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# USABILITY OF E-LEARNING PORTAL AND HOW IT AFFECTS STUDENTS' ATTITUDE AND SATISFACTION, AN EXPLORATORY STUDY

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## Abstract

*This paper reports a result of an exploratory study on student's attitude towards e-learning. The focus has been on the usability of Papyrus, an e-learning system developed in one department of a big university, and how certain usability factors affect students' attitude toward e-learning. An online survey has been conducted in which the respondents were the department students who attended courses that have been put up in Papyrus. Eighty six complete responses have been collected and analyzed. Data was analyzed using Visual PLS. The result shows that ease of navigation has strong effect on perceived ease of use, which in turn affects user attitude and satisfaction. The same also applicable for effectiveness in which it affects perceived usefulness, which in turn affects user attitude and satisfaction. Discussion about the result is given.*

Keywords: Papyrus, usability, attitude, satisfaction, Visual PLS

## 1. INTRODUCTION

For the past few years, e-learning has become more popular, especially among college students. Many colleges and higher education institutions have been trying to implement such a system for different purposes. Not to be left alone, Department of Electrical Engineering, Gadjah Mada University, Indonesia, has also joined the bandwagon in implementing e-learning system. This system is called Papyrus.

Papyrus was developed from Moodle. Moodle is a learning management system (LMS). LMSs combine the ubiquity of the Internet and increased availability of network bandwidth, and other learning technologies to enable hybrid or online learning (Ko and Rosse, 2004) to enhance learning in a variety of environment. Appropriate use of these packages can help to augment more traditional, teacher-centered courses (McArthur, et al., 2003). Students may communicate with their instructors and each other in learning communities, access learning material, take quizzes, and submit assignments using the power of the Internet. Appropriate use of these packages can help to augment more traditional, teacher-centered The focus of the Moodle project is always on giving educators the best tools to manage and promote learning (<http://moodle.org/about/>). The Moodle customization process to become Papyrus was conducted to suit the department needs and requirements.

In one hand, it is believed that Moodle has been designed in such a way to gain high level of usability. On the other hand, Moodle customization to create Papyrus was not free from usability problem that could result in lower level of usability compared to its original version. In order to understand whether such a customization was successful, an exploratory study has been conducted. The purpose of the study is to see whether some usability factors of Papyrus affect its users' attitude and satisfaction.

## 2. USABILITY OF E-LEARNING PORTAL

The NCSA e-Learning group defines e-learning as "is the acquisition and use of knowledge distributed and facilitated primarily by electronic means" (Wentling et al., 2000, p.5). Furthermore, Wentling et al. stated that e-learning depends on networks and computer, i.e. web technology The goal of e-learning is to offer the users the possibility to become skilful and acquire knowledge on a new domain (Costabile et al., 2005). E-learning is used interchangeably in a wide variety of contexts. In most universities, e-learning is used to define a specific mode to attend courses or programmes of study where the students rarely, if ever, attend face-to-face for on-campus access to educational facilities, because they study online. However, some varieties exist when we are talking about e-learning implementation.

Web usability has been the subject of many studies and discussions, e.g. Frokjaer et al. (2000), Konrad et al. (2003), and Palmer (2003). In particular, Frokjaer et al., based on ISO (1998) investigated the correlation between effectiveness, efficiency and user satisfaction. On this study, the authors did not see the strong correlation among the three. Konrad et al. investigated the influence of online shop usability toward buyers' intention and decision. The findings showed that online shop usability strongly influence the buyers' decision to shop online. Palmer, in particular, has developed web usability, design and performance metrics. In particular, Palmer studied download delay, navigability, interactivity, responsiveness, and content quality as independent variables toward perceived success.

Nielsen (2003, <http://www.useit.com/alertbox/20030825.html>) defines usability as a quality attribute that assesses how easy user interfaces are to use. Nielsen describes five quality attributes of usability, i.e. learnability, efficiency, memorability, error, and satisfaction. Nielsen (2000) also defined organization and navigation were two important usability factors that later were confirmed by Palmer (2003)

Most Websites make extensive use of navigation, a metaphor based on wayfinding in a physical space. Machlis (1998) posited that navigation is an important design element and making the information easier to find, and could be an effective solution for many problems in understanding and

manipulating a complex information space (Amant et al, 1998). This lead to the extension of the basic usability principles into website (Nielsen, 2000). Thus, navigation is very important in any Website, because if visitors cannot find information of interest, they cannot use it. If they cannot use it, they will not comeback. When on a website, for example, how many times have visitors asked themselves, “Where am I?” or “Where was I?” or “Where am I going?” If visitors cannot answer these questions, they are most likely having problems in navigating a website they are visiting (Chalmers, 2003).

In an e-learning portal, the same situation may happen. That is, students do not know where to go, where is their current location in respect to the whole e-learning portal structure, and where to go next. When students found that navigating an e-learning portal is hard to do, they would get frustrated. This lead to the first research question:

**RQ1:** How navigation affects user attitude and user satisfaction?

Nielsen (2003, <http://www.useit.com/alertbox/20030825.html>) defined memorability as how easy users re-establish their proficiency when they return to a website after some period of not using it. Memorability is important because some users may not be using e-learning portal on a regular basis. There are a variety of reasons for which a user may not be using an e-learning portal an extended period of time. When users come back to it, the designer of the e-learning portal have to make sure that they remember how to use it. In some ways, memorability can be tied to learnability in that it works in the dark recesses of our brains, with cues reminding a user how to use a particular function (<http://www.tnl.net/blog/2003/06/19/usability-101-memorability/>). Most users will probably not be interested in spending a lot of time learning the system unless they get more out of it. As a result, designer needs to get the basic stuff to be intuitive.

The memorable things are usually due to one or two factors: an unexpected reaction from the portal, and the existence of association between task need to be performed with screen cues. When reaction to users left the users with a good feeling, they will remember it. The opposite is also true. In short, the action caused a reaction that users remember. This lead to the second research question:

**RQ2:** How memorability affects user attitude and user satisfaction?

As stated earlier, effectiveness is one measure of usability (ISO, 1998). It deals with the accuracy and completeness with which users achieve certain goals. According to this standard, indicators of effectiveness include quality of solution and error rates. Frokjaer et al. (2000) investigated the relationship between effectiveness, efficiency, and satisfaction. This study failed to show the strong relationship among the three. This lead to the third research question:

**RQ3:** How effectiveness affects user attitude and user satisfaction?

Having stating the research questions, the following section discusses hypotheses development.

### **3. HYPOTHESES DEVELOPMENT**

Perceived ease of use (PEU) and perceived usefulness (PU) are two main constructs in the Technology Acceptance Model (TAM) that was first proposed by Davis (1989). Davis defined PEU as the degree to which a person believes that using a particular system would be free from effort.

One important Web success factor is navigation. Machlis (1998), Amant (1998) and Nielsen (2000) showed how navigation plays an important role for the success of a Website. With good navigation scheme, users will easily find what they are looking for. With intuitive navigation cues, users will be guided in finding the relevant information. This may lead to the feeling that there is no difficulty in accessing certain Website. This leads to the following hypothesis:

**H1:** Ease of navigation affects perceived ease of use positively.

Looking into web usability, there are several factors that determine the website usability. According to Nielsen (2003, <http://www.useit.com/alertbox/20030825.html>), usability is a qualitative attribute that assesses how easy user interfaces are to use. It comprises several factors, including memorability. Memorability refers to the quality of a website that allows its users to minimize his effort to do thing

in it when s/he revisit it. This is to imply that the less effort the users have to spend in accessing certain website, its users would think that the website is ease to use. Since Papyrus is also developed as a Website, the above is also implied to be true. Thus, following hypothesis is proposed:

**H2:** Memorability affects perceived ease of use positively.

Effectiveness can be defined as doing the thing right. In relation with Papyrus, effectiveness can be viewed as how students utilizing Papyrus to help them in their learning process, e.g. getting courses materials or tracking the progress of courses they are attending. If they use Papyrus in the correct way, i.e. regularly, they will find that Papyrus is useful in helping their learning process. Thus, the following hypothesis is stated:

**H3:** E-learning portal effectiveness affects perceived usefulness positively

As stated earlier, PEU, PU, and user attitude toward certain technology have been the important constructs in the Technology Acceptance Model (TAM) that was first investigated by Davis (1989). These three constructs along with user intention and actual usage, have been the subject of many studies, including those related to webcast lecture (Santosa, 2004) and online forum usage (Santosa et al., 2005).

ISO (2008) defines satisfaction as the user’s comfort with and positive attitude towards the use of the system. Satisfied users may spend a longer time at a Website, revisit it, and may recommend it to others. Hence, user satisfaction is a highly desirable Web design goal (Zhang and von Dran, 2000). Al-Gahtani & King (1999) have shown that PEU and PU are valuable tools for predicting attitudes, satisfaction, and usage. For the purpose of this paper, satisfaction is defined as the user’s comfort with and positive attitude toward Papyrus usage. Thus, the following hypotheses are proposed:

**H4:** Perceived ease of use affects perceived usefulness positively

**H5:** Perceived usefulness affects user attitude positively

**H6:** Perceived usefulness affects user satisfaction positively

The summary of the above hypotheses is presented as a research model depicted in Figure 1.

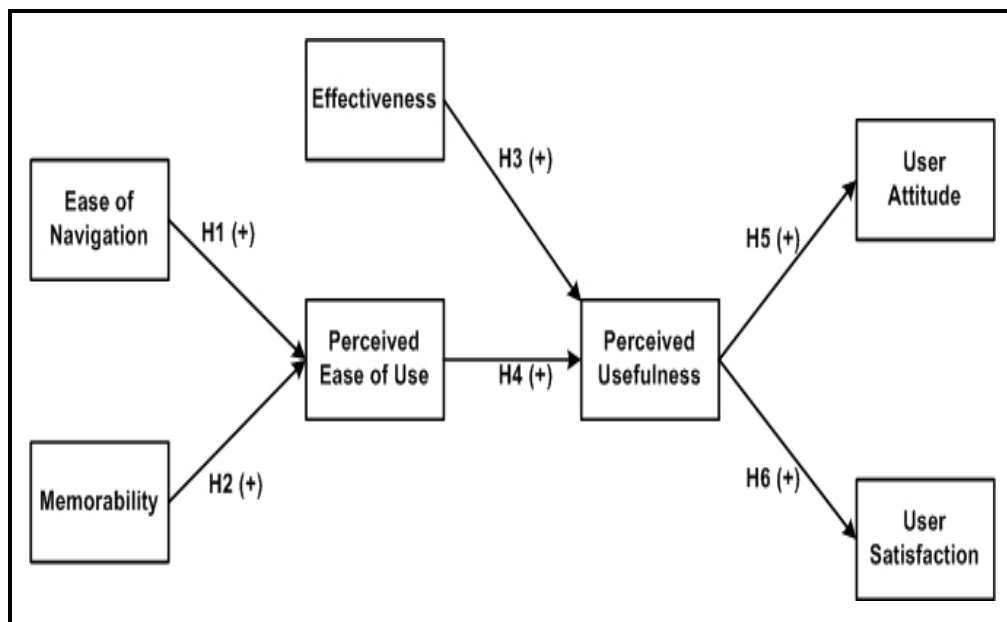


Figure 1. Research model.

## 4. METHODOLOGY

### 4.1 Subjects

An online survey was conducted. Respondents were DEE students who attended Papyrus-based courses. Participation was on the voluntarily basis after students being notified via email and call for participation was announced in class. The online survey application was self developed in which questions are presented one by one, except for the demography questions.

### 4.2 Measures

Latent variable user attitude was measure using 7-point semantic deferential scale, where 1 was on the extreme negative, and 7 was on the extreme positive. This latent variable was measured using 3 items or indicators. The rest were measured using 5-point Likert scale from strongly disagree to strongly agree. They were all measured using 4 items or indicators. The questionnaires are not presented here, but interested parties should contact the author directly for a copy of the questionnaires.

### 4.3 Survey Result

A total of 86 complete responses were collected. These responses came from 77 male students and 9 female students. Table 1 shows the distribution of the respondents based on their classes. This figure shows the exact portrait of the number of female students in the department, which usually is about 10% of the total number for each cohort.

Year	# Male students	# Female students	Total
1 <sup>st</sup>	41	3	44
2 <sup>nd</sup>	8	2	10
3 <sup>rd</sup>	9	3	12
4 <sup>th</sup>	19	1	20

Table 1. Respondent distribution.

The descriptive statistics of all the latent variables is presented in Table 2.

No.	Construct	Mean	Standard Deviation
1.	Memorability	3.06	0.72
2.	Ease of Navigation	3.36	0.65
3.	Effectiveness	3.78	0.66
4.	Perceived Ease of Use	3.31	0.58
5.	Perceived Usefulness	3.24	0.73
6.	User Satisfaction	3.51	0.62
7.	User Attitude	4.98	1.23

Table 2. Descriptive Statistics

## 5. DATA ANALYSIS

Hypothesis testings were conducted using partial least square (PLS) analysis. PLS data analysis PLS consists of two submodels (Barclay et al., 1995): (1) a measurement model describing the relationship between latent constructs and their manifest indicators, and (2) a structural model describing the relationship between latent constructs. In particular, an open source PLS application, namely Visual PLS version 1.04b1. The main difference between Visual PLS and PLS Graph (Chin, 1998) is that while in Visual PLS cross loading and AVE are calculated automatically, in PLS Graph these two important statistics need to be calculated manually.

## 5.1 Measurement Model

Assessment of measurement model concerns with construct validity. Construct validity consists of convergent validity and discriminant validity. They are explained below.

Convergent validity consists of item reliability and internal consistency. Item reliability is assessed by examining the manifest (indicator) loading to its respective latent construct. Fornell et al. (1982) suggested that the item reliability is judged to be adequate if the item's loading to its latent construct is equal or greater than 0.70 ( $\lambda \geq 0.70$ ). Hanlon (2001) also suggested that loading could be less than 0.70 but higher than 0.5 for certain situation, e.g. items are newly developed. Since some items loading were less than 0.5, for subsequent analysis, these items were omitted. Items that were omitted were EoN4, Mem2, Eff3, Eff4, and PEU4.

Internal consistency ( $\rho_{\xi}$ ), or construct reliability, is the second reliability measure to evaluate the measurement model. It can be seen from Table 3 that internal consistency for every latent variable is very high. Thus, every latent variable is deemed reliable.

Discriminant validity is also conducted for both the indicator and construct level. For indicator level, Barclay et al. (1995) suggest that no manifest variable should load higher on other constructs than on the construct it intends to measure. From PLS result (not shown in this paper) it is observed that all manifest variables load higher on their respective intended latent variable compared to other latent variables. Thus, discriminant validity at the indicator level is adequate.

At the construct level, discriminant validity can be assessed by comparing a square root of Average Variance Extracted (AVE) with the correlation of that construct with the rest of the constructs. AVE is the amount of variance captured by the construct in relation to the amount of variance attributable to measurement error. As stated earlier, Visual PLS calculates AVE automatically. Table 4 shows that square root of AVE for every latent variable exceeds 0.5, and greater than the correlation between that latent variable with the other latent variables. Therefore every latent variable is deemed to be adequate on its convergent validity. As such, the model exhibits acceptable discriminant validity (Barclay et al., 1995).

Latent Variable	ManifestVariable	Item Reliability ( $\lambda$ )	Internal Consistency( $\rho_{\xi}$ )
Ease of Navigation( $\xi_1$ )	EoN1	0.787	0.815
	EoN2	0.711	
	EoN3	0.761	
Memorability ( $\xi_2$ )	Mem1	0.853	0.811
	Mem3	0.764	
	Mem4	0.678	
Effectiveness ( $\xi_3$ )	Eff1	0.945	0.825
	Eff2	0.720	
Perceived Ease of Use ( $\eta_1$ )	PEU1	0.798	0.794
	PEU2	0.680	
	PEU3	0.768	
Perceived Usefulness ( $\eta_2$ )	PU1	0.740	0.838
	PU2	0.804	
	PU3	0.703	
	PU4	0.753	
User Satisfaction ( $\eta_3$ )	Sat1	0.795	0.858
	Sat2	0.883	
	Sat3	0.700	
	Sat4	0.716	
User Attitude ( $\eta_4$ )	Att1	0.921	0.906
	Att2	0.922	
	Att3	0.771	

Table 3. Convergent Validity

	EoN	Mem	Eff	PEU	PU	Sat	Att
EoN	<b>0.725</b>						
Mem	0.193	<b>0.768</b>					
Eff	0.248	0.107	<b>0.840</b>				
PEU	0.477	0.287	0.323	<b>0.751</b>			
PU	0.359	0.090	0.442	0.410	<b>0.751</b>		
Sat	0.352	0.196	0.42	0.401	0.628	<b>0.777</b>	
Att	0.178	0.112	0.406	0.353	0.363	0.148	<b>0.874</b>

*Tabel 4. Square root of AVE and Correlation Scores*

## 5.2 Assessment of The Structural Model

The structural model comprises the hypothesized relationship between latent constructs in the research model. By using Bootstrap or Jackknife sampling, we can obtain path coefficient and its t-value. With these values, we can assess statistical conclusion validity by testing the null hypothesis for each path coefficient. Table 5 shows the coefficient of each hypothesized path and its corresponding t-value obtained from 100-sample Bootstrap procedure in PLS. It can be seen from Table 6 that all hypothesis are supported by the data

The explanatory power of the estimated model, or nomological validity, can be assessed by observing the  $R^2$  of endogenous constructs. Table 6 shows the  $R^2$  values for all endogenous constructs. Falk and Miller (1992) recommend that  $R^2$  must be at least 0.10 in order for the latent construct to be judged adequate. Table 6 shows that all  $R^2$  satisfy this recommendation. As such, nomological validity is satisfactory. From Table 6, we can see that the model explains 14% and 43% of total variability of user attitude and user satisfaction, respectively. In summary, Figure 2 depicts the result of PLS estimation of the research model.

Hypothesis	Path		Path Coefficient (b)	t-value	Significant (2-tailed)
	From	To			
H1	EoN	PEU	0.502	6.826	$p < 0.001$
H2	Mem	PEU	0.194	2.005	$p < 0.05$
H3	Eff	PU	0.401	4.995	$p < 0.001$
H4	PEU	PU	0.285	2.553	$p < 0.05$
H5	PU	Att	0.373	3.752	$p < 0.001$
H6	PU	Sat	0.658	8.305	$p < 0.001$

*Tabel 5. Path Coefficients*

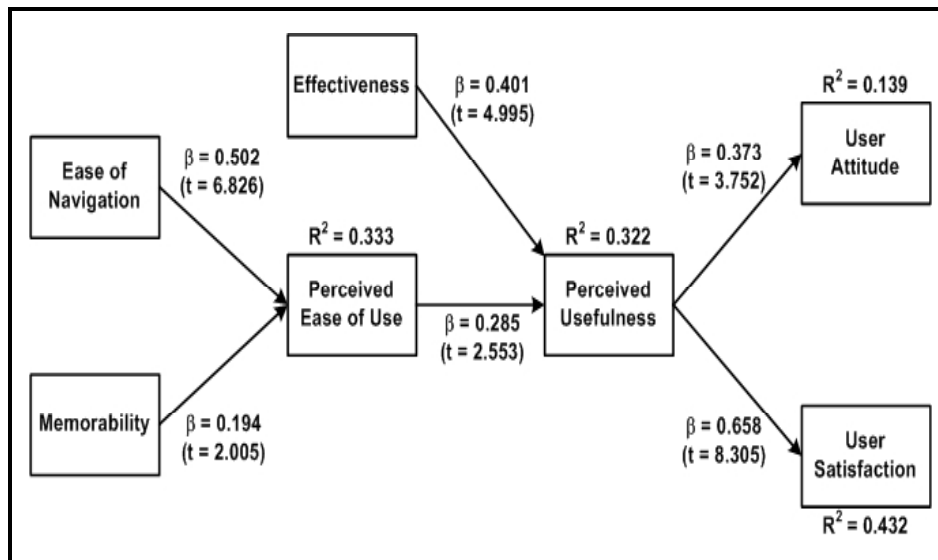
Construct	R2
Perceived Ease of Use	0.333
Perceived Usefulness	0.322
User Satisfaction	0.432
User Attitude	0.139

*Table 6.  $R^2$  for Endogenous Constructs*

## 6. DISCUSSION

This paper presents a result of an online survey that investigate the effect of ease of navigation, memorability, and effectiveness of Papyrus, an e-learning system, on students' attitude and satisfaction. The model includes TAM constructs as mediating variables.





**Figure 2.** PLS estimation of the research model.

The result shows that that all hypotheses were supported by the data. In particular, 2 hypotheses were supported with  $\alpha=0.05$ , i.e. positive effect of memorability towards perceived ease of use ( $\beta = 0.194$ ,  $t=2.005$ ), and positive effect of perceived ease of use towards perceived usefulness ( $\beta=0.285$ ,  $t=2.553$ ). The rest were supported with significant level of 0.001. Hypothesis H4 and H5 show that the model supports TAM (Davis, 1989), in which PEU positively affects PU, and PU positively affects user attitude.

The data analysis shows that several items have to be omitted due to the low loading to the respective latent variables. In particular, item 4 in “ease of navigation”, i.e. “I always found the information I need”, is dropped. This implies that not all information needed could be found. This is due to the lack of information updating and because not all courses are being Papyrus-based. Item 2 in “memorability”, i.e. “Online helps is always provided”, is dropped; again, due to the low loading of this item to latent construct “memorability.” It seems that this feature is considered as a tool when students having problem finding things, and it is not a feature that can be use to help them memorize what they have been doing previously.

Item 3 and 4 in “effectiveness” are also dropped. Item 3 says that “Papyrus helps me remembering the assignment due dates.” This implies that actually students did not care much about the assignment due date because of some reasons. This is very interesting, because not all the lecturers asked their students to submit their assignments electronically. Some of them actually allowed students to submit assignment using hard copies. Item 4 says that “Papyrus helps me getting supporting materials.” This implies that students felt that they had enough materials to study, and they thought they did not need any supporting materials. The other reason could be due to the lack of supporting materials posted.

Item 4 of “perceived ease of use” is also dropped. The item says that “I felt that Papyrus could do what I want.” This could be the result from the previous dropped items in which not all features were there and also because there was lack of the completeness of the materials posted on Papyrus. The other reason was because this item was not measuring perceived ease of use. Rather, it perhaps measuring the Papyrus capability.

In summary, as to answer the research questions, firstly, ease of navigation and memorability of Papyrus affect students’ attitude toward using Papyrus in their study, as well as affects students’ satisfaction with Papyrus as an e-learning system in the mentioned department. Secondly, effectiveness of Papyrus also affects students’ attitude and their satisfaction.

## 7. LIMITATION

This focus of the study was on the e-learning portal usability. It studied the relation between three quality components of usability to affective variables, i.e. attitude and satisfaction. It was not design to investigate whether the usability of the portal influences students' performance. This it is recommended that further study should include cognitive variables to see the complete picture of how e-learning portal should be designed to increase both affective and cognitive outcomes.

## References

- Al-Gahtani, S.S. & King, M. (1999) "Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology," *Behaviour & Information Technology* 18 (1999) pp. 277-297.
- Amant, R.S., Long, T. & Dulberg, M.S. (1998) "Experimental evaluation of intelligent assistance for navigation," *Knowledge-Based Systems*, Vol. 11, pp. 61-70.
- Barclay, D., Higgins, C., and Thompson, R. (1995) "The Partial Least Squares (PLS) Approach to Causal Modeling: Personal Computer Adoption and Use as an Illustration," *Technology Studies* (2:2), pp. 285-309.
- Chalmers, P.A. (2003) "The role of cognitive theory in human-computer interface," *Computers in Human Behavior*, Vol. 19, pp. 593-607.
- Chin, W.W. (1998), "The Partial Least Square Approach to Structural Equation Modeling," in G.A. Marcoulides (Ed.) *Modern Methods for Business Research*, Mahwah, NJ: Lawrence Erlbaum, pp. 295-336.
- Costabile, M.F.; De Marsico, M.; Lanzilotti, R.; Plantamura, V.L.; Roselli, T. (2005) "On the Usability Evaluation of E-Learning Applications," *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, 03-06 Jan. 2005, p. 6b.
- Falk, R.F. and Miller, N.B. *A Primer Soft Modelling*, Akron, Ohio: University of Akron Press, 1992.
- Frokjaer, E., Hertzum, M. & Hornbaek, K. (2000) "Measuring Usability: Are effectiveness, Efficiency, and Satisfaction Really Correlated?" *ACM, CHI Letters*, 2(1), pp. 345-352.
- Fornell, C., Tellis, G.J. and Zinkhan, G.M. (1982). "Validity Assessment: A Structural Equations Approach Using Partial Least Squares," *An assessment of Marketing Thought and Practice, Proceedings of American Marketing Association Educator's Conference*, Series No. 48, pp. 405-409.
- Hanlon, D. (2001) "Vision and Support in New Venture Start-ups," *Frontiers for Entrepreneurship Research*, <http://www.babson.edu/entrep/fer/Babson2001/XI/XIB/XIB.htm>, accessed on 5 March 2004.
- ISO 9241-11 (1998) "Ergonomic requirements for office work with visual display terminals (VDTs)", *Part 11: Guidance on usability*.
- Ko, S., & Rossen, S. (2004). *Teaching online: A practical guide* (2nd ed.). Boston: Houghton Mifflin.
- Konradt, U., Wandke, H., Balazs, Christophersen, T. (2003) "Usability in online shops: scale construction, validation and the influence on the buyers' intention and decision," *Behaviour & Information Technology*, Vol. 22, No. 3, pp. 165-174.

- Machlis, S. (1998) "Site redesigns keep it simple," *Computerworld* 32(43), 43–44.
- McArthur, D., Parker, A., & Giersch, S. (2003). Why plan for e-learning? Strategic issues for institutions and faculty in higher education. *Planning for Higher Education*, 31(4), 20-28.
- Nielsen, J. (2000) *Designing Web Usability*. New Riders Publishing, Indianapolis, IN.
- Palmer, J.W. (2002) "Web Site usability, Design, and Performance Metrics," *Information Systems Research*, Vol. 13, No. 2, pp. 151-167
- Santosa, P.I. (2004) "Mediating Effect of Student Involvement on Student Attitudes toward Webcast," *Proceedings of the International Conference on Computers in Educations*, 2004, pp. 1769-1779
- Santosa, P.I., Yeo. G.K., and Lin, J. (2005) "Understanding Students' Online Forum Usage," *Proceedings of the International Conference on Computers in Education*, 2005, pp. 369-376
- Wentling, T.L., Waight, C., Gallaher, J., La Fluer, J., Wang, C., Kanfer, and Kanfer, A. (2000) *E-Learning – A Review of Literature*, NCSA, Knowledge and Learning Systems Group
- Zhang, P. and Gisela, M. von Dran (2000) "Satisfiers and dissatisfiers: a two-factor model for website design and evaluation," *Journal of the American Society for Information Science*, Vol. 51, pp. 1253-1268.

## APPENDIX

This appendix presents the questionnaires used in the study. The original questionnaires were written in Indonesian.

### a. Effectiveness:

- Papirus helped me getting newest course materials
- Papirus helped me tracking the course in progress
- Papirus helped me memorizing the assignments' due dates
- Papirus helped me getting supporting materials

### b. Memorability

- The chosen activity was given a special sign
- Online helps is always provided
- Correct abbreviation and its acronym was provided
- The use of color coding helped me to memorize things

### c. Ease of Navigation

- I knew my relative position against the whole Papirus structure
- I could go back to the already visited pages without any difficulties
- I knew exactly parts of the Papirus I wanted to visit
- I always found the information I need

### d. Perceived ease of use

- I felt that Papirus is easy to operate
- I found it easy to interact with Papirus
- I felt that it is easy to master Papirus
- I felt that Papirus could do what I want

e. Perceived usefulness

- Papyrus increased my studying spirit
- Papyrus motivated me to study harder
- Papyrus increased effectiveness of my study
- Papyrus was very useful in my learning process

f. Attitude

- Dislike – like
- Not interested – interested
- Not challenged – challenged

g. Satisfaction

- I got valuable experience after I used Papyrus
- I satisfied with Papyrus ability
- I was helped with the existence of Papyrus
- I got new knowledge when I was using Papyrus