International Symposium Open, Distance, and E-Learning (ISODEL) 2009
Sheraton Mustika Hotel, Yokyakarta,Indonesia, 8-11 December 2009

THE USABILITY ANALYSIS OF AN E-LEARNING PORTAL TOWARDS STUDENTS OF A MATRICULATION COLLEGE IN WEST MALAYSIA

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ABSTRACT. The basic purpose of this study is to evaluate the affects (emotional response), efficiency, learnability, helpfulness and ease of use of an e-learning portal towards students of a matriculation college in West Malaysia. The e-learning portal was developed by a team of lecturers and since its launching in 2007, the e-learning portal has not been fully utilized either by the students or the lecturers. Every design on the portal interface was decided by the team of developers based on their own point of view. The main problem of this study is that the portal has never been put on a usability testing. Usability testing of the portal is important due to the fact that increase in the diversity of learners, technological advancements and radical changes in learning tasks, present significant challenges and render the possibility of defining the context of use of e-learning applications. The usability methodology presented in this paper for evaluating the five aspects of user satisfaction of the e-learning portal is plausible. This study used the Software Usability Measurement Inventory (SUMI) method (Kirakowski and Corbett, 1993), which was developed in the project 'Metrics for Usability Standards in Computing' (MUSiC, CEC ESPRIT project number 5429) by the Human Factors Research Group (HFRG), University College, Cork. Based on the evaluation, the usability of the portal is found to be within the lower and upper confidence intervals. In terms of usability, sub-scales showed that the results are consistent.

INTRODUCTION

Nowadays, students are no longer depending only on classroom teachings and textbooks. They now go beyond the traditional instruction and explore the virtual world for additional information to answer their curiosity and reasonable doubts. The effects of the changing learning context from traditional to e-learning have been widely researched. Brown and Voltz (2005) define e-learning as teaching and learning that are delivered, supported and enhanced through the use of digital technologies and media. Therefore, more and more educational institutions are using e-learning as an alternative learning tool for students to provide them with variety of learning experience. Siemens (2003) contends that variety is a central requirement for learning, and that media choices should be made according to desired learning outcomes.

As mentioned by Shakar and Neumann (2003), e-learning programs can, but do not always, deliver improved learning outcomes. However, there are advantages of using the web as a source of information especially for educational purposes. Because of its hypertext environment, web users exercise much control over the learning experience than listeners of lectures and readers of books (Landow, 1992). The fact that they are more exposed to conflicting sources on the web requires them to learn to judge the quality of the sources which involves some specific skills.

Wilson and Lowry (2000) defined the web as a valuable source of information for self-directed learners because the web is a rich source of information to be processed and understood. Besides gaining information from the web, students can also share the information they have with anyone on the web with the same interests. This is where active learning happens when learners do more than process information – they build an understanding through interaction with their environment.

Young (2003) describes this emerging e-learning environment as one that is adapted and developed for intellectual partnerships, suggesting that rich learning activities allow students to learn with computers rather than from computers (Brown and Voltz, 2005). To optimize web accessibility in the learning context, usability of an e-learning program is important to help users navigate around the website. Usability is concerned with making systems easy to learn and easy to use (Nielsen, 1993).

Problem Statement

E-learning is involves a network or online learning that takes place in a formal context and uses a range of multimedia technologies. Because of its easy interactivity and connectivity, lecturers and teachers are showing increasing interest in the use of e-learning web resources. Based on the Asia e-Learning Network (AEN) Survey Research in 2002, Malaysia has the fourth highest number of Internet users in Asia. This statistic shows that more and more people are having access to the web and therefore e-learning can be implemented in a learning environment.

Realising the importance of e-learning, a Matriculation College in West Malaysia was selected as one to be the Centre of Excellence (CoE) for online learning.

According to Muthukumar, Natarajan and Hedberg (2006) the concept of user satisfaction essentially consists of ensuring that the actual experiences of users on the designed website match the experiences one expects them to have. Therefore, an effective and user satisfied e-learning portal is important for the students learning experience. In other words, the e-learning portal needs to have high usability to cater the variety needs and abilities of the students.

Although a few studies have been done, no study have been done on the usability of the e-learning portal. Therefore, this study is done to analyze the usability of the e-learning portal in the aspects of user satisfaction, perceived ease of use and perceived usefulness. Besides that, the relationship between the students personality and the usability of the e-learning portal will also be looked into. This is to get better understanding on the types of usability that is suitable for the students.

Since its launching in 2007, the e-learning portal of the college has not been fully utilized either by the students or the lecturers. The main objectives of its development was to provide students with an independent and active learning environment. As Gee (2003) suggested, active learning experience is one where students experience the world in new ways, form new affiliations, and prepare for future learning. The portal was also a tool to help the students prepare themselves towards the environment of higher education learning where most of the institutions now used e-learning portal to post their lecture notes and hold forums. Online courses are much more than the

posting of traditional in class materials on the web (Nash, 2004). The objectives of the e-learning portal have not been achieved and the main idea of its usage and importance have not successfully reached the students as well as the lecturers.

Today, images, symbols, graphs, diagram, artifacts and many other visual symbols are particularly significant (Gee, 2003). Elements of effective e-learning design is important to assist in the development of high quality materials in a cost efficient way. For the effective design of e-learning materials, the target audience must be clearly identified in order to develop scenarios that are likely to engage and stimulate the learning (Brown and Voltz, 2005). Therefore, the portal should undergo rigorous testing and evaluation to investigate its functionality, as well as usability analysis to examine the interaction design.

It is becoming apparent that for e-learning to be usable, an appreciation of what students expect from the site, how they learn, what motivates them, and what helps them to achieve their learning goals is needed (Arh and Jerman Blažič, 2008).

Research Objectives

1. To identify the helpfulness of the e-learning to the students.
2. To identify the students' feel of control over the e-learning portal.
3. To identify the learnability of the portal towards first time users.
4. To identify the students' perceived ease of use of the portal.
5. To identify the students' perceived usefulness of the portal.

Hypotheses

Hypothesis 1: The e-learning portal is helpful to the students of PMC.

Hypothesis 2:The students feel in control over the e-learning portal.

Hypothesis 3:The e-learning portal is easy to learn for the first time users.

Hypothesis 4:The students perceive the e-learning portal as easy to use.

Hypothesis 5:The students perceive the e-learning portal as useful.

Models

Technology Acceptance Model (TAM)

TAM is a theory that models on how users come to accept and use a technology. When a new technology is presented to the users, a number of factors influence the users decision about how and when they will use the technology. Under the TAM theory, two determinants such as the perceived usefulness (PU) and perceived ease of use (PEOU) are explained.

These determinants provide explanation on the users behaviour. When the learners perceive the e-learning portal as useful, this will create a positive impression towards the application and they are more likely to use the technology that seems beneficial to them. As for PEOU, the chances of the learners to accept the e-learning portal is higher when they perceive it as easy to use. Both determinants are important to influence the learners to use the e-learning portal because they induce positive perceptions. TAM suggests that learners will formulate a positive attitude towards the technology when they perceive the technology to be useful and easy to use (Davis, 1989).

The DeLone and McLean Model of Information System Success (D&M IS Success Model)

D&M IS Success Model is a framework for conceptualizing and operationalizing Information System (IS) success. Figure 1 shows the updated D&M IS Success Model (DeLone and McLean, 2003):

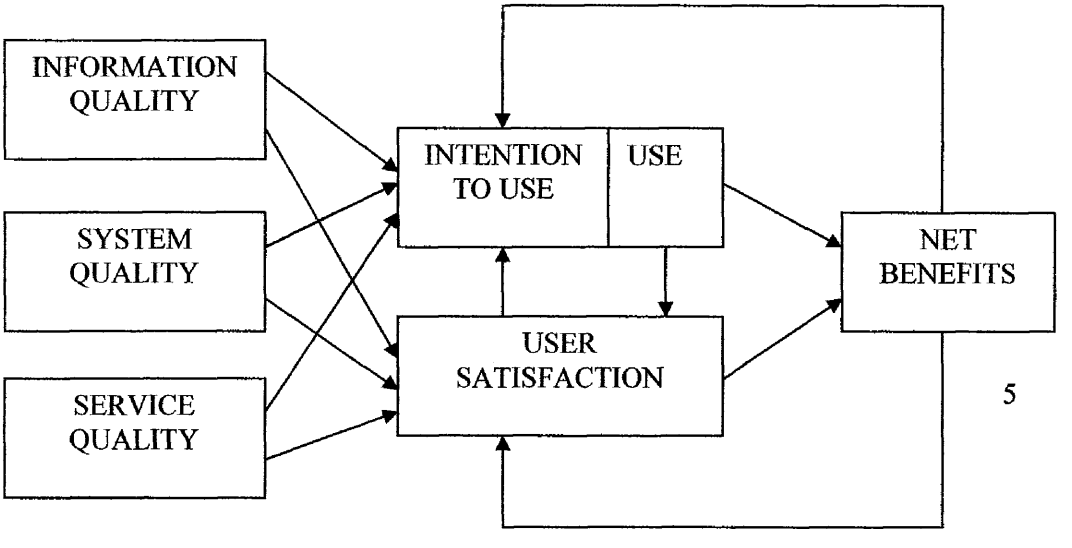

Figure 1: Updated D&M IS Success Model

The e-learning process fits nicely into the six dimensions of the updated D&M IS Success Model as shown in Figure 1 above.

Instructional Design Model

Basically an e-learning portal is a product that takes a significant amount of time and thought to develop. However, the e-learning portal will fail if it does not meet the needs of its users. Therefore, the users involvement in the design phase is important to incorporate the user-centered design in the e-learning portal. Users are encouraged to have a say, in other words, they are physically or discursively present in the decision making (Johnson, 1998).

Based on the model, the user is an important element to consider when designing the interface and developing the system or e-learning portal. The designer's image needs to suit the experience of the users situation. To incorporate user-centered design in the creation of e-learning, questionnaire and survey can be conducted.

E-learning Model

E-learning can be defined as instruction delivered via all electronic media including the Internet, intranets, extranets, satellite broadcasts, audio/videotape, interactive TV and CD-Rom (Engelbrecht, 2003). From the definition given, the value of e-learning lies in its ability to train anyone, anytime and anywhere. A successful implementation of e-learning programmes depends on building strategy that is able to meet the needs of the learners and the goals of the institution. A strategic planning process is important to pertain the ability to launch and sustain e-learning. One of the strategic planning process is a series of analysis using different models (Engelbrecht, 2003).

Significance Of The Study

This study can help to identify the needs for modification or upgrade on the design and functions of the e-learning portal. It can also help to identify the elements that promote effective learning using the portal. Besides that this study will be able to identify the users difficulties when using the portal.

THEORETICAL FRAMEWORK

Constructivist Learning Theory

Constructivist approach, also known as constructivism is a popular learning theory in the world of education. The term constructivism refers to the idea that learners construct knowledge for themselves where each learner constructs meaning as the learning takes place. Two of the most influential constructivist contributor are Piaget and Vygotsky. According to Piaget, thinking and learning is making links between new knowledge and past knowledge through the active process of organizing, ordering, classifying, identifying, relations, transforming and explaining. Therefore, for an e-learning application to be successful in delivering knowledge it has to provide the users with an experience which they can relate with. The e-learning provides communication and interaction between learners and teachers. Therefore, constructivist approach is suitable to be implemented in e-learning environment.

Usability

Since usability consider the users as the primary focus, therefore user satisfaction is an important component in determining the usability of an e-learning application. Many aspects of usability can best be studied by querying the users. However, for this research only five aspects in user satisfaction (Kirakowski and Corbett, 1993) that is highlighted:

- Learnability: If the information on the e-learning portal is presented effectively students who have never used the e-learning portal before will face no difficulty in getting started and learning new features in the portal.

- Control: Learning occurs when the learners are required to solve some task that is paired with series of learning opportunities. In this aspects, learners are given the control and freedom to navigate around the application.
- Helpfulness: Information presented in a helpful way will enable learners to solve problems independently. The environment of the e-learning portal in providing learners with the feel of security in getting assistance whenever they are out of track is important in resolving the operational problems.
- Affect: Using this e-learning will affect the emotional feelings of the learners in terms of the experience in using the portal. This aspects can be related to learners perceived ease of use because it refers to the user feeling mentally stimulated and pleasant or the opposite as a result of interacting with the application.
- Efficiency: The efficiency refers to the user feeling on how the portal is able to help the learners to perform their task in a quick and effective manner. These aspects can be related to perceived usefulness.

METHODOLOGY

Research Design

This study uses a non-experimental design. The main components of the research design in this study are:

1. End-user evaluations on the e-learning portal using questionnaires.
2. Data analysis to answer the research questions and investigating the usability problems as well as identifying the aspects of user satisfaction towards the e-learning portal.

The purpose of this study is to analyze the usability of an e-learning portal. A usability testing is one of the basic elements used to verify the user interface quality (Nielsen, 1993). Studies have shown that satisfaction can be subdivided into five aspects (Kirakowski and Corbett, 1993) which are efficiency, affect, helpfulness, control and learnability.

Population and Samples

The usability testing was done with 100 students from 5 different classes of Biological Science and Account stream. These classes were randomly chosen and during the evaluation each class was situated at the computer laboratory according to their time table. The samples are students of a matriculation college in West Malaysia who are currently in their first semester of 2009/2010 academic session. In this semester, only students from Accounts and Biological Science stream will be involved in the Information Technology course. In this course students will be exposed to the use of the e-learning portal as they will use the portal for their learning activities. The age range of the samples are below 18 to 18 years old. As part of recruiting process, all samples are ensured to have some basic computer and web browser experience. Beyond this basic level, the samples varied in their computer skills as well as in their language skills (mother language and English language).

Procedures

Usability testing of the matriculation college e-learning portal was done in a computer laboratory with a computer dedicated to each of the samples. The evaluation process was almost identical for every group of samples. The lecturer of each class involved explained the purpose of the evaluation session and present the methodology of the SUMI evaluation. Samples were also given a brief introduction on the e-learning portal. Since the samples have no previous experience with the e-learning portal, some training and a set of benchmark task were given to them. Benchmark tasks refer to task that reflect the realistic context of use of the e-learning portal such as downloading notes, uploading assignments, conducting forums and doing quizzes. The samples were given a list of tasks to complete using the portal. The samples spent about an hour navigating around the portal to be familiarize with its functions and interfaces. In the second phase, the samples were asked to fill the SUMI questionnaire for user-interaction satisfaction. The evaluation lasted about 15 minutes. During the sessions samples were not allowed to ask the lecturer questions.

SUMI Questionnaire

The SUMI questionnaire includes 50 items for which the samples selects one of the five responses ("strongly disagree", "disagree", "undecided", "agree", "strongly agree"). The statements presented to the participants are about their attitudes to the e-learning portal that they have just used. The questionnaire was designed to measure the affect, efficiency, learnability, helpfulness and control of the portal.

Variables

This study involves the use of three variables. The three variables involved are moderator variable, independent variable and dependent variable. The moderator variable involved in this study is the academic stream of the students: Accounts or Biological Science. The independent moderator for this study is the e-Learning Portal of the college. The dependent variable in this study is the results and findings done by analyzing the data collected from the usability testing done on the portal. There are five dependent variables in this study which are the five aspects of user satisfaction: learnability, control, affect, helpfulness and efficiency.

RESULTS

Data collected in this study was analysed using "Statistical Package for the Social Science" (SPSS version 16.0). The scale used in the adapted version of SUMI questionnaire ranges from 1 to 5. Scale 1 is the lowest and scale 5 is the highest. The results and findings are derived from one-sample t-test.

The findings from this study were analysed using one-sample t-test to evaluate the affects (emotional response), efficiency, learnability, helpfulness and ease of use of the college e-learning portal towards students of different gender and academic stream.

Demography of the samples such as gender, academic stream, years of experience using the Internet and frequency of Internet usage are collected to get an overview of the students' background. The results from the demography are explained in the tables below.

The results from the SUMI evaluations are presented in Table 1 in terms of the mean, upper and lower confidence intervals. These intervals are derived from the overall usability scale and each of the five usability sub-scales which are the dependent variables. The upper and lower confidence intervals represent the limits within which the theoretical true score falls 95% of the time for this sample of users.

Scale	Lower Confidence Interval	Mean	Upper Confidence Interval
OVERALL n=100	3.19	3.38	3.57
Efficiency	2.75	2.92	3.09
Affect	3.32	3.51	3.70
Helpfulness	3.33	3.50	3.68
Control	3.10	3.28	3.47
Learnability	2.87	3.08	3.28

Table 1: The results from SUMI questionnaires

Table 1 shows that, on the overall scale, the SUMI evaluation indicates that the usability of the e-learning portal is within the lower and upper confidence intervals. In terms of usability, sub-scales show that the results are consistent.

H1: The e-learning portal is helpful to the students of the college

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
H1	38.625	99	.000	3.600	3.42	3.78
H2	39.896	99	.000	3.820	3.63	4.01
H3	42.590	99	.000	3.750	3.58	3.92
H4	50.413	99	.000	3.860	3.71	4.01
H5	32.166	99	.000	3.180	2.98	3.38

H6	47.136	99	.000	3.700	3.54	3.86
H7	33.202	99	.000	3.190	3.00	3.38
H8	34.886	99	.000	2.920	2.75	3.09
H9	38.639	99	.000	3.370	3.20	3.54
H10	50.003	99	.000	3.650	3.51	3.79

Table 2: Results of Helpfulness

Table 2 shows that all ten items in the aspects of helpfulness are within the range of lower and upper confidence intervals. Thus, hypothesis 1 is accepted and the e-learning portal is found to be helpful to the students.

Report

Stream		H1	H2	H3	H4	H5	H6	H7	H8	H9	H10
Account	Mean	3.69	3.76	3.82	3.82	3.27	3.91	3.33	2.80	3.38	3.69
	N	45	45	45	45	45	45	45	45	45	45
	Std. Deviation	.848	.957	.806	.716	.986	.514	.953	.842	.834	.701
Biological Science	Mean	3.53	3.87	3.69	3.89	3.11	3.53	3.07	3.02	3.36	3.62
	N	55	55	55	55	55	55	55	55	55	55
	Std. Deviation	.997	.963	.940	.809	.994	.920	.959	.828	.910	.757
Total	Mean	3.60	3.82	3.75	3.86	3.18	3.70	3.19	2.92	3.37	3.65
	N	100	100	100	100	100	100	100	100	100	100
	Std. Deviation	.932	.957	.880	.766	.989	.785	.961	.837	.872	.730

Table 3: Helpfulness aspect based on stream

Table 3 shows that both streams find the portal to be helpful as the mean score are above average. However, both streams agreed that error prevention messages are not adequate (H8).

H2: The students feel in control over the e-learning portal

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
C1	26.300	99	.000	2.840	2.63	3.05
C2	41.151	99	.000	3.570	3.40	3.74
C3	34.741	99	.000	3.270	3.08	3.46
C4	39.571	99	.000	3.630	3.45	3.81
C5	30.143	99	.000	3.080	2.88	3.28
C6	39.795	99	.000	3.460	3.29	3.63
C7	44.588	99	.000	3.500	3.34	3.66
C8	31.845	99	.000	3.210	3.01	3.41
C9	30.333	99	.000	2.970	2.78	3.16

Table 4: Results of Control

Table 4 shows that all nine items in the aspects of control are within the range of lower and upper confidence intervals. Thus, hypothesis 2 is accepted and the students do feel in control over the e-learning portal.

Stream		C1	C2	C3	C4	C5	C6	C7	C8	C9
Account	Mean	2.91	3.60	3.20	3.69	3.22	3.42	3.58	3.07	2.93
	N	45	45	45	45	45	45	45	45	45
	Std. Deviation	1.041	.809	.968	.848	1.064	.917	.583	.986	1.074
Biological Science	Mean	2.78	3.55	3.33	3.58	2.96	3.49	3.44	3.33	3.00
	N	55	55	55	55	55	55	55	55	55

	Std. Deviation	1.117	.919	.924	.975	.981	.836	.918	1.019	.903
Total	Mean	2.84	3.57	3.27	3.63	3.08	3.46	3.50	3.21	2.97
	N	100	100	100	100	100	100	100	100	100
	Std. Deviation	1.080	.868	.941	.917	1.022	.869	.785	1.008	.979

Table 5: Control aspect based on stream

Table 5 shows that both streams find themselves to be in control of the portal as the mean score are above average. However, two items (C1 and C9) with the lowest mean from both streams provide information that they sometimes do not know what to do next with the portal (C1) and the portal occasionally behaves in a way which cannot be understood (C9).

H3: The e-learning portal is easy to learn for the first time users

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
L1	31.617	99	.000	3.110	2.91	3.31
L2	29.524	99	.000	3.120	2.91	3.33
L3	26.806	99	.000	2.650	2.45	2.85
L4	26.563	99	.000	2.800	2.59	3.01
L5	39.588	99	.000	3.570	3.39	3.75
L6	26.746	99	.000	3.100	2.87	3.33
L7	31.533	99	.000	3.210	3.01	3.41
L8	31.205	99	.000	3.310	3.10	3.52
L9	27.064	99	.000	2.770	2.57	2.97
L10	30.064	99	.000	3.130	2.92	3.34

Table 6: Results of Learnability

Table 6 shows that all ten items in the aspects of learnability are within the range of lower and upper confidence intervals. Thus, hypothesis 3 is accepted and the e-learning portal is easy to learn for the first time users.

Stream		L1	L2	L3	L4	L5	L6	L7	L8	L9	L10
Account	Mean	3.09	3.36	2.76	3.02	3.53	3.33	3.27	3.44	2.93	3.31
	N	45	45	45	45	45	45	45	45	45	45
	Std. Deviation	1.019	1.026	1.069	1.033	.869	1.128	1.009	1.056	1.095	1.019
Biological Science	Mean	3.13	2.93	2.56	2.62	3.60	2.91	3.16	3.20	2.64	2.98
	N	55	55	55	55	55	55	55	55	55	55
	Std. Deviation	.963	1.052	.918	1.045	.935	1.159	1.032	1.061	.950	1.045
Total	Mean	3.11	3.12	2.65	2.80	3.57	3.10	3.21	3.31	2.77	3.13
	N	100	100	100	100	100	100	100	100	100	100
	Std. Deviation	.984	1.057	.989	1.054	.902	1.159	1.018	1.061	1.024	1.041

Table 7: Learnability aspect based on stream

Table 7 shows that both streams find the portal easy to learn as the mean score are above average. However, three items (L3, L4 and L9) with the lowest mean from both streams provide such information:

L3: They sometimes wonder if they are using the right command.

L4: There is too much to ask before they can use the portal.

L9: They have to look for assistance most times when using the portal.

H4: The students perceived the e-learning portal as easy to use

One-Sample Test						
	Test Value = 0					
					95% Confidence Interval of the Difference	
	T	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
A1	46.947	99	.000	3.720	3.56	3.88
A2	44.359	99	.000	3.750	3.58	3.92
A3	44.017	99	.000	3.760	3.59	3.93
A4	42.378	99	.000	3.640	3.47	3.81
A5	32.503	99	.000	3.220	3.02	3.42
A6	42.294	99	.000	3.820	3.64	4.00
A7	43.896	99	.000	3.550	3.39	3.71
A8	26.146	99	.000	3.040	2.81	3.27
A9	31.350	99	.000	3.430	3.21	3.65
A10	31.645	99	.000	3.270	3.06	3.48
A11	33.967	99	.000	3.420	3.22	3.62

Table 8: Results of Affect

Table 8 shows that all eleven items in the aspects of affect are within the range of lower and upper confidence intervals. Thus, hypothesis 4 is accepted and the students perceived the e-learning portal as easy to use.

Gender		A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11
Male	Mean	3.78	3.78	3.91	3.76	3.15	3.78	3.65	2.96	3.43	3.35	3.43
	N	46	46	46	46	46	46	46	46	46	46	46
	Std. Deviation	.728	.841	.784	.874	1.053	.964	.706	1.134	1.025	1.059	1.088

Female	Mean	3.67	3.72	3.63	3.54	3.28	3.85	3.46	3.11	3.43	3.20	3.41
	N	54	54	54	54	54	54	54	54	54	54	54
	Std. Deviation	.847	.856	.896	.840	.940	.856	.884	1.192	1.159	1.016	.942
Total	Mean	3.72	3.75	3.76	3.64	3.22	3.82	3.55	3.04	3.43	3.27	3.42
	N	100	100	100	100	100	100	100	100	100	100	100
	Std. Deviation	.792	.845	.854	.859	.991	.903	.809	1.163	1.094	1.033	1.007

Table 9: Affect aspect based on stream

Table 9 shows that both streams find the portal easy to use as the mean score are above average.

H5: The students perceived the e-learning portal as useful

	Test Value = 0					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
E1	32.009	99	.000	3.290	3.09	3.49
E2	31.017	99	.000	3.330	3.12	3.54
E3	39.827	99	.000	3.760	3.57	3.95
E4	40.343	99	.000	3.820	3.63	4.01
E5	40.136	99	.000	3.710	3.53	3.89
E6	29.492	99	.000	3.270	3.05	3.49
E7	40.552	99	.000	3.810	3.62	4.00
E8	41.497	99	.000	3.770	3.59	3.95
E9	27.975	99	.000	2.850	2.65	3.05
E10	33.199	99	.000	3.230	3.04	3.42

Table 10: Results of Efficiency

Table 10 shows that all ten items in the aspects of efficiency are within the range of lower and upper confidence intervals. Thus, hypothesis 5 is accepted and the students perceived the e-learning portal as useful

Stream		E1	E2	E3	E4	E5	E6	E7	E8	E9	E10
Account	Mean	3.33	3.51	4.00	4.00	3.82	3.53	4.02	3.96	3.02	3.29
	N	45	45	45	45	45	45	45	45	45	45
	Std. Deviation	1.148	1.100	.905	.853	.834	.968	.839	.824	.988	.869
Biological Science	Mean	3.25	3.18	3.56	3.67	3.62	3.05	3.64	3.62	2.71	3.18
	N	55	55	55	55	55	55	55	55	55	55
	Std. Deviation	.927	1.038	.938	1.001	.991	1.177	.988	.952	1.031	1.056
Total	Mean	3.29	3.33	3.76	3.82	3.71	3.27	3.81	3.77	2.85	3.23
	N	100	100	100	100	100	100	100	100	100	100
	Std. Deviation	1.028	1.074	.944	.947	.924	1.109	.940	.908	1.019	.973

Table 11: Efficiency aspect based on stream

Table 11 shows that both streams find the portal efficient as the mean score are above average. Therefore, the portal is perceived as useful. However, there is one item (E9) with a mean score below 3.00. Both streams agreed that there are too many steps required to get something to work.

CONCLUSION

The usability methodology presented in this paper for evaluating the five aspects of user satisfaction of the matriculation college e-learning portal is plausible. The results and findings of the study gave important information for the producers and designers of the e-learning portal to know how users feel

when interacting with the system and how effective their workarounds are. This is certainly relevant for the institution that is interested in supporting lifelong learning systems over the Internet and improving the general educational level in the country.

The findings in this study are consistent with the hypotheses made . All hypotheses made based on the five aspects of user satisfaction are consistent and therefore accepted to be true. The e-learning portal is found to be helpful. The students feel in control over the e-learning portal. The e-learning portal is easy to learn for the first time users. The students perceived the e-learning portal as easy to use. The students perceived the e-learning portal as useful. On an overall scale, aspects of affect and helpfulness have the highest mean scores compared to other aspects. This shows that the users find the portal easy to use and helpful. Technology Acceptance Model (TAM) suggests that learners will formulate a positive attitude towards the technology when they perceive the technology to be useful and easy to use. In order to improve the score, the designers need to make modifications in the user interface to improve efficiency and learnability with better functions and informative functions. As for control scores, they show that users are not afraid to use portal although they are first time users.

However, there are a few items with lower mean scores that need to be taken into considerations by the producers and designers of the portal. Error prevention messages are found to be inadequate. Too many steps are required to get something to work. Users face problems when they do not have enough information on the next step to be taken. The e-learning portal occasionally behaves in a way which cannot be understood. The users often wonder if they are using the correct command and there is too much to ask before they learn to use the e-learning portal. The users also need to look for assistance most of the times when using the portal.

The results and findings of the study gave important information for the producers and designers of the portal to know how users feel when interacting with the system and how effective their workarounds are. Users are encouraged to have a say, in other words, they are physically or discursively present in the decision making (Johnson, 1998).

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