Development of geographic information systems for Small and Medium Enterprise centres

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Abstract. The small and medium enterprises (SME) actors support the economic development in Indonesia. The number of SMEs is increasing rapidly every year. One obstacle faced by SME is the difficulty of consumers to get business information and find the location of the place of business. The aim of this research is to design and to develop a geographic information system regarding the mapping of business centres. The system developed provides information in the form of a visual display of the business profile and business location of the SME. The method used is the Rational Unified Process, which consists of inception, elaboration, construction and transition. The results of the study consisted of the design and prototype of the geographic information system of the SME business centre that made it easy for users to find location information and SME business profiles. The business centre searches feature displays business locations in the form of a map that is connected with google map technology. In addition, the system built displays the latest and most accessible information as well as the SME contact information of search results. For system users who are interested in becoming members of the business centre, registration features are provided so that they get the facilities provided by the business centre. Future studies are expected to be able to show the route of travel from the user's position to the business centre by considering the closest distance or based on criteria determined by the user.

1. Introduction

Business has an important role and is interrelated with the economic existence of a country. Good business actor to drive the economy, good business actors and supporting facilities are needed. There are many small and medium enterprise (SMEs) businesses in Indonesia. SMEs play a role in overcoming unemployment as well as being a source of economic growth. In one regency in Indonesia, there are more than 13 thousand micro-businesses, more than 1 thousand small businesses and more than 150 medium businesses. This business actor faces obstacles, one of which is marketing manager of the products produced. Most SMEs agree that the role of government policy in removing existing barriers using information technology [1,2].

Technology is developing so rapidly. By using technology, SMEs can solve problems that occur. Currently SMEs in conducting their business are divided into two different ways, between adopters and non-adopters of electronic commerce. Electronic commerce has substantial potential to foster the growth (SMEs) in developed and developing countries alike [3], information technology has significantly influenced business without exception for (SMEs) [4]. Geographical information system (GIS) is one of the most popular techniques today. GIS makes it easy for MSEs to offer products to the
public so they can find the location and product position needed. The information presented in the form of location maps and product descriptions provided is managed on a website [5]. Information conveyed through mapping is more interesting than only textual in nature and makes it easier to find information [6]. In addition to displaying map forms, SMEs are arranged in the way of electronic catalogues, making it easier to classify information searches as needed [7-8].

The purpose of this study is to design and develop a website-based application to present information on SMEs business centre mapping in one of the districts in Indonesia. It provides an efficient support for the development of SMEs business.

2. Methods

The methodology used is Rational Unified Process (RUP) with steps namely Inception, Elaboration, and Construction [9], with modelling using Unified Modelling Language (UML) [10,11]. The problem-solving step shown in Figure 1, is the Work Breakdown Structure by following the steps in the Rational Unified Procurement methodology.

![Figure 1. Research methodology.]

3. Result and discussion

3.1. Inception

In this step determine the benefits generated from the software to be built. Determine the specification of system requirements and business manufacturing processes. Business process design through the identification actors who play a role in the system, the actors involved in the running system are explained in Table 1. User activities on the application, illustrated using use case diagram in Figure 2. Admin and user role in accordance with what has been determined at the actor identification stage.

Development requirements specifications the application is made based on several steps, namely the design of the display with supporting apps such as Microsoft Visio, for the coding phase aided by Sublime Text, to organize the show using CSS. As for the webserver, it still uses localhost with the help of Apache as the Webserver. The design does not use a framework, while for the database using MySQL.
Table 1. Actors who role in the system.

| Actor       | Activities                                                                 |
|-------------|----------------------------------------------------------------------------|
| Admin/Operator | - Login.  
|             |  - Managing business centre data includes adding, editing and deleting data.  
|             |  - Managing category data includes adding, editing, and removing categories.  
|             |  - Managing news data including adding, editing, and deleting news.  
|             |  - Manage information system profiles.  
|             |  - Read and delete comments.  
|             |  - Access the information system  
| User        | - Search for locations and view information.  
|             |  - Read the news.  
|             |  - Give comments.  

3.2. Elaboration

The elaboration step consists of 3 parts, namely the design of activity diagrams, the design of sequential diagrams and the design of class diagrams. Figure 2 shows the layout of activity diagrams of user activity on geographic information systems. It starts with running the application until it sees the location information in the form of mapping. Figure 3 shows a sequential diagram, how systems interact with each other. Next a structural diagram is made in the form of a class diagram, where the class diagram shows the data modelling and also its relation to the interface form of each menu from the previous design (Figure 4).
The results show that the application can work well, all functions contained by the system work according to the instructions given. Next, a beta test is done to assess the app from the user's side. The method used uses a usability test [13,14], measurement scores using a Likert scale with a scale of 1 to 5. The test results display the average rating of all aspects of more than

### 3.3. Construction

At the construction stage, the implementation of the design results in the form of diagrams into application layouts as smart dashboard system [12], and application design. Layout helps determine how the layout and structure of the menu will be created, Figure 5 shows the main page layout of the application. In the next stage, the implementation of coding on the layout view will produce a beta version of app (Figure 6).

### 3.4. Testing

The last step is to test alpha, the results show that the application can work well, all functions contained by the system work according to the instructions given. Next, a beta test is done to assess the app from the user's side. The method used uses a usability test [13,14], measurement scores using a Likert scale with a scale of 1 to 5. The test results display the average rating of all aspects of more than

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**Figure 4.** Class diagram.
3 meaning that in general the application is acceptable and is easy to operate and is able to provide business centre information based on location and product criteria required by the user (Table 2).

Table 2. Usability test score.

| Aspect       | Score |
|--------------|-------|
| Learnability | 3.32  |
| Efficiency   | 3.07  |
| Memorability | 3.21  |
| Errors       | 3.85  |
| Satisfaction | 3.94  |

Some users propose suggestions for adding features in the form of route tracing and the distance of the user's location to the business centre. Other opinions are in the form of a responsive display on mobile devices [15], as well as mobile-based applications.

4. Conclusion
This research has successfully developed a business centre geographical information system application that provides information on business profile and locations in the form of mapping. Future research is recommended to add a route determination feature and distance from the user to the business centre and to provide a mobile version of the application.

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