

INFLUENCE OF COGNITIVE ASPECT AND AFFECTIVE ASPECTS ON THE USABILITY PERFORMANCE OF E-COMMERCE

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ABSTRACT

The development of the internet facility currently has been used for the activities of trading (commerce) through e-commerce sites. The e-commerce site that serves an electronic transaction of sale and purchase from producers to consumers must have good usability value and ease of use. The development of the site is now considered not only focusing on the ease of use (cognitive) but also how to provide the emotional side (affective). It is very critical to provide both emotional and rational satisfaction. To testing the influence of cognitive and affective factors on the usability of e-commerce sites, the Structural Equation Modeling has been used. This study adopted the model of Oztekin and Han, which consists of three variables, namely usability, cognitive aspect and affective aspect. The results show that the cognitive aspect has a significant influence on the usability performance of the e-commerce site. However, the affective aspect has no significant effect on the usability performance. Moreover, the cognitive, and affective factors are interconnected significantly. The implications of this study are to provide useful insights for product designers to consider the cognitive aspects and also to help them identifying what needs to be considered in terms of continuous improvement or planning as well as product development.

Keywords: cognitive aspect, affective aspect, usability performance, e-commerce sites

1. INTRODUCTION

In the last few years the use of the internet has had a rapid growth. Based on the data from the Association of Indonesian Internet Service Provider (2015) mentions that the population of Internet users in Indonesia in 2013 has reached 71.19 million people and at the end of 2014 the

population of Internet users in Indonesia rose to 88 million users. Everyone can access all the information on the internet via the website. The website is a complete system and contains resources on the World Wide Web (Mourant et al., 2006).

The growth of the Internet is rapidly increasing because Internet access is getting cheaper, which consequently of course, this is encouraging more companies to market their products through sites on the Internet that can be accessed by people anywhere and anytime. Widespread development of e-commerce sites certainly a challenge by the company to remain (exist) between competitors and to attract customers as much as possible.

E-commerce sites displayed by the company must have a system quality, information quality and good service quality due to significant impact on the success of e-commerce (DeLone and Mclean, 2003). The third addition to the quality of Tsai, et al. (2010) argues to add quality of the design of the site as it can attract the attention of customers. This is in accordance with the opinion of Bonnardel, et al. (2011) suggesting that the development of design systems on the current site is not only focused on the usable side (easy to use), but also it must consider the appealing to the user side (of interest to the user). According to Han, et al. (2001) to design and evaluate the usability of a product, it can take into account the performance (cognitive) and factor impression (affective).

Based on these factors, a preliminary study on the 40 users of e-commerce sites has been made. The results of a preliminary study obtained three aspects that have the highest percentage for each factor of cognitive and affective factors. In the cognitive factor e-commerce, site users want the ease of operation, the information is understandable and has a complete information regarding all of its products. On the affective factor of e-commerce, the site users want their impression of comfort during use, pleasant impression during use and presentation of colors visually pleasing that created usability research on e-commerce sites for cognitive and affective factors.

In this study to measure the usability of e-commerce sites using the model Prastawa, et al. (2014) consists of usability, cognitive and affective variables. Usability using assessment indicators in accordance with the provisions of ISO 9241-151 namely the effectiveness, efficiency, and satisfaction. Cognitive variable use of assessment indicators Oztekin, et al. (2010) and Lee et al. (2012) that is error prevention, interactivity feedback, and help, readability, content relevance, and consistency. Affective variable use of assessment indicators Han, et al. (2001) and Park et al. (2013), namely color, brightness, salience, harmoniousness, comfort, reliability, and attractiveness.

The benefits of using models Prastawa, et al. (2014) in this study is that it enables to determine the influence of cognitive factors on the usability of e-commerce sites, determine the influence of affective factors on the usability of e-commerce sites and determine the influence of the relationship between cognitive factors affective factor on e-commerce sites. The object to be measured by the model Prastawa, et al. (2014) is the site of Lazada. The site is B2C (business to consumer) which are well known in Indonesia. Based on Techiasia (2014), this site is the most famous with the percentage of 29.2%. The measurement results can be known whether the measurement model Prastawa, et al. (2004) was able to measure both the usability of e-commerce sites for factors cognitive and affective factors, in addition, the measurement results can be used as an evaluation for sites and sites to further enhance the quality of its website.

Research objectives identify the effect on the cognitive aspects of e-learning website usability, identify the influence of affective aspects of the usability of e-learning, and identify the relationship between cognitive and affective aspects of the e-commerce website and provide recommendations for improvement based on factors which significantly affect website usability.

2. DEFINITIONS, ATTRIBUTES AND ASPECTS USABILITY

According to the International Organization for Standardization / ISO (1998), usability can be defined as the degree to which a product can be used by specified users to achieve specified objectives effectively, efficiently and gain satisfaction in the context of its use. According to Dumas, et al. (1999) usability is also to measure the level of user experience when interacting with a product system. In general, usability refers to how users can learn and use the product to obtain its objectives and how satisfying they are to use. Definition according to ISO (1998) emphasizes reusability is not just limited to "ease of use" but explained that the purpose for which a product is used must be achieved with effectiveness, efficiency, and satisfaction.

Usability Professionals' Association states that a usability is an approach to product development that involves direct user feedback in the product development cycle, with the aim that the product meets the needs of users. Shackel (1984) does not explicitly specify how to measure the two sides but provide suggestions for measuring usability with operational criteria, which includes four dimensions: effectiveness, learnability, flexibility, and attitude. Nielsen (1993) defines usability consists of five types of attributes, learnability, efficiency, memorability, errors, and satisfaction.

Electronic Commerce (EC) is a concept that describes the process of buying, selling and exchange of products, services, and information via computer networks, namely the Internet (Turban, 2002). According to Suyanto (2003), e-commerce has benefits for consumers, namely: allow customers to shop for 24 hours, providing more choice to customers, delivery to be very fast, provide a place for customers to exchange ideas, and facilitate the existing competition resulting in a substantial discount.

SEM or Structural Equation Modelling basically consists of two parts: (i) the measuring section that connects the observed variables with latent variables through confirmatory factor models and (ii) section linking structure between the latent variables through regression equations simultaneously (Ghozali, 2011). The steps work SEM are: Conceptualization models, preparation of flowcharts, develop a structural equation, choosing the type of input matrix and estimated the proposed model, and assess the structural model identification

3. CONCEPTUAL MODEL

In the expansion of integration between cognitive and affective aspects, considerations that are less precise in measuring usability, and only consider cognitive or affective as a single unit (Schultz et al, 2007; Hariri & Norouzi, 2011; Seva et al., 2011; Shin, 2012). Due to the advent of the affective aspects of the usability measurement, it is associated with many things in its development. In the previous research, it is found that cultural dimensions have influences to the affective and cognitive factors.

In this models, the use three variables to be measured. The dependent variable of this study is the variable usability while independent variables are cognitive and affective factors. In this study, the dimensions and indicators that are used to adjust the specific characteristics of e-commerce that can be seen in Figure 1:

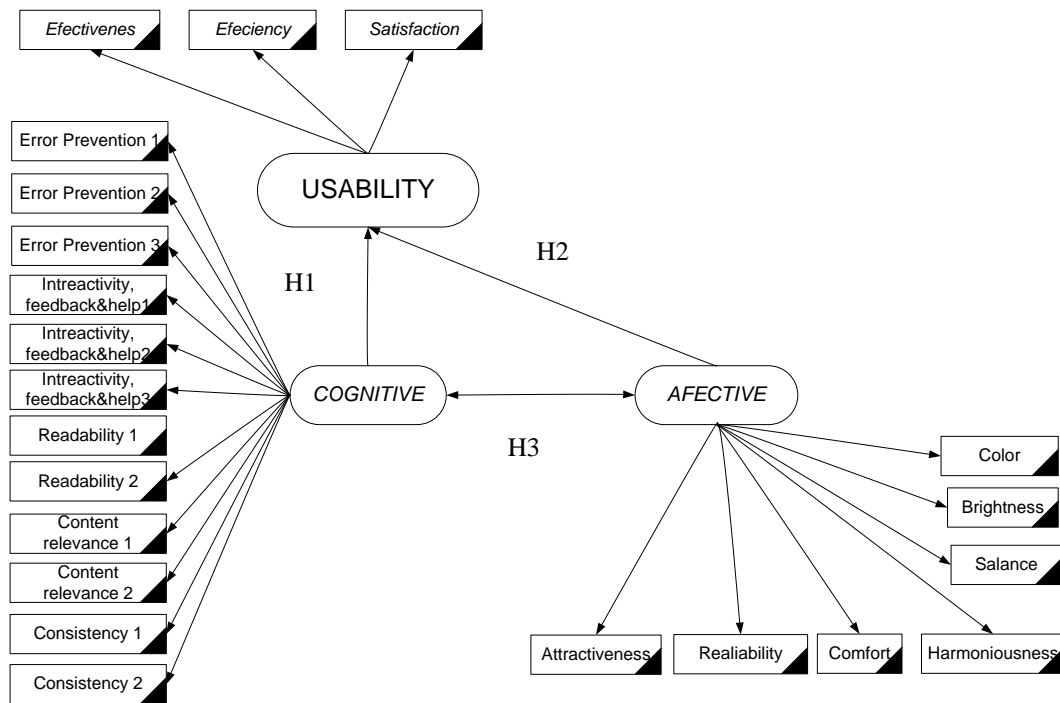


Figure 1 Conceptual model

Furthermore, formulated operational variables and indicators are analyzed in this study, with a trace of the existing literature. This consideration avoiding the stages of exploratory tests that require long procedures. By using dimensions and indicators that already exist, the test was implemented fairly through confirmatory test. , that can be seen in Table 1

Table 1 Indicators variables and source

Variables	Cognitive indicators	Operational definition/ questionnaires Item	Source
X1	<i>Error Prevention 1/EP1</i>	Can multiple but similar tasks be done easily?	Oztekin et al., , 2010
X2	<i>Error Prevention 2/EP2</i>	Can the user easily undo selections, actions, errors in arrangement or management of items?	
X3	<i>Error Prevention 3/EP3</i>	Do error or warning messages prevent possible errors from occurring?	
X4	<i>Interactivity, Feedback, and Help1/ IFH1</i>	Does the menu offer multiple opportunities for interaction and communication among the user, to the instructor, and to content?	
X5	<i>Interactivity, Feedback and Help 2 / IFH2</i>	Is regular feedback about user performance provided in a timely manner	
X6	<i>Interactivity, Feedback and Help 3/ IFH3</i>	Is the user provided with sufficient information to know where in the system he/she is?	

X7	<i>Readability 1/ RD1</i>	The website is already serving "sentences" that are easy to understand and clear	Lee et al., 2012
X8	<i>Readability 2/RD2</i>	The website is already present sufficient margin spacing between sentences it is easy to read	
X9	<i>Content Relevance 1 /CR1</i>	The website already presents appropriate information related to products sold	
X10	<i>Content Relevance 2 /CR2</i>	The website already presents the latest information (up to date) and accurately related products sold	
X11	<i>Consistency 1/CS1</i>	The website is already serving a similar display design on every page of his web	
X12	<i>Consistency 2/CS2</i>	The website already presents components (items) that are similar in each of his web page	
Variables	Affective indicators	Operational definition	Source
X13	<i>Color/ COL</i>	The conceptual image of a product developed by its color (e.g.warm,cool etc.)	Park et al., 2013 Han et al., 2001
X14	<i>Brightness/ BR</i>	The image of a product developed by its brightness (e.g. dark, bright, etc.)	
X15	<i>Harmoniousness/ HR</i>	Feeling that the components of a product are well-matched or in harmony	
X16	<i>Salience/ SL</i>	Degree to which a product is outstanding, prominent, and catching one's eyes	
X17	<i>Comfort / COM</i>	Degree to which the user feels easy and comfortable with a product	
X18	<i>Reliability/ RL</i>	Feeling that a product is dependable, fit to be trusted, or confident	
X19	<i>Attractiveness/ AT</i>	Degree to which a product is pleasing, charming, and arousing interest	

4. METHODS AND RESEARCH PROCEDURE

4.1. Methods

4.1.1. Hypothesis

In this study, respondents will conduct scenario / task of finding products that have been determined at the e-commerce site. When finished with the scenario, respondents are continued to respond the questionnaires usability of e-commerce sites.

Research Hypothesis, based on extends models of Prastawa (2014) the research hypothesis on the sites as follows:

- H 1 CF (cognitive factor) significantly influences usability.
- H 2 AF (affective factors) significantly influences usability.
- H 3 CF and AF are interconnected significantly

4.1.2. Profile of respondents

The participants were composed of 107 male and 123 female, the age between 17 to 22 years and Javanese was the majority. Respondents who were selected as research subjects are students who have a relatively uniform profile of the age factor, but with consideration of this group is quite familiar with the e-learning and e-commerce, the uniformity in the age group assumed to not disturb. Profile of respondents more is shown in Table 2

Table 2 Profile of respondents

Variable	Freq	% of totals
Gender		
Male	107	46.5
Female	123	53.5
Age		
17 – 18	18	7.8
19 – 20	132	57.4
21 - 22	80	34.8
Ethnics		
Javanese	205	89.1
Other	25	10.9

The questions were prepared and confirmed to several experienced participants and usability experts to enhance the validity of research instruments. Processing the data uses AMOS 20 software for Structural Equation Modeling (SEM) method.

The instrument provides a Likert five-point interval. This measurement was operationalized as: “Do error or warning messages prevent possible errors from occurring? Indicate your evaluation according to the scale: (5 = very important to 1 = not very important). Concerning the degree of expectancy, and (5 = very good to 1 = very bad).



Figure 2 Data collection

A structural equation modeling (SEM) can determine loading factor, the goodness of fit, test reliability, and discriminant validity. The calculation is done to the e-commerce sites involving the 230 respondents results :

4.2. Result

4.2.1 Internal consistency reliability test

Internal consistency reliability represents the degree to which items within a dimension measure the same constructs. The test is based on the Chronbach's alpha coefficients (Chronbach & Snow, 1977). Cronbach's alpha reliability coefficient normally ranges between 0 and 1. The closer Cronbach's alpha coefficient is to 1.0, the greater the internal consistency of the items on the scale.

Table 3 summarizes the results of internal consistency reliability tests with regard to constructs used in current research (Cronbach's alpha values). The Cronbach's alpha values range from 0.728 to 0.791.

Table 3 Results of Cronbach's alpha test.

Construct	Number of items	Cronbach's alphas
Cognitive Factor	6	0.728
Affective Factor	5	0.744
Usability	3	0.791

4.2.2. Confirmatory factor analysis

A confirmatory factor analysis was conducted to assess the validity of the constructs. To judge the model fit, the study used the comparative fit index (CFI), the goodness of fit index (GFI), normed fit index (NFI), and root means square error of approximation (RMSEA). CFI is the recommended index of overall fit (Gerbring & Anderson, 1993). GFI is usually used to measure the fitness of a model in comparison with another model (Hair, Anderson, Tatham, & Black, 2003); NFI is frequently used to measure the degree of improvement of the fitness of a model compared to a base model (Hair et al., 2003); and RMSEA gives information about the discrepancy per degree of freedom for a model (Steiger, 1990).

As suggested in the literature (Bollen & Long, 1993; Kline, 1998), model fit was assessed by several indicators. An acceptable ratio for χ^2/df value should be below 3.0 —for the values of CFI. GFI and NFI should be greater than 0.90; and RMSEA is recommended to be under 0.05 though acceptable up to 0.08 (Schumacker & Lomax, 1996). Table 4 shows the results of confirmatory factor analysis. All model fits were acceptable and, according to the literature, the validity of the measurements in the current study met the criteria.

Table 4 Result of confirmatory factor analysis.

Constructs	Items	Standardized regression weights	SE	CR	P ^{*)}
Cognitive Factor		0.802			***
	EP1	0.622	.163	7.184	***
	EP2	0.534	.148	6.890	***
	EFH2	0.597	.151	6.592	***
	RE1	0.559	.161	6.849	***
	CR2	0.535	.155	6.675	***
	CS1	0.581			***
Affective Factor		0.207			0.204
	COL	0.552			***
	HAR	0.692	.172	8.020	***
	SAL	0.670	.151	7.699	***
	COM	0.689	.158	7.614	***
	ATT	0.675	.150	7.518	***
Usability	EFT	0.625			***
	EFC	0.775	.122	9.196	***
	SAT	0.657	.129	8.257	***

*) *** = Significant < 0.05 0.204 = not significant > 0.05

4.2.3 Test of the measurement model

To determine the relationship between the constructs in the proposed model, the structural equation model was tested using AMOS 20 with the default maximum likelihood estimation method. Table 5 indicates the level of acceptable fit and the fit indices for the proposed research model in the current study. With the exception of the χ^2 , the fit indices considered in this study satisfy the recommended level of acceptable fit. A chi-square has been found to be too sensitive to sample size (Hair et al., 2006). Thus, the ratio of χ^2 to its degree of freedom (χ^2/df) is used under the condition that an acceptable fit for the proposed model should be below three

Table 5 Fit indices for the research model

<i>Goodness of fit Index</i>	<i>Cut-off Value</i>	<i>Values</i>	<i>Note</i>
<i>Chi-square</i>	< 93.945	142.218	<i>Marginal fit</i>
CMINDF	≤ 2.0	1.948	<i>Good fit</i>
Probability	≥ 0.05	0.000	<i>Marginal fit</i>
GFI	≥ 0.9	0.919	<i>Good fit</i>
RMSEA	≤ 0.08	0.065	<i>Good fit</i>
AGFI	≥ 0.9	0.884	<i>Marginal fit</i>
TLI	≥ 0.9	0.915	<i>Good fit</i>
NFI	≥ 0.9	0.871	<i>Marginal fit</i>

On the table, it can be known for both sites categorized nothing good on chi-square and probability. This is because the chi-square and the probability are very sensitive to the sample size. On-site there is four criteria e-commerce feasibility test is considered a good fit CMINDF, GFI,

indicator of whether the users of the e-commerce sites feel to see the site has been harmonious. Table 3, indicates that the value of alpha Cronbach's already above 0.70. This indicates that the indicators of these variables can consistently represent variable formations that are developed. At the root value AVE of e-commerce sites, when compared with the value of the variable, correlation between cognitive and affective variables remains below the correlation value. Correlation value the variable cognitive and affective variables for e-commerce sites is 0.815. This indicates that the variable cognitive and affective variables do not really describe the differences and has not fully captured the phenomenon being measured.

From table 6 known that the hypothesis 1 and hypothesis 3 is received while the second hypothesis is rejected for the site. Hypothesis 1 is accepted because it has a significant P value of below 0:05. Cognitive factors also have a positive effect on the usability of e-commerce sites in the amount of 0.802 to e-commerce sites.

In the case of e-commerce, the highest factors of expectation from affective dimension are *Salience, Comfort, Harmoniousness*, whereas the highest factors of perception from affective dimension are *Comfort, Salience, Harmoniousness*. The prominent indicators seem appropriate as well between expectation and perception.

Coursaris (2015) also explains the relative importance of each aspect. There are several reasons that cause cognitive variables significantly influence the usability of e-commerce websites. According to Lee, et al. (2012), *Content Relevance* has the greatest influence on the attention of the e-commerce users. The information on the product and the price clearly have a special attraction for the users of e-commerce websites. As claimed by the study from Chiou, et al. (2010), among 12 important aspects were measured in the e-commerce website. The factor of *ease of use* has 97%, the *quality information* has 92% and the *responsive role* has 87%. It is in line with this study that *ease of use* is represented by the indicator of error prevention, the *quality information* is represented by readability and then the *content relevance* and *responsiveness* are represented by the *Interactivity, Feedback & Help*.

An affective factors Prastawa et al, (2014) model's, refers to the reference Han, et al. (2001) is the usability of an electronic product consists of performance dimensions (cognitive) and the dimensions of the impression (affective). The framework is a framework that is intended for electronic products so that when the object aimed at e-commerce sites could potentially have different results. Han, et al. (2001) which states usability of electronic products consist of dimensions of performance and dimensions of the impression it was not proven in this study.

According to Pramana, et al. (2011), there are two types of aesthetics that could affect usability (an effective, efficient and satisfaction) e-commerce sites that classical aesthetics and expressive aesthetics. Classical aesthetics emphasis more on the design that is an orderly and clear contrast to the expressive aesthetics that better reflects the design on creativity, design and a wealth of complex designs. This research generates the hypothesis that e-commerce sites that apply classical design aesthetics have more positive effects for web usability compared to applying the expressive design aesthetics. This may imply that the design or appearance of e-commerce sites that simple or simpler are more recommended.

Cognitive factors have a Significant impact on usability. The implications in the field are designer still maintaining functional or cognitive considerations in the design of e-commerce websites. Priorities immediately obtain necessary goods and do transats the preferred. Although affective factors have no effect, but the tendency to influence began to appear. P = 0.204 meaningless.

6. CONCLUSION AND FURTHER WORK

Cognitive factors have a significant impact on the usability performance of an e-commerce site. Cognitive factors that influence the usability performance of an e-commerce site is a positive influence that can be interpreted in the value of cognitive factors that will increase the value of the e-commerce site usability.

Affective factors had no significant effect on the usability of an e-commerce site. The influence of affective factors on the usability of an e-commerce site is a positive influence that can be interpreted in the value of affective factors that will increase the value of e-commerce site usability.

Factors associated cognitive and affective factors significantly in e-commerce sites. Correlations between cognitive and affective factors is a positive correlation and Recommendations based research needs to be done by the site is the first to add a few items that serve cancel user activity on the site, the second is to show a consistent page design site.

Researchers that will be extended should add variable customer's loyalty and trust for e-commerce sites for it can be useful to have a loyal customer. In measuring the usability of e-commerce sites should combine objective data and subjective data (perception). Objective data can be applied to the efficient and effective indicator of usability variables that would be more accurate results.

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