Analysis of usability factors affecting purchase intention in online e-commerce sites

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Abstract. The growing number of internet users plays a significant role in the emergence of a variety of online e-commerce sites to meet the needs of Indonesians. However, there are still some problems faced by the users in using e-commerce sites. Therefore, a research related to user experience on their purchase intention to foster e-commerce sites is required. This study is conducted to find out the relationship between usability factors on e-commerce users’ purchase intention using a case study by using SEM to analyse the usability of the website. The result of this study shows that credibility, readability and telepresence are usability factors that directly affect purchase intention, while simplicity, consistency and interactivity are usability factors that indirectly affect purchase intention. Therefore, we can conclude that Indonesian consumers are on the Early Majority phase in adopting Company A.

1. Introduction

With around 255.5 million citizens, Indonesia is the fourth most populated country in the world. Population growth in Indonesia is also followed by the continuous development of technology, thus increasing the number of internet usage in Indonesia for about 3% every year [8].

Online shopping is one of the use of internet technology. With the provision of convenience, the number of consumers who shop online increases up to 7.4 million by 2015. The amount of online transaction in online E-commerce sites also increases. Total transaction recorded in 2015 was US$ 3.56 billion and it is predicted to reach US$ 4.96 billion in 2016 due to the increasing affordability of upper middle class. According to a preliminary study conducted using online questionnaire on 123 respondents, it is known that 84.6% of them have experienced shopping online on e-commerce sites. This shows that online shopping is starting to be common practice for Indonesian citizens.

The impacts of website design on customers’ purchase within the e-commerce scope could not be fully understood without doing website usability evaluation (DeLone and McLean, 2003) in [4]. Developing a useful website is very important on the success of e-business, because online consumers are only able to touch, feel, search and see the products (and service) through website. Developing a useful website is also known to give positive impact on online shop, increase loyalty and returning visits, and stimulate online purchase [4]. Some scientists have also done a research on the relationship between usability construct and various variables, such as between website usability and users’ perception, action, and determinants of user perceptions.

The measurement discussed in this study is about UX, focusing on analyzing usability factors affecting purchase intention in Indonesia’s online e-commerce sites. E-commerce sites will be represented using Company A. The purposes of this study are: 1. Knowing the usability factors affecting Company A users’ purchase intention; 2. Knowing the relationship between usability factors and...
Company A users’ purchase intention; 3. Giving recommendation to Company A in developing their facility according to User Experience. The result of this study is expected to help in developing or designing e-commerce website that could satisfy Indonesian users’ needs.

2. Preliminary concepts

2.1. User experience (UX)
UX quantitative model concept constructed by [6] is the most comprehensive one. The model is consisted of overall UX and three UX elements, namely usability, affect and user value (see figure 1). UX of an operating system is also affected by user interface, therefore a sufficient interactive system is needed. Interactive system provides a broad and complex functionality, and UX quality highly depends on its usability aspect.

2.2. Usability
According to ISO 1998, usability refers to the extent to which a product could be used by specific users to reach specific purposes with effectiveness, efficiency, and satisfaction in specific usage context. Developing a useful website is an important aspect in the success of e-business, because the internet is rapidly developing. Website usability refers to the extent to which a website could be used by the users to reach specific purposes in accessing with effectiveness, efficiency, and satisfaction in specific usage context.

Website usability construct is built up by Simplicity, Readability, Consistency, Interactivity, Learnability, Navigability, Content Relevance, Supportability, Credibility, and Telepresence factors [4]. A previous research also saw the relationship between website usability and purchase intention, thus forming a usability model as seen in figure 2 below.

Figure 1. UX Quantification Conceptual Diagram

Figure 2. Framework Website Usability Model

2.3. Technology adoption lifecycle (TALC)
Technology Adoption Lifecycle (TALC) is a socio-economic model which explains how a new idea and technology is distributed through consumers’ different cultures. This model describes the acceptance of a new product or innovation according to demographic and psychological characteristics of the recipient group. In other words, technology adoption lifecycle describes how a market develop new products. This TALC model elaborates the adoption stages of a new product or innovation, which is divided into 5 categories, namely innovators, early adopters, early majority, late majority, and laggards. They are illustrated by a belt-shaped curve [5].

2.4. Theoretical Framework
In general, the theoretical framework of this paper is presented in figure 3. This study focuses on the relationship between usability factors that affects e-commerce users’ purchase intention. The analysis is
done using Structural Equation Modelling (SEM). Company A is a representation of the market condition in Indonesia. The results will later be elaborated and analyzed further using Technology Adoption Lifecycle (TALC). The final results of this study are expected to provide improvement strategies that could be implemented for the development of Company A.

![Figure 3. Theoretical Framework of this Study](image)

3. Method of research and results

3.1. Method of research

The data type used in this study is primary data. The data is collected by distributing research instrument in a form of quantitative questionnaire. Google Forms service is used to make the questionnaire and it is then distributed online. The questionnaire uses likert scale of 5 to find out the level of agreement. Target respondents of this study are Company A users residing in DKI Jakarta and West Java.

| Hypothesis | Information |
|------------|-------------|
| H1         | Simplicity will positively affect the Interactivity |
| H2         | Simplicity will positively affect the Telepresence |
| H3         | Interactivity will positively affect the Telepresence |
| H4         | Navigability will positively affect the Telepresence |
| H5         | Simplicity will positively affect the Readability |
| H6         | Consistency will positively affect the Readability |
| H7         | Consistency will positively affect the Navigability |
| H8         | Consistency will positively affect the Learnability |
| H9         | Supportability will positively affect the Purchase Intention |
| H10        | Credibility will positively affect the Purchase Intention |
| H11        | Content Relevance will positively affect the Purchase Intention |
| H12        | Interactivity will positively affect the Purchase Intention |
| H13        | Telepresence will positively affect the Purchase Intention |
| H14        | Readability will positively affect the Purchase Intention |
| H15        | Navigability will positively affect the Purchase Intention |
| H16        | Learnability will positively affect the Purchase Intention |

This study uses usability construct model on purchase intention. This model constructed by [4] could provide a broader information and knowledge because it takes usability construct, which directly and indirectly related to purchase intention, into account. There are 11 latent variables in this study, namely Simplicity, Readability, Consistency, Interactivity, Learnability, Navigability, Content Relevance, Supportability, Credibility, Telepresence, and Purchase Intention. This study model is resulting in 16 hypotheses to be tested as shown in Table 1.

Validity and Reliability testing was conducted to determine the feasibility of the data obtained before inputting data to LISREL 8.80 software. SEM method used to analyze the relationship between factors of usability. Further analysis is then done using TALC method to determine Company A’s users’ characteristics so a solution for improving Company A’s website usability could be given.

3.2. Data processing result

This study is conducted using SEM method (LISREL 8.80 software). By Confirmatory Factor Analysis (CFA) in the measurement model, the first step is model specification. There are five exogenous and six endogenous variables with 3 to 5 observed variables each as seen in Appendix A. The second step is identification which needs an over-identified model. The model in this study is already categorized as over-identified with 875 degrees of freedom score. The third phase is estimation using Maximum Likelihood estimator which needs a minimum data of 220 respondents, and the data collected is of 729 respondents, thus making it sufficient. In goodness of fit test, validity test and reliability test are
conducted. Validity tests shows minimal t-value as 1.96 and standardized loading factor (λ) > 0.50, while reliability test shows construct reliability value as (CR) ≥ 0.70 and variance extracted (VE) ≥ 0.50. From the calculation, we could see that there are some values that are below standard, therefore a respecification is conducted to delete S3, S4, I1, N2 variables (marked by * in Appendix A). Then, goodness of fit test is reconducted and the result shows that the model is valid and reliable with 11 latent variables and 40 items used. Afterwards, structural model goodness of fit test is conducted, and the result shows that the entire models are good fit (Table 2). Structural Model Analysis is also seen from t-value path hybrid model to know the relationship between latent variables from study model.

| Goodness of Fit          | Recommended value | Result | Information            |
|--------------------------|-------------------|--------|------------------------|
| Chi-square (χ²)          | Small value       | 2827.75| Bad Fit                |
| p-value                  | p>0.05            | 0.00   | Good Fit               |
| Goodness of Fit Index (GFI)| ≥0.90           | 0.84   | Marginal Fit           |
| Root Mean Square (RMR)   | RMR≥0.05          | 0.05   | Good Fit               |
| Root Mean Square Error of Approximation (RMSEA) | RMSEA ≤ 0.08 | 0.061 | Good Fit               |
| Non-Normed Fit Index (NNFI) | ≥0.90        | 0.98   | Good Fit               |
| Normed Fit Index (NFI)   | NFI≥0.90          | 0.97   | Good Fit               |
| Adjusted Goodness of Fit Index (AGFI) | AGFI≥0.90 | 0.81   | Marginal Fit           |
| Relative Fit Index (RFI) | RFI≥0.90          | 0.97   | Good Fit               |
| Incremental Fit Index (IFI) | ≥0.90          | 0.98   | Good Fit               |
| Comparative Fit Index (CFI) | CFI≥0.90 | 0.98   | Good Fit               |
| CN                       | CN≥200            | 234.1  | Good Fit               |

4. Analysis

4.1. T-value analysis

T-value could describe the influence between one latent variable on another. Reference [10] explains that a variable is said to have an influence if the t-value is ≥ 1.96. According to structural model t-value, there are 10 hypotheses Accepted or above standard and 6 hypotheses Rejected or below standard. T-value of H1, H2, H3, H5, H6, H7, H8, H10, H13, and H14 are above 1.96. And t-value of H4, H9, H11, H12, H15, H16 are below 1.96. In other words, the result of this study shows that Company A users significantly feel that readability, telepresence and credibility could affect users’ purchase intention in online e-commerce sites. However, supportability, interactivity, navigability, learnability, and content relevance factors of Company A have not significantly affect purchase intention. Moreover, Company A’s simplicity and consistency through readability factor and interactivity through telepresence factor also indirectly affect users’ purchase intention. In other words, Company A consumers are now paying more attention to non-technical aspect such as transaction safety and confidentiality, easiness in understanding the website, as well as sense of belonging in Company A when purchasing.

4.2. Technology adoption lifecycle (TALC) analysis

According to Technology Adoption Lifecycle, which has five adoption stages: Innovators, Early Adopter, Early Majority, Late Majority and Laggards, we can conclude from the result of this study that Company A’s consumers are in Early Majority stage in accepting Company A as one of Indonesia’s online e-commerce website. In this phase, consumers are considered pragmatic because they tend to be cautious towards new product or innovation [5]. Consumers tend to be influenced by personal information source from the ones around then and will gather as much information relating to the advantages of the available product or innovation. Furthermore, consumers also depend on the other consumers’ experience in using a product or innovation. Consumers in this phase tend to avoid the risk of using new product or innovation, so they have relatively long time in making decisions compared to the consumers in Innovators and Early Adopters stage. With Early Majority stage market condition, companies have a few choices in developing marketing strategy, namely:
1. As a marketplace, Company A could do a collaboration and provide education to SME community about the importance of online media in reaching broader market, so that SME business operators could be interested in marketing their products through Company A.

2. Company A could design a website by combining pictures and font with a minimum standard size of 14 pixels [2]. This font size change will make it easier for users to read and understand the information stated on the website.

3. The company should provide education and make promotions regarding to shopping security and provide warranty for every purchase made in Company A. Furthermore, to increase Company A’s credibility on Indonesian consumers’ eyes, those efforts should be compensated by a good customer service support.

5. Conclusion
This study is conducted to identify the impact and relationship between usability factors on purchase intention in Company A. According to the model studied, usability factors that directly give positive impact on purchase intention are readability, telepresence, and credibility. Usability factors that indirectly give positive influence are simplicity, consistency, and interactivity.

The result of this study shows that according to Technology Adoption Lifecycle, Company A’s consumers are now on Early Majority stage in adopting Company A as Indonesian online e-commerce website. Consumers in this stage will tend to be more cautious in accepting innovation that they are considered pragmatic. Consumers will gather as much information as possible in accepting new information to reassure that the innovation is stable and that its benefit has been proven. In this case, Indonesian consumers are still more concerned with credibility, sense of belonging, and readability factor of an online e-commerce website.

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Appendix A. Definition and instrument items of factor used

| Construct      | Definition                                                                 | Instrument Items                                                                 | Code | Ref          |
|----------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------|------|--------------|
| Simplicity (S) | Provision of minimum contents and functions within a website              | The structure of the website is succinct                                          | S1   | Lee and Kozar (2012) |
|                |                                                                          | I can comprehend most components of a page within seconds                        | S2   |              |
|                |                                                                          | *The website has components that are not necessary                               | S3   |              |
|                |                                                                          | *There are redundant components in the website                                   | S4   |              |
| Readability (R)| Extent to which website components are well organized and easy to read and understand | The website's wording is clear and easy to understand                            | R1   | Lee and Kozar (2012) |
|                |                                                                          | The website has enough white space (or margins) to make it readable              | R2   |              |
|                |                                                                          | Every page contains the appropriate amount of components to fit into a page      | R3   |              |
|                |                                                                          | The website uses colors and structures that are easy on the eyes                 | R4   |              |
| Consistency (Cs)| Consistent location of page components within and across pages          | The website repeats the same structure, components, and overall look across pages | Cs1  | Lee and Kozar (2012) |
|                |                                                                          | The website contains similar components across web pages                          | Cs2  |              |
|                |                                                                          | Web pages in the website are consistently designed                              | Cs3  | (2012)       |
|                |                                                                          | Each web page on the website is of similar design                                | Cs4  |              |
| Interactivity (I)| Website's ability to create vivid interaction and communication with users | *The website provides an appropriate amount of interactive features (e.g., graphics, pop-up windows, animation, music, voices) | I1   | Lee and Kozar (2012) |
|                |                                                                          | The website contains components to help the interaction between it and consumers | I2   |              |
|                |                                                                          | Interactive features of the website are vivid and evoke responses                | I3   |              |
|                |                                                                          | The website provides features for interactive communication between consumers, or between consumers and the online company | I4   |              |
### Appendix A. Definition and instrument items of factor used (cont.)

| Construct | Definition | Instrument Items | Code | Ref |
|-----------|------------|-----------------|------|-----|
| Learnability | Easy to learn the main functionality and gain proficiency to complete the tasks | The contents provided by the website are easily understood | L1 | Lee and Kozar (2012) |
| | | The website is designed for easy understanding | L2 |
| | | I can easily remember how to reach the same page when I visit next time | L3 |
| | | As time passes, I am more accustomed to the website with less effort | L4 |
| Navigability | Capability to provide alternative interaction and navigating techniques | The website provides multiple search features (e.g., search engine, menu bar, go-back-and-forward button, etc.) to obtain the target information | N1 |
| | | *The web page that I am looking for can be reached through multiple pathways | N2 |
| | | There are multiple ways to access the web page that I am looking for and/or return to shopping menus | N3 |
| | | It is very easy to locate what is needed in this website | N4 |
| | | The website keeps the user oriented as they shop | N5 |
| | | The website contains in-depth information | CR1 |
| | | The website provides up-to-date information | CR2 |
| | | The scope of information provided by the website is appropriate | CR3 |
| | | The information provided by the website is accurate | CR4 |
| Content Relevance | Extent to which the content is up-to-date and pertinent | While visiting the website, I feel that I can get just-in-time support anytime I need it | Sp1 |
| | | The website provides features to ask for help anytime I need | Sp2 |
| Supportability | Additional information and support mechanisms readily available to enhance the website use | Getting support through a series of options is easy and convenient | Sp3 |
| Credibility | A holistic concept that covers an online user's perception of security, privacy, and reliability during the navigation | I feel safe in my transactions with the website | C1 |
| | | I trust the website to keep my personal information safe | C2 |
| | | I trust the website administrators will not misuse my personal information | C3 |
| | | The website is stable to use | C4 |
| | | The website provides detailed information about security features | C5 |
| Telepresence | Sense of presence in a virtual environment created by a computer/communication medium | I feel empathy with the website | T1 |
| | | I feel I have personal ties to the website | T2 |
| | | I feel as though I am emotionally connected to the website | T3 |
| Purchase Intention | How likely the user wishes to buy products from the website | I plan to shop at Company A’s website in the future | PI1 |
| | | I intend to shop at Company A’s website in the future | PI2 |
| | | I predict I would buy a product from Company A’s website in the future | PI3 |

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