Mapping Management Information System for Midwife Clinics in Batam City District

Fendi Hidayat [1*], **Dwi Ratna Fitriyani**[2], **Risqi Utami**[3], **Yoga Fitriana**[4]

[1,2,3,4] Batam University, Jl. Uniba No. 5 Ex. Belian, District. Batam City 29464, Indonesia

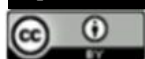*Corresponding author e-mail: fendihidayat@univbatam.ac.id

Abstract

Currently, there is no information system that provides information on the location of geographically integrated midwifery practices in the Batam City sub-district. the application of GIS can be done to map the location of the practice of midwives so that it can be used to find out the location of the practice, hours of service and other necessary information. This research uses descriptive research method and the system development method uses the waterfall method and the design model uses UML. With a mapping management information system developed using web technology so that it can provide information to the public at large

Keywords: Geographic Information System, Google Map Api, PHP, MySQL, UML

1. Introduction

1.1 Sub Introduction

Currently, there is no information system that provides geographically integrated location information for midwifery practice. This makes it difficult for people in Batam City District who want to control the content or immunization of their babies. In addition, it also makes it difficult for the parent midwifery organization, namely the Indonesian Midwives Association (IBI) of Batam City to give permission for midwife clinics to have an ideal distance between one clinic and another.

Based on Batam City BPS data (2021) Batam City is one of the sub-districts in Batam City which was formed in 2005 with a land area of 32.18 km2 with a population of 198,617 people distributed in 6 villages in the Batam City sub-district. Meanwhile, the number of health facilities in Batam City District consists of 2 General Hospitals, 2 Health Centers, 3 Sub-Puskesmas, 66 Pharmacies, 22 Polyclinics, and 47 Midwife Clinics. Of the total 47 midwife clinics, there are 24 midwife clinics in the Belian sub-district, the rest are scattered in other urban villages.

The geographic information system (GIS) is a computerized system that functions to process data and display data in geographic form (Rodonuwu et al., 2020). So that GIS can be used to assist users in determining the location. Currently, GIS has developed rapidly and has been applied to various fields, one of which is the health sector (Ferdiansyah, 2017).

The application of GIS in the health sector has been widely carried out, for example in research conducted byMooniarsih and Imansyah (2020)which

results that the application of GIS can be used to monitor the nutritional development of children under five and can help the Health Office to analyze data and facilitate the determination of the nutritional status of children under five in the region. Other research was conducted by Ady Aryanto and Marini Mandenni, (2020) by applying GIS technology to find out the location of the Puskesmas in Tabanan Regency, Bali.

According to research conductedSugiarto (2016), it is known that the application of GIS can be done to map the location of the practice of midwives so that it can be used to find out the location of the practice, hours of service, and other necessary information. Given this information is needed by the community. according to Setiawan et al., (2017) with the large information needs of the public, the presentation of information must be fast and easy to access. Research conductedIswati et al., (2020)shows that information about the distance or location of the maternity clinic can be a factor that plays an important role in maternal mortality cases so that the use of GIS for mapping the location of the maternity clinic is expected to be able to reduce the maternal mortality rate during childbirth. According to Hasanah inShaqinah (2020) With an easily accessible location, it will make it easier for pregnant women to check-up at the clinic.

Information on the location of the midwife's clinic is needed by the community, especially in Batam City District. A system that displays mapping-based information visualization will make it easier for the public to get clearer information. This system also makes it easier for IBI to see the location of the

midwife's clinic more completely and accurately so that the distribution of the midwife's clinic will be more evenly distributed.

This study aims to design and build a mapping-based system for a midwife clinic in Batam City District. The results of this study are expected to provide complete information for the midwife clinic database accompanied by mapping-based location information so that it is easier for the public to find information on midwife clinics and for IBI organizations it will be easier to make decisions and collect data.

2. Literature Studies

Previous research discusses the use of GIS technology to determine the distance and location of a place, one of which is the application of GIS to find the nearest hotel in Malang City using the location-based service method. After testing in the study, it resulted in user satisfaction with a sufficient value of 32.9%, good 52.9%, and very good 14.2% (Adi, 2018).

Another research that uses GIS technology in the health sector is about the distribution of pharmacies in Banyumas Regency. From the results of this study using GIS visualization, it can be seen the number of distributions and distances between pharmacies in Banyumas Regency. In addition, from this research, it is known that there is a relationship between the distance between the pharmacy and the visits of consumers and other health facilities (Manan et al., 2020).

Further research utilizes GIS technology to facilitate the search for information on social and health facilities in Garut City. With this research, it can make it easier for the public to search for social and health facilities complete with map locations (Nurul Hakim and Cahyana, 2016).

Nalendra et al., (2019) make research using GIS to map maternal and child health. With this mapping system, it will be easier for the Health Office to assist the authorities in issuing policies that reduce maternal and child mortality.

From some of the previous studies that have been discussed above, if you pay close attention, there will be some similarities between the studies that have been discussed with the topic of this research, even though the field of work is different. The similarity is using GIS technology to help provide information to the community using mapping and providing information to the community about the closest location to their area of residence. As well as assisting or facilitating the authorities in making decisions.

2.1. Geographical Information Systems (GIS)
Geographic Information System (GIS) is an Information Technology (IT) based technology that is used to manage, capture, store, display, and analyze geographic-based data.(Apata et al., 2019). GIS is a system that can work and display spatial or coordinated data (Saputra et al., 2018).
According to Prhasta (2002), inMooniarsih and Imansyah (2020) explained that GIS is a picture of the real world that is visualized on a computer device like a map in general. There are 4 main components supporting GIS, namely: 1) Hardware; 2) Software; 3)

Geographical Data and Information; 4) Human Resources/Management

2.2. Google Maps
Google Maps is one of the services provided by Google and is quite popular for displaying digital maps. Google Maps uses digital image technology to display objects on the earth's surface in real-time (Rahayu, 2018). To access Google Maps, you can use a browser application for this type of web-based application, but it can also be used for mobile-based applications. The Google Maps service is open source so that users can participate and contribute to the development of Google Maps (Saputra et al., 2018)

2.3. Database
According to Jogianto (2005), inHidayat and Safarudin (2018)A database is a collection of interrelated data that is stored in a hardware device and managed using a database management system (DBMS) software. According to Reksoatmojo (2018), Hidayat (2021) explained that by using a DBMS, users can manipulate data such as creating, reading, changing, and storing data in the database easily.

2.4. Unified Modeling Language (UML)
According to Rosa and Salahuddin (2016) in (Hidayat et al., 2020) Unified Modeling Language (UML) is a tool used to create object-based system modeling. UML is used to describe an information system that will be developed (Hidayat, 2020). According to Fowler (2004) in (Hidayat, 2018) explained that UML is a family of graphic notations that help explain the design of the system to be developed. This tool is used to explain in detail everything needed by the system (Haviluddin, 2011) in (Hidayat, 2021)

3. Method

This research uses a descriptive research method. Where in this descriptive study aims to explain a phenomenon or event that occurs in a scientific method (Wijaya, 2017). While the system development method uses the waterfall method and the design model uses UML.

3.1. Research sites
This research was conducted in Batam City District, which is one of the sub-districts in Batam City and is located between Nongsa District, Lubuk Baja District, and Bengkong District, Sungai Beduk.
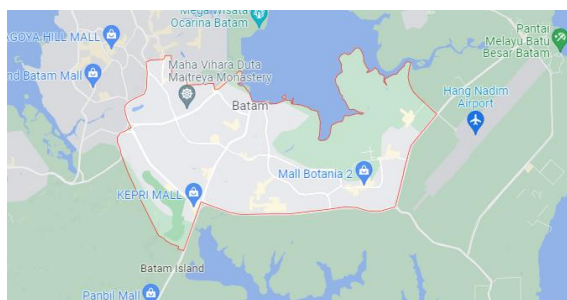

Figure 1. Showing Batam City District as Research Location

3.2. Research Stages

The stages of this research can be seen in Fig. 2. Where the initial stage in this research is conducting a literature study. This is done to find information, data, or related research in research. The data needed in this study are:

1. Data on Number of Midwife Clinics in Batam City District;
2. Field Clinic Data in Batam City District;
3. Information on the location of the Midwife Clinic in Batam City District;
4. Information about GIS;
5. Utilization of Google Maps.

This literature study will be used as the basis for this research. The process of searching or collecting data in this study was carried out by utilizing various existing media instruments. The location data of the midwife's clinic is obtained by utilizing the information available on the Google Maps platform.

After conducting a literature study, the next step is to collect existing data and proceed with formulating the system requirements to be built first. After the system requirements are made, the next step is to analyze the system to be built.

Then proceed with making the design of the system to be built. Designing is done by making system design fields using UML and making user interface (UI) and user experience (UX) designs.

After the design is made, the next step is to implement or build a computerized mapping system. The development of a web-based mapping information system for midwife clinics was built by utilizing map images on google maps, thus requiring google maps latitude longitude data for every midwife clinic in Batam City sub-district. After the system is built, then testing is carried out on the system. If there are still errors, then a re-evaluation of the system analysis is carried out and the next process is to redesign and improve the system.

However, if during testing the system that was built did not experience errors or was declared ready for use, then the process was declared complete and published. Each stage is carried out sustainably and interrelated so that it becomes a unified whole in this research.
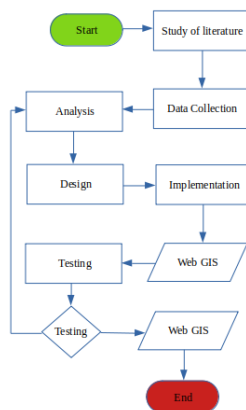

Figure 2. Stages of Research

To support the smooth running of this research, several tools or software were used to facilitate the research process, including Laptop/PC, Ms. Words, MS. Visio, Visual Studio Code, XAMPP, Google Maps and Google Chrome.

4. Result and Discussion

4.1. Functional Needs

In developing this system, the functional requirements needed are as follows:

Table 1. Description of Functional Requirements

Code	Requirement Name	description
UC-F-001	Login	User user validation
UC-F-002	Manage Clinic Data	Clinical data management system
UC-F-003	Looking for Clinical Data	Clinical Data Search System
UC-F-004	View Clinic	The system can display data as needed

In addition to functional requirements, non-functional requirements will also be explained which will focus on interactions and characteristics possessed by the system. The following are non-functional requirements on the system:

Table 2. Description of Non-Functional Requirements

Code	Requirement Name	description
NF-001	Response Time	The time the system processes and responds
NF-002	System Security	The data on the system must be safe
NF-003	Access rights	Data is accessed according to user level
NF-004	Data Accuracy	The data displayed must be accurate

Based on the functional and non-functional requirements above, the next system will be modeled using UML. The modeling will be a description of the system being developed, so it must be in accordance with functional requirements and real conditions. So that the developed system can be used and can assist users in finding the necessary information about midwifery clinics.
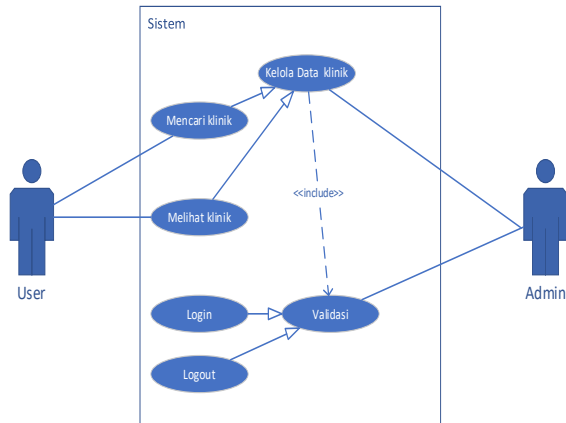
4.2. Use Case

Figure 3. Use Case Diagram

Based on Fig. 3 which shows the use case description, it can be seen that there are two groups of users, namely users and admins. General users will be included in the user category while users who are tasked with managing data will be categorized as admins. There are two types of services that can be accessed by users, namely searching and viewing clinical data. With this information, it is hoped that the user will get the necessary information about the details of the clinic info and the location of the nearest clinic from his place. The data accessed by the user is taken based on the data that has been entered by the admin user first.

Meanwhile, the admin user in order to be able to manage data must first validate the login. So the admin must enter the username and password first, then the system will validate the data. If the validation results fail, then the admin will get a failed or error message. If the validation is successful, the system will open a dashboard page that displays a clinical data processing menu. There are several menus in the management of clinical data management, including the process of creating, viewing, changing, and deleting data related to the clinic, data on the location of the clinic, and information data related to or required by the clinic.

Only logged-in users can access the clinic's data management page, if you don't log in, you won't be able to. After the data management process is completed by the admin, then the admin can exit the system by logging out first. This needs to be done to maintain the security of the system so that it is not misused by people who do not have access to the system.

4.3. System Design

Design is an advanced stage in the systems development life cycle. In this stage, an overview of the design display design of the system to be developed will be explained. There are several examples of system design views that will be discussed, including those as shown in Fig. 4 below:
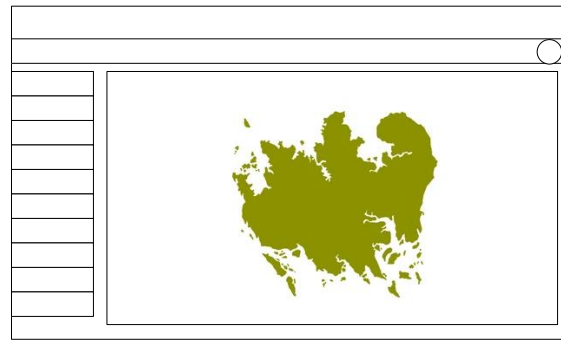

Figure 4. Admin dashboard

In Fig. 4 above, an example of a display design for the admin dashboard is shown. In the design, it looks like there are several menu buttons and there is also a page that displays a map. This dashboard page on the main page will display a map as a whole along with the location of the clinic. While the menu button on the left side bar is useful for controlling the data management page on the system to be built. On the top page, there is a small circle that will be used to display the profile photo icon of the user admin.

4.3. Implementation

The implementation stage is the stage for implementing the system by carrying out the coding process. This stage will realize the design that was previously made.

1. Data Input

Figure 5. Data Input

Fig. 5 shows the data input page for filling in the location of the obstetric clinic data. The admin will input some information related to the location of the clinic such as longitude and latitude coordinates and the location of the clinic's address. The location of the clinic can be determined using the map on the side.
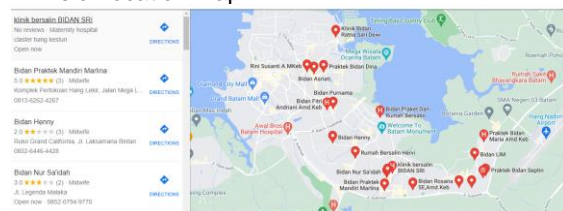
2. Field Location Map

Figure 6. Clinic Location Map

Fig. 6 shows a map and general location information of the midwife's clinic, users can search for the nearest clinic according to the user's location. So that it can help users to determine which midwife clinic to choose.

5. Conclusion

The conclusion that can be drawn from the research that has been done is that a mapping-based computerized system can be made using web technology so that it can provide information to the public at large. With easy internet access today, almost all levels of society have internet access and can access a web-based system using a browser application on their respective smartphones so that this system will make it easier for people to find the location and information of the nearest midwife clinic.

This system was developed by utilizing the API from Gmaps so that it can access maps provided for free by Google. This system still needs further development in order to have features that are in accordance with the development and needs of users.

6. Acknowledgments

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