ISSN 2085-4552

Developing an Android-based Tour Guide Application

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Accepted 25 June 2025
Approved 01 July 2025

***Abstract*— Yogyakarta, renowned as a student city, is also one of Indonesia's top tourist destinations. Its distinctive local culture attracts many visitors, particularly for traditional shopping experiences. An application named Sipasar now offers information about the traditional markets in Yogyakarta. Additionally, the tourism information currently available from the government agency TIC (Tourist Information Center) is only provided in the form of brochures. This information is not very comprehensive as it is limited to the brochure and is also not very up to date because the brochures are printed only in certain years. There is a need to develop an application that can fulfill the tourism information needs of Yogyakarta from the Sipasar application. Besides containing market information, this application also serve as a tour guide capable of providing route and navigation guidance, as well as helping tourists obtain information about local tourist destinations. To address these requirements, an Android-based application called Sipasar Tour Guide was developed. The application underwent blackbox testing to verify the functionality of all features. Moreover, the application was evaluated by respondents using the MARS (Mobile Application Rating Scale) method. This method involved 25 respondents using the application first, then answering questions by giving ratings on a scale of 1 which is the worst to 5 which is the best score. The data analysis results showed that the designed Sipasar Tour Guide application successfully met the needs of providing tourism information to users which is proven by the score of the average from all the answers at 4,5 of 5 scales or 90%, as well as providing routes and navigation for trips. This was proven not only by the results of the blackbox testing but also by the respondents' ratings during the application testing using the MARS method. The highest ratings from the four dimensions (usability, functionality, aesthetics, and information quality) were in functionality and information quality, with percentages of 92.4% and 91.6%, respectively.**

Index Terms*— *Android Application; Local Tourist Destinations; Tour Guide; Route; Navigation.

I. INTRODUCTION

Yogyakarta is recognized as a major tourist hub in Indonesia. In 2009, there are about 1,2 million visitors. This number rose substantially in 2017 to approximately 4,7 million tourists, and by 2018, Yogyakarta saw around 5 million visitors [1]. One of the attractions that tourists often choose is traditional shopping. In traditional markets, tourists can find traditional foods, iconic items, and so on. Although the locations of these markets are already available on the SiPasar application, which can be accessed through mobile or web applications, Sipasar can give information about traditional market in Yogyakarta, start from traditional things, market's map, and many more. Furthermore, data from the Yogyakarta City Tourism Office indicates that numerous tourists struggle to access information about tourist attractions [2]. A significant number of these visitors seek help by going to government offices, like the Tourism Information Center (TIC) at the Yogyakarta City Tourism Office. However, the TIC can only help by providing brochures of available tourist spots. Thus, the recommendations for tourist spots are not very up to date, and the information presented is incomplete, as it is limited to the brochures [2].

Currently, there are applications that can be used to guide tourists during their travels. Applications like Google Maps are now frequently chosen to guide people to their destinations. However, Google Maps does not provide cultural information or unique tourist icons at those locations, so users must find that information on their own. To get information about the culture of a specific location, tourists can also use the TripAdvisor application, but that application cannot provide direct guidance to tourists to reach their intended destinations.

Based on these issues, this research will develop an application that can serve as a tour guide for tourists by adding new tourist data to the SiPasar application. This application will use a text-to-speech feature, so tourists can enjoy their journey while listening to information about the location. This is because Text to Speech is a system that converts text into audio signals [3]. Additionally, to reach specific locations, users can select multiple points at once and use real-time turn-by-turn navigation to reach their destinations.

To develop the application, design planning is required first. According to Rahmasari, design planning is a stage that must be undertaken to create several alternative solutions before the development and implementation of the application [4]. Therefore, a data collection stage must be conducted first to understand what kind of application design will be carried out.

In this application, after conducting benchmarking, it is envisioned that there will be a map that can navigate and thus serve as a tour guide. This service can be provided using Mapbox, a location platform company that offers tools for displaying and analyzing spatial data [5]. A tour guide functions as an interpreter, educator, community ambassador, and a mediator for interactions between local culture, residents, and tourists from both abroad and within the country [6]. Therefore, it is crucial for tour guides to convey information effectively. To meet this need, a text-to-speech feature has been integrated into the travel navigation system to provide audio information about tourist sites. This application is being developed using Kotlin, a programming language that runs on the Java Virtual Machine [7].

The objective of this study is to develop and evaluate the *Sipasar Tour Guide* application, which aims to provide travel routes for tourists and offer information about tourist attractions in Yogyakarta. This application is expected to help tourists familiarize themselves with Yogyakarta's culture and tourist destinations through the provided information. Additionally, it facilitates tourists in determining their travel destinations by offering recommendations based on their proximity to related traditional markets. With this application, tourists can have a more guided and informative experience while exploring Yogyakarta.

This research is conducted by considering the existing studies. From these studies, the beneficial aspects are adopted, and for the less beneficial aspects, alternative solutions are sought to find more relevant options. This way, the research can be carried out optimally to achieve the desired results.

Collecting data through interviews with official government agencies to obtain concrete information, as done by Mersing et al. which also developing an android application for tourism objects in Batam city, seems appropriate for this research [8]. This approach can be applied in this study because of the similarity in the need to build a system.

For the system design model, in the research conducted by Mersing et al. which also developing android application for tourism object in Batam and Adil et al. which also using Mapbox API to map tourism, they used the waterfall model and succeeded [8][9]. However, considering the nature of that model, which is not flexible, it may not be suitable for implementation in this study. This is because this research requires a lot of improvements and changes based on the data collection conducted.

In Adil et al.'s research to map tourism, they use Mapbox, they use its API with JavaScript programming language [9]. Mapbox would be suitable for implementation in this study because it is free to use, and it provides comprehensive features. However, using JavaScript based on the web platform might not be appropriate for this research because the features to be used are compatible with mobile programming.

In the research conducted by Ahmadi et al. that concerning in pickup-and-delivery problems using electric vehicles with Mapbox multistops and also Choudhary et al. that using Augmented Reality for the Turn-by-Turn Navigation System for mobile devices, they used Mapbox features such as multi-stop and turn-by-turn [10][11]. Multi-stop is used to determine multiple destination points, while turn-by-turn can be used to navigate users in real-time to reach their destinations. These features would certainly be very helpful for tourists if implemented in this study.

Modeling with the SDLC prototype has more flexibility, compared to waterfall, making it easier to make corrections if there are errors [12][13]. Considering the practicality of coding and the continuity of application development, Kotlin would be more suitable to implement than Java

II. METHODOLOGY

A. Research Object

The object used in this research is a prototype of a tourist guide application designed to help tourists decide on travel destinations and obtain information about those destinations. It was tested on local tourists to determine the application's success in meeting their needs.

B. Research Subject

This research focuses on usage by tourists, with 10 respondents for prototype testing and 25 local tourists for system application testing. All respondents are aged 17-30 years and come from outside the city of Yogyakarta, as the application is focused on walking tours typically undertaken by this age group. The 10 respondents in the prototype testing assessed the system's suitability to user needs.

The study focuses on respondents aged 17-30 years, as this demographic represents the most active users of mobile applications and digital tourism services. This age group is also considered more adaptive to technology and frequently uses mobile applications for travel planning.

Based on data from the Central Statistics Agency of the Special Region of Yogyakarta Province, the number of international tourists in Yogyakarta Province is 6,258 [14]. Compared to the 469,227 international tourists visiting Bali, as reported by the Central Statistics Agency of Bali Province, the number of tourists in Yogyakarta can certainly be considered small [15].

Thus, considering this comparison in numbers, the margin of error used is 20%. To achieve a confidence level of 80% or a margin of error of 20%, the number of respondents needed according to the Slovin's formula is as follows:

$$N = 6.258(\text{number of population or visitors})$$

$$e^2 = ((20\%)/100)^2 = 0.2^2$$

$$n = \frac{6.258}{1 + (6.258 \times 0{,}2^2)}$$

$$n = 24{,}9 = 25 \text{ people/respondents}$$

Thus, there are a total of 35 respondents: 10 people for prototype testing and 25 people for system application testing, as well as research using the MARS (Mobile Application Rating Scale) model.

The limited number of respondents in prototype testing (10 people) is due to the qualitative nature of this phase, which aims to gather detailed feedback before the full system application testing. Meanwhile, 25 respondents were used for system application testing as a representative sample within the targeted user demographic in Yogyakarta.

The number of 25 respondents for application testing was determined using Slovin's formula, which is commonly used to calculate an appropriate sample size from a given population while considering a margin of error.

C. Testing Procedure

For the 25 respondent, the testing procedure can be outlined as follows:

1. Respondents are informed about the purpose of the research. Respondents must also be prepared to use the application for testing using the MARS method. This aims to ensure that respondents feel involved in this research.
2. Respondents are required to fill out the distributed form after using the application. This is necessary for conducting calculations in research using the MARS method.

D. Research Block Diagram

This research uses the SDLC Prototype method. In this research the first step is literature review to know people's needs for tourism. In SDLC Prototype, the research develops the prototype using Figma and develops the application based on the prototype design using Android Studio. To make sure the application is running well, this research uses blackbox testing. Then after the application passes the blackbox testing, MARS testing can be done to know the user's evaluation. The stages of this research can be seen in Figure 1.

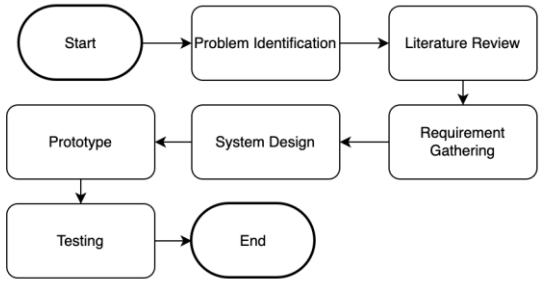

Fig. 1. Research Diagram

D.1. Problem Identification

The research begins by identifying the need for an application that provides travel routes and tourism information in Yogyakarta, particularly integrating traditional markets as part of the tourism experience.

D.2. Literature Review

Relevant studies on tourism applications, route recommendation systems, and usability testing methods are reviewed to establish a strong theoretical foundation.

D.3. Requirement Gathering

To understand user needs and expectations, data is collected through surveys. This stage helps define essential features such as market information, tourism categories, and route recommendations.

D.3.1. Collection of Tourist Place Data

During this stage, observations are made on tourist locations around the market to gather information about these tourist spots. This is useful to ensure that the tourist data collected is actual. Therefore, surveys and browsing related to this matter are necessary.

D.3.2. Use Case Diagram

The Sipasar Tour Guide application features a main tour guide for tourist spots around traditional markets, with tourism categories, tourist spot choices, and detailed information about each place. Users can view travel routes to selected destinations and use real-time navigation. These features are depicted in the Use Case Diagram in Figure 2.

Fig. 2. Use Case Diagram

D.4. System Design

Based on the findings from the literature review and requirement gathering, the application prototype is designed.

D.4.1. Application Flowchart

The details of this application flow can be seen in Figure 3.

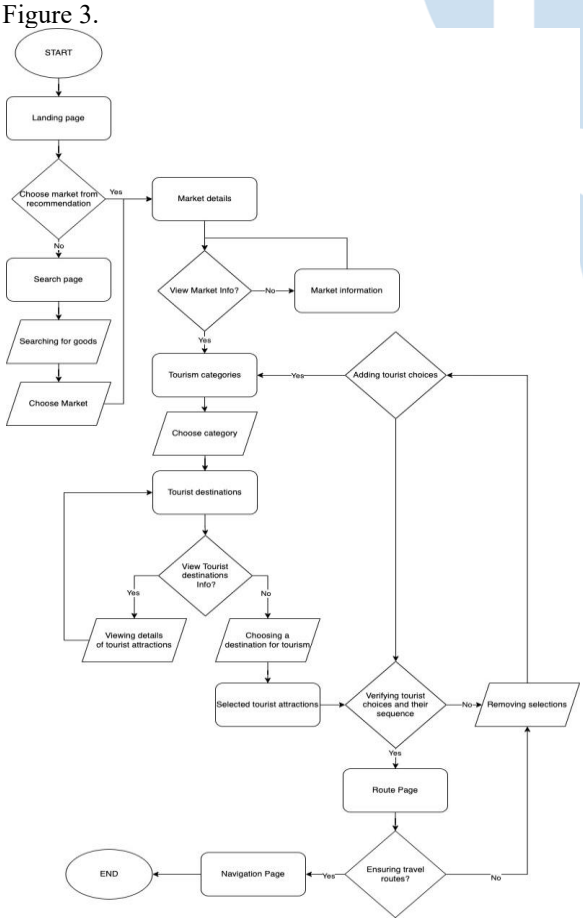

Fig. 3. Application Flowchart

D.4.2. System Requirements Analysis

An Android application named "Sipasar Tour Guide" was built to help users determine their travel destinations. The application aims to offer the following features:

a. Displaying a list of goods and markets that sell those goods

b. Displaying detailed market information

c. Displaying selectable categories of tourist destinations

d. Displaying options of various tourist destinations according to the selected category

e. Displaying travel routes in the form of a map for the selected tourist destinations

f. Displaying real-time travel navigation that provides travel instructions

D.4.3. Functional Requirements Analysis

The functional requirements analysis focuses on identifying and defining the key features that the application must provide to meet user needs effectively. This stage is based on data gathered during the requirement gathering phase, including user expectations and tourism-related use cases. The functional features identified in the analysis are as follows:

1. **Search** - On the search page, users can view and search for goods as well as market options selling those goods. Once a user selects a market, they will be directed to the detailed page of that market.
2. **Market Details** - The market detail page displays photos and a market layout, with an information tab containing descriptions, history, notes, item tags, and its stalls. The tourism tab showcases three relevant tourism categories associated with the market.
3. **Tourist Destination Options** - The tourist destination options page allows users to view 3 different tourist destinations within each selected category. They can see the distance from each destination to the targeted market, as well as detailed information about each place, including the number of reviews, photos, address, operating hours, and description.
4. **List of Selected Tourist Destinations** - On this page, users can view the list of tourist destinations they have selected. Users can also sort these tourist spots again.
5. **Travel Routes** - The travel routes page allows users to view routes to their selected tourist destinations, with estimated travel times between points. They can also remove tourist spots if the route does not align with their intended destination.

6. **Travel Navigation** - The navigation page provides real-time travel instructions at every road turn and displays information about tourist destinations upon arrival. Users can read or listen to this information using the text-to-speech feature.

D.4.4. Non-Functional Requirements Analysis

In addition to functional requirements, non-functional requirements play a crucial role in determining the overall performance, usability, and reliability of the "SiPasar Tour Guide" application. The following sections outline the necessary software and hardware requirements for the development and use of the application.

1. **Software Requirements Analysis**
   The applications and website that support the development of the "Sipasar Tour Guide" application in this research are Figma and Android Studio (Flamingo 2022.2.1).
2. **Hardware Requirements Analysis**
   The minimum hardware specifications required to use the "Sipasar Tour Guide" application are Android 8.0 (API level 26) and it must be an Android device.

D.5. Prototype

The prototyping phase is essential in the development of the "SiPasar Tour Guide" application, as it allows for iterative improvements based on user feedback. This stage involves designing and refining the application's interface and features before moving on to full-scale development.

1. **Concept *Design*** - This step begins with creating a design for the desired prototype concept in an abstract manner.
2. **Low Fidelity Prototype** - Once the concept and type of prototype are determined, in the initial stage of prototype development, the creation starts from a low-fidelity prototype of the application system. The prototype consists of landing page, search page, market detail page, tourism categories, tourist destination options page, places detail information, travel route, and travel navigation.
3. **High Fidelity Prototype** - In addition to creating designs for each feature and page, in the prototype stage, the existing designs are also converted into a High-Fidelity Prototype. This is necessary because the prototype will be tested by 10 respondents. Therefore, the prototype tested must accurately represent the functionality of the application system to be developed.

D.5.2. Database Design

Database Design in this research is carried out to determine the appropriate database structure for managing existing data. In the development of the Sipasar Tour Guide application, a database is needed to manage the selected tourist destinations. Since this function is relatively simple, the suitable database to use is Room Database.

Room Database is suitable for managing relatively simple and lightweight data, such as the selected tourist data in this application.

Within the system flowchart in Figure 3, this database is specifically utilized for storing tourism destination data. The primary structure used in this implementation is the Choices table, which holds information about selected tourist destinations. Figure 4 is the data structure employed in this research.

Choices	
PK	id (int)
	nama (string)
	foto (string)
	alamat (string)
	bintang (string)
	ulasan (int)
	jamOperasional (string)
	latitude (double)
	longitude (double)
	deskripsi (string)
	sumber (string)
	sumberGambar (string)

Fig. 4. Choices Table Structure in Room Database

D.5.3. User Interface Design

1. **Initial Design**
   In the initial design stage, after testing the prototype with 10 respondents, the implementation of these designs into the application system development begins. This involves building all desired features, starting from the landing page, search page, market details, tourism category options, tourist destination choices, travel routes, and travel navigation.

   However, upon reviewing the feedback and suggestions received, both from guidance sessions and from respondents, it appears that there are still shortcomings in the implemented application system. The deficiency lies in the search page, where all displays are presented in a list format, including item names that number in the tens. This layout is considered less effective and efficient for users. The design of the search page in the first iteration can be seen in Figure 5.

Fig. 5. Search Page in Initial Design

2. **Second Design**

After improving the application system, it turns out there is still an error in the search page layout. Although the displayed item names are different, the market options for each item remain the same. This is a fairly significant mistake. This error can be seen in Figure 6.

Because of this error, tourists can only see these markets, which may not necessarily sell the displayed items. Additionally, in this improvement, there is a distance between the markets and the users, so that users can more easily choose where to shop. However, because the list of markets is not correct, this is still not relevant.

Fig. 6. Search Page in Second Design Iteration

D.6. Testing

D.6.1. Testing Method

This application is tested using the blackbox testing method. The definition of blackbox testing itself is a method used to test a system without knowing its code structure [16]. After the application successfully passes blackbox testing, it is also assessed using the Mobile Application Rating Scale (MARS).

The MARS assessment is a reliable type of assessment that is simple, multidimensional in scale, and requires little training to implement. There are 4 aspects evaluated in MARS: engagement, functionality, aesthetics, and information quality. Each feature is rated on a scale from "inadequate" to "excellent" [17]. In the MARS (Mobile Application Rating Scale) method, calculations using the Cronbach's alpha formula are also conducted to determine whether the questions posed are the appropriate parameters for testing the application.

In the study by Roberts, et al. [17], there are six levels that serve as boundaries for determining the degree of internal consistency. These levels are very good, good, acceptable, questionable, poor, and the last is unacceptable. These boundaries are also used to determine whether the average rating of the application is very good or not. The calculation formula for MARS is as follows:

$$Average\ Score = \frac{Total\ Score}{Total\ of\ Respondents}$$

$$Total\ Score = 1st + 2nd + \cdots + N\ dimension\ average\ score$$

Thus, the application is evaluated not only for its functionality in being usable but also validated by users that it is informative and useful enough for them, addressing the issues intended.

D.6.2. Testing Phase

In the blackbox testing phase, independent testing is conducted on the developed application. This is used to test for bugs, errors, or incorrect information in the application. The stages involved in blackbox testing are as follows:

1. **Interface Testing**

Interface testing is conducted to determine whether the Sipasar Tour Guide application can display results that correspond to the input provided by the user. Describing the interface testing of the final implementation of the "Sipasar Tour Guide" application. On the landing page, several test cases were conducted, including market selection, start button, search input, item name button, and market selection. The test results showed that the system displayed the market details page and search results according to the given input. On the search page, the search input and item name button were also tested, and the results showed that the system could display the searched item name along with related markets. The market detail page was tested with several features such as market images, layout images, information tab, tourism tab, and back button, all of which showed results that met expectations.

On the tourism selection page, the system was tested to display the details of the selected tourist spots, save the selected spots, and remove

unchecked spots. The test results showed that the system could save and remove tourism selections correctly and display the number of selected spots on the number button. The selected tourism page was also tested with results showing that the system could remove data of unchecked spots.

Testing on the route page showed that the system could display the route map, remove tourism spots from the list, orient the map view to the North, and start route navigation. On the route navigation page, features such as re-center button, overview, volume, route instructions banner, and close button were tested, and the results showed that the system could follow and display the route map properly during the journey.

2. **Basic System Functionality Testing**

Basic system functionality testing is conducted to verify if the features available in the application can function correctly according to user needs, and to address any discrepancies in the displayed output. Describing the basic function testing of the final implementation, where the system was tested for item search, selecting tourist spots, deleting tourist spots, viewing travel routes, and using travel navigation. The test results showed that the system could display the searched items, save and delete selected tourist spots, display travel routes, and effectively guide users to the selected tourist spots.

a. Validation Testing

Validation testing is conducted to determine whether the designed validation system works successfully without any errors. Focusing on the validation of the number of selected tourist spots. The system was tested to provide a message when the user has selected 5 tourist spots and to disable checkboxes for further selections. The test results showed that the system successfully provided the message and disabled the checkboxes according to the specified limit.

b. Real Testing

Real testing is conducted to assess whether the application functions well for users. In this research, real testing is performed using the MARS method after ensuring that the application system runs smoothly without any errors. The real testing section explains that the final testing in the application research was conducted by having respondents use the application to fill out the MARS (Mobile Application Rating Scale) form. Some tasks given in this testing included searching for batik and selecting Beringharjo Market, choosing 5 tourist attractions including Empal Bu Warno, deleting 4 attractions and leaving Empal Bu Warno, and starting navigation and waiting for a message to appear.

III. Result and Discussion

A. Implementation

In this implementation phase, we start by developing the Sipasar Tour Guide application. Based on data collected from observations and prototype testing of the application, we have developed an application that includes not only market information system features but also tourist information around those markets. In this application, there are several pages that contain information about markets and tourist spots.

A.1. Database Implementation

Room Database is implemented in the application to manage the tourist data selected by users, through database initialization, table initialization, and DAO (Data Access Object) implementation. The integration of Room Database in the application can be seen in the code below.

Managing Android application development requires DAOs that contain methods to access the database such as query, insert, update, and delete. DAOs ensure that interactions with the database are performed through safe and consistent methods that can be called from other classes.

A.2. *Final Implementation*

In the final implementation, corrections and improvements were made based on the shortcomings of the previous implementation. The list of markets and the distance between markets and users are displayed correctly.

A.2.1. Landing Page

On the landing page, users are presented with instructions about the application's features and recommendations for items such as batik and snacks, based on the habits of local tourists who enjoy culinary tourism and shopping for traditional clothing. This allows them to bring souvenirs for their family and friends.

A.2.2. Search Page

On the search page, users can view up to 7 items and 7 related markets. They can choose from the options displayed or search for desired items themselves.

The markets are displayed based on the distance from the user to facilitate the walking tour. Recommendations for the nearest markets help users determine their destinations.

A.2.3. Market Detail Page

This market detail page contains all the information about the market, such as photos, history, address, stalls, and items sold. Users can zoom in on images, including market photos and maps. This page has 2 accessible fragments.

The first fragment contains detailed information about the market, while the second fragment displays categories of tourist attractions around the market. Each market in Yogyakarta has its own uniqueness based on history, stereotypes, and culture, resulting in different categories of tourist attractions. The market detail page is shown in Figure 7 and Figure 8.

A.2.4. All Selected Tourist Destinations Page

Users can view, delete, and see the details of the selected tourist attraction on this page. The distance between the market and the tourist attraction, as well as the total distance from the first to the last tourist attraction, is also displayed. This can be seen in Figure 9.

A.2.5. Travel Route Page

Users can view the travel route that includes the selected tourist attractions. These attractions can be removed if deemed unsuitable. The user's target market will be the final destination on the map, as shown in Figure 10.

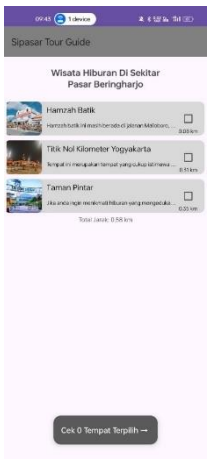

Fig. 7. Tourist Options

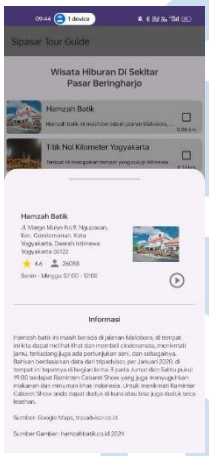

Fig. 8. Tour Details

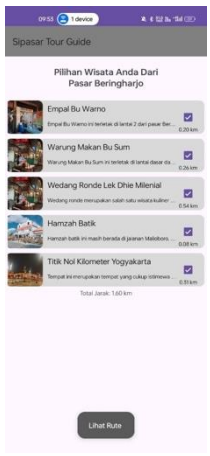

Fig. 9. Selected Tourist Options

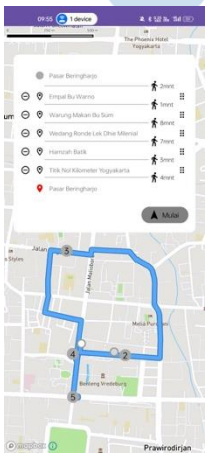

Fig. 10. Travel Route

A.2.6. Travel Navigation Page

After selecting a place, users can press the start button for real-time navigation with Mapbox's text-to-speech feature, providing turn-by-turn directions (Figure 11).

In Figure 12, when users reach their destination, information about the destination will be displayed and read aloud using a different text-to-speech feature from Mapbox. Users can stop this feature and read the information themselves in the bottom sheet dialog that appears at the destination.

B. Analysis

After finding an application that can meet the needs of local tourists, 25 respondents from outside Yogyakarta, aged between 17 and 30, tested the application. During the application testing, users were asked to fill out a form to evaluate the application using the Mobile Application Rating Scale (MARS) method.

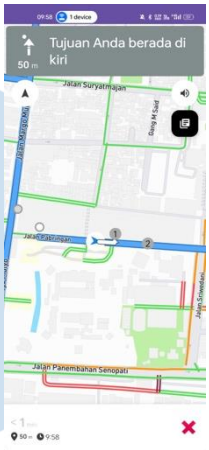

Fig. 11. Real-time navigation

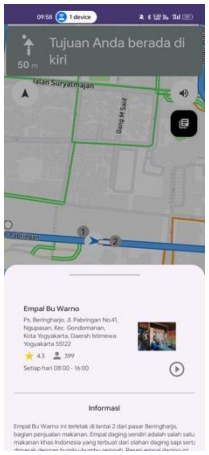

Fig. 12. Destination's Information

At this stage, research was conducted from four different dimensions. The first dimension is engagement, the second dimension is functionality, the third dimension is aesthetics, and the fourth dimension is information quality. This research was conducted by having respondents fill out a form containing questions for them to provide answers on a scale of 1 to 5.

The 1-5 rating scale was chosen based on the Likert scale methodology, which is widely used in user satisfaction and usability research. According to previous studies, a 5-point Likert scale effectively captures user feedback with balanced positive and negative response options.

From these four dimensions, the main focus of this research is on functionality and information quality dimensions. Because the aim of this research is to give travel tour which is the functionality and providing Yogyakarta tourist information which is related to the information quality. Here is the list of questions provided to the respondents:

1. Usability/Engagement: This dimension assesses the ease of users in recognizing the application system, to determine how familiar users are with the provided features. In the assessment of the Usability dimension, there are 3 questions.
   Q1. How intuitive is the navigation of this application for you?
   Q2. How easy is it for you to understand the messages or instructions given by the application?
   Q3. How responsive is the application to your inputs or interactions (e.g., deleting destinations, adding destinations)?
2. Functionality: This dimension assesses the utility of the application for users. Whether users feel that this application is useful for exploring the city of Yogyakarta or not. There are 6 questions provided in this dimension.
   Q1. How quickly does the application respond to your selected tourist destinations?
   Q2. How often do you experience lag or delays in accessing tourist information within the application?
   Q3. How stable is the application in performing its tourist functions without experiencing crashes or recurring errors?
   Q4. How smooth are the transitions between pages or menus within the application?
   Q5. How often would you use the main features of this application (especially the tourism features)?
   Q6. How easy is it for you to find and access the tourism features and information you need?
3. Aesthetics: The aesthetic dimension assesses the beauty of the application, focusing on the combination of colors, elements, and layout in the application's interface. There are 3 questions in the testing for this dimension.
   Q1. How appealing is the layout and visual design of this application to you?
   Q2. How consistent is the design style (colors, fonts, icons) throughout this application?
   Q3. How well does the application utilize design elements to enhance user experience (images, text-to-speech, infographics)?
4. Information Quality: The information quality dimension itself can be assessed based on whether the information provided is substantial, relevant, and helpful for users to understand the tourist attractions they intend to visit. There are 5 questions in the testing for this dimension.
   Q1. How clear and understandable is the information structure presented in the application?
   Q2. How useful are the information features and tourist options provided by this application?
   Q3. How clear is the information presented by this application?
   Q4. How well does the application provide solutions or answers to your tourism problems or needs?
   Q5. How well does the application handle your needs to provide tourist recommendations and suggest travel routes for those recommendations?

B.1. Dimension of Usability

Based on TABLE I, the Usability dimension obtained an average score of 4.53. This score, compared to the highest possible score of 5, is quite good. In percentage terms, this indicates the application's engagement level is at 90.6% , which can be considered "excellent" [17].

After testing the respondents and reviewing their responses, it seems they were pleasantly surprised and satisfied with the travel navigation instructions provided by the application. Despite the instructions being in Indonesian with an English accent, they were quite satisfied because the instructions were still easily understandable.

TABLE I. RESULT OF USABILITY DIMENSION

Questions	Respondents Rated (Likert 1-5)					Average Score (max 5)
	5	*4*	*3*	*2*	*1*	
Q1	14	11	0	0	0	**4.56**
Q2	14	10	1	0	0	**4.52**
Q3	15	8	2	0	0	**4.52**
					Average	**4.53 of 5**
					Average in persent	**90.6%**

B.2. Dimension of Functionality

Based on TABLE II, the average of all six questions in functionality dimension is 4.62. This score can be considered "excellent," as it translates to 92.4% in percentage terms [17]. This result is very satisfactory because it meets the research objective of providing travel routes for tourists and providing tourist information in Yogyakarta effectively through the application.

From the review of the application, questions 3 and 6 received the highest score of 5 mainly because the application has never experienced errors or crashes. Furthermore, tourist destinations can be easily found because their positions are clearly marked like the market's detailed information. Users can simply tap on a tourist destination to view its details.

TABLE II. RESULT OF FUNCTIONALITY DIMENSION

Questions	Respondents Rated (Likert 1-5)					Average Score (max 5)
	5	*4*	*3*	*2*	*1*	
Q1	15	9	1	0	0	**4.56**

Questions	Respondents Rated (Likert 1-5)					Average Score (max 5)
	5	*4*	*3*	*2*	*1*	
Q2	15	10	0	0	0	**4.60**
Q3	19	6	0	0	0	**4.76**
Q4	14	11	0	0	0	**4.56**
Q5	15	10	0	0	0	**4.60**
Q6	16	9	0	0	0	**4.64**
					Average	**4.62 of 5**
					Average in persent	**92.4%**

B.3. *Dimension of Aesthetics*

The results, as shown in TABLE III, are somewhat unsatisfactory in terms of aesthetics because when averaged, the first question only received 4.16, the second question received 4, and the last question received 4.6. Overall, in terms of average ratings across all questions, the aesthetic dimension only scored 4.25 out of the highest scale rating of 5.

It's undeniable that the development of this application has been more focused on functionality and the quality of information provided. Therefore, at this point, the visual design of the application still lacks satisfaction in terms of color combination and elements. However, with a percentage of 85% from the score of 4.25, it falls within the "good" rating category [17].

From the redesign review of this application, the first and second questions received low scores because the colors used are still too monotonous. Additionally, the layout of the elements presented in this application is also not very attractive. Although it has improved compared to the prototype, it is still not sufficient to be considered excellent.

TABLE III. RESULT OF AESTHETICS DIMENSION

Questions	Respondents Rated (Likert 1-5)					Average Score (max 5)
	5	*4*	*3*	*2*	*1*	
Q1	10	11	2	2	0	**4.16**
Q2	7	13	3	2	0	**4.00**
Q3	17	6	2	0	0	**4.60**
					Average	**4.25 of 5**
					Average in persent	**85%**

B.4. *Dimension Information Quality*

Based on TABLE IV, the overall average for the information quality dimension is 4.58. These results are quite satisfactory as they exceed 90%, specifically 91.6%. This percentage in the information quality dimension can be considered "excellent" [17].

From the user evaluations and application reviews regarding information quality, respondents indeed feel that the provided information is sufficient for them to determine their tourist destinations. Details such as addresses, operating hours, and other relevant information about the attractions have been very helpful. Additionally, the fact that this information is sourced from reliable sources adds to its credibility.

TABLE IV. RESULT OF AESTHETICS DIMENSION

Questions	Respondents Rated (Likert 1-5)					Average Score (max 5)
	5	*4*	*3*	*2*	*1*	
Q1	17	8	0	0	0	**4.64**
Q2	11	10	0	0	0	**4.52**
Q3	16	9	0	0	0	**4.60**
Q4	14	11	0	0	0	**4.56**
Q5	15	10	0	0	0	**4.60**
					Average	**4.58 of 5**
					Average in persent	**91.6%**

C. Discussion

In this section, we discuss the evaluation results of the developed application. The discussion includes two key aspects: Cronbach's Alpha Score, which assesses the reliability of the questionnaire used in the study, and a comparison with similar applications, highlighting the distinguishing features and advantages of our system. These aspects provide a deeper understanding of the application's effectiveness and usability.

C.1. *Cronbach's Alpha Score*

In addition to evaluating its usability, this study also conducted an analysis using Cronbach's alpha. This was done to determine whether all the questions posed were reliable tools for measuring the application under study. This analysis helps validate statements about whether the application is good or bad in its respective dimensions.

The formula for Cronbach's alpha is as follows:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k} \sigma_i^2}{\sigma_{total}^2}\right)$$

α = Cronbach's alpha value

k = The number of items in the scale

σ_i^2 = The variance of each item

σ_{total}^2 = The variance of total score

The calculation using Cronbach's alpha for this application study resulted in an alpha value of 0.81 [17]. This result falls into the category of good, as seen within the established thresholds.

C.2. *Benchmarking with Similar Applications*

Aplikasi Sipasar Tour Guide juga dibandingkan dengan fitur-fitur pada aplikasi sejenis lainnya. The applications studied were A = "Google Maps," B = "Tripadvisor," and C = "Roadtrippers." The results of benchmarking these similar applications can be seen in Table V.

TABLE V. BENCHMARKING RESULTS

Feature	A	B	C	Sipasar Tour Guide
Login	Yes	Yes	Yes	No
Search	No	Yes	Yes	Yes
Tourist Recommendations	Yes	No	Yes	Yes
Travel Route	Yes	No	Yes	Yes
Selecting Multiple Destinations	Yes	No	No	Yes
Travel Navigation	Yes	No	Yes	Yes

Overall, across the four dimensions tested, this application received a rating of 4.5 out of 5 from 25 respondents. Based on the established scale, this data falls into the "very good" category, as it is at 90% [17]. The comparison graph for each dimension is shown in Figure 13.

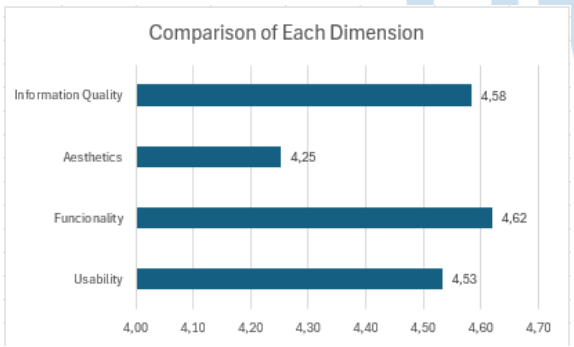

Fig. 13. Comparison of Each MARS Dimension

To determine whether the average rating of 4.5 is considered satisfactory compared to other applications, a comparison was made with the ratings of similar applications obtained from user reviews on the Play Store. From the research results of the average reviews of 3 similar applications, the following data was obtained, as shown in Figure 14:

- Google Maps
  - Average: 4,3
  - Number of Reviews: 17.228.001
- Tripadvisor (Mobile)
  - Average: 4,6
  - Number of Reviews: 1.378.167
- Roadtrippers – Trip Planner
  - Average: 4,3
  - Number of Reviews: 7.528

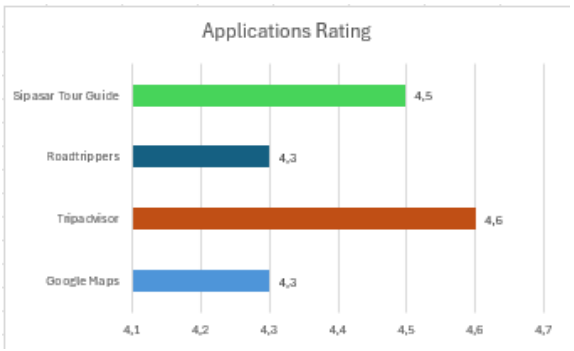

Fig. 14. Comparison of the 'Sipasar Tour Guide' Application with Similar Applications

Although the number of reviews for these compared applications is much higher, the 25 participants tested in this study are sufficient as research samples. This is because the study focuses more on the scope of tourism in the city of Yogyakarta alone. Meanwhile, these applications receive numerous reviews because they provide information not only for one city but for the entire world.

However, from the results obtained, it turns out that the application from this research is quite satisfactory compared to those applications. Although currently, this application receives a much lower average rating compared to Tripadvisor. This application is still very new and can be further developed to achieve much higher ratings. Development can be done across various dimensions.

IV. CONCLUSIONS

A. *Conclusion*

From the research and analysis carried out it can be concluded that the "Sipasar Tour Guide" application has succeeded in meeting the needs of local tourists. With the Sipasar Tour Guide, local tourists can effectively search for and obtain detailed information about tourist destinations in Yogyakarta.

This is proven by the average results of research analysis using the MARS method, where overall the four dimensions received a "very good" rating. What stands out most is the functionality dimension, which has the highest average rating in this application study, with a percentage of 92.2%. This shows that the application is very functional and usable for the users. Moreover, the dimension with the second highest ranking is the information quality dimension, with a score of 91.6%. This shows that the detailed tourist

information provided is very useful for users in determining their travel destination.

B. Recommendations

After drawing these conclusions, here are several recommendations that can help improve the "Sipasar Tourist Guide" application:

- It is recommended to support various languages other than Indonesian. This allows the application to be enjoyed not only by Indonesian citizens, but also by foreigners.
- Colors and elements can be made more attractive to increase the aesthetic appeal of the app.

It is hoped that the suggestions above can become valuable recommendations for the development of the "Sipasar Tour Guide" application.

ACKNOWLEDGMENT

We extend our gratitude to the Institute for Research and Community Service at Duta Wacana Christian University for funding our research. Special thanks are also extended to the respondents who agreed to participate in our team's pilot study.

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