

A Web-Based Geographical Road Project Monitoring and Information System for the Department of Public Works and Highways - Cagayan De Oro District, Philippines

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Abstract— The Department of Public Works and Highways (DPWH) Cagayan de Oro District 1 and 2 is one of the regional offices of the DPWH that responsible for all the projects in the field of public works, maintenance of the city road network and irrigation system. The office is also responsible for implementing transparency on its project information through released and accessed by the public. However, most of the accomplished and on-going road projects information is not highly available and not easy to navigate in the current website.

Considering many road projects information requires it to be reliable, updated, relevant and easily accessible. A web-based geographical system as new approach is introduced in this study. The purpose of this study is to design and develop a program application that could provide information about the road projects in a more detailed and informative way that can be easily accessed by the public.

Usability test was used to evaluation the application. Based on the results, the visual clarity, consistency, and effectiveness of the project are rated as excellent. The information is presented in clearer and more satisfying view.

Index Terms— DPWH, Road projects, web-based, web mapping

I. INTRODUCTION

Roads and Highways are cornerstones of any nation's infrastructure. For centuries, roads and highways have carried people, goods and ideas from one corner of the earth to another. Roads are identifiable routes or paths between two or more places. They are typically smoothed, paved, or otherwise prepared to allow easy travel. Historically, many roads were simply recognizable routes without any formal construction or maintenance [1]. It is the responsibility of the designated executive department of the government to build and maintain quality roads and highways, maximizing public convenience [2].

The Department of Public Works and Highways is the executive department of the Philippine government responsible for all the projects in the field of public works. It is responsible for the maintenance of the Philippine road network and irrigation system. DPWH is also responsible for collecting, storing, retrieving, managing, analyzing and presenting the data to the public.

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Many development projects have serious dependence on transport network. Authentic information on the transport infrastructure is fundamental requirement for many decision making process [3]. Therefore information requires it to be reliable, updated, relevant and easily accessible. This demand for information requires new approaches in which data related to transportation network should be identified, collected, stored, retrieved, managed, analyzed, communicated and presented. Considering the complexities in developing, updating and processing of the transport related data, there is an urgent need to adopt new concepts and technologies for designing and developing the information resource management of transport infrastructure in the city[4][5]. Therefore, the development in the field of information technology is especially relevant to the field of transportation engineering.

Web mapping is the process of using maps delivered by geographical information systems. The locations can be express in many different ways, such as latitude and longitude, address, or ZIP code. Many different types of information can be compared and contrasted [6]. Web Mapping clearly promises many great benefits to DPWH and to its functionality. Web mapping can be a great help in its aim to inform the citizens about their road projects as well as to build positive relations with the citizens it is serving [7].

Here in Cagayan de Oro, the DPWH consists of two districts. The 1st District office is located at RES Compound, Barangay Bulua while the 2nd District is at Barangay Puntod. The first district's area of responsibility starts from the roads of Barangay Iponan to the Cagayan de Oro River while the second district starts from the Cagayan de Oro River to Syre Highway.

II. METHODOLOGY

2.1 Designing the graphical user interface

2.1.1 Website Architecture and Design

The first step during the creation of the website is performing a research. Getting an understanding of the client's needs and others through thorough examination and brainstorming to learn more about the subject that is to be expose on the site is the first thing to do. There is a need to a keen gathering of information as much as possible to help develop an outline for the site and also for its design when meeting with the client. This includes asking about the target audience, goals, creative direction and other variables that

inadvertently wreaking havoc when trying to modify system behavior. Unit testing gives a bit more confidence in the overall system stability.

2.3 Implementation of the web-based geographical road project monitoring and information system.

During the implementation process, the system together with the main system of the DPWH simultaneously runs. This parallel operation is done so that if the new system does not work correctly, the DPWH can still use the old system as a backup. This is made until the users, management and the IT personnel are satisfied with the function of the new system and see that it is completely utilizable.

2.4 To evaluate the web-based geographical road project monitoring and information system.

Performing an evaluation process assesses the performance of the website after the implementation. This process helps the researchers determine whether the site is effective or not.

III. RESULTS AND DISCUSSION

3.1 System Screenshots

The Figure 5 below shows the login page of the administrator. The 1st and 2nd District of DPWH Cagayan de Oro City have different administrator and they can only add and update projects according to which district they log in.

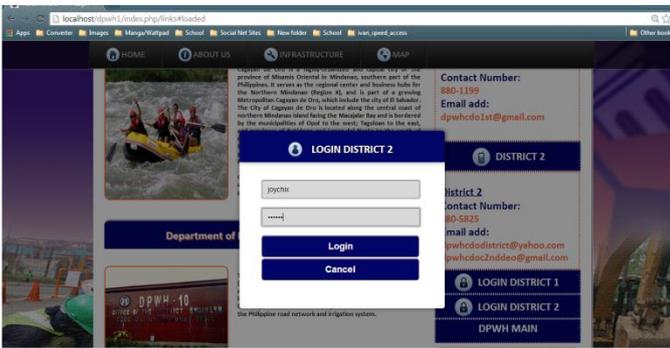


Figure 2. Administrator Login

Once the admin is logged in the system, he can now add and update projects and contractors. He can also update and view the map. Figure 6 shows the administrator profile and menus that admin can access. This area is where manipulation of information that the public viewer sees on the main page.



Figure 6. Administrator Profile

transparency of the project status. Figure 7 shows the adding section of the project which is to be done by the administrator. After adding all the project information it will then be registered on the database and those info will then be retrieved for the viewer to see the newly added project. When



Figure 1. Adding New Road Project

the admin updates, the same process occurs. In order for the viewer to visualize the data clearly, getting the main information from the database to be displayed on the table is done. Figures 8 show the said results. Base on the results it is clearer if the data are categorized according to what project category it belongs.

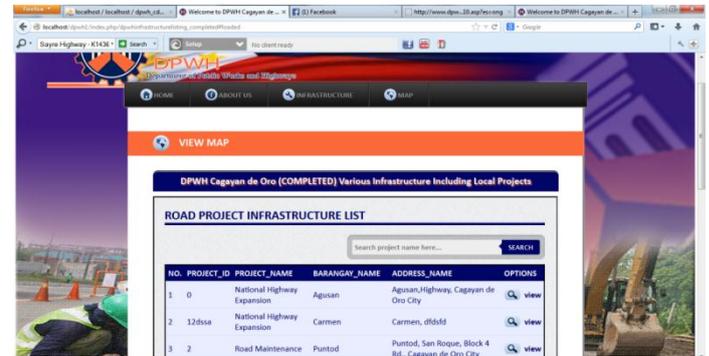


Figure 3. List of Completed Projects

Once the view option is click basing on last figures mention, a new page will load. On Figure 9 the specific project location is emphasize with a colored polyline indicating what project category it belongs. Presentations of different colors on project category allow viewers to distinguish where it belongs. Viewers prefer this zoomed out image to appear if the viewer clicks the view option.



Figure 6. Project Location

Adding and updating project is essential in the department's

3.2 Evaluation Results

The following graphs show the results of the evaluation from the public users. There are 20 respondents who evaluate the system.

The results assess the performance of the website being implemented. Figure 11 shows the evaluation results. The first criterion deals with the visual clarity which discusses about the organization of the site from the user's perspective. The findings show that data is truly quick and easy basing on the average rating at 4.75. Necessary animations display in fact fit the site according to the 4.9 very good rating of the respondents. When it comes to the sites' design respondents' average rating is 4.5. A clear presentation of the data it is at 4.85 rating.

With all of these results the system achieves a very good rating which means that public users agree that it coincide the visual clarity criterion. Figure 12 shows all the said results. Rating Scale: 1 poor 2 fair 3 good 4 very good 5 excellent

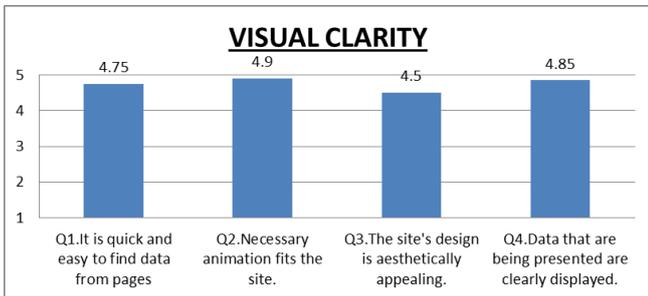


Figure 11. Public Evaluation for Visual Clarity

At Figure 13 the second criterion which deals with the consistency of navigating different pages of the site which must reflect to the homepage is seen. When navigating the site, consistency and uniformity are the things that user considers so respondents' rate it as 4.75. Icons are understandable basing on the 4.75 rate of the respondents. Basing on the 4.85 mark, links labelled with certain texts provide a vivid indication where they are leading to. The data from the table in fact corresponds to the data displayed on the map base on the computed average at 4.65. The convenience in navigating from pages is achieved basing on the 4.45 evaluation of the respondents. To sum it all, basing from this criterion the system attains a very good rating indicating that respondents agree to its consistency from each page when users access it. The conformity in the application of something, typically that which is necessary for the sake of logic, accuracy, or fairness is accomplish.

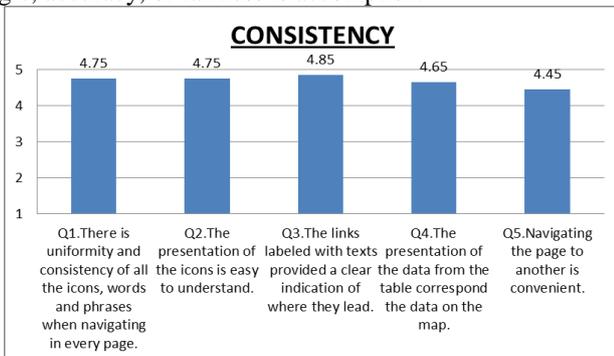


Figure 12. Public Evaluation for Consistency

In Figure 13 tells the results from the evaluation that tackles about the effectiveness of the system. With the system's

capacity it facilitates the department's growth and development which marks as 4.33. Execution of the tasks is correctly done, this conclusion is according to the 4.5 admin evaluation. The projects' locations are precisely displayed as what the 4.17 average results illustrate. 4.33 average results demonstrate that it is very effective to use map on displaying projects for the public's awareness. The given information on the map was very necessary based on the 4.33 result. The usefulness of the site is at 4.5 rating. The effectiveness on using map on the project monitoring of the department really helps according to the 4.33 average rating. Effectiveness issues are solved and it is prove that with the systems' help, the DPWH will surely improve their public service.

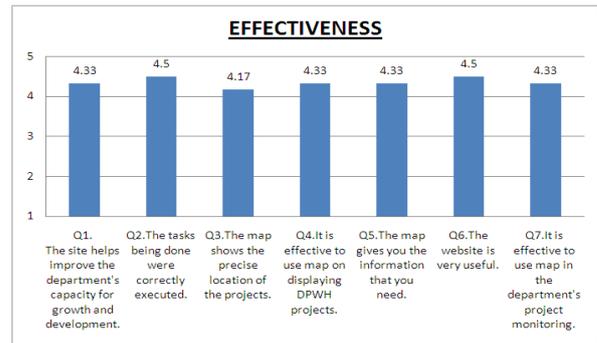


Figure 13. Public's Evaluation for Effectiveness

IV. CONCLUSION

In the past, the DPWH road projects information is not well presented or displayed. Specific project location is not available as well as the basic information needed by the public.

Through the map, the viewer can easily locate the location of the road projects. It is clearly proven that with aid of the system the data displayed truly match the data being displayed on the map from 4.65 public rating and 4.33 admin rating. They can easily access its information and details. It is more convenient than the main website and the bulletin board posted outside the department's compound. The aim to a vivid display of data is certainly attain.

The user interface is not easy to navigate. With the Web-based Geographical Road Projects Monitoring and Information System, the information presents in an organized tabular form together with a map that presents a clearer and more satisfying view. A very good visual comprehensive presentation of the data achieves as 4.85 public' viewer mark and at 4.67 admin' mark.

Only the administrator can edit and update the data so that the information presented will secure and cannot be easily alter or delete. It is easy to navigate. The map is dynamic and connected to the database so it can store a lot of data that the admin can update from time to time. With the results given public viewer marks 4.75 and admin at 4.33, users mostly agree that the study reach its goal to improve the public's

awareness while facilitating the department's capacity for growth and development. While targeting the effectiveness of the system to road project monitoring it confirms from admin rating at 4.33 which certainly mean that the study is a great help to the department.

In accordance to the Cagayan de Oro DPWH's specification, the system's capability will definitely give them the support they need in providing and managing for the public's consciousness specifically on the project transparency of the department.

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