

Development and Evaluation of an Institutional Research Repository Using Content Management System

Jake M. Laguador¹, Abner Tupaz², Evelyn L. De Castro¹, Conrado I. Dotong¹

¹College of Engineering and ²Management Information System,
Lyceum of the Philippines University, Batangas City, Philippines.

Abstract

Having an online repository of research related activities is an important part of the university website to provide proper medium or facility for the students and faculty members in accomplishing their research proposals and projects. This study aimed to integrate a research webpage from the existing LPU-Batangas Website to address the needs of the institution of making its research findings accessible to all interested researchers. WordPress is an open source content management system used in the study to develop the webpage for research. Results showed that the WordPress is truly beneficial to the Web Developers and to the Web Masters who manage the content of the page that will not necessarily require a graduate of Information technology or any computer related technical courses or degree programs. The webpage obtained high evaluation rating from the students and employees. It is considered highly functional, useful and reliable due to its user-friendly environment and contents that can be easily accessed from the page.

Keywords: Research Webpage, Content Management System, Functionality, Reliability and Usability

Introduction

Archiving and disseminating information are significant stages of data life cycle that provide strong support to the proper documentation and serve as reference for future use of data and information. Through the use of website, information can be easily accessed anywhere and anytime provided that the user has Internet connection and access. When it comes to the research findings of an academic institution, it is ideal and practical to have a repository of research activities which is accessible for students, faculty members and administrators not only to monitor the research performance of their respective colleges but also to utilize information for their ongoing research projects and proposals.

Research as one of the significant functions of higher learning institutions should be given emphasis in innovating the ways and means on how technology can be integrated for wider dissemination of findings and information. Learners themselves are changing and there has been much discussion in recent years about the rise of the 'digital native' or of the 'net generation' [1]. Therefore, making research findings accessible in the net through the implementation of a repository management system is an efficient way of managing and maintaining data collection through the use of computer software in order for the students to download the content easily. It enhances the manual storage and retrieval of

important records through establishing a system that would provide an effective method of preserving and sharing information in a well-organized manner. It is the primary responsibility of the web content managers in ensuring the veracity of the inputs to generate faster summary reports with integrity.

The Research and Statistics Center in Lyceum of the Philippines University manages important data and findings of institutional research studies from different colleges. It is the role of the Center to maintain an updated collection of completed studies and disseminate its results to a larger community of researchers through uploading the information and making the research abstracts available in the university website so that the students and teachers from LPU and other universities could access and utilize these findings.

The data included in the content management system are the following but not limited to the name of the authors, research title, name of the college, year completed, abstract, keywords, research category, research event presentation and publication, research utilization, and the faculty members with listed research publications. The page also features on-line "Call for Papers" to invite researchers from other academic institutions and industry partners to submit their research papers for the refereed journal publication and research conferences of LPU.

The following mentioned information can be made available in the web through the use of content management system (CSM). As open source, CMS has its own advantages but out of so many only few like Joomla, Drupal, WordPress are popular in the market because of good functionality and support [2].

WordPress started as just a blogging system, but has evolved to be used as full content management system and so much more through the thousands of plugins and widgets and themes. A developer can use PHP to create simple graphics on the fly. He can also use it to edit existing graphics [3]. WordPress is initially designed as a blogging platform; in the last several years WordPress has changed itself as a useful content management system [4].

A CMS is a software package that allows the development of websites that can be quickly and easily updated by non-technical staff members [5]. These open source systems are created and supported by a community of developers and can be downloaded without costs. Both their feature sets make open source systems particularly attractive to nonprofits.

Currently, there are several viable open source systems but which are not as widely used worldwide. Therefore, it requires a comparative analysis of the existing CMS packages on the market in order to be chosen that package which will enable

the development of website according to customer requirements [6].

System for digital library application provides solutions adopted to support the management if different metadata descriptions of multimedia documents are in the same repository [7]. Database programs have many different methods for storing and retrieving data, as well as for organising the stored data on the computer. One popular way for accessing data, both to store and to retrieve it, is to use a computer language called Structured Query Language (SQL). It was specially designed for database access [8] while MySQL is a database system used on the web. Basically, a MySQL database allows you to create a relational database structure on a web-server somewhere in order to store data or automate procedures [9].

This Web-based database supports a wide range of publication types and features simple extraction of counts and lists of publications based on a variety of query criteria. Therefore, the database also serves as an important research documentation tool [10]. Keeping in mind the progress in communication and database technologies (concurrency, consistency and reliability) has increased the data processing potential [11].

As one of the most popular open source content management systems available today, WordPress boasts a framework that allows the users to easily customize and extend it through plugins [12]. With the content-based server, educators can save and archive their files online easily, and integrate their online resources without any Web design skill [13].

The developed webpage will also be evaluated in terms of functionality, usability and reliability to ensure that the presentation of information is favourable to the end-users. It is important to check its functionality to determine its characteristic as user-friendly environment. Usefulness of the webpage to the intended and interested end-users has also significant bearing to consider the medium as valuable. Having reliable outputs as how the user expected it to be utilized is also imperative to make the webpage dependable.

The development of a research website for the Research Center would facilitate an easy way of storing and retrieving research information to be utilized for the presentation of the accreditation and certification requirements. Since international program accreditations are requiring some pertinent documents to be available electronically either in remote computer or in the web, this research undertaking of converting manual procedure of documenting research files using WordPress as development tool for integrating a webpage dedicated for the research activities as repository of information would help the university in meeting and responding to the needs of internationalization.

Objectives of the Study

This study primarily aimed to embed a webpage in the existing website of the institution for managing, maintaining and sharing research information and findings of the Research and Statistics Center at the Lyceum of the Philippines University-Batangas. Specifically, this study aimed to integrate a research webpage in the LPU-Batangas website as repository of research activities using a content management

system; make the research findings and related activities of the institution in research accessible for all stakeholders through the LPU-B website; evaluate the functionality, usability and reliability of the institutional research repository using ISO 9126 evaluation criteria; and determine if there is significant difference between the evaluation of students and employees in the research webpage.

Conceptual Framework

The concept of the study begins with the adoption of the functions of the open-source Content Management System which is being used by the University in managing its institutional website. The research webpage is embedded in the University Website as one of the major menus to give importance as one of the tri-fold functions of Higher Education Institutions. It provides platform for proper dissemination of research outputs of students and faculty members in a form of online publication. Google Scholar recognizes the research papers uploaded in the webpage; performs appropriate Google indexing; and counts the citation.

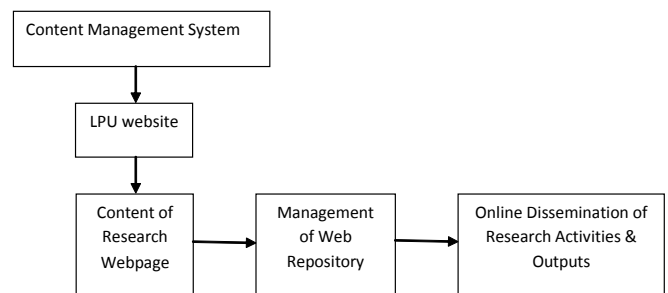


Figure 1: Conceptual Framework

The management of web repository includes updating through uploading new files, editing, deleting and archiving. Updating of information is being done whenever there is a new activity conducted or to be hosted by the University; new completed research paper, new published research article, new presented conference paper, new training attended or participated, and new research membership connected.

The research webpage also serves as good medium for repository of all research activities of the institution for wider dissemination of information as output. The result of this project is expected to be useful for the student and faculty researchers of the University even with the other researchers from various Higher Education Institutions.

Methods

Research Design

This study is a web development project which aims to utilize the capability of content management system using WordPress as tool to generate the webpage for the Research and Statistics Center particularly in storing, managing, maintaining, retrieving and sharing information and findings of Institutional Research studies and be readily available and accessible anywhere and anytime.

CMS is generally used to make easy web hosting process so that any non technical person can easily operate its site and routine work [14]. According to Alexa's rankings for the top one million websites run on which CMS in terms of the technologies used on those sites, WordPress get over 12.5% of site under it. Joomla is on 2nd place with almost 2.5% share, and Drupal goes down to 3rd with 1.4% [2].

The following are the Core Features of WordPress: Full standards compliance; No rebuilding; WordPress Pages; WordPress Themes; Cross-blog communication tools; Spam protection; Full user registration; Password Protected Posts; Easy Importing; XML-RPC interface; Workflow; Intelligent text formatting; and Multiple authors [15].

For the system requirement, WordPress strongly recommends the latest versions of PHP and MySQL, but it is understood that this is not right for everyone, and that sometimes hosts can be slow or hesitant to upgrade their customers since upgrades to PHP and MySQL have historically broken applications. WordPress will always work on the latest versions of PHP and MySQL, which are often faster and more stable. To run WordPress, it is recommended that the host supports PHP version 5.6 or greater and MySQL version 5.6 or greater [16]. WordPress also works with PHP 5.2.4+ and MySQL 5.0+, but these versions have reached official End of Life and as such may expose the site to security vulnerabilities.

Wordpress already offers its own specific PHP-based Widget API and it was very simple to extend this to enable Wordpress to call the Widget Configuration API and render a widget in its sidebar [17]. The file types stored in the research webpage are only Microsoft word documents, images in .jpeg or .png formats and Portable Digital Format (PDF).

Participants

The respondents are fifty (50) employees of the Lyceum of the Philippines University-Batangas composed of the academic heads (Deans, QMR and VPAR), department chairs and faculty researchers with at least 10 percent of the estimated total population of all employees of the university. On the other hand, at least 5 student organization officers from each college constituted the 50 sample student-respondents who tested and evaluated the webpage. This is to solicit their opinions and suggestions for the improvement of this page which is integrated in the LPU Website.

Instrument

A researcher-made questionnaire was used as the main instrument of the study to evaluate the functionality, usability and reliability of the Institutional Research Repository using Content Management System based on ISO 9126 evaluation criteria. The instrument was adapted from the study conducted by Laguador and Pureza [18] and Valenti, Cucchiarelli and Panti [19] which was also modified to become appropriate to the context of the present study being evaluated.

Procedure

The researchers submitted an institutional research proposal which was reviewed by the Research Council and later approved by the Research Director, Executive Vice President

and the University President for the endorsement of research budget and honorarium.

The researchers created a layout of the page similar to the LPU website. With the permission from the Management Information System of the institution, a subdomain was created for this purpose and the contents from the records of Research and Statistics in terms of Research Production, Presentation, Publication, Memberships, Training, Conferences and Journals were uploaded using WordPress as a Content Management System tool. This is the web address of the Research Webpage: <http://research.lpubatangas.edu.ph/>, which serves as its homepage.

The following paths denote the section of the Research Webpage after the domain extension that indicates to browser which folder or file to open which also presents the main menu:

1. Research Production Page -
<http://research.lpubatangas.edu.ph/production/>
2. Research Presentation Page -
<http://research.lpubatangas.edu.ph/presentation/>
3. Research Publication Page -
<http://research.lpubatangas.edu.ph/publication/>
4. Conference Page -
<http://research.lpubatangas.edu.ph/conference/>
5. Training/Seminar Page -
<http://research.lpubatangas.edu.ph/training-seminar/>
6. Membership Page -
<http://research.lpubatangas.edu.ph/membership/>
7. Forms Page - <http://research.lpubatangas.edu.ph/forms/>
8. Research Policy Page -
<http://research.lpubatangas.edu.ph/research-policy/>
9. Research Staff page -
<http://research.lpubatangas.edu.ph/resc-staff-2/>
10. News & Photo Gallery Page -
<http://research.lpubatangas.edu.ph/photo-gallery/>
11. Journals Page -
<http://research.lpubatangas.edu.ph/journals/>

Testing on the functionality of all buttons and links were done right after the hyperlinks were created to check if it redirects the link to its intended page. The research webpage obtained 100 percent functional based on the testing procedure. The contents of the webpage were also verified by the Research Staff to ensure its reliability and accuracy.

After the researchers finished uploading all the data in the created webpage, the evaluation process was done through collecting data using researcher-made survey instrument. The respondents who were composed of the students and employees evaluated the webpage. Primarily, the staff of the Research and Statistics Center who are directly involved in the utilization and maintenance of the system served as employee-respondents; secondarily, the faculty members, administrative personnel and students served as end-users also evaluated the webpage in terms of its functionality, usability and reliability.

The respondents were informed on the purpose of the study and were invited to participate through asking them to visit the page and answering the survey which was communicated to them using the Social Networking Media - Facebook. The survey was conducted during the Third week of October 2014

(Semestral Break) up to the Third week of November 2014. This is the period when work loads are started to loosen up and respondents could take time to do other things aside from their usual daily routine.

Data Analysis

The following statistical tools were employed in interpreting the data obtained from the survey:

1. Weighted Mean and Rank were used to describe the result of evaluation made by the respondents to the functionality, usability and reliability of the added research page to the LPU website.
2. Independent Sample T-test was used to test the difference between the responses of students and employees on the evaluated webpage.

Table 1: Arbitrary Numerical Guide to Interpret the Result of the Evaluation of the Respondents to the Institutional Research Webpage

Weight	Range	Verbal Interpretation
5	4.5 – 5.00	Strongly Agree
4	3.5 – 4.49	Agree
3	2.5 – 3.49	Moderately Agree
2	1.5 – 2.49	Disagree
1	1.0 – 1.49	Strongly Disagree

Table 1 shows the 5-point Likert scale used to interpreted the result of the evaluation through the level of their agreement from strongly agree to strongly disagree.

Results and Discussion

The following figures presented in the discussion are sample of screen shots of the research web pages. The layout of the webpage is very similar to the University website for consistency of themes.



Figure 3: Institutional Research Home Page

Figure 3 illustrates the Institutional Research Home Page where some introduction about the Research and Statistics

Center as well as its Mission Statement, Quality Objectives and Contacts can be seen to provide background information. The menu bar includes: Production, Presentation, Publication, Conference, Training/Seminar, Membership, Forms, Research Policy, RESC Staff, News/Photo Gallery and Journals considered as the major contents of the webpage. The Homepage provides the overview of the Research and Statistics Center. The entire research webpage is considered static as it does not interact with the users and it only displays data and information. A static website contains Web pages with fixed content. Each page is coded in HTML and displays the same information to every visitor ("Static Website").

Research Production Page

This where the completed research projects of all faculty members are listed from 11 different colleges that include Allied Medical Profession; Computer Studies; Business Administration; Education, Arts and Sciences; Criminology, Dentistry; Engineering, Maritime Education, Nursing; Tourism & Hospitality Management and the Graduate School. The information provided for each research paper includes the title of the research paper, Author/s, year completed and the short abstract. In displaying the abstract, it used the ShowHide WordPress Plugins to provide option for the users if they want to view or not the abstract of a certain paper. By default the content is hidden and user will have to click on the "Show Content" link to toggle it. Similar to what Engadget is doing for their press releases. Example usage: [showhide type="pressrelease"]Press Release goes in here.[/showhide]

Research Publication Page

This is where the published papers of students and/or faculty members in national and international research journals are listed per college with hyperlinks to view and download the full paper and to visit the website of the certain issue of the journal where the paper was published. For the colleges with many published papers, the publication is categorized based on School Year of publication date for them to easily monitor and compare the number of published papers each School Year. The complete list of both past and present Faculty members and administrative personnel with research publication can be seen in Appendix A so that they may also be informed and they can also monitor the number of their published research papers as the main author and co-author with the students.

List of Training/Seminar Page

This is the list of training/seminar page including research conferences conducted inside and outside the LPU-Batangas. The list is subdivided into School Year to monitor the number of attended research activities per school year. All submitted research reports to the Research and Statistics Center are being listed in the webpage of training and seminar also for the reference of the Deans and other faculty members. Short description of the activity is also sometimes provided as additional information.

List of Institutional and Individual Membership Page

This is the page for the list of Institutional and Individual Membership of LPU-Batangas and faculty members,

respectively. It also uses ShowHide WordPress Plugins to view the list of members of each organization. LPU-Batangas is a member institution of the following research organizations: International Association of Multidisciplinary Research (IAMURE), Philippine Association of Institutions for Research (PAIR), Network of CALABARZON Educational Institutions (NOCEI), CALABARZON Research Council (CRC), Research and Educational Development and Training Institute (REDTI), Philippine Society of Educational Research and Evaluation (PSERE), and the Philippine Social Science Council (PSSC)

News/Photo Gallery Page

This is the page for the News and Photo Gallery of research activities attended by the faculty members and students of LPU-Batangas. Full report of the event is also provided in the page for the detailed information.

List of College Journal Page

This is the list with corresponding hyperlinks of some Research Journals of each college which include the Asia Pacific Journal of Multidisciplinary Research for the Graduate School; Asia Pacific Journal of Education, Arts and Sciences for CEAS; Journal of Tourism and Hospitality Research for CITHM; old Graduate School Research Journal; and the STETH for CAMP. All research papers published by the faculty members of the university are open access which means that the copy of the full paper of a research title can be downloaded directly from the page. This serves as a medium for the college journals to be available in the web because these journals have no domain name of its own.

Table 2: Evaluation of Institutional Research Repository in terms of functionality, usability and reliability

	Student		Employee		Total		
Functionality	WM	VI	WM	VI	WM	VI	Rank
The website has...							
1. functional properly labelled buttons and links	3.86	A	4.14	A	4.00	A	4
2. several links which can easily direct the user to any desired page	4.00	A	4.14	A	4.07	A	2
3. a feature of being user-friendly	4.00	A	4.05	A	4.02	A	3
4. a well-designed, attractive and functional layout	4.09	A	4.24	A	4.16	A	1
Composite Mean	3.99	A	4.14	A	4.06	A	
Usability							
The user can easily.							
1. adapt to the environment of the website	3.77	A	4.00	A	3.89	A	3
2. learn the tools necessary for its operation	3.82	A	4.00	A	3.91	A	1.5
3. understand the functions of each button	3.91	A	3.90	A	3.91	A	1.5
4. locate the needed information from the website	3.77	A	3.91	A	3.84	A	4

Composite Mean	3.82	A	3.95	A	3.89	A	
Reliability							
The content of the website...							
1. is reliable and accurate	3.91	A	3.92	A	3.91	A	3.5
2. is substantial and informative.	3.95	A	3.91	A	3.93	A	2
3. is relevant to the needs of the students/faculty/researchers	4.09	A	4.00	A	4.05	A	1
4. yields good reputation for the university	3.86	A	3.95	A	3.91	A	3.5
Composite Mean	3.95	A	3.94	A	3.95	A	

The students and employees of LPU-Batangas agreed to the functionality of the institutional research repository that the website has a well-designed, attractive and functional layout (4.16); has several links which can easily direct the user to any desired page (4.07); has a feature of being user-friendly (4.02) and has functional properly labelled buttons and links (4.00). Functionality as an important component of a website should always be considered one of the priorities in creating an efficient and operative site to disseminate information. The composite mean scores of 3.99 from the students and 4.14 from the employees imply that the research web pages have high functionality rating from the respondents.

The respondents both agreed that the integrated web pages as repository of institutional research activities can be easily learned by the users especially the tools necessary for its operation (3.91); understand the functions of each button (3.91); adapt to the environment of the website (3.89) and locate the needed information from the website (3.84). The composite mean scores of 3.82 from the students and 3.95 from the employees imply that the research web pages have high usability rating. The webpage is considered useful to the respondents as it serves as repository of completed and published research papers of administrative personnel, students and faculty members. They can easily access the content of the full papers without visiting the Research and Statistics Center for the copies as reference for their projects and proposals. They could gather substantial information about the findings and conclusions of previous studies for them to utilize and serve as guide for future directions. It is also useful for the researchers outside LPU-Batangas for they are also given free access to the content of the webpage.

They both agreed that content of the research website is relevant to the needs of the student and faculty researchers (4.05); it is substantial and informative (3.93); it is reliable and accurate (3.91) and it yields good reputation for the university (3.91). The composite mean scores of 3.95 from the students and 3.94 from the employees imply that the research web pages have high reliability rating from the respondents. The major purpose of having a reliable webpage of Research Center is to provide services for the dissemination and archive of research papers and other research-related activities of the university. It provides information and materials intended for researchers.

Table 3: Difference on the Evaluation Between Students and Employees

	t-value	p-value	Interpretation	Decision Ho
Functionality	-0.423	0.674	Not Significant	Accept
Usability	-0.379	0.706	Not Significant	Accept
Reliability	0.033	0.974	Not Significant	Accept

The computed p-values of 0.674 for functionality, 0.706 for usability and 0.974 for reliability are all far greater than the 0.05 level of significance, therefore there is no significant difference between the evaluation of faculty members and students. The null hypothesis is accepted. This signifies how the group of students evaluated the institutional research webpage with common characteristics from the evaluation of the employees. The research webpage is also believed to be valuable for both students and faculty members with the desire of satisfying their interest in research activities or fulfilling their requirements in certain undergraduate and graduate degree programs. It aims to serve general public without any restrictions in downloading files and sharing the content for educational purposes.

Conclusion

The development of a webpage is easier nowadays through the use of open-source content management system specifically the WordPress that was used in this study compared to the previously introduced web development programs. WordPress is truly beneficial to the Web Developers and to the Web Masters who manage the content of the page that will not necessarily require a graduate of Information technology or any computer related technical course or degree programs. Anyone who has a simple knowledge on Word processing and Internet could be a Webmaster who can maintain and update the content of the page.

The Institutional Research Webpage was just integrated in the website of the Lyceum of the Philippines University-Batangas and it consists the bulk of the content of the University Website. Every now and then, the webpage is being updated whenever there is completed research project for its production, presentation and publication for students and employees. It is a good medium or repository for making the findings of university researches accessible in one webpage so that any information disseminated could be utilized in a timely manner.

The webpage obtained high evaluation rating from students and employees. It is considered highly functional, useful and reliable due to its user-friendly environment and contents that can be easily accessed from the page.

There is no significant difference in the evaluation of students and employees in terms of the functionality, usability and reliability of the institutional research repository.

Recommendation

One personnel from the Research and Statistics Center may be assigned to update consistently the webpage once the office

received any information related to the Research production, presentation, publication, attended conferences, training and seminar, news and photos, new release of journal and any changes in the research policies and processes to maintain its usability and reliability.

Faculty members may encourage their students to visit the research webpage through providing assignments and projects that would require data and information from the research papers produced, presented and published to utilize the findings of the LPU-B researchers.

Thesis advisers may also motivate the students to cite related papers published by the faculty and student researchers which can be found in the University Research Webpage, so that when these new papers were already published, the citation count of the university research papers will increase gradually. The webpage may include links to other research databases like Directory of Open Access Journals, ISI Thomson Reuters, Science Direct and Scopus. Widgets for online survey in terms of the user satisfaction on the webpage can also be an added feature to get some inputs and feedback from the user.

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