

Interaction Design Steppy Application Based on Factor Usability on Services SHESOP

Ekal Hadiyatma^{#1}, Ary Setijadi P.^{#2}, Yoga Priyana^{#3}

[#] School of Electrical Engineering and Informatics

Bandung Institute of Technology, Ganeshha Street 10, Bandung 40132, Indonesia

¹ekal.hadiyatma@students.itb.ac.id

²asetijadi@lskk.ee.itb.ac.id

³ yoga@lskk.ee.itb.ac.id

Abstract— A system with SHESOP name built with the aim to facilitate and assist a person in obtaining services and information on health. This system was built in the complex, which could include a Steppy application on mobile devices that invites people to make physical activity of walking. This application will perform its counting footsteps, to monitor the achievement of physical activity daily. Steppy designed with usability aspects of the application, so that it can be useful to effectively and efficiently for the wearer. Interaction design is designing a product to help people interact in daily life. This paper describes the interaction design Steppy based on factor usability which is make this application acceptable by user.

Keywords— footsteps, interaction design, Steppy, usability

I. INTRODUCTION

Health is a state of physical, mental, and social well-being that good which is a single entity and not just freedom from disease or disability.

Health is very important for humans. Almost all human activity should be supported with good health. Welfare and quality of life of the individual is closely related to the quality of its health. Most of the people will realize the importance of health after illness. Actually, the disease can be prevented with attention to healthy lifestyles and recognize the symptoms start to appear, but often someone ignore it until the symptoms are causing severe. If such a thing had happened before they do something like go to the hospital or doctor which of course the more severe the impact will be greater costs to be incurred.

The number of busyness makes people often forget health care. One example is the activity of the office that takes third day (8 hours) is one of the causes someone forgot a variety of things including health care. Plus office activities that compel a person to less mobile such as too much sitting increased the risk of developing the disease in the future. One of the health problems caused by the busyness factor is overweight. This is caused due to irregular diet and lack of exercise.

According to the Basic Health Research (Risikesdas) in 2007 showed a lack of physical activity urban areas increased by 57.6%. Sedentary behaviors and practices found in the habit of spending leisure time as in the habit of sitting. Heart rate was strongly influenced human activity, especially in sedentary behaviors with prolonged sitting. While not ideal body weight

can lead to heart disease risk. The sound of the human heartbeat can Interpret heart activity. So as to maintain the condition of the heart rate and body weight under normal circumstances can avoid the risk of the disease - the disease. Changes in physical conditions and human health is also affected by the amount of excess calories that can add to a person's weight. Conditions in the human body is the ideal weight would avoid a major risk factor for diseases such as diabetes mellitus type 2, hypertension, cancer and cardiovascular diseases. National Diabetes Prevention Program is based on two factors that affect the number of calories burned in the body every day that the dietary factors and physical activity. According to information reported through C3 Collaborating for Health 2012 to reduce the risk of heart attack are advised to walk for 30 minutes every day. In another penelitaaan also said to reduce half kilogram of body weight (± 1 pound) is equivalent to 3500 calories. One alternative to burning calories in the body is to carry out daily physical activity such as walking. By walking 30 minutes every day with as many as 5000 steps ideally, it will burn calories as much as 250 calories (HW fa H. Community).

One of the health monitoring system are the Smart Health System as Open Platform (SHESOP). Smart Health System as Open Platform (SHESOP) is a health monitoring system in real time that exists to support an Indonesian public health service as a whole ranging from vital-sign checks vital health be integrated in a variety of sensor equipment, mobile and desktop. Furthermore, data processing and measurement of health is monitored through the website. Application of health vital signs measurements one of them implemented on a chair to measure vital signs such as weight health and heart rate. As for calculating the number of footsteps using mobile applications.

One product SHESOP is Steppy. Steppy is an android based application that is useful for calculating the number of footsteps. Then the data will be saved to the database and will be shown on the website SHESOP. The main purpose of this application is to encourage users to perform the activity of walking as a form of maintaining healthy way.

II. LITERATURE REVIEW

A. Human Computer Interaction (HCI)

Human Computer Interaction is a field of science that evolved since 1970 that studied how to design a computer screen in a convenient information system applications that are used by the user (Nugroho, 2009: 2). The main role of HCI is to produce a system that is easy to use, safe, effective and efficient.

HCI is the main key to the efficiency (usability), which means that a system must be easy to use, provide safety to the user, easy to learn and so on.

Definition of human and computer interaction is as follows.

1. Set the process, dialogue and activities through which users utilize and interact with the computer.
2. A discipline that emphasizes the aspects of design, evaluation and implementation of interactive computing systems for human purposes by considering the phenomenon around the man himself.
3. A scientific study of society in the work environment.

The model of interaction between human and system involves three components, namely the user, interaction and the system itself.

1. Human.

Humans seen as a system that processes the information as follows.

- a. Information received and responded to process input-output.
- b. Information is stored in memory.
- c. Information processed and applied in various ways.

Income and expenditure process that occurs in humans is a vision. This process has two stages, namely:

- a. physically income of stimulus,
- b. management and interpretation of stimulus.

Physical tools that are used to get the vision is the eye. The process that occurs in the eye to get the vision is as follows.

- a. Light reception is a mechanism that transformed into electrical energy.
- b. Light bounces off the object to be viewed and the image is focused upside down on the retina.
- c. Retina contains rod (rod-shaped organ) for the view and the weak light cone (cone-shaped organ) to view color.
- d. Ganglion cells (central nervous system) function to detect patterns and movement.

2. Computer.

Computer is defined as an electronic device that can be used to process data by means of a program that is able to provide information. Computers can also be interpreted as a machine that receives input for processing and generating output. The computer system consists of a processor, memory, I / O. The basic function which is formed by a computer system are executable programs. Program to be executed by the CPU contains a number of instructions stored in the memory.

3. Interaction.

The system translates the interaction between what is desired by the users of the existing system. If the user wants to make the phrase "Human and Computer Interaction", then the user must first know what the program can be used for writing the sentence. If the user does not know what the program should be used, then the misunderstanding occurred between users with the system.

If the user is using the right program, users will be able to type the sentence using the device keyboard. The relationship between the user and the computer is bridged by a user interface.

B. Usability

Studies on usability (usability) is part of a multi-disciplinary science Human Computer Interaction (HCI). Usable Usability comes from the word that generally means it can be used properly. Something can be said to be especially useful with both failures in use can be eliminated or minimized as well as the benefits and satisfaction to the users (Rubin and Chisnell, 2008) in Joana (2010).

Usability is the quality level of the system that is easy to learn, easy to use and encourages users to use the system as a positive tool in completing the task. In this context, referred to as the system is software. Usability is a measure, which the user can access the functionality of a system with an effective, efficient and satisfying to achieve certain goals.

Usability factor plays big enough so that the system can be accepted by both user and all parties associated with the system. To achieve a usability defined by several specifications (Nielsen 1994), namely:

1. learnability defined how quickly users are proficient in using the system as well as the ease of the user running the function and what users want can meraka get,
2. efficiency is defined as the resources expended to achieve accuracy and completeness purposes,
3. memorability defined how the Traffic users retain knowledge after a certain period of time, the ability mengngat obtained from laying a menu that is always fixed,
4. error is defined how many mistakes any user generated, user-created errors mismatch covers what users think about what is actually served by the system,
5. satisfaction defined freedom from discomfort, and positive attitudes towards the use of products or subjective measures, as users feel about the use of the system.

The main core of usability is to answer the question, whether the product is in accordance with user needs. The goal of usability.

1. Effectiveness, how a system works well in accordance with the existing goals of the system.
2. Efficiency, the way the system supports the user in a purpose built system.
3. Safety, a system built under conditions that do not endanger the user.
4. Utility, the extent to which the system provides the proper function so that users can carry out its activities.

5. Learnability, how easy it is to learn to use the system.
6. Memorability, how easily the user to remember to use the system once learned.

III. METHOD

A. Measuring Usability with Use Questionnaire.

Measuring usability means to measure the effectiveness, efficiency and user satisfaction. To that can be done in two ways:

1. rely on assumptions or the program makers themselves,
2. the use of usability metrics.

Usability measurement results can be utilized for some of the following (Tullis and Albert).

1. Getting input from the data, a more objective than his own opinion.
2. Can be used to compare two product usability.
3. Can classify the problems (if any).
4. Making predictions of actual product use.
5. Provide illustrations on the management based on facts.

Currently, there are several types of metrics or usability measurement techniques, which can generally be divided into two categories:

1. The desired quality, an observation in the form of the finished size / absence of a task (Yes / no), or whether an outcome is reached, or received / absence of a statement (agree / disagree),
2. The quantitative measurement, measure the scale of certain numbers, eg X% user can finish the job less than a minute.

Questionnaires can be used to measure usability is the USE, there are several aspects of usability measurements according to Ido namely efficiency, effectiveness and satisfaction. Several studies that have been conducted show that most evaluation refers to the three-dimensional product. The results of several observations also showed a correlation and interplay between the parameters of ease of use and usefulness. Usefulness factor is usually less important if the system is an internal system where users are mandatory. A questionnaire was developed in the form of a score of 5-point Likert scale with the model, for measuring the level of user approval of the statement of the measurement results are then processed by methods of descriptive statistics and analysis performed well against each of the parameters or to the whole parameter. Use one package of non-commercial questionnaire that can be used to research the usability of the system.

According to Jacob Nielsen, usability is a quality attribute that describe or measure the ease of use of the interface (interface). The word "usability" also refers to a method for improving ease of use during the design process. Usability is measured by five criteria, namely: learnability, efficiency, memorability, errors, and satisfaction.

IV. DESIGN AND DEVELOPMENT

A. Needs Analysis

In general, human computer interaction has the aim of facilitating human interaction with computers. In addition to fulfilling aspects of usability, an application must have a user experience which should be considered in system design. A good application should have three main requirements to meet the user experience (user experience) that is useful, usable and desirable. In the design of the application must be made so that the user needs analysis of the function of this application is appropriate (useful). Furthermore, the application must be used by all application users with ease (usable). Once these two conditions are met, the application must also be interesting to let users continue to want to use this application (desirable).

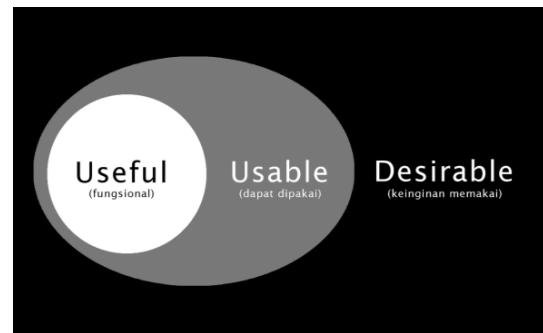


Figure 1 User experience in human computer interaction.

B. Analysis of User Needs Steppy

The user needs to support the activity of walking should be able to qualify useful, usable and desirable. Here are some of the analysis of user needs Steppy under the terms of the common good application.

1. Under the terms useful, Steppy application must be able to monitor the number of footsteps, the mileage and calories burned during walking or running activity.
2. Under the terms usable, application Steppy applied to mobile devices with a design that is easy and comfortable to use by the user.
3. Under the terms desirable, Steppy must have gamification apps designed to let users continue to want to use the application Steppy.

C. System Requirements Analysis Steppy

Steppy design as a sub-system of the system SHESOP should be able to answer the needs of users of the system, the following needs analysis system designed and built.

1. The system is able to record the activity of footsteps as retrieval time, the number of steps, distance and calories burned.
2. Data which is already available from the use of the system, should be sent into the server as medical records and users of the system can be displayed on a mobile device.
3. The system should be interesting and may provide information that is clear and understandable by the user.

- The system has gamification which aims to attract users to want to continue to use Steppy.

D. System Specifications.

To answer the needs of users in the application Steppy, this system has the following specifications.

- Users must have a mobile device with Android operating system and connect to the internet so that user data can be stored on the server.
- Users to register first to integrate user data on a mobile device with the server. Registration form to be filled include:
 - email address, needed as the username to log into the application,
 - telephone numbers, useful as supplementary data for users,
 - the name displayed is the name that will be displayed on the dashboard page of the application,
 - password, is useful as a user password to log into the application,
 - age, required for analysis of health data users,
 - gender, needed for the analysis of health data users,
 - height, required for analysis of health data users,
 - weight, required for analysis of health data users.
- Steppy After logging in, the user will be taken to a page chart achievement of the steps that have been made. Recording system records the user steps and stored on a server that has been integrated before. This chart is divided into 3 parts, namely:
 - week, the graph that displays the number of user steps within the last week,
 - month, the chart that displays the number langkah users in the last month,
 - year, a graph that displays the number of user steps within the last year.
- Before starting Steppy applications, more users perform calibration prior to adjust the sensitivity to be used with a range of footsteps each user. This application provides several sensitivity, namely:
 - higher, the higher the sensitivity value limit value of 6.6667 accelerometer sensor,
 - medium, the sensitivity of the medium has a value limit value accelerometer sensor 10,
 - lower, the sensitivity of the lower value limit value accelerometer sensor 15,
 - low, the sensitivity of the low value limit value accelerometer sensor 22.5,
 - very Low, the sensitivity at very low values boundary value accelerometer sensor 33.75,
 - Low extra, extra low sensitivity of the value limit of 50 625 accelerometer sensor value.
- After performing the calibration, Steppy applications can be run by pressing the Start button Counting. After selecting the button the user will be taken to eat on the page calculation steps. On this page, will display the data as follows.
 - Steps, which measures the number of users that have been achieved in one day.
 - Km, the distance traveled in one day.

- Km / h, the speed of the user every step.
- Calories burned, the amount of calories you have burned during the step in one day.
- Applications Steppy can be minimized so that the application does not have to remain open while running, because the application will continue to run as long Steppy not be stopped (stop).
- In order for users interested in using this Steppy application, Steppy features the form of missions that must be completed. This mission is useful to familiarize the foot of the steps little steps per day per day to achieve health expert advice to achieve a healthy lifestyle. Additionally, these missions if resolved is also a requirement to follow the events to be held by Team SHESOP. Another feature of this application is Steppy share feature, a feature to distribute or share to social media.

E. System Design

Useful, the application can do something functional. In this study, the application should have functions that can answer all the user needs to be able to assist the user in the activity of walking.

Steppy design function is divided into 3 sections.

1. The function counts the number of footsteps.

In designing the tally of the foot using the accelerometer sensor. Accelerometer sensor is a sensor that already exists on some mobile devices, the output value of the change in the x, y and z accelerometer sensor compared to the sensitivity of the application.

The formula used to calculate the number of footsteps is:

$$\text{Footstep} = \text{accelerometer : sensitivity}$$

To search the number of footsteps also depends on the sensitivity used. Steppy is designed with 6 kinds of sensitivity have a limit value for counting the number of steps. If the accelerometer sensor passes sensitivity value is used, then the amount will be increased by one step. So before using an application, the user must select the appropriate sensitivity with each user action, because everyone has a stride length and stride ways different.

2. The function calculates the distance of the user.

Besides the number of footsteps counted, then what counts is the mileage users. To calculate the distance using the following calculation.

$$\text{Distance} = \text{Number of steps} * 0.5\text{ft (in feet)}$$

$$0.5\text{ft} = 15:24 \text{ cm}$$

$$\text{Distance} = \text{number of steps} * 15:24 / 100000 (\text{in km})$$

When calculating the number of footsteps, the device used is placed in a pants pocket or placed in arm use the armband, so that the calculated step length is the length of step one foot only. So the stride length is half of the size of 1 foot is 15:24 cm.

3. The function calculates calories burned.

To calculate the number of calories burned, using the following calculation.

$$\text{Calories} = \text{Weight} * \text{MET} (\text{metabolic equivalent of task}) / \text{Distance}$$

Where in the weight Calories obtained from the user in units kg, multiplied by MET, where MET to walk is 0708, and then divided by the distance that has been searched before.

After all the data is obtained, then the data will be stored in the local database using SQLite every minute once. Then for the second minute, the data is stored again by summing the data that has been stored previously. Then so on.

After an hour of use the application, if the user connected to the Internet then the data will be saved to the database server, the database Melsa. Then from the database Melsa the data displayed back to the mobile device in the form of graphic user steps based on time, its the data step weekly, monthly and measures the data and move the data annually.

G. Interaction Design

To meet Usability aspects in an application, it takes a good interaction design and correct application. All the concepts in the design of these applications ranging from the selection of colors, logo and layout or the layout of the application will meet the aspects of learnability, memorability and satisfaction of users. Usable, the application must be able to be used easily by the user. Therefore, the application must be designed as possible so that users have no difficulty in using the application. In this study, the application is designed on a mobile device. Applications on the mobile device designed for the average urban people own a mobile device. In addition, the mobile device is also easy to carry when on the move such as walking and running. To create a design application that is easy to use, the application Steppy designed with logos and colors that match Steppy purpose, namely to assist the user in the move on foot.



Figure 2 Welcome screen Steppy.

Steppy application, there are several menu pages and navigation buttons. Page menu design and navigation buttons in this application provides convenience and easy to remember for the user. Two factors usability is highly considered in the

design visualization application Steppy.

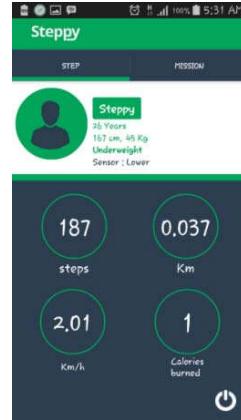


Figure 3 Display menu Steppy counting.

H. The Design of Gamification

Desirable, that the application should be attractive so that users continue to want to use this application. This relates to aspects of satisfaction (satisfaction) to enable the users of these applications are positively assess subjective so that users will continue to use this application as a medium that is able to invite users to perform the activity of walking. Therefore, designed a gamification in this application. This gamification is punishment and reward, meaning that users will get a prize if completing the missions that have been given. Conversely, if the user does not complete the missions within a certain time limit, the missions that had been done would be considered a failure, so users have to do again the missions.

Gamification is useful to make users more interested in using the application and users also prefer to walk with the one thing that must be achieved, namely the missions are designed in accordance with the standard number of steps that should be carried out within one day for health.

V. ANALYSIS AND RESULT

A. Application Functionality Testing Results

One of the tests performed in this study is testing the functionality of the system. Steppy functionality testing on SHESOP system based on the functions that can be performed by the system and shown in Table 5.1.

Table 5.1 List of testing functionality SHESOP with Steppy.

No.	Functionally tested	Results
Functional Steppy		
1.	Counting the number of footsteps	succeed
2.	Calculate the mileage achieved	succeed
3.	Calculating the number of calories burned	succeed
4.	Displays a list of missions	succeed

Table 5.2 List of testing functionality for users.

No.	Functionally tested	Results
User interaction with the system		
1.	See the data of the number of footsteps on the application	succeed

2.	See the data of the distance on the application	succeed
3.	See data from calories burned on application	succeed
4.	See chart achievement user step by time	succeed
5.	View a list of missions that have been done and undone users	succeed

User data on the website SHESOP

1.	See information on the number of footsteps all application users on a website Steppy SHESOP	succeed
2.	Look at the information level and the mission is being carried out on the website users SHESOP	succeed

B. Analysis Usability Steppy.

Based on the results of the questionnaire questionnaire quality factor according to Nielsen usability and JRLewis, questionnaire results obtained as follows.

Table 5.3 The median interval value responder.

Value	Description
1,00 – 1,75	Disagree
1,76 – 2,51	Doubtful
2,52 – 3,27	Agree
3,28 – 4,00	Strongly agree

Here are the results of calculations based on the analysis of usability aspects of the questionnaire obtained in Steppy.

Table 5.4 Aspect learnability of application Steppy

Description	Amount	Percentage	Weight	Score	Average Score
Strongly agree	10	25%	4	40	3.03
agree	24	60%	3	72	
Doubtful	3	7.5%	2	6	
Disagree	3	7.5 %	1	3	
Total	40	100%		121	

Table 5.5 Aspect efficiency of application Steppy

Description	Amount	Percentage	Weight	Score	Average Score
Strongly agree	3	5%	4	12	2.52
agree	33	55%	3	99	
Doubtful	16	26.67%	2	32	
Disagree	8	13.33%	1	8	
Total	60	100%		151	

Table 5.6 aspect of the application Steppy memorability.

Description	Amount	Percentage	Weight	Score	Average Score
Strongly agree	11	27.5%	4	44	3.08
agree	25	62.5%	3	75	
Doubtful	0	0%	2	0	
Disagree	4	10%	1	4	
Total	40	100%		123	

Table 5.7 Steppy aspect of the application error.

Description	Amount	Percentage	Weight	Score	Average Score
Strongly agree	0	0%	4	0	2.50
agree	12	60%	3	36	

Description	Amount	Percentage	Weight	Score	Average Score
Doubtful	6	30%	2	12	50
Disagree	2	10%	1	2	
Total	20	100%		50	

Table 5.8 aspect of the application Steppy satisfaction.

Description	Amount	Percentage	Weight	Score	Average Score
Strongly agree	21	35%	4	84	3.25
agree	33	55%	3	99	
Doubtful	6	10%	2	12	
Disagree	0	0%	1	0	
Total	60	100%		195	

VI. RESULT

After going through the process of designing, implementing, testing and analysis of the study, it can be concluded from the study Usability Factor Analysis Application Steppy In SHESOP Health Services (Smart Helath System as Open Platform) as follows.

- In this Steppy application design, the theory used is human computer interaction, namely the concept of usability. After obtaining the data required in an application, be approached using foot step count that is packed into mobile devices and incorporate gamification in the application, so that users are interested in using this application.
- After getting the application model, conducted the analysis of the assessment of the level of usability of the application Steppy. In this analysis used Jacob Nielsen usability approach with techniques use questionnaire.
- Overall, the application Steppy satisfied in using this application. This application can help encourage users to walk as a way to maintain health, but there should be improvement in some parts, such as the error rate Steppy applications are still confusing for users.

REFERENCES

- [1] Bumgardner, Wendy, How Many Pedometer Steps Per Day are Enough?, <http://walking.about.com/cs/measure/a/locke122004.htm>, 7 Mei 2015, 16:46 WIB.
- [2] Dumas, Redish, A practical guide to Usability Testing, John Wiley & Sons, 1999.
- [3] International Organization for Standardization, ISO 9241-11: Guidance on Usability, 1998.
- [4] Nielsen, J., Heuristic Evaluation. In In J. Nielsen and R. Mack (eds.), Usability Inspection Methods, Wiley, New York, 25-62, 1994.
- [5] Nielsen, Jakob, “Usability 101: Introduction”, <http://www.useit.com/alertbox/20030825.html>, 12 Juli 2015, 21:00 WIB.
- [6] Tullis, Tom, and Albert, Bill, Measuring The User Experience, Morgan Kaufmann, 2008.
- [7] Yeap, Michael, “PSSUQ: Post-Study System Usability Questionnaire – Lewis of IBM. <http://michaelyPSSUQ: Post-Study System Usability Questionnaire – Lewis of IBM>, 21 Juli 2015, 19:18 WIB.
- [8] , Interaksi Manusia dan Komputer, <http://aqwam.staff.jak-stik.ac.id/files/11.-interaksi-manusia-dan-komputer.doc>, 27 Juli 2015, 23:11 WIB.