Design and Implementation of a Web-Based eRepository System for Academic Libraries: A Case of J.H. Cerilles State College

Amor Dianne A. Carillo[1*]

[1]J.H. Cerilles State College, Pagadian City, Philippines.

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*Corresponding Author:** amordianne.carillo@jhcsc.edu.ph

Libraries are crucial for advancing research and education, serving as the brain of the institution. They play a vital role in promoting education and research, and advancements in Information and Communications Technology (ICT) have transformed the way scholarly information is organized, managed, and disseminated. The integration of multiple ICT tools and resources was employed in this study, with the primary purpose of developing an eRepository that automates the storage and retrieval of theses and capstone projects in the library, as well as tracks their utilization. The researcher conducted interviews and observations with library users, staff, and librarians, and reviewed related literature and studies to gather preliminary information. The waterfall model, with its six phases for the System Development Life Cycle (SDLC), was also employed. The participants who tested the system and completed the evaluation survey were chosen through subjective sampling. Findings revealed that library users and personnel faced various experiences and challenges. Analyzing the gathered data from research participants revealed key user functions, including uploading, searching, downloading, and viewing manuscripts, as well as data visualization. As a result of the system's evaluation and testing using ISO 25010 standards criteria, it scored "excellent" with a grand mean of 4.65. It was concluded that the eRepository has been successfully developed, revealing that the users' needs, the system's quality, and objectives have been met adequately. Thus, the college library needs to create a comprehensive program that focuses on innovating the eRepository, ensuring the system's maintenance, and implementing utilization programs.

*Keywords:** *Library Automation, eRepository, ICT, SDLC Waterfall Model, Web-Based Library System.*

1. Introduction

Libraries serve as the cornerstone of research and education by organizing, managing, and disseminating knowledge resources **(Gavit, 2019; Rathnabahu, 2023)**. Traditionally viewed as repositories of printed materials, libraries are now evolving into digital information hubs due to the rapid advancement of Information and

Communication Technology (ICT) **(Awamleh & Hamad, 2022; Masenya & Ngulube, 2021)**. The integration of ICT in academic libraries has transformed conventional preservation and retrieval processes into efficient, automated systems that ensure accessibility and long-term sustainability of scholarly works.

Guided by **Ranganathan's *Five Laws of Library Science* (1931)**, libraries are dynamic entities that must adapt to the changing needs of their users. In the digital era, this adaptability is reflected through the emergence of web-based services, which extend the library's reach beyond its physical walls **(Sharma, 2022; Salman, 2000)**. **Connaway and Dickey (2010)** observed that students increasingly favor web-based services for their convenience and immediacy, while **Tenopir et al. (2013)** emphasized the value of remote access to scholarly materials. Consequently, transitioning from manual to automated systems has become essential for academic institutions committed to sustainable knowledge dissemination.

Digital repositories have emerged as central tools in supporting this transformation. Institutional repositories manage and preserve the intellectual output of academic institutions by providing structured, centralized platforms for storage and retrieval **(Melo & Sanches, 2020; Okon et al., 2020)**. These systems enhance knowledge visibility, promote collaboration, and ensure long-term preservation (Rathee & Kaushik, 2019). Moreover, relational database management systems (RDBMS) improve repository performance by minimizing redundancy and strengthening data organization **(Igere, 2022; Suseela & Venkataraman, 2016)**.

In the Philippine context, the growing number of theses and capstone projects in higher education institutions highlights the need for efficient digital preservation **(Arruejo, 2020)**. Manual archiving often results in inefficiency, space constraints, and difficulties in information retrieval. Addressing these issues requires the adoption of innovative, ICT-driven systems that promote automation, accessibility, and sustainability in academic library operations.

To address this need, the present study has developed a web-based eRepository that automates the storage, retrieval, and utilization of theses and capstone projects. The system was designed using the Software Development Life Cycle (SDLC) Waterfall Model and evaluated based on ISO 25010 quality standards to ensure usability and reliability.

Specifically, the study sought to:
➢ Identify the challenges and problems encountered by library users, staff, and the librarian in storing, accessing, and utilizing hardbound theses and capstone projects.
➢ Determine the system requirements specifications for developing a web-based application to support thesis and capstone projects.
➢ Implement the identified system requirements based on the Software Development Life Cycle (SDLC) Waterfall Model.
➢ Evaluate the functional requirements of the developed eRepository.
➢ Assess the overall system quality using the ISO 25010 standards.

2. Review of Related Literature
2.1. Related Literature

The integration of digital technologies has revolutionized information management in libraries. **Masenya and Ngulube (2021)** asserted that digitization enhances accessibility and preservation of academic materials, while **Awamleh and Hamad (2022)** emphasized its role in ensuring equitable access to scholarly content. **Gavit (2019) and Chanda (2021)** observed that web-based library services improve user satisfaction and expand knowledge dissemination across institutions.

Digital repositories, as discussed by **Sharma (2022) and Rathee and Kaushik (2019)**, are now indispensable in managing increasing volumes of academic output. These repositories rely on robust database systems for efficiency and scalability. According to **Suseela and Venkataraman (2016)**, relational databases provide structured data management, while **Igere (2022)** highlighted their role in enhancing accessibility and reducing redundancy. Likewise, **Melo and Sanches (2022) and Okon et al. (2020)** found that institutional repositories increase usability and visibility of scholarly works through centralized digital platforms.

Ranganathan's (1931) principles continue to underpin these digital transformations. The concepts of "every reader his or her book" and "save the time of the reader" remain relevant in

the design of automated and user-friendly systems **(Salman, 2000)**. Modern users now demand instant access to digital content **(Connaway & Dickey, 2010)**, and web-based services have become integral to academic engagement **(Tenopir et al., 2013)**.

2.2. Related Studies

Several studies have demonstrated the effectiveness of web-based systems in enhancing library services. **Arruejo (2020)** developed eBirok, an online repository that facilitates uploading and retrieval of research papers, significantly improving access and efficiency. **Chalukya (2021)** and **Gaikwad and Bilawar (2023)** further explored how emerging technologies reshape library operations by promoting digital literacy and automation.

In system development, **Bassil (2012)** introduced a simulation model based on the SDLC Waterfall approach, providing a structured sequence for requirement analysis, design, Implementation, and evaluation. **Ahmad et al. (2019)** supported this framework, noting its contribution to model-based testing and software quality assurance. In the Philippines, **Alinaitwe (2018) and Widianto et al. (2020)** demonstrated that ICT-based solutions enhance operational workflows, improve storage reliability, and increase user satisfaction.

Overall, the reviewed literature and studies reveal that while digital repositories are increasingly adopted worldwide, many institutions have yet to implement fully automated, user-centered systems tailored for managing theses and capstone projects. The present study addresses this gap by developing a web-based eRepository aligned with modern library standards and evaluated through ISO 25010 to ensure system quality.

3. Methodology
3.1. Research Design

This study employed a developmental-descriptive research design to develop and evaluate a web-based eRepository system for theses and capstone projects. The Software Development Life Cycle (SDLC) Waterfall Model served as the framework for the development process. According to **Bassil (2012)**, the Waterfall Model provides a linear and structured approach, ensuring that each phase is completed before the next begins. This approach allows systematic documentation, minimizes development errors, and ensures that project requirements are properly met throughout the process.
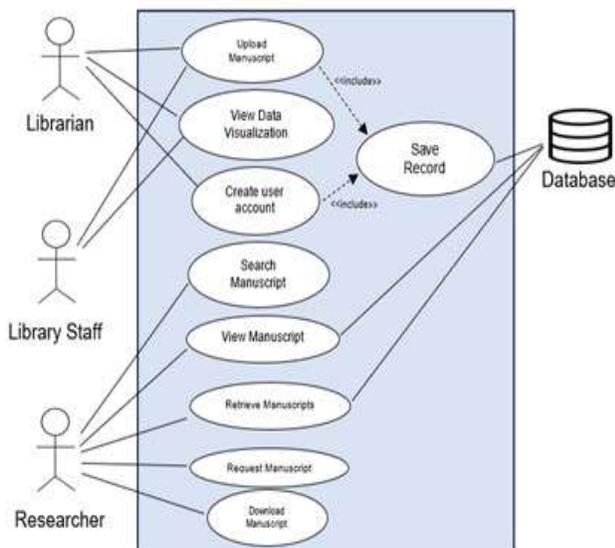
Figure 1: *Waterfall Model*
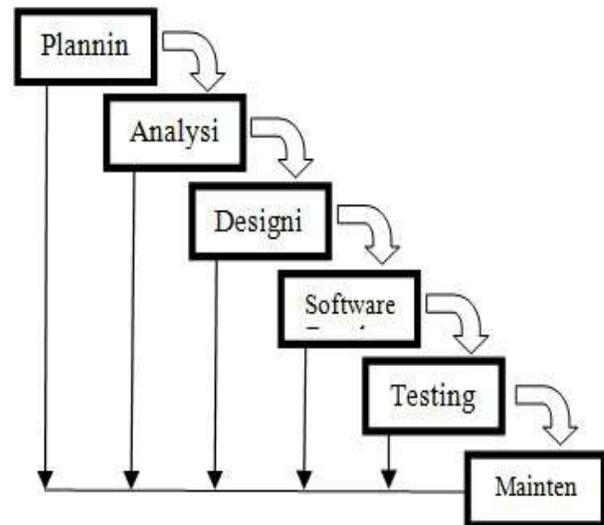
3.2. Development Framework

The SDLC Waterfall Model guided the creation of the system through five sequential stages:

➢ Requirements Analysis – The researcher identified user needs and challenges in the manual storage and retrieval of academic works. Data were collected through interviews and survey questionnaires from students, faculty, and library staff.

➢ System Design – Using the gathered requirements, the researcher designed system architecture through data flow diagrams, entity–relationship diagrams, and interface mockups to ensure functionality and usability.

➢ Implementation (Coding) – The system was developed using Python for back-end processing, MySQL as the database platform, and HTML/CSS/PHP for the web interface. These technologies were chosen for their open-source flexibility and scalability in managing library data.

Figure 2: Use-Case Diagram: Web-Based eRepository Application

Table 1: Hardware and Software Requirements

Category	Tools
Hardware	Hardware requirements of the system on which the eRepository was developed.
	Min 4GB RAM
	Min 1GB space on HDD
	Graphics Card
	Min 1 Mbps wireless adapter (Wi-Fi)
	Processor core i5 with 2.11 GHz
	Hardware Requirements of the system on which the application is intended to run.
	Mobile phone compatible with Android OS or iOS
	PC devices with any up-to-date web browsers
Software	Software required on which the eRepository was developed.
	Windows 11
	Visual Studio Code V 1.80.0 (user setup)
	MySQL Workbench V 8.0 CE
	Python V 3.11

	Adobe Photoshop – graphic design
	Software on which the eRepository is intended to run.
	Android OS or iOS with any up-to-date web browser.

➢ Testing and Evaluation – The system underwent functionality and usability testing, ensuring that all modules performed according to design specifications. Revisions were made to addr ess identified issues.

➢ Deployment and Maintenance – The final version was deployed in a local institutional server, and maintenance protocols were developed for long-term system operation. Image 1 System's Main Page
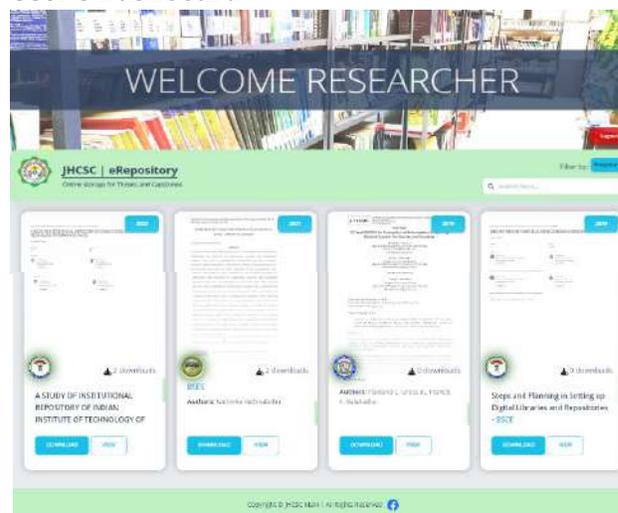
System's Main Page

User's Dashboard

3.3. Respondents and Locale of the Study

The study was conducted at J.H. Cerilles State College, Mati, San Miguel, Zamboanga del Sur,

Philippines. Participants included students, faculty members, and library staff who were directly involved in managing or utilizing theses and capstone projects. Purposive sampling was used to select respondents capable of providing relevant feedback for system design and evaluation.

3.4. Research Instrument

A validated survey questionnaire served as the main research instrument. It was divided into two parts:

(1) the assessment of existing challenges in the manual process, and

(2) the evaluation of the developed system using ISO 25010 software quality characteristics.

Three experts in information technology and research reviewed the instrument to ensure validity, clarity, and relevance to the study's objectives.

3.5. Data Gathering Procedure

The data gathering process consisted of three phases:

- ➢ Needs Assessment – Identification of existing issues in thesis and capstone project storage.
- ➢ System Development – Application of the SDLC Waterfall stages for system creation.
- ➢ Evaluation – Distribution of survey instruments to users for feedback on functionality and performance.

Quantitative results were supported by qualitative observations gathered during testing.

3.6. Evaluation Criteria

The developed system was evaluated using the ISO 25010 Software Quality Model, which measures product quality based on functionality, reliability, usability, efficiency, maintainability, and portability (Ahmad et al., 2019). Respondents rated each attribute using a five-point Likert scale: 1 (Poor) to 5 (Excellent). Descriptive ratings were derived from mean scores to interpret overall system performance.

3.7. Data Analysis

Descriptive statistics such as weighted mean and standard deviation were used to analyze quantitative data, while qualitative feedback from users provided insights into usability and improvement areas. The integration of both

analyses offered a comprehensive evaluation of the eRepository's effectiveness.

4. Results and Discussion
4.1 System Overview

The developed system was evaluated using the ISO 25010 Software Quality Model, which measures product quality based on functionality, reliability, usability, efficiency, maintainability, and portability (Ahmad et al., 2019). Respondents rated each attribute using a five-point Likert scale: 1 (Poor) to 5 (Excellent). Descriptive ratings were derived from mean scores to interpret overall system performance.

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5. Results and Discussion
5.1 System Overview

The developed Web-Based eRepository System was designed to automate the storage, retrieval, and utilization of theses and capstone projects in the academic library of J.H. Cerilles State College. The system features three primary modul
es:

- ➢ User Module, which allows students and faculty to upload, search, and view digital copies of research works;
- ➢ Administrator Module, which enables librarians to approve, organize, and manage submissions; and
- ➢ System Management Module, responsible for user control, file categorization, and database

The system architecture was built using Python, MySQL, and HTML/CSS/PHP, which ensured compatibility, efficiency, and scalability for institutional use. These technologies allowed for secure storage, real-time search, and user-friendly access through any web-enabled device.

5.2 System Evaluation Using ISO 25010

The functionality and performance of the eRepository were evaluated using the ISO 25010

Software Quality Model, which includes six primary attributes: functionality, reliability, usability, efficiency, maintainability, and portability (Ahmad et al., 2019). Evaluation data were obtained from 40 respondents, consisting of students, faculty, and library staff.

The overall weighted mean was 4.65, interpreted as "Excellent." This score indicates that the developed system successfully met user expectations and satisfied the ISO 25010 standards for quality software systems.

Table 2: Overall result of the testing and evaluation of repository

ISO 25010 Criteria	Weighted Mean	Interpretation
Functionality	4.75	Excellent
Reliability	4.61	Excellent
Usability	4.67	Excellent
Efficiency	4.59	Excellent
Maintainability	4.62	Excellent
Portability	4.65	Excellent
Overall Mean	4.65	Excellent

These results affirm the system's efficiency and usability in automating the manual repository process. Respondents highlighted the convenience of uploading, retrieving, and viewing research outputs online. This aligns with Gavit (2019) and Masenya and Ngulube (2021), who found that digitization increases accessibility and enhances information management in libraries.

5.3 Discussion of Findings

The findings revealed that the eRepository system effectively addressed the challenges of manual thesis and capstone project storage. Users noted that the system streamlined retrieval time, reduced physical storage dependency, and improved accessibility for both students and faculty. These outcomes support Awamleh and Hamad (2022), who emphasized that digital preservation fosters inclusivity and accessibility of academic resources.

The application of the SDLC Waterfall Model ensured that system requirements were clearly defined and implemented in a systematic manner. This structured process contributed to the system's stability and functionality, consistent with Bassil (2012), who highlighted the model's reliability in software development.

Moreover, the study confirmed that database-driven systems significantly improve information retrieval efficiency and data organization (Suseela & Venkataraman, 2016; Igere, 2022). The integration of relational databases in the eRepository enhanced its performance and ensured data integrity.

Qualitative feedback also showed high user satisfaction, particularly in terms of system design, functionality, and ease of navigation. Users appreciated the ability to access theses and capstone projects remotely, a result consistent with Connaway and Dickey (2010) and Tenopir et al. (2013), who observed that users prefer systems offering immediate and remote access to digital content.

Overall, the eRepository proved to be a reliable, efficient, and sustainable platform for digital thesis and capstone project management. It supports institutional goals of knowledge preservation and accessibility and exemplifies the integration of ICT in modern academic library operations.

6. Conclusion and Recommendations
6.1. Conclusion

The study successfully developed and evaluated a web-based eRepository system designed to automate the storage, retrieval, and utilization of theses and capstone projects in the academic library of Saint Columban College. Guided by the Software Development Life Cycle (SDLC) Waterfall Model, the system was systematically designed, implemented, and tested to address the limitations of manual storage and retrieval practices.

Findings from the ISO 25010 software quality evaluation revealed an overall mean score of 4.65 (Excellent), indicating that the system met high standards in terms of functionality, reliability, usability, efficiency, maintainability, and portability. The results demonstrate that the eRepository achieved its primary objective—to provide an efficient, accessible, and sustainable platform for managing academic research outputs.

The system proved effective in improving accessibility for students and faculty, reducing

retrieval time, and promoting better preservation of scholarly works. Moreover, it reinforced the role of ICT integration in academic libraries as a driver of innovation, collaboration, and long-term knowledge management. The study confirmed that the adoption of digital repositories can significantly enhance institutional research visibility and operational efficiency.

6.2. Recommendations

Based on the findings and evaluation results, the following recommendations are proposed:

1. Institutional Adoption: Academic libraries, particularly those in higher education institutions, are encouraged to adopt similar web-based repositories to strengthen digital preservation and accessibility of scholarly outputs.
2. System Enhancement: Future improvements may include the integration of advanced search algorithms, AI-assisted metadata tagging, and automated plagiarism detection to enhance functionality and user experience.
3. Training and Orientation: Continuous user training should be provided to library staff, students, and faculty to ensure effective system utilization and awareness of digital preservation practices.
4. Periodic Evaluation: The system should undergo regular updates and quality assessments using the ISO 25010 framework to maintain high performance and adaptability to emerging technologies.
5. Scalability and Collaboration: Expanding the system's coverage to accommodate other institutional repositories and inter-library networks can promote collaboration and strengthen research visibility across academic institutions.

Through these measures, the eRepository system can serve as a sustainable model for digital library management, supporting the broader goal of transforming traditional academic libraries into innovative, technology-driven learning environments.

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