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Evaluating the Quality of Emergency Reporting Mobile Application on Usage Service Decision

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Abstract. Emergency Reporting Mobile Application is an android-based application that was built to provide convenience to the public in reporting emergency conditions. This application is divided into 2 end-user applications, there are the sender application and the receiver application. The sender application pages consist of the registration page for new users, pattern lock as security, and the preferred service page. The receiver application pages consist of the login page, inbox page, history page and profile of main service office page. The application has been developed and an assessment of the quality of the application is needed to improve the use of the application. Therefore, this study aims to evaluate applications on the sender side. The evaluations of the analysis result are needed as recommendations for future application development. The evaluation of the application use usability instruments which consist of components of effectiveness, efficiency and user satisfaction. The research was conducted by distributing the SUS (System Usability Scale) questionnaire to 20 respondents and each statement was given a weight based on the Likert scale. The results showed that the application was in the excellent category and could be accepted by the community.

1. Introduction

The Android-based mobile application is the most widely used application by Indonesian people [1]. From all of the various mobile applications that are developing today, one of the most widely used is an application that is engaged in services. Therefore, this research was developed by observing these conditions. The application that was developed from 2017 is an application that can be used by the general public, namely an emergency reporting application [2]. Figure 1 illustrates all the pages contained in the sending application at Emergency Reporting Apps. This application is intended for the general public with the aim of facilitating them in accessing emergency service offices in the area where they live. The application consists of 5 emergency services are a firefighter, police station, hospital, car crane, terrorist, and Search and Rescue (SAR). While emergency service offices are spread out in each district. The public does not need to know the emergency office service contact number, because the application will automatically call the service that matches the user's choice available in the options menu.



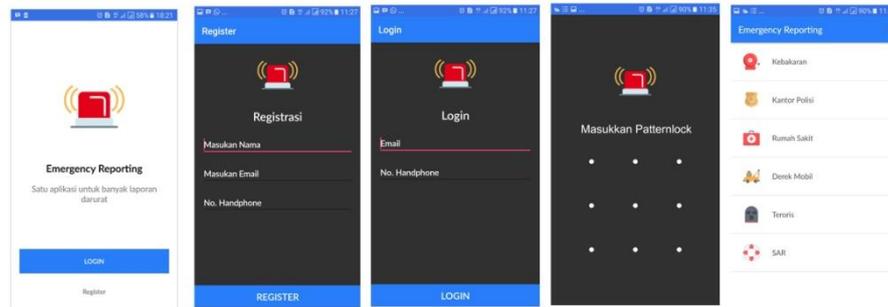


Figure 1. All pages on Emergency Reporting sender application

In order to achieve success in implementing applications, it is necessary to measure user needs (usability). Usability testing is a quality measurement to assess the ease felt by the user in using the application [3]. Usability testing is also a way to find out the user's problems when using the application. Usability testing consists of components of effectiveness, efficiency and user satisfaction (ISO 9241-11) [4]. The effectiveness component refers to the completeness in which the user reaches a specific goal. The value of the effective component is obtained from the calculation of the success rate, that is the level of success of the user completing the task scenario. The efficiency component is the time that the user needs to finish the task accurately and completely. The value of the efficiency component is obtained from the calculation of time-based efficiency, that is the level of user speed for finishing the task scenario. The component of user satisfaction is a user's positive response of the system/application [5].

The study was conducted to measure the usability value of the Emergency Reporting application. Measurements are made by conducting usability testing, namely giving assignments and distributing questionnaires. The results of the task can be known as the value of the effectiveness and efficiency of the application. While from the data in the questionnaire can be known the level of user satisfaction. The questionnaire used refers to the System Usability Scale (SUS) [5] [6]. The results of the study are the results of user evaluations of the Emergency reporting application. From the results of this evaluation, there will be some input for the development of this application in the future.

2. Literature review

Some previous literature has discussed the assessment of websites and applications using several methods. From the results of studies, there are different attributes of usability, for his early study, Booth (1989) suggested four aspects of usability, namely, usefulness, effectiveness, learnability, and attitude. Shaker (1991) identified four usability evaluation criteria focusing on how users accomplish their tasks in using a system, learnability, flexibility, effectiveness, and user attitude. Nielsen's model (1993), which is most relevant in the usability of engineering areas, poses five attributes are learnability, efficiency, memorability, low error rates, and subjective satisfaction. Another Usability model proposed by the International Organization for Standardization (ISO) calculates usability based on three main constructs, such as effectiveness, efficiency, and satisfaction. ISO has set these three constructs as international standards, ISO9241-11 [4].

Soohyung Joo, et al (2011), Usability evaluation model was developed to assess the website of academic libraries. This model was developed based on expert consultations and literature studies. The development results are empirically verified from the user's survey data directly. From the document analysis and expert consultation, this is an eighteen measurement items to survey the three constructs of usability, effectiveness, efficiency, and learnability, in the academic library websites. The evaluation tool was validated with regard to data distribution, reliability, and validity. The empirical examination based on 147 actual user responses proved to be acceptable in assessing the academic library website usability [4].

Vederico Pitsalitz Sabandar and Harry Budi Santoso (2018), assessment of learning media applications for basic statistical courses using the usability testing method. The research was conducted to evaluate a learning media application in order to get recommendations for the next development. The evaluation was conducted focusing on the usability aspect which consisted of components of effectiveness, efficiency and user satisfaction. Data from the three components were obtained from the results of filling out questionnaires by 30 respondents. The results showed that the application had fulfilled the usability aspect and received several recommendations, namely on the display interface and content contained on the home page, game education, and material, which needed to be redesigned to make it easier for the user and not cause saturation [5].

Nabilla Ridha Permana, et al (2018), evaluating Grab Applications by Using the Usability Testing Method. Grab application is an application that is engaged in the service sector and has long been circulating in the community. However, users still experience some difficulties when using the application. In this study, a test was carried out to measure the usability level by using the assignment method and questionnaire distribution. Tests were carried out on 5 respondents from new users of the Grab application and questionnaires were filled out by 100 active user respondents from the Grab application. From the results of the study, it was found that respondents experienced difficulties when making payments, respondents had difficulty finding the address of origin and destination on the "pick-up" menu, and difficulty finding the original location because it was not in accordance with the map [6].

Ida Giyanti and Erni Suparti (2017), the quality assessment of MUI's halal application with webqual 4.0. Applications that are valued using the standard webqual 4.0. This standard uses 3 variables, namely Usability (USE), Information Quality (INF), and Service Interaction (SERV). Test the relationship between the quality variables on the decision to use is done by multiple linear regression analysis. The results showed that the average value of quality was 3.08 from a scale of 4.00 which means that the MUI Halal application was rated as good quality by users [7].

In this study, the assessment of the Emergency Reporting application uses the Usability method by taking 3 assessment components, there are effectiveness, efficiency and user satisfaction. Getting the data by the method of completing the task and distributing questionnaires.

3. Usability method

Usability method is used to evaluate usability, namely usability testing. Usability testing is a way to evaluate a product or service by testing a sample of users [8]. Usability testing is done by observing the work of the test respondents by giving them some tasks. Observation is done by looking, listening and recording with the aim of identifying usability problems, collecting qualitative and quantitative data and determining respondent satisfaction with the product or service. The steps taken in usability testing include identifying test respondents, creating usability testing tasks, completing usability testing and analyzing results.

Table 1 Task scenario.

Task Scenario
Today, when you are going out somewhere, you see a motor vehicle accident. By using the Emergency Reporting application that has been installed on an Android device, you intend to contact the police/ambulance office to report the emergency situation.

During creating usability tasks, we prepared the task scenario that was given to all respondents. The task scenario is one of the steps taken to conduct usability evaluation. The task scenario aims to see the

effectiveness and efficiency needed by the user in completing the given task. The assignments are given as shown in table 1. After compiling the task scenario, the next step is to do usability testing. All respondents were given a chance to use the Emergency Reporting application. The respondent's activity when completing the task is recorded using an application, this is done to see the success and length of time worked. The number of respondents who successfully run the task scenario is needed as data of effectiveness level measurement and the time that was needed by each respondent in completing the task is needed as a data for the efficiency level measurement of the application.

After the respondents work on the task scenario given, then the respondent fills a questionnaire was given. The questionnaire was compiled based on System Usability Testing (SUS) which has 10 questions as seen in table 2. The answers obtained from the questionnaire indicate the level of user satisfaction in using this application.

Table 2 SUS questioner.

No	Statement
1.	I think I will use this application again when facing an emergency situation
2.	I feel this application is complicated to use
3.	I feel this application is easy to use
4.	I seem to need the help of a technician to run this application
5.	I feel the features/menus on the application are running well
6.	I feel that something is inconsistent in this application
7.	I feel that other people will easily learn this application quickly
8.	I feel this application is confusing
9.	I feel there are no obstacles in using this application
10.	I feel, I have to learn many things before I can start using this application

Assessment for each answer on the SUS questionnaire uses a Likert scale. A Likert scale is a scale used in a questionnaire to see the approval of respondents from a series of statements or statements given [9]. Each statement on the questionnaire is given a value between 1 and 5, where the value 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree and 5 = strongly agree. A system can be said to have a good level of usability if it has a SUS value above 70. The following is a picture of the range of values and acceptance in SUS [10]:

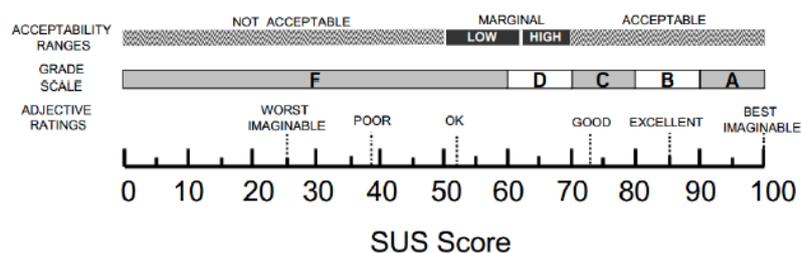


Figure 2. SUS scale rating

4. Result

From the tests that have been done, the results obtained are the level of effectiveness, efficiency and user satisfaction with the Emergency Reporting application. The level of effectiveness is measured by the value of the Success Rate (SR), the level of efficiency is measured by looking at the value of Time Based Efficiency (TBE) and the level of user satisfaction measured by the SUS score [5][6].

4.1. Effectiveness

The data used to measure the level of effectiveness of the application is how many respondents successfully completed the task. The level of effectiveness of the application can also be interpreted as a level of convenience for users in using the application. To get the effectiveness value from the Emergency Reporting application, it is necessary to test the respondent using the task scenario that has been compiled in table 1. Furthermore, the effectiveness of the application is calculated using the success rate parameter below:

$$SR = \frac{s+(PS \times 0.5)}{T} \times 100\% \quad (1)$$

where SR is a success rate (%), s is a success task, PS is a partial success task, and T is a total task.

$$SR = \frac{20 + (0 \times 0.5)}{20} \times 100\%$$

$$SR = 100\%$$

After getting the results of the assignment that we have given to all respondents, it was found that the 20 respondents succeeded in completing the task very well, so the success task value calculated the success rate $s = 20$, meaning, automatically the value for the partial success task variable $PS = 0$. The variable T as the value of the total task is 20, which is the number of tasks multiplied by the number of respondents tested, so the value of $T = 20$. By using formula 1 above, the SR success rate = 100%, meaning that all respondents stated that the application is very easy to use. SR results = 100% also stated that the level of achievement of the application was declared very effective [5] [11].

4.2. Efficiency

From the data that has been collected, then the value of efficiency is calculated as shown in formula 2. The data that was obtained for conducting efficient analysis is the time used to finish on task scenario. Figure 3 illustrates the time that allows each respondent to be able to complete the task scenario. The numbers of respondents are 20 person, where the fastest time to finish a task scenario is 8 seconds and the longest time is 25 seconds. From the data that has been collected, then the efficiency value was calculated using formula 2.

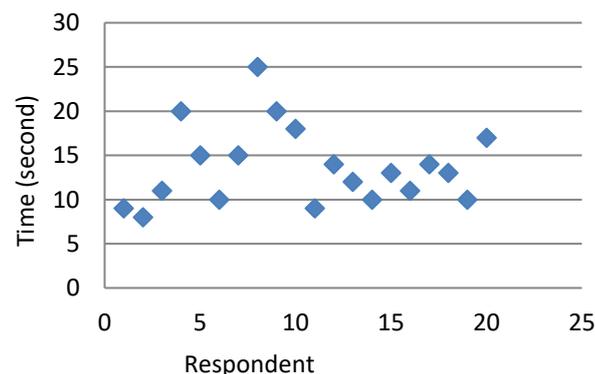


Figure 3. Time of task completion.

The efficiency value was calculated using the time-based efficiency parameter below:

$$TBE = \frac{\sum_{j=1}^R \sum_{i=1}^N \frac{n_{ij}}{t_{ij}}}{NR} \tag{2}$$

where TBE is a time-based efficiency (goals/second) , N is a total task (goals), R is a total respondent and t is a time (second). So that it can be calculated the average processing time for a task:

$$TBE = \frac{\frac{1}{9} + \frac{1}{8} + \frac{1}{11} + \frac{1}{20} + \frac{1}{15} + \frac{1}{10} + \frac{1}{15} + \frac{1}{25} + \frac{1}{20} + \frac{1}{18} + \frac{1}{9} + \frac{1}{14} + \frac{1}{12} + \frac{1}{10} + \frac{1}{13} + \frac{1}{11} + \frac{1}{14} + \frac{1}{13} + \frac{1}{10} + \frac{1}{17}}{1 \times 20}$$

$$TBE = 0,079 \text{ goals/second}$$

From the calculation of the TBE above, a TBE value is 0.079 goals/second. These results are very satisfying results because in the time behavior indicator the value of TBE = 0.079 goals/second is included in the very fast category [5] [11].

4.3. User Satisfaction

The data was used to measure the level of user satisfaction is obtained from questionnaire data. The questionnaire was distributed to 20 respondents who used the Emergency reporting application for the first time. First, respondents receive an explanation of how to use the application step by step. Next, respondents tried the application independently and then fill out the questionnaire provided.

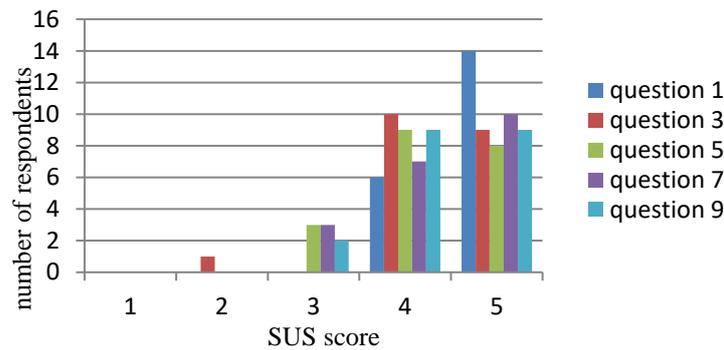


Figure 4. Questionnaire value for odd question numbers

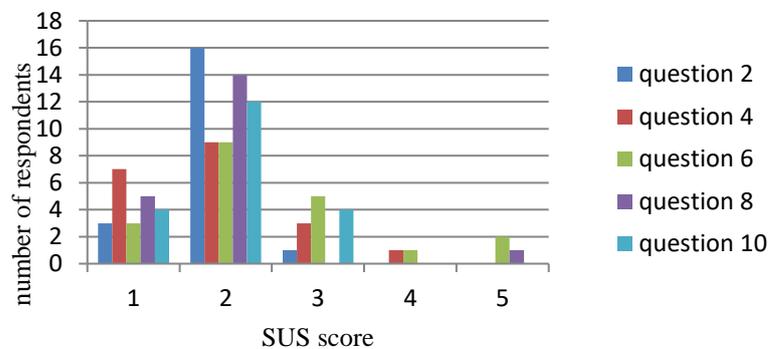


Figure 5. Questionnaire value for even question numbers

The questionnaire consisted of 10 questions compiled based on SUS (table 2), so we get the results were obtained as shown in Figure 4 and Figure 5. Figure 4 and Figure 5 illustrate SUS score diagrams obtained

from the answers of 20 respondents. Each respondent was given 10 questions where Figure 4 is questionnaire data for odd number questions, where SUS score 1 is the lowest and the 5 is the highest. While in Figure 5 is questionnaire data for even number questions, with the opposite assessment of the odd SUS score question.

Processing the questionnaire data obtained using the Likert method with the following conditions [12]:

1. The statement of the odd questions on a questionnaire using the formula:
 $\text{Score} = (\text{answer value} - 1) \times 0.25$
2. The statement of the even questions on a questionnaire using the formula:
 $\text{Score} = (5 - \text{answer value}) \times 0,25$
3. All the answers from each respondent are summed. We will get the total score between 0-100
4. To get the total value of SUS, the answers for each respondent are summed and averaged.

For this study, after doing the calculation, the average SUS score is 79.5. Based on the SUS Score Rating Scale in Figure 2, the result shows that the application is acceptable in the Acceptability Range category, the application is in grade C in the Grade Scale category, and the application is also in the excellent category in the Adjective Range category. This means that the Emergency Reporting application can be accepted by respondents as a sample from the community and respondents are also very satisfied in using this application.

5. Conclusion

We have successfully evaluated the Emergency Reporting application on the sender application side. The evaluation was done using the usability testing method, where the results obtained are effectiveness value, efficiency value and user satisfaction level. The level of effectiveness is stated to be very effective seen from the results of the SR calculation which reaches 100%, as well as the level of efficiency of the application stated in the TBE parameter with a value of 0.079 goals/second which means that the application is included in the category very fast. Furthermore, to measure the level of user satisfaction, it is found that the application is included in the category of excellent and can be accepted by the user. The level of effectiveness, efficiency and user satisfaction shows a simultaneous relationship to user decisions in using and utilizing applications.

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