Original Research Article

Research and Capstone Project Electronic Repository

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ABSTRACT

Aims: Higher Education Institutions are challenged to manage research and capstone projects output available through open access is something that is increasingly mandated by funders and universities in many countries.
Study design: This is to widen the dissemination of results to the community which information technology practices and theory can address.
Place and Duration of Study: This project tries to investigate the possible outcomes by developing an online repository for research and capstone project in Southern Philippines Agri-Business and Marine and Aquatic School of Technology that can deposit students output, register various accounts, log transactions and an interactive website.
Methodology: Innovative research approach is being manifested in the development that uses modified waterfall, white-box testing and survey-type methodologies are being highlighted.
Results: The website is successfully developed with specific functionality on referencing, data storage, data security, data extraction and some special functionalities. The fifty evaluators gave very agreeable results to the reliability, functionality and usability of the website.
Conclusion: Although, the system is functional and evaluated very agreeable to the respondents the testing is very crucial that proper monitoring should be in place in the entire plan.

Keywords: Research Repository, Innovative Research, eXtreme Programming

1. INTRODUCTION

Making publications available through open access is something that is increasingly mandated by funders and universities in many countries (Francke, et. al., 2017). An electronic thesis repository provides several instruction-based opportunities to advance learning. For example, courses within an honors college often enroll students from a variety of disciplines. In research methods courses, students can easily examine examples of thesis to familiarize themselves with the writing styles and formatting in their discipline.

Similarly, in a colloquium-style course that addresses diverse topics, students can use the repository to become familiar with research approaches and writing styles outside of their discipline; this is a particular advantage for undergraduates because, as they progress in their course of study and certainly once they begin graduate or professional programs, they rarely have time for this type of cross-disciplinary interaction (Levy, et al., 2012). The repository mentioned is a bank of network accessible database of researches or capstone

project, with a set of services to capture, store, index, preserve and disseminates an institution's scholarly output in digital format. It is a new model for storing the research output of a given institution(Murugathas, 2017). An institutional repository is a digital archive of the intellectual product created by the faculty, research staff, and students of an institution and accessible to end users both within and outside of the institution with few if any barriers to access (Crow, 2002).

The Information Technology students in SPAMAST are making a capstone project for the requirements before graduation. School capstone project hard copies are very important, but some of these are missing after borrowed & used as references by incoming fourth-year students for their capstone preparation.

The develop Research and Capstone Projects Electronic Repository for references will allow end-users to browse and secure all the data stored in the electronic repository by the registered user including students, faculty, and guest. The student can browse journal references that provide a variety of resources that can be the basis for the upcoming study. The major characteristics of this developed website basically can build electronic document storage that is reliable, functional and usable.

1.1 The Problem

This study sought to develop a Research and Capstone Project Electronic Repository that aims to provide the research and capstone references for students, faculty, and staff in SPAMAST. Specifically, to investigate the process in developing Research and Capstone Projects Electronic Repository that can store data references, electronically, and browse using generic references. Secondly, document the development of a login page that can identify duplication of user entries, an invalid username and password verification. Then, record the development of a page that has a search engine and displays different category such as research papers and capstone projects titles, and display a suggestion of advisers based on specific topic or study. Also, document the development of a page that can add and display comments. In addition, record the development of a page in the system for the admin that has user logs, Finally, evaluate the level of performance of the system in terms of reliability, functionality, and usability when tested with students, faculty, guest, and administrator.

1.2 The Significance

Results of this study provide an electronic repository for restoring journal references that can help the students or the faculty browse the references conveniently. Also, helps secure and store reliable documents.

This website has the same relevance to students in providing electronic repository used for research and capstone project for retrieval of information purposes. Also, the said website is useful and helpful for all the students and faculties as it serves as the basis or guidelines in creating research and capstone projects.

1.2 The Conceptual Framework

This study followed the input-process-output model to understanding and explaining team performance. Typically describes the general structure of a system specifying the input-process-output is important to determine the effectiveness of the functionality in each individual component. Similarly, the IPO model has a causal structure, in that outputs are a function of various group processes, which are in turn influenced by numerous input

variables (Hackman, 1987). The modified framework of the study is illustrated in the figure below.

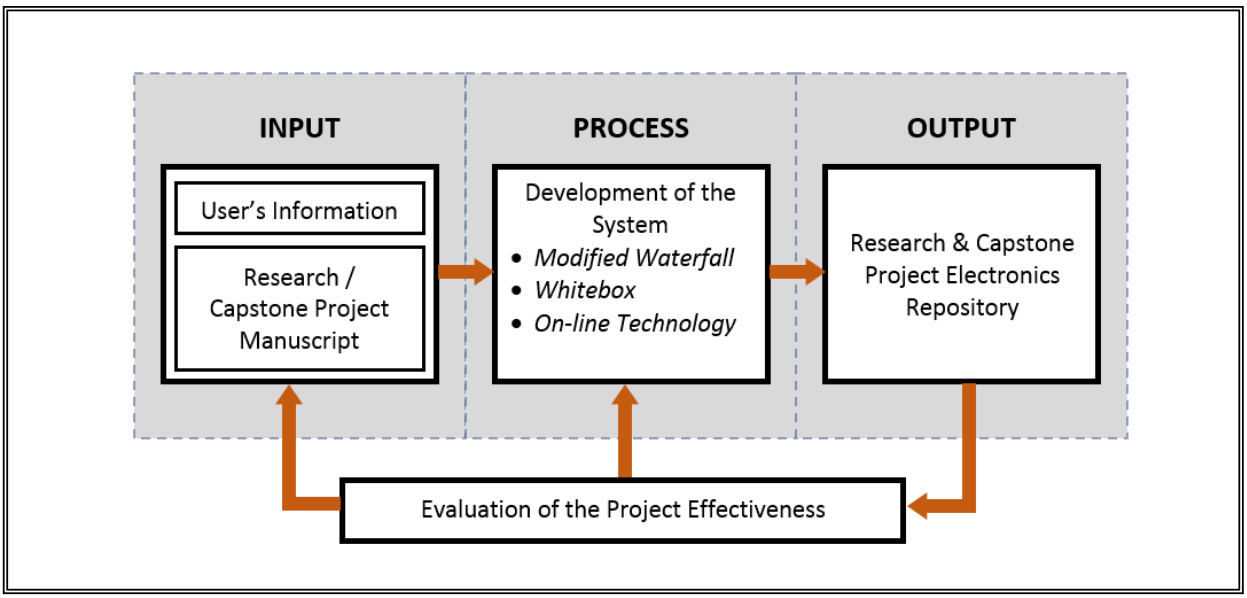

Fig. 1. Conceptual Framework of the Project

2. METHODOLOGY

Presented in partare the research design, research locale, population and sample, research instrument, data collection and statistical tool. The software development approaches used are also discussed in details with the analysis of the specifications of the entire project.

2.1 Research Locale

This study is conducted at Southern Philippines Agri-Business and Marine and Aquatic School of Technology, Matti, Digos City. The researcher selected SPAMAST Digos Campus as its project locale so that it can easily be tested. This is also the venue for the institution to level-up in terms of publication because the technology is still not available.

2.2 Research Design

The research design refers to the overall strategy that you choose to integrate the different components of the study coherently and logically (Labaree, 2009) investigated which this study used an innovative research design. According to Takhar-Lail and Ghorbani that innovation is the process of both generating and applying creative ideas in the project that can be applied to a research method or system. The highlighted recommendation in the study are the two stages in the process of innovation. The invention that consists of idea generation, idea evaluation and opportunity recognition specifically creativity. The exploitation that consists of development and commercialization mainly innovation. Therefore, it is best for the study to adopt such a design to extract the complete result (Fields, 2014).

This study conducted by describing the performance of the website that data is obtained through a survey method. The researcher used a modified-questionnaires in obtaining

responses from the subjects that fit the objective of the study. The survey tries to ascertain the Research and Capstone Projects Electronic Repository in SPAMAST.

The following are the strategies use in this study is based on the framework and procedure. The extreme programming (XP) is an iterative and incremental process which is best to use in this project because the indicators included in this method are cost, time, quality and scope which is relevant to the researcher. This method is best because during XP projects every team member learns a lot and in fact, one of the key benefits of XP lies in the distribution of knowledge throughout the team (Dudziak, 2000).

The system design helps in specifying system requirements and helps in defining the overall system architecture. The website layout for Research and Capstone Project Electronic Repository is the process of planning and creating a website.

The testing phase of the system determines whether the software meets the requirements of the projects. White box testing is also known as structural testing or code-based testing. This method of testing not only verifies a code as per the design specifications (Rongala, 2015).

2.3 System Design

In this, the system design helps in specifying system requirements and helps in defining the overall system architecture. The website layout for Research and Capstone Project Electronic Repository is the process of planning and creating a website.

The system requirement defines the needed information, function, performance and interfaces that establish the components for building the system. The system requirement defines the needed information, function, performance and interfaces that establish the components for building the system. Included in the technologies to be used are the software and hardware needed in creating the project.

The hardware device used for developing and browsing the website is a commonly used laptop because it's handy and convenient. The software used in this study is commonly used by junior development. Microsoft Visual Studio 2012 used in designing and developing a website or system, it also uses to design the developer used this software for the back-end of the project, in which is responsible for the codes and also for the whole environment of the project. MySQL Administrator used to structure the database of the website and Adobe Photoshop 2012used in editing the images used the website.

For the implementation of the project, it includes the components, modules, and data for a system to satisfy specified requirements. The system needs to have a domain to fully access the website through the internet since it is Online but users are exclusive in SPAMAST only. The domain hosting is One Thousand two hundred pesos only (Php 1,200.00) purchased online.

This study provides a use case diagram to describe the steps or actions between a user's and a website which leads the user towards something useful. The use case diagram focuses on describing how to achieve a goal or task. The administrator is the authorized person the right to fully access the entire website.

Also, the dataflow diagram shows all the information, functionalities and events of the System. It represents the flow of data through an information system and modelling its process aspects. It can be also the basis for the visualization of data processing and shows what kind of information will be input to an output from the system.

2.4 Data Gathering

In gathering data, it talks about the reliability, functionality and usability of this capstone project Research and Capstone Projects Electronic Repository. The system reliable, if it is free from bugs and errors, functional when the system is responsive; and usability if the system is good enough.

The total data gathered from descriptive survey questionnaires are used as the basis for the interpretation that aid to solve problems, recognize several factors that affect the structures and features of the development of the system.

The data gathering first is to asked permission for the evaluation of the system. Request letter of permission is secure to instructors and approved with the approval of the department chairman. The team briefs and orient the respondents on how to use the system. Then, gives an adequate time to operate the system to test the functionalities and indicate their responses on the rating sheets. Rating sheets are retrieved after respondents answered all the questions in the survey. Finally, the results are evaluated and tabulated for further discussion in the document.

2.5 Statistical Tools

The response to the questionnaire and evaluation were consolidated and tabulated. In the analysis and interpretation of the data, the values were summarized through the summation of all scores given by the evaluators and divided by the total number of evaluators. The weighted mean was used to describe the impact of the system on the evaluators as calculated using the expression.

3. RESULTS AND DISCUSSION

This part presents the result and discussion of the entire project in developing and evaluating the Research and Capstone Projects Electronic Repository. This part of the study discusses the (1) development of the system, (2) security features of the system, (3) search engine capacity of the system, (4) interactive features of the system, (5) data management of the system, and (6) performance of the developed system.

The developer uses software tools to meet the specific objective in creating the Research and Capstone Projects Electronic Repository. The system was developed according to the specific output which is searchable in the browser using the domain name. Domain name is the address where Internet users can access your website. According to Franke state that making publications available through open access is something that is increasingly mandated by funders and universities in many countries (Francke, et., al 2017). In developing this project need to have this software component which is the domain to fully access the website through the internet since it is Online. First step to have it, is to register on site which deals a domain and payable through bank account of the company, upon registering input the possible username and password for the control panel security, second upon receiving the domain name the company send the link and ready to use the control panel contents the upload develops project.

In this, the developer applied CSS (Cascading Style Sheet) used to format the layout of Web pages. They can be used to define text styles, table sizes, and other aspects of Web pages that previously could only be defined in a page's HTML.PHP language stands for (Hypertext Preprocessor) is an open source, server-side, scripting language used for the development

of web applications. By scripting language, we mean a program that is script-based lines of code written for the automation of tasks. phpMyAdmin is a free and open source administration tool for MySQL and MariaDB. As a portable web application written primarily in PHP, it has become one of the most popular MySQL administration tools, especially for web hosting services. Bootstrap framework is built on HTML, CSS, and JavaScript (JS) to facilitate the development of responsive, mobile-first sites and apps.

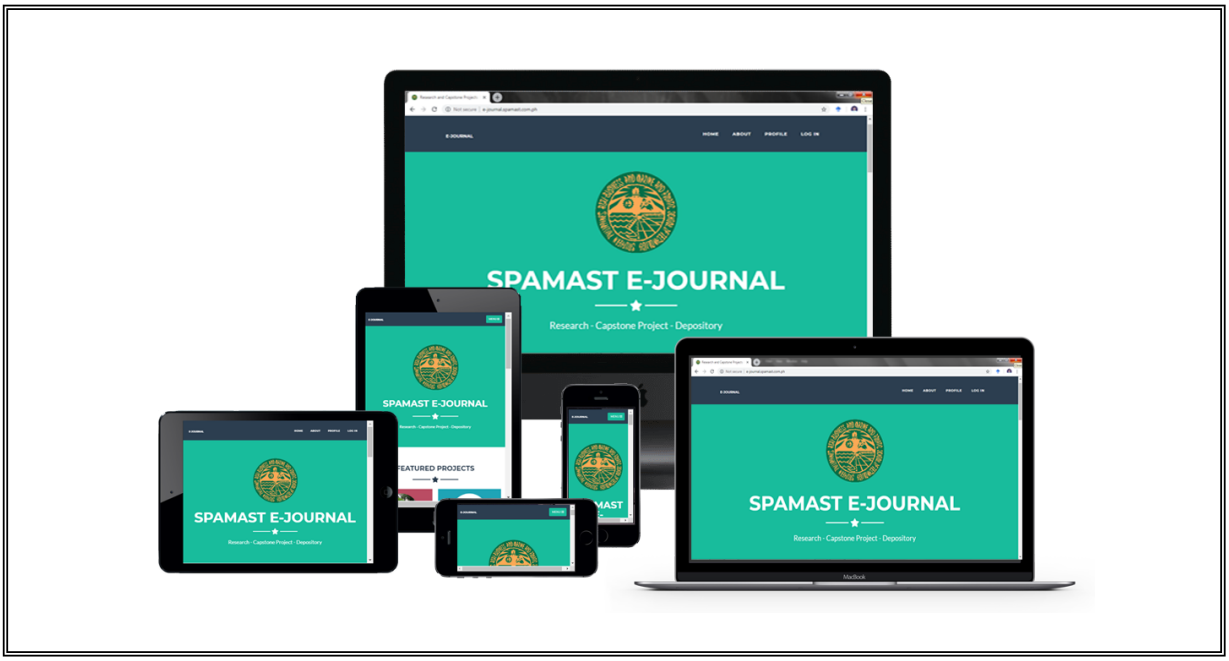

Fig. 2. Display of the Developed Website

Webpage map diagram shows the entire plot of the web that describes and illustrates the behaviour inside the application. The guest account is included as to makes clear on the access of the non-member to the entire web application. The user and administrator accounts are clearly connected to give more emphasis to the difference between the two users. The user is also classified to have the same access though they are students of faculty so the classification is a user.

Each of the users has different menu navigation that provides them with the access to each of the page. Clear enough that separating the user's account access is one way to develop a web that has a characteristic that separates entirely the users so that conflicts of functions will be eliminated. The table below shows the accessibility of each user.

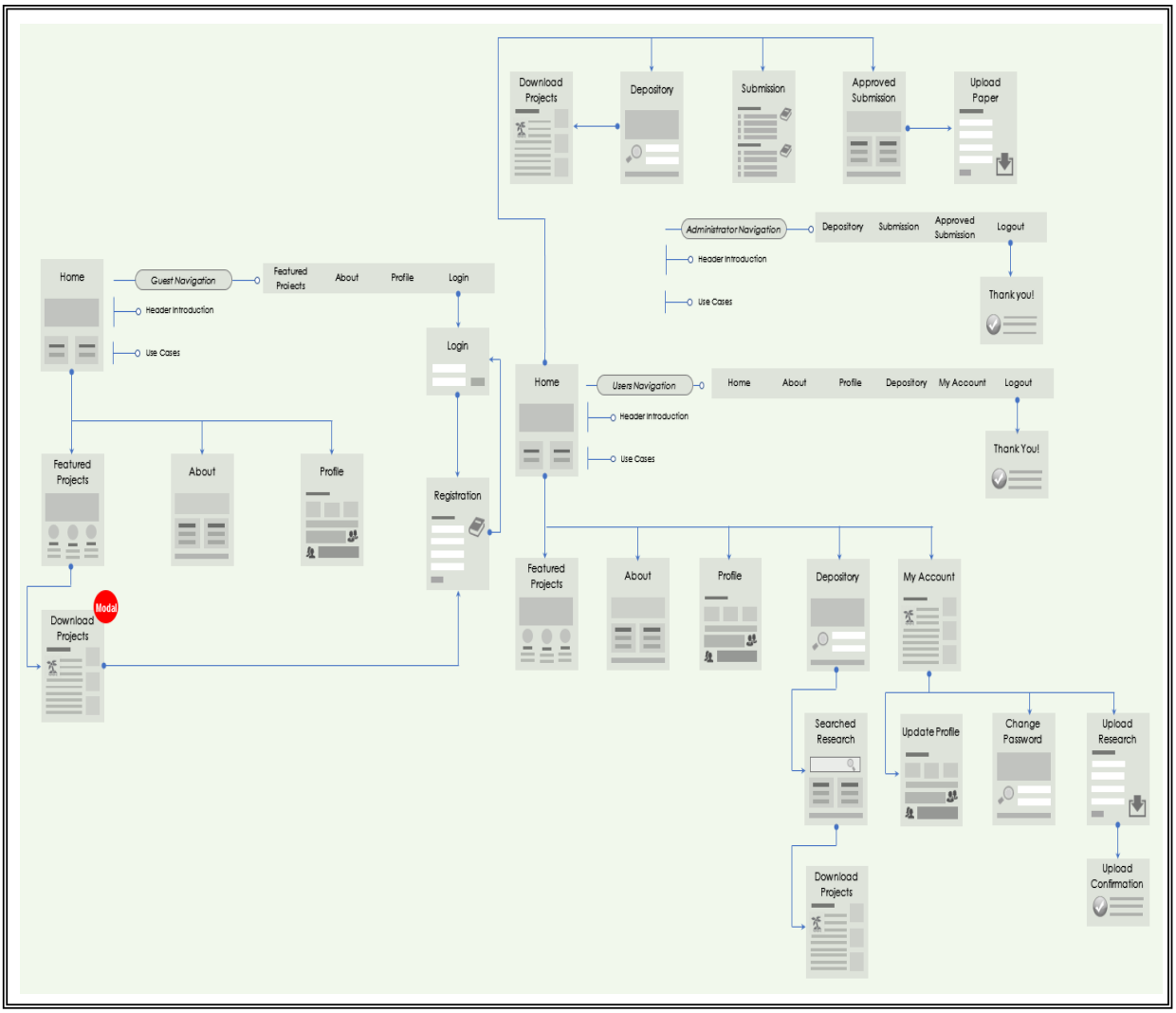

Fig.3. Website Map Diagram

3.1 Development of Referencing Module

Developing a module for referencing that provide a variety of resources that can be the basis for the upcoming study. This website can build electronic document storage that is reliable.

3.1.1 Electronics Data Storage

The develop Research and Capstone Projects Electronic Repository for references allows end-users to browse and secure all the data stored in the electronic repository by the registered user including students, faculty, and guest. The student can browse journal references that provide a variety of resources that can be the basis for the upcoming study. This website can build electronic document storage that is reliable. According to Muragathas state that repository is a network accessible database, with a set of services to capture, store, index, preserve and disseminates an institution's scholarly output in digital format. It is a new model for storing the research output of a given institution (Muragathas, 2017).

3.1.2 Development of Generic Referencing

Research and Capstone Project Journal uploaded by the users will serve as basis or guidelines in creating research and capstone projects converted in PDF. PDF (Portable Document Format) is a file format that has captured all the elements of a printed document as an electronic image that you can view, navigate, print, or forward to someone else.

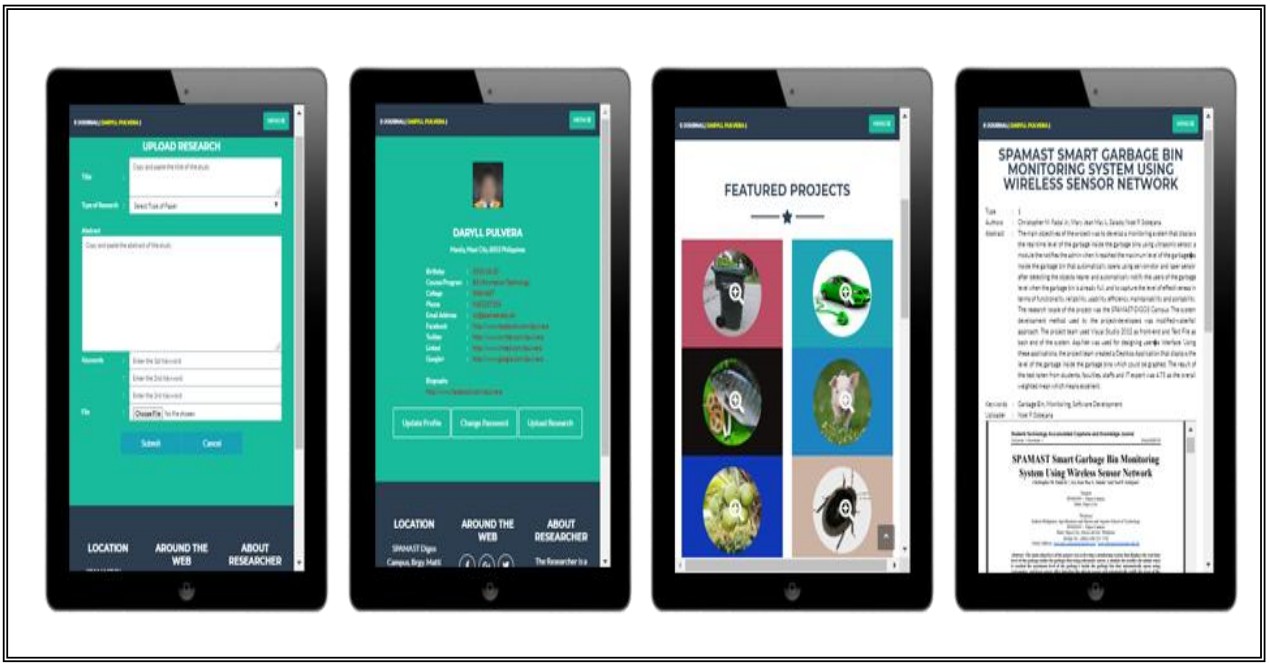

Fig. 4. Screen Shots for the Output of the Referencing Module

3.2 Development of Login Page Module

The login page module consists of a username and password for security measure designed to prevent unauthorized access to confidential data. When attempting to log into a system, the usernames and passwords entered by the potential user are compared with data contained in special databases on the system.

3.2.1 Check Duplication User Entry

The user needs to sign up before accessing the entire website. Sign up for the information of the users also requires username and password for the verification and to compare if it has the same users.

To register an account, the user must fill-up the registration and submit with complete information. The username must be unique and must not have duplication to the existing user account. The most important information is the email address thus it is a must to validate the registration through email. Clicking the link provided through automatic system generated link sent to an active email address to confirm the registration of the account. After doing the said procedure authorization to log-in to the website and enjoy the functionality is being granted.

```
1$query = "SELECT * FROM <table name>WHERE email='$email'";
2$result = mysqli_query($db, $query);                    user for
3if(mysqli_num_rows($result) >0){                        username
4     array_push($errors,"EmailExist!");}
5                                  Username for user
6if(count($errors) == 0){
7     <statements for saving the information &
8     sent link validation code>}
```

The developed code above used in checking the duplication of email address and username entry to the registration page for the user account. The array "*array_push*" accepts error data for display. At an instance the array is null, the email address and username are available or not taken. The red arrow with reading label illustrates that when checking for username copy line 1 to 4 then change the name of the entity comparison that would fit the desired datatype to compare. Also, for the error handling text to push in the array and to display in the error page. The green text is the statement or label of a specific variable for modification. Finally, the statement for saving the information & sent link validation code are developed syntax code used in validating the account through email.

```
1$confirmcode = rand();
2$email_from = 'e-journal@spamast.com.ph';
3$message = "
4Confirm your email.
5Click the link below to verify your account.
6http://e-journal.spamast.com.ph/email_confirm.php?user=$user&code=$confirmcode";
7$headers = "From: $email_from \r\n";
8 $headers = "Reply-To: DoNotReply@spamast.com.ph";
9mail($email, "e-Journal Confirm Email!", $message, $headers);
```

The developed code above is very relevant to the website because the strong security feature of the registration is addressed. The syntax code line 4 to 5 are the content of the email to the email address of the applicant that includes the combination of a clickable Uniform Resource Locator (URL) directly to confirm the active email address of the user updating the table field status from "*Inactive*" to "*Active*". An active user account is tag as validated information that can be used in the login page.

3.2.2 Verification of User Account

A user with an account that is validated through email owned a unique username and password for the verification and for the authorization. This method can help prevent spam attacks by bots, fraud and account takeovers, and identify unreachable users due to stale or incorrect information.

Once the input of the user to the login page is correct information the webpage returns the home page of the Research and Capstone Project Electronic Repository. Thus otherwise an alert message appears in the instance the information is incorrect or did not match to the database. This also means that the guest is not registered or the user trying to access the website with no proper authorization.

Fig.5 Screen Shots for User Registration Page and Login Page

3.3 Development of the Search Engine

Developing of the search engine confirms the necessity of the module. The module is very relevant in locating and sorting the information stored in the database. Once the search engine has crawled the contents of the database, it indexes that content based on the occurrence of keyword phrases in each individual record. When developing the search engine for specific keywords the given study added more automation and simplification for locating research and capstone project documents.

3.3.1 Displaying the Searched Results

In searching for an approved paper or documents, input specified keywords and returns a list of the possible results that similarly match the keywords. The results then display in a manner that a user can easily understand based on the pre-formatted style of the system. Each displayed element has specific indexes that can be accessed by clicking. Then the detailed and structured display of the entire paper is viewed.

3.3.2 Displaying the Research Paper

The result of the search engine is displayed in list format which can be clicked redirected to the specified research paper document that displays the Portable Document Format (PDF) of the entire document. Included in the display page are some primer of the paper. The code of this module is also important because the usual the displaying technique is not following the basic coding but instead using advance displaying code using a combination of HTML and CSS and action codes using PHP and JavaScript.

```
1<?php
2if(count($s_results) >0):
3?>
4<divstyle="width:92%;margin:0px auto;padding: 10px;
5border: 1px solid #33a6cc; color: #a944442; background:
6#ffffff; border-radius: 5px; text-aligh: left;">
 7<font color="#33a6cc"><?php foreach ($s_resultsas
 8 $s_result): ?>
 9<p><?phpecho $s_result; ?></p>
10 <?phpendforeach?></font>
11 </div>
```

The research paper display page is divided into two (2) major display. The first one is the display for the primer of the paper. The title, research type, authors, abstract keywords and

the uploader of the paper. The second portion of the display is the viewing of the preformatted

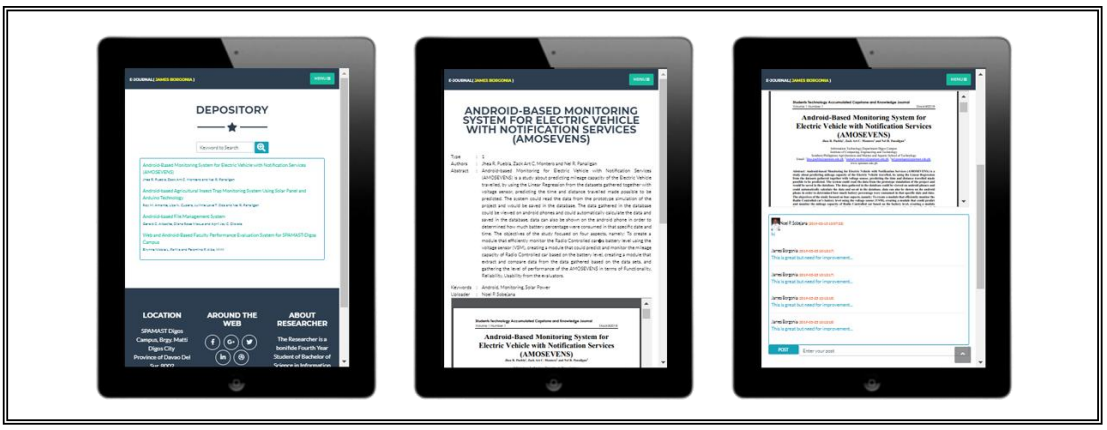

Fig.6 Screen Shots to Find Research and Capstone Project Paper

3.4 Development of the Comment Box Module

Some of the people give some suggestions and comments to broad their learnings. You know that writing comments about what the audience is interested in, and that is something every writer hopes to do. Good conversations will have other benefits, too. Many times, confusion is cleared up in the comments and other people add their ideas or experience so it just gets better and better.

3.4.1 Adding Comments Function

The functionality to add comments is typing the comment in the box provided then click post buttons. If the information is available, the comments are submitted and posted. Otherwise, if the data are not available nothing will happen then refreshes the page. The comments are freely posted as suggestions, appreciation and recommendation in the said study. Posting is a way of sharing feedbacks to the researcher and viewers.

3.4.2 Displaying Comments Function

The comment module is embedded in the displaying of the research and capstone project documents. Upon retrieving the documents in the system, the comments are included in the page. Interfacing the functionality of posting comments to the system is strategic because opportunities and linkages to experts on the field of study can leave and provide an additional improvement to the study.

3.5 Development of Security & Logging Features

The system has security features to protect against fraud. The administrator can log in automatically while users must register and confirm their email before they can log in in the site. In addition, the website has an important feature that allows to record and store the transactions or changes made by the user. The log module serves as the history tracker of the web that provides a list of manipulation of the users to the database as part of the accessibility and tracks the behaviour of the users inside the system. Figure 28 shows the access point that log module is being activated. In every page that the user makes access,

an entry to the database with date and time of the action, identification of the user and the Uniform Resource Locator (URL) address of the specific page.

In searching for an approved paper or documents, input specified keywords and returns a list of the possible results that similarly match the keywords. The results then display in a manner that a user can easily understand based on the pre-formatted style of the system. Each displayed element has specific indexes that can be accessed by clicking. Then the detailed and structured display of the entire paper is viewed.

3.6 Level of Performance of the System

The performance of the system in terms of reliability, functionality and usability is evaluated by eighteen (18) registered users, thirty-one (31) guests and one (1) administrator. The fifty (50) evaluators from Table 4 are part of the research locale the Southern Philippines Agri-Business and Marine and Aquatic School of Technology under the Information Technology Department. The technical expertise and the basic knowledge of the respondents are all in the field of Information Technology.

Reliability of the system from the evaluation of the respondents resulted to 4.00 which described as Very Agree. The characteristics of the website provide reliable output and consistent error handling capabilities that are supported with the highest weighted mean of 4.04 mark as Agree Very in item "*the system is capable of maintaining its performance despite the presence of errors during operations"*. The item "*system resumes working and restores lost data after failure"* had the lowest weighted mean of 3.96 marks as Agree because of external factor that is uncontrollable in the project development. As mentioned in the study of Por and the team that to identify a good system it must be able to provide the quality services (Por, et al., 2012). Therefore, developing a reliable website deals with thorough execution of the methodologies to anticipate tiny details most especially connectivity aspect that greatly affects the system performance.

The overall rating of the system's functionality had a total mean of 4.49, remarked as Very Agree that manifest completeness according to the objectives of the project and users' preferable website actions. The completeness of the developed website clearly illustrated in the item*"the system can require task is performed by the system satisfactory*" that scored the highest weighted mean of 4.64 mark as Strongly Agree. Thus, the item *"the system helps the user overcome any problem encountered while using it*" resulted to a lowest weighted mean 4.28 mark as Very Agree because the website has no clear specific instruction or process to follow. Therefore, a website design that illustrates clear process and instruction is very important because as stated in the study of Zhang, Maron and Charles, that interface design is the issues specifically layout and consistency should be considered to satisfy users (Zhang, Maron, & Charles, 2013).

In the Usability of the system, the overall rating had a total mean of 4.36, remarked as Very Agree that described the developed system by the evaluators useful. Expectedly, the developed system is useful although the challenged to institutions is to be at par with the international standards that concept of learning objects repositories is steadily increasing to serve educational purposes (Alanazi & Abbod, 2014) but still the item *"the system performs tasks in a straightforward manner*" marked low with weighted mean 4.30 mark as Very Agree since testing and evaluation done with a limited duration. The item *"the documentation is very informative*" got high weighted mean of 4.42 mark as Very Agree as methodology implies that iteration approach keeps the project team more aware to the entire characteristics of the website that is illustrated more detailed in the documentation. Therefore, proper management with concrete methodology in the development that deals

with cost, time, quality and scope is beneficial to the projects team member and the distribution of knowledge throughout the team is very relevant (Dudziak, 2000).

The over-all performance of website resulted in a weighted mean of 4.28 marked as Very Agree. Though, the indicators resulted in very agreeable result still reliability got the lowest because of the storing capacity of the system that users question the completeness of the information stored in the database. Thus, the functionality of the website clearly manifests that the developed website functions to its purpose. However, the results are still not strongly agreeable to the users because as stated in the project of Ampatzoglou, Michou and Stamelos that using repository software are more significant to inexperienced users which depict on this project (Ampatzoglou, Michou, & Stamelos, 2013). The evaluators of the project are generally Information Technology practitioners which means experience in using various software. Therefore, the performance of quality software depends on the selected evaluators and users.

4. SUMMARY AND CONCLUSION

4.1Summary

The Development of Research and Capstone Projects Electronic Repository was conducted to determine the level of satisfactoriness on the assessment with corresponding surveys gathered. An evaluation method was used in this study is to inquire respondents. It was distributed to the Information Students and faculty with regards specifically to the functionalities of the project.

This study developed based on those problem stated, the developer aims to developed this Research and Capstone Projects Electronic Repository to upload documents electronically and reliable, functional, usable in terms of using it.

The study found out that the "Research and Capstone Projects Electronic Repository" was equivalent to very agree in terms of functionality. It also revealed that the respondents come up with some problems in terms of browsing the site through mobile phone because of the storage capacity of the website it can't perform properly.

4.2 Conclusion

From the result of the project, it was concluded that the testing of the website was functioning as it was expected, though there were problems encountered such as the capacity of the website can't perform properly on other gadgets. It was concluded by the fifty (50) respondents and rated that the project is very agreed and met all the objectives.

The Reliability of the system from the evaluation of the respondents resulted to 4.00 which described as Very Agree. The characteristics of the website provide reliable output and consistent error handling capabilities that are supported with the highest weighted mean of 4.04 mark as Very Agree.

The functionality of the system had a total mean of 4.30, remarked as Very Agree that manifest completeness according to the objectives of the project and users' preferable website actions.
The Usability of the system, the overall rating had a total mean of 4.34, remarked as Very Agree that described the developed system by the evaluators useful.

The over-all performance of website resulted in a weighted mean of 4.28 marked as Very Agree. Though, the indicators resulted in very agreeable result still reliability got the lowest because of the storing capacity of the system that users question the completeness of the information stored in the database.

It was further concluded that during the testing of the project there are some encountered problems but the researcher fixes it and test it back.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

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