

Design and Implementation of Smart Village Application

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Abstract: In 2019, according to TripAdvisor Bali is the top 5 favorite destinations in the world. Bali offers cultural and natural tourism attraction as a unique characteristic. Many traditional villages tried to provide cultural and unique tourism attractions to attract tourists to visit. The dorp with those characters is called a tourism village. Many tourism villages in Bali do not have an application or information system to promote or even to manage their resources yet. This research aims to develop a smart village application to help tourism village to manage and promote their tourism resources. The smart village application development begins with requirements analysis to gathering customer needs and the system specifications. Design the system architecture, the use case diagram, and the database. The main features of the application are tourism attraction, art shop, culinary, lodging, and event. Users of the application are the admin village, the owners of tourism resources, and guests. This web-based application can provide the ability to manage and promote its tourism products. Information about the tourism village included the location also prepared before the tourists visiting the dorp.

1 INTRODUCTION

In 2019, according to TripAdvisor Bali is the top 5 popular destinations in the world. Bali offers cultural and natural tourism attraction as a unique characteristic. The provincial government of Bali has taken steps to maintain Bali as a favorite tourism destination. One of the steps is by developing Tourism Village. Since 2013, the government has targeted the development of a hundred new tourism villages. Tourism Village is a form of integration between attractions, accommodations, and supporting facilities that provided in the community structure that integrates with the prevailing traditional procedures. Like other areas in Indonesia, there is a gap between well-developed tourism villages and the poor one. Well developed tourism villages in Bali are using Information and Communication Technology (ICT) to promote their tourism potentials. The usage of ICT so far just for promotion needs. It does not include the management aspect yet. Empowering tourism villages and promoting tourism potentials as well, the use of ICT is necessary. The utilization of ICT is needing to empowering tourism village is also spelled out by Purnomo. He stated by taking

advantage of the ICT utilization the tourists can get sufficient information about object tourism before visiting.

The ICT utilization in the tourism villages development field was also described by Choirunnisa, in the case of tourism villages in Yogyakarta. This research aims to design the architecture system, user interface, use case diagram, and activity diagram of a smart village application for tourism village. The application is design to manage and also promote tourism objects and accessible by computers and smartphones.

2 RELATED WORKS

There are many studies and interpretations of the smart village. According to Shukla, a smart village should be interactive and multifunctional. It needs the active participation of people in various activities. A smart village is an integration of several modules stored in a database that can access via smartphone or tablet. Another definition of a smart village is an innovation of sustainable planning approach at the village level that promotes knowledge-based

development through the continuous learning of human resources as an integrative part of village resource development, especially in encouraging rural areas development as a part of the regional system in the context of national development planning system. The objective of rural development in Indonesia is to encourage rural development in smartness manner known as the smart village with respecting the existing diversity values of each village

One of the characteristics of a smart village is the usage of ICT to manage and promote the village resources. The development of smart village application has been carried out by many researchers. Marlintha had designed and implemented a smart village mapping Geographic Information System of the Cinunuk village. GIS has been used extensively in developing a smart village application. Afnarius has developed GIS for buildings in the customary village of the Minangkabau Koto Gadang West Sumatera Indonesia. Information Technology is one important factor to support and promote the potential of village tourism. An application of geoinformatics for smart village creation has been conducted by Prakash R, a case study of Vishnupuri village in eastern Maharashtra, India.

3 METHODOLOGY

According to the Bali Government Tourism Office, there are 155 tourism villages in Bali. Less than fifty percent of those villages had an application or information system to manage and promote the village resources.

This research aims to design an able application used widely by tourism villages. The methodology of this research consists of requirements analysis, design, implementation, and testing.

3.1 Requirements Analysis

To meet the user needs, we need to communicate the basic need of the user. Good communication can give sufficient information to develop an application that can meet customer objectives. Requirement analysis took place at the very beginning of the development process. There are three types of requirements: customer requirements, functional requirements, and performance requirements.

1. Customer requirements: Define system expectations based on certainty facts, and assumptions. Table 1 shows the business processes of the tourism village.

Table 1: Business processes of tourism village.

Business	Business Processes		
	Main Processes	Products	Owner
Culinary	Selling, ordering	Food & Beverage	Villager
Artshop	Selling, ordering	Handycraft, painting, clothes	Villager
Lodging/ guest host	Renting, booking room	Room, services	Villager, village
Tourist Attraction	Promoting, ticketing	Attraction	Villager, village
Village Event	Promoting	Cultural attraction	Village

Understanding the customer wants it done by conduct a survey of several tourism villages in Bali. In this research, there are several certainty facts can be concluded during the communication with the user and observation during the requirements gathering process. Table 1 shows the business processes of a tourism village. The data as gathered in, the business process, and the characteristic of villagers in a tourism village. The villager characteristics are also important things to define user requirements. The villagers of the tourism village have various educational backgrounds and ages. As we observed in the survey area, most of them can communicate in English. They also have a strong will to encourage themselves to achieve a better income.

Several assumptions are made to make the application constraints. Based on the survey's result, several parties are directly involved with the application. We named it as a potential user. We defined three users, which are the village's government (admin village), villagers (owners of tourism potencies), and guests (tourists). The system design for computers and Android smartphones or tablets use.

2. Functional requirements: is used to describes inputs, outputs, and system behaviors. Based on Table 1, the system functionality is created. The system functionality has to be able to manage culinary, art shop, guest house/ homestay, tourism attraction, and to manage the village's events as well.

3. Performance requirements: are the degree to which missions or functions are required. The performance requirements of an application are determined by the speed of data entry, data transferring, and processing. When we develop a smart village application, we must define which features of the application that needs speedy transferring and processing. The application is designed to be able to provide information to the

tourist quickly. The database must be made effectively and efficiently to provide information faster.

3.2 Design

1. System Architecture: The smart village application provides services to users. The services must be accessible to all users using various devices, such as computers or laptops, smartphones, and tablets. The system architecture is described in Figure 1.

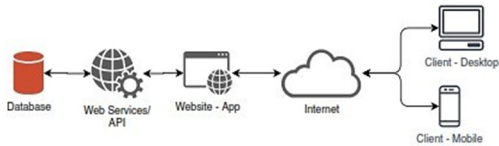


Figure 1: System architecture.

2. Use Case Diagram: To model the system requirements we used use case diagrams. The steps to build a use case diagram are identify the actors and the relationship of each actor, identify use cases, and the relationship between use cases. The actors from the result of requirement analysis are village admin, owners dan guests. The uses cases of the system are derived based on Table 1. The system functionality spelled out into use cases. There are five business processes will be developed. They are culinary, art shop, Lodging/guest host, tourist attraction, and village event. The culinary, art shop and tourist attractions have similar main processes. The basic idea of the village event is to promote the cultural event, which is they need no ticket to watch the event. The lodging has different main processes, which are renting and booking rooms. Therefore we designed the use cases are the same for similar business processes. Figure 2 describes the use case diagram of the application. The main business process is broken down into several use cases using extend relations. Two main use cases of each business process are "add" and "find" functions. Users can add and find the data or information they need.

Figure 3 shows the guest use case diagram of the smart village application. The sub-use cases are review and ticket order. The guest needs to register first before reviewing the products to avoid unappropriated reviews from anonyms. The users' review can give much information to the owners and admin village to improve the services.

3. The Database: A good design of the database can enhance the ability of the application to run fastly. Fig 4 shows the relational tables of the database of the application. Each main process of Table 1 is mapped

in tables in the database. Lodging, art shop, culinary, tour, and event, and other tables are created to accommodate the data.

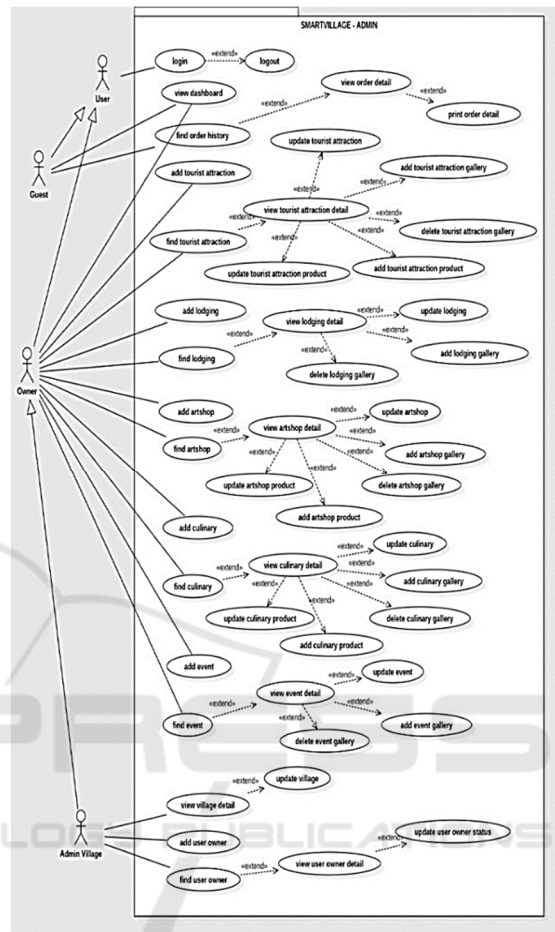


Figure 2: Use case diagram of smart village application

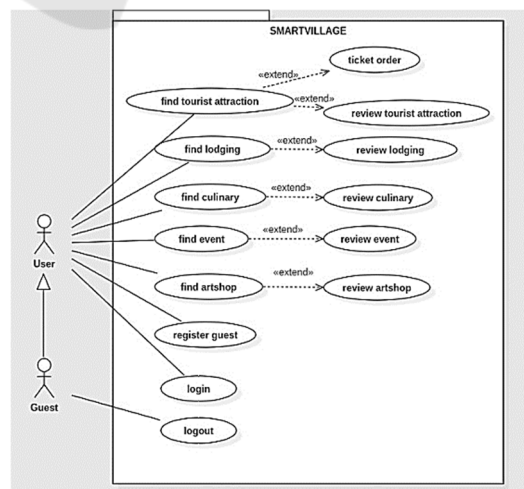


Figure 3: Guest use case diagram of smart village application.

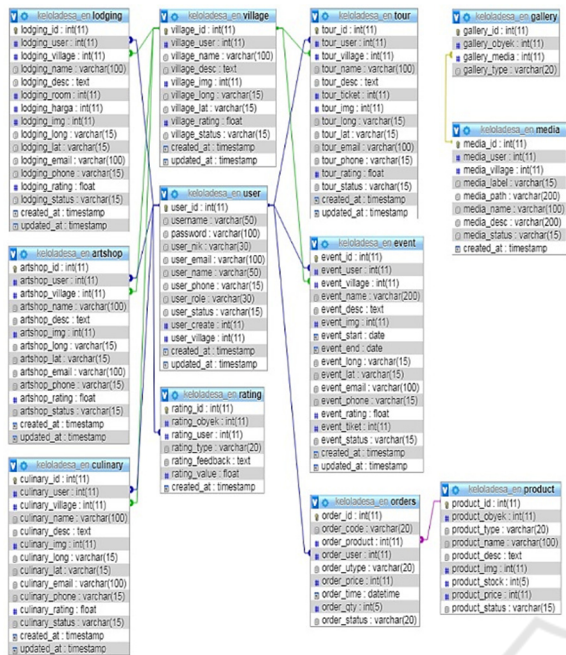


Figure 4: Relational tables design.

3.3 Implementation and Testing

The design that had conducted in the previous becomes a reference and guidance to develop the application. The development of the application using the following programming languages:

- Front end web using HTML, CSS, and Javascript with vue.js framework.
- Web services using PHP with SLIM framework
- Database using MySQL version 5.0.12

Application testing we used black-box testing. The tester only knows the input and the required output of the testing. Black-box testing is focused on the testing of functionality of the software application. We ran testing for more than 48 testing units. Each testing unit can consist of more than one scenario. Table 2 shows the result of black-box testing of the login unit the application. Table 2 shows the test result of black-box testing of the login unit of the application.

Table 2: Black-Box Testing Result Of The Login Unit.

Scenario	Required Result	Result	Conclusion
Username: (empty) Password: (empty)	The system will reject, and it's displaying message: username is required	As required	valid
Username: (empty) Password: admin	The system will reject, and it's displaying message: username is required	As required	valid
Username: email address Password: (empty)	The system will reject, and it's displaying message: invalid data	As required	valid
Username: email address Password: text	The system will accept the input and proceed.	As required	valid

The application has six features: village profile, tourism object, lodging, art shop, culinary, and events. Each feature has geotagging to give directions to the guests. Figure 5 shows the homepage of the application.

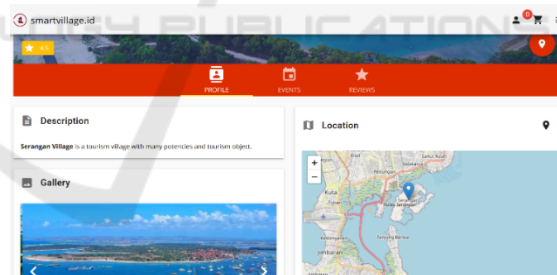


Figure 5: Homepage smart village application.

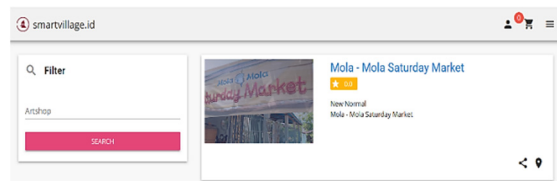


Figure 6: The artshop feature.

4 RESULT AND DISCUSSION

The smart village application to manage and promote the potencies of tourist village consists of several main menu or features. Each potential business process is made the form application feature.

Figure 6 shows the art shop feature. The smart village application that developed in this research is not only used GIS to give location information about the tourism objects that conducted by others researcher in

the related works, but it also can manage and promote the tourism objects. The application can accommodate the basic need to manage many tourism objects owned by villagers.

5 CONCLUSION

The smart village application design begins with requirements analysis to gathering customer needs and system specifications. The design process consists of designing system architecture, making the use case diagram and relational table also conducted in the design process. Implementation of the application is using HTML, CSS, and Javascript for front end web, PHP for web services, and MySQL for the application database. Users of the application are owner, village admin, and guest (tourist). The application can manage and promote the tourism potential of the village as well. The application is a web-based application only. A mobile smart village application can be developed with a payment gateway feature for future works.

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