The Application of Mobile Geographic Information System (MGIS) for Android-based Mapping of Micro, Small and Medium Enterprises

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Abstract. Micro, Small and Medium Enterprises (MSMEs) have great potential in driving community economic activities and at the same time become a source of income for most people in improving their welfare. Therefore, to improve the efficiency and effectiveness of independent and developing MSMEs, Information Technology (IT) is needed to promote enterprises and their products. For this purpose, Mobile Geographic Information System (MGIS) application was developed for android based mapping of MSMEs. In data collection process, the authors employed observation and interview as methods. The purpose of developing this application is as an alternative promotion media and to make it easy to find the location of MSMEs in Surabaya. Black box test was conducted to test the appropriateness of the application. In addition, testing was also conducted using a questionnaire involving 50 respondents with 15 questions representing 5 stakeholder needs. From the questionnaire results, it was concluded that 4 needs, namely, the need to promote products, to spread information, community service, and information of MSMEs have been highly fulfilled by the application, while the need to increase gross domestic product was sufficiently fulfilled by the application.

1. Introduction

The small industry sector is one form of alternative strategies to support economic growth in long-term economic development. Currently, the condition of small and medium industrial products in Indonesia is still a concern. Products from other countries easily penetrate Indonesian market causing the local products to be less competitive [1]. Since the monetary crisis in 1997/1998, the authorities have begun to pay attention to the development of MSMEs both in terms of quantity and quality. This is because MSMEs have relatively good resilience compared to large-scale businesses. In addition, compared to large-scale businesses, the role of MSMEs is very important due to their main characteristics [2]. MSMEs stands for Micro, Small and Medium Enterprises. MSMEs is regulated based on Law Number 20 of 2008 concerning Micro, Small and Medium Enterprises. In the regulation, it is explained that a company classified as a MSME is a small company owned and managed by a person or small group of people with a certain amount of wealth and income [3]. One of the problems faced by MSMEs is the lack of promotion and the difficulty in finding types of MSMEs are in a region. Problems and research on MSMEs led to the idea of registering MSMEs to the Department of Cooperatives and MSMEs Surabaya and making an application to search for MSMEs based on Android with appropriate software as well as using...
SQLite database to store MSMEs location. This application can be used by the user with the selection of a place or guide to the MSMEs’ location. The activity in question is like seeing a route to MSMEs. While MSMEs players can register their business easily by filling out the form available in the application then waiting for the verification results from the Department of Cooperatives and MSMEs Surabaya.

The inherently complex field of mine action, with its many political, financial, and physical considerations, is also a spatial, data-driven field; and as a result, geographic information systems (GIS) stand to play a major role [4].

The model used in designing this system is the Prototype model. Software engineering establishes a foundation for a complete software process by identifying a number of framework activities applied to all software projects, regardless of size and complexity [5]. The key to making this prototype model work well is to define the rules of the game at the beginning, namely the customer and developer must agree that the prototype was built to define needs. Prototype will be partially or completely removed and the actual software engineered with determined quality and implementation [6].

The expected results of this application are helping MSMEs players and consumers, particularly Surabaya community and generally Indonesian people. The main objective of this research is to develop application for MSMEs in Surabaya which can be used to provide information about MSMEs and their location so as to facilitate them in delivering their promotion.

Android is a collection of software for mobile devices that includes the operating system, middleware and main mobile application [7]. SQLite is a public domain software package that provides a relational database management or RDBMS. The relational database system is used to store user-defined records on large table size and process complex query commands as well as combining data from various tables to produce reports and data summaries. The word “Lite” in SQLite does not refer to its ability, but refers to the nature of SQLite which is light when associated with settings complexity, administrative overhead and resource usage [8].

Database Management System is a software system that allows users to define, create, manage, and control the access to the database [9]. While Global Positioning System (GPS) is a radio navigation system to determine the position using satellite. GPS can provide position of an object on earth accurately and fast (three-dimensional coordinates x,y,z) and provide information on time and speed continuously all over the world[10].

This research discusses the Location Based Service (LBS). LBS technology is a part of Mobile Geographic Information System (MGIS) implementation which is more likely to provide daily applied function such as displaying city directories, vehicle navigation, address searching, and social networking than the functionality of popular MGIS technology for Field Based GIS [10].

2. System Design

The location used as a research study was generally Surabaya city area. The data collected in this study came from the Department of Cooperatives and MSMEs Surabaya in April 2017. Application development method used were object-oriented method with Prototype model as system development method which can be used to connect client misunderstandings about technical matters and clarify the client’s desired specification needs to software developers. System analysis was carried out by identifying users between MSMEs players, Department of Cooperatives, and public. The problems are presented in table 1:

| Table 1. Needs Analysis |
|-------------------------|
| **Actors’ Needs Analysis** | **Needs** | **System** |
| MSMEs (User) | Promoting products | Using Map/ LBS as location guide |
| | Spreading information about MSMEs | Detailed information on MSMEs is easier to obtain |
Department of Cooperatives and MSMEs Surabaya (Administrator) | Increasing Gross Domestic Product | Data visualization
---|---|---
Public (User) | Community service | MSMEs information that is easy to access
 | MSMEs information | MSMEs data is based on location by using Map/ LBS as a location guide

The following is the use case diagram in Figure 1, a system development carried out by the admin and user in carrying system functionality that is running on the application.

![Use Case Diagram](Figure 1. Use Case of System Functionality)

The flow process of activities carried out by system users is the administrator accessing the laptop/ PC media. While the user accesses the electronic media (smartphone). First, the user installs the application on android smartphone. The flow process starts when the user wants to see the information they want. Then, the application will send the data to the server via web service. The server will process to display information that the user needs, shown in figure 2:

![Deployment Diagram](Figure 2. Deployment Diagram)

3. Result

3.1. System Testing
The system that has been completed is built through coding stage, then tested. This is done to ensure the software made can be used properly and is suitable for use or it still needs to be refined. Black Box testing is a method of designing test data based on software specifications. The results obtained after testing are presented in table 2 and table 3:

Table 2. The Test Result of Android Application Functions

| Test ID | Objective                              | Input                                              | Expected Result            | Status        |
|---------|----------------------------------------|----------------------------------------------------|-----------------------------|---------------|
| 1       | Opening the application’s main menu    | Choosing application icon on Android               | Showing the main menu       | \[ √ \] Suitable | \[ ] Not suitable |
| 2       | Opening MSMEs map                      | Choosing “maps” menu                               | Showing MSMEs map           | \[ √ \] Suitable | \[ ] Not suitable |
| 3       | Opening MSMEs details                  | Choosing “MSMEs details” menu                      | Showing MSMEs details       | \[ ] Not suitable | \[ ] Not suitable |
| 4       | Looking at MSMEs route map             | Choosing navigation button                         | MSMEs map is shown          | \[ √ \] Suitable | \[ ] Not suitable |
| 5       | Calling MSMEs                          | Choosing call button                               | Confirmation message for calling is shown | \[ √ \] Suitable | \[ ] Not suitable |
| 6       | Sharing MSMEs                          | Choosing share button                              | Smartphone application in which MSMEs information will be shared is shown | \[ √ \] Suitable | \[ ] Not suitable |
| 7       | Looking at the list of registered MSMEs| Choosing “MSMEs list” menu                         | Showing MSMEs data          | \[ √ \] Suitable | \[ ] Not suitable |
| 8       | Registering MSMEs                      | Choosing registration menu and filling out registration form | Showing registration form and the data were sent to the server | \[ √ \] Suitable | \[ ] Not suitable |
| 9       | Application information                | Choosing info on the list of menu                  | Showing application information | \[ √ \] Suitable | \[ ] Not suitable |
| 10      | Closing the application                | Back button on the smartphone                      | The application is closed   | \[ √ \] Suitable | \[ ] Not suitable |

Table 3. The Test Result of Administrator Functions

| Test ID | Objective                | Input                                              | Expected Result            | Status        |
|---------|--------------------------|----------------------------------------------------|-----------------------------|---------------|
| 1       | Opening the application  | Inputting username and password                    | Showing the main menu       | \[ √ \] Suitable | \[ ] Not suitable |
| 2       | Looking at MSMEs data    | Choosing “MSMEs data” menu                         | Showing MSMEs data          | \[ √ \] Suitable | \[ ] Not suitable |
3.2. System Evaluation and System Use

The system that has been tested was then evaluated and used. After the questionnaire was given to the participants, the data obtained were processed to get the assessment results. The statement of needs analysis and observation results that have been distributed to respondents are as follows:

3.2.1. The need to promote products.

Does MGIS application help to promote products?

| Answer Code | SS | S | TS |
|-------------|----|---|----|
| Answer Frequency | 14 | 30 | 6 |
| Score | $14 \times 3 = 42$ | $30 \times 2 = 60$ | $6 \times 1 = 6$ |
| Total Score | 108 |
| Percentage | $108 / 150 \times 100\% = 72\%$ |

Continuum Line

| Score | TS | S | SS |
|-------|----|---|----|
| 50 | 100 | 150 |

Based on the aforementioned percentage results, it can be concluded that the assessment of the need to promote products was 108 of which was expected to be 150, or can be categorized as strongly agree.

3.2.2. The need to spread information

Does MGIS application help to spread the information of MSMEs in Surabaya?

| Answer Code | SS | S | TS |
|-------------|----|---|----|
| Answer Frequency | 24 | 23 | 3 |
| Score | $24 \times 3 = 72$ | $23 \times 2 = 46$ | $3 \times 1 = 3$ |
| Total Score | 121 |
| Percentage | $121 / 150 \times 100\% = 80\%$ |
Based on the aforementioned percentage results, it can be concluded that the assessment of the need to spread information was 121 of which was expected to be 150, or can be categorized as strongly agree.

3.2.3. The need of community service

Does MGIS application give information services on MSMEs to the society?

| Answer Code | SS | S | TS |
|-------------|----|---|----|
| Answer Frequency | 12 | 29 | 9 |
| Score | 12 x 3 = 36 | 29 x 2 = 58 | 9 x 1 = 9 |
| Total Score | 103 |
| Percentage | 103 / 150 x 100% = 68% |

Based on the aforementioned percentage results, it can be concluded that the assessment of the need of community service was 103 of which is expected to be 150, or it can be categorized as strongly agree.

3.2.4. The need to increase gross domestic product

Can MGIS application increase gross domestic product in the Department of Cooperatives and MSMEs Surabaya?

| Answer Code | SS | S | TS |
|-------------|----|---|----|
| Answer Frequency | 4 | 27 | 19 |
| Score | 4 x 3 = 12 | 27 x 2 = 54 | 19 x 1 = 19 |
| Total Score | 85 |
| Percentage | 85 / 150 x 100% = 56% |

Based on the aforementioned percentage results, it can be concluded that the assessment of the need to increase gross domestic product was 85 of which is expected to be 150, or can be categorized as agree.
3.2.5. The need of MSMEs information

Does MGIS application show the need of data desired by consumers?

| Answer Code | SS | S  | TS |
|-------------|----|----|----|
| Answer Frequency | 20 | 25 | 5  |
| Score | 20 x 3 = 60 | 25 x 2 = 50 | 5 x 1 = 5 |
| Total Score | 115 |
| Percentage | 115 / 150 x 100% = 76% |

Based on the aforementioned percentage results, it can be concluded that the assessment of the need of MSMEs information was 115 of which expected to be 150, or can be categorized as strongly agree.

4. Conclusion

1. Based on the questionnaire result of 50 respondents, the Mobile Geographic Information System application for mapping MSMEs in Surabaya functioned well in accordance with the expected needs analysis with the following achievements:
   - Assessment of the need to promote products was 108 of which was expected to be 150, or can be categorized as strongly agree.
   - Assessment of the need to spread information was 121 of which was expected to be 150, or can be categorized as strongly agree.
   - Assessment of the need of community service was 103 of which is expected to be 150, or it can be categorized as strongly agree.
   - Assessment of the need to increase gross domestic product was 85 of which is expected to be 150, or can be categorized as agree.
   - Assessment of the need of MSMEs information was 115 of which expected to be 150, or can be categorized as strongly agree.

   It can be concluded that the application developed was sufficiently fulfilled the initial development purpose.

2. With this application, it is expected that it can help the government of Surabaya in increasing public interest in MSMEs in order to increase the independence of an area.

5. References

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