

DATA VISUALIZATION OF BOOK COLLECTION FOR THE UNIVERSITY OF SOUTHEASTERN PHILIPPINES

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ABSTRACT

The Data Visualization of Book Collection is a web-based system intended for the University of Southeastern Philippines librarian and library staff, faculty, student, and other stakeholders. It is a tool to identify the strength and weaknesses of every subject in the program, serves as a monitoring system in the selection and acquisition of library resources, and assist in the conduct of collection assessment. Furthermore, this study intends to develop a data visualization of book collection through a) development of a module to build a library collection per program and college; b) generate data visualization reports in terms of date of publication, number of volumes, and titles, resources not used, and per program; and c) generate library collection reports classified by course. This study is anchored on the use of Modified Rapid Application Development (RAD) as a methodology that includes the planning, design and development, and implementation and testing. The system developer used the following tools in the development, namely: Laravel, Pusher, GMAIL SMTP, and REST API as the backend development tools; Element UI, Bootstrap, Vue-Chart JS, ChartJs as the frontend development tools; Heroku as cloud web hosting; MySQL as server; and the others tools used are Axios, CSS, Javascript, HTML 5, and PHP. Using backend and frontend development tools, cloud web hosting, server, and other tools, the system was able to generate reports in terms of date of publication, number of titles and volumes, resources not used, and resources in specific programs in graphical format. Moreover, the system also provides an additional function, such as to export a list of library resources per program in word format. A functionality test was conducted to fifteen (15) randomly selected respondents participated by library staff, students, and faculty of the University of Southeastern Philippines. The assessment revealed that most end-users were extremely satisfied with the system in attaining its usefulness and reliability in terms of functionalities and capabilities.

Keywords: Collection Development, Book Data Visualization, Collection Analysis

INTRODUCTION

Academic libraries have a long history of collecting data and a way of reporting their data analysis. Libraries traditionally collect data that focuses on gathering information about library services in which data were often compiled into library statistics and used as the basis for library services evaluation and decision-making. In recent decades, academic libraries have been known in the collection and development of data assessment, like library survey usability and collection analysis (Association of College and Research Libraries, 2010). Because of this, the increasing amount of library data and information available in the library makes it a difficult task to manage and handle. The present and stack of data in the library goes beyond the traditional way of counting and compiling statistical measures. Libraries nowadays are engaging in multifaceted data analysis, such as data visualization to help improve and understand the trends in library services (Cox, B. L. & Janti, M., 2012). Data visualization commonly refers to us as a tool for managing data and provides an overview and trends in the library. It communicates and presents data, information, and knowledge that helps librarians to perceive easily, understand, comprehend, and discover large data sets (Purchase et al., 2008; André et al., 2009; Beale, 2007 cited in the study of Mercun, T. & Zumer, M., n.d.). Visualizations help librarians recognize and understand data otherwise obscure trends.

According to Loetscher (1985), using data visualization as a representation of library holdings serves as a tool in three different ways: it will show the strength of the collection which can be compared to the institution's current curriculum; it will determine collection size, and it will show the quality of collection as it responds to curricular needs. Furthermore, library collection using data visualization shows a new way of conducting a collection assessment. As such comparing the collection with the curriculum may be used as a suggestion on weeding-out decisions (Finch, J., & Flenner, A., 2016). One of the major issues in the library is not only on visualizing data in terms of statistical reports but also on reports related to collection assessment where there is a need to develop, maintain and update a list of collections per program and course that shows the total number of titles and volumes present to a subject. Collection assessment will measure the collection intensity and shows if it meets the needs of any program and course.

The USeP Learning Resource Center gathers, consolidates, and generates numerous data from the utilization, acquisition, and collection, among others. The USeP-LRC being the brain of the institution that strongly supports governance, extension, research, and instructions, play a role in strengthening its collection and meet the diverse information needs of its users. The librarians take responsibility in collection development by dissemination of lacking titles and the need to select and procure library resources and to take the initiative to conduct collection assessment, evaluation, and information needs analysis of each collection in a particular program and course. In the collection development cycle, the ULRC implements the collection assessment and evaluation in which it guides the ULRC in the delivery of information resources to its users, provide evidence-based for decision making, and provide the current information that directly relates to the core functions of the University (USeP Library Manual, 2019). It is completed by consolidating the library resources available in the Online Public Access Catalog intended for each program and course.

The current USeP-LRC integrated library system can produce reports which are limited to the number of library transactions performed in a day and services related to book borrowings such as checkout of books in a day, and checkout of books per borrower. Whenever an accreditor or there is an immediate need for graphical representation of library collection, the library or librarian cannot provide it immediately. There is a need to consolidate it manually by tallying all the data gathered and present in the library. The reports generated by the system are not enough to support the needed library documents during accreditation. particular program and courses, which is based mainly on the prospectus. The list of collections is manually gathered by copying the bibliographic data such as title, author, place, and name of publication, copyright year, call number, and indicate the number of titles and volume in the format specified by the library. Moreover, updating the list is more tedious because the librarian needs to search the subject again in the OPAC and perform counterchecking in the list if it is added already or not. This process is labor-intensive, and very time consuming for some librarians as it involves manual sorting, updating, and compiling the list of library resources per program and courses.

In the light of the above issues and concerns, the researcher believes that there is an urgency to develop a system that will address the above concerns and will streamline the current setup. The system proposed will also guide the procurement process of the library by determining the subject or program that needs prior attention when it comes to collection development. Furthermore, the library also needs a system that will immediately generate a list of collections, which may reduce the cost of overtime allotted to each staff and librarian in doing manual consolidation and updating. Thus, the system will focus on grouping library resources according to college and program. It will also generate visualization reports of library resources according to copyright year, number of volumes and titles, library resources not used, and library resources per program, and generate a list of collections classified by course. This helps create good management, showcase the best practices of the ULRC, and assess if the ULRC meets the standard requirements and compliance in terms of library holding.

Objectives of the Study

Generally, the main purpose of this study is to develop a data visualization of book collection for the University of Southeastern Philippines (USeP) as the basis for the selection and acquisition of library resources. The researcher intends to:

1. Develop a module to build a library collection per college and program.
2. Generate data visualization reports of library collection.
3. Generate library collection reports classified by course.

Scope and Limitations of the Study

This study focuses on the design and development of data visualization of book collection for the University of Southeastern Philippines (USeP). The system provides an automated grouping of library resources per college, program, and subject. It also generates a report of library resources according to its date of publication, number of volumes and titles, library resources not used, and library resources per program. The system serves as a tool in generating and downloading a report of library resources in graphical format and a list of library resources per course and program in word format.

The system contains two modules: 1) the admin module is limited only to librarians which allows them to add, edit and delete library resources, admin account, courses and programs, and subjects, and generate reports in a list format and graphical format; and 2) user module is an interface which allows the user to search library resource per college. The system includes the integration of the MARC21 standard format for bibliographic data, which was developed by the Library of Congress intended to provide detailed information and description of a book. Librarians and library staff will use the MARC21 standard in adding, and encoding library resources in the system. To support the grouping of library resources, the system will also contain the subject code and subject description of each program for every college in which it determines the number of collections available for every major subject and general education subjects.

Moreover, it also serves as a track in knowing the recency of the library holdings and as a basis for the prioritization of the procurement. The system is accessible over the Local Area Network (LAN) of the library. Furthermore, the study adopted the modified rapid application development life cycle process. Basically, the system is intended for the librarian, library staff, faculty, and students of the university who is directly utilizing the library services. External clients of the university are not allowed to access and utilize the system.

RELATED LITERATURE

Data visualization becomes a hot topic over a few years. Libraries have not been left behind by this application because creating compelling visualization is an immense success in the library. Data Visualization aids the understanding of librarians in terms of dealing with the present library collection but also on the other available data in the library. Libraries tend to gather common data such as reference transactions accomplished, the number of books circulated, the number of users entering and availing library services, and this is the data needed to justify the existence and importance of the library. Furthermore, an effective presentation of data has nothing to do with the display but gives emphasis and focus on the purpose of presenting it (Tuffe, E. R 2001).

The Indianapolis Museum of Art displays its web dashboard visualizing the changing quantity of artwork collection, library users and visitors, and Facebook followers. The University of North Carolina

State University Libraries initiates data visualization projects that visualize the usage of reference services, course tools, computer workstations, and group study rooms. The Harvard Library Lab showcases the tools that view the collection size and enable them to group their collection by subjects (Phetteplace, E., 2012). In the study of Agee, J. (2005) states that there are ways to evaluate specific subject areas. The commonly used is the core curriculum guides or also referred to librarians as checklist of most current resources in any given subjects, this gives the librarian a way to compare the current holdings, determine the number of collections a particular subject has, and allows the library to solicit inputs from the faculty. On the other hand, syllabi and reading lists from the faculty can generate concrete evidence of user expectation, and a survey, focus group discussion, and collection evaluation can help determine the collection's usefulness, strength, weaknesses, and, most importantly, will build collaboration between faculty and librarians.

According to Kumar, P. A. (2017), one of the purposes of an academic library is to provide access to books and other library collections. The ability of the library to meet the demand and information needs of its users depends on the availability of information materials, and most significantly rest on the collection development activities implemented by the library. Collection development has attracted diverse interpretations from librarians and other information professionals. The selection of library materials should involve faculty, staff, and student to determine the need of each program, and this implies that faculty and librarians should work closely, and the collection development should be viewed as a joint partnership. However, this partnership does not indicate that the completion of the selection process is the responsibility of the faculty, staff, and student, it is the obligation of the librarian. (Strauch, K. 1990, & Riggs, D. E., 1995, Hurt, C., et al., 1995, and Chu, F. T., 1995). The expertise of the faculty members and keeping them informed about the library implies effective collection development (Reference User Services Association Committee, 2001).

Furthermore, strength and weaknesses, and the attainment of the required number of copies of collection or title per program is also assessed and seen during accreditation. Accreditation is a process that utilizes tools and techniques that determines the strength and weaknesses of the library and serves as a mechanism in checking the quality of library performance. One of the performance indicators measured in accreditation is the library collection, whether it is sufficient to support the institution's needs, and to continually check and evaluate itself against the standards set by the different accrediting agencies (Paqueo, V., et. al., 2012).

As an overview, there are several accrediting agencies and bodies responsible in the conduct of accreditation such as Association of Christian Schools, Colleges and Universities – Accrediting Agency (ACSC-AA), Accrediting Association of Chartered College and Universities in the Philippines (AACCUP), Association of Local Colleges and Universities – Commission on Accreditation (ALCU-COA), Philippines Association of Accrediting Association of Schools, Colleges and Universities (PAASCU), Philippine Association of Colleges and Universities – Commission on Accreditation (PACUCA), the focus of the accreditation covers nine (9) areas such as vision and mission, faculty, instruction, laboratories, library, physical plant and facilities, student personnel services, research, and extension (Pila, R. A., et. al., 2016).

One of the areas assessed during accreditation is the library. The Standards for libraries in Higher Education aims to guide academic libraries in advancing and sustaining their role as partners of the community. All academic libraries need to comply with the minimum standards set by the Commission on Higher Education, such as to have a collection of Filipiniana books equivalent to ten percent (10%) of the total collection published within the last ten (10) years. The core collection of the undergraduate program should have five (5) relevant book titles for each professional subject, twenty percent (20%) of its total collection should be published within the last five (5) years. And the remaining eighty percent (80%) should be published within the last ten (10) years. The library shall comply with ten (10) relevant titles per subject and for the initial offerings, a minimum number of book titles covering the first (1st) to third (3rd) year courses for the graduate program (Commission on Higher Education, 2017).

Accreditation in academic libraries is essential because it determines if it meets or exceeds the minimum requirement set by the CHED and opens an opportunity for improvement by embedding innovative library education, resources, and services in the teaching and learning environment. Furthermore, librarians must understand their role and the value of participation in the accreditation, which can result in the library improvement per se, thus paving the way towards the pathway to excellence in the information arena. Gathering, analyzing, and communicating library usage and reports provide a foundation for a thorough assessment and require time and expertise to be able to produce a useful statistical report. However, automated gathering, analyzing, and communicating data can save and reduce the amount of time, the energy required, and increase the staff capacity in data science such as dealing, interpreting, and analyzing statistical reports (Meyer, A., 2018). In a larger sense, effective tools or system that can attain the problems in collection assessment can greatly aid the delivery of reports in terms of collection per program and data visualization of collections in terms of year, resources not used and others.

THEORETICAL FRAMEWORK

Cognitive Model of Visualization Comprehension

In general, the term visualization means a graphical representation of data or concept as visualization can work as a cognitive tool and serves as a powerful tool in the construction of knowledge using a human understanding and cognitive capacities (Alexandre, D. S., & Tavares, J. M., 2010). Card, S., K., et. al. (1999), describe visualization in his study that computers must support the use of visual representations in order to extend the human cognition in an interactive mode.

Pinker, S. (1990) proposed a cognitive model of visualization comprehension, which provides an interactive structure that explains the mechanism in understanding data graphs. This model suggests that from a visual array, the unprocessed neuronal firing in response to visualization, bottom-up encoding mechanism is used to construct a visual description, a visual stimulus. The visual stimulus produced in the encoding mechanism usually results in long-term memory for knowledge relevant for interpreting the visualization. This knowledge leads to be in the form of a graph schema. The viewers use a matching process where the graph schema is retrieved when this schema is found it becomes instantiated. The visualization conventions associated with the graph schema helps the viewer interprets the visualization.

Information-Seeking Behaviour Model

Information seeking behavior is a human process that requires adaptive and reflective control over the afferent and efferent action of the information seeker. Information seeking is an effort to acquire information in response to a gap of knowledge of a particular user (Case, D. O., 2002). Taylor, D. and Procter, M. (2005) explain that information seeking is simply the ability to efficiently look for answers using the manual or computerized method used to identify a set of useful information, article, and books. Therefore, it is a set searching ability by looking for suitable information to satisfy the desired information needs (Singh, K. P. & Satija, M. P., 2006).

Furthermore, it illustrates a thorough searching for information as consequences of a need to satisfy users' needs that may result in success or failure in finding relevant information. Success in retrieving this information will result in user satisfaction, while failure to provide it will result in non-satisfaction and requires the user to use another information system (Wilson, T.D., 1999, pg.251). Seeking information to do research, assignments, and seeking answers to specific questions, users may use and interact with manual information systems such as newspapers or books, in libraries and information centers, or with computer-based systems like the internet-world wide web.

CONCEPTUAL FRAMEWORK

This study follows the functional model of Input-Process-Output or IPO. In this model, a process is shown through a series of boxes connected by inputs and outputs. Flow charts and process diagrams are used to represent a certain process (Harris & Taylor, 1997). The IPO model will provide a general structure and serves as a guide for the direction of the study. The following inputs were used for the system to determine the desired output. The system contains the following: 1) The bibliographic information which contains book information such as author, title, call number, subjects, publisher and copyright date which plays the main component of the system which transforms the input to a system as desired; 2) The course number, course description, course code from the prospectus which will be the basis in grouping the library resources per program.

This system is composed of an end-user side and an admin side. The end-user side can be accessed by the faculty, student, and other stakeholders of USeP, while the librarians can access the admin side. Once the end-user accesses the system, it will allow them to search library resources by college and show them a search result of library resources specific to their college and program. While the admin side will enable librarians and library staff to add, edit, and delete bibliographic data, MARC tag, course and program, user, and generates a report that visualizes the library collections in terms of date of publication, number of volumes and titles, resources not used and resources per program. Every modification done on the admin side is an update to the end-user side.

METHODS

The method applied in this study is a modified Rapid Application Development Model. It is an agile project management strategy popular in software development that prioritizes fast project turnaround. This model reduces the planning time and emphasizes measuring actual progress and real-time on evolving changes that result in greater efficiency, faster development, and effective communication (<https://www.lucidchart.com/blog/rapid-application-development-methodology>). Each stage has a role to play in the development of the system. It involves the following phases: 1) Planning, 2) Design and Development, and 3) Implementation and Testing.

In the planning phase, the researcher will collaborate with the developer to plan the content of the system. Furthermore, it is also the task of the researcher to conceptualize the content of the system by providing the bibliographic data of library resources consisting of book details such as author, title, number of volumes and titles, copyright date, publisher, and MARC Tags. The researcher will also gather information such as the list of major subjects, course description and course code per program from the prospectus and consolidate all the logos of the colleges. The researcher will use all the consolidated information to produce a data visualization of book collections. The developer will input and use the data gathered by the researcher to determine and assess the other needs for the completion of the system.

Once the database model is established, the system developer will start building the system. The development of the system includes the implementation of the agreed tools, interface, and data to be included in the system based on the need. The system will have a minimalistic viewpoint that it is easy to access and used by users. The system developer used the following: Code development using MySQL relational database, Laravel 5.8 – PHP framework, VueJS 2.5.17 – Javascript Framework, and Bootstrap 4.3.1 – CSS framework. In the development of this system, there are significant parts to be implemented: (1) develop a module to build a library collection and program, (2) generate data visualization reports in terms of: (a) date of publication, (b) number of volumes and titles, (c) resources not used, and (d) per program, and (3) generate library collection report classified by course.

Table 1. Content of the Data Visualization of Book Collection of University for the Southeastern Philippines.

ADMIN MODULE	
Content of the System	Description
Admin Content 1	The system shall have a module that will allow the admin to add, edit, and delete.
Admin Content 2	The system shall contain MARC 21 format for Bibliographic Data for library resources.
Admin Content 3	The system shall contain the name of all colleges including its respective programs and majors' subjects
Admin Content 4	The system shall generate user statistics in terms of years, number of titles and volumes, resources not used, and resources on specific programs.
USER MODULE	
Content of the System	Description
User Content 1	The system shall provide an interface for the user that will allow them to search library resources

After the building, thorough planning of the design and development of the system, it will undergo a functionality testing phase. The Functionality Test was implemented as part of verifying the performance of the system. In the actual test, the researcher will introduce the link to the participants. The researcher will let the users manage, access, and browse the system. After, a functionality test questionnaire will be given to them to gather their feedback, opinions, suggestions, and recommendations about the system. The collected data from the users will be used to enhance and develop the contents and functionalities of the system.

RESULT AND DISCUSSION

Develop a module to build a library collection per college and program

The first step in grouping the library resources per college and programs is the creation of the homepage. The homepage in this system serves as the default page when a user accesses the system. In the creation of the homepage, CSS, Vue JS, and Laravel were used in layouting the content of the homepage. A administrator account is provided for Librarians. From the administrator page, the Librarian can manage the following modules: Bib, Department, Course, and Subject (DCS), User, Reports, and Profile. These modules are further described, discussed, and explained in Table 2.

Table 2. Admin and User Module.

ADMIN MODULE	
Module	
Bib	This module contains New Bib, New MARC, and View MARCs and Extract List of Resources.
Department, Courses, and Subjects (DCS)	This module contains New Department, New Course, and New subject.
User	This module allows the admin to add a new user.
Reports	This module allows the admin to generate reports in graphical format.
USER MODULE	
This module allows the user to search and browse library resources per program.	

To enable the grouping of library resources, the Librarian accesses the DCS module, consolidates all the logos of the colleges, names of the courses and programs, course code and course description based on the prospectus. The Librarian will click the New Department button to upload in the system all the logos of the selected samples with its corresponding descriptions. After, the Librarian will provide the program name and description by clicking the New Course button and followed by encoding the course code and its description taken from the prospectus on the New Subject page. In this study, there were eight (8) colleges and one (1) general subjects encoded in the system namely: General Education Subjects (GE), College of Arts and Science (CAS), College of Technology (CT), College of Business and Administration (CBA), College of Education (CED), College of Applied Economics (CAec), College of Engineering (CoE), College of Information and Computing (CIC), and School of Law (SoL). The researcher will select one (1) college as a sample, in the selected sample, the researcher will choose one course and program, and identify its major subjects including the course code and description. After, the researcher encoded various library resources classified under the selected sample, which will form part in the reports produced by the system.

In creating, updating, and deleting the data, a Vue JS script and Axios handle the process. To enable encoding, all the common MARC Tags are added to the system as shown in Table 3. The added DCS and MARC Tags are used to add library resources, which can be viewed and searched on the homepage. The creation of New Bib in the system is the most important as it will form part in the generation of reports. A popup dialog box will appear, which shows the MARC Tags and its description, and it allows the Librarian to encode and save all the bibliographic information.

All the input made by the Librarian will reflect on the homepage of the system. It is the default page when a faculty, staff, and library user will access and search library resources per program, college, and subjects in the system. When a search activity is performed, the Vue JS script will send a search request to the backend script, and when the researcher clicks one search result, a bib view will be incremented as seen in Figure 1.

Generate data visualization reports of library collection

The system has a report generation capability that allows the admin user to generate graphical reports by years, number of volumes and titles, resources not used, and resources specific to programs. The system

Table 3. Common MARC Tags used in encoding library resources

ADMIN MODULE	
MARC Tags	Non-MARC Description
016	Accession Number
020	ISBN
082	Call Number
100	Personal Name Main Entry (AUTHOR)
245	Title Information
250	Edition
260	Publication Information (Place of Publication: Name of Publisher, copyright date)
300	Physical Description
490	Series Statement
520	Annotation or summary note
650	Topical Subject Heading
700	Personal Name Added Entry (editor)

Call Number	Book Titles	Author	Address Number	Copyright	No. of Titles	No. of Volumes	
Cir. 005.1 1074.2008	Ultimate project management / Hughes, Bob and Collell, Mike.	Hughes, Bob	U3910	2006	1	1	More detail
Cir. 005.1421 2002.2002	Software quality and software testing in internet times/ Edited by Dirk Meyerhoff.	Edited by Meyerhoff, Dirk	1001	2002	1	1	More detail
Cir. 005.14 2005.1087	Software Reliability: measurement, prediction, application / John D. Musa, Anthony Jannink and Kenneth Clemons.	Musa, John D.	170	1987	1	1	More detail
Cir. 005.122 2009.2009	Software & systems requirements engineering : in practice / Bernd Beberbach ... [et al.]	Bernd Beberbach, Bernd	18500	2009	1	1	More detail
Cir. 005.1 A565.2010	A guide to software : managing, maintaining, and troubleshooting / Ivan Andrews.	Andrews, Ivan	27490	2010	1	1	More detail

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Figure 1. Snapshot of the search result.

developer used Vue Chart JS and Phpspreadsheet in exporting of data and automatic creation of charts. Each generated report differs in implementation and depends on the display of data in the graph. Generating reports by date of publication is based on the year indicated in the call number of each library resources. The encoded call number includes location symbol, classification number, author number, and date of publication. The counting of the number of volumes and titles of each resources is based on the number of library resources encoded by the Librarian as seen in Figure 2. Every encoded library resources are equivalent to one title; in terms of number of volumes, the Librarian will input it in the system.

Each library resources that is not browsed by any user is counted as resources not used. When the user performs a searching activity and tries to browse library resources, the remaining library resources that are not browsed by the user are considered as the resources not used as seen Figure 3.

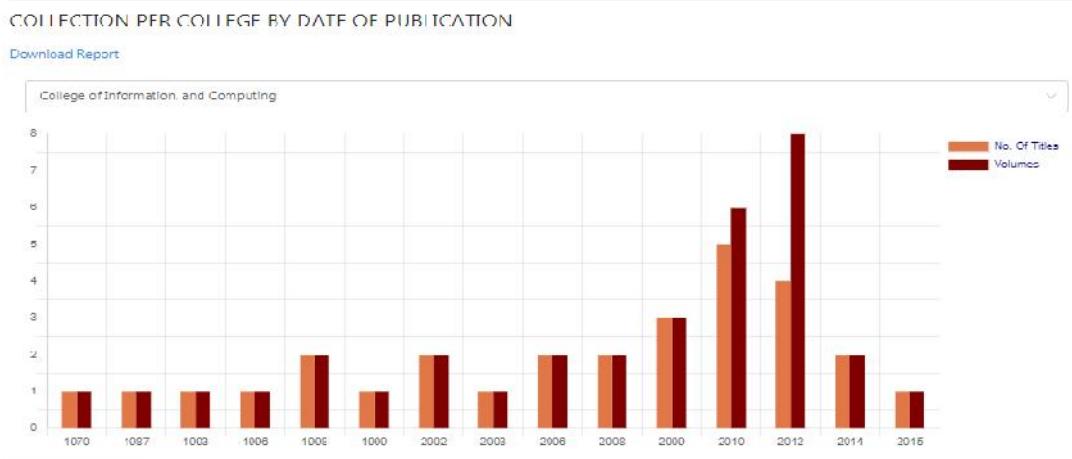


Figure 2. Snapshot of the visualization report.

ALL COLLECTION NOT USED

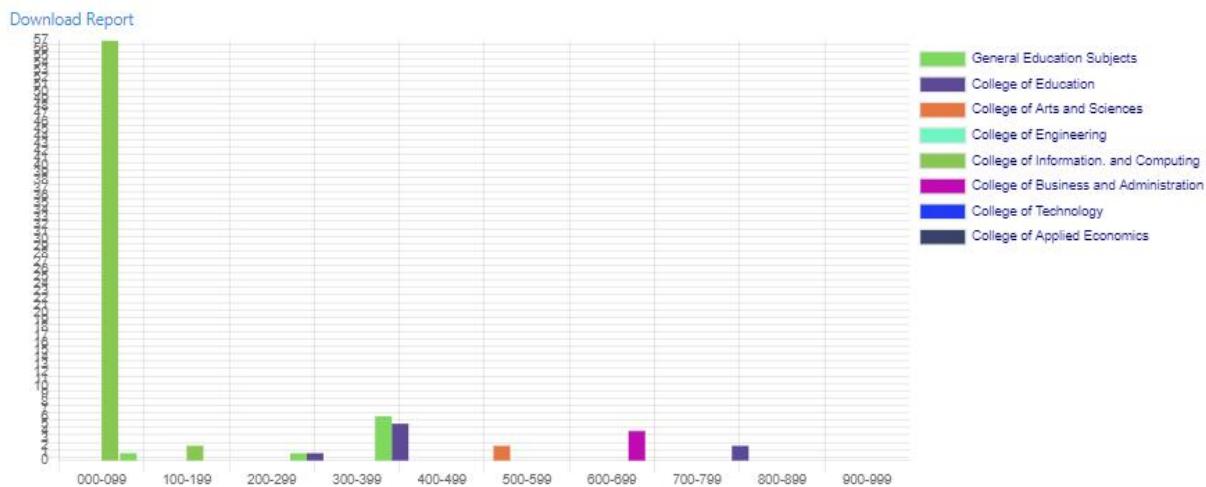


Figure 3. Snapshot of the report on resources not used.

On every input of library resources in the system, a data is added in the report, and on every reload of the page, Axios handles the request of data from the server, Vue JS builds the interface, and the design and layout of the chart were created through ChartJS. When the Librarian exports data, the Vue-ChartJS controls the versioning of Chart.js. which allows it to be downloaded in Phpspreadsheet or excel format.

Generate library collection reports classified by course

The system also allows generating a list of library resources by program and course. The report generated by the system is based on the collection present in a particular program and course. The report includes call number, book titles, author, accession number, copyright, number of titles, and number of volumes, as seen in Figure 4.

Course/Code Description	Title	Overall Collection No. of Titles	Volumes	Call Number
LOS 3111	Advances in school library media studies / Maria E. L. Manal, Bily J. Scott, Barbara Calif. Libraries Catalogued, 2010.	1	1	CE G23.2713 MB75 2010
	Advances in library administration and organization / Dennis E. Williams, William D. Adams, Editors. Emerald, 2012.	1	1	CE D71.100- W24 2012
	Accounting for libraries : theories and methods in practice / TONY H. Bradt and Peter M. Veldman. Westport, Conn.: Praeger, 2000.	1	1	CE Q27.8 B975 H254 2010
	Charging and collecting fees and fines in libraries / Michael S. Nelson.			CE N67

Figure 4. Snapshot of the sample downloaded list of library resources.

The researcher conducted a Functionality Testing after the completion of the system. It is a type of testing that validates a particular system against the functional requirements or specifications (<https://www.guru99.com/functional-testing.html>). The purpose of this testing is to give assurance to the prospect users that the created system fulfills its requirements and specifications in terms of testing each action in the module or system (Conway, A., 2016).

There were fifteen (15) randomly selected participants tasked to critique and rate the system based on their observations during the hands-on testing. The link of the system was given to respondents for the hands-on testing. After the hands-on testing, the respondents were asked to answer a questionnaire, which was done through google form and paper-based questionnaire disseminated to library staff, faculty, and students of the University of Southeastern Philippines. The access given to library staff was the admin account, while for the faculty and students, a user account was given.

The Functionality Testing Questionnaire was composed of sixteen (16) questions divided into System for library collection, System for report generation, and System Usability. The respondents will rate the questionnaire using a scale of five (5) as Extremely Satisfied, four (4) as Very Satisfied, three (3) as Neutral, two (2) as Not so Satisfied, and one (1) as Not at all Satisfied.

The Figure above entails user satisfaction in terms of grouping library resources and how the system helps and provides the user with the library resources they need in their subjects. Fifty-four percent (54%) or eight of the respondents are extremely satisfied, thirty-three percent (33%) or five of the respondents are very satisfied, and thirteen percent (13%) or 2 of the respondents are neutral with how the system grouped library resources per college. There are seven (7), or forty-seven percent (47%) of the respondents who are extremely satisfied, six (6) or forty percent (40%) of the respondents are very satisfied, and two (2) or thirteen percent (13%) of the respondents are neutral with how the system grouped library resources per program. Moreover, seven (7) or forty-seven percent (47%) are extremely satisfied, five (5) or thirty-three percent (33%) are very satisfied, and three (3) or twenty percent (20%) are neutral with how the system works and what it provides. User response in terms of the usefulness of the system in finding library resources shows sixty percent (60%) or nine (9) respondents are extremely satisfied,

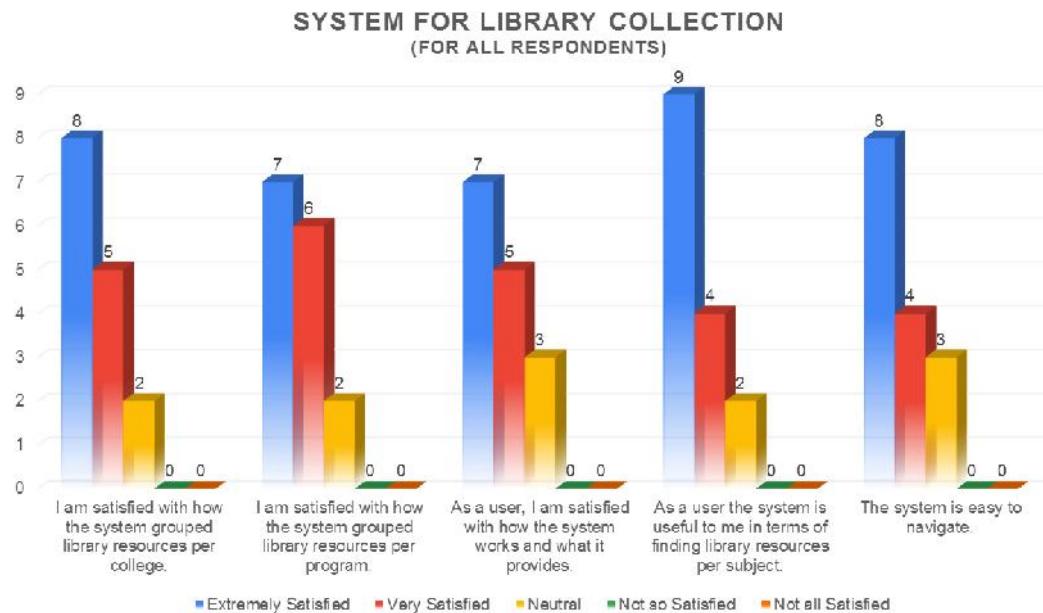


Figure 5. Graphical Presentation of the Result of the first part of the questionnaire.

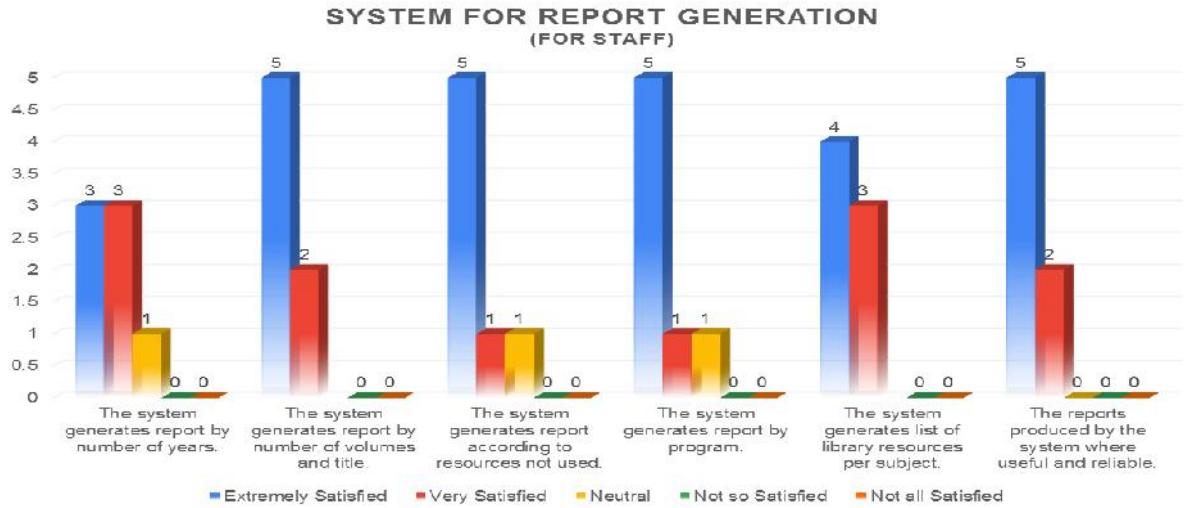


Figure 6. Graphical Presentation of the Result of the second part of the questionnaire.

thirty-three percent (33%) or four (4) respondents are very satisfied, and thirteen percent (13%) or two (2) respondents are neutral. Furthermore, the systems' navigation was rated as fifty-three percent (53%), or eight respondents are extremely satisfied, thirty-three percent (33%) or four respondents are very satisfied, and thirteen (13%) or three respondents are neutral. In the result given, the majority of the respondents are extremely satisfied with the systems' functionality in terms of providing and grouping library collection.

The Figure above shows the result of the functionality test conducted on report generation. This portion is only intended for librarians and library staff who are given an administrator account. There are seven librarians and library staff who participated in the functionality test. As a result, three (3) or forty-three percent (43%) indicate that they are extremely satisfied and very satisfied, and one (1) or fourteen percent (14%) rated neutral in the way the system generates a report by number of years. Five (5) or seventy-one percent (71%) agree that they are extremely satisfied, and two (2) or twenty-one percent (29%) also agree that they are very satisfied with how the system generates a report by number of volumes and titles. The system also generates reports according to resources not used, and report by program, seven (7) respondents or seventy-one percent (71%) rated it as extremely satisfied, one (1) respondent or fourteen percent (14%) indicate that they are very satisfied and neutral. There are four respondents or equivalent to fifty-seven percent (57%) are extremely satisfied, and three (3) or forty-three percent (43%) are very satisfied with how the system generates a list of library resources per subject. Five (5) or seventy-one percent (71%) are extremely satisfied, and two (2) or twenty-nine percent (29%) are very satisfied in terms of usability and reliability of the reports produced by the system. Based on the results mentioned above, the majority of the library staff are extremely satisfied with the systems' generation of reports.

Figure 7 indicates the result in system usability intended for all respondents. There are forty-seven percent (47%) or seven (7) respondents who rated extremely satisfied and very satisfied, and seven percent (7%) or one (1) respondent favors to be neutral in the usefulness of the systems' modules towards library work and user needs. Thirty-three percent (33%) or five (5) respondents are extremely satisfied, forty-seven percent (47%) or seven respondents are very satisfied, thirteen percent (13%) or two respondents prefers to be neutral, and seven percent (7%) or one respondent rated not all satisfied with the presentation of the system in terms of easy to understand, use and its minimalistic view. Fifty-three percent (53%) or eight (8) respondents favor to rate extremely satisfied, thirty-three percent (33%) or

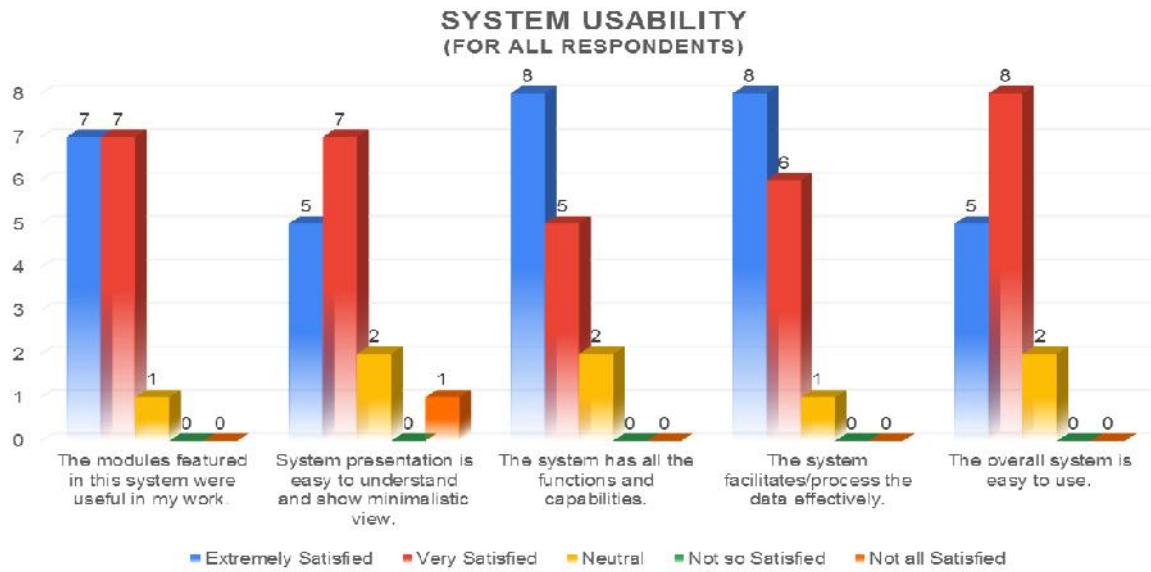


Figure 7. Graphical Presentation of the Result of the third part of the questionnaire.

five respondents are very satisfied, and thirteen percent (13%) or two respondents rated neutral in the systems' functions and capabilities. In terms of how the system facilitates and process data effectively, fifty-three percent (53%) or eight respondents are extremely satisfied, forty percent (40%) or six respondents rated very satisfied, and seven percent (7%) or one respondent rated neutral. Additionally, thirty-three percent (33%) or five respondents are extremely satisfied, fifty-three percent (53%) or eight (8) respondents are very satisfied, and thirteen percent (13%) or two respondents are neutral with the overall system usability.

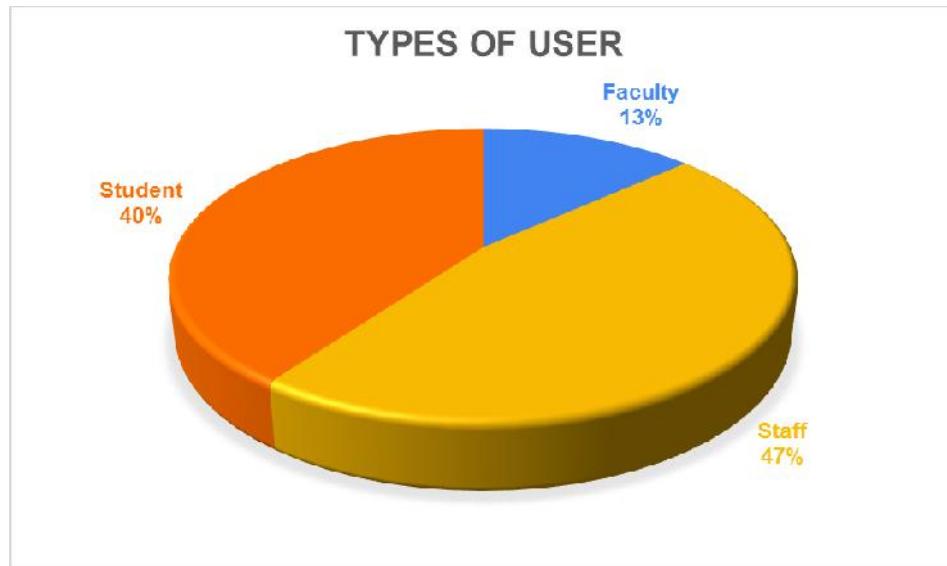


Figure 8. Graphical Presentation of the types of users.

As seen in Figure 8, there are fifteen (15) respondents tasked to manage and browse the system. Respondents are composed of seven (7) library staff who access the system using the user and administrator account. Furthermore, there are two (2) faculty and six (6) students who also browse the system using the user platform. They are tasked to browse the system and perform search activity. The graphical representation of users specifies that the majority of the respondents are library staff, which is the primary user of this system.

The overall result of the Functionality Test conducted implies that the system attains its purpose, such as to grouped library resources according to college and program since it provides an avenue to encode library resources using the admin account and allows the user to search the library resources according to their college and program. Furthermore, the system also allows the extraction of reports, a helpful tool for librarians and library staff that will enable them to generate reports in graphical format and download a list of library resources per program.

CONCLUSION

Conclusions

The researcher achieved the objectives specified in this study, which is to grouped library resources and visualize it to generate reports. Based on the objectives, the following conclusions are given:

1. The system provides a module that will group library resources by college and program which can be accessed by using the admin account;
2. The system will generate reports in terms of years, number of volumes and titles, library resources not used, and library resources for specific programs.
3. The system provides a user interface that lets them browse and search library resources in terms of author, title, keyword, and subject code.

Recommendations

The recommendation presented here is based on the researchers' observations and users' comments and suggestions during the functionality testing of the system. The following recommendations are presented to enhance the functionality of the system:

1. The system shall allow integration of its functionalities such as data visualization report and library collection reports classified by course into the existing USeP ELIB library management system (LMS) or any LMS that will be used by the library;
2. The system shall provide admin account intended for the faculty members to validate the library resources included in their respective programs;
3. The system shall have the capacity to integrate the syllabus used by faculty to comply with the CHED requirement in terms of references used by the faculty;
4. The system shall allow comparison of library resources against the standard set by the accrediting agencies to quickly determine the required percentage of the collection in terms of recency;
5. The system shall allow grouping library resources by subject headings assigned to determine the number of titles and volumes per subject;
6. The system shall allow remote access.

7. The system will have the capability to capture RFID tags.
8. An additional (search all) capability shall be added in the systems platform.
9. The system needs to provide (import) capability to allow importing of data from other databases.
10. It is highly recommended to develop this system further and improve its functionality with similarity to the functions of the USeP ELIB Integrated Library System or any library system that will be used by the library.

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