User interface evaluation of mobile application krl access using user experience approach

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Abstract. The development of technology happens in various aspects, one of the aspects is information and communication technology. In the development of information and communication technology era, internet is a thing that cannot be separated. The most widely used device for internet browsing is smartphone devices. Total of mobile phone users in Indonesia is growing simultaneously with mobile app users in Indonesia. Mobile application that are downloaded by many Indonesian smartphone users are transportation, references, maps or navigation, and news. Therefore, an Android based app is created that can display train and schedule information. From previous research, the level of commuterline (KRL) passengers’ satisfaction is affected by the complete information that the train operation gives to its customers. The purpose of this study is for evaluating the User Interface of the KRL mobile application Access using the User Experience approach that uses performance metrics, self-reported metrics, behavioural metrics, and issue-based metrics that assess how perceived performance, perceptions, behaviour and user’s impressions in interactions with the application. Based on the evaluation results, in the dimensions of Ease of Use, interface quality, and satisfaction was not good enough, so User Interface (UI) re-design using UI design principles and Activity Relationship Chart (ARC) is done. The result of this research is user experience assessment, recommendation, and interface re-design of Access KRL application that can increase user satisfaction.

1. Preface
In the development of information and communication technology, the Internet is a thing that cannot be separated. In its development from year to year, internet users in the world have increased. In 2007 the number of internet users in the world is as many as 1,373,226,988 people or as much as 20.6% of the total 6,681,607,320 population of the world population. While in 2016, there are about 3,424,971,237 people of the world or 46.1% of the total 7,432,663,275 population of people around the world who are internet users [1]. The growing use of the Internet in the world also occurs in Indonesia.

With the increasing number of mobile app users in Indonesia, successively applications that are also owned by many Indonesian smartphone users are the application of transportation, reference,
maps or navigation, and news. In 2015, three researchers from the University of Indonesia are Dr. Nadia Yovani, M.Si from the Department of sociology, Himawan Pratama, M.Si from the Japanese literature department and Tridianto Subagia, S.Kom from computer science department in cooperation with PT KAI Commuter Jabodetabek (PT KCJ) created an Android-based app that can display information Train schedules and electric railway (KRL) positions and reports of travel disruptions in real-time. In addition to train schedule information, KRL users can also file complaints through e-mail or complaint e-mail features.

The researchers compared data on the behavior of train users in Japan and Indonesia. From the results of this study can be concluded that the level of customer satisfaction train is strongly influenced by the success of train operators in providing complete information to its customers.

In order to reach the target of 1.2 million passengers by the year 2019, KCJ Train application is expected to answer the challenge. KCJ Train application is expected to increase consumer confidence and create excellent service of PT KCJ.

2. Methodology

Some people are difficult to distinguish between Usability and User Experience. Usability is the ability of the user to use something to do a task successfully, while User Experience takes a broader view and looks at the whole of the individual's interaction with the object, and also focuses on the thoughts, feelings, and perceptions that are generated. [3] User experience focuses on user understanding, what users need, what's valuable to users, user capabilities, and user limitations. The definition of User Experience according to ISO 9241-210 is a person's perception and response resulting from the use or anticipation of the use of a product, system or service. A subsection

2.1. Data

The object of this research is an application called KRL Access. The selection of KRL Access application as an object in this research is motivated by the high chance of this application in meeting the needs of the community and technology development that is being done by PT. KCJ allows for this study to conduct a user experience evaluation study of Access KRL applications to measure its success in meeting user needs and satisfaction. The data used in this study is data derived from the respondents. The determination of research respondents is one thing that is critical in conducting research. To that end, determined the specific criteria for respondents. In this study the respondents are divided into two groups, namely respondents who have used the Access and KRL applications that have not been. It aims to determine whether experience affects users in using the Access KRL application. The number of respondents in this study is 20 people, 10 groups have already been and 10 of the group has never been. According to Tom Tullis and Bill Albert [3], the number of respondents in usability testing is only required by 5-10 respondents to reveal the problems and problems of the interaction between the system with the user, whereas in the fifth respondent 83% usability problem has been revealed and every addition Respondents, the increase in the problems found did not increase significantly.

User experience has a wide range of views from various theories and studies that have been developed to date. The theory and research use diverse and diverse metrics and dimensions. Therefore, a further review of the selection of metrics and dimensions is appropriate for the purpose and type of research. In determining the metrics and dimensions in this study, there is one major reference book in conducting this research, namely: Tullis, T., & Albert, B. [3]. Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics (Second Edi). Elsevier Inc. Based on these reviews, the metrics determined in this study are described in table 1.
### Table 1. Metrics in Research

| No. | Metrik                          | Objective                                                                 | Measuring Instrument                                                                                     |
|-----|---------------------------------|---------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| 1.  | Performance metrics             | Know the performance (effectiveness & efficiency) of the user against his  | - Task success                                                                                  |
|     |                                 | interaction with the system to achieve a task.                           | - Time on task                                                                                 |
|     |                                 |                                                                           | - Error                                                                                                   |
|     |                                 |                                                                           | - Efficiency                                                                                             |
| 2.  | Self-reported metrics          | Measures overall user perception of their interactions with the system   | - Single Ease Question (SEQ)                                                                           |
|     |                                 |                                                                           | - Post Study System Usability Questionnaire                                                             |
|     |                                 |                                                                           | - Questionnaire of User Interface Ssatisfaction                                                        |
| 3.  | Behavioral metrics             | Measures visual attention to the system display design                     | Eye tracking: melalui frekuensi dan durasi fixation pada area of interest                            |
| 4.  | Issue-based metrics            | Identify problems that arise from interactions between users and the system | Retrospective think-aloud: frekuensi persoalan yang muncul dari responden                           |

#### 2.1.1. Performance Metrics

The data that has been collected through performance metrics is processed into three dimensions of UX namely effectiveness, efficiency and error. Each dimension gets input data which is then processed by calculating the average of each parameter and performing different test of two mean according to the type of data obtained to know the difference between two groups of respondents. In this dimension, both groups of respondents are all capable of completing the task given so that the completion rate shows 100% achievement.

Next is processing time data on task. The working time between the groups of respondents has never been and has never had a considerable difference on each task. It is proved by the independent sample t test test conducted in chapter 3 that in task 1, 3, and 5, the time of task work differs significantly between the two groups of respondents. This suggests that experience in using the Access KRL app affects the time required to reach a goal.

When viewed in terms of efficiency, efficiency in performance metrics obtained from the calculation of task success per number of task completion time in minutes. The greater the number shown, the higher the efficiency. The efficiency means the number of tasks that can be done successfully in a minute (goal / minute).

The group of respondents had been on the whole task of having higher efficiency when compared with the group of respondents had never been. Based on data processing conducted with independent sample t-test, significant efficiency differences occur in tasks 3 and 5.

The "never-Use" group of respondents is seen to have more number of errors than the respondent group "Ever Use". The highest number of errors in this group also occurs in tasks 2 and 5. This indicates that in the execution of tasks found difficulty in understanding the display given the Access KRL application so that still cause errors on the user, especially on new users.

#### 2.1.2. Self-Reported Metrics Data Processing

In Self-Reported Metrics, there are three types of questionnaires used are SEQ, QUIS, and PSSUQ. The SEQ Questionnaire is a questionnaire that measures the UX dimension of ease in using the Ease of Use application. This dimension is measured by the value or rating of the SEQ questionnaire.

The result is that the difference between the two groups of respondents is not significant on each task. Although the difference is not significant, it appears that the assessment given by the respondent group "already" shows a lower value which means the level of convenience is higher than the "never"
Similar to SEQ assessment, QUIS assessment also shows that respondent groups "have" given higher (more positive) grade averages than respondents "never before". Differences in the assessment of both groups of respondents have tested their significance with the Mann-Whitney test and gave no significant difference to all questions except to question 29 (feedback given system) which means that the previous usage experience did not have a significant effect on user perceptions except for Question number 29 in using the Access KRL app.

In this PSSUQ questionnaire, the higher the assessment given the more disapproving (negative) respondents to the statements given in the questionnaire. Similar to the SEQ assessment, PSSUQ's assessment also shows that respondents "have already" provided a lower average (more positive) rating than the "never-before" respondents. The respondent group "never" has the highest (most negative) score on the Interface Quality aspect, as well as the "respondent" group of respondents. This assessment indicates that the Access KRL application requires improvements in the interface quality aspect immediately to improve user satisfaction in using the application. Different assessments in both groups of respondents tested their significance with the Mann-Whitney test and gave no significant difference to all questions.

2.1.3. Behavioral Metrics Data Processing
This section will display data processing from data collected through self-reported metrics collected by eye tracking method. The data collected through eye tracking is the visualization data of heatmaps per menu according to the tasks assigned to the respondents processed into UX dimensions ie visual appeal to see the visual appeal of the Access KRL application.

![Figure 1. Heatmaps Dwell Time Task 1 until Task 5 Respondent “Never Use” (Left) and Respondent “Ever Use” (Right)](image)

In the figure 1 respondents "never use" and respondents "ever use" both look to the area according to the task ordered, but the respondent "has never" also look to the part that does not fit the task. Therefore, things that are the main menu should be placed centrally so as not to make the user have to think.

2.1.4. Issue-Based Metrics Data Processing
Based on RTA data processing results, through the paretto diagram obtained 18 types of major problems that must be fixed from the application of Access KRL. 18 types of problems are divided into four classifications with the number of 8 visualizations, 6 functions, 2 layouts, and 2 content. The main problem obtained from the RTA process will then be the input and suggestions that will be combined with the problems found in other metrics to generate a new design design from the Access KRL application. The most commonly encountered issues are visualization, layout, structure, content, and functionality.

2.1.5. User Interface Design
Colors are used in the computer graphics world to code information, draw attention to an object, signal to users, and display aesthetics [4] Application color selection in User Interface design is an important thing. Access KRL as an application issued by PT. KCJ has an identity color that is red. To maintain
the identity of the Access KRL application, redesigning the User Interface will use the same color as the identity color of PT. KCJ, which is red. The selection of fonts in the application in User Interface design is one of the important things. Based on the evaluation results, the fonts used by the Access KRL application create a less modern impression. Therefore, the font used in the new UI design uses the Roboto font and other family types (light, regular, bold). The size used is 12 pt for the contents for the writing can be clearly visible, and the size of 14 pt for the title (header) to look bigger. The use of the Roboto font is a common font used on websites and e-commerce that emerged in the 2000s and above. Roboto has also been used on over 9.8 million websites. The next stage is to rearrange the layout of the User Interface of the Access KRL app. To be able to redesign the layout of the User Interface, identified elements in the application view that are an important part of running the main activity of the application. The design of the application layout using Activity Relationship Chart (ARC).

This diagram is created to be able to map systematically the existing relationships. The relationship is illustrated by the net diagram of Figure 3.

3. Results and discussion
The thing that needs to be done in designing the improved Access KRL application design is by combining UI principles, translating ARCs, net diagrams, and evaluation results into visual form. In accordance with the results of the analysis, things to note in this design is the color, font, location, and image. The following is the result of the combination design that has been created in the form of User Interface design.

After redesigning the Access KRL application interface, verification tests were conducted on the new design using the QUIS questionnaire. The verification results show that between the old and new UI designs have significant differences in the assessment of overall reaction to time category (6 statements), screen (4 statements), and usability and UI (5 statements). These significant differences should be reviewed by looking at the higher average design ratings to draw conclusions that the new
designs proved to improve user satisfaction or lower it. Therefore, the assessment of the old UI design and new views and compared perbedannya. Comparisons were made on each category in the QUIS questionnaire. The difference in scoring is shown in Figure 5.

Figure 5. Comparison of QUIS Rating Category Overall Reaction to Time, Screen, and Usability and UI against Old and New User Interface Design

4. Conclusion
The performance of users in completing a given task can be achieved entirely either by respondents who have or have not used the Access KRL application. This achievement also shows that from both respondents there is no difference between the two groups of respondents to achieve their goals in using the Access KRL application so that it shows the process that existed in the main activities of the Access KRL application can be understood by the respondent or the user.

The attention of the eyes or the behaviour of the respondent's vision has a similar pattern, but the difference is in the respondents "never" respondents still often look the other direction that is not related to the task. Therefore, things that are the main menu should be placed centrally so as not to make the user have to think Based on retrospective think-aloud data it is found that the main problem most often experienced by the respondent mainly is the problem on visualization, function, layout, and content.

Recommendations in the form of a User Interface (UI) redesign for some parts of the application display are done to improve the User Experience of Access KRL applications and ultimately increase user satisfaction. UI redesign is done by combining the evaluation results of the approach method used. Display improvements mainly focus on the use of colours, fonts, layouts and structures using the UI design principles and the Activity Relation Chart.

The new UI design of the application proved to increase user interest within the perception satisfaction limits measured from the QUIS questionnaire results that have a higher average score in the overall reaction to time, screen, usability and UI categories and Proved to be a significant increase

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