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LBELIB: A Development of Digital Library System for

Lawang Bato National High School

A Research Presented

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by

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CHAPTER I

INTRODUCTION

BACKGROUND OF THE STUDY

The Ashurbanipal Library is the oldest example of a traditional library, having been around since the 7th century BCE. Libraries have been a common sight since the beginning of civilization. Although they have faced difficulties, libraries have been essential in facilitating information access and encouraging literacy.

Libraries have limited opening hours, which may not align on everyone's schedules. This can be a problem for people with busy schedules and little free time. According to the University of People (2022), Crowding can be a problem especially around public libraries. Take ValAce for example, a public library in Valenzuela City. During its peak hours, finding a space to even sit and read can be difficult. The Lawang Bato National/Senior High School is an institution in Valenzuela City's first district. accommodating practically all of the nearby students. Originally a tiny school, the complex currently consists of three four-story buildings. According to Aufmann(2020), documenting research is important in studies, ensuring the credibility and traceability of findings. Proper documentation plays a crucial role in validating research and facilitating knowledge sharing. Having said that, the researchers believe that a system for collecting student-produced research papers can assist the Lawang Bato National High School in recording these documents and preserving the students' achievements.

In summary, an archiving system for school research is vital for preserving academic achievements, facilitating future research, and maintaining the institution's academic legacy. It contributes to the school's reputation and quality of education while upholding legal and ethical standards.

The initiative was started and is being carried out by former LBNHS students, it has a special perspective. It takes into account the worries and goals of students who have firsthand knowledge of the academic atmosphere at the institution.

The development of the project will be conducted in Valenzuela City, for these reasons, the mentioned school, Lawang Bato National High School (LBNHS) is located in the city. Also, the researchers studied before this school, making access and communication to the school much easier.

PROJECT CONTEXT

In this modern age of Technology, we find ourselves relying on Information systems. Information sources are multiplying rapidly and becoming more dispersed as the digital world gets bigger. The days of knowledge being restricted to the walls of actual libraries are long gone. Now, with the click of a button, one can access databases of information. Recognizing this shift, numerous academic institutions across the globe have proactively adapted. They have transitioned toward digital libraries, an effort to provide their audiences with an integrated platform for the effortless accessing and sharing of learning materials, bridging the gap between traditional and digital learning.

However, while the digital shift has opened up countless opportunities, it has not come without its challenges, especially for local research endeavors. Students and educators find themselves navigating a maze of platforms when seeking specific academic materials. According to Zine (2022), Most Filipino researchers chose to go abroad to practice their profession, leading to a 139 researchers per 1 million people in the country, plus the lack of support from the government, local knowledge can be scarce. According to Libago (2024) occasional unfamiliarity, particularly students, with digital repositories and

the lack of understanding on using digital tools and resources on finding, evaluating and communicating information, not only slow down academic progression but also create barriers to collaboration, which are crucial in an educational experience.

Lawang Bato National High School (LBNHS) acknowledges the importance of embracing these changes to enhance the learning experience for both students and faculty. However, as our student population continues to grow, issues arise regarding limited access to essential books for research and educational purposes, particularly concerning our cultural history.

To address these challenges, researchers have proposed the digitalization of the school library. This move aims to eliminate problems associated with limited access to physical books and ensure convenience for students. Furthermore, the wear and tear of physical books over time, resulting from frequent borrowing, **underscores** the need for digitalization. Representative Carlo V. Lopez (2nd District, Manila) has emphasized the importance of digitizing libraries under the provisions of Republic Act 10066, or the National Cultural Heritage Act of 2009.

Moreover, the proposal aligns with Senate Bill No. 477, also known as the Philippine Online Library Act, which mandates the Department of Education (DepEd) to convert essential textbooks and reference materials into digital format for primary and secondary education. Additionally, lawmakers have introduced measures to modernize the National Library of the Philippines (NLP), aiming to promote intellectual and cultural development through reading. This statement aligns because almost 20-30 school documents, research papers and reading materials are lost or stored in dust-collecting cabinets. This is a waste of knowledge, as these research documents can help students in the future. That's why the researchers proposed this project in order to showcase and preserve research documents as long as time allows.

Overall, this project isn't just about providing a digital tool. It's about crafting a repository that'll be available for access for students, faculty staff, and storing documents as long as time allows.

PROBLEM STATEMENT

The researchers aim to tackle the widespread use of paper at Lawang Bato National High School. Digitizing books, research materials, and storing other important documents for schoolworks, books and documents will be the plan. This is important for keeping academic achievements safe, helping future research, and preserving the school's academic history. **It also helps improve the school's reputation and the quality of education while following legal and ethical rules**. Additionally, this project seeks to protect the valuable information in these old books by turning them into digital copies. This way, students and faculty can easily use and save these books for the future, making the school library even better.

PROJECT OBJECTIVES

The general objective of the study is to design and develop a user-friendly web platform that serves as a central repository for library materials, documents, and studies conducted by students and faculty members of Lawang Bato National High School.

The study specifically aims to:

1.User and Capabilities

- These are the capabilities of the following users:
  a. Students can log by requesting an account provided by the LBHNS Information Technology Officer. They are capable of borrowing ebooks, books and researches both physically and digitally using the borrowing system. They can access e-books and research materials. Students are privileged to receive alerts or notifications for their

unreturned books. Lastly, they can search for books and research materials within the system.

b. Librarians can log in using the account provided by the LBHNS. They are capable of monitoring student transactions (Borrowing System). They are the ones who are privileged to add books to the inventory (database). They are capable of sending alerts to students who haven't returned books. They are capable of confirming borrowed or returned books. Lastly, they have the privilege to update, modify, and add books to the system.

c. System administrators are assigned to the creation, modification, and deletion of user accounts; they are capable of doing those. They are capable of viewing the dashboard that will show the statistics on what books are the most viewed or borrowed and of viewing reports on how many users access the system on average. Just like the librarian, system administrators can also monitor student transactions (the borrowing system), add books to the inventory (the database), send alerts to students who haven't returned books, confirm borrowing or returning books. Lastly the admin can update, modify, and add books to the system using the Librarian Dashboard.

2.Generated Reports

● The system will be capable of delivering reports on what books or materials are the most accessed by the students. This will be helpful in identifying the trend of what books students used the most. Also, the system will also produce data on how many students use the system per month average. The system will generate the following reports:

- ○ **Borrowed Books Report:** This report tracks the number of books borrowed each week, month, or year, offering insights into reading trends and popular titles to optimize the library's collection.

- ○ **Number of Cancels Report:** Provides data on canceled borrowing requests, helping identify service issues and improve user satisfaction by refining operational procedures.

- ○ **Number of Researches Borrowed:** Quantifies borrowing activity for research materials, guiding collection development and demonstrating the library's support for academic endeavors.

- ○ **Most Borrowed eBook:** Shows which eBook has been borrowed the most.

- ○ **Most Viewed Material:** Highlights which digital content has been viewed the most.

- ○ **Current Active Users:** Tells how many users are currently using the digital library.

- ○ **Average Users This Month:** Gives the average number of users using the library this month.

- ○ **Total Users:** Shows the total number of users who have ever registered.

- ○ **List of Users:** Provides a list of all registered users.Active Users:Identifies users who have recently used the library.

3.Technology

- ● As per the technologies to be used for development of the system, We'll be using Backend, Frontend and Database technologies.

a. **Backend**

■ Django – According to IBM, Django, pronounced as "Jango" is an open-source web development framework that can speed up the process using the python programming language.

b. **Front-end**

■ Bootstrap – According to Oulette(2023) Bootstrap is a vast assemblage of useful, reusable HTML, CSS, and JavaScript code makes up Bootstrap. Additionally, it is a frontend development framework that helps designers and developers create completely responsive websites fast.

■ HTML & JavaScript – According to Testbook(2023) HTML or Hypertext Markup language is a Markup Languages used for creating static webpages while JavaScript is used with HTML to increase the interactivity of webpages

c. **Database**

■ Sqlite3 – According to Rakiviran (2023) an embedded relational database management system without a server is called SQLite. It is an unrestricted, free library that runs entirely in memory and doesn't need to be installed. It is also incredibly convenient because its size is less than 500 kb, a substantial reduction from other database management systems.

4. ISO 25010

1. **Functionality:**

○ Accuracy: Information retrieved through searches and citations should be precise and correct.

2. Performance Efficiency

- Resource utilization - Degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements.: Degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements.

3. **Compatibility:**

   - Interoperability: The system should be compatible with the various web browsers and operating systems that teachers, staff, and students frequently use. To ensure access and usability across multiple platforms

4. **Usability:**

   - Operability: The system should support users in completing tasks efficiently, such as searching for documents, citing sources, and borrowing materials.

5. **Reliability:**

   - Maturity: The system must function consistently and dependably to guarantee constant resource access.

6. **Security:**

   - Confidentiality: User data and borrowing records should be kept secure and accessible only to authorized personnel.

   - Watermarking: The system must prevent unwanted use or distribution of documents stored. This can be achieved by watermarking.

7. **Maintainability:**

   - Modifiability: The system architecture and codebase should be designed in a way that makes modifications and updates simple. In order to accommodate future changes and enhancements.

8. **Portability / Flexibility**

○ Adaptability - Degree to which a product or system can effectively and efficiently be adapted for or transferred to different hardware, software or other operational or usage environments.

PURPOSE AND DESCRIPTION

A web-based system called the LBLIB: Lawang Bato National High School Digital Library System was created to update the institution's library's manual lending and book storage procedures. The goal of the project is to provide the Lawang Bato National High School community—students, faculty, researchers, and outside stakeholders—with an invaluable resource. The following features will be included in the system:

1. **Search Feature:** Implement a robust search functionality that includes both advanced and keyword search. Users should be able to efficiently locate specific documents or topics of interest within the archive.

2. **Citation Management Tools:** The system will make use of features that enable it to automatically produce APA citation styles for the library's documents.

3. **Bookmark System:** Enable users to save and organize important documents by bookmarking papers for quick access at a later time.

4. **Book Cataloguing:** Integration of the Dewey Decimal System, to categorize and filter ebooks and researchers for easy access and searching.

5. **Anti-Plagiarism Feature:** To deter unauthorized use and distribution of copyrighted material, implement anti-plagiarism measures like preview-only mode, watermarking, and no download options for documents.

6. **Speech Command**: By utilizing voice commands instead of physical touch, the system will allow users particularly students to access materials and carry out tasks.

7. **Feature for Borrowing:** Establish a system for users to check out and return documents or books, so as to ensure that library resources are managed properly.

SIGNIFICANCE OF THE STUDY

The development of the DLS holds significant importance, as the proposed system promises to bring about a transformative impact, benefiting various stakeholders within the National High School. This innovative system is poised to elevate the institution in several ways. The result of this study will benefit the following:

1.1 Students

A web-based library significantly impacts students by providing convenient access to diverse educational materials, fostering self-learning, facilitating collaboration, accommodating diverse learning preferences, and promoting critical thinking skills and effective resource evaluation.

1.2 Teachers

Educators also are provided easy access to diverse educational resources, streamlining lesson planning, offering professional development opportunities for lessons, and fostering collaboration among both fellow educators and for their students.

1.3 Lawang Bato National High school

The implementation also significantly enhances the academic environment by providing convenient access to additional educational resources for both students and teachers. This accessibility

encourages independent study, research, and collaboration, ultimately contributing to improved both academic performance and education.

1.5 Future Researchers

The system will provide Future Researchers existing studies about different branches of knowledge available within the DLS, by making information searchable and accessible.

SCOPE AND DELIMITATION

The scope of the Web-Based Digital Library System for Lawang Bato National High School encompasses the creation of a web-based software solution designed to serve as an online library system and to foster a culture of innovation, and knowledge sharing within the academic community. Its primary beneficiaries include students and faculty of Lawang Bato National High School. The proposed software will feature a document repository, user profiles, advanced search capabilities, privacy and security measures, and accessibility features, with the intent of empowering users and promoting open access to academic knowledge.

The study will focus on the technical aspects, functionality, and user experience of the platform. The study will exclusively focus on enhancing the capabilities of students, faculty, and researchers by providing an advanced platform for knowledge sharing. Matters unrelated to these subjects will not be within the study's scope. The study will be only focusing on designing and developing features such as The Search feature allows students to search within the system efficiently, aiding them in locating books, ebooks, and research materials with ease by allowing users to enter specific keywords or phrases associated with their research topics, this tool streamlines the process of locating pertinent resources. Students can quickly access a variety of educational resources that are kept in the system's database by using this feature. The system's intuitive interface improves the whole search experience by making it easier to retrieve information quickly and efficiently. Overall, the implementation of Search feature streamlines the research process for students, promoting productivity and academic success. Next, Citation Management Tools. The system will use features to automatically create citation styles (APA) for documents stored in the library. This function helps users format citations correctly according to recognized standards, making academic writing and research easier. With this capability, users can save time and effort in formatting citations manually. It ensures consistency and accuracy in citing various sources within documents. Overall, this feature simplifies the citation process, enhancing the quality and professionalism of academic work produced using the system.. Bookmarking System,The Bookmark System permits users to mark papers for quick retrieval at a later time, thereby improving their capacity to organize and safeguard essential documents. By providing this functionality, students can easily access and reference materials that they find particularly valuable or relevant to their work. This feature contributes to efficient information management, as they scan conveniently, locate and revisit important papers whenever necessary. Overall, the implementation of the Bookmark System enhances user experience by facilitating effective organization and retrieval of pertinent materials within the system. To borrow materials from the institution's library, they must visit or send a borrow request from the librarian..
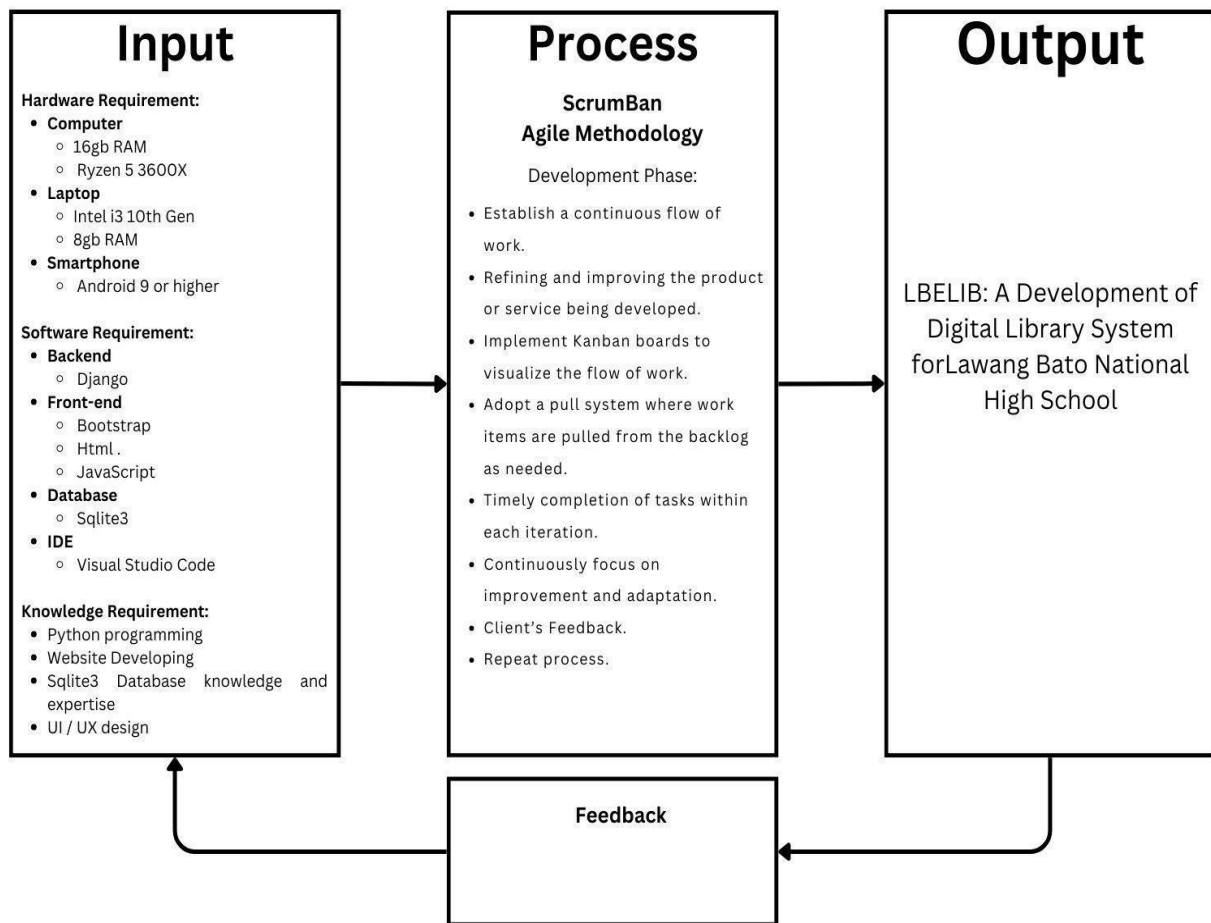
To borrow materials digitally, they must log in to the system and request the materials they require. The request can then be approved by the librarian via their dashboard. In the absence of the librarian, the system administrator can also fulfill the request.Regarding research papers, they are exclusively available for viewing within the digital library; they cannot be borrowed. Additionally, to maintain academic integrity, students are unable to download these papers due to the system's built-in anti-plagiarism feature. Speech Command, The system will empower users, particularly students, by granting them the ability to read and navigate through the materials and execute commands through voice interaction. Through the utilization of speech recognition technology, users can interact with content, take action, and navigate through resources without needing to physically touch the device. This promotes a more engaging and effective learning environment in addition to improving accessibility and convenience.

CONCEPTUAL FRAMEWORK

Input

Hardware Requirement:
- **Computer**
  - 16gb RAM
  - Ryzen 5 3600X
- **Laptop**
  - Intel i3 10th Gen
  - 8gb RAM
- **Smartphone**
  - Android 9 or higher

Software Requirement:
- **Backend**
  - Django
- **Front-end**
  - Bootstrap
  - Html .
  - JavaScript
- **Database**
  - Sqlite3
- **IDE**
  - Visual Studio Code

Knowledge Requirement:
- Python programming
- Website Developing
- Sqlite3 Database knowledge and expertise
- UI / UX design

Process

ScrumBan
Agile Methodology

Development Phase:

- Establish a continuous flow of work.
- Refining and improving the product or service being developed.
- Implement Kanban boards to visualize the flow of work.
- Adopt a pull system where work items are pulled from the backlog as needed.
- Timely completion of tasks within each iteration.
- Continuously focus on improvement and adaptation.
- Client's Feedback.
- Repeat process.

Output

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Feedback

Figure 3. Conceptual Framework of Development of Lawang Bato National High School Research Hub(LBNHS-RH): A Web-based Research Archive Platform

Figure 3 shows the necessary hardware, software, and knowledge needed to successfully finish the suggested project. In order for the development to continue hardware tools are needed, Includes a laptop with an Intel i3 10th Gen processor and 8GB RAM, a computer with a Ryzen 5 3600X processor and 16GB RAM, and a smartphone with Android 9 or higher. These personal computers will be used for development, while servers will be needed for deployment.

The software requirements include Django for backend development, according to IBM, Django, pronounced as "Jango" is an open source web development framework that can speed up the process using the python programming language. The common markup language for making websites is HTML. Programming languages like JavaScript for front-end development let you add sophisticated functionality to web pages. SQLite3 is a C library designed for database management.This lightweight disk-based database can be accessed without the need for a separate server process. For system development, Visual Studio Code is recommended as an independent integrated development environment (IDE) that works with Windows, macOS, and Linux. Developers must be experts in Python programming, UI/UX design, SQLite3 database administration, and website development to ensure that the system is user-friendly. This is essential for the "Development of Lawang Bato National High School Digital Library System," which will be web-based.

The project will use the Scrumban Agile Model, a hybrid approach combining Scrum and Kanban methodologies. According to Ladas (2023), Scrumban aims to improve the flow of work by incorporating Kanban's visual management principles into Scrum's structured framework, helping teams achieve a balance between flexibility and structure, allowing for continuous improvement and adaptation. To ensure the system's effectiveness and usability, developers will seek user feedback following the digital library system's deployment and make modifications in response to suggestions and user needs.

THEORETICAL FRAMEWORK
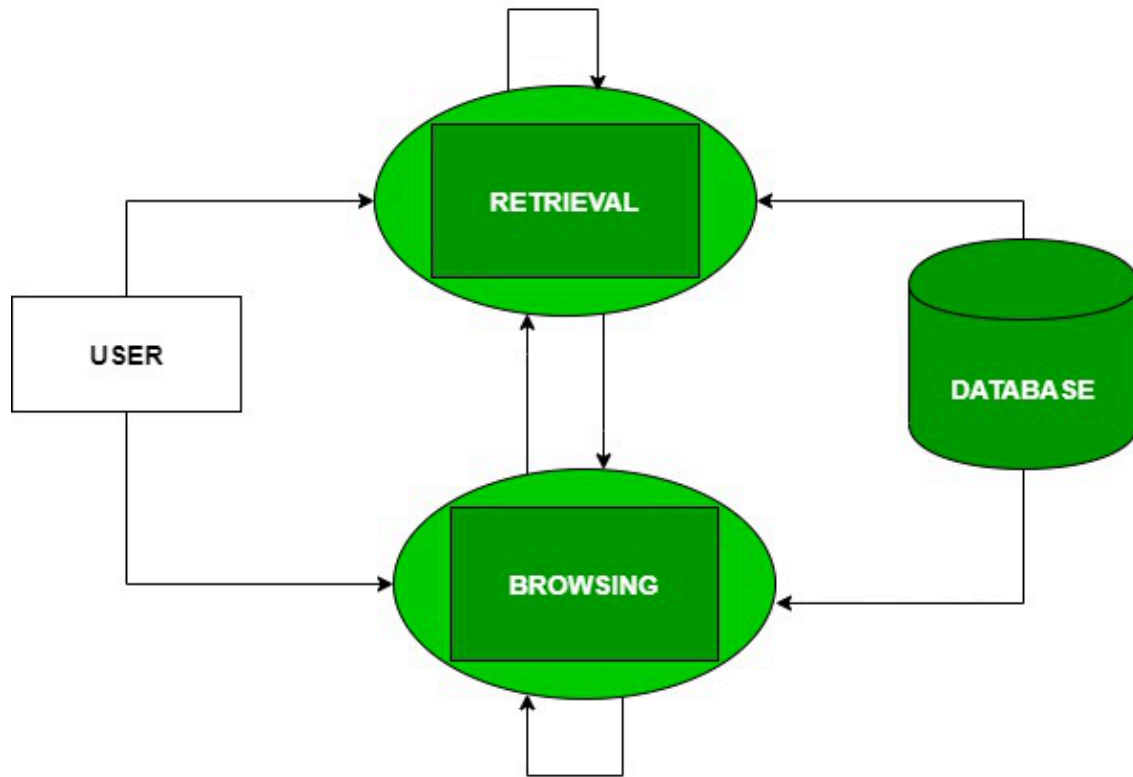
Information Retrieval Model Theory

The foundation of this study relies on Information Retrieval (IR) Models, which are essential for creating an effective digital library system tailored to Lawang Bato National High School's needs. These models help structure and find educational resources within the system, making it easier for students and teachers to access information. Considering that high school students may not be experienced with digital libraries, our system aims to provide clear guidance, instructions, and examples to make navigation and understanding straightforward. This user-friendly approach is meant to help students find and use educational resources more easily. Additionally, IR Models play a crucial role in offering personalized user experiences. Through an analysis of user behavior and preferences, these models are able to

recommend pertinent resources, increasing the digital library's usefulness for specific purposes. Furthermore, these models aid in the logical and accessible organization of vast amounts of data. This organization ensures that information is well-arranged and readily available, which is important for Lawang Bato National High School's educational needs.Furthermore, integrating these models allows for continuous improvement based on user feedback and usage patterns. This adaptability is essential for keeping the digital library relevant and helpful over time, meeting the changing needs of students and teachers.

In summary, Information Retrieval Models are crucial for developing a digital library system that's easy to use and meets the needs of Lawang Bato National High School. By making resources accessible, offering personalized suggestions, and organizing information effectively, our system aims to enhance the educational experience for all users.

DEFINITION OF TERMS

- **Digital Library** – A digital library, According to Hannais, K. T.(2023) a collection of digital objects, such as books, magazines, audio recordings, video recordings and other documents that are accessible electronically.

- **IDE** – According to Codecademy (2022), IDE or integrated development environment, gives programmers the ability to combine the many elements of developing a computer program. By incorporating common software development tasks like editing source code, creating executable files, and debugging into a single tool, IDE boosts programmer efficiency.

- **Bootstrap** – According to Zola, A.(2022), Bootstrap is a free, open-source front-end development framework for the creation of websites and apps. Designed to enable responsive development of mobile-first websites, Bootstrap provides a collection of syntax for template designs.

- **DJango** - According to Aryan Gupta (2023), Django, a web application framework built on Python, is freely available and open source. It simplifies development by offering a collection of modules bundled together, enabling the creation of apps or websites without the need to begin coding from the ground up.

- **Agile** – Agile SDLC or Agile Software Development Life Cycle, According to Monday's blog(2022), it represents a change from the traditional software development life cycle that front-loads the work for software development teams.

- **LBNHS** - Lawang Bato National High School or LBNHS, located in Centro St. Lawang Bato, Valenzuela City. The school is commonly known as the first solar-powered facility in Metro Manila.

- **Dewey Decimal Classification(DDC)** - According to The Editors of Encyclopaedia Britannica. (1998b, July 20) The Dewey Decimal Classification system organizes library contents into 10 main groups, each divided into more specific categories using a numerical shorthand for easy identification and location. Developed by Melvil Dewey in 1873, it remains adaptable for various library sizes and uses patterns for memorization and cross-referencing.

CHAPTER II

REVIEW OF RELATED LITERATURE AND SYSTEMS

TECHNICAL BACKGROUND

The development of Lawang Bato National High School Digital Library System involved a thoughtfully curated blend of technologies and methodologies. According to Aryan Gupta (2023), Django is a web application framework built on Python, freely available and open source. It simplifies development by offering a collection of modules bundled together, enabling the creation of apps or websites without the need to begin coding from the ground up. The researchers incorporate HTML (Hypertext Markup Language) and CSS (Cascading Style Sheets) into our application for fundamental reasons related to web development. HTML, as outlined by e//ow (2023), serves as the backbone for structuring the content of web pages, and defining elements like headings, paragraphs, and links. On the other hand, CSS, as described by G, D. (2023), is crucial for styling and layout, allowing us to control the visual presentation, including aspects like colors, fonts, and overall design.

The utilization of HTML and CSS is essential for creating a well-organized and visually appealing user interface in our Lawang Bato National High School Digital Library System. While CSS helps create a unified and visually appealing design, HTML makes sure that content is properly organized to make navigation and information presentation easier. When combined, these technologies improve the user experience in general and increase the accessibility and usability of our web application.JavaScript, according to Madhyastha H. V. (2022), was employed for dynamic front-end interactivity, enhancing the

user experience. SQLite as highlighted by Christudas (2019), was selected for robust database management, ensuring reliability and data integrity.

The researchers will use the ScrumBan Agile software methodology because of its systematically structured and linear development approach, which was deemed highly suitable for achieving clear project milestones and ensuring comprehensive documentation (Harkirat Kaur Aroral, 2021). This approach aligns well with the requirements of developing the Lawang Bato National High School Digital Library System Application, providing a solid framework for overseeing the entire development process and achieving successful outcomes.

Text-to-Speech (TTS) functionality, our attention is directed towards the eSpeak text-to-speech system. This compact, open-source software speech synthesizer is meticulously designed for English and various other languages, ensuring compatibility with both Linux and Windows operating systems. Employing the "formant synthesis" technique, eSpeak exhibits versatility by supporting numerous languages while maintaining an efficient, compact size. However, it is crucial to acknowledge that the clarity and speed of the speech generated by eSpeak may compromise the naturalness and fluidity present in larger synthesizers relying on human speech recordings. The application scope of eSpeak significantly extends into the domains of education and accessibility. In educational settings, eSpeak proves invaluable for enhancing content accessibility and addressing diverse learning needs. Additionally, the text-speech feature also improves the accessibility for those visually impaired and learning disabilities users.

In network security, Web application firewalls, or WAFs, are a crucial piece. They are thoroughly examined in "Web Application Firewall: Network Security Models and Configuration." Web application firewalls (WAFs) are vital for safeguarding web applications because, when set up correctly, they offer a

wide range of security measures. But if these tools are used excessively, it can create a false sense of security, which is a serious concern.The application of WAFs extends across critical areas of network security, educational data protection, and compliance. In network security, WAFs contribute to fortifying the infrastructure against cyber threats and unauthorized access. Within educational environments, these systems play a crucial role in safeguarding sensitive data, and ensuring the security and privacy of educational information. Moreover, WAFs contribute to compliance efforts, assisting institutions in meeting regulatory requirements and standards for network security.

An analysis of the technological landscape of content curation, according to Juan D. Aguilar-Peña (2022), points us toward an advanced content curation system that is described in the section titled "Intelligent Content Curation System (ICCS)." Web application firewalls (WAFs) are crucial for safeguarding web applications because, when set up effectively; they offer a wealth of security features. Overuse of these tools, however, carries a significant risk of creating a false sense of security.The adaptability of this content curation system spans across educational resource management, student learning support, and administrative functionalities. Within educational settings, ICCS facilitates the seamless curation and organization of relevant resources, enriching lesson planning and classroom activities. Its personalized support for learning aids students in navigating educational content tailored to their needs. Administrators benefit from ICCS by efficiently managing and optimizing the educational content landscape, aligning with institutional goals and educational objectives.

Diving into the technical landscape, our attention shifts to Semantic Keyword Search, showcased by the advanced Intelligent Keyword Search Engine (IKSE) in the section titled "Intelligent Keyword Search Engine (IKSE)." While Shneiderman (2018) provides insights into keyword search, it's crucial to note that the discussion on IKSE stands independently, highlighting an innovative technology that harnesses semantic understanding. IKSE enhances traditional keyword search capabilities by going

beyond simple string matching and exploring the context and meaning of keywords to deliver results that are not only accurate but also contextually relevant. The application scope of IKSE is extensive, particularly emphasizing education, student research, and administrative functions. In educational contexts, IKSE refines information retrieval, contributing to enriched learning experiences. Its utility extends to student research, facilitating the discovery of pertinent academic resources, while administrators benefit from IKSE's enhanced search capabilities in managing and optimizing information retrieval systems within educational institutions.

In their study on electronic library keyword search, Enny Dwi Oktaviyani, Ari Lestari, and Licantik explore a novel approach using a syntactic semantic similarity algorithm named sinsem. By leveraging techniques based on wordnet and Levenshtein distance, this algorithm aims to enhance the precision and recall of search results. The researchers highlight the importance of efficient search functionalities in electronic libraries, which house vast collections of digital resources. They address the common issue of mismatches between search queries and results and propose sinsem as a solution. Through experimentation with updated datasets, the study demonstrates the effectiveness of sinsem in improving the accuracy of keyword searches within electronic libraries. In the study "Accurate Approach Towards Efficiency of Searching Agents in Digital Libraries Using Keywords" by Vijayalakshmi Yellepeddi et al. , a method for rapid and effective signature-based similarity search in digital libraries is discussed. In the study "Enhanced Algorithm for Searching in Library and Scientific Research Bases" by Basahel et al introduces a modified approach to improve search accuracy and effectiveness. The proposed algorithm, based on modifying the term frequency-inverse document frequency (TF-IDF) technique at the paragraph level, aims to address limitations in traditional search methods. It assigns importance weights to paragraphs and enables users to search for specific elements within documents. Comparative evaluations demonstrate the superiority of this approach, suggesting its potential application in scientific production platforms. The paper on "Dimensions of Plausibility for Narrative Information Access to

Digital Libraries," the authors conduct case studies to analyze the process of making a narrative plausible. They contribute a set of dimensions essential for realizing narrative information access in digital libraries, emphasizing the complexity beyond keyword-based access paths.

RELATED LITERATURE

Through their analysis of the Swedish government's activities, Borgerud and Borglund's research highlights the coordinated endeavor to guarantee the availability of publicly funded research data and scientific publications. Their analysis emphasizes the importance of accessibility while highlighting the challenges in preserving the long-term dependability of this important data. Their focus on the need for improved coordination and standard operating procedures strikes me as a crucial component of accessible and long-term information sharing. The insights provided by Edward A. Fox, Marcos A. Gonçalves, and Neill A. Kipp (N.D.) regarding digital libraries suggest that these resources will play a major role in altering educational paradigms. Their creative ideas represent the increased use and accessibility of interactive materials, hinting at the significant impact these developments may have on more general digital preservation projects in the field of education.

Understanding the complicated context around digital libraries in education requires a complete understanding of the studies given by Astrias Digital Library. Their research not only clearly acknowledges and addresses important difficulties, but also highlights the many positives, such as enhanced searchability, ongoing availability, and accessible from anywhere in the world. These include intricate issues including the potential for copyright violations, variations in access speeds, costly infrastructure, bandwidth limitations, challenges with efficiently obtaining content, and inherent differences from a regular library setting. Azim, Yatin, Jensonray, & Ayub@Mansor's detailed exploration into the multifaceted concept of digitization and its profound impact on the accessibility and preservation

of records and archives. Their study resonates with the paradigm shift in administrative approaches towards preserving evidential data and historical documents over prolonged periods, emphasizing the widened accessibilities and innovative presentation methods digitization brings forth. Malak's comprehensive study offers a panoramic view of the intricate hurdles in the domain of digital preservation. Unpacking challenges ranging from the peril of data loss due to hardware failure or cyber threats to the intricate landscape of file format obsolescence, storage fragility, and the crucial need for stringent backup strategies and standardized protocols, their research underscores the imperative for holistic solutions in this complex arena.

Abdul Shareef Pallivalappil and Jagadeesha S. N.'s proposed decentralized archiving system represents an innovative stride toward enhancing the prioritization and accessibility of scholarly articles. Their technological proposition aligns seamlessly with the evolving landscape of digital preservation strategies, marking a potential shift in archiving methodologies for research articles. Rahul Verma and Eetika Kapoor's report on India's ambitious plan for a National Digital Library for children signifies a monumental leap towards democratizing education. With a primary aim to offer high-quality educational resources, this endeavor is poised to become a fulcrum supporting research and education across various educational tiers, encompassing elementary to postgraduate levels, while promising additional facets like non-curricular reading and digital epigraphy. In an intricately woven tapestry of studies by various researchers like David and Alayon, Ballecer, Bautista and Subingsubing, Subia and Corpuz, Dela Peña, Lacsamana, Cabato, and Katigbak-Lacuesta, the landscape of digital archiving, Philippine digitalization, cultural heritage preservation, and the challenges tethered to traditional archival methods unfolds. These studies collectively paint a vivid picture of the multifaceted efforts, challenges, and advancements within the Philippine context, amplifying the importance of digital preservation and knowledge access within the region.

This research article "Development of an Open Source Automated Library System with Book Recommendation System for Small Libraries", authored by Kitti Puritat and Kannikar Intawong, presents a method to develop an open-source automated library system with book recommendation features, tailored for small libraries. The approach combines machine learning techniques, including support-vector machines, with various book features such as title similarity and bibliographic information. The method was evaluated using data from Banpasao Chiangmai school, demonstrating its effectiveness for small libraries. Allana Delgado(2021) curated a list of seven digital libraries in the Philippines, highlighting their online accessibility amid COVID-19 restrictions. Among these is the Filipinas Heritage Library, known for its focus on Philippine history and culture, offering digitized materials via its Online Library. The University of Santo Tomas also contributes with its Heritage Collections, providing access to rare and historical materials in digital format. Additionally, the Department of Science and Technology's PCAARRD eLibrary offers research resources, while the Supreme Court's E-Library serves legal research needs. The SEAFDEC AQD Library and Data Bank Online Repository supports aquaculture research, and the Legislative Information Reference and Service Development Bureau of the House of Representatives provides COVID-19 E-resources. Lastly, the National Library of the Philippines offers various online resources and conducts virtual activities amidst the pandemic, ensuring continued access to knowledge. Aineena Hani (2021) discusses the rise of digital libraries in the Philippines amidst the COVID-19 pandemic, emphasizing their crucial role in remote education. The National Library of the Philippines (NLP) aims to enhance its services and facilities to meet evolving learning needs, including improving online resources and preserving cultural heritage. Digital libraries bridge the gap between learners and resources, especially during nationwide closures, and have become essential tools for preserving heritage and promoting human development. As e-libraries continue to grow, fueled by technological advancements and changing learning habits, they remain integral to the education landscape. On text to speech. The article by H. Frank Cervone (2013) in Oclc Systems & Services explores strategies for

enhancing accessibility in digital libraries, emphasizing responsive design and various techniques. These insights are closely related to the importance of text-to-speech (TTS) technology, which enables users with visual impairments or learning disabilities to access textual information through auditory means. Integrating TTS capabilities aligns with the broader objective of digital libraries to provide inclusive platforms for diverse user groups. The paper "Speech Recognition Technology for OPAC Service: An Innovative Idea for Indian Libraries" by Maneesh Kumar Bajpai et al. proposes implementing speech recognition technology to improve library search services. The authors advocate for a talking WebOPAC (Web-based Online Public Access Catalog) to address concerns over traditional text-based search interfaces, highlighting the growing preference for voice search in the digital age. The article "Text to Speech Converter Using Python" by S. S et al. presents an innovative technique for converting text images into speech, aiding visually impaired individuals in computer interaction. The authors emphasize the importance of enabling users to hear text content, particularly in scientific literature, and describe the design, implementation, and experimental outcomes of the proposed converter. Within the domain of text-to-speech processing, the scholarly work titled "Text-to-speech processing" authored by Chicote Roberto Barra et al. represents a significant advancement. This study takled deep into the intricate process of generating synthesized speech from input data. At its core lies a sophisticated speech model, meticulously designed to encompass various components. Notably, an encoder is employed to meticulously encode input data, transforming it into a contextual vector. Subsequently, a decoder comes into play, tasked with unraveling this vector and translating it into spectrogram data. Moreover, the authors introduce a novel aspect to the model—the voice decoder, which plays a pivotal role in interpreting vocal characteristic data to refine the synthesis process further. In "Recommender Systems in Digital Libraries Using Artificial Intelligence and Machine Learning: A Proposal to Create Automated Links Between Different Articles Dealing With Similar Topics" by Namik Delilovic, the author explores the limitations of current advanced search options in digital libraries, which often provide only basic

parameters such as year, author name, and publisher. The chapter proposes leveraging machine learning and artificial intelligence techniques to enhance the search experience by offering continuous recommendations for additional content while users are reading articles. In "Digital Library: An Innovation in Infrastructure in Learning and Development amongst Students" by Devrshi Upadhayay, the author explores the concept of digital libraries as a recent development in Library and Information Science. The paper aims to provide literature on digital libraries focusing on user-driven approaches, potentially benefiting future research in the field. In "Citation Management Tools: A Practical Guide for Librarians" by David Petersen, the author provides a practical guide for librarians, offering a comparison of citation managers and cite managers. The article highlights the time-saving features of citation managers, particularly their ability to quickly create bibliographies, which has historically perplexed researchers. In their exploration of digital library service construction and enhancement, the authors into the dynamic field of digital books and libraries. Addressing the evolving landscape shaped by 5G technology, big data, and artificial intelligence, the paper underscores the increasing relevance of digital libraries in meeting diverse information needs. Emphasizing the importance of adapting to the changing environment, particularly in response to digital and paper book developments, the authors propose strategic measures for university libraries. Among these considerations, the role of bookmarking likely emerges as a crucial aspect in facilitating user engagement and information access within digital library services. In his examination of digital libraries, Sampathkumar into the intricacies of their features, strategies, infrastructure, and benefits for users in the digital era. Emphasizing the transition from traditional libraries to digital ones, the paper sheds light on the specialized nature of digital libraries, which house a collection of diverse digital assets. Among the various aspects discussed, the paper likely addresses bookmarking as a pivotal feature enhancing user interaction and resource accessibility within digital library environments. De Castell, Christina, et al. (2022) focuses into the legal considerations surrounding the lending of digital copies of books by libraries in Canada, with a focus on bookmarking as

a practical aspect. Adapted from a whitepaper by Hansen et al., the paper explores controlled digital lending and its implications within the Canadian context. It discusses the legal and policy rationale for this process, highlighting practical considerations for implementation. By addressing bookmarking, the authors aim to enhance user experience and access to digital lending materials within Canadian libraries. The Sampathkumar, M. (2020). of the study on library digitization (2022) stress the advantages of digitization in terms of document preservation, improved access, and reduced plagiarism. Digital Library, Features, Strategies, Infrastructure and their Benefits for Users in Digital Era. Journal of Emerging Technologies and Innovations, 7(9), 964-975. This literature provides a detailed overview of the digitalization of libraries, discussing their benefits, limitations, planning, infrastructure, hardware, and software requirements for library users.

RELATED STUDIES

Many studies provide important insights into issues and solutions related to information preservation and access in the context of archive systems and research data management. In their research paper "Research and Capstone Project Electronic Repository," Lalisan and Sobejana (2019) establish the foundation for future studies by highlighting the remarkable functionality and usability of electronic repositories in spite of website performance issues. Comparably, Nurdin (2021) highlights in "Archives as Information Infrastructure and Their Urgency Towards Research" the vital role archives play in maintaining primary documents and raising the caliber of research, which is consistent with our own emphasis on the archives' critical role in assisting academic pursuits and the upkeep of historical records.

In addition to our focus on archiving systems and data management, Wright, Brunner, and Nebel's (2018) study addresses the difficulties in managing research data and emphasizes the significance of

centralized and secure storage solutions. This highlights the wider implications and importance of secure data storage for academic and research institutions. When combined, these studies offer a thorough understanding of how archiving systems and efficient research data management are related. As a central repository essential for nursing-related information, Minabelle L. Gutierrez's (2020) Philippine Nursing Research Archive highlights the potential influence of even the tiniest data piece on saving lives. Using this archive guarantees that vital information is available, which improves nursing practice, lowers healthcare costs, and influences patient recovery. Han Xiao, Zhang Xiongfei, and Mao Guangjun (9 January 2018) further stress the significance of creating a quick search function in an archive system in order to lessen burden and improve database performance. The construction of an e-document archiving system with SMS support is discussed by Alpasan et al. (2021), who highlight the system's efficacy in safeguarding school data and provide insightful information about the functionality and efficiency of archiving systems, which is in line with our scientific goals. Chang et al. (2018) and Caluza (2018) highlight the benefits of digital archive systems over traditional techniques in the field of education archiving systems, emphasizing their necessity to minimize document loss due to disasters and increase knowledge integrity. Shinga's (2020) observations on technology in education and Itsourcecode's (2018) Thesis Online Archiving System further highlight the value of digital platforms for accessing historical research and improving educational opportunities. Jon E. Royeca (2022) focuses into the Spanish Origins of the National Archives of the Philippines, providing insight into the creation and conservation of historical Spanish records, before moving on to the topic of Local Studies. By digitizing World War II Philippine archives, Sobreviñas (2019) adds to the conversation on digital preservation while also working to prevent documents from deteriorating. Other studies takled into electronic document archival systems, archiving in educational institutions, performance and cultural archives, and the role of web archives in supporting future researchers, providing a comprehensive view of historical origins, technological advancements, and preservation efforts across various domains. The research by Mugi

Praseptiawan, Puji Siswanto, and Tjut Afrida explores the integration of digital libraries within the context of Generation 4.0 education, emphasizing the significance of conceptual design in the development of these libraries. Many existing studies on digital libraries fail to address the diverse needs and behaviors of different users. To address this gap, the authors developed a digital library system with a novel interface and improved content-sharing capabilities for educational purposes. The system was evaluated using two experimental classes and a control class. Qualitative feedback from users showed a high level of satisfaction, with 80.9% of comments being positive, indicating the system's suitability for the learning process. The evaluation results also demonstrated that students in the experimental classes exhibited better information technology literacy skills compared to those in the control class, underscoring the effectiveness of the digital library in enhancing learning outcomes. Authors A. M. Fresnido and Sharon Maria S. Esposo-Betan conducted a study in 2017 titled "Going Green: Sustainable Practices in Philippine Libraries." It examines the sustainability efforts of Philippine libraries, aiming to gauge their progress in adopting environmentally friendly practices. Through a descriptive survey method using the Preliminary Green Assessment Checklist, the study found that a majority of surveyed libraries received a green rating, indicating advancements in sustainability. Despite limitations in survey responses, this study is the first of its kind in the field, shedding light on the environmental initiatives within Philippine libraries. In "In Modern Digital Environment various features of Citation Management tools Mendeley & Endnote: A study" by Payel Saha, various features of the citation management tools Mendeley and EndNote are examined to enhance research management. The study concludes that Mendeley is superior in importing data from Google Scholar, offering valuable insights for researchers on the usage of these tools. In the study by Gada, Dharmil, et al. introduces ReLis, a smart e-library system designed to address challenges in accessing and navigating through books, particularly for users who cannot physically visit libraries. The system aims to be eco-friendly and secure, emphasizing the importance of web security in protecting user information and digital data. It highlights the significance of

digital libraries in preserving research data and information for future generations, especially in the context of online learning growth. In their exploration of digital library services, Dr. V. Senthur Velmurugan's examination of digital library services places a spotlight on the crucial function of bookmarking within these platforms. By emphasizing the role of bookmarking features, the paper illuminates how users can efficiently save and organize digital resources for future reference. In the context of academic and research organizations, bookmarking capabilities enhance the accessibility and retrieval of pertinent information, contributing to a streamlined and efficient scholarly workflow. Sanjay Singh's exploration of library digitization and the rise of digital libraries sheds light on the pivotal role of bookmarking within these evolving platforms. Emphasizing the utilization of the Greenstone digital library software, the paper elucidates how bookmarking features enhance user experience and information accessibility. By facilitating efficient saving and organization of digital resources, bookmarking emerges as a crucial component for librarians and information scientists navigating digitization initiatives. This discussion underscores the significance of bookmarking in streamlining access to diverse digital library collections, catering to the needs of global communities across various fields. Bhowmick et al. (2022) discuss the National Digital Library of India (NDLI) in Communications of The ACM. NDLI democratizes education by offering diverse educational content in multiple languages. Unlike general search engines, NDLI focuses solely on educational resources and provides bookmarking features for users to save and organize content, enhancing accessibility and usability for learners and educators nationwide. Liu, J., Wang, H., Zhang, X., & Qin, P. Method and device for updating local speech library. This study introduces a method and apparatus for updating a local speech library, which addresses the issue of poor offline speech recognition due to limited locally stored speech resources by periodically updating the speech library with the latest voice control commands used by users, thereby improving recognition accuracy. Chen, J., & Chen, L. . Digital library book acquisition system integrating book borrowing with book returning. Journal/Conference Name. This study presents a digital library book

acquisition system that integrates book borrowing with book returning, featuring components such as a reader book borrowing card, downloading and card reading module, reader client side, converter, central processor, digital library, timing module, third-party payment software, and copyright owner client side, aimed at enhancing the convenience and efficiency of the borrowing process for users. Sun, Y., Zhu, X., Xiao, J., Tang, G., & Liao, Y. Library E-book borrowing method, device and system oriented to multiple content distributors. Journal/Conference Name. This study presents a method, device, and system designed for library E-book borrowing, enabling seamless integration with existing paper book borrowing systems and reducing management costs associated with E-book borrowing.

RELATED SYSTEMS

The **Digital Archives of the University of the Philippines Diliman** (UPD) serves as the official Institutional Repository and holds the responsibility for preserving the enduring archives of various offices within the UP System. Its main responsibilities are to identify, acquire, maintain, preserve, and make digital institutional records and historical documentation of the university easier to access. Given their ability to ensure the preservation of the institution's collective memory, the Digital Archives are crucial to upholding UP Diliman's rich history and legacy.

Scholarly articles and content about the historical narrative of the Philippines and its diverse communities are published in the internationally recognized journal **Philippine Studies: Historical and Ethnographic Viewpoints**, which is published by Ateneo de Manila University. The journal actively encourages contributions from academics with no particular background in Philippine studies and promotes a transnational and comparative viewpoint. It is open to international peer review. Emphasizing

accessibility without overly technical language, it serves as a platform for enriching theoretical insights within the broader context of Philippine history and culture.

The **Southeast Asia Digital Library** (SEADL), established by CORMOSEA, provides free and unrestricted access to a wide range of materials related to Southeast Asia. SEADL includes digital versions of books, manuscripts, periodicals, and multimedia content like videos and oral histories. Beyond primary source materials, SEADL offers indexes of supplementary online sources relevant to the region. Serving researchers, educators, and the general public, SEADL creates a unified online platform that is user-friendly for browsing and searching, presenting unique digitized resources to a global audience.

The **National Archives** of the United States Federal Government safeguards approximately 1% to 3% of documents and materials deemed historically or legally significant. The National Archives preserves these priceless documents and makes them easily accessible to anyone researching historical subjects, confirming military service, or tracing family history. The National Archives is essential in making historical records available to the public because of its dedication to information preservation and accessibility.

The University of Chicago Archives is responsible for maintaining the institution's historical records, which include the contributions made by its faculty and the dynamics of the academic community. Systematically acquiring and conserving a diverse range of materials, including digital content, the University Archives holds records pertaining to administrative operations and academic entities. These collections include memorabilia, photographs, audio recordings, video and film, campus publications, personal papers of faculty, trustees, administrators, students, and alumni. The University Archives helps to preserve and share the rich history of the University of Chicago by means of its extensive holdings.

Scispace stands out as an innovative tool created to bridge the divide between intricate research papers and their comprehension in more accessible terms. This tool offers an exceptional benefit to researchers by simplifying the understanding of complex papers. Notably, SciSpace enables researchers to takle into related papers and provides a convenient feature for preserving crucial segments of papers, greatly aiding in their literature review process. Furthermore, it proves to be valuable for exploring new research areas and cultivating future research interests.

A web search engine that is publicly available, **Google Scholar** comprehensively indexes scholarly literature from a variety of academic disciplines and publishing formats. Researchers, students, and academics looking for information and references in a variety of fields will find this platform to be a priceless resource as it scans and contains the complete text or metadata of books, conference papers, research articles, and other scholarly works.

Educational resources and literature are available in full-text and index format through the helpful database **ERIC (Education Resources Information Center).** supported by American taxpayers. A useful tool for academics researching education is the Department of Education's Institute of Education Sciences. ERIC contains links to numerous full-text documents containing a wide range of source types, including conference papers, books, dissertations, curriculum guides, journal articles, and policy papers. Additionally, researchers can narrow down their search results based on education levels, such as Early Childhood Education, and intended audiences, like Counselors or Teachers. This feature enhances the precision of information retrieval.

Elsevier is dedicated to the enduring accessibility and protection of scholarly research, striving to guarantee access through the conversion and enhancement of digital file formats in accordance with

contemporary technology standards. Our collaborative efforts extend to working alongside various organizations while simultaneously maintaining our proprietary digital archive.

DOAJ stands as a distinctive and comprehensive repository of diverse open-access journals worldwide, powered by a burgeoning global community. It upholds a dedicated commitment to making quality content accessible to all, free of cost, through online platforms. DOAJ is steadfast in its commitment to provide free services, including journal indexing and unrestricted access to its data. This pledge aligns with the overall goal of ensuring unimpeded access to essential academic resources.

Sematic Scholar, a inovative search engine intriduce by The Allen Institute for Atificial Intellegence.It is efficiently connects academics, researchers, and students with scholarly literature by offering precise search results and facilitating the discovery of significant insights. Semantic Scholar promotes collaboration within the academic community and democratizes knowledge through its emphasis on open-access initiatives. Its tailored recommendation system informs users of new advancements in their domains, making it an effective and intuitive tool for sifting through the large volume of scholarly literature.

A popular academic social networking site that encourages researcher collaboration is called **ResearchGate.** By exchanging publications, establishing connections with peers, and participating in dialogues, users can foster a collaborative atmosphere. By enabling researchers to share their work globally, offering metrics for publication impact, and acting as a virtual gathering place for interdisciplinary interactions, the platform places a strong emphasis on accessibility. ResearchGate is essential for removing obstacles to cooperation and advancing science more quickly.

Microsoft Academic is a scholarly search engine designed for the efficient exploration of academic literature and research papers. With advanced algorithms, it offers precise search results and

integrates seamlessly with Microsoft tools like Word. The platform provides features that will surely help the users: citation metrics and author profiles, making it a valuable resource for researchers and students.

WorldWideScience an international search engine that serves as gate way to a collection of global scintific database. It enables users to efficiently explore and access scientific research and literature. The platform is notable for its multilingual search capabilities, which promote inclusivity and cross-border collaboration within the scientific community.

The Bielefeld Academic Search Engine, or BASE, is a thorough search engine made to make scholarly resources easier to find. It is an effective tool for exploring scholarly publications, theses, and articles for researchers, students, and academics. With an extensive collection of content from various sources, BASE offers a user-friendly platform for efficient and targeted academic research.

Internet Archive Scholar is a pioneering initiative preserving scholarly content from diverse sources, including the Wayback Machine and Archive-It collections, digitized print materials, and general archive.org collections. The 2019 FORCE11 conference presentation outlines its technical framework and commitment to facilitating text and data mining. Metadata is sourced from the user-editable catalog at fatcat.wiki, with regular uploads to archive.org ensuring ongoing access to the full metadata corpus.

Taking inspiration from Cornell University's arXiv.org, the **Research Archive of Rising Scholars** stands as an open-access repository dedicated to scholarly articles contributed by the most inquisitive and talented young minds of our generation. Articles that have not been subjected to peer review can be found in this archive, which covers a broad range of academic subjects like STEM and the humanities. Its main objective is to give up-and-coming academics an open-access platform where they can exhibit their work while they get their articles ready for other publications.

The University of Oxford's institutional repository, known as ORA (Oxford University Research Archive), was founded in 2007. It aims to provide open access to a wide range of academic content, including articles, theses, research data, and more. It securely archives research materials created by Oxford's members. The repository promotes the sharing of scholarly output under open access conditions, facilitating free access to research and aligning with university compliance with research funder policies. Visit the Open Access Oxford website for additional information on open-access initiatives at the University of Oxford.

ERA, the digital repository of The University of Edinburgh, houses original research works authored or affiliated with academic entities at the university. These documents, deemed of sufficient quality for preservation by the library but not controlled by commercial publishers, encompass a variety of content, such as full-text digital doctoral theses, master dissertations, project reports, briefing papers, and out-of-print materials.

The faculty, staff, and knowledge creators at American University have their intellectual contributions updated and stored in **AURA, the AU Research Archive**. A wide variety of research outputs, including working papers, preprints, manuscripts, datasets, theses, dissertations, and other scholarly materials, are preserved and made freely accessible through this archive.

MC Digital Library, guided by Catholic teachings, provides quality resources and services to support the school's mission. It aims to offer diverse materials, create a conducive learning environment, and empower users through well-trained staff. It envisions becoming a dynamic hub for collaboration and knowledge exchange, leveraging technology for equal access to resources.

The National Library of the Philippines (NLP), University of the Philippines (UP), Department of Science and Technology (DOST), Department of Agriculture (DA), and Commission on Higher

Education (CHED) have collaborated to create **Philippine eLib**. The objective of this cooperative endeavor is to augment the availability of digital resources and foster information exchange among diverse establishments and interested parties throughout the Philippines.

The University Library Diliman, comprising a Main Library and 29 College/Unit Libraries, serves as a premier information hub for diverse fields of study. Established officially in 1922, it has grown to support teaching, research, and extension work. Prioritizing excellence, it aims for full automation, a top-notch collection, and modernized services. Key functions include providing accessible learning spaces, enhancing information literacy, curating diverse resources, adopting modern technologies, and ensuring resource longevity through effective archiving.

PROJECT SYNTHESIS

The researchers synthesized foreign and local studies, literature, and research findings. The review explores various topics, including archival systems, research data management, digitization of records, challenges in digital preservation, educational archives, and the impact of technology on education.

Research and writing on digital archiving and preservation tells a whole story by fusing together several viewpoints on this ever-evolving field. The Swedish government's efforts to make publicly financed research data accessible are clarified by Borgerud and Borglund, who emphasize the vital need for improved coordination and defined methods for long-term trustworthiness. The investigation by Fox, Gonçalves, and Kipp highlights the expanded accessibility to interactive resources while projecting the revolutionary role that digital libraries will play in education. A sophisticated take of the benefits and difficulties of incorporating digital libraries into educational settings is offered by the Astrias Digital Library research.

Azim, Yatin, Jensonray, & Mansor takled into the concept of digitization, emphasizing its profound impact on the accessibility and preservation of records and archives. Malak's comprehensive study unravels the many hurdles in digital preservation, resulting in solutions to address challenges ranging from data loss to file format out datedness..

Shifting focus, Pallivalappil and Jagadeesha S. N. propose an innovative decentralized archiving system, offering a fresh perspective on organizing and prioritizing research articles. Verma and Kapoor's report on India's National Digital Library for children shows a considerable leap in democratizing education.

Turning to related studies, Lalisan and Sobejana contribute insights into electronic repositories, acknowledging their functionalities despite some performance issues. Nurdin emphasizes the vital role of archives in supporting research. Wright, Brunner, and Nebel discuss the challenges in managing research data, emphasizing the importance of secure storage solutions. The Philippine Nursing Research Archive emerges as an important repository for nursing-related information. Alpasan et al.'s discussion of an e-document archiving system underperforms its effectiveness in safeguarding school data.

In essence, this synthesis provides an analytical and informed perspective, collecting insights from related literature and studies. The varying nature of digital archiving and preservation becomes apparent, offering a valuable resource for researchers, educators, and practitioners in the field.

CHAPTER III

DESIGN AND METHODOLOGY

3.1 Development Model
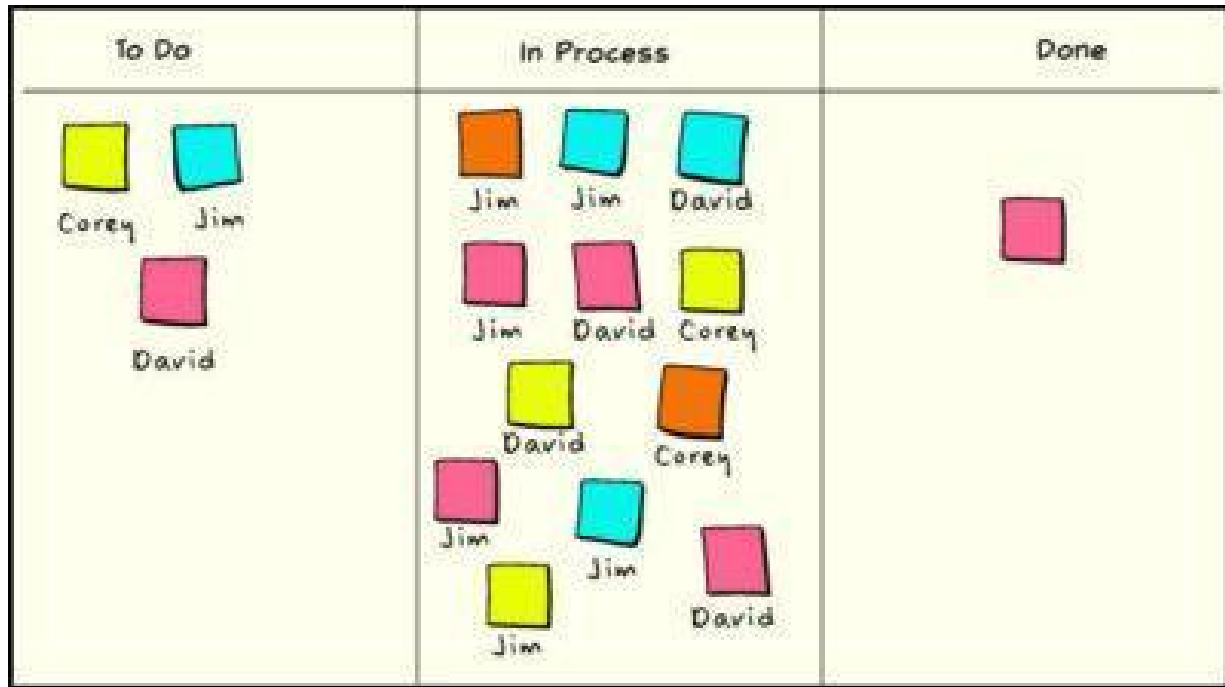
Figure 1.ScrumBan Agile Model

The researchers will use the ScrumBan Agile methodology because of its hybrid project management approach, which was deemed highly suitable for achieving clear project milestones and ensuring comprehensive documentation (Ladas Corey, 2023). This approach aligns well with the requirements of developing the Lawang Bato National High School Digital Library System, providing a solid framework for overseeing the entire development process and achieving successful outcomes.

3.2 Requirement Analysis/ Documentation

3.2.1 Functional Requirements

ISO 25010

9. **Functionality:**

   ○ Accuracy: Information retrieved through searches and citations should be precise and correct.

10. Performance Efficiency

    ○ Resource utilization - Degree to which the amounts and types of resources used by a product or system, when performing its functions, meet requirements.

11. **Reliability:**

    ○ Maturity: The system must function consistently and dependably to guarantee constant resource access.

12. **Usability:**

    ○ Operability: The system should support users in completing tasks efficiently, such as searching for documents, citing sources, and borrowing materials.

13. **Security:**

    ○ Confidentiality: User data and borrowing records should be kept secure and accessible only to authorized personnel.

    ○ Watermarking: The system must prevent unwanted use or distribution of documents stored. This can be achieved by watermarking.

14. **Compatibility:**

    ○ Interoperability: The system should be compatible with the various web browsers and operating systems that teachers, staff, and students frequently use. To ensure access and usability across multiple platforms

15. Maintainability:

○ Modifiability: The system architecture and codebase should be designed in a way that makes modifications and updates simple. In order to accommodate future changes and enhancements.

3.4 Project Design

3.4.1 Existing System Context Diagram

Figure 2. Context Diagram of Existing Process

Figure 2 :Context Diagram of Existing Process, shows the overview of the existing system, students can borrow books and the finished research is stored in the library. The librarian can hand books to students and catalog the said books.

3.4.2 Existing System Level 1 Diagram
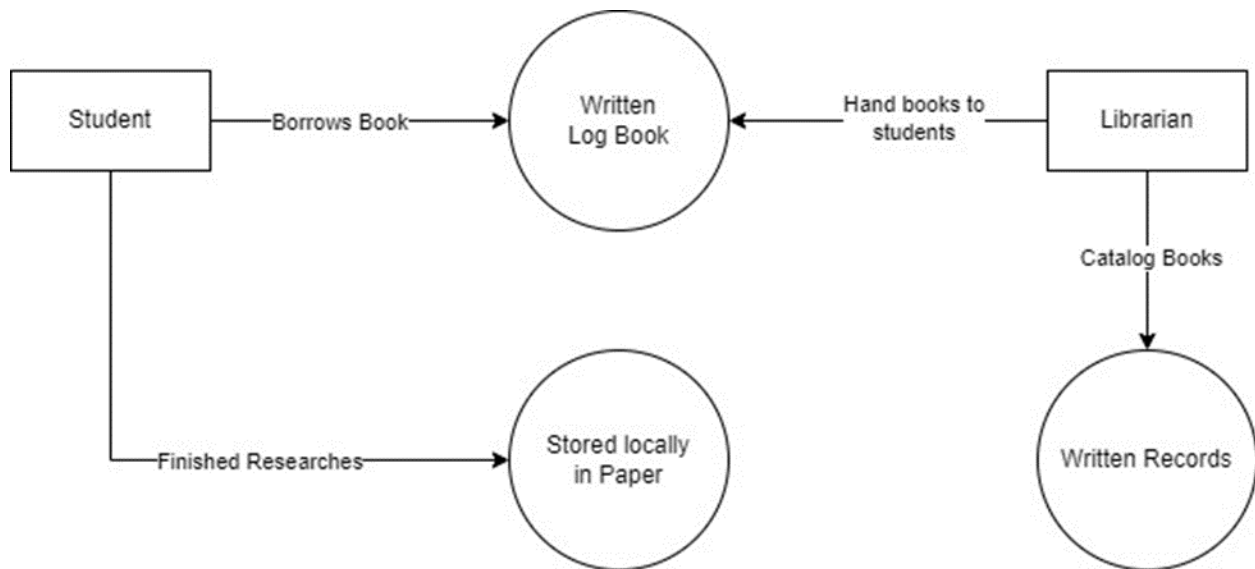
Figure 2.1. Existing System Diagram Level 1

Figure 2.1. Existing System Diagram Level 1 shows a much more detailed view of the system. Students can borrow books to the library and the librarian will hand books to the students. These processes will be recorded in a written log book. Finished research will be stored locally in paper and lastly, librarians can catalog books also in written manner.

3.4.3 Proposed System Context Diagram
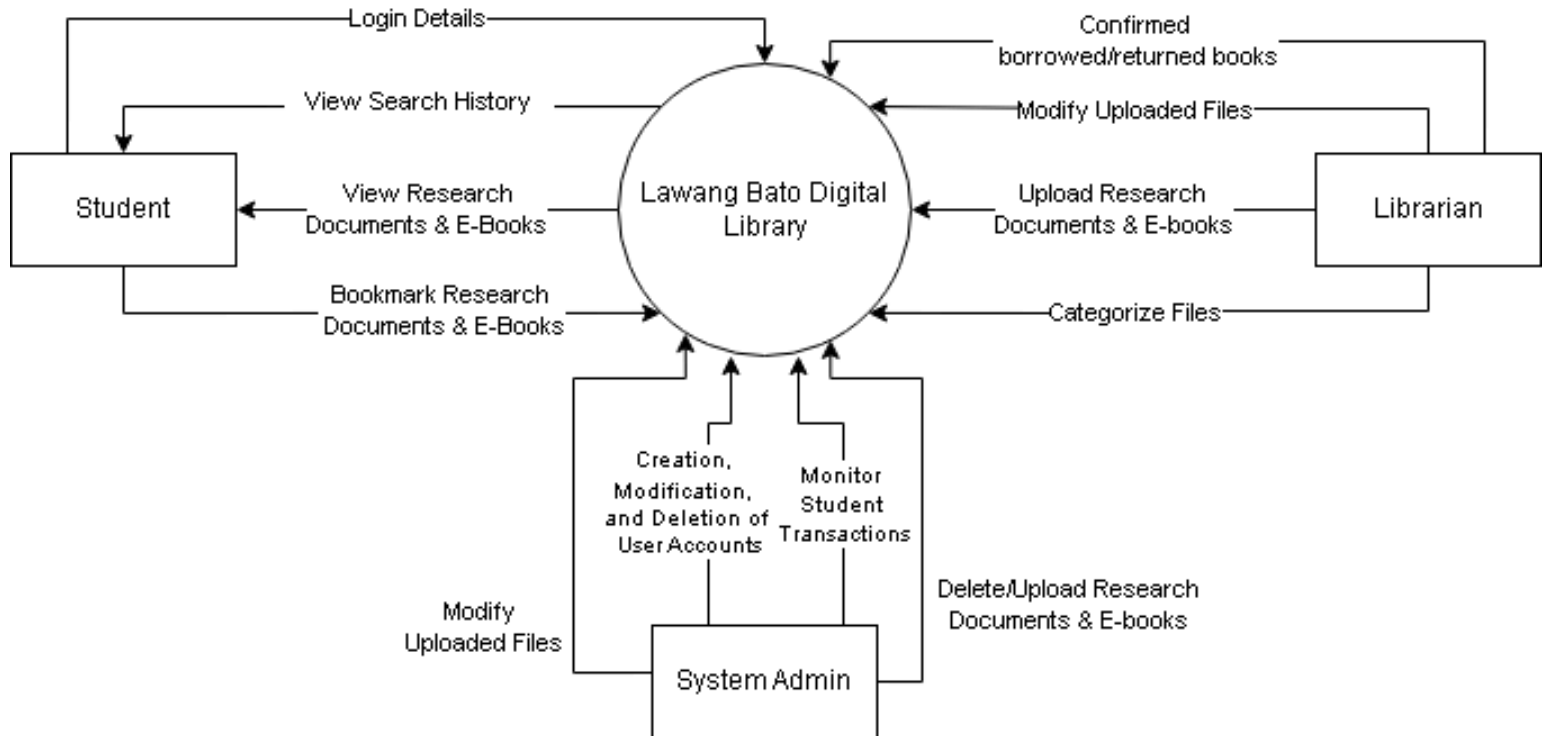
Figure 3. Proposed System Context Diagram

Figure 3. Proposed System Context Diagram provides an abstract overview of how the data is distributed among the users. Here, we can see students can register and login, view documents, get generated citations from the system and input feedback to help developers in improving the system, while the teachers can also register and login, they're the only one who can upload documents. Lastly, system admin can approve register requests of the other 2 users. Aside from that the system admin can also create, modify and delete the user accounts. Also, modification of uploaded files, and upload and delete research/ books & e-book, system admin can also monitor student transactions.

3.4.4 Proposed System Level 1 Diagram

3.4.4.1 Student Side (*Figure 4*)
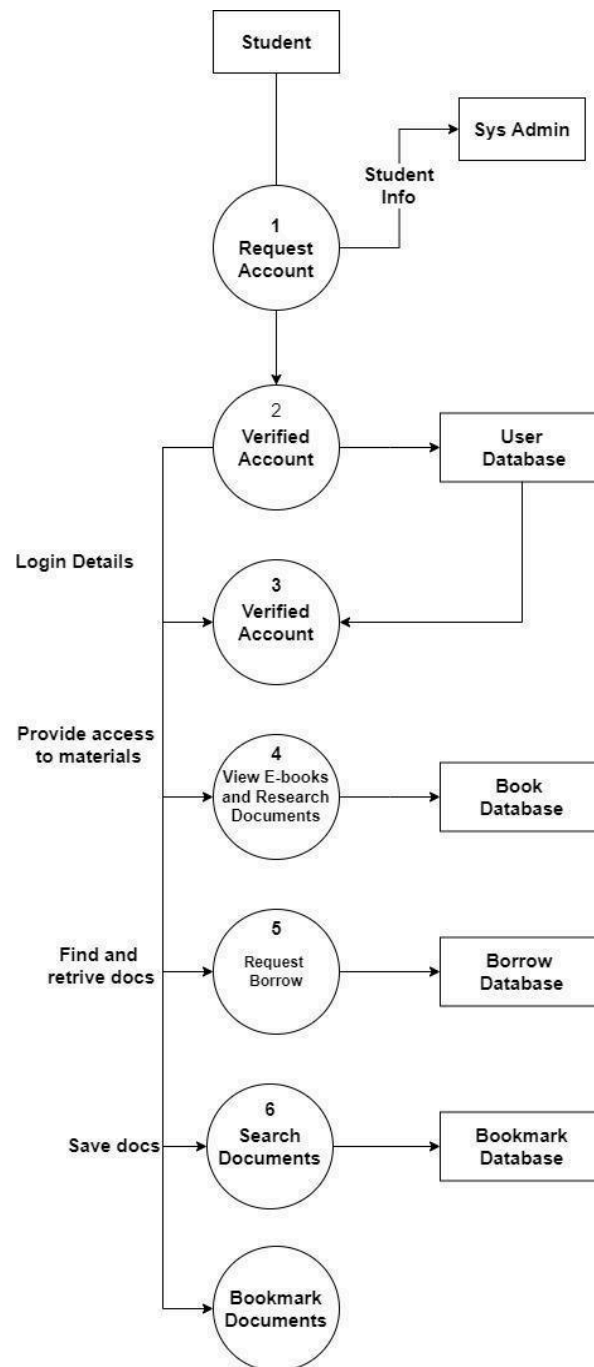
3.4.4.2 Librarian Side (*Figure 4.1)*
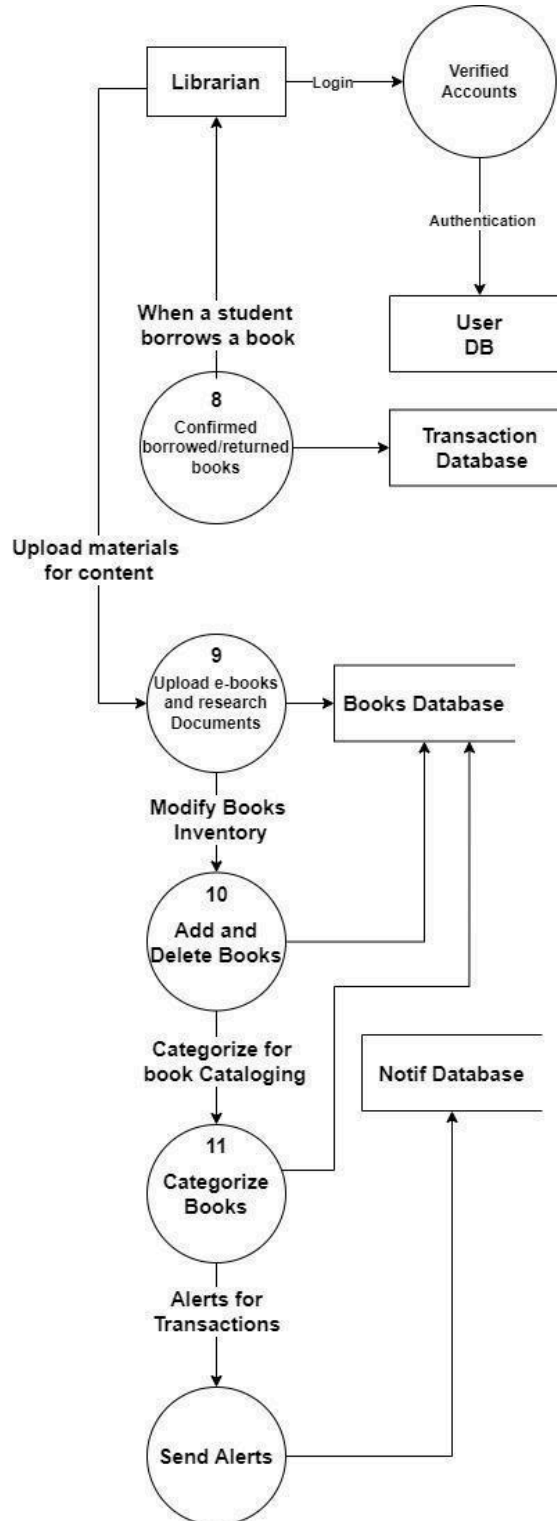
3.4.4.2 Admin Side (*Figure 4.2)*
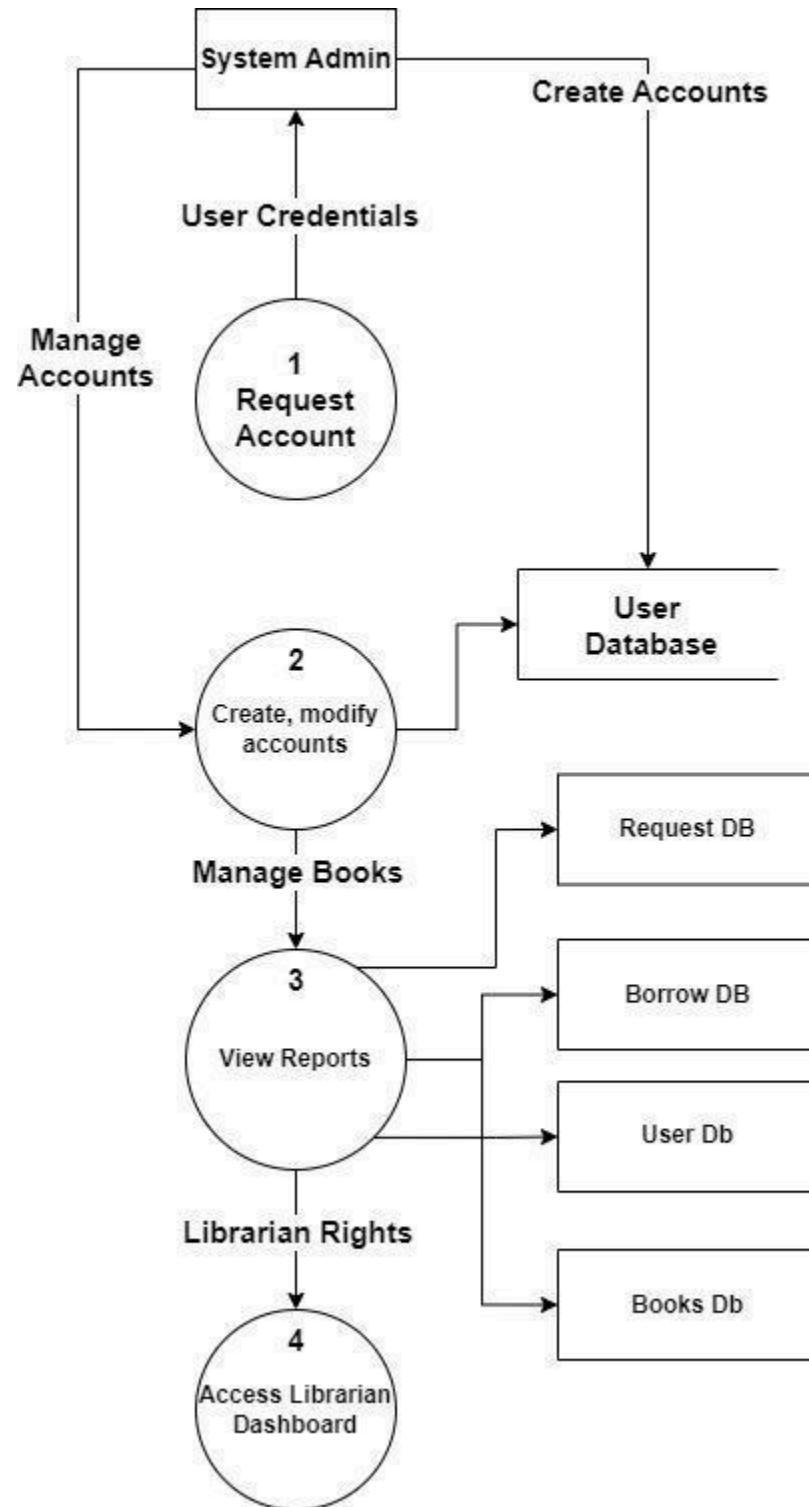
Figure 4. Proposed System Level 1 Diagram for the student side, students must firstly request an account to the System Admin, once approved, they can view, search and bookmark ebooks and research documents. on the other hand, figure 4.1 Proposed System Level 1 Diagram for the Librarian Side, shows similar process at the beginning with the student, User Authentication, after that, the librarian can confirm borrow requests from students, upload materials to the system, Modify those materials, categorize and send alerts to students regarding their borrowing transactions.

Lastly figure 4.2 Proposed System Level 1 Diagram for the admin, lets them create accounts based on students request, views reports and logs, and access to the librarian dashboard. The system admin can act as the librarian in absence of one.
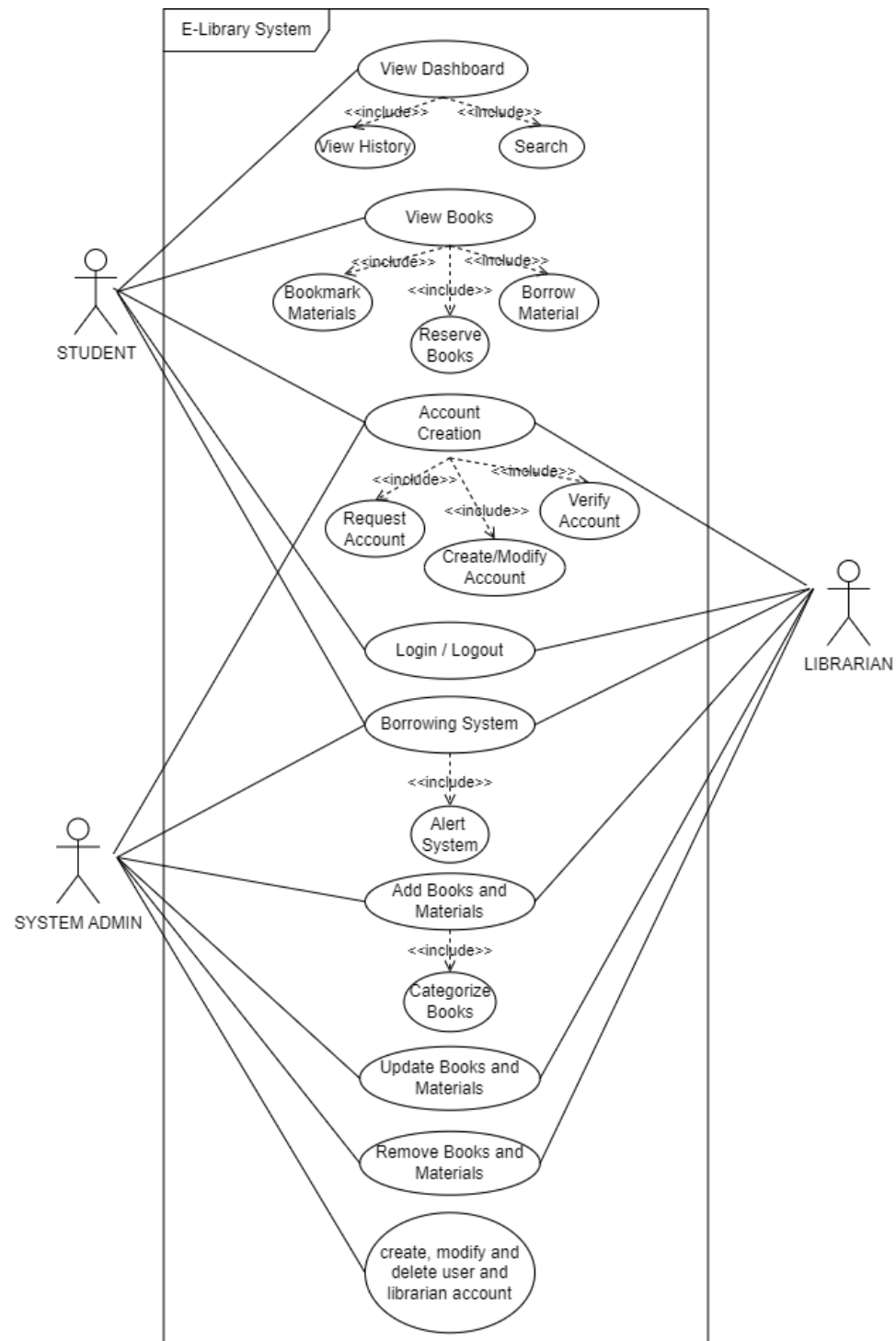
3.4.5 Use Case Diagram

Figure 5. Use Case Diagram

Figure 5: Use Case Diagram illustrates the interactions between students, librarian, system admin, and the system, detailing the associated limitations on system access. All actors in the diagram can access the borrowing system, but only the librarian and the student can log in and log out. As for the accounts of the users, Account creation will be done by requesting an account to the admin and waiting until the admin approves the request of creation and verifying them . The student can search for books, view their borrowing history, and view detailed book information. Additionally, they can bookmark books, make reservations, and borrow books within the system.On the other hand, the librarian and system admin share several similar functionalities within the system. Both can add, update, and remove books and other materials. However, the system admin holds the unique capability of creating, modifying, and updating user accounts. This separation of duties ensures that while the librarian and system admin can manage book-related tasks, only the system admin has control over user account management, highlighting a structured and secure approach to system access and functionality.

3.4.6 Project Design

3.4.6.1 User and Borrow Database (*Figure 6*)
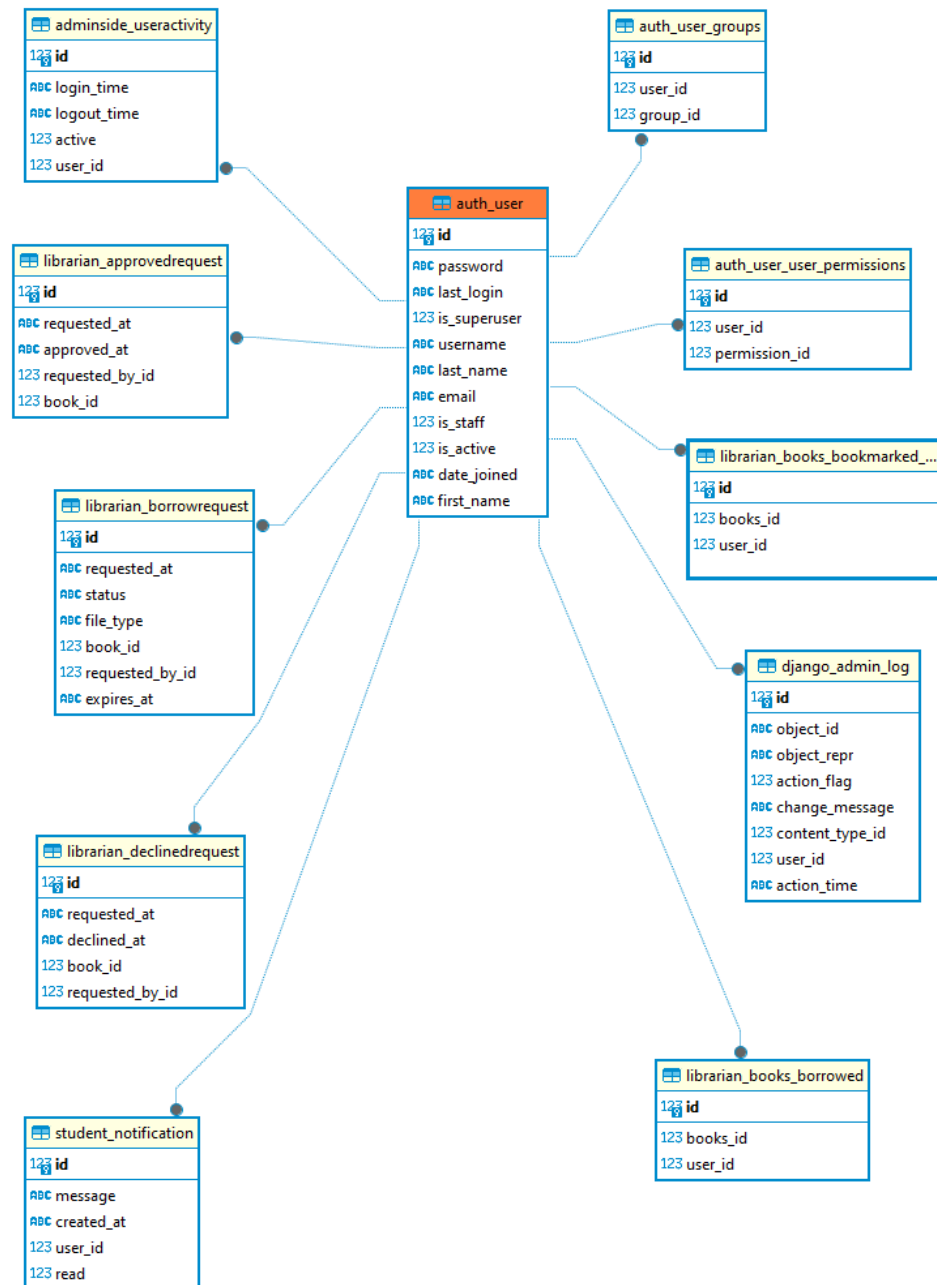
3.4.6.1 Book Database (*Figure 6.1***)**
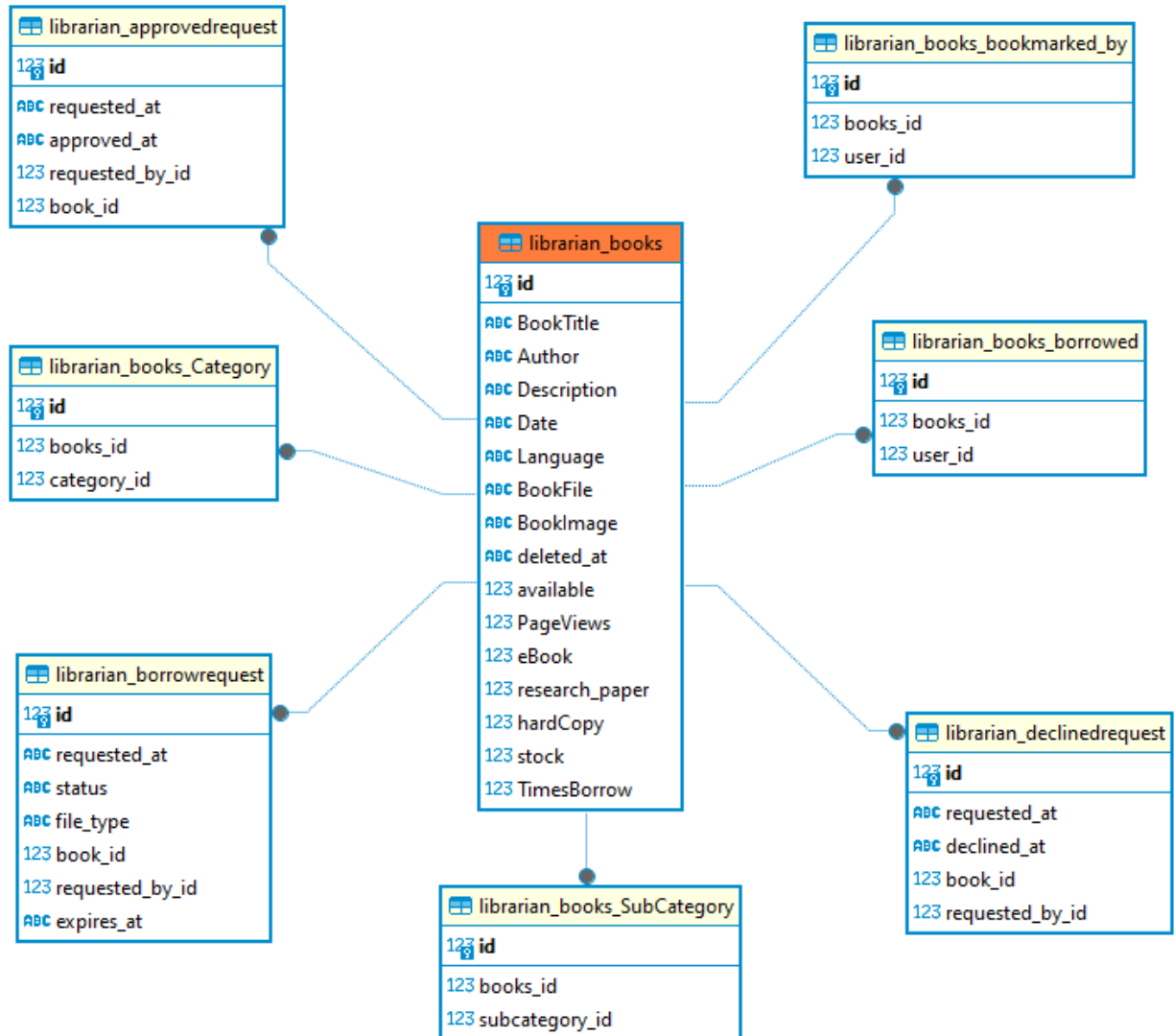
Take a look at the User and Borrow Database (*figure 5),* we can see that the auth_user at the center is connected to auth_user_groups, the table determines if the auth_user which stores all the accounts is a student, librarian or an admin. When a student requests a book, the data will be stored at the librarian_borrowrequest, if the librarian approves the request, the data will be transferred into

librarian_approvedrequest, and when declined, it'll be stored in librarian_declinedrequest instead. The table librarian_books_bookmarked is referencing the librarian_books (*figure 6.1*) table and the auth_user, this stores the bookmarked materials of the user. The adminside_useractivity is a table that records a users login and logout time, their active status and saves it up to 1 month.

Next let's look at the Books Database design (*figure 6.1*), the center librarian_books, stores all the necessary fields for Ebook and Research files. The table includes an ebook and research boolean field which determines if the material is one. The librarian_borrowrequest stores which user and what book did he/she wants to borrow. The librian_books_category & librian_books_Subcategory stores all the main categories for Dewey Decimal System for book cataloguing.

3.3.7 System Architecture
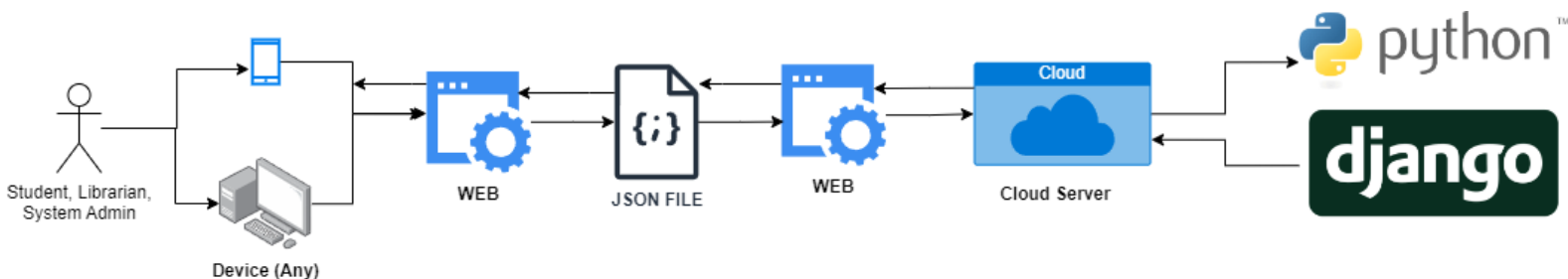
Figure 7. System Architecture

In Figure 6, the System Architecture is depicted, Users, mainly students, librarian, system admin can open the system on any device, accessing the web. All user interactions, request from the system will be sent through a Json file that encrypts the data and sent into the cloud server. The json file will then be decrypted by the Django Project and return a json response back to the user to give them what they require.

3.4.7 Wireframes/Prototypes/Screenshots

Student Side
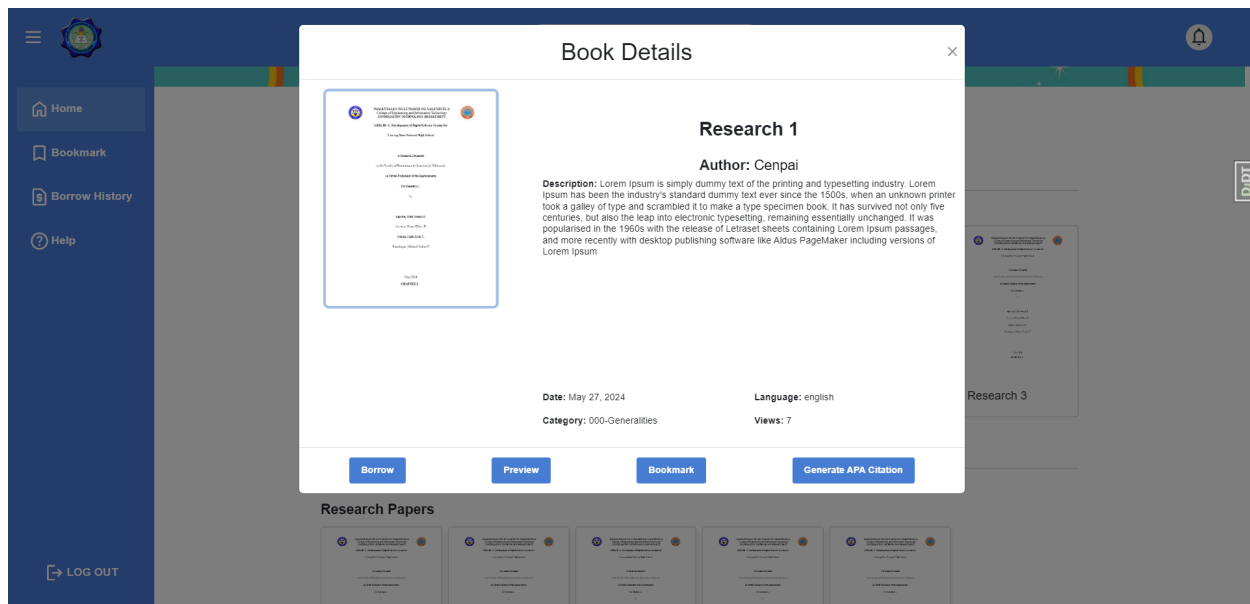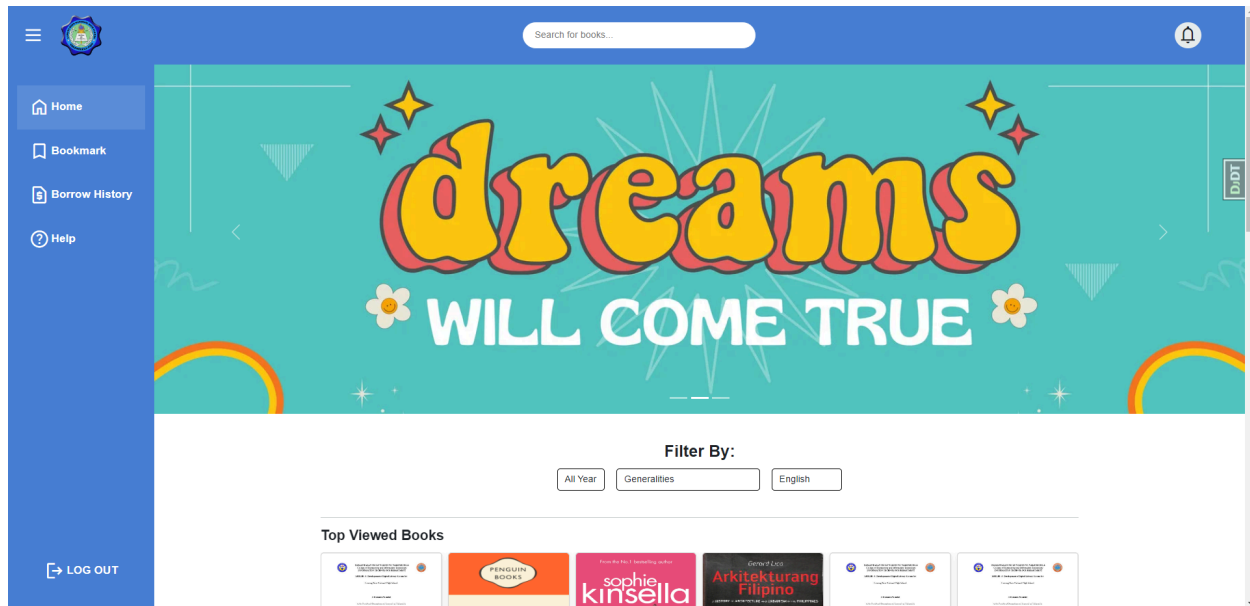
☰

Search for books...

🔔

🏠 Home

🔖 Bookmark

📄 Borrow History

❓ Help

➡ LOG OUT

Bookmarks

Unbookmark All

Research 1

☰

Search for books...

🔔

🏠 Home

🔖 Bookmark

📄 Borrow History

❓ Help

➡ LOG OUT

Request History

Pending Requests

Book Title	Status	Requested At	Expires At
Research 5	Pending	May 28, 2024, 12:02 a.m.	May 31, 2024, 12:02 a.m.

Approved Requests

Book Title	Requested At	Approved At
Research 1	May 28, 2024, 12:01 a.m.	May 28, 2024, 12:02 a.m.

Declined Requests

Nothing to see here.

Librarian Side

Upload

Title:

Author:

Description:

Date:

mm/dd/yyyy

Category:

Generalities

SubCategory:

Select a subcategory

Stock:

Ebook: ■   **Research Paper:** ■   **HardCopy:** ■

Language:

English

Book File(PDF): Choose File No file chosen

Book Image(JPG): Choose File No file chosen

Upload

Book to be borrowed

Title	Image	Author	File Type	Expires at	Status
Book 1	MY BOOK COVER	Pam	EBook	May 31, 2024, 12:03 A.M.	IN

Books to be Returned

Title	Image	Author	Return Time	Status
Book 2	sophie kinsella The Un Domestic Goddess	Pam	May 28, 2024, 12:03 A.M.	OUT

No Recent Logs

Admin Side
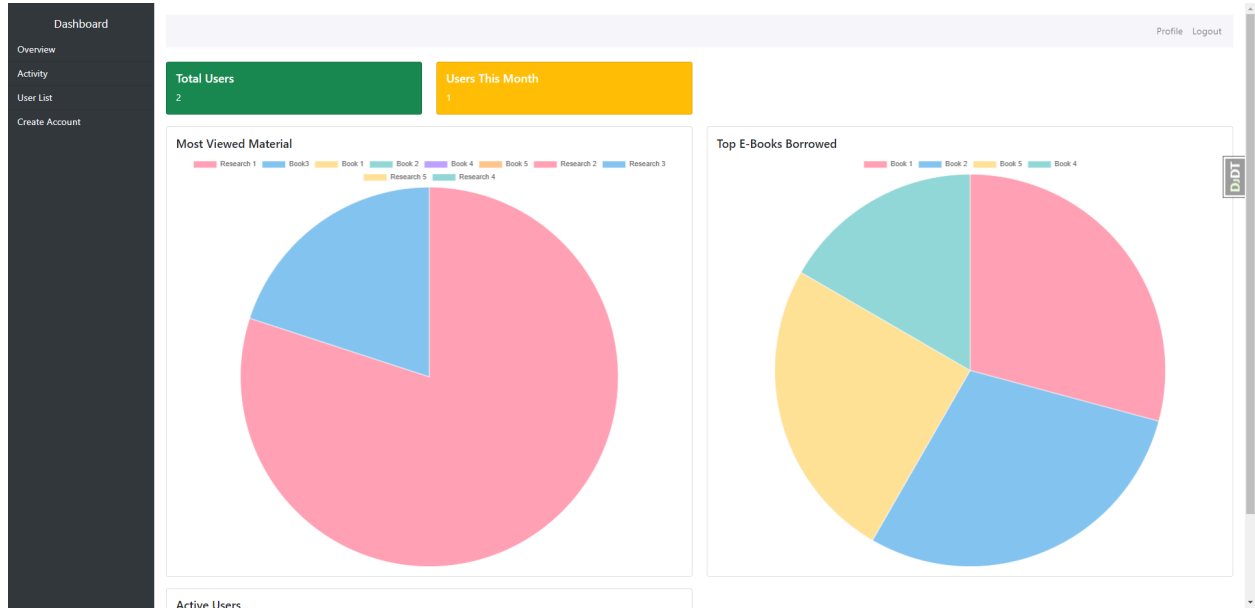
Dashboard
Overview
Activity
User List
Create Account

Profile Logout

User List

Username	Email	Name	Active	Action
123456789101	pamulaganmichael947@gmail.com	Michael, Pamulagan	True	Disable
ceniz		.	True	Disable
pam	pam@pam.com	pam, pam	True	Disable

Dashboard
Overview
Activity

Create Account

Profile Logout

Account Creation

Student

LRN

First Name

Last Name

Address

Birthday
mm/dd/yyyy

Age

Email

Create Account

3.5 Testing and Evaluation

3.5.1 Testing Plan

The developers will use a Functional test plan wherein this test, ensures that each function of the software application works properly and meets the required specifications.

Features to be Tested

The features to be tested for the Digital Library will include citations generation, bookmarking documents, and testing the login and registration capabilities. Additionally, the advanced search functionality and text-to-speech feature will also be included in the testing scope. These features are essential components of the website's functionality, and testing will be conducted to ensure that they operate as intended. The testing approach will include functionality, usability, security, and performance testing to validate the functionality and effectiveness of each and every feature.

Testing Approach

Different approaches will be employed in the testing process to guarantee the application's security and quality. This includes usability testing to see how easy it is for users to access and use the features, security testing to guarantee the privacy of user data when logging in or registering. Perform tests that will be done to ensure responsiveness of the system and the citations, bookmarks, and user history.

Test Scenarios

Here are the following test scenarios for this project:

Citations Generation:

- Confirm that the citations follow standard citation formats (e.g., APA, MLA, Chicago)

Bookmarking Documents:

- Test the ability to add and remove documents from the user's bookmark list
- Validate that bookmarked document can be easily accessed from the user's profile

Login/Register Capabilities:

- Test user registration process, including validation of required fields and email verification
- Validate user login process, including authentication and session management
- Advanced Search Capabilities
- Test filters provided by the system and ensures it outputs the proper data.

Text-to-Speech Functionalities

- Ensures that the tts functionality is accurate and delivers proper audio output

Test Data

 Test data will be prepared and used to ensure that the testing plan is carried out as intended. In order to ensure accurate and correct creation of the citation's generating feature, sample documents will be prepared to aid in the testing of citations. To ensure that the functionality is tested in a range of situations, more test cases will be created with numerous scenarios. To test the features related to registration and login, test accounts will be created. This will make it possible to analyze the user registration and

authentication processes in great detail. The use of test data will enable secure validation of the Digital Library's features and functionalities.

Risks and Mitigation

Text-to-speech functionality failure resulting in poor voice quality or difficult-to-hear text-to-speech output is one of the risks detected as potentially emerging. To mitigate this risk, study, evaluation, and trial and error with various text-to-speech providers will be conducted to determine which one produces high-quality audio output. Another noted risk is that the advanced search feature may fail when used by the user. To avoid this issue, it is recommended that you install an active monitoring and logging function to track the advanced search feature's performance and behavior. This method can assist identify potential issues early on and facilitate quick debugging to avoid failures.

3.5.1 Evaluation Tool

The developers will employ a 4-point Likert scale with the following criteria and table:

Objective: To evaluate the overall performance and user experience of the website.

Criteria	Strongly Agree(1)	Somewhat Agree(2)	Somewhat Disagree(3)	Strongly Disagree(4)
Functional Suitability - covers all the tasks and user				

objectives.				
Performance efficiency - Response and processing time is fast				
Compatibility - Components can exchange information to other components successfully.				
Functionality- The system is appropriate for research material needs, and can be used properly by students				
Reliability- the system is reliable under normal operation				
Security- The system protects information and data, and provides confidentiality.				

Maintainability-The system can be modified to improve it				
Portability - The system can serve as a replacement for other research databases such as Google Archive, Research Gate, etc,.				

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%20UX%20designer%20ensures%20a,page%20visually%20communicates%20that%20path.

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