Integration and Geographic Visualization of TKA-TPA Data Using Mapbox

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Abstract

TKA-TPA data management is performed conventionally and inaccurately. Accordingly, it may result in considerable data loss. Data collection for TKA-TPA by BADKO Kasihan Bantul Yogyakarta is still carried out conventionally. Therefore, this study supports BADKO TKA-TPA in data management, data reporting, data mapping, and data publication. A Web Geographic Information System (GIS) was created using the CodeIgniter framework with the Hypertext Preprocessor (PHP) programming language, MapBox on the Maps API Service, MySQL database, and the SDLC with the prototype method. The study result is a web-based GIS application. This GIS application has been successfully built and can be used by BADKO TKA-TPA Kasihan Bantul Yogyakarta for its data management and mapping system.

***Keywords:** MapBox, Geographic Information System, TKA-TPA management.*

1. Introduction

The rapid development of technology has brought humans into life side-by-side with it, impacting some people to leave searching for information manually, which takes longer to obtain the desired information. Information technology currently developed can manage more actual information optimally. The use of information technology aims to achieve efficiency in various aspects of information management, as indicated by the speed and timeliness of processing and the accuracy and precision of information. It results in the development of information systems that appear in new variations. The merging of information systems with geography is currently one of the widely used alternatives in information management, called geographic information systems (GIS)[1], [2].

Many information systems models will provide a variety of information. This information provides much inspiration for creating models to design systems that can help activities in all aspects of life. GIS mapping is one of the most widely used information system models for making various decisions, planning, and analysis. GIS can be applied as the main interactive, interesting, and challenging tool to increase understanding, learning, and education regarding the idea or concept of location, space, population, and geographical elements found on the earth's surface [3], [4].

Children's Qur'an Learning Centers (TKA-TPA) are non-formal education centers that teach how to recite the Qur'an and Islamic religious values based on the Qur'an and Hadith as the learning guide. Moreover, students are also taught various

Islamic materials. In its development, people need this institution to allow their families to learn how to recite the Qur'an and understand Islamic laws.

TKA-TPA are considered crucial institutions required by parents as intermediaries to provide proper religious education to their children. Unfortunately, many parents do not pay attention to the importance of Islamic religious education for their children. One of the main factors is the lack of information related to TKA-TPA, such as location, number of students, number of ustadz (teachers), hours of admission, and day of entry, in their area.

In Kasihan District, Bantul Regency, Yogyakarta, there is an institution called the Coordination Agency (BADKO) of TKA-TPA[5]. This agency is tasked with collecting and managing location data for TPA-TKA within the area. However, the data are still managed conventionally, written in journal books. Indeed, it has a high risk of data loss due to the data not being published.

Web Geographic Information System (GIS) is a website displaying a digital map accessible for the public. Web GIS was built using the PHP programming language, MapBox GL JavaScript, CSS, and Mapbox Key APIs.

Therefore, a web GIS is highly required to assist BADKO TKA-TPA of Kasihan in publishing the locations of many TKA-TPA to the people within the area and its surroundings. Hence, people can easily discover the locations and information of TKA-TPA in the Kasihan Bantul area of Yogyakarta.

2. Method

The database for the TKA-TPA Web GIS was MySQL. This Web GIS employed the PHP programming language, the CodeIgniter framework, the MapBox Key API, a WebServer, and a MapServer [6], [7]. When users accessed it, they could view the TKA-TPA data in a map or a table, save, edit, add, and delete the required data. The system architecture is depicted in Figure 2.1.
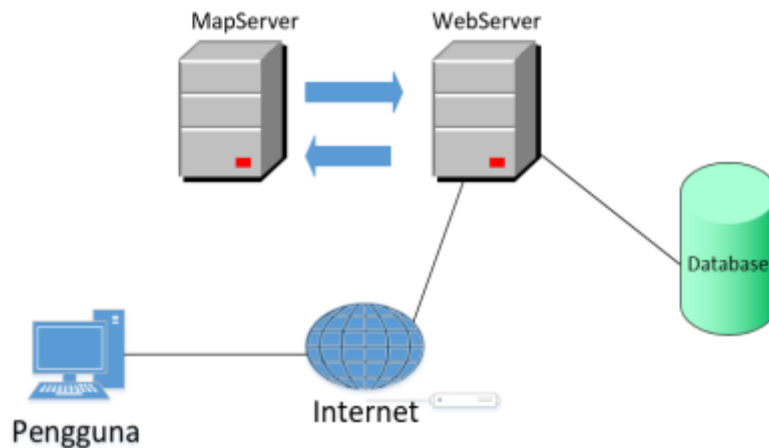

Figure 2.1 System Architecture

3. System Build

This study applied a software system development cycle to manufacturing the system using the Software Development Life Cycle (SDLC) method [8], [9]. The prototype model was utilized.
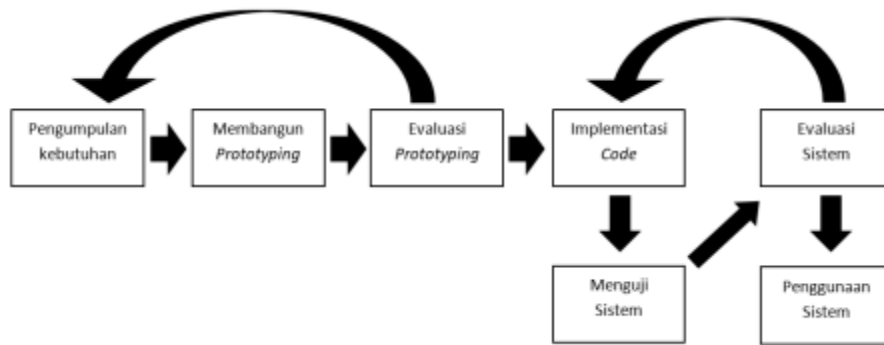
Figure 3.1 Prototype Model

The first stage of gathering data was performed by interviewing the chairman of the BADKO TKA-TPA of Kasihan regarding the requirements, architecture, and technology used.

A test was carried out using the Black Box method. Black Box test is a complementary approach to the White Box technique because it is expected to reveal other classes of errors wider than the White Box technique[10]. It focuses on testing the functional requirements of the software to obtain a set of input conditions that match the functional requirements of a program.

Creating a prototype in an interface design application is vital in the design process to facilitate presentation to clients and ease programmers to make the application. The following is the prototype of the TKA-TPA Web GIS application. Figure 3.2 illustrates the admin main page, where the admin can manage the data of TKA-TPA and the photo gallery displayed on the home page.

Figure 3.2 Admin Main Page

When users clicked the TKA-TPA prototype menu, it displayed a page containing a list of TKA-TPA data, as depicted in Figure 3.3.
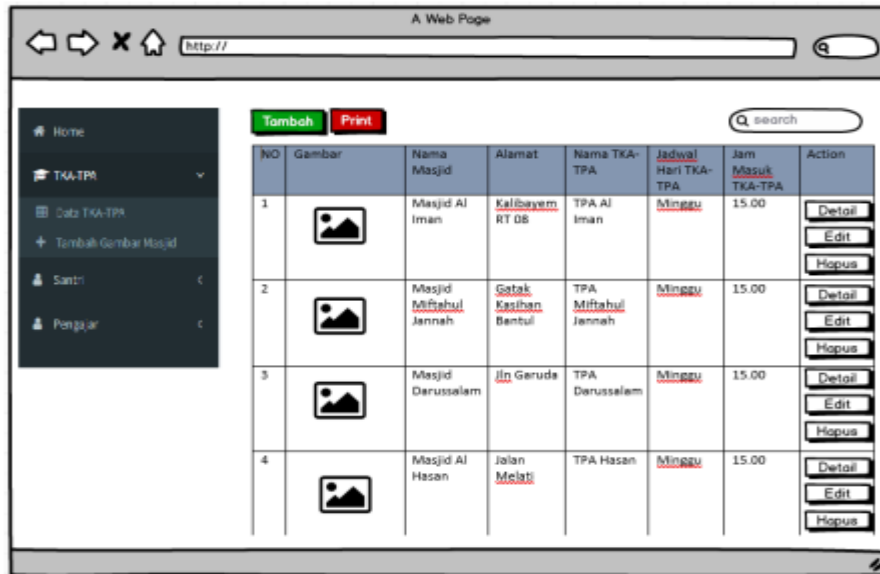
Figure 3.3 The Result of Clicking the TKA-TPA Menu

4. Results and Discussion

Figure 4.1 illustrates the start page appearing the first time when users access the TKA-TPA Web GIS. On the home page, there are three menus: home, the list of TKA-TPA, and log-in. The home menu contains a map display of the locations of all TKA-TPA in Kasihan Bantul, along with information on the names of the mosques, pictures of the mosques, the names of the TKA-TPA, the number of students, the number of teachers, and the schedule for the days of entering the TKA-TPA, in the form of a popup. There are also tables and charts for the data of TKA-TPA, the number of students, and the number of teachers. In the information popup, a detail button serves to direct users to the user details page. The TKA-TPA list menu serves to enter the TKA-TPA data list page.
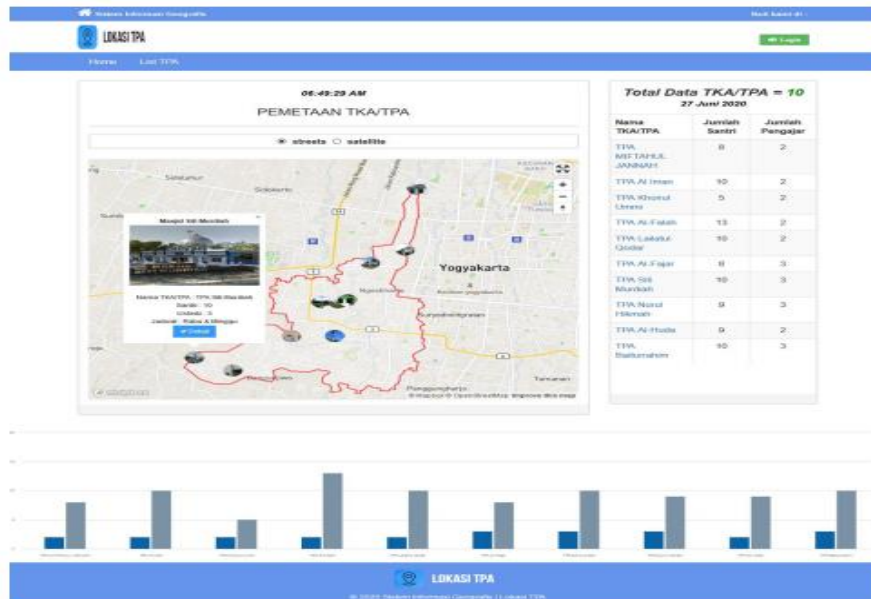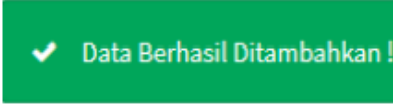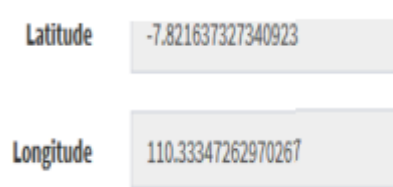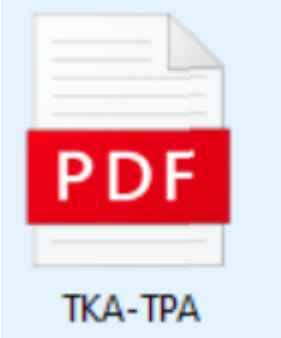

Figure 4.1 Home page

A test was carried out using the Black Box method by observing the execution results through test data and checking the software's functionality. The following Table 1 are several samples from the test.

Table 4.1 Test Results

Scenario	Scenario Object	Expected Result	Testing Result	Conclusion
Switching pages when clicking Add Data		The system displays the Add Data page		Succeed
Showing a delete confirmation popup when clicking Delete		The system shows a delete data popup		Succeed
Switching pages when clicking Edit Data		The system displays the edit data page		Succeed
Displaying the alert of "Adding TKA-TPA is Successful"		The system displays a success alert		Succeed
Displaying latitude and longitude values automatically when dragging		The system displays the longitude and latitude values automatically		Succeed

markers on the map				
Printing when clicking the Print button	Print	The system prints in pdf format	PDF TKA-TPA	Succeed

5. Conclusions

The test results lead to the following conclusions. Integration and visualization of TKA-TPA data have been completed using the CodeIgniter and MapBox Frameworks. The application has features, such as TKA-TPA data, photo gallery data, and the Kasihan Bantul Yogyakarta map containing the locations of all TKA-TPA in the area. The application has been successfully tested using the Black Box method.

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