No	TAHAPAN	TANGGAL	BUKTI FISIK	CATATAN
1	Submit	21 November 2020	Bukti 1	
2	Decision Letter 1	16 Maret 2021	Bukti 2	
3	Revisi 1	22 Mei 2021	Bukti 3	
4	Decision Letter 1	6 Juli 2021	Bukti 4	
5	Revisi 2	3 Agustus 2021	Bukti 5	

From: editor@twc.com

To: heruprastawa@undip.ac.id

CC:

Subject: Theoretical Issues in Ergonomics Science - Decision on Manuscript ID TTIE-2018-0018.R1

Body: 31-May-2018

Dear Mr Prastawa:

Your manuscript entitled "The effect of cognitive and affective aspects on usability" which you submitted to Theoretical Issues in Ergonomics Science, has been reviewed. The reviewer comments are included at the bottom of this letter.

The reviewer(s) would like to see major revisions made to your manuscript before publication. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript.

When you revise your manuscript please highlight the changes you make in the manuscript by using the track changes mode in MS Word or by using bold or coloured text.

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Once again, thank you for submitting your manuscript to Theoretical Issues in Ergonomics Science and I look forward to receiving your revision.

Sincerely,
Professor Karwowski
Co-Editor in Chief, Theoretical Issues in Ergonomics Science
wkarwowski@gmail.com

Reviewer(s)' Comments to Author:

• It is not clear what the authors intend to say in the following paragraph (e.g., what is meant by "all aspects of influence and form of procedure", expand for the reader because this is in essence part of your justification for why the world needs your tool). Similarly, in the second sentence, what do you mean by "main factor" (consider revising this sentence)?
o "Previous measurement models have the characteristics of being a very broad framework, taking into consideration all aspects of influence and form of procedure (Louie, 2002, Kom, 2011). Usability measurement models are preferred for specialized products and more consider the cognitive aspect as the main factor (Lioljegren, 2006; Li, 2012). As a usability evaluation instrument, the question in System Usability Scale (SUS) involves the cognitive and affective aspects together so it cannot see the magnitude of the weight of influence each aspect holds (Ackerman et al., 2016)."

• I have reservations with your implication that adults older than 55 years old are not productive regardless of whose citation you use. There are plenty of 55+ productive adults in the workforce to invalidate such an argument. If your intention was simply to provide a justification for why you only used undergraduate students the just say so. But to imply that adults over 55 are not productive is incorrect.

• The "Subject and Methods" section is confusing. It is understood that the "Lazada" site was chosen as the e-commerce site but it is not clear which e-learning site was used to assess the e-learning part of the model. After all the authors go to great lengths to suggest that a specific usability tool is warranted for e-commerce and e-learning. By excluding an e-learning site they cannot may any inferences on their tool with regards to e-learning.
o "The first is to identify the influence of cognitive and affective aspects on e-commerce and e-learning websites; the second is to examine the relationship between cognitive and affective aspects in the usability of e-learning and e-

commerce websites."

• A detailed description of the method is not provided. What activities, if any, where participants asked to performed? How did participants get a perceptive impression (i.e., the visceral aspect of the interaction) without being distracted or biased by the behavioral interaction (i.e., it is typical of methodologies involving visual impressions to be based on impression alone)? At the same time participants need an opportunity to interact with an experience (e.g., the e-learning site) to be able to judge its usability. How were participants able to judge usability and at the same time form a perceptual impression? A description and discussion on the methodology and its limitations would be warranted.
• The authors indicate that "The questions were prepared and confirmed by several experienced participants and usability experts to enhance the validity of the research instruments." Could they expand on what kind of validity and how did they increase it based on participant (i.e., undergraduate students) and experts (e.g., what qualified them as experts?).
• Given that the authors only intend to measure aesthetic properties then it would be wrong to label the measure as one focusing on the "affective" element of the interaction. It would be ok to say that they are measuring visceral affect but not "affect" as a whole since affect encompasses many other constructs (e.g., emotions, attitudes, moods, affective traits) which are not considered in this study. Further there is no discussion or literary review of what elements constitute visceral affect. The authors mention that elements in Han et al. and Park et al. cover elements of color, brightness, harmoniousness, comfort, reliability, acceptability and neatness yet the authors offer no support as to why these qualify as visceral affect nor why others may not be necessary (e.g., disgust, attractiveness) or elements such as biophilia.

• On a similar note, it is challenging if not impossible to truly measure or develop a universal measure of aesthetic affect without using very primitive elements that trigger universal reposes (e.g., fear, disgust). This is because cognition and affect are largely inseparable and modulate each other and thus what once was a negative visceral experience (e.g., certain fermented foods, bitter coffee) may be turned into a positive behavioral or symbolic experience based on acquired taste. In addition, it is very difficult to predict affective reactions given that these occur as autonomic responses the individual has based on current concerns (e.g. goals), affective traits, underlying moods, etc.

• The authors indicate that they based their model on Oztekin et al, and Han et al. 2001. As such it is important that they present such models and discuss which elements or how are they integrated into their model (e.g., what is the Han model and what of it was used in the author's model). The Han paper provides a nice graphic of such model so an adaptation of that image may be warranted to help the reader understand. The authors should do the same with the Oztekin paper and any other manuscript they used to guide their model. Also, the Oztekin paper is not in the lists of references. If it is the this one (https://doi.org/10.1016/j.jss.2009.06.047

) then it would be of help to readers to note that it is based on the SevQual model which a recognized tool.

• Regarding the instrument itself. There are issues with the statements used in the questionnaire itself. I can think of at least two issues. One being the grammar which makes some of these statements hard, if not, impossible to understand. For instance, X13 reads “The conceptual image of a product developed by its color (e.g., warm, cool, etc.)”. This statement is very confusing as it does not clearly state what is being asked about (e.g., what is a conceptual image?). It is understood that this may be a product from direct translation from another language to English, yet it is important for the reader to understand what the statement refers to (after all you intend to publish in an English language journal and to an English-speaking audience). The second issue is with the indicators chosen. In some instances some indicators seem to have no a direction (e.g. good-bad while others do not such as color, brightness; what is good or bad color?). In other instances it is not clear what the indicator is referring to (e.g., acceptability; is it the acceptability of the product being sold or of the e-commerce site?). In other instances it is not clear why some elements were chosen for one questionnaires but left out in the other. The authors need to explain why the affective indicators are different for e-commerce and e-learning. For instance why is “acceptability” and “neatness” not a factor in e-learning? Why is “reliability”, “attractiveness”, “appealing” not part of e-commerce?

Date Sent: 31-May-2018

The effect of cognitive and affective aspects on usability

Journal:	*Theoretical Issues in Ergonomics Science*
Manuscript ID	TTIE-2018-0018.R1
Manuscript Type:	Research Paper
Keywords:	Cognitive aspect, affective aspect, usability, e-commerce web, e-learning web

The effect of cognitive and affective aspects on usability

ABSTRACT

Studies on customer needs, desires and preferences have become highly important in the product design and development process. One consideration in usability is the cognitive aspect, which is related to the accommodation and evaluation of human cognitive capabilities, limitations, and tendencies. In addition to the cognitive aspect, a recent study has shown that the affective aspect has been considered in the evaluation of product usability. Thus, both cognitive and affective aspects are deemed to be important for product design and the development process. Inherently, both aspects deliver complete human and product interaction and experience. However, studies that consider the affective process as a complement to the cognitive process for usability are relatively rare. To address this gap, this study discusses how an integrative framework of the cognitive and affective aspects can be applied to a product for usability assessment via empirical studies on e-commerce and e-learning platforms. The sample involved 230 respondents, using purposive sampling. The result shows that both cognitive and affective aspects have a significant effect, although with different weights. The affective aspect has been shown to improve product usability and user acceptance.

Keywords: ***Cognitive aspect, affective aspect, usability, e-commerce web, e-learning web***

1. Introduction

In today's competitive markets, a shift has occurred in approaching production orientation, namely, a shift toward a marketing-oriented approach and ultimately to a customer-oriented approach (Hsiao & Chen, 2006). Studies on needs, desires and preferences are highly important in the development of user-centered products (Liljegren & Osvalder, 2011, Demirtas et al., 2009). The best practices in user-centered design are summarized in ISO 9241-210 (2008).

The cognitive aspect for usability has been implemented into electronic equipment (Han et al., 2001), medical devices (Chou et al, 2007), and mobile phones (Seva et al, 2011). Apart from cognition, Lindholm et al. (2003) concludes that emotional needs are also important in the design of new products such as mobile handsets and communication devices. Because websites are part of the HCI field, human behavior should also be included in website evaluation. In the case of websites, the predominant dimensions of the cognitive aspects include content, ease of use, identification, download delay, trust, and made-for-the-medium. For usability in electronic commerce or e-commerce (Downing & Liu, 2011), navigation, interaction (Calisir et al., 2011), website layout, merchandise information quality and merchandise price are important factors (Li and Li, 2011).

The cognitive aspects of usability are always centered on the perceived efficiency and effectiveness of the system. The perception of satisfaction as an integral part of the usability criterion, wherein the affective dimension plays a significant role, has received little attention. In the information

systems (IS) domain, it has been suggested that a design's affective dimensions, including colors, images, and shapes, affect the overall perception of the information system. Numerous studies conducted decades ago focus on such emotional aspects as enjoyment (Davis et al., 1992; Van der Heijden, 2004; Thong et al., 2006; Cyr et al., 2009; van Schaik and Ling, 2011; Aranyi and van Schaik, 2015). Therefore, although research on acceptance of new technologies has been primarily centered on cognitive dimensions, awareness of the importance of the affective dimension in design, in relation to a growing perception of utility, reveals the need to adopt cognitive-affective models to analyze and design information systems (Kwong et al., 2016).

There has been no definite conclusion about the relationship between aesthetics (affective) and usability. Several of these studies found support for the aesthetics–usability relation (e.g., Hartmann et al., 2008; Lavie and Tractinsky, 2004; Quinn and Tran, 2010), but other studies could not find this relation (e.g., Hassenzahl, 2004; van Schaik and Ling, 2009; Alexandre 2012 et al.). The combination of the cognitive and affective dimensions is expected to deliver a more comprehensive explanation for user satisfaction, and relative importance can also be assessed.

Previous measurement models have the characteristics of being a very broad framework, taking into consideration all aspects of influence and form of procedure (Louie, 2002, Kom, 2011). Usability measurement models are preferred for specialized products and more consider the cognitive aspect as the main factor (Lioljegren, 2006; Li, 2012). As a usability evaluation instrument, the question in System Usability Scale (SUS) involves the cognitive and affective aspects together so it cannot see the magnitude of the weight of influence each aspect holds (Ackerman et al., 2016).

This study proposes a model of usability measurement that integrates both the affective and cognitive aspects in conjunction with usability. The work explores the significance of the influence of cognitive and affective aspects on usability and that of their interactions. Empirical cases in e-learning and e-commerce are examined taking into account that both types of sites are widely used by productive-age users. Selection of the productive-age group was restricted to those between 15 and 55 years old, according to research by Sonderegger et al. (2016) on the influence of age in usability measurement. Considering the limited research, most of the respondents are undergraduate students aged 17-22, who fall into the productive age group of 15-55 years. In addition, in Smith's (2013) study, people aged 18 to 44 show a high proportion of owning a smartphone compared to people in other age bands (Kim, 2016).

Therefore, this study has two objectives. The first is to identify the influence of cognitive and affective aspects on e-commerce and e-learning websites; the second is to examine the relationship between cognitive and affective aspects in the usability of e-learning and e-commerce websites. This paper is organized into an introduction, followed by the research methodology, literature review and

research hypotheses**.** Then, the main contribution of this research is presented, and the paper ends with the discussion and conclusion sections.

2. Research Methodology

2.1. Participants

The participants included 107 males and 123 females between 17 and 22 years of age, for a total of 230 students at a large state university in Indonesia. Participants were recruited according to whether or not they were already familiar with the sites, especially e-learning and e-commerce types. These considerations encouraged a selection of respondents from students, and the sampling plan used is non-probability sampling, more precisely purposive sampling. The mean age was 20 years (SD = 1.45); 46.5% were male, and 53.5 (77%) were female. Ethnically, 89.1% were Javanese and 10.9% were 'other'. All were students of the X University in Indonesia. Demographic data on this group is shown in Table 1.

The proposed usability measurement model uses the cognitive and affective variables as assessment factors. Certain differences occur in the chosen indicators for the e-learning and e-commerce models. Each model is conceptual, as outlined in the following section. Empirical data was collected through simulations performed in the multimedia laboratory of the Department of Industrial Engineering at the X University.

The questions were prepared and confirmed by several experienced participants and usability experts to enhance the validity of the research instruments. Data processing was conducted using AMOS 20 software for the Structural Equation Modeling (SEM) method.

2.2 Subjects and methods

Electronic learning (e-learning) has been identified as the enabler for people and organizations to keep up with changes in the global economy that now occur in Internet time. In a corporate training context, e-learning refers to training delivered on a computer that is designed to support individual learning or organizational performance goals (Clark and Mayer, 2003). The appearance and the usability of the websites are revealed as key factors to determining the satisfaction of the students (Luis, 2016).

E-learning and e-commerce sites were selected as case studies based on the argument that e-learning sites are now widely used by schools, universities, and educational institutions in Indonesia (Ramdiani and Atan., 2013).

The object to be measured by the model is the Lazada site, which is a B2C (business-to-consumer) effort and is well known in Indonesia. According to the Technician (2014), Lazada is the most

famous site and has a percentage recognition of 29.2%. Selection of e-commerce and e-learning is through websites, but with different goals. Although both sites include services, the purpose of e-commerce is a transaction process, while for e-learning, it is a learning process.

The survey was conducted in the multimedia laboratory using online questionnaires. Potential respondents were approached and asked to participate. The interviewer briefly introduced him/herself and explained the purpose of the research and the survey procedures. The data for this research was collected using the questionnaires. The respondents were randomly selected students (107 males and 123 females) who use e-learning sites.

H_1 : Cognitive aspect positively influences usability

H_2 : Affective aspect positively influences usability

H_3 : Cognitive and affective aspects are significantly interconnected

Three expected ('expecteds') and perceived ('perceiveds') hypotheses were tested on an e-learning website and on an e-commerce website. The expecteds are expressed as a degree of probability that an event will occur, whereas the perceiveds are assessed based on user experience in accessing the site. Selection of the tested expecteds and perceiveds was conducted to evaluate the consistency of the desired expecteds and applications on the site chosen for the case study.

2.3 Validity and reliability test

Before testing the hypotheses of each case, firstly, we underwent an examination of the statistical testing, including a test of internal consistency of reliability, and confirmatory. Internal consistency of reliability represents the degree to which items within a dimension measure the same constructs as one another. The test is based on Cronbach's alpha (Cronbach & Snow, 1977). The coefficient of Cronbach's alpha's reliability normally ranges between 0-1. Should the value of Cronbach's alpha coefficient be closer to 1.0, the internal consistency of the items is greater. The analysis of the confirmatory factor was performed to assess the validity of the constructs. To judge the model's fit, this study employed the comparative fit index (CFI), the goodness of fit index (GFI), the normed fit index (NFI), and the root mean square error of approximation (RMSEA). CFI is the recommended index of an overall fit (Gebring & Anderson, 1993) and is commonly applied to measure the fitness of one model compared to another (Hair, Anderson, Tatham & Black, 2003). Further, NFI is frequently used to measure the degree of improvement of a particular model's fitness with a base model (Hair et al, 2003), and RMSEA delivers information on the discrepancy per degree of freedom of a particular model (Steiger, 1990).

In determining the relationship between the constructs in the proposed mode, the structural equation model was tested using AMOS 20 with the default maximum likelihood estimation method. Except the χ^2, the fit indices considered in this study meet the recommended level of acceptable fit. The chi-square was discovered to be too sensitive to this sample size (Hair et al., 2006), and therefore, χ^2 ratio to its freedom degree (χ^2/df) is used under the condition that an acceptable fit is identified for the proposed model.

3. Literature review and research hypotheses

We propose three hypotheses according to the current research on the interrelationship among the three constructs, namely:

3.1 Cognitive aspect and usability

According to Han et al. (2001), the cognitive process consists of three stages: perception, memorization, and control. Perception or cognition consists of usability dimensions that assess how well users understand and interpret the interface product or system. Certain dimensions, such as directness, explicitness, model quality, observability, responsiveness, and simplicity, are important dimensions in the design and evaluation of how the system status information is sent to the user via an interface (e.g., display panel, label, icon, and indicator status). The memorability dimension explains how quickly users become familiar with the product and how well they remember it. Learnability and memorability are typical dimensions of usability in this category, the others being consistency, familiarity, informativeness, and predictability. The next dimension used in checking terminology is used to label control and display behavioral interactions. The categories of control or action, which represent a dimension that describes the user control activities and results, include accessibility, adaptability, controllability, effectiveness, efficiency, and several other dimensions. Therefore, it is critical to achieve user acceptance, accessibility, and usability of products and systems (Johnson and Turley 2006). From the customer's point of view, through co-creation, a customer can create value that is deemed of primary importance to him or her by fulfilling his or her affective and cognitive needs, i.e., user experience (Zhou et al. 2011). Current research has demonstrated that cognitive overload can be an important aspect of usability (Adam, 2007).

Think aloud is a familiar technique in cognitive psychology, used in the context of usability tests to reveal thinking processes and subjective experience that cannot be examined behaviorally (e.g., McDonald, Zhao, & Edwards, 2013).

H_1: Cognitive aspect positively influences usability.

3.2 Affective aspect and usability

In addition to evaluating the usability aspects of the product, other aspects, such as image and impression or assessment of product taste, also affect the user. The consumer's choice of the product depends on a number of multidimensional factors, including affective, perceptual and behavioral dimensions, that designers must continue to strive to understand (Chuang, & Ou, 2001). These elements include shapes, colors, materials, ornaments, and texture. A round shape connotes tenderness and continuity, and a sharp angle is perceived as sudden or even unsafe (Lewalski, 1988; Fagerberg et al., 2004). The emotional needs of consumers, or the so-called Kansei needs, have become important factors in product design (Huang et al., 2012). In the service industry, the emotional dimension has been widely studied, including examining customer perspective, in order to measure service quality in the logistics field (Baki et al., 2009; Meng et al., 2010; Chen et al., 2014; Thai et al., 2014), and the Nordic perspective of evaluating logistics service quality in terms of the dimensions of logistics outcome quality and process quality has also been studied (Giovanis et al., 2013).

Several studies have investigated the relation between usability and aesthetics (Hassenzahl and Monk, 2010). A number of these studies found evidence for the aesthetics–usability relation (e.g., Hartmann et al., 2008; Quinn and Tran, 2010), but other studies could not find this relation (e.g., Hassenzahl, 2004; van Schaik and Ling, 2009). Norman (2004) explains three aspects of design that can induce affective results in users: appearance (Visceral), behavior and function (Behavioral), and image and brand considerations (Reflective), while Kim (2016) distinguishes the affective aspect between being primitive (e.g. color, texture), descriptive (e.g. delicacy, simplicity) and evaluative (e.g. attractiveness, luxuriousness).

H_2: Affective aspect positively influences usability.

3.3 Interaction between cognitive and affective aspects

According to the assessment theory, the same stimulus of a product can produce different affective responses from various individuals based on the product's perceived meaning and relevance to the individual. The image is only a component of the affective aspect, which is related to a person's emotions. The affective dimension is also used as one of the elements relevant to analyzing the user experience (Heidig, et al., 2015).

Rubin and Chisnell (2008) explain that a product can be said to be usable if in its use, no frustration is found. Some general factors can be used as benchmarks in measuring usability, namely learnability, efficiency, memorability, errors, and satisfaction (Nielsen, 1993). This study attempted to confirm that cognitive, cognitive-affective, and affective were factors influencing perceived usability.

H_3: Cognitive and affective aspects are significantly interconnected

3.4 Conceptual model of usability for e-learning

The conceptual model proposed by Oztekin et al. (2009) and Han at al. (2001) was selected to incorporate the cognitive and affective aspects. For a more specific conceptual model application in e-learning, each aspect or factor is elaborated in accordance with e-learning indicators. Two aspects are used to measure usability performance: the cognitive and affective aspects. The cognitive aspects consist of error prevention (e.g., the ability to easily undo selections); interactivity, feedback and help (e.g., performance delivered in a timely manner); learnability (presented in organized chunks to support learnability); flexibility (an online learning environment with the addition of resources); memorability (cognitive load reduced by creating familiarity); easy navigation; logical navigation; undesirable site direction; and an easy escape option. The affective aspects consist of color, brightness, salience, appeal and pleasantness, comfort, reliability and attractiveness.

This research aims to determine the effects of the cognitive and affective aspects of usability on e-learning, to determine the relationship between the cognitive and affective aspects in e-learning, and to create recommendations based on the results of the usability measurements. Thus, the measurement results can be used as a reference in usability improvement for e-learning sites. The conceptual model used in this research is presented in Figure 1 and Table 2. The elements (questions) on the questionnaire of Indicator variables are seen in the table in Appendix

3.5 Conceptual model of usability for e-commerce

According to Korgaonkar et al. (1999) and Lindegaard et al. (2003), the basic purposes of e-commerce sites can be classified into four types, namely, entertainment, destination information, communication, and trafficking (commerce). E-commerce sites displayed by a company should have high-quality systems, information, and services, because these factors significantly impact the success of e-commerce (De Lone and McLean, 2003).

A fifth addition to these quality aspects was proposed by Tsai et al. (2010), who argued that additional quality website design is needed to attract the attention of customers. This statement is in accordance with the work of Bonnardel et al. (2011), which states that the development of design systems at these sites should not only focus on ease of use but should also consider that the site design should be more interesting to the users. According to Han et al. (2001), design and evaluation of product usability should consider performance (cognitive) and impression (affective) factors.

The cognitive variables based on the assessment indicators reported by Oztekin et al. (2010) and Lee et al. (2012) consist of error prevention; interactivity, feedback and help; readability; content

relevance and consistency. The affective variables based on assessment indicators from Han et al. (2001) and Park et al. (2013) include color, brightness, harmoniousness, comfort, reliability, acceptability and neatness. The conceptual model used in this research is presented in Figure 2. Variables and indicators are presented in Table 3. The elements (questions) on the questionnaire of Indicator variables are in the table in Appendix.

4. Results

4.1 Usability analysis on e-learning website

The participants were asked to evaluate the importance of individual usability indicators. The construct of the cognitive aspect has 11 indicators, and that of the affective aspect has 8 indicators. The full model achieves a fit condition after 4 iterations, and the results are shown in Tables 4 to 7 and Figure 3.

4.1.1 Internal consistency reliability test

Table 4 summarizes the results of the internal consistency reliability tests with respect to the constructs used in the current research (Cronbach's alpha values). The Cronbach's alpha values range from 0.747 to 0.847. With a cut-off value limit of 0.70, the reliability test results show that usability variables, cognitive and affective factors are worthwhile, which means that indicators of these variables can consistently represent the formation variable developed.

4.1.2 Confirmatory factor analysis

Table 5 shows the results of the confirmatory factor analysis. All model fits were acceptable on the basis of all indicators exceeding the cut-off value limit of 0.50, and according to the literature, the validity of the measurements in the current study met the criteria.

4.1.3 Test of the measurement model

Table 6 indicates the level of acceptable fit and the fit indices for the proposed research model in the current study.

Table 6 shows marginal fits for chi-square and the probability of the e-learning sites because the chi-square and the probability are highly sensitive to the sample size. Each e-learning feasibility test of a site considers four criteria for a good fit: CMINDF, GFI, RMSEA, and TLI. A category with a marginal fit

in a careful review of the model means that the model can be improved by including additional indicators, and if the criteria suggest a good fit, then the model can be said to fit.

4.1.4 Test of the structural model

The results of the hypothesis tests and path coefficients of the proposed research model are shown in Table 7 and Figure 3 below.

In the case of expectations for an e-learning website, of the 11 preferred indicators of cognitive variables, only two indicators are excluded, namely, interactivity, feedback and help (IFH) and readability (READ), and for the affective variables of seven indicators, only one, reliability (RELI), was not supported. The indicator that has the greatest loading factor among the cognitive variables is Easy Navigation, with a value of 0.714. Easy navigation is an indicator that measures whether the user can easily use the navigation on the website.

The indicator with the greatest loading factor for affective variables for the website is comfort, with a value of 0.783. Comfort demonstrates that the indicators of the variables consistently represent the formation variables developed. Based on the table, the Cronbach's alpha value is greater than 0.70, which suggests that indicators of the variables consistently represent those variables.

Table 6 shows that hypotheses 1, 2 and 3 are accepted because they have significance values of below 0.05. Three hypotheses are supported by the data, as cognitive and affective factors directly predicted usability which reinforces the interrelation between cognitive and affective factors.

In the case of perception of an e-learning website, of the 11 preferred indicators of cognitive variables, the following are not qualified: interactivity, feedback and help, and readability. For the seven indicators of affective variables, reliability was not supported. The indicator that has the greatest loading factor for cognitive variables is easy navigation, with a value of 0.6999, and for affective variables, the greatest factor is comfort, with a value of 0.783. Based on the table, the Cronbach's alpha value is greater than 0.70. Hypotheses 1, 2, and 3 are accepted because they have significance values of below 0.05. Cognitive factors have a positive influence on the usability of an e-learning website, with a value of 0.545**,** which is greater than that of the affective factor, which is 0.322.

4.2 E-commerce website

The participants were asked to evaluate the importance of individual usability indicators. The construct of cognitive aspects contains 12 indicators, and that of the affective aspects has 6 indicators. The full model achieves a fit condition after 4 iterations, and the results are shown in Tables 8 to 11 and Figure 4.

4.2.1 Internal consistency reliability test

Table 8 summarizes the results of the internal consistency reliability tests with respect to constructs used in the current research (Cronbach's alpha values). The Cronbach's alpha values range from 0.704 to 0.791.

4.2.2 Confirmatory factor analysis

Table 9 shows the results of the confirmatory factor analysis. All model fits were acceptable on the basis of all indicators exceeding the cut-off value limit of 0.50, and according to the literature, the validity of the measurements in the current study met the criteria.

Test of the measurement model

Table 10 indicates the level of acceptable fit and the fit indices for the proposed research model in the current study.

4.2.3 Test of the structural model

The results of the hypothesis tests and path coefficients of the proposed research model are shown in Table 11 and Fig. 5 below.

In the case of expectation from an e-commerce website, out of the 12 preferred indicators of cognitive variables, only five were accepted, with the seven others failing to be decisive factors affecting cognitive variables. The indicator with the greatest loading factor for the cognitive variable is error prevention 2 (EP2), with a value of 0.662. Error prevention 2 is an indicator that shows whether or not the user can easily perform activities on the website.

The indicator with the greatest loading factor for the affective variable is brightness, at 0.895. Brightness is an indicator that measures whether the user feels that the website appears to be sufficiently bright. The value of Cronbach's alpha is greater than 0.70, indicating that the variables consistently represent the formation variables developed.

Table 11 shows that hypotheses 1, 2 and 3 are accepted because they have significant p-values below 0.05. The cognitive factor has a positive influence on the usability of the *e-commerce* website, with a value of 0.536, which is greater than that of the affective factor.

On e-commerce sites, the indicator that has the largest factor for the cognitive variable is error prevention, with a value of 0.622. Error prevention 1 is an indicator of whether users of the e-commerce sites report ease of activity on the site. The table also showed that the largest factor loading of the

indicator variable is error prevention sites, which is also a cognitive factor. This result indicates that convenience of user activity on e-commerce sites has the greatest influence on e-commerce sites.

E-commerce sites can also be assessed using indicators with the largest loading factor of the affective variables, for which the value of harmony is equal to 0.692. Harmoniousness is an indicator of whether users of e-commerce sites feel that the site experience has been harmonious. Table 11 shows that hypotheses 1 and 3 are accepted and that hypothesis 2 is rejected for the site. Hypothesis 1 is accepted because it has a significance value of below 0.05. Cognitive factors also have a positive effect on the usability of e-commerce sites, with a value of 0.802 for e-commerce sites.

In the case of e-commerce, the highest factors of expectation in the affective dimension are Salience, Comfort, and Harmoniousness, whereas the highest factors of perception in the affective dimension are Comfort, Salience, and Harmoniousness. The prominent indicators appear appropriate as well between expected and perceived aspects.

Coursaris (2015) also explains the relative importance of each aspect. There are several reasons that cause cognitive variables to significantly influence the usability of e-commerce websites. According to Lee et al. (2012), Content Relevance has the greatest influence on the attention of e-commerce users. Information on the product and the price clearly has a special attraction for users of e-commerce websites.

5. Discussion

5.1 Usability model on the e-learning website

Based on Table 5, of the 11 indicators of cognitive variables, 9 have a sufficient loading factor: error prevention 1, 2 and 3, learnability, memorability, easy navigation, logical navigation, use of site direction, and easy-to-go-back option. Further, of the 8 indicators of affective variables, 7 have a sufficient loading factor: color, brightness, harmoniousness, salience, appeal and pleasantness, comfort, and attractiveness. A significant difference is not observed between the effects on users of expected and perceived elements for the cognitive aspects of usability.

Factors of usability for the e-learning website were based on the factors studied previously by Zaharias and Poylymenakou (2009) on visual design subjects. These consist of convenience and ease of understanding the interface, including layout, color, font and images. The factor of The Navigation Browsing covers activities on the website, and the use of features is the main aspect of such a factor. The aspect of Accessibility summarizes the access of website pages and features. Meanwhile, the factor of interactivity consists of all communication forms in the learning context facilitated by the system.

In prior studies on affecting design in multimedia learning (Plass et al., 2014; Um et al., 2012), we analytically deduced intrinsic emotional design features. Previous research has shown a relationship

between learner emotions and learning (e.g., Goetz et al., 2012; Linnenbrink-Garcia, Rogat, & Koskey, 2011). For instance, Pekrun et al. (2002) found that pleasant emotions, such as enjoyment, predict high achievement, whereas unpleasant emotions, such as test anxiety, predict low achievement.

5.2 Usability model on e-commerce website

Based on Table 9, of the 12 indicators of cognitive variables, those with sufficient loading factors include 5 indicators for expectation and 6 for perception: error prevention 1, 2 and 3, interactivity, feedback and help 2, readability 1, and consistency 1 and 2. The 6 indicators of affective variables that have sufficient loading factors include 2 indicators for expectation and 5 for perception, among others, color, brightness, harmoniousness, salience, comfort and attractiveness.

Navigability, interactivity, learnability, readability, and content relevance had a direct influence on cognitive aspects. The affective aspects of color and brightness had an influence on expectations and on comfort, harmoniousness and salience, and comfort and harmoniousness are factors that influence purchase intention.

Cognitive factors have a significant impact on usability. The implications in the field are designed to maintain functional or cognitive considerations in the design of e-commerce websites. Elements that directly impact the access to necessary goods and transactions are a priority. This result is supported by previous research linking the cognitive aspects of system design and use—more specifically, efficiency and effectiveness—with an account of affective dimensions, including aesthetics and playfulness (Coursaris, 2015). Although affective factors have no effect, the tendency toward influence began to appear at $p = 0.204$ but was non-significant.

5.3 Overall usability model on e-learning and e-commerce websites

The indicators for cognitive and affective variables used in evaluation of usability are not the same for both types of websites. The e-learning website is primarily used in the learning process, and thus, the influences of emotional (affective) aspects are stronger. Cognitive factors are required as a condition to support e-learning, which relies heavily on information and communication media.

This study has shown that the affective aspect represents a usability factor to varying degrees. In the e-learning case, comparisons of the factor influences between affective and cognitive variables in usability measurement are 0.391:0.536 for expected and 0.322:0.545 for perceived elements. In the case of e-commerce, the comparison between affective and cognitive variables is 0.202:0.536 for expected and 0.207:0.802 for perceived elements. This shows that in the case of the e-learning website, the affective process has more influence on usability than the cognitive one does.

E-commerce is used universally for every type of business or commercial transaction that includes information transmission via the Internet. E-commerce websites allow clients to purchase goods or services online through the Internet. Their expansion has made the assessment of the website usability experience highly relevant. One reason why the time required to interact with an e-learning website is longer than that required to interact with an e-commerce website is that the aim of the latter is to end the transaction.

The design of website usability is critical to e-learning and e-commerce success. This study identified website usability constructs, and developed as well as validated measurement tools for this reason. Several interactions between website usability constructs and usability were discovered through causal mapping analysis and a questionnaire-based field study. Although challenges exist in the generalizability of our findings, this study successfully demonstrated that the identified constructs have strong psychometric properties based on a large amount of variance in usability.

As shown in Table 12, this study first confirmed the presence of nomological networks between the cognitive and affective aspects and the usability. For all cases, we found that the cognitive aspect had a direct influence on usability. The cognitive aspect in the perception of e-commerce was the strongest factor in usability, indicating that creating indicators for cognitive factors has relevance for inducing usability. Error prevention, interactivity, feedback and help, readability, content relevance, and consistency became the main important considerations.

The affective aspect in the perception of e-learning was the strongest factor in usability, indicating that affective aspects are relevant to usability. Harmoniousness, Salience, Comfort, and Attractiveness became the main important considerations. For the cognitive aspect, the findings are consistent with those of previous studies (DeLone W.D. and McLean E.R., 2004), noting that information quality is crucial, mainly for users who visit websites with utilitarian goals (e.g., to purchase products/services). Thus, customers will then perceive safety while purchasing products from the site.

The findings for affective aspects show that the associated indicators are highly supported. Indications show that the affective aspects contributed to the performance and were quite significant to usability, especially in the case of e-learning.

Figure 5 presents a visualization of the loading factors for the cognitive and affective aspects of usability, equivalent to Table 12. The results of this research show that both the cognitive and affective dimensions are significant as predictors of usability. In the case of e-learning, the highest factor of expectation from the cognitive dimension is easy navigation, followed by logical navigation. This result is in line with the purpose of users who access this website. The factors of perception from the cognitive dimension are easy navigation, memorability, and error prevention. The prominent indicators appear

appropriate between expected and perceived elements. Although they are different indicators, the contribution of cognitive aspects to usability is in agreement with the general criteria for e-learning (Zaharias and Poylymenakou, 2009). The influence of the affective aspect on usability is highly important for addressing user needs. According to Coursaris (2015), combining cognitive and affective dimensions is expected to result in the most comprehensive display for users, including usability.

This study offers several essential result findings for both researchers and practitioners. Theoretically, this work attempts to present a comprehensive exploration of the multifaceted elements of website usability, especially in e-learning and e-commerce. These instruments might be used in future usability studies, and the accumulated result can be directly compared. Therefore, the authors agree on the importance of website usability instrument development (Green and Pearson, 2002). The research confirms the complexity of a model in which cognitive, affective and cognitive-affective fundamentals are present, and advances knowledge on the consequences of usability and similarity with perceived interactivity (Cyr, 2009). The research found that the influence of perceived usability was mainly direct and less mediated by the affective dimensions (Porat, T, 2012).

Second, this work suggests and validates nomological networks between website usability constructs and the absence of previous theoretical models of website usability. By examining the interactions among the usability constructs, we can identify the effect of each construct precisely. Therefore, the identified nomological networks can be used to enhance existing theoretical models or to develop alternative theoretical models of website usability to create a better understanding of the website usability phenomenon. Finally, although additional validation must be performed, the proposed model can be considered to be an alternative theoretical model of website usability. Through a series of empirical tests, the model was validated to explain many variances in customer online purchase intentions and purchases, implying that the model can be used in future studies to successfully measure the effect of website usability construction on online purchases.

Thus, the affective and cognitive aspects should be considered simultaneously. The human brain consists of two parts: logic and emotion. Both of these exercise different functions in determining our behavior, but the two are interdependent.

The practical implications of this study offer useful insights for product designers in considering cognitive aspects and also aid in identifying items for consideration in continuous improvement or planning as well as product development. The affective process refers to the emotional responses in a user's perceptions and feelings, and thus all of the processes related to usability rely on cognitive processing, whereas the semantic form uses affective processing (Hartono, 2011).

This study has certain confines that must be researched in future studies. First, the single-target websites used in this study do not represent all e-learning and e-commerce domains. Previous studies on information systems and marketing areas (Burke, 2002) found that individual consumer beliefs, attitudes, and behaviors were significantly influenced by different products, industries and technologies. Future studies with broader e-business domains are recommended. Second, the cognitive aspects were found to model website usability but not the affective aspects. Several researchers have alluded to the ability of a website to stimulate emotional responses between consumers (Norman, 2004; Heijden, 2004). Therefore, it is suggested that future studies attend to the construction of other affective usability factors. Another limitation of this study is that the respondents are still clustered at the age of 17-22 years (students), so the conclusions do not yet describe the entire productive age.

6. Conclusions and further research

Studies that consider the affective process as a complement to the cognitive process for usability are relatively scarce. To address this gap, this paper discusses how an integrative framework of the cognitive and affective aspects can be applied to a product for usability assessment via empirical studies on e-commerce and e-learning platforms. There are 3 validated constructs, of which, two constructs affecting usability performance are the cognitive and affective aspects. One important finding showed that cognitive aspects still showed a strong influence on usability. However, the affective aspects also have a significant influence, to varying degrees, between e-commerce and e-learning. Considering the cognitive and affective aspects of web design simultaneously becomes necessary, the argument being that both are interdependent.

This research offers several potential contributions. First, the results can be used to determine the proportion of cognitive and affective aspects in product design, particularly those related to usability. Product designers can get feedback on how their design features affect user satisfaction by interpreting the relationship models. Second, for better usability, interface designs for e-learning and e-commerce websites must focus on the need for affective and cognitive aspects to improve usability.

The results of this study have two implications for further research. First, to anticipate limited resources, further studies must focus on the additional indicators and affective aspects of applications in different websites and the most frequently used products in consumers' daily lives. Second, the affective aspects might vary based on age differences, professional groups and numbers of respondents that represent actual users. Therefore, future studies must examine the applications of the model, either with different websites or different products, e.g., consumption of products such as tablets and gadgets and different (cultural-based) users.

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THE EFFECT OF COGNITIVE AND AFFECTIVE ASPECTS ON USABILITY

Table 1 Profile of respondents

Variable	Frequency	% of total
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
Ethnicity		
Javanese	205	89.1
Other	25	10.9

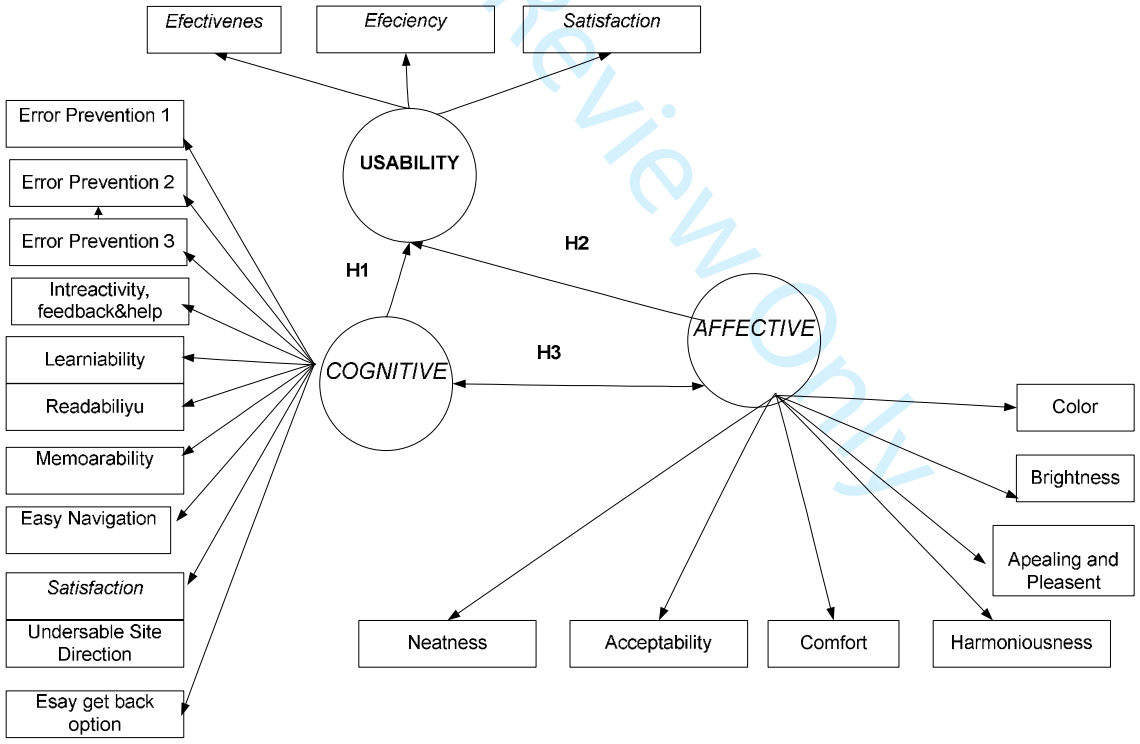


Figure 1 Conceptual model of usability for e-learning

Table 2 *Variables and Indicators for E-learning*

Variable	**Cognitive indicator**	Abbreviation
X1	*Error Prevention 1*	EP1
X2	*Error Prevention 2*	EP2
X3	*Error Prevention 3*	EP3
X4	*Interactivity, feedback and help*	INFH
X5	*Learnability*	LEAR
X6	*Readable*	READ
X7	*Memorable*	MEMO
X8	*Easy Navigation*	ENAV
X9	*Logical Navigation*	LNAV
X10	*U Site Direction*	UNSD
X11	*Easy-to-Go-Back Option*	EGBO
Variable	**Affective indicator**	
X12	*Color*	COLO
X13	*Brightness*	BRIG
X14	*Harmoniousness*	HARM
X15	*Salience*	SALI
X16	*Appealing and Pleasant*	APPL
X17	*Comfort*	COMF
X18	*Reliability*	RELI
X19	*Attractiveness*	ATTR

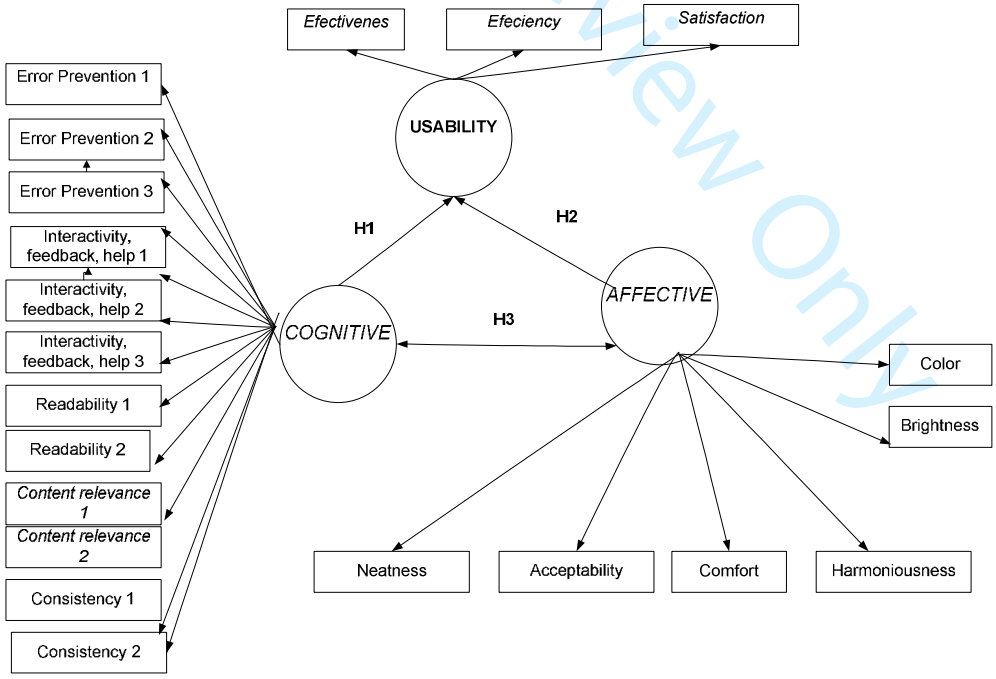


Figure 2 Conceptual model of usability for e-commerce

Table 3 Variables and indicators for e-commerce

Variable	Cognitive indicator	Abbreviation
X1	Error Prevention 1	EP 1
X2	Error Prevention 2	EP 2
X3	Error Prevention 3	EP 3
X4	Interactivity, feedback and help 1	IFH 1
X5	Interactivity, feedback and help 2	IFH 2
X6	Interactivity, feedback and help 3	IFH 3
X7	Readability 1	READ 1
X8	Readability 2	READ 2
X9	Content Relevance 1	CR 1
X10	Content Relevance 2	CR 2
X11	Consistency 1	CONS 1
X12	Consistency 2	CONS 2
Variable	**Affective indicator**	
X13	Color	COLO
X14	Brightness	BRGT
X15	Harmoniousness	HARM
X16	Comfort	COMF
X17	Acceptability	ACCP
X18	Neatness	NEAT

Table 4 Results of Cronbach's alpha test.

Construct	Number of items	Expectation of e-learning web		Perception of e-learning web	
		Cronbach's alpha	$\sqrt{AVE}$	Cronbach's alpha	$\sqrt{AVE}$
Cognitive aspect	10	0.847	0.708	0.890	0.707
Affective aspect	6	0.763	0.706	0.837	0.727
Usability	3	0.784	0.707	0.747	0.729

Note: AVE = average variance extracted

Table 5 Results of confirmatory factor analysis.

Construct	Item	Expectation of e-learning website				Perception of e-learning website			
		SRW	SE	CR	P*)	SRW	SE	CR	P*)
Cognitive aspect		**0.580**				**0.536**			
	EP1	0.700	.149	6.178	***	0.543	.119	9.405	***
	EP2	0.616	.160	7.113	***	0.609	.103	8.467	***
	EP3	0.588	.185	6.603	***	0.552	.123	8.108	***
	LEAR	0.703	.157	5.957	***	0.523	.119	8.843	***
	MEMO	0.629	.149	5.770	***	0.565	.115	9.089	***
	ENAV	0.714	.163	6.374	***	0.699	.116	9.527	***
	LNAV	0.636	.157	6.367	***	0.651	.097	8.786	***
	UNSD	0.689	.157	6.367	***	0.591			***
	EGBO	0.507			***	0.507	.118	8.272	***
Affective aspect		**0.322**			***	**0.62**			
	COLO	0.674			***	0.529			***
	BRIG	0.517	.122	8.075	***	0.558	.072	8.491	***
	HARM	0.728	.135	7.748	***	0.609	.091	10.182	***
	SALI	0.743	.120	7.073	***				
	APPL	0.610	.149	5.830	***	0.575	.127	8.343	***
	COMF	0.783	.127	7.487	***	0.633	.091	10.777	***
	ATTR	0.732	.128	6.683	***	0.595	.087	9.706	***
Usability	EFT	0.658			***	0.625			***
	EFC	0.793	.165	7.652	***	0.775	.165	7.652	***
	SAT	0.658	.123	7.567	***	0.657	.123	7.567	***

Note: ***)= Significant with a significant value of 0.05 *SE*: Scalar Estimates
SRW: *standardized regression weight* *CR*: Construct Reliability

Table 6 Fit indices for the research model

Goodness of fit Index	Expectation of e-learning website			Perception of e-learning website		
	Cut-off Value	Values	Note	Cut-off Value	Value	Note
Chi-square	< 93.945	142.218	Marginal fit	< 93.945	224.190	Marginal fit
CMINDF	≤ 2.0	1.948	Good fit	≤ 2.0	1.525	Good fit
Probability	≥ 0.05	0.000	Marginal fit	≥ 0.05	0.000	Marginal fit
GFI	≥ 0.9	0.919	Good fit	≥ 0.9	0.910	Good fit
RMSEA	≤ 0.08	0.065	Good fit	≤ 0.08	0.049	Good fit
AGFI	≥ 0.9	0.884	Marginal fit	≥ 0.9	0.883	Marginal fit
TLI	≥ 0.9	0.915	Good fit	≥ 0.9	0.953	Good fit
NFI	≥ 0.9	0.871	Marginal fit	≥ 0.9	0.892	Marginal fit

Note: *CMINDF*: *the minimum sample discrepancy function/degree of freedom,*
GFI: *goodness of fit index,* *RMSEA*: *root means square error of approximation,*
AGFI: *(*Adjusted Goodness of Fit Index*), TLI*: *Tucker Lewis Index* *NFI*: *normed fit index*

Table 7 Hypothesis testing results.

Hypothesis	Path	EOEL		POEL		Result
		SPC	t-Value	SPC	t-Value	
H_1	CF ⟹ US	0.536	3.378***	0.58	4.156***	Supported (two-tailed test)
H_2	AF ⟹ US	0.202	2.582***	0.62	1.271***	Supported (two-tailed test)
H_3	CF⟺ AF	0.104	4.492***	0.14	5.102***	Supported (two-tailed test)

Notes: SPC: Standardized path coefficient
EOEL: Expectation of e-learning website
POEL: Perception of e-learning website
***) Significant with a significant value of 0.05
CF: Cognitive factors
AF: Affective factors
US: Usability

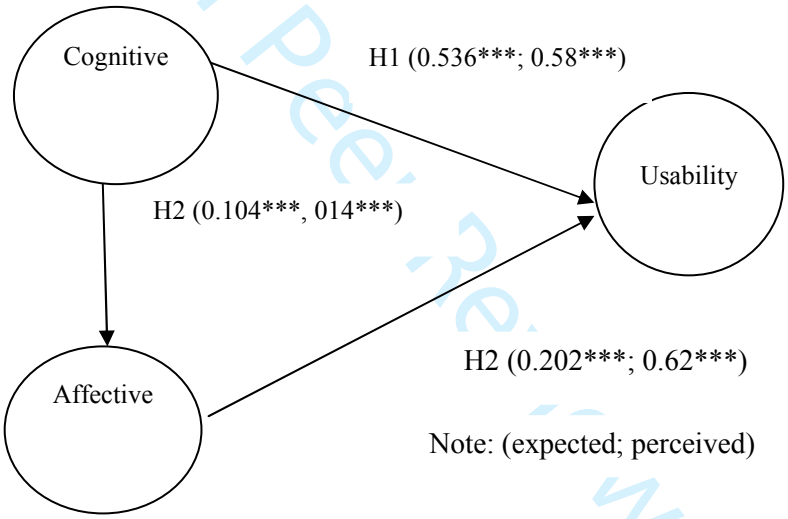


Figure 3 Standardized path coefficients for e-learning

Table 8 Results of Cronbach's alpha test.

Construct	Number of items	EOEC website		Number of items	POEC website	
		Cronbach's alpha	$\sqrt{AVE}$		Cronbach's alpha	$\sqrt{AVE}$
Cognitive	5	0.704	0.667	6	0.728	0.689
Affective	2	0.712	0.577	5	0.744	0.572
Usability	3	0.773	0.796	3	0.791	0.658

Note: EOEC: Expectation of e-commerce website
AVE: Average variance extracted
POEC: Perception of e-commerce website

Table 9 Results of confirmatory factor analysis.

Construct	Item	Expectation of e-commerce website				Perception of e-commerce website			
		SRW	SE	CR	P*)	SRW	SE	CR	P*)
Cognitive Factor		**0.536**			***	**0.802**			***
	EP1	0.625	.149	6.105	***	0.622	.163	7.184	***
	EP2	0.662	.156	5.556	***	0.534	.148	6.890	***
	EP3	0.564	.159	5.514	***				
	IFH2					0.597	.151	6.592	***
	RE1					0.559	.161	6.849	***
	CR2					0.535	.155	6.675	***
	CS1	0.516	.130	6.620	***	0.581			***
	CS1	0.502			***				
Affective Factor		**0.207**			***	**0.207**			**0.204**
	COL	0.552			***	0.552			***
	BRT	0.692	.187	6.861	***				
	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	0.652			***	0.625			***
	EFC	0.744	.220	5.660	***	0.775	.122	9.196	***
	SAT	0.596	.160	6.324	***	0.657	.129	8.257	***

Note: ***) Significant with significant value of 0.05 SE: Scalar Estimates
SRW: Standardized regression weight CR: Construct Reliability

Table 10 Test of the measurement model

Goodness of fit Index	Cut-off Value	Value	Note	Cut-off Value	Value	Note
Chi-square	< 43.773 (5%, 85)	53.031	*Marginal fit*	< 93.945	142.218	Marginal fit
CMINDF	≤ 2.0	1.768	*Good fit*	≤ 2.0	1.948	Good fit
Probability	≥ 0.05	0.006	*Marginal fit*	≥ 0.05	0.000	Marginal fit
GFI	≥ 0.9	0.956	*Good fit*	≥ 0.9	0.919	Good fit
RMSEA	≤ 0.08	0.058	*Good fit*	≤ 0.08	0.065	Good fit
AGFI	≥ 0.9	0.919	*Good fit*	≥ 0.9	0.884	Marginal fit
TLI	≥ 0.9	0.940	*Good fit*	≥ 0.9	0.915	Good fit
NFI	≥ 0.9	0.914	*Good fit*	≥ 0.9	0.871	Marginal fit

Note: *CMINDF*: *the minimum sample discrepancy function/degree of freedom,*
GFI: *goodness of fit index,* *RMSEA*: *root means square error of approximation,*
AGFI: *(*Adjusted Goodness of Fit Index*), TLI*: *Tucker Lewis Index* *NFI*: *normed fit index*

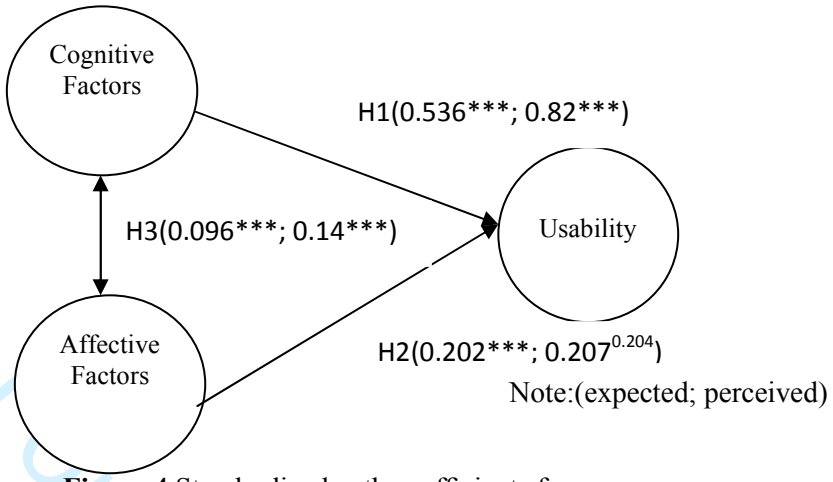


Figure 4 Standardized path coefficients for e-commerce

Table 11 Hypothesis testing results.

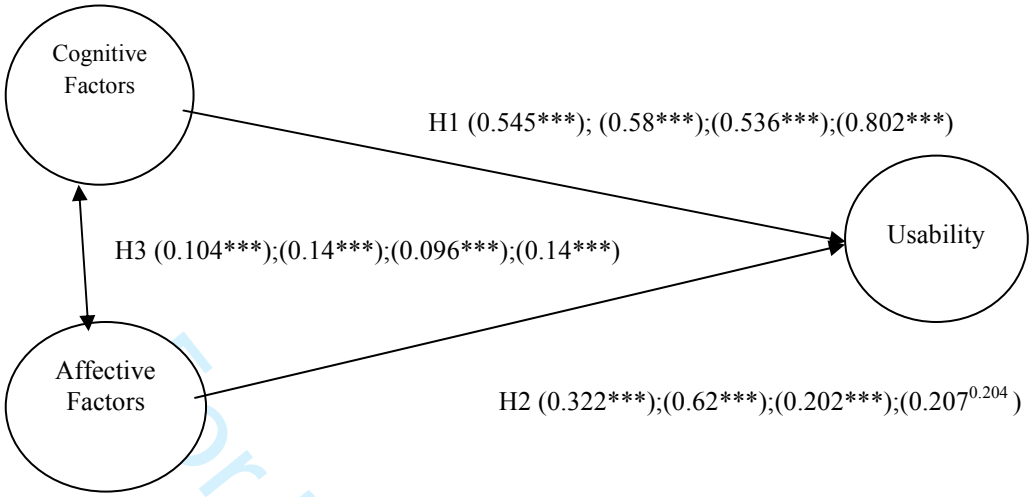
Hypothesis	Path	EOEL		POEL		Result
		SPC	t-Value	SPC	t-Value	
H1	CF ⇨ US	0.536	3.926***	0.58	4.156***	Supported (two-tailed test)
H2	AF ⇨ US	0.202	1.974***	0.62	$1.271^{0.204}$	Non-Supported test
H3	CF⇔ AF	0.096	3.831***	0.14	5.102***	Supported (two-tailed test)

Notes: SPC: Standardized path coefficient
EOEL: Expectation of e-learning website
POEL: Perception of e-learning website
***) Significant with a significant value of 0.05
CF: Cognitive factors
AF: Affective factors
US: Usability

Table 12 Summary of hypothesis testing results.

Hypothesis	Path	E-learning		E-commerce	
		Expected	Perceived	Expected	Perceived
H_1	CF → US	0.545***	0.58***	0.536***	0.802***
H_2	AF → US	0.322***	0.62***	0.202***	$0.207^{0.204}$
H_3	CF ←→ AF	0.104***	0.14***	0.096***	0.14***

***) Significant with significant value of 0.05



Note:
(expected e-learning);(perceived e-learning);(expected e-commerce);(perceived e-commerce)

Figure 5 Visualization of loading factors in four website cases

Appendix

Table 1 Indicators variables and source (e-commerce)

Variables	**Cognitive indicators**	Operational definition/ questionnaires Item	Source
X1	*Error Prevention* 1/EP1	Can multiple but similar tasks be done easily?	Oztekin et al., , 2010
X2	*Error Prevention* 2/EP2	Can the user easily undo selections, actions, errors in arrangement or management of items?	
X3	*Error Prevention* 3/EP3	Do error or warning messages prevent possible errors from occurring?	
X4	*Interactivity, Feedback, and Help1/* IFH1	Does the menu offer multiple opportunities for interaction and communication among the user, to the instructor, and to content?	
X5	*Interactivity, Feedback and Help 2 /* IFH2	Is regular feedback about user performance provided in a timely manner	
X6	*Interactivity, Feedback and Help 3/* IFH3	Is the user provided with sufficient information to know where in the system he/she is?	
X7	*Readability* 1/ RD1	The website is already serving "sentences" that are easy to understand and clear	Lee et al., 2012
X8	*Readability* 2/RD2	The website is already present sufficient margin spacing between sentences so easy to read	
X9	*Content Relevance* 1 /CR1	The website is already present appropriate information related to products sold	
X10	*Content Relevance* 2 /CR2	The website already presents the latest information (up to date) and accurately related products sold	
X11	*Consistency* 1/CS1	The website is already serving a similar display design on every page of his web	
X12	*Consistency* 2/CS2	The website is already present components (items) are similar in each of his web page	

Variables	**Affective indicators**	Operational definition	Source
X13	*Color/* COL	The conceptual image of a product developed by its color (e.g. warm, cool, etc.)	Park et al., 2013 Han et al., 2001
X14	*Brightness/* BR	The image of a product developed by its brightness (e.g. dark, bright, etc.)	
X15	*Harmoniousness/* HR	Feeling that the components of a product are well-matched or in harmony	
X16	*Comfort /* COM	Degree to which the user feels easy and comfortable with a product	
X17	*Acceptability/ACCP*	Feeling that a product is fun and acceptable	
X18	*Neatness/NEAT*	The degree to which the user feels neat and orderly.	

Variables	**Indicator**	Operational definition/ questionnaires Item	
X19	*Effectiveness*	Users are able to operate e-learning accurately and perfectly according to its purpose.	Han, et al. 2001 ; Oztekin, et al..,2010
X20	*Efficiency*	Users in using e-learning can be facilitated in completing its objectives quickly, effectively and economically.	Han, et al. 2001 ; Oztekin, et al..,2010
X21	*Satisfaction*	Users feel satisfied after using e-learning according to its purpose.	Han, et al. 2001 ; Oztekin, et al..,2010

Table 2 Indicators variables and source (e-learning)

Variables	**Cognitive indicators**	Operational definition/ questionnaires Item	Source
X1	*Error Prevention* 1/EP1	Can multiple but similar tasks be done easily?	Oztekin et al., , 2010
X2	*Error Prevention* 2/EP2	Can the user easily undo selections, actions, errors in arrangement or management of items?	
X3	*Error Prevention* 3/EP3	Do error or warning messages prevent possible errors from occurring?	
X4	*Interactivity, Feedback, and Help1/* IFH1	Does the menu offer multiple opportunities for interaction and communication among the user, to the instructor, and to content?	
X5	*Learnable/LEAR*	How to use e-learning can be learned easily.	
X6	*Readable/READ*	The website is already serving "sentences" that are easy to understand and clear	
X7	*Memorable//MEMO*	Steps of using e-learning are easy to remember.	Lee et al., 2012
X8	*Easy Navigation/ENAV*	The website is already a present existing guide to operate e-learning is easy to run.	
X9	*Logical Navigation/LNAV*	The website is already a present existing guide to operate e-learning is logic to run.	
X10	*Understable Site Direction/UNSD*	The website is already serving a similar display design on every page of his web	
X11	*Easy Get Back Option/EGBO*	The website is already a present option to return to the previous page is already available.	

Variables	**Affective indicators**	Operational definition	Source
X12	*Color/* COL	The conceptual image of a product developed by its color (e.g. warm, cool, etc.)	
X13	*Brightness/* BR	The image of a product developed by its brightness (e.g. dark, bright, etc.)	Park et al., 2013 Han et al., 2001
X14	*Harmoniousness/* HR	Feeling that the components of a product are well-matched or in harmony	
X15	*Salience/* SL	The degree to which a product is outstanding, prominent, and catching one's eyes	
X16	*Appealing and Pleasant/APPL*	The appearance of e-learning is interesting and can arouse user interest	
X17	*Comfort/COMF*	The degree to which the user feels easy and comfortable with an e-learning	
X18	*Reliability/RELI*	The degree to which the user feels reliable can be trusted with an e-learning	
X19	*Attractiveness/ATTR*	The degree to which the user feels very pleasing with an e-learning	

Variables	**Indicator**	Operational definition/ questionnaires Item	
X19	*Effectiveness*	Users are able to operate e-learning accurately and perfectly according to its purpose.	Han, et al. 2001 ; Oztekin, et al..,2010
X20	*Efficiency*	Users in using e-learning can be facilitated in completing its objectives quickly, effectively and economically.	Han, et al. 2001 ; Oztekin, et al..,2010
X21	*Satisfaction*	Users feel satisfied after using e-learning according to its purpose.	Han, et al. 2001 ; Oztekin, et al..,2010

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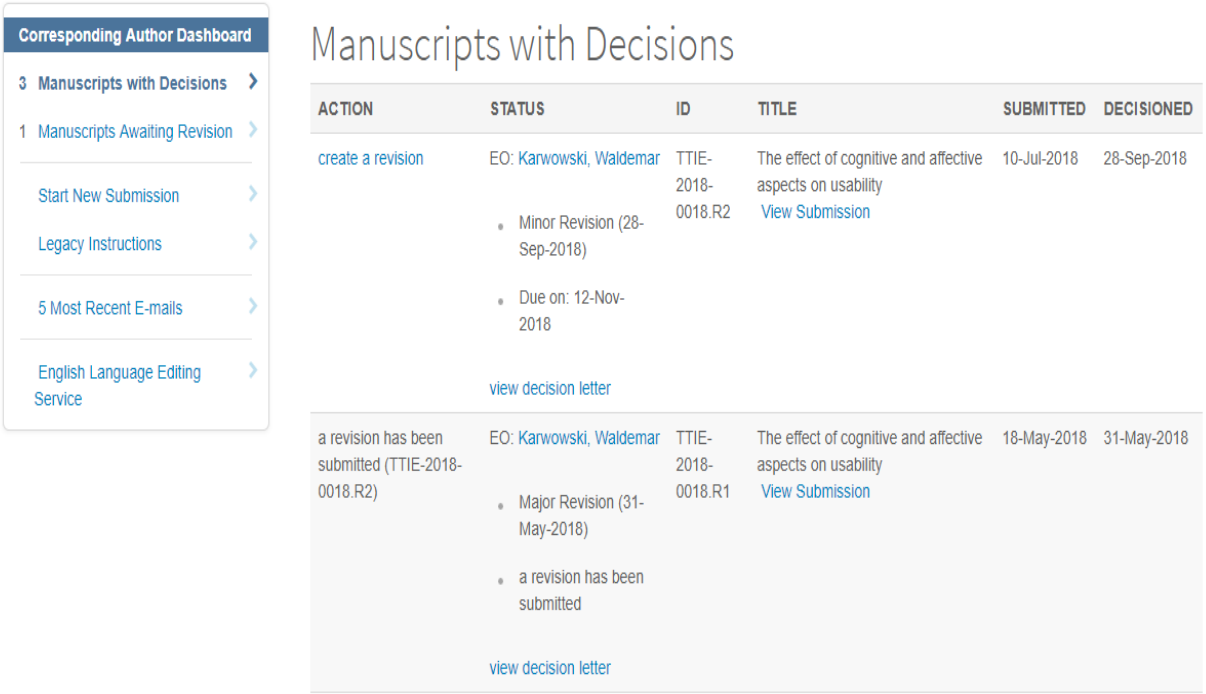
	Moses Laksono Singgih is a is a Professor and senior lecture at the Department of Industrial Engineering.He passed his Master Doctoral degree in in University of Queensland, Australia. To date, Moses has teaching responsibility for Graduate and Doctoral student Program in many Departments of ITS, courses taught: Sustainable Manufacturing and Environmental Management. Quality Management, Advanced Manufacturing System, He is a Certified an Associate Professional
	Markus Hartono is an Associate Professor at the Department of Industrial Engineering, University of Surabaya, Indonesia. He received his Bachelor of Engineering (B.Eng.) in Industrial Engineering from University of Surabaya (Ubaya), Indonesia, in 2000 with predicate of Cum Laude. In 2004, he received the ASEAN Graduate Scholarships (AGS) award for pursuing his master's degree in Industrial and Systems Engineering from National University of Singapore (NUS), and he obtained his Master of Science (M.Sc.) in 2005. In 2008, he received a prestigious award of NUS Graduate Research Scholarships for 4 years for pursuing his PhD, and obtained his PhD degree in 2012. He received Best Paper Award of the 14th & 15th Quality in Research (QiR) in 2015 and 2017, respectively. His teaching and research interest is in ergonomics, product design and management, Kansei Engineering, and time and motion study. He is a Certified Human Factors Professional (CHFP), a member of IEA Affective Design Technical Committees, and Vice President of Indonesian Ergonomics Society (IES) 2015–2018.



From: editor@twc.com

To: heruprastawa@undip.ac.id

CC:

Subject: Theoretical Issues in Ergonomics Science - Decision on Manuscript ID TTIE-2018-0018.R2

Body: 28-Sep-2018

Dear Mr Prastawa:

Your manuscript entitled "The effect of cognitive and affective aspects on usability" which you submitted to Theoretical Issues in Ergonomics Science, has been reviewed. The reviewer comments are included at the bottom of this letter.

The reviews suggest with revisions that your paper could be suitable for publication. Please consider these suggestions, and I look forward to receiving your revision.

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Sincerely,
Professor Karwowski
Co-Editor in Chief, Theoretical Issues in Ergonomics Science
editor@twc.com

Comments to the Corresponding Author

Review document for grammar issues.

The following statement does not make sense. The authors indicate that "This study focuses on measuring visceral affect, other factors such as emotions, attitudes, moods and affective traits are not considered in this study." There so called "other" factors are the only types of affect that exist. Which of them are you measuring? The so called "visceral" affect must is by definition an emotion. You may not be measuring discrete emotions (e.g., happiness, sadness, anger) but from what I can understand you are targeting representations of emotions felt while interacting with the website. If you are not measuring emotions then perhaps you are measuring attitudes, but attitudes come together from emotions and cognitive experiences, thus I am not sure they are representative of the "visceral" affect reactions you seek. Whatever it is you are targeting you must be consistent with what is understand about human experiences.

I understand what you are trying to do yet the manuscript is very cryptic. In one part you describe "In this study, participants were requested to complete a questionnaire to obtain the expected level
of importance indicators that should be attached to the site, while the perception of assessment was based on the facts and experience in using the selected sites." Are you saying that participants first rated the importance of the questions in your questionnaire and then had an experience with a website and rated their experience using the questionnaire?
Further in the document the authors indicate "The participants were asked to evaluate the importance of individual usability indicators". Yet how can asking untrained undergraduate for the importance of usability factors (which they may have little understanding of) be a valid approach? Or is this statement indicating that participants simply rated their experience.
As you can see I am very confused as to the methodology you utilized, and thus your results are hard to interpret the reader cannot understand what you did or how the data came together.

Date Sent: 28-Sep-2018