

# **Evaluation of Malang City Public Transportation Route Search Mobile Application Implementation**

**Nurizal Dwi Priandani and Herman Tolle**

Department of Computer Science,  
Faculty of Computer Science - Brawijaya University  
e-mail: [priandani@ub.ac.id](mailto:priandani@ub.ac.id), [emang@ub.ac.id](mailto:emang@ub.ac.id)

## **Abstract**

*Malang City is a second most populated city in East Java – Indonesia that known as City of Education, Industrial, and Tourism. The existence of public transportation in Malang City becomes an essential factor to support its inhabitant. The most used public transportation in Malang City is Angkutan Kota (Angkot). There are 25 Angkot routes available for connecting three main terminals. The complicated problem of Angkot route search encourages the necessity of media that can provide information and recommendations to the society. This paper presents the evaluation of Mobile Application for Malang City public transportation route search application which named Angkot Malang. The evaluation has been done by measure the user satisfaction using interview and questionnaire dissemination to the Angkot user. The result showed that the application is highly accepted and useful for the users of Angkot Malang City.*

**Keywords:** *Evaluation, User Satisfaction, Public Transportation, Route Search, Mobile Application.*

## **1 Introduction**

Malang City is a second most populated city in East Java – Indonesia [1]. Known as City of Education, Industrial, and Tourism, Malang attracts many newcomers to study, enjoy the tourism, or to find a better career [2]. The existence of public transportation in Malang City becomes an essential factor to support its inhabitant. The most used public transportation in Malang City is *Angkutan Kota* (Angkot). There are 25 Angkot routes available for connecting three main terminals, which are Arjosari Terminal (Northern Malang), Gadang Terminal (Southern Malang), Landungsari Terminal (Western Malang) [2]. There is alphabetical code to mark

Angkot's departure point and destination point. For example, "ADL" route which connects Arjosari Terminal to Landungsari Terminal via Dinoyo.

The amount of Angkot routes and the typical of Angkot Routes system which a single street is passed by several Angkot routes, causing difficulties to choose the Angkot route that appropriate to be used by the user. In some case, the user has to transfer or using several Angkot routes when there is no direct Angkot route. The user must be know where the transfer position and what next Angkot route which should be use to arrive at the destination. To handle this complicated problem, media is a necessity to provide better information about Angkot routes to the society.

We have designed and implement a mobile-based application to give information and best recommendation about Malang City Angkot routes, in purpose to increase the effectivity of angkutan route information. The Angkot route search application was designed and implemented as an Android platform application which named *Angkot Malang App*. *Angkot Malang App* used Modified-Path Planning algorithm to searched Angkot routes from the origin point to destination point and Haversine Formula to determined the origin point and the destination point based on the current place nearest distance.

This paper will evaluate the impact of *Angkot Malang App* that utilized by Angkot user. The impact means the user satisfaction and response on *Angkot Malang App*. The measurement will be done by interview and questionnaire dissemination to the Angkot user. The descriptive analysis will be conducted to conclude user satisfaction on the application after the interview and questionnaire dissemination were conducted.

## 2 Application Review

*Angkot Malang App* is a Map-based application which utilizes Google Map API. *Angkot Malang App* has been distributed and published in Google Play store (<https://play.google.com/store/apps/details?id=com.orion.angkotmalang&hl=en>). *Angkot Malang App* has several functional features. The main feature in *Angkot Malang App* are interactive map to find Angkot route and shows angkot routes information.

By the interactive map feature to find Angkot route, the user can use GPS to locate the user's position or choose the origin position. The user determines the destination position by touching the appropriate place on the map. When the origin and destination position is acquired, the application will search the most relevant with minimum transfer Angkot route. Then, the application will show the *directions* or link route of both positions included with the Angkot transfer information. The screenshot of this feature is shown in Figure 1.

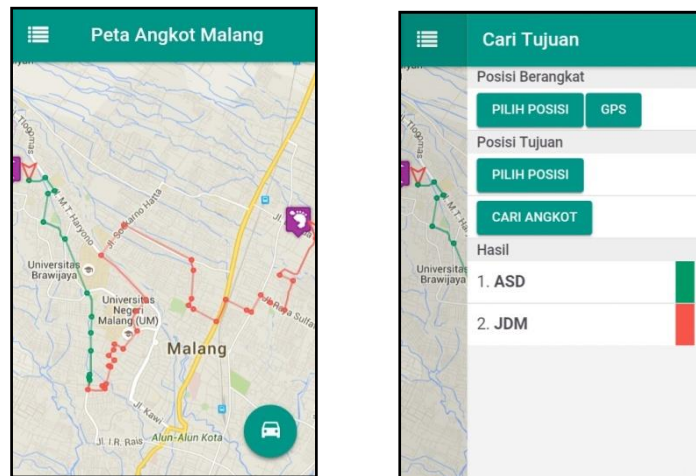


Fig. 1: Interactive Map to Find Angkot Route Feature

Shows Angkot routes information feature in *Angkot Malang* application provides Angkot routes information and list of streets passed by the Angkot routes. The desirable route information is shown on the map to ease the user to understand the list of streets which passed by the Angkot. The screenshot of Shows Angkot Routes Information feature is shown in Figure 2.

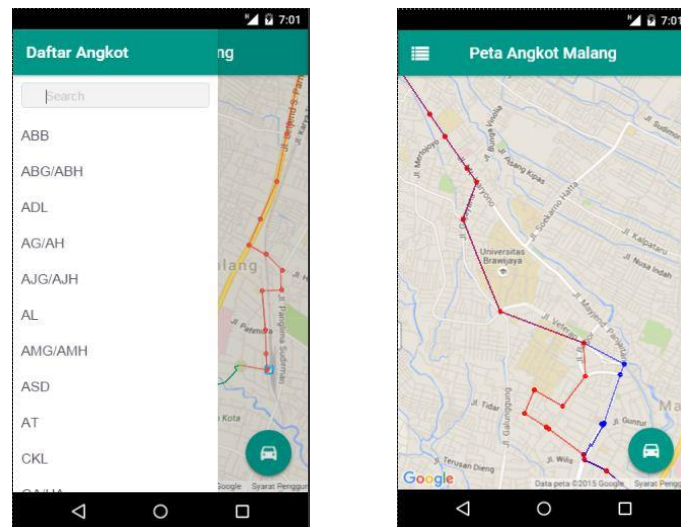


Fig. 2: Angkot Routes Information Feature

### 3 Impact Measurement and Strategies

The *Angkot Malang* application impact measurement based on user satisfaction in Usability, Performance, Reliability, Accuracy and Precision aspect. The measurement has been conducted with questioner dissemination. The questionnaire dissemination has been conducted by spreading directly to schools and online media, such as Facebook or Twitter, by using online form. The

respondent was the user of Angkot. The Angkot user definition is one who use Angkot as the daily public transportation. There were 100 people as the respondent. Before asking the user satisfaction, it was a necessity to fully understand the identity, frequency of Angkot utilization, general awareness about Angkot routes, and existing system information about it, from the user. The purpose was to understand the user's profile and ensure any complicated problem related to confusing routes and minimum system information. The question form which used to gather the user profile information was close question with single response. However, the questionnaire model which used to gather the user satisfaction was rated response which used the likert scales. The descriptive analysis was conducted after the answer was gathered from the user which in rated response form.

#### 4 Questionnaire Preparation and Pre-Analysis

Pre-survey had been conducted before the actual interview and questionnaire dissemination began. The purpose of pre-survey was to test the validity and reliability on the question in the questionnaire [3]. In case there was an invalid question, the question would be deleted. The reliability test was conducted on the valid question [4]. The reliable question would be inputted in the actual survey. The pre-survey have been carried out on first fifty Angkot user as the respondent. The test calculation of validity and reliability have been conducted with IBM SPSS ver 21.

The validity test has been done with Pearson *product-moment correlation*. The correlation was a correlation between score in each of the questions with the variable total score. The formula for calculating the sample Pearson's correlation coefficient between variables  $x$  and  $y$  is given by [5]

$$r = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{[\sum_{i=1}^n (x_i - \bar{x})^2][\sum_{i=1}^n (y_i - \bar{y})^2]}} \quad (1)$$

Where  $x_i$  and  $y_i$  are the values of  $x$  and  $y$  for the  $i$  individual.

Table 1 shows rule of thumb for interpreting the size of a Correlation Coefficient [6]. In the questionnaire,  $r$  value result in each question was greater than 0,8. It meant that the question in the questionnaire was valid.

Table 1: Interpretation of the size of a correlation Coefficient [6]

Size of Correlation	Interpretation
0.9 to 1 (-0.9 to -1)	Very high positive (negative) correlation
0.7 to 0.9 (-0.7 to -0.9)	High positive (negative) correlation
0.5 to 0.7 (-0.5 to -0.7)	Moderate positive (negative) correlation
0.3 to 0.5 (-0.3 to -0.5)	Low positive (negative) correlation
0 to 0.3 (0 to -0.3)	Negligible positive (negative) correlation

Reliability test conducted to aware if the question in the questionnaire was reliable to be inputted in the next survey. The reliability test used *Alpha Cronbach*. *Alpha Cronbach* provided a measure of the internal consistency of a test or scale; it was expressed as a number between 1 and 0 [7]. Internal consistency ought to be determined before a test can be utilized for research or examination purposes to ensure validity. Reliability assessments demonstrate the measure of estimation error in a test [3]. This interpretation of reliability was the correlation of test with itself. The formula for calculating Alpha Cronbach is given by [8]:

$$a = \frac{n}{n - 1} \left( 1 - \frac{\sum V_i}{V_{test}} \right) \quad (2)$$

Where:

- $n$  = number of questions
- $V_i$  = variance of scores on each question
- $V_{test}$  = total variance of overall scores on the entire test

The closer Cronbach's alpha coefficient is to 1.0 the greater the internal consistency of the items in the scale. The rule of thumb of Alpha Cronbach as follows [9]:

- $\alpha > 0.9$  – Excellent
- $\alpha > 0.8$  – Good
- $\alpha > 0.7$  – Acceptable
- $\alpha > 0.6$  – Questionable
- $\alpha > 0.5$  – Poor
- $\alpha < 0.5$  – Unacceptable

In the questionnaire, *Alpha Cronbach* value result was greater than 0,7 for every acquired variable. It showed that all of the questions were reliable. Furthermore, the questionnaire could be used for the actual survey.

## 5 Result and Analysis

The result data has been acquired from questionnaire answer by 100 respondents. The analysis method was descriptive analysis based on the amount of the respondent answers. Before asking about the user satisfaction, the user profile has been asked to the respondent. Respondents profile consisted respondent distribution, angkot utilization frequency, awareness of angkot routes, awareness of existing angkot apps or information system, and user preference on angkot routes searches application basis.

Respondent distribution consisted about their background activities. The questionnaire answer was grouped into three, which are, junior-senior High school, College Student/Employee/Worker, and Tourist. The purpose of this question was

to aware the user activities related to Angkot utilization. The involved respondent consisted 16% Tourist, 26% College Student/Employee/Worker and 58% junior-senior High school as shown in Figure 3.

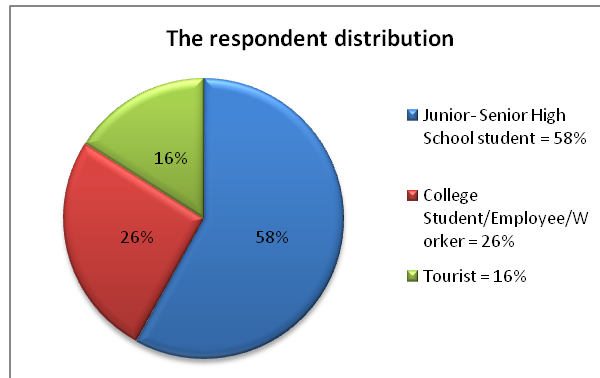


Fig. 3: The Respondent Distribution

The purpose of the respondent Angkot utilization frequency question was to understand the Angkot utilization frequency related to the user activities. The questionnaire answer was grouped into four which are "at least once in two days", "at least once in a week", "at least once in a month" and "this is the first time". Based on the respondents answers, 72% of the respondents use angkot at least once two days, 16% of the respondents use angkot for the first time, 10% of the respondents use angkot at least once in a week, and 2% of the respondents use angkot at least once in a month. Figure 4 shows the chart of respondent angkot utilization frequency.

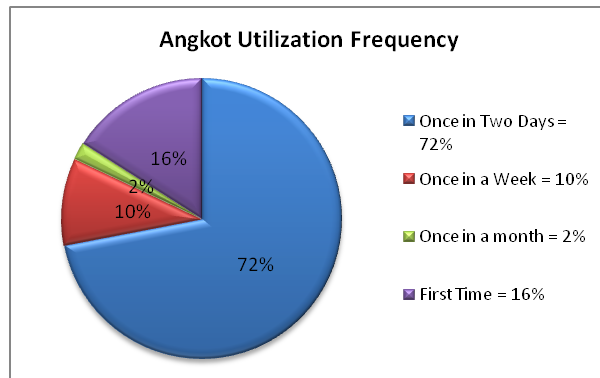


Fig. 4: Angkot Utilization Frequency

The purpose of user awareness of angkot routes question was to understand the user awareness about Angkot routes and user behavior when the user did not aware the Angkot routes. 96% of the respondents choose to ask another people when they do not understand the suitable angkot routes. The rest choose to find the suitable Angkot routes in the internet. Figure 5 shows the respondent awareness of Angkot routes.

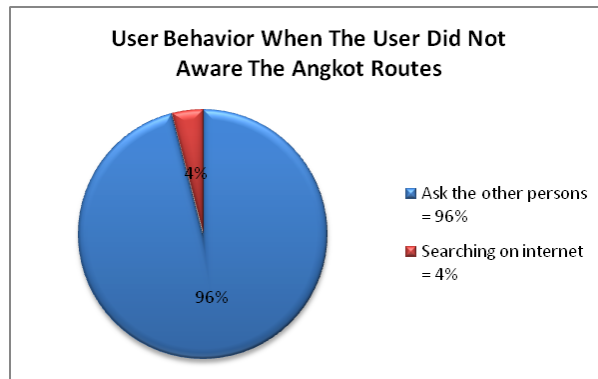


Fig. 5: User Behavior When The User Didn't Aware The Angkot Routes

The purpose of the awareness of existing angkot apps or information system question was to understand the user awareness of existing Apps or information system which provided Angkot routes or Angkot routes search. The answer of each question were Yes and No. When the user knows the existing Angkot Apps or information system, the user should answer Yes and vice versa. As shown in the Figure 6, 97% of the respondents did not know the existing angkot Apps or information system.

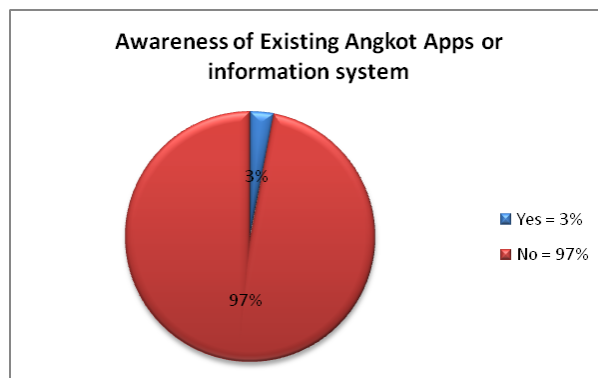


Fig. 6: Awareness Of Existing Apps Or System

The last question about respondent profile was “Does The Respondent Have smartphone?”. This question was a supporting issue for the question about the user preference. As shown in Figure 7, 95% of the users had Smartphone.

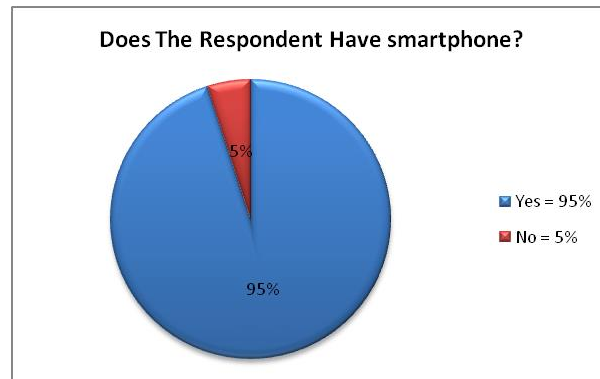


Fig. 7: Does The Respondent Have smartphone

Based on the questionnaire answers, it could be stated that almost every respondent encounter difficulties to search Angkot route, specifically to a new destination for the user, even though public transportation was a regular thing for the user. The user would like to ask another person (Such as Angkot driver and Police.) rather than searched on the internet. There is a possibility that the user did not aware about the available system information. Figure 6 shows only 3% of public transportation user aware about system information related to public transportation routes. Based on figure 7, 95% respondent have a smartphone. It simplifies the user to use the mobile based application to search the suitable angkot routes.

After the user profile and awareness have been understood, *Angkot Malang* application was introduced and tried by the user. Then, we asked about the user satisfaction with the application. The result from the respondent answers based on measurement of each aspect is discussed in the section 5.1 to 5.4. The descriptive analysis was conducted after the answer was gathered from the user to gain a conclusion based on the user satisfaction measurement.

## 5.1 Reliability

The parameter of this aspect are "No failure", "No forced close" and the application display moves smoothly in the user's smartphone. Figure 8 shows the user's opinion on reliability aspect. 88% of the respondents felt that the application worked very smoothly on their Smartphone. 10% of the respondents felt that the application worked smoothly, and 2% of the respondents felt that the application worked quite smoothly.



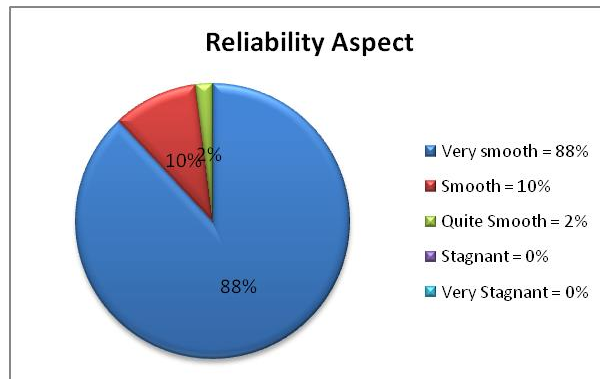


Fig. 8: Reliability Aspect

## 5.2 Usability

The parameter of usability aspect were "The application is informative" and "Easy to use for the user". Figure 9 shows the user's opinion on usability aspect. There were 3 answers chosen by the users. 80% of the respondents stated that the application was very informative and easy to use.

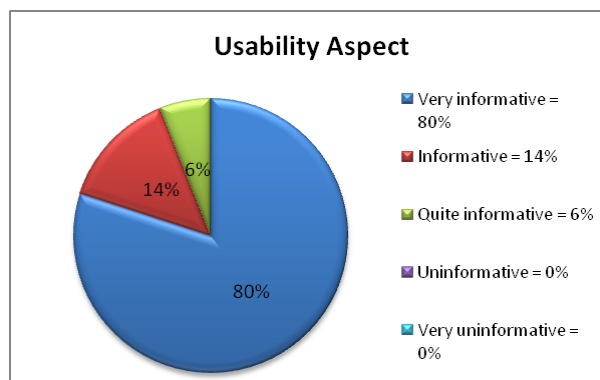


Fig. 9: Usability Aspect

## 5.3 Performance

The parameter of this aspect was "The application able to work fast and not frustrates the user when displays the Angkot routes or in searching process". Figure 10 shows the user's opinion on the performance aspect. 90% of the users answered that the application worked fast and there was no lag, which 76% of them claimed that the application worked very fast.

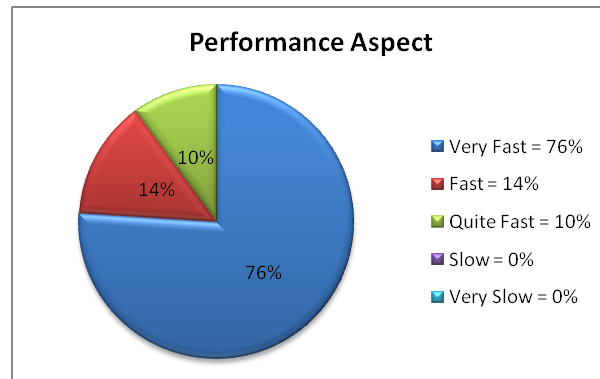


Fig. 10: Performance Aspect

#### 5.4 Accuracy and Precision

The parameter of this aspect was "The application able to generates and displays routes, fit with the user expectation". 86% of the users felt that the result given by the application was very accurate. Figure 11 shows the user's opinion on accuracy and precision.

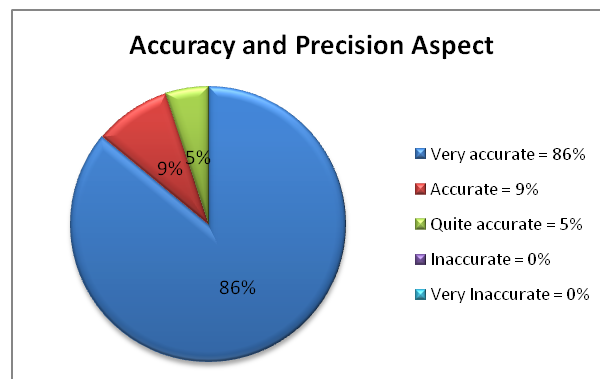


Fig. 11: Accuracy and Precision Aspect

Based on respondent's answers which displayed in figure 8 to 11, there are several conclusion related to user satisfaction with *Angkot Malang* application. In user's opinion, the application has worked perfectly. 88% user stated that the application was very smooth, and no failure when the application ran on various devices. 80% user said that the application performance was fast when in searching process for *Angkot* route. In Figure 10, 94% user stated that the application was made and designed easy to use. On Accuracy and Precision aspect, 95% user stated that the application has produced an identic result and tolerated by the user.

## 6 Conclusion

Based on respondent's answers, the application has worked perfectly. 88% user stated that the application was very reliable with no failure when the application ran on various devices. 80% user stated that the application performance was fast when in searching process for Angkot route. On usability aspect, 94% user found that the application was informative and easy to use. On Accuracy and Precision aspect, 95% user believed that the application has produced an accurate result and tolerated by the user. Based on all of the fact, it can be concluded that the application is highly accepted and useful for the users of Angkot Malang City.

### ACKNOWLEDGEMENTS

This research was supported under the Riset Scholarship Program funded by the Faculty of Computer Science – Brawijaya University. The authors would like to thank Ms. Carlin Soniawinda, Ms. Asharina Dwi and Mr. Yeremia Anggarianto for their effort to comment the statistical part and collect the data.

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