

Usability Evaluation of Ticket Purchasing Applications, Case Study Public Railways in Indonesia

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Abstract— This study is an experimental research aimed at evaluating the usability of a mobile-based application used to facilitate passengers in purchasing train tickets. Currently, the ratings and comments on the Play Store indicate that users are experiencing a poor user experience with the ticket purchasing application. As an application widely used by the public, the usability evaluation is essential. The evaluation was conducted in a laboratory setting by measuring usability in three aspects: effectiveness, efficiency, and user satisfaction. The level of effectiveness and efficiency was measured using task analysis, analyzing the final results of each respondent after performing five predetermined tasks. The system usability scale method was used to determine the user satisfaction level. The measurement involved 10 respondents who actively use the application. The results show that the effectiveness and efficiency of the application are good. However, the measurement of user satisfaction aspect indicates less favorable results. This obviously results in poor user experience (UX) for users. Therefore, the practical implication of this study is the need for improvements to the application, both in the user interface (UI) and existing business processes, to enhance the user experience.

Index Terms—ticket; system usability scale; testing; usability

I. INTRODUCTION

Transportation is an essential means in daily life, facilitating people to travel anywhere. One of the public transportation options is the train. According to [1], transportation is an effort to move goods and/or passengers from one origin location to a destination location. One of the transportation modes in Indonesia is the train. The government provides train transportation services managed by Badan Usaha Milik Negara (BUMN), namely PT Kereta Api Indonesia (Persero). The Badan Pusat Statistik (BPS) reported that in September 2023, there were approximately 31.5 million train passengers in Indonesia [2]. Meanwhile, if calculated from January to September 2023, the number had reached 270 million train passengers. Compared to the data for the same period in 2022, this figure represents a 40% increase [2].

Currently, train tickets can be purchased at various locations such as train station counters, Alfamart, and Indomaret. Additionally, there are several applications available for purchasing train tickets online, including Traveloka, Shopee, and several other similar applications. Therefore, to facilitate passengers in purchasing train tickets, PT Kereta Api Indonesia officially released a mobile-based application. This application was first launched on September 10, 2023. Data from kai.id website shows that the number of users using the ticket purchasing application is approximately 12.4 million registered users [3]. Among these application users, there are approximately 6.1 million active users, including premium members. The data indicates that during the period from January to June 2023, there were 9.2 million (62%) train ticket bookings made through the application.

Furthermore, data from the Play Store indicates that more than ten million users have downloaded the ticket purchasing application. The application is expected to be a modern solution for train users to facilitate train travel with innovative features. Additionally, this application is a digital-based innovation from KAI equipped with reliable technology, a fun and youthful user interface, as well as various feature enhancements and seamless services. All of these are expected to enhance the user experience.

The success of an application depends not only on its advanced features but also on how easy it is to use [4][5]. Users should be able to interact with the application quickly and effectively. A usable application can reduce user frustration, increase efficiency, and reduce the time required to learn how to use it [6]. Usability heavily relies on easy-to-understand design, clear navigation, and consistent layout and icons [7]. An application must have good usability to attract users, increase retention, and provide a positive user experience (UX) [8].

However, data from the Play Store indicates that the ticket purchasing application has received a rating of 2.3 out of 5. Several user reviews suggest that the app's UI and UX are problematic. Specific issues reported by

users include a complicated payment system, the absence of an option to view seat orientation (front or back), and the lack of a feature to display travel history. These reviews suggest that users currently have poor user experience with the application.

Therefore, this research proposes the following research question: R1 Does the ticket purchasing application offer users an effective and efficient process?; R2. How satisfied are users with their experience using the ticket purchasing application? The results obtained will indicate whether users have a good user experience (UX) when using the application. Usability testing is crucial because the ticket purchasing application is widely used by train users for public transportation in Indonesia. In addition to testing the effectiveness and efficiency of the application, this research will also measure user satisfaction levels using the system usability scale method. The method has been widely used by researchers to measure usability scales in various applications, including Microsoft Teams [9], mobile-based learning applications [10], and augmented reality-based learning applications [11].

II. LITERATURE REVIEW

Usability is an important characteristic of any application, as it directly affects the application's overall quality. Consequently, numerous studies have focused on usability, though they remain relatively limited. An experiment conducted by [12] assessed the usability of a web-based application by examining three key aspects: effectiveness, efficiency, and satisfaction. Similarly, a study by [13] tested the usability of a mobile-based learning application using both undergraduate and postgraduate students as the respondents. Moreover, usability testing has been shown to enhance the quality of electronic health (eHealth) applications, making them more easily adopted by users [14][15].

More specific usability research has explored user satisfaction by utilizing a system usability scale. Researchers [16] compared scores of system usability scale among various mobile-based social media applications. Additionally, a systematic review summarized the use of system usability scale to measure usability in different educational applications [5]. The system usability scale method has also been adopted to evaluate the usability of mobile-based health applications [17][19]. During the Covid-19 pandemic, system usability scale was also employed to measure the usability of the Microsoft Teams application [9].

III. METHODOLOGY

This study is an experimental research aimed at examining user experience through usability testing carried out in a laboratory setting. The measurement will be based on three aspects including Effectiveness, Efficiency, and User Satisfaction [12][18]. Testing of all these aspects is carried out using the task analysis

method, which involves inviting respondents who are the target users of the ticket purchasing application to perform a series of tasks. The respondents involved are users of train transportation services who are accustomed to purchasing train tickets directly at the counter or through other applications but have never used the ticket purchasing application before.

Next, in conducting task analysis, a task list is created to serve as a tool for measuring the Effectiveness and Efficiency aspects of the ticket purchasing application. There are five tasks that each respondent must complete. These five tasks involve using the main features of the application that users will utilize when purchasing train tickets. The details of these five tasks are as follows:

A. Task 1

Viewing train schedules is a crucial step before purchasing tickets. Viewing schedules on the ticket purchasing application is used to check availability, select suitable times, and make better travel plans. In Task 1, respondents are expected to view the train schedule from Gubeng Surabaya Station to Jember Station, with the date set to one day after the task is performed. The expected steps for each respondent to complete Task 1 are shown in Figure 1.

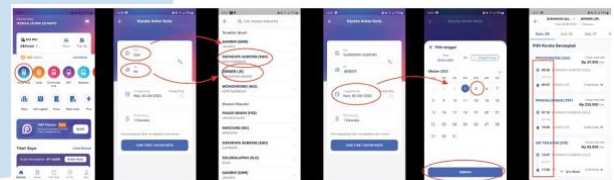


Fig. 1. Steps of Task 1

B. Task 2

Booking train tickets is a primary feature of this application. This feature provides information about ticket availability, various class options, as well as seat and meal selection. In Task 2, respondents have to book train tickets. Task 2 is a continuation of Task 1. Respondents are required to view the train schedule, choose one of the schedules, and proceed to the payment stage. Respondents do not need to pay for the ticket but only to complete the ticket booking. The steps for Task 2 can be seen in Figure 2.

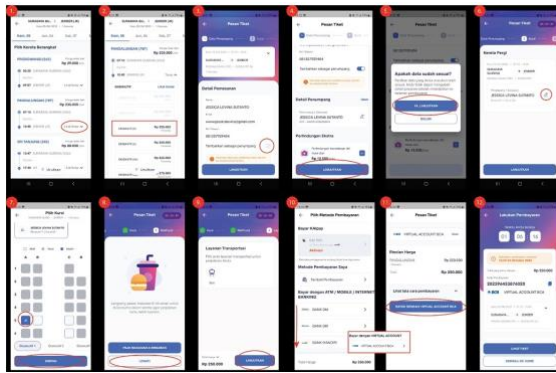


Fig. 2. Steps of Task 2

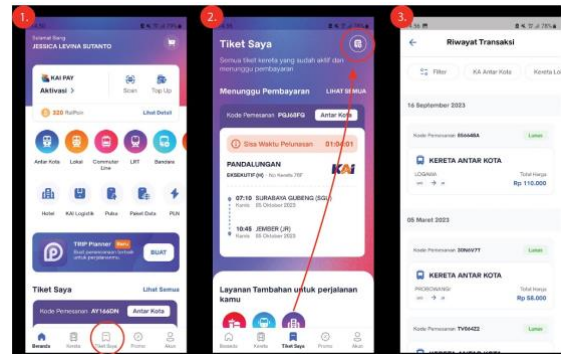


Fig. 4. Steps of Task 4 (1st scenario)

C. Task 3

The feature to view booked tickets is included as one of the most important features of this application. Users are required to show proof of booking in the form of an e-boarding pass to the inspector when boarding. Therefore, in Task 3, respondents are asked to view the tickets that have been booked in the previous Task 2. The steps for Task 3 can be seen in Figure 3.

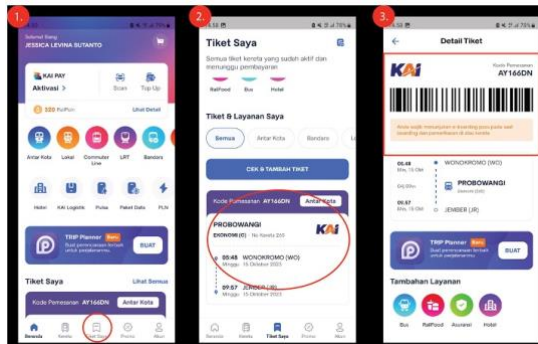


Fig. 3. Steps of Task 3

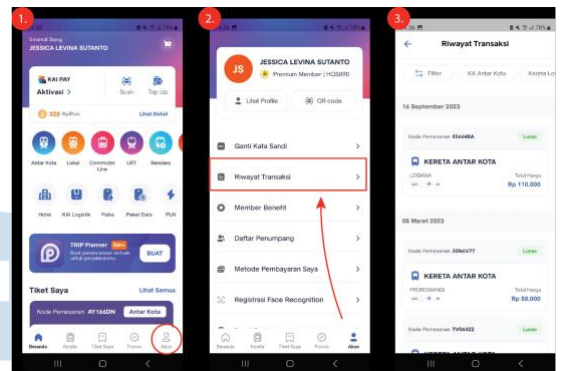


Fig. 5. Steps of Task 4 (2nd scenario)

E. Task 5

The profile feature allows users to access and manage their personal information easily, enabling users to validate their identity. In Task 5, respondents need to view their profile on the application. Respondents are advised to log in or create an account before starting Task 5. The steps for Task 5 can be seen in Figure 6.

D. Task 4

For users, viewing booking history is a useful tool for future reference, serves as confirmation and evidence of previous travel details, and tracks expenses and personal preferences. In Task 4, respondents are expected to view the booking history of tickets that have been previously purchased. There are 2 ways to complete this task. The first scenario for completing Task 4 can be seen in Figure 4. Meanwhile, the second scenario can be observed in Figure 5.

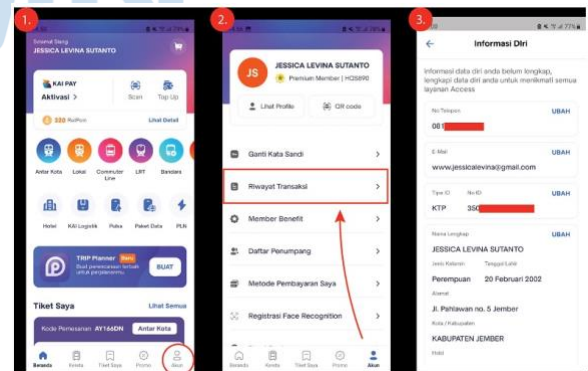


Fig. 6. Steps of Task 5

Furthermore, to measure the level of user satisfaction, the system usability scale measurement instrument is used. Respondents have to indicate whether they agree or disagree with 10 provided statements [19]. The system usability scale score results will determine the level of user satisfaction with the application.

IV. RESULT AND DISCUSSION

A. Respondent Profile

This study involves 10 respondents following the guidelines from [20]. The characteristics of these 10 respondents are that there are six (60%) females and four (40%) males. Figure 7 shows the profile of respondents based on gender.

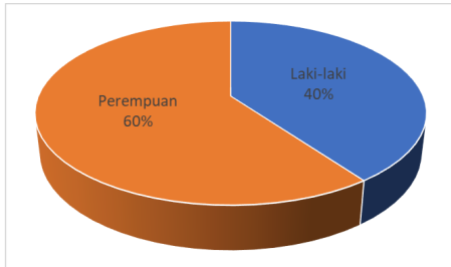


Fig. 7. Respondent profile based on gender

Based on age, there are 7 respondents aged between 21 to 30 years old (70%), while 3 respondents are over thirty years old (30%). The percentage breakdown of both age groups can be seen in Figure 8.

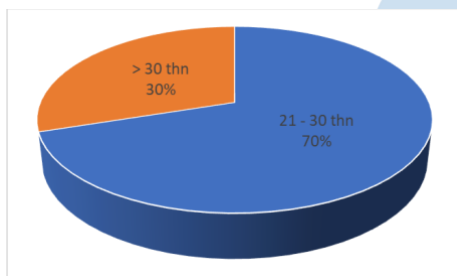


Fig. 8. Respondent profile based on age

B. Task Analysis Results

This section provides a detailed explanation of the results obtained after all respondents completed all the specified tasks. The final score is obtained from the calculation of the average completion time of tasks by all respondents. Each task has a maximum completion limit depending on the difficulty of the given task. The completion results of each task by the 10 respondents will be explained as follows:

1. Task 1: The completion time limit for this task is 60 seconds. The final score indicates that the average time taken by respondents to complete Task 1 is 28.82 seconds. One respondent failed to complete this task.
2. Task 2: The completion time limit for the task given to respondents is 90 seconds. The final score indicates that the average time taken by respondents to complete Task 2 is 55.91 seconds. One respondent failed to complete this task.

3. Task 3: Respondents were given a maximum of 10 seconds to complete this task. The final score indicates that the average time taken by respondents to complete Task 3 is 6 seconds. Three respondents failed to complete this task.
4. Task 4: The time limit given to respondents to complete this task is 30 seconds. The final score indicates that the average time taken by respondents to complete Task 4 is 20.45 seconds. Four respondents failed to complete this task.
5. Task 5: The completion time limit for this task is 10 seconds. The final score indicates that the average time taken by respondents to complete Task 5 is 5 seconds. One respondent failed to complete this task.

C. Effectiveness Measurement

Effectiveness is the accuracy of users in achieving the specified goals. To calculate the effectiveness, this study uses the formula proposed by [21] as follows:

$$\text{Effectiveness} = \frac{\text{Number of tasks completed successfully}}{\text{Total number of tasks undertaken}} \times 100\% \quad (1)$$

Based on the task completion results and the formula above, the effectiveness results for each task are quite good, as shown in Table I. All tasks have effectiveness values above 60%, with an average value of 80%. This indicates that the effectiveness of the ticket purchasing application is high [22].

TABLE I. EFFECTIVENESS RESULTS

No Task	Percentage
Task 1	9/10 * 100% = 90%
Task 2	9/10 * 100% = 90%
Task 3	7/10 * 100% = 70%
Task 4	6/10 * 100% = 60%
Task 5	9/10 * 100% = 90%

D. Time Based Efficiency Measurement

Time Based Efficiency measures the time used in an activity or process that can be optimally utilized to achieve the desired results. Time Based Efficiency is obtained using the following formula:

$$\text{Time Based Efficiency} = \frac{\sum_{j=1}^R \sum_{i=1}^N \frac{n_{ij}}{t_{ij}}}{NR} \quad (2)$$

N (total tasks) = 5

R (total respondents) = 10

Nij: The result of task i by user j; Nij = 1 if the user completes the task, otherwise Nij = 0

T_{ij} : The time needed by user j to complete task i . If the respondent can not complete the task, then T_{ij} = time the respondent quits the task

By using the formula above, we obtained a quite good result with a value of 1.320 goals/sec. This result shows that the ticket purchasing application is efficient.

E. User Satisfaction Measurement

User satisfaction level is measured using the system usability scale. The measurement consists of 10 questions that respondents must answer by ranking from 1 to 5 based on how much they agree with the given questions [23]. The details of the system usability scale questions are listed in Table II.

TABLE II. SYSTEM USABILITY SCALE QUESTION

No.	Question
1.	I will frequently use this application
2.	I feel this application is unnecessarily complex
3.	I find this application easy to use
4.	I need technical assistance to use this application
5.	I find a variety of features integrated well in this application
6.	I find many inconsistencies in this application
7.	I believe many users would be able to learn this application quickly
8.	I find this application very impractical to use
9.	I am very confident in using this application
10.	I need to learn a lot of things first to be able to use this application

Based on the provided guidelines, here is the calculation of the system usability scale score for the ticket purchasing application:

- For each of the odd-numbered questions, subtract 1 from the score.
- For each of the even-numbered questions, subtract their value from 5.
- All scores are then summed up, and the result is multiplied by 2.5 to obtain the system usability scale score.

After calculation, the value indicates that the system usability scale score for the ticket purchasing application is 65. Based on the guidelines from [24] as seen in Table III, a score of 65 can be interpreted as the user satisfaction level for the application is still low, as the application falls within the "poor" category. This will undoubtedly result in a subpar user experience. Therefore, improvements to the user interface of the application are necessary to enhance the user experience.

TABLE III. SYSTEM USABILITY SCALE INTERPRETATION

Score	Grade	Interpretation
> 80.3	A	Very Good
68 – 80.3	B	Good
68	C	Average
51 – 68	D	Poor
< 51	E	Very Poor

V. CONCLUSION

The objective of this study is to assess the usability of the ticket purchasing application, a mobile-based platform designed to assist passengers in purchasing train tickets. The assessment was conducted in three aspects: effectiveness, efficiency, and user satisfaction. The measurement results indicate that the effectiveness of the application is good with an average score of 80%. Additionally, the efficiency of the application is also quite good, as evidenced by the Time Based Efficiency score of 1.320 goals/sec and the Overall Relative Efficiency score of 72.18%. However, based on the system usability scale score obtained, user satisfaction with the ticket purchasing application is still low at 65. This can potentially lead to a subpar user experience for users.

Furthermore, this research provides practical guidance for government decision-makers on improving ticket purchasing applications. This can be achieved by optimizing the user interface (UI) and refining business processes to enhance the user experience. However, there are some limitations to this study. The evaluation of usability in Indonesian ticket purchasing applications might produce different results if replicated in other countries. Moreover, the sample size in this study was relatively small, suggesting the need for further research with a larger group of respondents.

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