

## MEASURING USER EXPERIENCE IN AN ONLINE STORE USING PULSE AND HEART METRICS

**Paulus Insap Santosa**

Department of Electrical Engineering and Information Technology, Universitas Gadjah Mada

Email: insap@ugm.ac.id

### Abstrak

Beberapa sukses faktor toko daring dapat diringkas ke dalam elemen kebergunaan toko daring tersebut. Secara umum, kebergunaan berfokus pada kegunaan dan dapat digunakannya toko daring untuk membantu kustomer belanja secara daring. Akhir-akhir ini pengalaman positif pengguna ketika berbelanja secara daring menjadi tuntutan yang semakin nyata. Kebergunaan dan pengalaman pengguna adalah dua hal yang berbeda meskipun sangat berkaitan. Kebergunaan berfokus pada produk, dan pengalaman pengguna berfokus pada perasaan dan emosi pengguna. Artikel ini melaporkan studi empiris untuk mengidentifikasi faktor yang berkontribusi pada pengalaman positif situs belanja daring. Responden berjumlah 121 yang merupakan mahasiswa yang belum pernah melakukan belanja daring. Para responden dihadapkan pada sebuah toko daring yang menjual beberapa barang. Mereka mengikuti skenario yang memungkinkan mereka melihat hampir semua fitur toko daring. Pengalaman pengguna diukur dengan menggunakan kombinasi metrik PULSE dan HEART dengan beberapa modifikasi untuk disesuaikan dengan keadaan. Analisis data menunjukkan bahwa responden mendapatkan manfaat yang lebih tinggi dibanding biaya yang harus ditanggung, dan kebahagiaan dan sukses menjalankan tugas merupakan dua peubah yang memberikan pengaruh tertinggi kepada pengalaman pengguna.

**Kata kunci:** pengalaman pengguna, kebergunaan, toko daring, PULSE, HEART, scenario

### Abstract

*Several success factors of online store can be summarized as usability. In general, usability focuses on how useful and usable the online store toward helping customers in doing their online shopping. Recently, more demand towards user positive experience becomes apparent. Usability and user experience are two different things but closely related. Usability focuses on products, and user experience focuses on user's feelings and emotion. This paper reports an empirical study to determine factors contribute to positive experience in an online store success. There were 121 respondents who were students who had never done online shopping. They were exposed to a mockup online store selling several merchandises. They followed certain scenario that allowed them experiencing most online store features. User experience was measured using a combination of PULSE and HEART metrics with some modification to suit the current condition. Data analysis showed that respondents gained more benefit compared to the incurred cost, and happiness and task success were two variables provided more influence to user experience.*

**Key words:** user experience, usability, online store, PULSE, HEART, scenario.

## INTRODUCTION

The main characteristic of the new services on web-based applications, among others, is the ever increasing content that can dynamically be created by its users, changing patterns of use, and the emergence of composite applications and services provided by different parties. This condition creates increasing difficulties to the institutions or organizations to see clearly the quality of the user experience of their web-based. User's expectation for speed and availability of web-based applications is also increasing. If they cannot ensure the optimal level of end-user experience quality, their businesses are jeopardized.

Web-based applications are now become an integral part of everyday life. Users increasingly want a simple interface, useful, and tangible. To develop web-based applications that meet these criteria, thus different from existing competitors, the measurement of web-based applications that only taking into account of its usefulness is no longer sufficient. Thus, measuring the usability of web-based applications is no longer enough. Beside usability, more comprehensive user experience needs to be measured as well.

## LITERATURE REVIEW

Online store has been the focus of many studies for both the design and its success factors, e.g. store design[1], affective aspect of e-commerce user interface [2], product information and categorization [3], hedonic, goodness, and beauty of the design[4], and hedonic and utilitarian motivation [5]. In a quest to have more understanding of factors influencing user experience, [6] conducted a study to analyze the design of websites across German, Japan, and the US. To pin point certain criteria of web design element investigated in this study, it seems that the US put the highest percentage of navigation, and Japan was the lowest. On the other hand, Japan ranks first in term of web content, in which 71% of their web emphasized at the content and Germany ranks last, i.e. 20%. In different setting, [7] stated that web experience is considered as a key factor in determining buyer's decision.

ISO 9241-210:2010 clause 2.15 defines user experience as "person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service". It includes "all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use". It is "a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of the interactive system, the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use". Furthermore, clause 2.15 also mentions "usability criteria can be used to assess aspects of user experience" [8]. It explores users' affective feeling that is experiential, meaningful, and worthwhile after they have finished using certain product<sup>1</sup>.

User experience is dynamic feelings that depends on internal and emotional condition of a person, which is likely to undergo changes during and after interaction with a product [9][10]. HCI field mentions three important components of user experience, i.e. emotions, motivation, and reflection[11]. Based on some notions, [12] defines the user experience as positive or negative emotions that can be experienced by a user when he uses a product and when he is done using that product that can motivate him to use the same product at the later date.

In order to measure user experience, several factors that influence user experience directly and indirectly needs to be known. According to [12], there are two factors that affect the user experience before, during, and after a user is using a product, namely the basic needs of users and the product quality. Users' basic needs are the main reason they use certain products [13]. Furthermore, [12] states that the fulfillment or frustration of the above needs influence user experience that is determined by product quality. According to [14], product quality product is determined by its utility, usability, visual appeal, and hedonic quality. Interactivity and convenience have also been considered as

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<sup>1</sup>[http://en.wikipedia.org/wiki/User\\_experience](http://en.wikipedia.org/wiki/User_experience)

web success, e.g. [15]. In addition, [16] divided web elements as high task relevant environmental cues including web structure, content organization, and navigation structure. These three are in fact emphasized by [17].

Several metrics or frameworks for measuring user experience aim to the overall health of the products are mostly focus on the business or technical aspects of the product. Those metrics include PULSE, HEART, and GSM [18]. Related to the online store, PULSE comprises:

- *Page view*: the average number of web visit in certain period of time
- *Uptime*: the average number of hours that the web is in service in certain period of time
- *Latency time*: the average time that is needed to access the web in certain period of time
- *Seven-day active users*: the average number of different visitors who visit the web in certain period of time. Revisit is excluded.
- *Earnings*: the perceived benefit that the users obtain after they have finished using the web. This variable is mainly intangible.

By focusing on the online store, [18] defined HEART metrics as:

- *Happiness*: this metric is closely related to the aspects of user experience such as satisfaction, positive recommendation, and perceived ease of use.
- *Engagement*: this metric is related to user involvement on a web. The metric is often associated with frequency, intensity, or depth of interaction with a web at certain period of time.
- *Adoption*: this metric is used to determine the number of new visitors using certain criteria, e.g. the number of new users registering on a website.
- *Retention*: this metric is used to determine the number of visitors who made repeated requests for certain period of time after previous period is exceeded.
- *Task success*: this metric is closely related to the efficiency, effectiveness, and error rate.

A simpler framework than the above two is referred to as GSM, stands for goal, signal, and metric. This framework refers to the *goal(s)* to be achieved by certain product equipped with built in features. This goal will be followed by identifying *signals* that indicate the level of success of a product, and

the development of *metrics* to observe the signal that has been identified previously.

PULSE and GSM focus on certain product, while HEART focus on the users' emotional feelings after they have finished using the product. The framework proposed by [12] combines the human basic need (relatedness, influence/popularity, stimulation, competencies, security, and autonomy) and the product quality (utility, usability, visual attractiveness, and hedonic quality).

There are other methods that can be used to track and analyze web-based application. Data mining has been used to categorized customers based on their behavior, e.g. [19]. Another method to test the online store design using two similar but different designs, often called as A/B test, has been used by [20]. In this study, two similar websites were developed. In shopping cart screen, for example, two groups of users were exposed to the same information but different designs. For example, in the first web, there are two 'Continue Shopping' buttons, while in the second web there is only one button.

## HYPOTHESES DEVELOPMENT

Web design elements have been divided into two categories, i.e. motivators and hygiene factors [21]. Motivators are those elements that enhance user's satisfaction with the web. Hygiene factors are those elements that must be available in order for the web to work normally. In different setting, these two factors have been operationalized as perceived benefit and perceived cost, e.g. [22]. Naturally, although users are hardly care about the hygiene factors, especially when they enjoy working with the web. This is apparent, for example, when the Internet speed getting slower, as long as there is still something interesting, users are still willing to stay put. To keep users' stay, a web should be designed in such a way that the perceived benefit is always greater than the perceived cost. This is also applicable especially to online store. As such, the first hypothesis is stated as follow:

- H1: Online store provide its users with more benefit than the incurred cost.

As stated earlier, several factors have been identified as online store success factor, e.g. presentation flaws [23], web atmosphere [16], familiarity and usability [24], informativeness [25], and social influence [26]. On the other hand, no one knows which factor is superior compare to the rest. This can be understood as the previous studies were conducted in different setting. This current study, although it is also using different setting, tries to understand which of the metric of HEART metrics is superior to the rest. As such, the following hypothesis is stated:

H2: There is a metric in HEART metrics that superior as compared to the rest.

## RESEARH METHOD

**Survey Questionnaire** As stated in the previous section, both PULSE and HEART metrics comprise five different metrics each. Due to the time constrain in order to answer hypothesis H1, this current study took three metrics from PULSE metrics, i.e. uptime, latency, and earnings. In [21] both uptime and latency were considered as hygiene factors. Thus, following [22], these two were combined into operational variable named perceived cost. Looking further at the perceived cost, the measurement of perceived cost was also considering several factors as stated in [21]. Earning was then named as perceived benefit and it was measured using several items that were considered as the benefit of conducting activities in an online store.

In order to answer hypothesis H2, three metrics were employed in this study, i.e. happiness, engagement, and task success. These three metrics were then operationalized according to the definition given by [18]. As such, there were five variables, i.e. perceived benefit, perceived cost, happiness, engagement, and task success, each of which comprised four items. Table 1 presents the survey questionnaire that originally written in Indonesian Language. These questionnaires were measured using 5-point Likert scale, where “1” stands for “strongly disagree” and “5” stands for “strongly agree”.

Subjects and Scenario

Subjects were second year students who never purchased any merchandise from online store. The subjects were voluntarily participated after a call for participation was emailed to them. Total number of subjects was 121 students. Due to limited space, the subjects each group was divided into three smaller groups, each smaller group comprised 20 subjects, except for one group.

Table 1. Survey questionnaires.

No.	Statement
1.	Product information is complete
2.	The store displays various products
3.	Checkout process is easy
4.	The store design is excellent
5.	The navigation is hard to follow
6.	Information about product is confusing
7.	Access to the online store is slow
8.	Uptime is intermittent
9.	I feel satisfied after using this online store
10.	I am happy to shop using this online store
11.	I feel that this online store is easy to operate
12.	I am happy with the design of the online store
13.	I will increase my using this online store
14.	I will use this online store to by my favorite products
15.	I feel comfortable with this online store
16.	I feel happy to use this online store
17.	I can choose product easily
18.	I can checkout very fast
19.	I can easily get information I need
20.	I can easily add and subtract product from my shopping cart

There were four scenarios were used to allow the subjects to move around the online store implemented that they were able to exercise all provided features. The four scenarios were as follow:

1. Subjects were asked to buy one piece of school backpack, put it into shopping cart, followed by filling in checkout data before they were brought to the checkout counter to pay for the merchandise bought.
2. Subjects were asked to look for a playing doll with certain brand, and when they

found it, they were asked to buy one unit of this doll. However, before they went to the checkout counter, they were asked to change the quantity several times. This scenario was used to test the adding or subtracting quantity before they were asked to checkout.

3. Subjects were asked to buy certain merchandise with predetermined quantities, put them into shopping cart. It continued with adding different merchandise before subjects were asked to go to the checkout counter.
4. Scenario 4 similar to scenario 3. However, after second merchandise was added to the shopping cart, the first merchandise was taken out/deleted from the shopping cart. Before subjects were asked to go to the checkout counter, they were asked one more time to search for certain merchandise, and put them into shopping cart.

## THE EXPERIMENT

As stated earlier, due to limited space, subjects were divided into six groups. At the beginning of the experiment, subjects were admitted to the laboratory, given a brief introduction telling them about the purpose of the experiment, and let them familiarized with the mockup online store presented to them. In this session, they could ask question regarding the experiment as well as the mockup.

After introduction section, subjects were instructed to do some activities according to the above scenario. During this activity, subjects were kept from each other that they were not allowed to talk to each other. After they have finished with their activities, roughly in 20 minutes time, they were presented with the post survey as presented in Table 1.

## DATA ANALYSIS AND DISCUSSION

### Questionnaires Reliability and Normal Distribution

In total, there were five variables and each of them was measured using 4 items as stated in Table 1. Questionnaires' reliability was checked using Cronbach's Alpha score.

Table 2 shows the Cronbach's Alpha score for each variable. It can be seen from Table 2 that each variable has Cronbach's Alpha score that is greater than 0.7. Thus, all variables were reliable and suitable for further analysis [27].

One measure of whether follow normal distribution is to check their skewness score. According to [28], data are deemed to follow normal distribution when their skewness score is between -1.0 and 1.0. Table 2 shows that all variables follow Hildebrand's rule of thumb that all data are deemed to follow normal distribution. Thus, all data are suitable for further analysis.

Table 2. Questionnaires Reliability and Normal Distribution\*\*

Variable	Cronbach's Alpha	Skewness
Perceived Benefit	0.737	-0.940
Perceived Cost	0.715	0.142
Happiness	0.860	-0.310
Engagement	0.852	-0.682
Task Success	0.755	-0.323

Table 3a. Mean and Standard Deviation of Perceived Benefit and Perceived Cost\*\*

Variable	Mean	Standard Deviation
Perceived Benefit	3.134	0.604
Perceived Cost	2.702	0.685

Table 3.b. Mean Difference of Perceived Benefit and Perceived Cost\*\*

Mean Difference	t	Sig.
0.432	4.810	0.000

Hypothesis H1 says that the perceived benefit is greater than the perceived cost. Table 3.a shows the mean and standard deviation of perceived benefit and perceived cost. Using paired-samples t test, presented in Table 3.b, it can be seen that the mean difference between perceived benefit and

\*\*Data were taken from the unpublished research report entitled "Identifikasi Faktor Keberhasilan Pengalaman Pengguna untuk Situs Belanja Online" by Paulus Insap Santosa, 2014.

perceived test is significant. Thus, hypothesis H1 is supported by the data.

Hypothesis H2 says that there is a metric in HEART metrics that superior compared to the rest. Table 4.a shows mean and standard deviation for the three variables (happiness, engagement, and task success), i.e. 3.061, 2.841, and 3.077, respectively.

Hypothesis H2 was tested using paired-samples t test for each pair of the above three variables. Table 4.b shows the significance of the mean difference of every pair among these three variables. In particular, the following results were observed:

- Happiness versus engagement is significantly different ( $\delta = 0.220$ ,  $t = 5.366$ ). Thus, happiness influences user experience more as compared to engagement

Table 4.a. Mean and Standard Deviation of Happiness, Engagement, and Task Success<sup>\*\*</sup>

Variable	Mean	Standard Deviation
Happiness	3.061	0.707
Engagement	2.841	0.656
Task success	3.077	0.631

Table 4.b. Mean Difference of Happiness, Engagement, and Task Success<sup>\*\*</sup>

Variables	Mean Difference	t	Sig.
HP vs EN <sup>2</sup>	0.220	5.366	0.000
HP vs TS <sup>3</sup>	0.016	0.375	0.708
EN vs TS	0.236	5.400	0.000

- Happiness versus task success is not significantly different ( $\delta = 0.016$ ,  $t = 0.375$ ). Thus, happiness and task success have the same degree of influence to user experience
- Engagement versus task success is significantly different ( $\delta = 0.236$ ,  $t = 5.400$ ). Thus, task success influences user experience as compared to engagement.

<sup>\*\*</sup>Data were taken from the unpublished research report entitled "Identifikasi Faktor Keberhasilan Pengalaman Pengguna untuk Situs Belanja Online" by Paulus Insap Santosa, 2014.

<sup>2</sup> HP: happiness, EN: engagement

<sup>3</sup> TS: Task success

From the above assessment it can be observed that two out of three variables in HEART metric, i.e. happiness and task success had higher mean as compared to engagement. Thus, hypothesis H2 is supported by the data.

This study was intended to measure user experience in an online store employing two metrics. They were PULSE metrics focused on product, i.e. online store, and HEART metrics focused on user's feelings. Due to time constrain, three metrics from PULSE were used, i.e. uptime, latency, and earnings. The first two were then operationalized as perceived cost, and the third as perceived benefit. The data provide a proof that the mean for the perceived benefit was greater than the incurred cost (3.124 versus 2.702). This finding shows that during their online activities, when there was no problem with the hygiene factors, users were willing to lengthen their stay on an online store as they perceived more benefit.

Three metrics from HEART were used, i.e. happiness, task success, and engagement. The first two had significantly higher means than the third. On the closer look, it can be seen that task success had slightly higher mean as compared to happiness, although their difference was not significant. It is, however, provides an interesting discussion.

Although in this study the relationship amongst metrics were not investigated, due to the nature of both metrics, the result of this study can explain their relationship although it might arguable. When users are using online store, they will not have any complain as long as there is no event related to the technicality of the online store that prevent them to continue their activity. This is because the hygiene factors were fulfilled[21]. In other word, users did not have any objection about the incurred cost.

With the hygiene factors were fulfilled, thus the perceived cost was acceptable, users would continue using the online store to gain more benefit whether tangible or intangible. This would lead to task success in which users were successful with the task in hand. On the other side, with the benefit in hand, users might feel happy that they are willing to stay longer in an online store; thus increases user engagement.

As stated earlier, PULSE metrics focused

on product, in this case an online store, whilst HEART metrics focused on human feelings. Referring back to ISO definition of user experience [8], measuring user experience must consider both product and person's emotion, belief, and the like.

## CONCLUSION AND FUTURE WORK

There are two things that can be drawn from this study. Firstly, users who shopped in an online store perceived more benefit as compared to the perceived incurred cost. Secondly, happiness that the users experiencing when using online store and task success

influence user experience more as compared to engagement.

Two variables in PULSE metric were not used, i.e. up time and seven day active user, due to the nature of this study. Thus, the future study should be designed as a longitudinal study to measure the above two variables as well. Two variables in HEART metric were not used either. They were adoption and retention. In order to include these two variables in the future study, a longitudinal study should be designed thoroughly. To obtain better generalization, future work should also cover different group of subjects, not just students.

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