



Implementation of Geolocation Tagging and Web Service Technology in Information Systems for the Distribution of Micro, Small and Medium Enterprises (MSME)

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ARTICLE INFO

Article history:

Received Nov 03, 2022
Revised Nov 16, 2022
Accepted Nov 30, 2022

Keywords:

Android
Geolocation tagging
UMKM
Web Service

ABSTRACT

MSME stands for Micro, Small and Medium Enterprises. MSME is a business or business run by individuals, groups, or business entities. The distribution of MSME in Fakfak Regency is quite wide, but there are still obstacles in the promotional media for MSME locations and the products sold. Until now, there is no application that provides information about MSME in Fakfak Regency. Therefore, we need an application that can provide information about MSMEs in Fakfak Regency. This application is designed based on Android so that it can be easily accessed by the public. In developing this application using the waterfall method. In implementing geolocation tagging technology using Google Maps, while Firebase is used as a web service (BaaS). From the results of black box testing, it was obtained that the application ran well according to the given scenario, and the results of user testing through questionnaires showed an average value of 90.3% for the level of user satisfaction.

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1. INTRODUCTION

The development of information technology is currently growing rapidly. One aspect of technology that continues to develop is mobile technology with smartphone devices (Sari, 2020). Smartphone technology that is currently becoming a trend is the existence of an Android-based operating system, which can provide many conveniences and benefits for its users (Jamaludin et al., 2020).

Nowadays, the smartphone has become part of a person's life, in which case the smartphone can be a medium used to search for information (Arridha et al., 2022). With the availability of internet access and also an information provider platform, providing a lot of information that can be accessed, of course this has increased the standard of human life. However, there is some information that is not yet available on this platform, therefore many developers are competing in developing information technology applications (Nugroho, 2020).

MSME stands for Micro, Small and Medium Enterprises and is called UMKM (Usaha Mikro, Kecil, dan Menengah) in Indonesian. MSME is basically a business or

business run by individuals, groups, or business entities. As stipulated in the legislation no. 20 of 2008, MSME in Indonesia are classified into Micro, Small, and Medium Enterprises (Sarfiah et al., 2019).

In Fakfak Regency there are various types of MSME, ranging from food businesses, beverage businesses, clothing stores, electronics stores, and many other types. MSME themselves are also driving the economy wheels in Fakfak Regency, the distribution of MSME in Fakfak Regency is also quite wide. The problem faced is that there are still many MSME location that are not known by the general public, and currently there is no application that can be used to find information about MSME, MSME locations and MSME services in Fakfak Regency.

Several related studies have been carried out by (Azizah & Widiastuti, 2018) regarding MSME mapping with the K-Means cluster algorithm based on geolocation technology implemented in Android applications using the waterfall method. In this study, MSME data was clustered using the K-Means algorithm, then the results from the cluster were entered into Android application, which was displayed per category of existing industrial centers. This application does not provide a web service as a backend. Another study entitled Mobile Application of Searching and Mapping Temporary Waste Disposal Site in Fakfak Regency (Arridha, et.al., 2022) conducted a mapping of Temporary Waste Disposal Sites (TPS). The built system cannot add/change data directly from the Android application. Other research by (Insani & Alkadri, 2019) conducted MSME Mapping in Pontianak City with a Web-Based Geographic Information System. This application is built based on the web and does not provide Android-based services.

In the current study, the waterfall development model was used, this model proposes a systematic and sequential software development approach that starts from the level of system progress in all analysis, design, code, testing and maintenance (Wijaya & Astuti, 2019). In the implementation of geolocation tagging technology, Google Maps is used. Firebase is used as a web service with a realtime database implementation. As a medium for interaction with users, an Android-based mobile application was built. The Android application built supports services with administrator/admin mode and user mode. Administrator mode can manage data on Android applications while user mode can use services provided by the system.

2. RESEARCH METHOD

This research was conducted in Fakfak Regency by choosing Fakfak Regency Investment and One-Stop Service Office as the place for collecting MSME data.

2.1 System overview

In this application design there is 2-way communication between the system and user. In this application there are 2 user levels that can be used to access the system, namely admin level and user level. At the admin level, users can manage all MSME data in the Firebase database. Admin can save or update data via smartphone (Android). The data is sent to Firebase via the internet network and stores or updates existing data in the Firebase database. Meanwhile, at the user level, the user can choose one of the MSME provided by the system. The system displays data sourced from Firebase as a backend service and utilizes the Google Maps geolocation tagging feature via the internet. The user gets complete information about the selected MSME and also provides navigation to the location of the MSME. Users can also get information about the location of MSME in the vicinity.

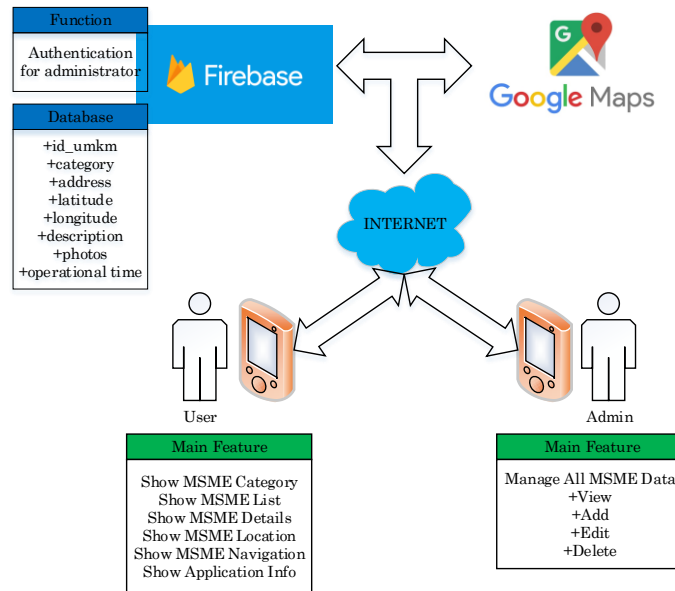


Figure 1. System Overview

2.2 Unified Modeling Language (UML) Design

UML is defined as a standard language in visualizing, designing, and documenting the built system. In the process of designing a UML system, it is necessary to prepare the blueprint for the application built to be well documented (Zhang et al, 2016). The several UML diagrams used in the development of this system are as follows.

a. Use Case Diagram

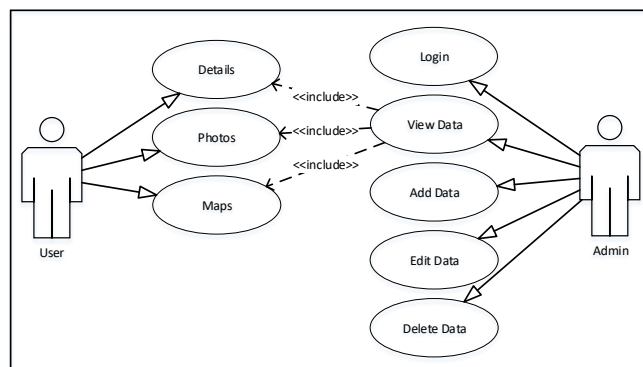


Figure 2 Use Case Diagram

Use case diagram is one of the several types of UML diagrams that describe the interaction between the system and actors. Use case diagram can describe the type of relationship between the user and the system (Aleryani, 2016).

Figure 2 is a use case diagram of the system built. There are two actors in the system, namely Admin and User. The admin has access to all pages in the application, while the user can only see the list and detailed MSME data and get navigation to the selected MSME location.

b. Sequence Diagram

Sequence diagrams are diagrams that explain and display interactions between objects in a system in detail (Campean & Yildirim, 2017). The sequence diagram in the system built is as follows.

a) Add / Edit MSME Data

The admin inputs MSME data through the MSME added form, the data sent and stored in Firebase at the MSME data model. The sequence diagram for adding/editing MSME is as shown in Figure 3.

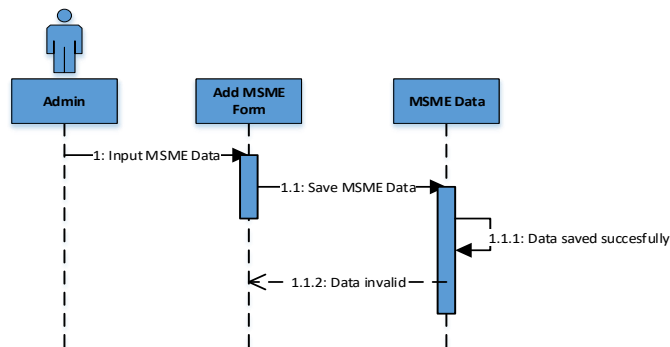


Figure 3 Sequence Diagram of Adding MSME Data

b) Delete MSME Data

In figure 4, Admin sees a list of MSME on the MSME list page, Admin can delete MSME data, MSME data is deleted from the MSME data model on Firebase.

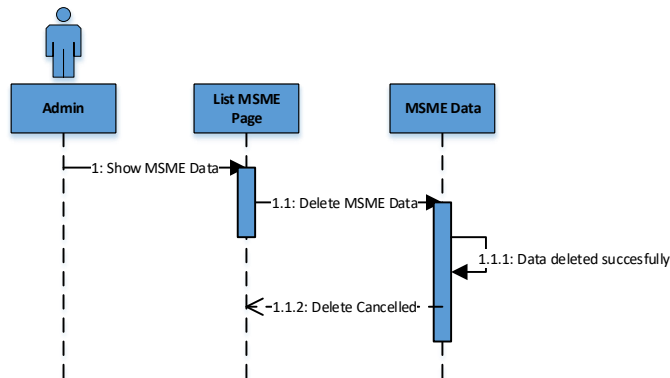


Figure 4 Sequence Diagram of Remove MSME Data

c) View MSME Data

Users can view MSME categories, select an MSME, view detailed MSME information, view MSME locations around, view specific MSME location points and navigate to the MSME location via the Maps provided. Figure 5 displays a sequence diagram, see MSME data.

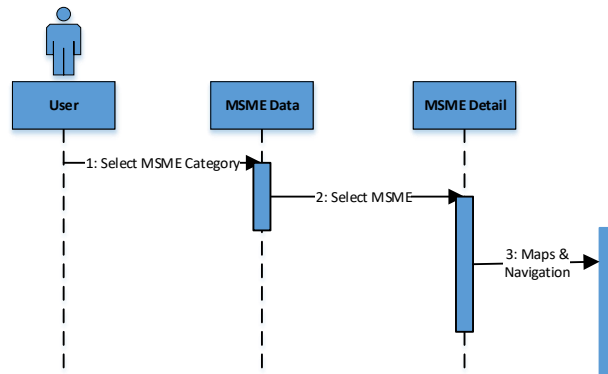


Figure 5 Sequence Diagram of View MSME Data

c. NoSQL Database Design

Database is created on Google Firebase as a web service, more specifically using Realtime Database. Firebase Realtime Database based on noSQL, so data is in the form of keys and values (Ohyver et al., 2019).

Figure 6 shows the application database design. In the design of the database in this study, there is 1 main data, namely "UMKM Data", which then consists of 5 branches/subsidiaries. The five branches are food, drinks, souvenirs, shops, and fashion. Each of these branches stores data, namely id_umkm, nama_UMKM, category, image, description, work time, address, and Maps.

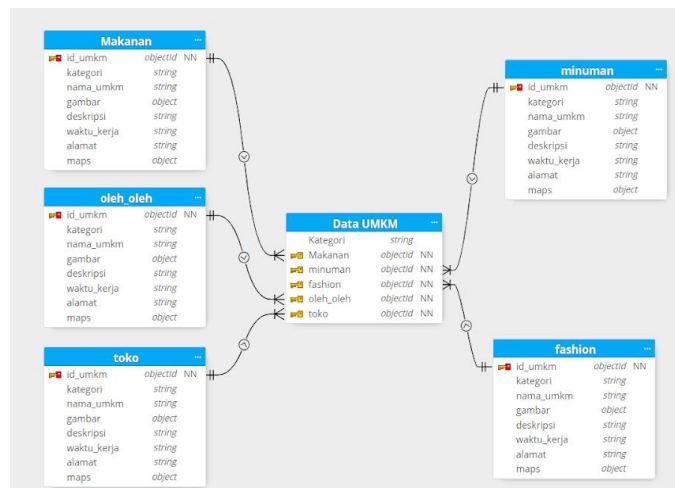


Figure 6 Database Design

3. RESULTS AND DISCUSSIONS

The result of this study is an Android-based application that implements geolocation tagging technology based on Google Maps and Web Services using Firebase. The description of the results of the study is as follows.

3.1 Display of Home Page

Figure 7 displays the main page of the application. The main page consists of several menu options according to the available MSME categories. Users can also open other menu options by pressing the bar in the upper left corner.

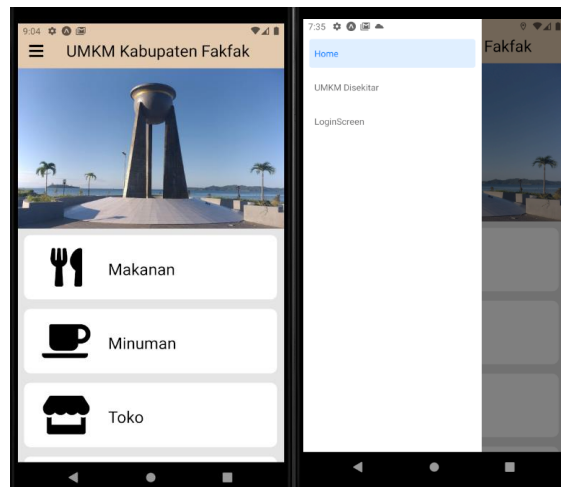


Figure 7 Home page

3.2 Display of MSME List and Details Pages

In the Figure 8, MSME data is displayed based on the selected category. The list of MSME that is displayed suits to the category options selected on the main page.

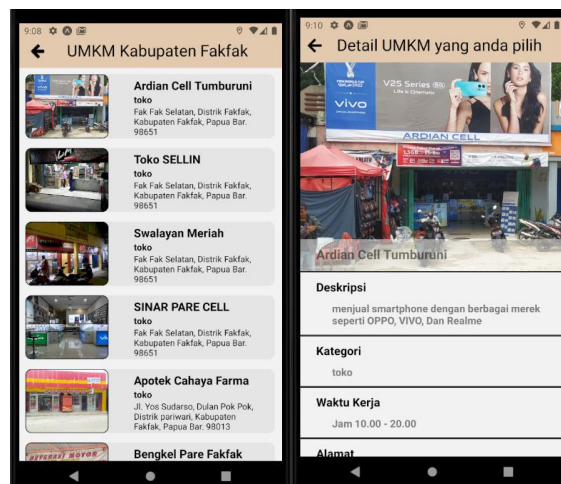


Figure 8 MSME List & Details Page

When one of the MSME clicked, it displays all data related to the MSME that selected. This data is sourced from data stored in Firebase. At the bottom of the detail page there is a view button on maps which takes the user to the maps page with the MSME location point and is accompanied by an option to navigate to that location.

3.3 Display of the Add / Edit MSME Data Page

Figure 9 shows that the admin can fill in the existing form, then press the add MSME data button. Data that has been added is automatically stored in the realtime database. The data that needs to be entered is the MSME name, description, operational time, address, latitude, longitude, and category.

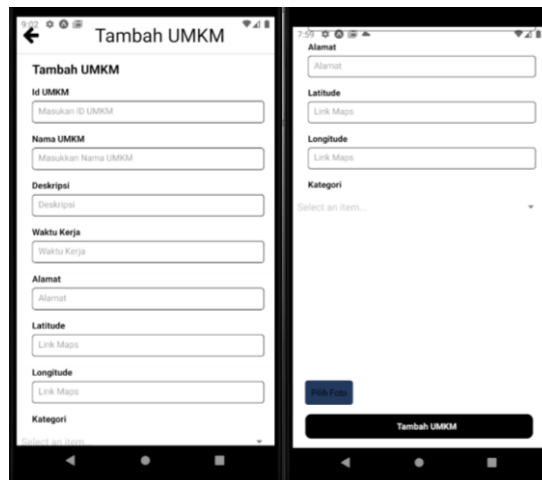


Figure 9 Add / Edit MSME Data Page

3.4 Display of MSME Around, Maps and Navigation Pages

In the Figure 10, a map appears containing the user's location and the MSME points around the user, when pressed on the point it displays the name, MSME category, and the MSME address. If the MSME name that appears clicked, the user directed to the MSME detail page. MSME location points are distinguished based on the categories provided.

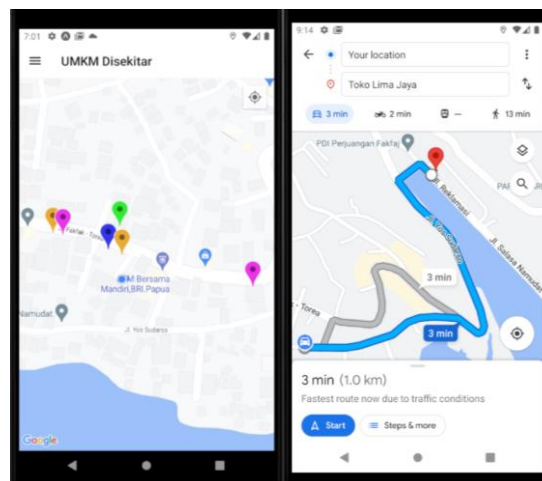


Figure 10 MSME around & Map navigation page

Next, a map displayed with the point from the MSME earlier, if that point clicked, the name of the MSME will appear. At the bottom right, there is a navigation button which when clicked opens Goggle Maps and gives us the best route to that location.

3.5 Black Box Testing

The testing process is carried out on all functional requirements that have been designed at the application design stage (Arridha & Roy, 2021). The several items tested and the test results detailed in table 1.

Table 1 System testing

Test Items	Testing Scenarios	Expected results	Success/Not
Login	Input the wrong username and password	The system refuses and show a notification that the username/password is incorrect	success
	Input the right username and password	Login is successful and redirected to Home admin page	success
Add MSME data	Adding new MSME data using the MSME id that already exists in the database	The system refuses and displays a message that the MSME id already exists	success
	Adding new MSME data using MSME id that are not yet in the database	The system accepts and MSME data that has just been added to the MSME list	success
Edit MSME Data	Changing one of the data MSME data	MSME data is successfully changed	Success
Delete MSME Data	Deleting one of the data MSME data	MSME data is successfully deleted	Success
View MSME Data	User views MSME detail	Data from the selected MSME is displayed, such as pictures, detailed info, and navigation.	Success
Navigation	Users use the navigation menu	The application is expected to direct the user to the Google maps application, and immediately shows the navigation direction to the selected MSME	Success
Logout	Admin Logs Out	Admin returns from the admin home page to the normal home page	Success

Based on the results of the black box testing that has been done, satisfactory results are obtained where all components in the system work properly and are in accordance with the test scenarios that have been made.

3.6 User Testing

Besides testing using the Black Box method, a usage test carried out by distributing questionnaires that answered by users while testing applications (Magfirah et al., 2022). The questions given were 10 questions with 22 respondents who had tried this application. Each question has a value, namely SS (Strongly Agree) with score of 5, S (Agree) with score of 4, N (Neutral) with score of 3, TS (Disagree) with score of 2, and STS (Strongly Disagree) with score of 1. The process of determining the score of each question uses the Likert scale method (Joshi et al., 2015). The formula used to calculate the Total Score:

$$\text{Total Score} = T \times P_n \quad (1)$$

T = Total number of respondents

P_n = Likert scale score

Meanwhile to determine the Index as follows:

$$\text{Index (\%)} = (\text{Total Score} / X) \times 100 \quad (2)$$

X = maximum total score

Table 2 User testing

No	STATEMENT	Likert Scale					Total Score	Index (%)
		SA	A	N	D	SD		
User interaction with the application								
1	The use of colors in the application is appropriate	13	5	3	1	0	96	87,3%
2	The placement of items in the application is not confusing	16	3	3	0	0	101	91,8%
3	Easy to use application	15	3	3	1	0	98	89,1%
4	All buttons in the application can work properly	15	4	3	0	0	100	90,9%
5	The application displays maps properly	16	3	3	0	0	101	91,8%
Application function								
1	The application provides good information about MSME	13	5	4	0	0	97	88,2%

No	STATEMENT	Likert Scale					Total Score	Index (%)
		SA	A	N	D	SD		
2	The application provides good navigation to MSME	16	3	3	0	0	101	91,8%
3	The application provides good MSME information around the user	15	3	4	0	0	99	90,0%
4	The application can show the location of MSME accurately	13	6	3	0	0	98	89,1%
5	This application is useful for increasing knowledge about the existing MSME	16	4	2	0	0	102	92,7%
Average								90,3%

In terms of testing user interaction with the application, with the items tested, namely whether the use of color in the application is comfortable to look at, a score of 87.3% was obtained; for the placement of items in the application is not confusing, the score of 91.8% is obtained; is the application easy to use, the score of 89.1% was obtained; whether all the buttons in the application work properly, the score of 90.9% is obtained; and whether the application displays maps properly, the core of 91.8% is obtained. From the result of user interaction testing with the application, an average value of 90.2% is obtained which is in the strongly agree interval.

Furthermore, in terms of application function testing, with the items tested, namely whether the application provides good information about MSME, the score of 88.2% is obtained; the application provides navigation to MSME with a good score of 91.8%; the application provides information about MSME around the user with a good score of 90%; the application can accurately show the location of MSME with the score of 89.1%, and whether the application is useful for increasing knowledge about existing MSME, the score of 92.7% is obtained. From the results of testing the application function, an average value of 90.4% is obtained which is in the strongly agree interval.

According to the two statements above, the results show that respondents strongly agree with this system, with an average value of 90.3% which is in the strongly agree interval.

4. CONCLUSION

Based on the research that has been done, it can be concluded that MSME in Fakfak Regency are growing and increasing over time, more and more new MSME locations are taken into consideration in making a business. In the research that has been done, an Android-based MSME distribution application has been built. This application implements geolocation tagging using Google Maps, and uses a Firebase-based web service as a backend and a place to store all MSME data in this application.

From the results of the blackbox testing that has been carried out, satisfactory results are obtained where all components in the system work properly and are in accordance with the test scenarios that have been made. While the results of user testing through questionnaires regarding user interaction with applications and application functions show that the majority of users strongly agree with this application with an average value of 90.3% which is included in the strongly agree interval scale.

With this application, people can easily obtain information about MSME around them and also navigate quickly using smartphones. This application can be used by related agencies to assist in the process of mapping business locations in the Fakfak Regency so that it can assist the local government in the process of making policies related to the progress of MSME in the local area.

This application can run properly if the user's smartphone is connected to the internet, it means that it cannot function properly when in offline mode. This is also a weakness of the system being built. This application can still be developed to support the

use of offline maps and also support the buying and selling process directly through the application.

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