Geographic information system design of tourism in Bengkayang regency

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Abstract. Bengkayang Regency is a place that has a uniqueness that is rarely found in another area because Bengkayang has a coastline, islands, and forests that are still sustainable and protected. Bengkayang also has many unique cultures and traditions. Although it has a uniqueness, which is rare in Bengkayang Regency, only a few people understand about the various potentials that exist in Bengkayang Regency. That is because the regional government still has problems in developing Bengkayang Regency tourism. After all, there are no media that can be a means of information as well as promotion for tourists. Therefore, the authors build a web-based geographic information system using the PHP programming language and MySQL database called PARAYANG. This system is equipped with a Travel Destination Map feature to provide tourists with an overview of the distribution of the location points of each tourist destination in Bengkayang Regency. PARAYANG is intended for tourists because it can convey complete and interactive information about attractions and available events around Bengkayang Regency. The output from the development of this system is that the application can facilitate tourists in getting information about tourism and events in Bengkayang Regency. Besides, the existing tourist map feature in the method can provide information about the distribution of tourist destination locations in Bengkayang Regency so that it can assist tourists in determining the desired tourist destination.

1. Introduction

Bengkayang Regency is an area in West Kalimantan Province, Indonesia. The Bengkayang Regency itself has several different types of natural conditions, namely the coast and land, hills, and mountains. Bengkayang Regency itself also has several islands, totaling around 12 islands, all located in the Natuna Sea.

In almost every region, the tourism sector is a sector that can be said to have a very vital role, especially in the development sector, because the tourism sector can generate income that is very useful for economic development in a region [1]. Due to the highly varied natural conditions, Bengkayang regency has various types of natural attractions that are interesting to explore. With all the inherent natural beauty that is still awake naturally makes the tourist attractions in Bengkayang Regency have a unique appeal that is certainly not inferior to the tourism potential in other areas, especially in West Kalimantan. Bengkayang Regency is also known for its cultural richness. Dayak tribe, which is a native population in Bengkayang Regency, is famous for having many unique cultures and traditions. Many cultural traditions also held as an annual cultural event that invites many tourists. One example of the remarkable cultural event in Bengkayang is Nyobeng. Nyobeng is a ritual to bathe human skulls. This event is held routinely every year and invites many local and foreign...
tourists. Although all of this tourism potential well managed, it will undoubtedly have a positive impact on regional income [2].

A critical key to increasing the growth of tourist visits to a tourist area is the right promotion through the internet [3]. One of the factors that can affect tourist trips for potential tourists is knowledge in traveling or often known as travel awareness, which contains information about tourist destination areas and the availability of facilities and services [4]. If information about a tourist attraction is complete and easy to obtain, of course, this will facilitate the local government in terms of promoting its tourist objects to tourists. A tourist attraction would be impressive if the number of tourist visits to the area can increase over time [5]. One of the obstacles currently experienced is that the media for mapping tourism objects that owned considered to be lacking because the publication is only through tourist brochures issued by the Department of Youth, Sport, and Tourism of Bengkayang regency. The map of attractions contained in the Bengkayang regency tourism brochure is also less accurate and interactive because it is only a two-dimensional map.

Therefore, to facilitate tourists in obtaining information about attractions in Bengkayang regency and facilitate tourists in securing the information on mapping the location of appeals, a web-based information system is needed that can provide all information about all tourist areas in Bengkayang regency completely and also accurate. The system is a Geographic Information System. The geographic information system itself is all information about the existence of the geographical location of an object on the surface of the earth [6]. Geographic Information Systems are often used to manipulate geophysical data of a place [7]. This web-based tourism geographic information system as a source of information for tourists and provide a more interactive and accurate picture of the spread of tourist attraction locations in Bengkayang regency for tourists who wish to visit Bengkayang regency and the expectation for this system can help Bengkayang regency government, especially the Department of Youth, Sports and Tourism of Bengkayang regency to promote and advance Bengkayang regency tourism.

2. Literature Review
In this study, reference is using from previous studies following the topic of research discussion. In-Depth research is creating a comparison of the advantages and limitations contained in the last examination. Thus, it can increase the understanding of the author in conducting this research. The previous studies used as a reference are still related to the research topic, namely the development of Geographic Information Systems applications.

2.1. Previous Research
In a study conducted in 2013, a web-based geographic information system designed in which contained information on tourist types, tourist locations, and facilities such as hotels and travel in the city of Kupang. In this research, GIS is the right solution to find out the location and tourism information in Kupang because GIS has the ability in terms of mapping and analysis so that the technology is often used in the spatial planning process [8].

The research that describes the Android-Based Geographic Information System for Tourism in the Magelang area, an Android-based GIS application has an aims to provide information on tourism locations in the Magelang area. This application has an additional feature, which is to search for culinary places and also search for lodging places, and there is a sorting feature of the closest distance using the Bubble Sorting method [9].

In other studies conducted in 2014, a desktop-based GIS application designed that is standalone, which means it can run on an installed PC application. The advantage of the Desktop GIS application is the ability to perform data analysis and processing, besides applications are used more compatible with spatial databases and can store vector data into databases rather than file bases [10].
3. Theoretical Basis

3.1. Tourism
According to the UU No. 10 concerning tourism in 2009 on the 1st Article at the 1st paragraph, tourism is a travel activity by visiting certain places for recreation purposes, learning about the uniqueness of attractions, personal development, carried out by a person or group of people in a temporary time while tourism is a variety of tourist activities and supported by various facilities and services provided by the community, entrepreneurs, government, and regional governments [11]. Tourism separates into several types, namely: educational tourism, natural tourism, religious tourism, and culinary tourism [12].

3.2. Bengkayang Regency
Bengkayang Regency is a regency located in the north of West Kalimantan Province. From the perspective of tourism potential, Bengkayang regency has full natural and cultural tourism potential. Bengkayang has a coastal area, islands and also has a forest that is still sustainable, protected, and there are many waterfalls. With this varied natural structure, Bengkayang Regency has many tourism objects and potentials, ranging from marine tourism, nature, forests, and mountains. The diversity of these natural structures also influences the abundance of distinctive wealth from the original culture of the Bengkayang Regency.

3.3. Geographic Information System
GIS is a system to collect, store, combine, organize, transform, manipulate, and analyze geographical data [13]. Geographic information systems are widely used by various groups to explain events, plan strategies, and predict what happens [14]. The term geographic information system is a combination of three main elements, namely, geography, methods, and information [15]. By looking at the necessary features, it is clear that GIS is an information system. GIS is a system that emphasizes aspects of geographic information. The term "geographical" is part of spatial (spatial). GIS is a system that highlights elements of geographic information. The name "geographical" is part of spatial (spatial). The name "geographical information" implies information about knowledge of the position where is projected on the surface of the earth, and it contains the data (attributes) whose location is known.

4. System Analysis and Design
This section contains a discussion of the analysis and design of geographic information systems for tourism in Bengkayang regency (PARAYANG), such as software functionality requirements, system architecture, and interface design.

4.1. System Analysis
PARAYANG is a web-based geographic information system that can convey information in the form of attractions, event agendas, tourist maps, and galleries in the Bengkayang Regency. With this application, it will increase the interest of tourists to visit Bengkayang Regency and to know more about tourist objects in Bengkayang Regency.

4.2. Product Perspective
PARAYANG is a web-based software developed to provide information about the locations of potential tourism areas that are spread in Bengkayang Regency quickly, accurately and can be accessed by anyone, anytime and anywhere. This software contains two types of pages, back-end pages, and front-end pages. The back-end page is for Administrators who are in charge of managing data and while the front-end page is for tourists to get information about tourism and events.

This software can run on any browser, made using the PHP programming language, and MySQL as the database. PARAYANG architecture uses a client-server system. Administrators and tourists are
clients. The storage of all existing data is available on the server, and the Client can access the information on the server by opening a website that refers to the system on the webserver.

4.3. Data Flow Diagram

DFD (Data Flow Diagrams) are diagrams that use notations to describe system data flow logically. DFD describes the components of a system.

4.3.1. DFD Level 0.

DFD level 0 is a basic description of the Bengkayang Regency Tourism GIS data flow, which will decompose into a more detail system. This DFD level 0 has two entities, and one process shown in Figure 1.

![Figure 1. DFD Level 0](image)

4.3.2. DFD Level 1.

Data Flow Diagram Level 1 in Figure 2 contains the core processes that exist in the system, and there are three processes complete, namely:

a. Login Admin, as checking the admin login to get access rights to manage database content and manage the system. Every time the admin logs in, the data entered will auto check with the database. If the data same as the data in the database, then the admin can access to manage database content. However, if they are not the same, the system will refuse users from entering.

b. Maintenance Data, this process is owned by the admin to handles all access related to managing data displayed on the website. Admin can manage data such as adding data, changing data, deleting data, and so on, as needed.

c. Information Request, this process is owned by tourists and is used to request the system to provide information about some data such as event data, travel data, and map data for tourist destinations.

![Figure 2. DFD Level 1](image)
4.3.3. **DFD Level 2: Login Admin.**

The initial process that must be passed by the Administrator to be able to enter the admin system is through the admin login process. Admin login process starts from entering the username & password then the system checks whether the data has stored in the system or not. Afterward, if the Admin data is appropriate, it will directly enter the main menu. DFD level 2 Admin Login process appears in Figure 3.

![Figure 3. DFD Level 2 Login Admin Process](image)

4.3.4. **DFD Level 2: Event Data Maintenance.**

Here is explained in more detail about the flow of all event data maintenance processes starting from the show event data, add new event data, change event data, and delete event data — each method stored in a database. DFD level 2 Event Data Maintenance process shown in Figure 4.

![Figure 4. DFD Level 2 Event Data Maintenance Process](image)

4.3.5. **DFD Level 2: Commentary Maintenance.**

In the figure above is explained in more detail about the flow of commentary data maintenance processes. There are two main processes, namely input comments and deleting comments — each method stored in a database. DFD level 2 Commentary Maintenance process shown in Figure 5.
4.4. **Product Function**
The products functions of PARAYANG software are as follows:

4.4.1. **Login Function**
The login function is a function that allows users to enter the system and use the functionality available in the order.

4.4.2. **Registration Function**
The registration function is a function that allows tourists to register tourist accounts into the system.

4.4.3. **Managing User Data**
The function of managing user data is a function used by the Administrator to handle user data registered on the system. This function consists of displaying user data, changing user data, displaying user data details, deleting user data, and searching for user data.

4.4.4. **Managing Tourist Attractions Data**
The function of managing tourist attractions data is a function used by the Administrator to manage tourist attractions data on the system. This function consists of displaying tourist attractions data, adding tourist attractions data, changing tourist attractions data, showing tourist attractions data details, deleting tourist attractions data, and searching for tourist attractions data.

4.4.5. **Managing Tourist Attraction Gallery Data**
This function is used by Administrators to manage tourism gallery data for each tourist site. This function consists of displaying tourism gallery data, adding tourism gallery data, changing tourism gallery data, deleting tourism gallery data, and searching for tourism gallery data.

4.4.6. **Managing Commentary Data**
This function used to manage comment data. This function consists of displaying comment data, adding comments, deleting comment data, and searching for comment data.

4.4.7. **Managing Event Data**
This function is used by Administrators to manage event data. This function consists of displaying event data, displaying event details, adding event data, changing event data, deleting event data. Furthermore, searching for event data.

4.4.8. **Managing Slider Data**
This function is used by the Administrator to manage the slider data on the system. This function consists of displaying the slider data and changing the slider data.

4.4.9. **Managing Pages About Bengkayang**
This function is used by Administrators to manage page data for the About Bengkayang menu. This function consists of displaying page data about Bengkayang, adding page data about Bengkayang,
displaying page data details about Bengkayang, changing page data about Bengkayang, and deleting page data about Bengkayang.

4.4.10. Rating
This function used to provide scores on tourist attractions in the system. An evaluation only can be evaluated by tourists who already registered on the method. It expected that this rating could provide the information needed to tourists.

Displays the Tourist Maps
This function used to view a map containing the distribution of points of location of each tourist attraction in the system. There are search and filter features to make it easier for tourists to get the information they need.

5. System Analysis and Design
This section discusses software implementation and testing. The application contains an explanation and description of the system part. The experiment used to analyze whether the system meets the targets or not.

5.1. Interface

5.1.1. Admin Login
The Admin Login interface in Figure 6 used to authenticate users who will enter the system. There are input fields that must fill in, such as a Username and Password, and only users that verified can enter the system.

![Login Interface](image)

Figure 6. Admin Login Interface

5.1.2. Managing Tourist Attractions Data
The interface shown in Figure 7 used to manage existing tourism data on the system. There is a list of tourist destinations in the system.
Figure 7. Managing Tourist Attraction Data Interface

5.1.3. Map of Tourist Destinations
The interface in Figure 8 used to display the location of a tourist destination through maps. The red marker on the map indicates the position of the tourist location. If the red marker clicked, it would display information about the name of the tourist site and its short address. Users can also filter the tourist locations to show based on the type of tourist destination.

Figure 8. Map of Tourist Destinations Interface

5.1.4. Showing Tourist Destinations
The interface in Figure 9 used to display a list of tourist destinations based on the type of tourism in the system. Tourism data revealed consists of images, tourism names, tourism locations, and rating values.

Figure 9. Showing Tourist Destinations Interface
5.1.5. Showing Event
The interface in Figure 10 is used to display a list of events held in the Bengkayang Regency. The activities that are displayed are arranged sequentially based on the date the event was held. Two input fields can be used to filter events based on a specific period. When detailed information about an event is needed, directly click on Details.

![Figure 10. Showing Event Interface](image)

6. Conclusion and Future Research

6.1. Conclusion
Based on the results of the design, implementation, and testing of the system that has been made, some conclusions can be drawn, including:

1. The application can facilitate tourists in getting information about tourism and events in the Bengkayang Regency.
2. The existing tourist map feature in the system can provide information about the distribution of tourist destination locations in the Bengkayang Regency so that it can assist tourists in determining the desired tourist destination.

6.2. Future Research
Suggestions that can be given for future application development are:

1. Add multi-language features so visitors from abroad can understand website content.
2. Develop a mobile platform application to increase application flexibility.
3. The addition of navigation features so that it can facilitate tourists to go to tourist sites.

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