is a distance learning system which offers training courses, and custom tailored to the needs of learners [1]. E-learning will not work if the system is not used in accordance with user needs. It is a measure allowing users to progress at their own speed [2].

E-learning is expected to facilitate the weakness that existed or found in the conventional education. Through e-learning is hoped education become more accessible, cheaper, more fun and easier to share and to learn [3]. But in reality, the e-learning was not entirely successful as expected. The success of e- learning process, like any other product depends greatly on learners' satisfaction and some other factors that will encourage learners' intention for continuous use [4]. The e-learning system implementation at universities has encouraged a number of studies. Yet, the influence of various students' experiences relating to their satisfaction and continuance intention is not clearly understood [5].



Why e-learning does not function properly because it is not in accordance with the user need (perceived usefulness and perceived ease of use) [2]. The purpose of application is to provide ease of use, not to answer the difficulties were faced by students [7]. The important to determine whether application useful or not is usability.

In many projects, the problem with the user interface is not visible until the system is ready for use and the users complete their work. At that time, may be very costly to make changes. There are many theories that discuss the interface evaluation design, but they are not integrated into a single conceptual framework that facilitates their usage by developer [6]. Various problems will arise in the design of the user interface to suit the needs of e-learning users.

The effectiveness of learning and design of the interface will be significantly related. Interface is used to communicate with the user in an interactive system. E-learning will be less than optimal if the system is not effectively used in accordance with user needs. Well-designed interface, as good educators, and instructional materials, must make a "teacher-student" relationship that guides the user to learn and enjoy what they do [2]. Good interface can be challenging for users to expand their understanding of user interfaces and computer systems. Thus, the user interface is very important for designers to understand and be aware of user habits, physiological, and the ability of the user.

This study aims to identify and measure the variables to develop e-learning users interface model based on these reasons;

- a) Many theories had discuss about the interface usability evaluation and user technology acceptance separately, actually why we do not integrate between interface usability evaluation and user acceptance to enhance e-learning process. Therefore, the evaluation model for e-learning interface acceptance is considered important to investigate.
- b) How to develop the integrated e-learning user interface evaluation model, based on the user interface acceptance measurement and the structural model. Is there any influence of user learning style, usability function and user benefits to success e-learning interface?

2. Phases of research

In generally, there are three phases in this research activities; first phase is information gathering and formulation, the second phase is estimation fit model and the last phase is model prototyping and evaluation. When designing an e-learning interface, instructors are faced with many considerations and decisions that consequently affect how students experience instruction construct and process knowledge. These decisions related to the didactic design of e-learning course may refer to one of five fields of instruction [8].

2.1. Model Design

Model design includes organization of the research activity in model proposing which are most likely to achieve this study objective. It can be described as a blue print to perform this model, which involves the description of model approach, information gathering, user needs identification, envisioning and evaluation, requirement specification, estimation, assessment, modification, fit model, prototype developing, testing, evaluation and model contribution, also sampling size, tool and methods of data collection to answer specific research questions or for testing research hypothesis. The purpose of model design is to provide answers to model research questions and to control model research variance.

These are the steps for developing UIA model in this research;

- Developing good theoretical Model and some hypotheses to represent that model
- Case screening, missing data and unengaged responses

- Missing variable, Skewness, and Kurtosis
- Exploratory factor analysis
- Clean pattern matrix, convergent validity, discriminate validity, reliability
- Confirmatory factor analysis and Structural model

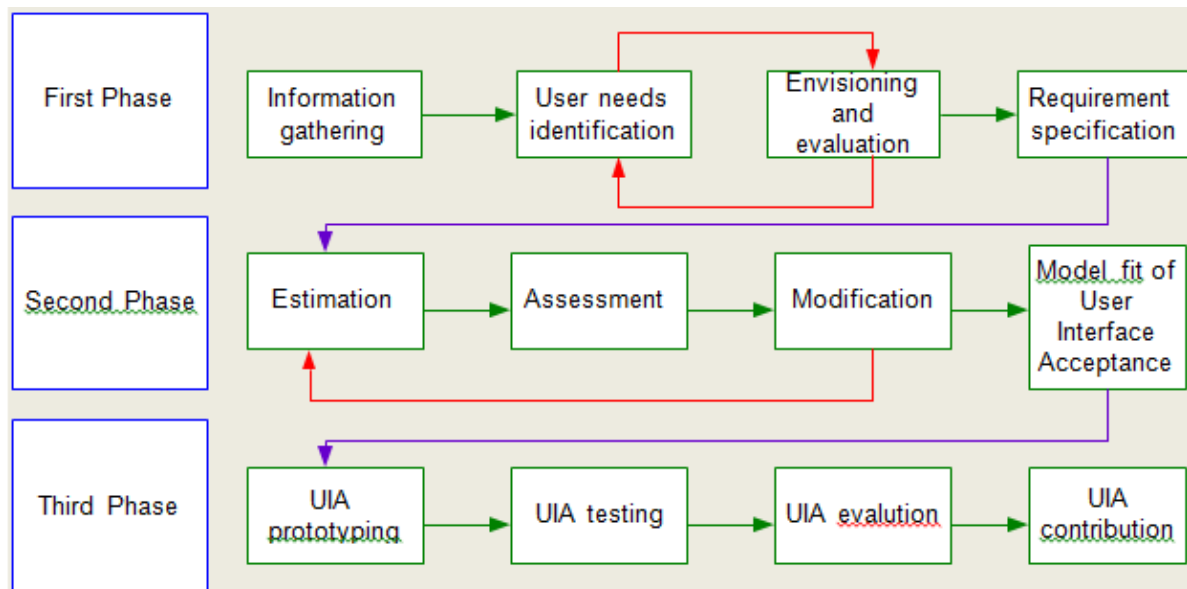


Figure1. Research Activities

We can illustrate this research activities in Figure 1 which each process has some input and output data. The researcher collected the learner problem in e-learning interface acceptance. The research activities such as; information gathering, user needs identification, envisioning and evaluation, and formulate the user requirement specification for research hypothesis. User needs identification in this research was collected from observation and case study at Language Technology Centre in ELS in UPM.

2.2. First Phase of Research

Understanding user requirement is an integral part of information system design and is critical to the success of interactive system. The problem of this study is how to develop integrated model in e-learning interface system. The system is benefits if it was developed with understanding the user needs and requirement. It can include; increase productivity, enhance quality of work, reduction in support and training costs, to encourage their knowledge and to help them finishing their task, and improve user satisfaction.

2.2.1. Information Gathering. This step is related to the initial formation of the structural equation model, prior to estimation. Initial model was formulated based on a previous theory or research. In this study, the previous researches were used as references, for instance, user learning style and usability evaluation. Especially user benefit is the original theory for these research hypotheses. There are some factors that need to be prepared in order to test hypotheses to represent the issues contained in this research. This research model consists of:

- User Learning Style [9]; Learning style, motivation and user knowledge
- Usability [3]; Know-ability, operability, efficiency, robustness, safety and subjective satisfaction
- *User Benefits*; Media elements, communicativeness and user expectation

In a confirmatory technique, the model must be specified correctly based on the type of analysis that the researcher is attempting to confirm. When building the correct model, we use two kinds of variables, exogenous and endogenous variables. In this model, a variable can act as both independent and dependent variable. Two main components of models are distinguished in SEM [10].

2.2.2. User Need Identification.

Based on the previous evaluations and theories about the interface acceptance, we developed hypotheses and designed new model then followed by making some in Table 1 there are fifteen hypotheses in this research, twelve hypotheses for measurement model and three hypotheses for structural model.

Table 1 Research Hypothesis

Hypothesis	Research Hypothesis
H1 10	There is no correlation between User Learning style and User's Style
H 2 10	There is no correlation between Motivation and User's Style
H 3 10	There is no correlation between Knowledge ability and User's style
H 4 20	There is no correlation between Know-ability and Usability
H 520	There is no correlation between Operability and Usability
H 620	There is no correlation between Efficiency and Usability
H 720	There is no correlation between Robustness and Usability
H 820	There is no correlation between Safety and Usability
H 920	There is no correlation between Subjective Satisfaction and Usability
H10 30	There is no correlation between Media elements and User Benefits
H11 30	There is no correlation between Communicativeness and User Benefit
H12 30	There is no correlation between User expectation and User Benefits
H13 40	There is no correlation between User's Style and UI Acceptance
H14 40	There is no correlation between Usability and UI Acceptance
H15 40	There is no correlation between User Benefit and UI Acceptance

2.2.4. Research Question Design.

This research has twelve indicator variables and each indicator variable has three criteria. Totally the variables in this research are 36 attributes as shown in Table 2

Table 2 Research Attributes

Variables	Goals	Attributes
Y1	Learning style	CIEP Level, Study habits
Y2	Motivation	frequency of learning time, finishing study,
Y3	Knowledge ability	grades
Y4	Know-ability	learnability, understandability, memorability
Y5	Operability	ease of use, effectiveness, flexibility
Y6	Efficiency	user workload, efficiency, productivity

Y7	Robustness	error management, trustfulness, errors
Y8	Safety	safety, secure, comforTable
Y9	Subjective Satisfaction	Attractiveness, Compliance, Satisfaction
Y10	Media element	Usefulness, Completeness, Increase
Y11	Communicativeness	Simple, Intuitive, Perceptive
Y12	User Expectation	User need, Capability, Expectation

2.2.5. Data Collection Method. The research was held in July 2013 at English Language School language Center Course in Putra Malaysia University. There are nine level of English class in English Language School; each level consists of around ten until 20 students. We involved all students in each level to become the research respondents. The questionnaires were distributed when the students finished their exercises in language laboratory (LTC). The minimum sample size recommended [11] for the sample in this study, depending on the number of variables to be studied. The formula is as follows: $k(k+1)/2$, where k is the number of variables. It needs at least samples to calculate the minimum model of in this research is: $12(12+1)/2=78$ respondents in this research.

In data research collection, the authors distributed 125 questionnaires and only 120 were returned. After disability questionnaires were eliminated, the total samples were used 116 respondents.

2.3. Second Phase of Research

In this phase, the researcher did the model estimation and measurement in UIA model. The research activities in these phases such as; estimated the research hypothesis model, model assessment and produced the last fit model for the UIA to answer the research questions and hypothesis.

2.3.1 User Acceptance Model Estimation. Data collected in this study is ordinal data that has changed to continuous data, so the estimation method we use is the method of maximum likelihood. After it was estimated then we prepared the suitability test of the model. We compare the estimation results of the early models to the latest models. Then we calculate the average value of user interface acceptance. Model fit test was performed in order to assess whether the construct model suitable and consistent with the data collected.

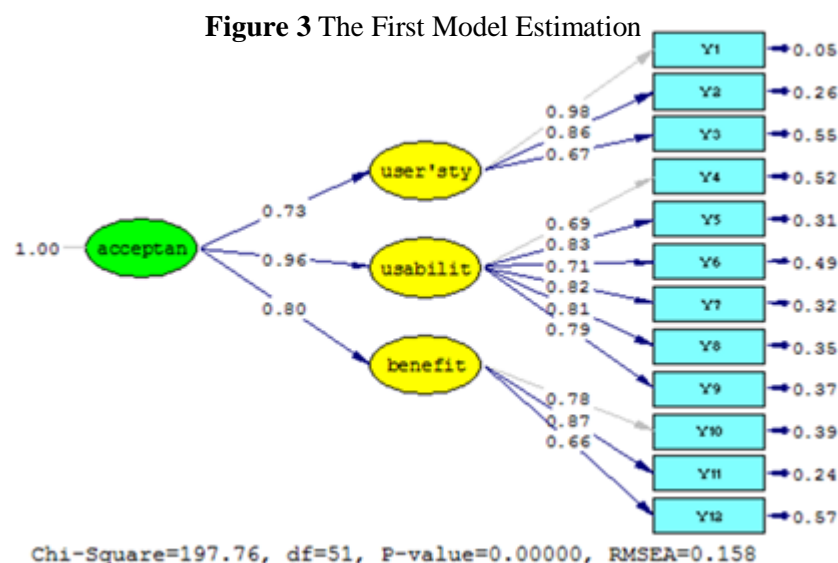


Figure 3 shows that all hypothesis model (measurement and structural model) estimation are

significant ($p = .000$), we can see that $\gamma_1 = 0.73$, $\gamma_2 = 0.96$ and $\gamma_3 = 0.80$. Chi-Square= 197.76 and RMSEA= .158. This evaluation is done to measure the reliability and validity of the concept model of UIA. T-value ≥ 1.96 of mean relevant variables significantly related to the concept of related design, and is a verification of the relationship between variables and constructs that have been defined. The high factor loading value is greater than 0.70.

2.3.2 User Interface Acceptance Measurement. Reliability is used to see the consistency of a measurement. High reliability suggests that the indicators have consistently high in measuring latent constructs. The evaluation of the reliability can be done by using two types of measurements that measure reliability or construct composite reliability and variance extracted measure. Measure of the reliability of a construct can be said to be good if the value of its 0.70 construct reliability and variance extracted value of its 0.50. Examination of the structural model is done by examining the significance of the estimated coefficients. If the value of t is 1.96 then the coefficient is significant.

2.3.3 UIA Model Modification. The model may require to be customized in order to get better the model fit, so estimating the relationships between variables to be expected. Modification indices report the change in χ^2 that result from freeing fixed parameters: usually, as a result adding a path to a model which is presently set to zero. Modifications to a model, especially the structural model, are changes to the theory claimed to be true. Modifications must make sense in terms of the theory being tested, or be approved as limitations of that theory [10].

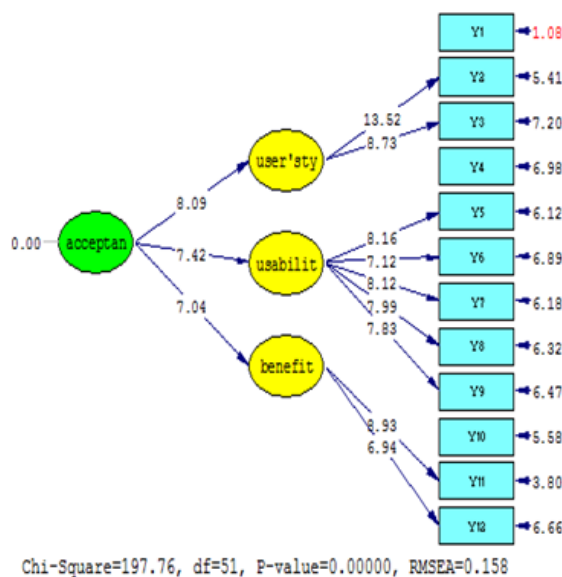


Figure4. T value estimation

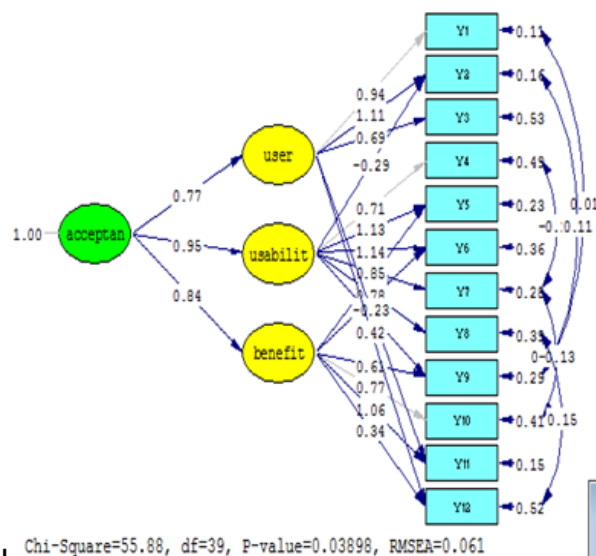


Figure5. Model Modification

Figure 4 shows that all our hypothesis model (measurement and structural model) estimation are significant ($p = .039$), we can see that $\gamma_1 = 0.77$, $\gamma_2 = 0.95$ and $\gamma_3 = 0.84$. Chi-Square=55.88 and RMSEA=0.061. T values are above than 1.96, it means that the model is significant. Figure 5 shows that all hypothesis model (measurement and structural model) estimation are significant ($p = 0.039$), we can see that $\gamma_1 = 0.77$, $\gamma_2 = 0.95$ and $\gamma_3 = 0.84$. Chi-Square = 55.88 and RMSEA= 0.061.

Table 3 Research Hypothesis Results

Name	Lambda	t value	H_0	Research
Knowledge Ability	2.90	*		
Motivation	1.18	5.41	Rejected	H21 Accepted
Learning Style	0.66	7.20	Rejected	H31 Accepted
Knowing-Ability	1.21	6.98	Rejected	H42 Accepted
Operability	0.84	6.12	Rejected	H52 Accepted
Efficiency	0.66	6.89	Rejected	H62 Accepted
Robustness	1.36	6.18	Rejected	H72 Accepted
Safety	0.84	6.32	Rejected	H82 Accepted
Subjective Satisfaction	1.74	6.47	Rejected	H92 Accepted
Media Element	0.93	5.58	Rejected	H103 Accepted
Communicative	0.97	3.80	Rejected	H113 Accepted
User Expectation	5.54	6.66	Rejected	H123 Accepted
User Style	0.73	8.09	Rejected	H134 Accepted
Usability	0.96	7.42	Rejected	H144 Accepted
User Benefit	0.80	7.04	Rejected	H154 Accepted

Table3 is about the hypotheses measurement model result estimation. It values were confirmation from LISREL output. All attributes in our hypotheses are significant as indicator variables where all t-values are above 3.80.

Table 4 Variance Extracted and Construct Reliability of model

Variables	Construct Reliability (>0.70)	Variance Extracted (>0.50)
User style	0.88	0.71
Usability	0.90	0.61
User Benefit	0.82	0.60
Acceptance	0.73	0.69

Based on Table 4 model of e-learning user interface has a highly significant correlation values and strong construction between variables, which is evidenced by the size of the construct reliability values above 0.70 and the value of its variance extracted 0.50.

2.4. Third Phase of Research

2.4.1. User Interface Acceptance Prototype. Beside UIA model, this study also developed a prototype for e-learning acceptance evaluation. The application was built using Learning Management System Moodle v1.9. Figure 6 describes e-learning prototype for user engaged in learning process.

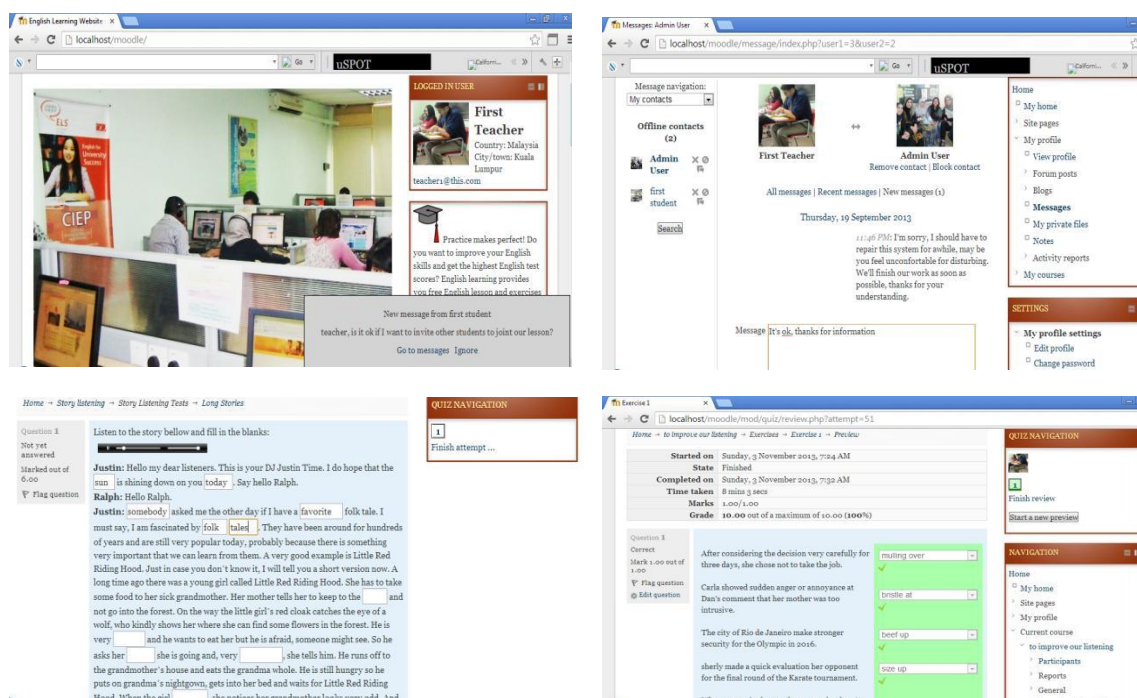


Figure 6. Prototype for E-learning Acceptance

2.4.2. User Acceptance Testing.

In model testing we tried the user to evaluate the application program. There are two different student groups who evaluated e-learning interface. Each group has experiment using Learning Technology Center. In this phase, the researcher shared some questioners about the e-learning interface Acceptance. The questioners were collected and measured using MANOVA. The objective of MANOVA is to determine whether there are differences among group members on dependent variables. The first group based e- learning application and the second groups based on grades.

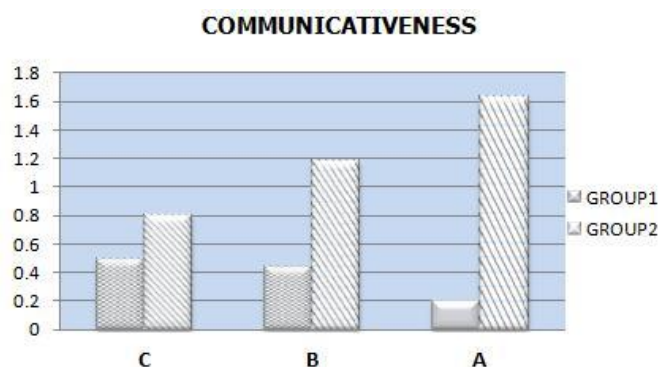


Figure 7 Communicativeness Acceptances

Figure 7 describe about respondent perception about communicativeness in both groups; group 1 (dark bar) is ELS without UIA model and group 2 (light bar) is ELS with UIA model. The dark bar is group 1 (C=0.50, B=0.44, A=0.20) and the light bar is group 2 (C=0.80, B= 1.18, A= 1.63). From the profile plot we can see communicativeness has significant different between two groups (H_0 is rejected; $p=0.000$).

3. Conclusion

User Interface is very important to encourage the users to use the application. Failure in using e-learning interface could be caused by application development which does not provide ease of use; neither answers the difficult task faced by its users. Therefore, user interface is required to be evaluated in term of user interface usability and technology acceptance. Yet, many theories discussed user interface usability evaluation and technology acceptance separately. Thus, it is necessary to correlate between interface usability evaluation and user acceptance. Hopefully this model can be considered in developing an e-learning application in the future.

4. References

- [1] Soufiane B. 2009 Learning style appropriate to the personal character of a learner: “*Pedagogical Indexing Learning Object*”. IEEE.
- [2] Guralnick, D. 2006 “*How to Design Effective, Motivating User Interfaces*”. American Society for Training & Development TechKnowledge Conference, Denver, Co.
- [3] K Marçal de Oliveira 2010 *New research challenges for user interface quality evaluation* Interaction Homme-Machine ACM New York: 287–294.
- [4] Chiu, C.-M., Sun, S.-Y., et.al. 2007 An empirical analysis of the antecedents of web-based learning continuance. *Computers & Education*, 49 (4), 1224–1245.
- [5] Wing S. Chow and Si Shi 2014 Investigating Students’ Satisfaction And Continuance Intention Toward E-Learning: An Extension Of The Expectation–Confirmation Model. *Procedia – Social and Behavioral Sciences* 141: 1145 – 1149
- [6] Ríos A, García A and Bonillo. 2010 *Usability: A Critical Analysis and a Taxonomy*. Intl journal of Human–Computer Interaction 26 (1): 53–74.
- [7] Olga.B.A. 2004 *The metrics for quantitative evaluation of user interface usability construction methodology*. SPECOM: 9th Conference Speech and Computer St. Petersburg, Russia, September 20-22.
- [8] Manuela P., Brigitte M., and Daniel M., 2010. Students’ expectations of and experiences in e-learning: Their relation to learning achievements and course satisfaction. *Computers & Education* 54:222–229
- [9] Sfenrianto, Hasibuan ZA, Suhartanto H 2011 The Influence Factors of Inherent Structure in e-Learning Process. *International Journal of e-Education, e-Business, e-Management and e-Learning –IJEEEE*, 1(3), 217-222.
- [10] Von Oertzen, T. 2010 "Power equivalence in structural equation modeling". *British Journal of a Mathematical and Statistical Psychology* 62 (2): 257–272.
- [11] Joreskog, Karl.G.dan D.Sorbom 1996 LISREL 8: *User’s Reference Guide*. Chicago: SSI, Inc.