

Web-Based Mapping Design of Muhammadiyah and 'Aisyiyah High Education (PTMA) In Indonesia

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Abstract. Muhammadiyah and 'Aisyiyah Universities (PTMA) are educational institutions spread across Indonesia including universities, colleges, institutes, polytechnics and academies. The breadth of Indonesia becomes an obstacle in the dissemination of information and promotion from each Muhammadiyah and 'Aisyiyah Universities. Therefore, it is needed WebGis PTMA that maps muhammadiyah and aisyyah universities throughout Indonesia where the system is created using php and mysql and google maps api. The purpose of this research is to facilitate and provide information about Muhammadiyah 'Aisyiyah Universities in Indonesia. The method used by the prototype, which is this method to make it easier to design the mapping system of Muhammadiyah and 'Aisyiyah Universities by utilizing geographic information systems. Based on the test results from the percentage rate of 90.07% of the 50 respondents, the success of this system is already feasible and meets the category of needs that are.

Keyword: PTMA, Indonesia, Mapping, Web

1. PREFACE

Muhammadiyah Higher Education and 'Aisyiyah (PTMA) are educational institutions that are spread across Indonesia with different types including universities, colleges, institutes and polytechnics. The extent of Indonesia becomes an obstacle in the dissemination of information and promotion of each PTMA. The uneven distribution of PTMA makes the implementation of GIS quite efficient in mapping all PTMAs, in order to know the geographic distribution of PTMA in Indonesia. Prospective students from both Indonesia and from other countries who wish to continue their higher education and the public can find out how many PTMAs are geographically spread across Indonesia. The results of this mapping make prospective students and the community know that PTMA has an existence in the world of education.

Web-based geographic information system (Elly, 2016) or also known as the word WebGis is a solution and alternative to this problem, where the existence of this web can be used as a linking line of information to prospective students, student guardians and the community in finding information about geographically based PTMA. There is a growing need for more efficient and effective GIS implementation in the spread of PTMA in Indonesia. So that prospective students, campus academics, and the public can see the potential of each PTMA after the implementation of the GIS.

PTMA WebGis was carried out, after taking the initial research data using a questionnaire (Appendix 7) to find out how much they knew PTMA in Indonesia with parent and student respondents or prospective students, 50 respondents got the calculation result of 17% Yes (knowing) and 83% Not (not knowing) it can be concluded that there are still many who do not know Muhammadiyah Higher Education and "Aisyiyah in Indonesia, because the vast area of Indonesia makes many parents or prospective students still do not know the spread of each PTMA in Indonesia along with detailed information.

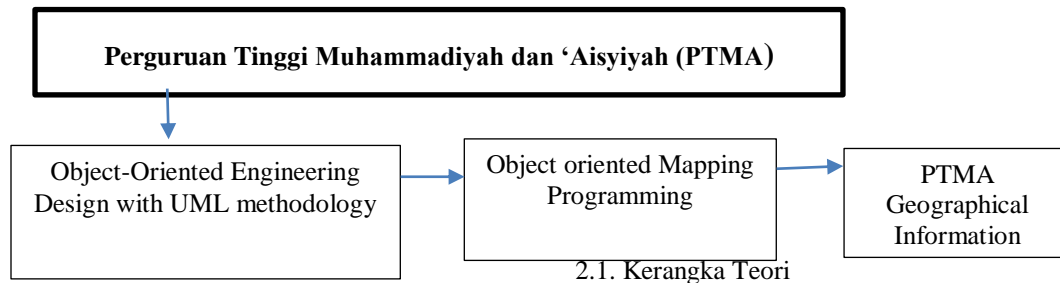
PTMA information using WebGis is a new way that is able to provide information and data about the intended PTMA in the form of campus facilities, accreditation, the number of lecturers and other information related to campus and WebGis provides information on the route or the fastest way to the location of each destination PTMA.

Based on this, the researcher carried out a mapping of Perguruan Muhammadiyah and 'Aisiyiah (PTMA) along with detailed information through WebGis technology mapping and determined and informed the fastest distance that must be traveled to get to the PTMA that the user wanted. To solve this problem, the researcher limits the scope of the problem so that it is more focused and reaches the desired target, namely (a). create a mapping with the Google Maps API, (b). Geographically mapping PTMA, prospective students and the community as the target WebGis users, and (c). Data from the Directory of Muhammadiyah Universities and 'Aisiyiah Majelis Dikti Year 2019.

The PTMA mapping system throughout Indonesia will provide convenience, processing, and information for prospective students and the public, both from Indonesia itself and from other countries. This will become a map of the strength of PTMA in Indonesia. This PTMA system also produces GIS (Geographical Information System) technology with the Google Maps API to be used as a mapping system that provides the fastest and mileage information to the intended PTMA user. So that people in getting information needs about the existence and profile of PTMA in Indonesia. Prospective Students can also represent the distance between PTMAs and know the large number of PTMAs in Indonesia geographically.

2. STATE OF THE ART

State of The Art is the highest achievement of a research development process. This study will discuss theories or concepts related to the research topic being discussed.



2.1. Perguruan Tinggi Muhammadiyah dan Aisiyiah (PTMA)

Higher Education Muhammadiyah and 'Aisiyiah (PTMA) are educational institutions spread across Indonesia with different types including universities, colleges, institutes and polytechnics. Based on the guidebook for the recapitulation of PTMA data from the PP Muhammadiyah Diktilitbang Council and the PP Aisiyiah Dikti Council in 2019 is shown in Table 2.1.

Tabel 2.1. Bentuk PTMA

Bentuk	Bentuk PTMA		Jumlah
	PTM	PTMA	
Akademi	10	2	12
Politeknik	4	1	5
Sekolah Tinggi	97	4	101
Institut	5	0	5
Universitas	47	1	48
Jumlah Total	163	8	171

The PP Muhammadiyah Diktilitbang Council and the PP Aisiyiah Dikti Council in 2019 also recapitulated the Study Program Levels in Figure 2.2, Accreditation Value in Figure 2.3. , The number of PTMA Lecturers according to education level is in Figure 2.4., The number of PTMA Lecturers according to the Functional Position in Figure 2.5.

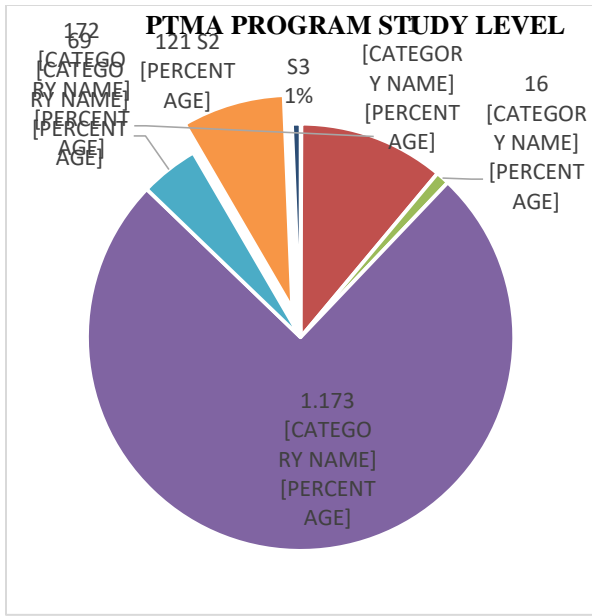


Figure 2.2. Study Program Level

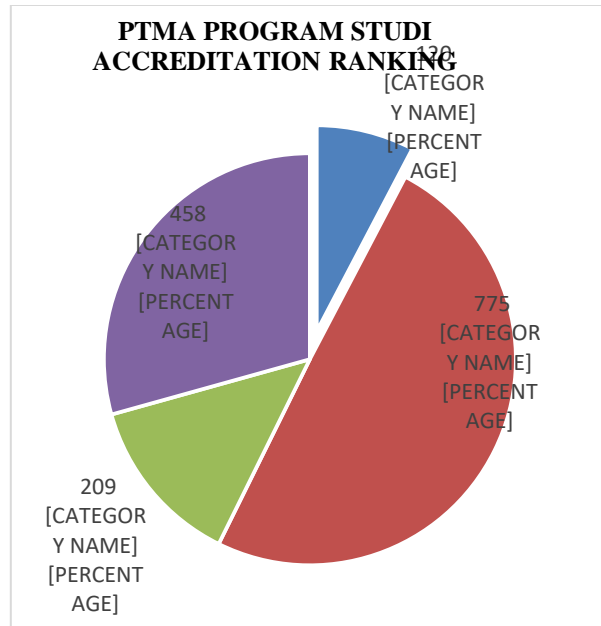


Figure 2.3. Accreditation Score

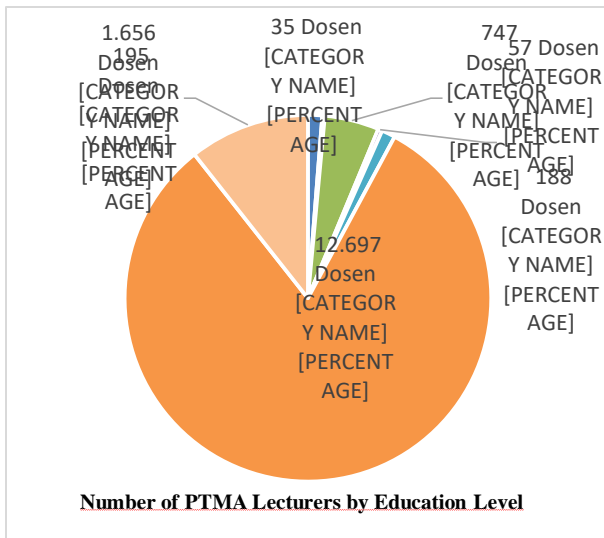


Figure 2.4. PTMA Lecturers by Education Level

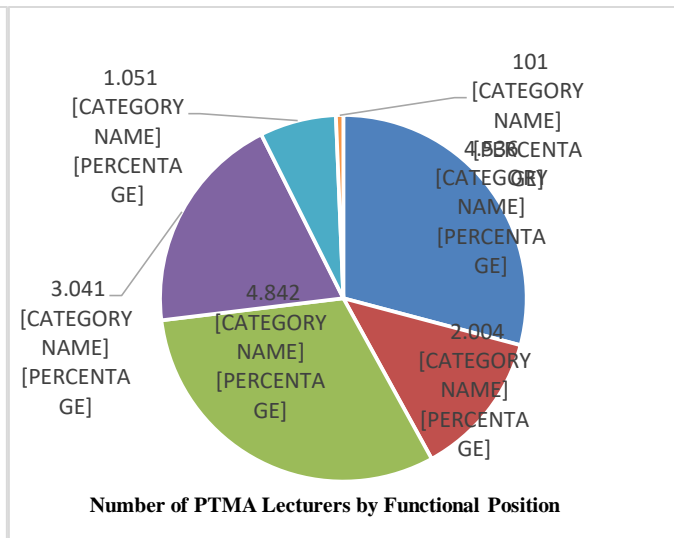


Figure 2.5. PTMA Lecturers According to Functional Positions

Functional design uses an object-oriented methodology, namely the Unified Modeling Language (UML) methodology, which is a modeling 'language' for systems or software used to document and specify object-oriented (Urva et al., 2015). The designs that are carried out are: (a). Use Case Diagrams: Use Case Diagrams are a type of diagram in UML that describes the interaction or behavior between systems and actors, use case diagrams can also be used to find out what functions are contained in the system (Urva et al., 2015). Use case diagrams facilitate communication between analysts and users as well as between analysts and clients can be seen in Figure 2.6.

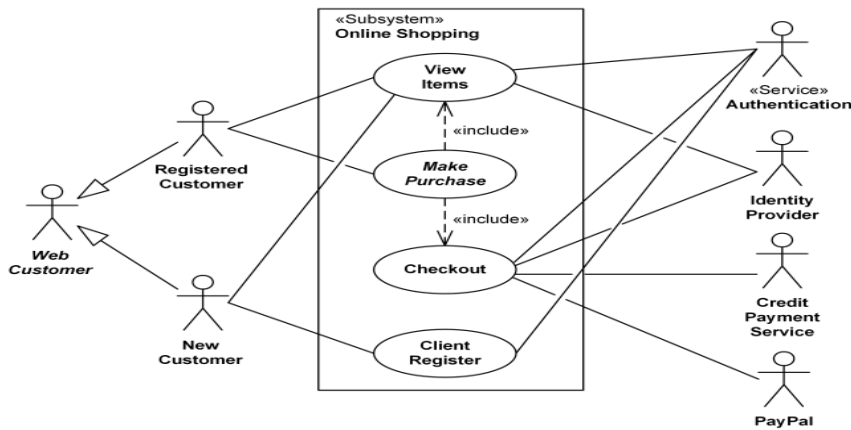


Figure 2.6. General Forms of Use Case Diagrams
Source (www.uml-diagrams.org)

(b). Class Diagram: Class diagram type diagram in UML that is used to display classes and their relationships with other classes in a system, class diagrams display operations and properties in operations (Arifin & Hs, 2017).

(c). Activity Diagram: Activity Diagram shows the steps in the work flow and is the control from one activity to another and describes the actions and results (Arifin & Hs, 2017).

Development and facilities from google maps that have complete support, such as business information services, roads, locations, services, and public services (Information & Sig, 2017). By using it, you can use google maps on the website, even though it was previously a javascript API. The Maps API was later expanded to include an API in the Adobe Flash application. The success created by the google maps API gave birth to several competitors including Yahoo! Maps API, Bing Maps Platform, MapQuest Development Platform and OpenLayers (Bangun et al., 2019).

Special information systems that can process spatial (spatial reference) and aspatial (non-spatial) data (Zusrony et al., 2018). Another meaning is a computer system capable of storing, building, processing, analyzing, collecting, distributing and displaying geographically referenced information (District & Based, 2016), for example data identified by location (Bangun et al., 2019).

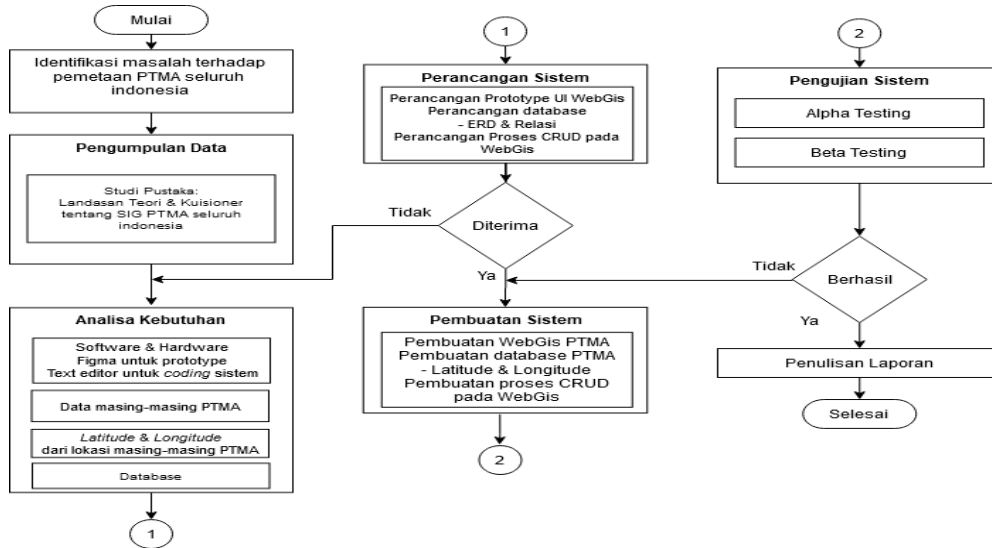
GIS mostly handles spatial data whose data is geographically oriented, has a certain coordinate system and has two parts that make it different from other data, namely location information (spatial) and descriptive information (attribute) (Indrasmo, 2013).

Here are some research on mapping. In 2019, Zulfauzi1), Apriander2) conducted a research entitled "Design of a Web-Based Geographical Information System for the Location of BRI Bank ATMs in Lubuklinggau City" (Zulfauzi, 2019). This study conducted an alternative to present information media on the location of BRI Bank ATMs in the city of Lubuklinggau for users. Research in 2016 Adytama Annugerah1), Indah Fitri Astuti2), Awang Harsa Kridalaksana3) entitled "Web-Based Geographical Information Systems Mapping Location of Typical Souvenir Stores in Samarinda" (Annugerah et al., 2016). This research makes it easy for web users to get information about the location of the store, shop information, goods sold and directions for souvenirs typical of Samarinda. In 2015, Priska Gurantill1), Affandy2) conducted a research entitled "The Google Maps API Application in the Development of a WEB-Based Tourism Geographical Information System (GIS) (Case study: Sidoarjo Regency)" (Kusuma & Budisusanto, 2015). This research combines Web-based GIS technology (WebSIG) with Google Maps API to present information and provide information and provide features so that the people of Sidoarjo regency can participate in tourism development activities in Sidoarjo Regency. In 2014 Fauzan Masykur conducted a research entitled "Implementation of Geographical Information Systems Using Google Maps Api in Mapping Student Origin" (Masykur, 2014). This research with GIS can determine the geographic origins of students who take lectures at the Faculty of Engineering. Produce an overview of where students come from so that the campus knows how well they are known in the community.

In the previous research, the Geographical Information System (GIS) provided information on the location or location of each place, when determining the route, you must first determine the origin and destination differently so that errors do not occur. The difference with previous research is that there is a direction on the marker label to directly determine the distance calculation, and the moving marker label shows each location marker, utilizing the Google Maps API to determine the fastest distance and provide a more dynamic interface.

3. RESEARCH METHODOLOGY

The flow of this research describes the stages of the PTMA mapping process based on Geographic Information Systems. Making the system used is the prototype method, because this method describes the process of the design made by the author by describing the concepts, requirements and models of the system, besides this method is a good path in building communication between users and developers. gradually described. The flowchart for the research methodology is shown in Figure 3.1.



Gambar 3.1. Geographical Information Systems Research Flow for Mapping Perguruan Tinggi Muhammadiyah dan Aisyiyah (PTMA)

The research begins with the following steps: (A). identification of problems. At this stage the researcher identifies a problem in PTMA mapping, the problem encountered is that the information about PTMA is not evenly distributed in Indonesia, so the implementation of WebGIS is an effective step to map the number of PTMA geographically. (B). Data collection: This data collection aims to strengthen and facilitate researchers in system design, namely: literature study to find research relevant to this study, questionnaire, this stage the researcher distributes questionnaires to WebGIS. (C). Requirements Analysis: In designing a system to be built, software and hardware are needed to support the creation of PTMA mapping GIS. The tools are: (1). Hardware: the hardware used in designing GIS applications, are:

- a. Processor : Intel® Core™ i3-4005U CPU @1.70GHz (4 CPUs)- 1.7GHZ
- b. HDD : 500 GB
- c. RAM : 4 GB
- d. VGA : Intel(R) HD Graphics Family

(2). Software: software used for application development as follows:

- a. Sistem Operasi : Windows 10
- b. Desain *Mockup* : Figma
- c. Bahasa Pemrograman : HTML,PHP,JavaScript.
- d. *Text Editor* : *Visual Studio Code*

(4). Latitude & Longitude: This stage aims to collect each location of each PTMA so that it can be done geographically. Data Attached in ANNEX B. (5). PTMA data: This stage aims to collect all PTMA data, including universities, colleges, institutes, and polytechnics. (6). Database: This stage provides a database that aims to accommodate the requirements for mapping, one of which is latitude and longitude.

(D). Design: System design is done to help facilitate the development process in product design. At the design stage, the design process consists of the design experience (UX) and interface (UI). Experience design creation is processed using the Unified Modeling Language (UML) as a step in modeling a system. This research carried out

several design stages, namely: (1). Functional System Design: The system design that is carried out is the main system design or as a whole which is a blue print of the Geographical Information System for Mapping Muhammadiyah and Aisiyah Universities. Functional design shows the relationship between the guest and the system that represents a user when interacting with the system. The use case diagram is illustrated. The following is an overview of the Use Case diagram shown in Figure 3.2.

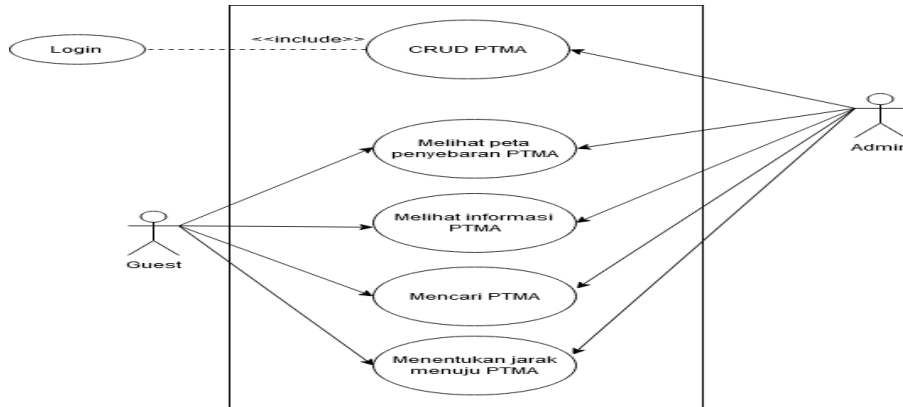
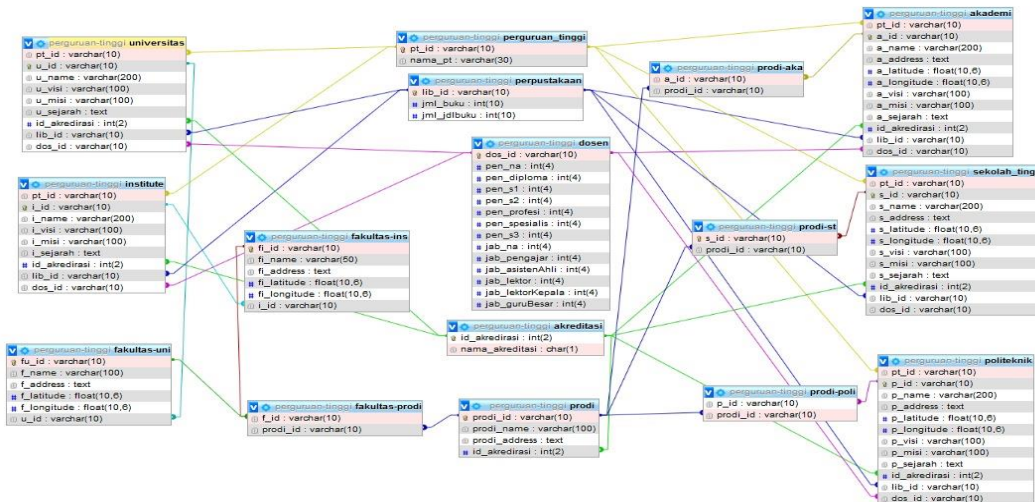


Figure 3.2 Use Case Diagram of Geographical Information System for Mapping Perguruan Tinggi Muhammadiyah dan Aisiyah (PTMA)

(2). Database Design with Class Diagrams showing the Database Design that relates each class based on the PTMA Webgis Use Case Diagram. Figure 3.3 is a Class Diagram for PTMA Webgis throughout Indonesia. At this stage, the design of the database design will be carried out, aiming to facilitate the data collection process. This design involves two ways, namely ERD and Relations.



Gambar 3.3. Perancangan Database Class Diagram Webgis PTMA Seluruh Indonesia

(3). CRUD Design: At this stage the CRUD design will be carried out, aiming to find out what requirements can be entered, deleted, and updated in the database.

(4). Designing the Component Diagram in Figure 3.4 shows the Component Diagram design that relates the component requirements for the Webgis PTMA software.

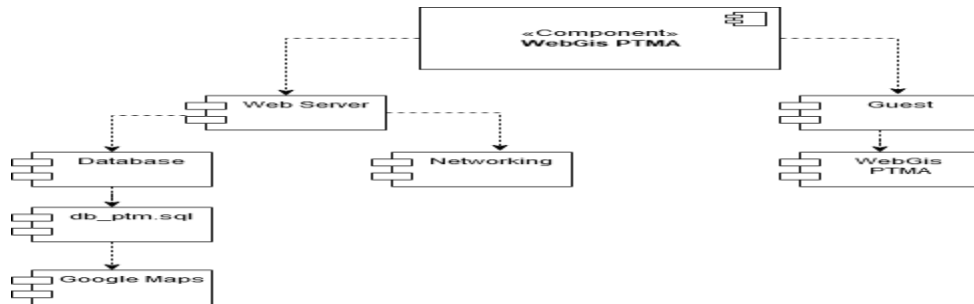


Figure 3.4 Component Diagram of PTMA Webgis

(5) The design of the Deployment Diagram in Figure 3.5 shows the Deployment Diagram that relates the hardware requirements for Webgis PTMA.

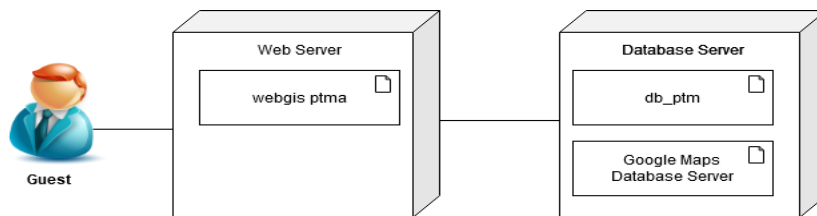


Figure 3.5 Deployment Diagram of PTMA Webgis

(5). Prototype UI: At this stage the design for the User Interface of the PTM mapping system will be carried out. Prototype UI design by describing the MockUp Interface System. Mockup design of the user interface which aims to describe the appearance of the system and the features that are made based on needs. The results of this design are expected to facilitate the implementation of the system created. The following is the interface design of the PTMA WebGis which is shown in Table 3.1

Table 3.1. Interface Design

No.	Design	Information Design
1.	<p>Halaman Utama</p>	<p>This page is the main page of the PTMA WebGis, on this page a search feature is available to find one of the campuses of PTMA</p>

(D). System Development, Performed several stages of making the system, namely: (a). Website Development: At this stage, a GIS-based website is made for PTM throughout Indonesia, in accordance with the UI WebGis prototype and other design processes that have been approved at the system design stage. (b) Database creation: At this stage, a database is created that applies to storing requirements for PTM mapping, including Latitude and Longitude as data to determine location coordinates and data or information held by each PTM. (c) Making a CRUD: At this stage it is made in order to perform data processing, all data will be input using CRUD processing starting from the latitude and longitude as well as information from each PTM.

(E). After the creation of the PTM GIS website has been completed, the next step is to conduct system testing, where there are three types of testing, namely: (a). Alpha Testing: This test is carried out by the researchers

themselves to reduce various errors or errors in the system being created. (b) Beta Testing: This test is carried out by application users, namely students and the community as test targets for the feasibility of the system.

(F). System Implementation: Implementation is the final stage where a system that has been tested can be used and function properly for its users when applied.

(G) Testing: Application testing is carried out in two directions, namely (a). Testing the Alpha and Beta applications, testing is carried out by the developer before carrying out the manufacturing process or distributing it to users. (b). Testing the System by the User, this test is carried out using the black box method to check whether every component that has been made in the system has worked and the system process. At this stage, the test will be trialled on PTMA WebGis visitors. Researchers distributed testing questionnaires to 50 respondents who visited PTMA WebGis with 4 categories, namely parents, students, students and others. Testing is aimed at system features, whether the system can run or not. This test applies the black box method that focuses on the functionality of a system. The following are the results of the questionnaire calculations on the Likert scale table 4.9 and 4.10.

4. RESULTS AND DISCUSSION

This chapter will explain the stages in making a geographic information system for mapping PTMA throughout Indonesia, which aims to simplify the information retrieval process, so that the process that is usually carried out is less effective becomes more effective. The results of this analysis and design are also expected to help prospective students or parents from Indonesia and abroad to get more information. (a). System Interface, Displaying the results of the implementation of the program on the PTMA WebGis in the form of a display built in accordance with the design plan. This section will display the entire interface of the system that has been created. The system interface is done in 2 ways, namely: (1). Main Menu Interface. The main view of the PTMA WebGis applied to map PTMA in Indonesia. This main menu consists of Home, About, Map, Gallery, Contacts and Login. On this page there is also a PTMA search feature and can be seen in Figure 4.1.



Figure 4.1 Main Menu Interface

When Guest selects about menu, map, gallery, and contact will scroll down showing the page from each selected menu. The PTMA WebGis interface can be seen in Figures 4.2, 4.3, 4.4, and 4.5.

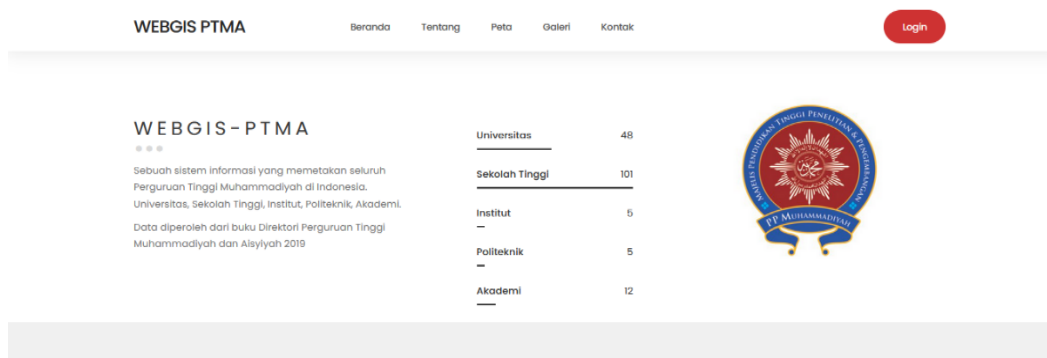


Figure 4.2. Interface About



Figure 4.3. Map Interface

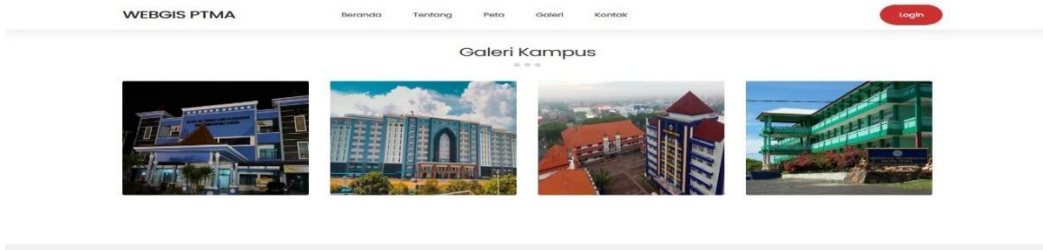


Figure 4.4. Campus Gallery Interface



Figure 4.5. Contact Interface

Guest scrolls down to the PTMA Category page after the Gallery page, which will display the interface of the PTMA Category which includes Universities, Institutes, Colleges, Polytechnics, and Academies and if one is selected by pressing more info it will display the names of each campus according to its category. and pressing more info on the selected campus will display information from the campus. The PTMA category display can be seen in Figures 4.6, 4.7, and 4.8.

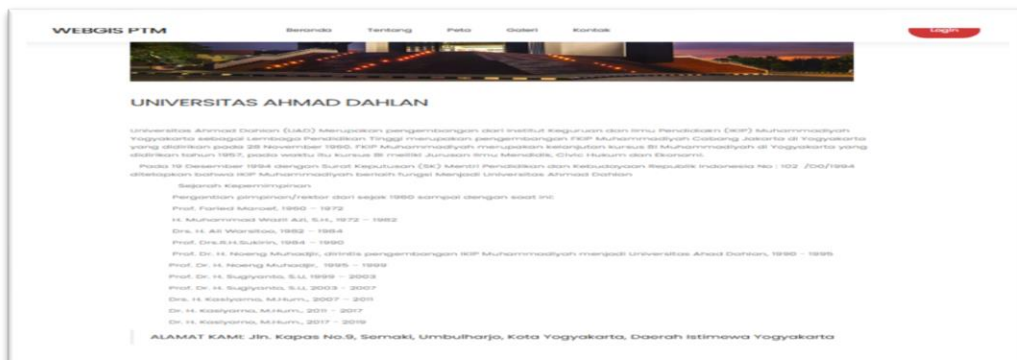


Figure 4.6 PTMA Detailed Interface.

(2). Direction interface, when the Guest selects the direction button or selects direction at the blue point (marker) on the map, it will redirect to the google maps page to see and find the fastest distance to campus. The direction button interface is shown in Figure 4.7, the direction on the map marker is shown in Figure 4.8, and for Google maps is shown in Figure 4.9.



Figure 4.7 PTMA Direction Interface

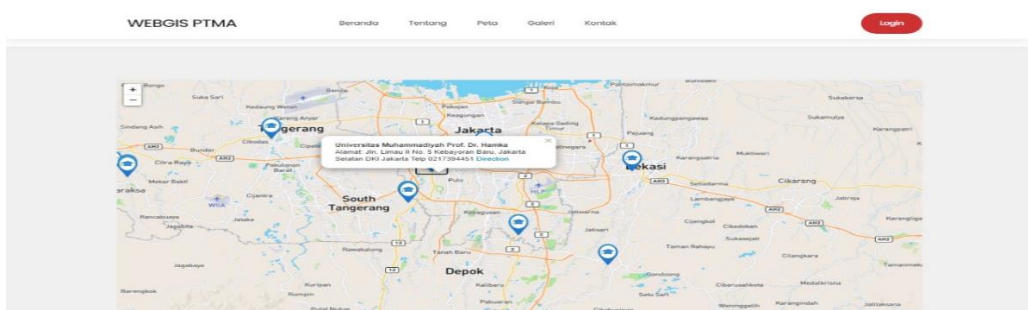


Figure 4.8. PTMA Direction Marker interface display

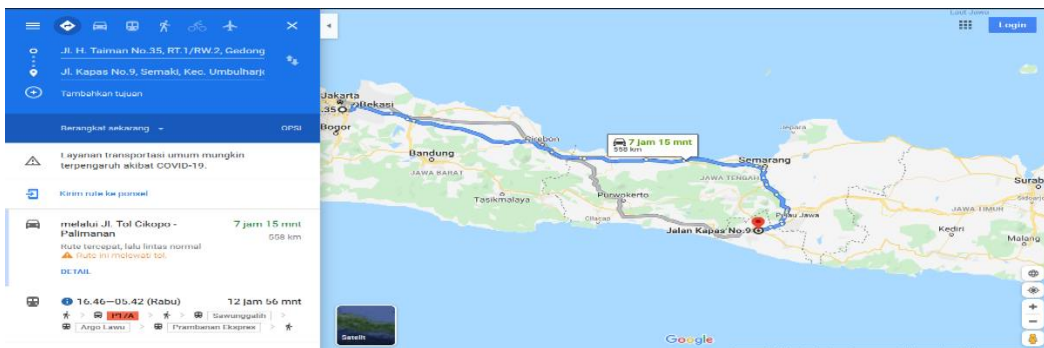


Figure 4.9 The Google Maps interface

(3) Admin interface, when the admin chooses the login button, the system will redirect to a special admin page which is useful for managing admin and campus data. The admin interface is shown in Figures 4.10, 4.11, 4.12.



Figure 4.10 The Admin Login Interface

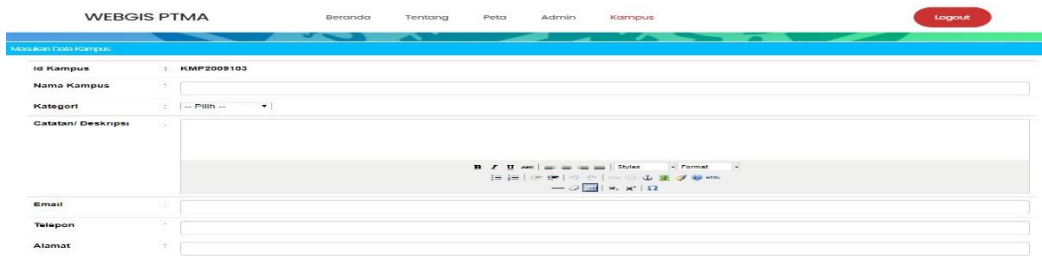


Figure 4.11. Campus CRUD Interface

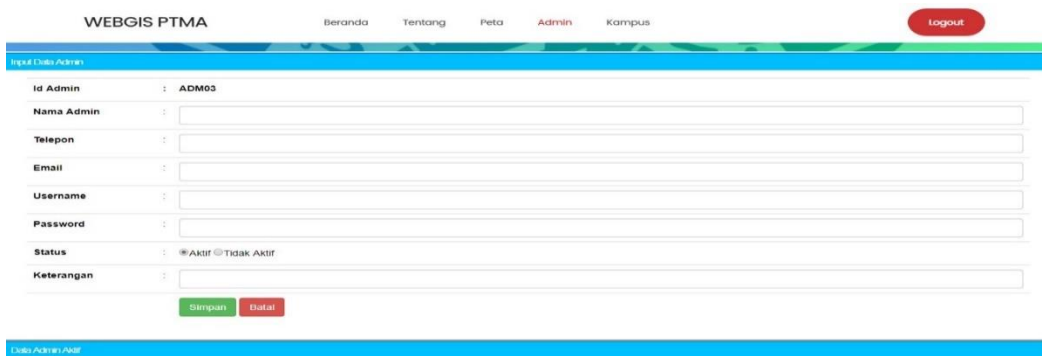


Figure 4.12 CRUD Admin Interface

Tests conducted with Alpha and Beta on the tested menu consisting of the Main Menu, Login Menu, About, Map, Campus Gallery, PTMA Category, More Info and Contacts and all the features in it are successfully displayed. Testing the System by Users from 7 questions and 50 prospective students get an average score of 90.7, so the success of this system is feasible and meets the categories of needs used by users. Table 4.1. Indicates the eligibility level of the PTMA System.

Table 4.1 Final Results of the Questionnaire

PTMA WEBGIS FINAL QUESTIONNAIRE CALCULATIONS

No	Score				N-Max	Total score				Total	Percentage (%)
	1	2	3	4		1	2	3	4		
1	0	1	15	34	200	0	2	45	136	183	91,5
2	0	1	13	36		0	2	39	144	185	92,5
3	0	0	19	31		0	0	57	124	181	90,5
4	0	0	19	31		0	0	57	124	181	90,5
5	0	0	23	27		0	0	69	108	177	88,5
6	0	0	22	28		0	0	66	112	178	89
7	0	0	24	26		0	0	72	104	176	88
Total	0	2	135	213		0	4	405	852	1.261	630,5
Average											90,07

SUMMARY

Based on the results of research, design and discussion, the authors conclude as follows: (1). This system can provide information on the mapping of Muhammadiyah and 'Aisiyiah (PTMA) campuses in Indonesia and its dissemination and provides information that describes the strengths of each of the PTMAs in Indonesia. (2). Researchers use the Google Maps API as a support for mapping PTMA in Indonesia to make it more efficient and easier. (3) Researchers have created a PTMA mapping information system in Indonesia based on a geographical information system as supporting information for users based on the results of system testing that has been tested in

alpha and beta testing, where the test applies calculations from the Likert scale which results in an ideal score with 90.07 satisfaction against the user.

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