Mobile gis app for guiding geopark at unesco global geopark ciletuh palabuhanratu, indonesia

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Abstract: This study aims to produce a mobile GIS application as a spatial data-based information media for the geopark area at UNESCO Global Geopark Ciletuh Palabuhanratu in a more exciting and informative way. The development process is by Analysis, Design, Development, Implementation, Evaluation (ADDIE). This application offers navigation, interpretive information, digital maps, offers guide route selection for users, geopark areas, geographical diversity, biodiversity, cultural diversity, tourist destinations, and tourist itineraries. In testing using a drawn questionnaire, the system conclusions made by users are asked to be interested in the application.

1. Introduction

Geopark is an area that has unique geology, archaeological, ecological and cultural values, where local people are invited to contribute actively in efforts to preserve and improve the function of natural heritage [1]. Ciletuh Palabuhanratu Geopark is a regional management concept that harmonizes geological, biological and cultural diversity, through the principles of conservation, education, and sustainable development in eight subdistricts in Sukabumi District, West Java Province, Indonesia. Ciletuh Palabuhanratu Geopark has an area of 126,100 Ha or 1,261 km². This area includes 74 villages, in eight subdistricts namely Ciracap, Surade, Ciemas, Waluran, Simpenan, Palabuhanratu, Cikakak, and Cisolok.

In recent years, the rapid increase in the development of geographic information system (GIS) technologies has led to the development of a number of integrated global positioning system (GPS)/GIS applications, which can be taken advantage of by the tourism industry [2];[3];[4];[5];[6];[7]. for example, have already applied GPS methods to collect data on the spatial and temporal activities of tourists.

Traditionally Sign interpreting, multi-media presentations in the audio-visual space, and extensive knowledge of the guide. But now, it is possible to utilize cellular GIS and GPS techniques to improve the guide process and offer visual and graphical representations of multi-media information to users [8]; [9];[10]. GIS and GPS techniques have been used to utilize individual space-time in the community [11]. GIS can provide easy access to spatial databases, query features, create themes and layouts, and provide reports [12]. Benefit from this, mobile GIS, accessed by mobile, can be accessed by visitors to find their way, beautiful places in tourist destinations.

There has also been rapid technological development of mobile map applications beginning in the mid-1990s [13]. With the appearance of mobile computing devices and cheap location-sensing systems, location information has become an important resource for both mobile and desktop users [14]. Mobile GIS is already being applied for the development of location-based services (LBSs), where knowledge of the location of an individual is used to personalize the service [15]. The technological advances that have produced hand-held mobile devices, such as smart phones, personal digital assistants (PDAs) and GPS units have made the development of LBS-guiding information services possible. For example, one can look at the successful implementation of the WebPark project (October 2001–September 2004),
which provides information to visitors in natural areas. The platform for this system was developed from a combination of smart phones and GPS [16].

In addition to the rapid increase in technology related to smart phones and their mobile application solutions, GIS professionals have experienced an explosion in technology related to mobile GIS. Application software (apps) for smart phones has become increasingly popular and useful. Mobile devices and their respective apps allow GIS professionals to monitor the spatial patterns of visitors to an area, and record and verify information for tourists.

This work presents a prototype of a cellular tour guide system equipped with cellular GIS technology. The Ciletuh Geopark application uses a mobile GIS platform that can be operated on Android. The aim of the assistance is to offer spatial data-based multi-media information, a tourist guide to places of interest at the UNESCO Global Geopark Ciletuh Palabuhanratu. In addition, user evaluations and previous versions of the mobile tour guide system have been carried out, and the results are used to help us improve new applications. This application offers navigation, interpretive information, digital maps, offers guide route selection for users, geopark areas, geographical diversity, biodiversity, cultural diversity, tourist destinations, and tourist itineraries.

2. Methods
This research is an implementation of the development of the Mobile GIS application, this application offers navigation, interpretive information, digital maps, selection of access guides for users, geopark areas, geographical coverage, biological coverage, cultural diversification, tourist destinations, and travel plans. The target of using this media is guides and tourists at UNESCO Global Geopark Ciletuh Palabuhanratu. The development method for research use is the ADDIE model.

ADDIE is an acronym for Analyze, Design, Develop, Implement, and Evaluate. ADDIE is a product development concept. The ADDIE concept is being applied here for constructing performance-based episodes designated for learning space. Learning space is the term used to refer to intentional learning environments rather than intentional learning that occurs all the time. Intentional learning environments are complex and ADDIE provides a way to navigate the complexities associated with developing modules for use within intentional learning environments. The application of ADDIE to instructional systems design facilitates the complexities of intentional learning environments by responding to multiple situations, interactions within context, and interactions between contexts. Yet, the fundamental ADDIE components remain the same throughout various applications and variations of the ADDIE paradigm depend on the context in which ADDIE is being applied.

This strategies that move away from didactic, limiting, passive, singular modes of design, and instead move toward designs that facilitate active, multi-functional, situated, inspirational approaches to learning. The goals of first present the ADDIE concept

Analyze: The first phase of the ADDIE instructional systems design process. Its purpose is to identify the probable causes for the absence of performance and recommend a solution; design: The second phase of the ADDIE instructional systems design process. Its purpose is to verify the learning tasks, performance objectives, and testing strategies; develop: The third phase of the ADDIE instructional systems design process. Its purpose is to generate and validate the training materials; evaluate: The fifth phase of the ADDIE instructional systems design process. Its purpose is to assess the quality of the training materials prior to and after implementation and the instructional design procedures used to generate the instructional products; implement: The fourth phase of the ADDIE instructional systems design process. Its purpose is to conduct the training [6].

3. Results and Discussion
3.1 Media specifications
This application offers navigation, interpretive information, digital maps, offers guide route selection for users, geopark areas, geographical diversity, biodiversity, cultural diversity, tourist destinations, and tourist itineraries. The concept of this application is easy, fun, and educational. Easy because it does not
require a long time, because of interactive media sites in the delivery of material, as well as edutourism material, about the UNESCO Global Geopark Ciletuh Palabuhanratu region.

3.2 System Implementation and Testing

System implementation is the stage of translating the needs of application development into software representations in accordance with the results of the analysis that has been done. After implementation the new system will be tested where deficiencies will be seen in the new application for further system development.

The purpose of system implementation is to explain the module manual to all users who will use the system. So that the user can respond to what is displayed on the system and provide input to the system maker to make improvements so that the system is better.

| No | Hardware   | Specification                  |
|----|------------|--------------------------------|
|    | Laptop     |                                |
| 1  | Processor  | Intel(R) Core(TM) i7 CPU M330 @2.13GHz 2.13GHz |
| 2  | Monitor    | 14”                             |
| 3  | VGA        | 4 GB                            |
| 4  | RAM        | 4 GB                            |
| 5  | Hard disk drive | 1 Tera                        |
|    | Mobile     |                                |
| 1  | Layar      | 7”                              |
| 2  | Ram        | 2 GB                            |
| 3  | SD Card    | 16 GB                           |
| 4  | Kamera     | 5 MP                            |

| No | Software       | Specification                  |
|----|----------------|--------------------------------|
|    | Laptop         |                                |
| 1  | Sistem Operasi | Windows 10                     | Android 5.1 Quad Quadro Processor |
| 2  | Tool Pembangun | Arcgis Online dan Arcgis desktop (arcmap) | - |
| 3  | Tool Desain    | Story Maps Arcgis Online       | - |
| 4  | Library        | -                              | Vuforia Qualcomm |

3.3 Interface Implementation

At this stage the application of interface design results is implemented into a system built using software that has been described in the software implementation sub-section. The following are some of the interface displays that have been implemented.
Table 3 Menu Interface Implementation

| No | Interface                                                                 | Description                                                                                                                                 |
|----|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Selecting an Application on the Cellphone and the Opening Process (loading) | Application on a desktop mobile phone with an Android system, and the process of opening an application depends on the internet network.       |
| 2  | Select Main Menu and Choose Menu How to Use                                | The main menu interface is the menu that first appears when accessed by the user. The following displays the interface from the main menu that has been implemented. Implementation of the main menu interface, there are menu choices that can be chosen according to the information needed. The interface of how to use is a menu that can be accessed by users to find out how to use the application. The following is an interface display of how to use that has been implemented |
| 3  | Selecting the Exit Button and Selecting the Current Location Button (GPS)  | Implement the exit menu interface and display the GPS menu to find out the user's location.                                               |
4 Displays location search and displays related object descriptions

Display the location search menu to find the location of the search that has been implemented. Displays the information menu to explain information and descriptions related to the sought object that has been implemented.

5 Displays a zoom in, home and zoom menu

Display a zoom menu, home, and zoom out to see the snack to suit the wants and needs of the user that has been implemented

| No | Interface | Description |
|----|-----------|-------------|
| 1  | Displaying Interface related to spatial information on the location of the UNESCO Global Geopark Ciletuh Palabuhanratu that has been implemented | Displaying interfaces related to spatial information, distribution, location, and destination attributes in the UNESCO Global Geopark Ciletuh Palabuhanratu region that has been implemented |
| No | Interface | Description |
|----|-----------|-------------|
| 2  | ![Image](image1.png) | Displaying interfaces related to spatial information, distribution, location, and diversity attributes in the UNESCO Global Geopark Ciletuh Palabuhanratu region that has been implemented. |
| 3  | ![Image](image2.png) | Displaying interfaces related to spatial information, routes, road networks, and GPS in the UNESCO Global Geopark Ciletuh Palabuhanratu region that has been implemented. |

3.4 *Media usability testing*

Stages of validation or application testing are treated qualitatively and quantitatively. This is qualitative as a questionnaire for guiding and tourists about application products using the black box method. This is a quantitative assessment sheet material experts and media experts. At this stage, before conducting the trial, the initial test (design validation) is carried out through material experts and media experts. The point is to ensure that the material and appearance of the application are suitable and suitable for use.

This calculation uses the likert scale with scale 1-4. The result of the calculation process is presented in the table to obtain the eligibility test score media. The interval is determined by using the equation with a maximum score of 4 and score a minimum of 1. Then by equation (3.2) found the
interval class (i) 0.75. Minimum scale is set to 1.00. Then the resulting categories can be seen in Table 4. The likert scale was analyzed by calculating the score of each interval from the statement given to the respondent. The following is the result of the assessment of the test against the user with each variable.

| Table 5 Categories Interval |
|-----------------------------|
| Interval | Categories |
| 3.28 – 4.03 | Excellent (E) |
| 2.52 – 3.27 | Good (G) |
| 1.76 – 2.51 | Poorly (P) |
| 1.00 – 1.75 | Bad (B) |

### 3.4.1 Display Testing Menu

The menu display test is a functionality test to display the menus that have been applied in the application, as shown in table 5 below.

| Table 6 Display Testing Menu |
|-----------------------------|
| No | Components Tested | Test Scenarios | Expected Result | Test Result |
|--------------------------------|
| 1 | Menu | Select Menu Applications Using | Displaying information in the form of geographical information on the Unesco Global Geopark Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| | | Select Menu How to Use | Displays information on how to use the application | [v] Accepted | [ ] Rejected |
| | | Select the Exit Button | Exit the application | [v] Accepted | [ ] Rejected |
| | | Select the existing window according to the desired object and information | Displays information options for the object that you want to display | [v] Accepted | [ ] Rejected |

### 3.4.2 Display Object Testing

Object testing is carried out to determine whether each object shown has an error or not, the results of the test can be seen in table 6 below.

| Table 7 Display Object Testing |
|--------------------------------|
| No | Components Tested | Test Scenarios | Expected Result | Test Result |
|--------------------------------|
| 1 | Object | Unesco Global Geopark Ciletuh Palabuhanratu area | Displays the location and boundaries of the Unesco Global Geopark Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| | | Objects / Destinations in the Unesco Global Geopark Area Ciletuh Palabuhanratu | Displays the location and distribution of destinations as well as information related to destinations that are integrated with the concept of edutourism in the Unesco Global Geopark region Ciletuh | [v] Accepted | [ ] Rejected |
| No | Components Tested | Test Scenarios | Expected Result | Test Result |
|----|-------------------|----------------|----------------|------------|
|    |                   | Palabuhanratu Sukabumi Regency, West Java Province |               |            |
| 1  | Diversity         | Displays the location and distribution of destinations related to diversity as well as information related to destinations that are integrated with the concept of edutourism in the Unesco Global Geopark region Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| 2  | Biodiversity      | Displays the location and distribution of destinations related to biodiversity as well as information related to destinations integrated with the concept of edutourism in the Unesco Global Geopark region Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| 3  | Geodiversity      | Displays the location and distribution of destinations related to geodiversity and information related to destinations that are integrated with the concept of edutourism in the Unesco Global Geopark region Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| 4  | Culturdiversity   | Displays the location and distribution of destinations related to culture and information related to destinations integrated with the concept of edutourism in the Unesco Global Geopark region Ciletuh Palabuhanratu Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| 5  | Community         | Displays the location and distribution of the geopark driving community and information related to destinations that are integrated with the concept of edutourism in the Unesco Global Geopark area in Ciletuh Palabuhanratu, Sukabumi Regency, West Java Province | [v] Accepted | [ ] Rejected |
| 6  | Accessibility and Global Position System | Displays the road network and the user's position when using the application as a pointer. | [v] Accepted | [ ] Rejected |

3.4.3 Validation Of materials expert
The material expert in developing this application, UPI Tourism Geography Professor. Expert assessment of data material for mobile developed GIS applications is carried out with 4 aspects, namely aspects of the feasibility of 5 item contents, aspects of the appropriateness of 5 item application views, aspects of media effects on data and information of 5 items and 5 item contextual aspects. Based on the results of the validation calculation the material experts can conclude the data and information presented in the application per assessment of 94.9% were declared very good and 5.1% were well approved, with an average score of 3.93 and the "Excellent" category.

| Categories | Scale | Frequency | Total | Percentage (%) |
|------------|-------|-----------|-------|----------------|
| Excellent (E) | 4 | 28 | 112 | 94.9 |
| Good (G) | 3 | 2 | 6 | 5.1 |
| Poorly (P) | 2 | - | - | - |
| Bad (B) | 1 | - | - | - |
| Total | - | 30 | 118 | 100 |
| Average | | | 3.93 | |
| Categories | Excellent | |

4. Conclusion

Based on the results of assessing the appearance of the object, the menu using blackbox testing can be concluded that the application that was built functionally has issued results that are as expected. While the validation of material experts included in the category is very good for the operation of the application, both content and appearance. The opinions of the experts during the use of the application were very positive. They showed confidence that this application could be used for tourism activities at UNESCO Global Geopark Ciletuh Palabuhanratu.

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