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ResearchHub: Capstone Projects Information Management System

A Capstone Project & Research 2

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In Partial Fulfillment of the Requirements for the Degree of

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Department of Information Technology

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DEDICATION

I dedicate this work to my loved ones. A special thank you to my loving parents, whose support and efforts never end to motivate me. My siblings, who are very special and have never left my side. This is also dedicated to all my friends who have helped me along the way. I will always be grateful for everything they did, particularly my professors, whose guidance and knowledge had a major impact on my intellectual development. Thank you all and I appreciate your support.

- Jed Allen Gubot

I dedicate this project to all those incredible individuals who have stood by my side, offering unwavering support and encouragement throughout this journey. To my beloved partner, Charles, whose unwavering belief in me has been my guiding light, I am endlessly grateful for your presence and unwavering support. Your love and dedication have been the driving force behind the completion of this project, and I love you. The Almighty God, who has seen my sleepless and tearful nights, whose divine grace has sustained me through countless sleepless nights and tearful moments of doubt, I prayed to you. To my parents, for their financial and emotional assistance during this project, their unwavering faith in my abilities and their boundless sacrifices have been the cornerstone of my success I thank you. To my siblings, your presence has been a source of joy and comfort during the most challenging moments of this project, your laughter and companionship have lifted my spirits and reminded me of the importance of family bonds, I enjoy spending time with you. To my friends, who have walked

alongside me through similar struggles and challenges, I admire each and every one of you.

- Mizzy Perez

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- Iresh May Sajulga

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- Frahser Jay Tayag

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ABSTRACT

Title	:	**ResearchHub: Capstone Projects Information Management System**
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School Year	:	**2023 - 2024**
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ResearchHub is an innovative Capstone Projects Information Management System designed to streamline access to past-year capstone projects within Rizal Technological University's Computer Department. This web-based platform offers students, faculty, and researchers a comprehensive repository of capstone projects, facilitating easy navigation, search, and retrieval of relevant academic work. With user-friendly interfaces and advanced functionalities such as filtering and keyword search, ResearchHub empowers users to efficiently explore and engage with a vast array of scholarly content. Overall, ResearchHub represents a pivotal tool for promoting academic research, collaboration, and knowledge dissemination within the university community.

Keywords: Information Management, OCR, IMS

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CHAPTER I

THE PROBLEM AND ITS BACKGROUND

A comprehensive analysis of the research background, research challenges, research aims, and research rationale is also presented. The chapter concludes by providing an overview of the research investigation, offering insight into its organization.

INTRODUCTION

It is impossible to exaggerate how important it is in the modern world to grasp the art of data management. The gathering, storing, processing, and sharing of information are just a few of the many tasks that fall under the umbrella of this comprehensive field. According to Zwass's (2021) observations, an information system is accurately described as a complex network of linked parts that have been carefully created to collect, secure, alter, and distribute useful insights and digital resources. In the modern world, both people and companies are dependent on this complex network of technology.

Use of Information Management System, which, as explained by Maguire (2018), may be divided into two different types, the first method entails the manual organization of documents via the use of paper and writing utensils. The reliability of this particular technique is compromised by the potential impact of natural components, while its use necessitates a significant time investment in information retrieval. The second system under consideration is a contemporary computer-generated management information system, now used in the 21st century. Using paper and a pen to keep track of crucial papers is a time-honored but rather inaccurate practice. This outmoded

method, however, is full of potential hazards, including sensitivity to environmental deterioration and the slowness of finding information inside massive paper archives. As a result of the development of computer technology, the second style, on the other hand, symbolizes a cutting-edge solution rooted in the twenty-first century. Data management has changed dramatically as a result of the modern Information Management System, which has greatly improved accessibility and convenience for all parties involved. It is an appropriate answer to the new and ever-growing problems that information management systems are posing, problems that might have a big influence on enterprises all over the globe.

In the modern world, mastering data management is vital. The ResearchHub or the Capstone Projects Information Management System at Rizal Technological University promises to make academic research more accessible. Information Management Systems are crucial for efficient data management, with computer-based systems significantly improving accessibility. The Capstone Information System offers a user-friendly platform for discovering and sharing capstone projects, benefiting students and fostering an academic community.

In particular, the Capstone Projects Information System stands out as an expertly designed web-based tool that promises to provide a user-friendly and cost-free avenue for the discovery of Capstone projects within the revered halls of Rizal Technological University - Boni Campus, particularly within the departments of Computer Engineering and Information Technology. Users are given the easy option to browse, sort through the repository inside of this digital refuge. These capstone projects from the students have the great potential to provide junior students who are just starting

their academic adventures and those who are currently rooted in their Capstone studies with important assistance. This collection has the potential to grow into a goldmine of ideas, inspiration, and examples of how to do things in practice, nurturing a thriving academic community.

BACKGROUND OF THE STUDY

The use of Information Management Systems (IMS) has become more essential within the dynamic realm of data management. Frequently seen in the form of digital database applications, these systems exhibit a wide range of capabilities and characteristics, facilitating the storage, retrieval, surveillance, examination, and categorization of data. The inherent flexibility and scalability of these assets make them essential for organizations of all sizes and scopes, since they can easily adjust to the changing demands of enterprises.

In addition to its use in the business sector, information management systems have a wide range of value in the field of education, including various educational institutions such as schools and universities. In such educational environments, these technologies enable efficient communication between educators and learners, rapid dissemination of instructional resources, and simplified assessment of student progress. These platforms provide students with integrated self-service features that enable them to take charge of their educational journey. These features facilitate many activities, including assignment submission, schedule access, paper requests, and a thorough examination of course materials. By using automation in administrative tasks such as

payroll generation and attendance tracking, educators may dedicate more time and attention to their core duty of providing exceptional educational services.

The fundamental functions of information management systems include five key elements: information collection, storage, processing, dissemination, and access. These systems effectively collect information from many internal sources, such as data processing and transactional systems integrated inside the management architecture. By use of a rigorous procedure including the gathering, examination, and conversion of unprocessed data, it is possible to turn it into intelligible and practical information. The aforementioned data is securely kept into specialized databases, ensuring its confidentiality and integrity. These databases are designed to facilitate the dissemination of information throughout the network, allowing authorized users to access crucial data without any disruptions.

Despite the considerable potential for transformation offered by information management systems, a significant problem continues to exist in the administration of capstone projects within the educational sector. The conventional techniques of record-keeping, which rely on paper-based systems and involve extensive manual effort, demonstrate a significant lack of efficiency. Many students often encounter the task of accessing physical archives inside libraries, where they must search through a vast number of volumes in order to locate specific capstone projects. This process may be time-consuming and daunting for students. Further complicating this challenge is the restricted accessibility to several projects on the internet, intensifying the arduous and time-intensive nature of the search procedure.

Recognizing the aforementioned difficulty, the computer department of Rizal Technological University has undertaken proactive efforts via the implementation of a Capstone Project Information Management System. This novel method effectively oversees and safeguards capstone projects while also guaranteeing their availability to students. The implementation of this strategic method has great potential in offering substantial advantages to prospective computer science students, as it offers them a user-friendly avenue to retrieve and explore previous capstone work. The Capstone Project Information Management System is a forward-thinking system that supports the university's dedication to improving the educational experience for students by providing relevant examples and streamlining academic procedures.

STATEMENT OF THE PROBLEM

This capstone project addresses the issue of the Rizal Technological University – Computer Department's absence of an effective and centralized system for maintaining and accessing information connected to capstone projects. Several difficulties have arisen as a consequence of the lack of a specialized platform, including:

1. How can the system improve the current existing storage method used by the administrative personnel contribute to the efficacy of capstone project management within the academic field?
2. What is the degree of precision shown by the current recording process, and how might any errors affect the accuracy of recorded information pertaining to capstone projects?

3. To what extent does the availability of tangible copies of capstone projects hinder or enhance the prompt and easy retrieval for administrative personnel and relevant stakeholders?

This capstone project seeks not only to rectify the immediate challenges faced by the academic institution but also to contribute to the broader academic discourse surrounding effective information management systems within educational contexts.

OBJECTIVES OF THE STUDY

The Capstone Projects Information Management System objectives of the study are:

1. To design, develop, and deploy a web-based platform called ResearchHub that will enhance accessibility and allowing authorized users to retrieve project information promptly
2. To ensure that capstone projects are stored efficiently and in a manner that facilitates easy retrieval and management by administrative staff
3. To implement a standardized recording mechanism, minimizing errors and ensuring the accuracy of data associated with each capstone project.

In summary, the Capstone Projects Information Management System not only aims to provide an efficient and centralized solution for storing and accessing capstone project information but also addresses specific concerns related to effectiveness, accuracy, accessibility, and security. By doing so, it aims to elevate the administrative processes within the Rizal Technological University – Computer Department and enhance the overall management of capstone projects.

SIGNIFICANCE OF THE STUDY

The significance of the study is that it will develop a comprehensive and user-friendly database of all capstone projects completed by students in the Computer Department. This database will make it easy for students, faculty, and other stakeholders to find and access information about capstone projects, including project titles, student names, advisers, year publishes, and abstracts.

The capstone project information management system will be a valuable resource:

To the Students: Students can use the database to learn about previous capstone projects and to identify potential research topics. The database can also help students to identify potential mentors for their capstone projects.

To the Faculty: Faculty can use the database to advise students on their capstone projects and to identify students who are interested in working on specific research topics. Faculty can also use the database to identify potential collaborators for their own research projects.

To the Future Academic Researchers: Future Researchers gain from a centralized repository, supporting future research endeavors and ensuring data integrity. By exploring the breadth of topics and approaches taken in previous capstone projects, they can identify gaps in knowledge and potential areas for further investigation.

To the Institution: The institution may benefit from this system by enhancing its reputation as a technologically proficient and intellectually forward-thinking organization within the wider educational landscape.

SCOPE AND LIMITATION

This section shows a thorough exploration of the scope and boundaries as well as the limitations of this research endeavor. A meticulous examination of the parameters delineating the study's reach is imperative for comprehending its applicability and the potential constraints that may influence its outcomes.

Scope

The major aim of this research project is to support the Departments of Information Technology and Computer Engineering in the development of a comprehensive Capstone Project Information Management System (ResearchHub). The primary objective of this system is to efficiently manage the records of student research studies. It also aims to facilitate administrators in offering online resources and serve as a platform for sharing research studies with both visitors and students. The website has a distinct page that is specifically designed to showcase prospective mentors for students. Furthermore, the website is equipped with functionalities aimed at aiding the administration in the effective management of submitted research projects.

There are two separate user roles, each with certain access capabilities.

Administrator:

- Manage (add, update, archive) all student research studies.
- Store and organize information provided by capstone project.
- Generate a statistical report about the number of capstone projects in the system.

Students:

- Browse categories and view capstone projects information.
- Viewing of the capstone project's essential information.

Limitation

The system's dependence on technological infrastructure raises the potential for interruptions caused by technical concerns, such as server outages. Also, the system may encounter hard-time reading a capstone project that is not consistent with the majority of the templates provided and may need to result into manual input of information. The process of users embracing and using a new system or technology may encounter difficulties, since there may be reluctance to change or lack of familiarity that obstructs general participation. The system's success relies on the thoroughness of project archives, and its application is restricted to the Computer Engineering and Information Technology departments, which hinders collaborative integration. Accessing the capstone project for download is unavailable due to adherence to the Intellectual Property Code of the Philippines. Although cybersecurity protections are in place, there are inherent security vulnerabilities. Specific user groups may be affected by accessibility obstacles, such as restricted internet access and difficulties in usability. Regular maintenance and upgrades are necessary for achieving the best possible performance, which may be difficult in situations with limited resources. Recognizing these limits is essential for effectively managing expectations

and adopting ways to overcome these restrictions in the deployment and usage of the technology.

CONCEPTUAL FRAMEWORK

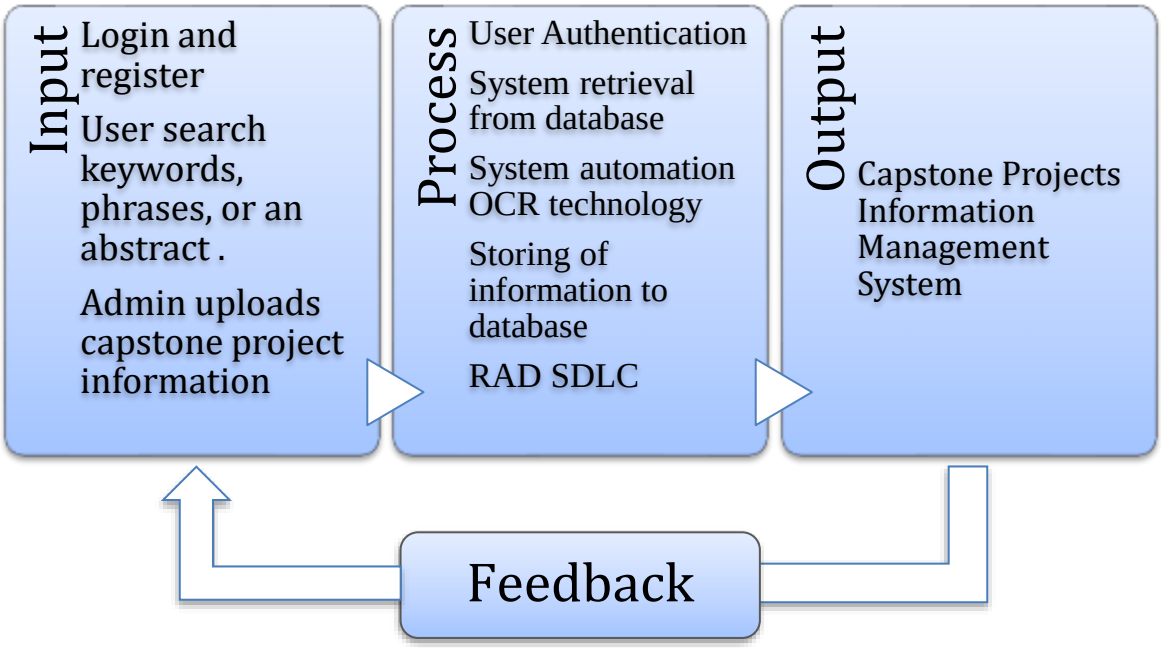

Figure 1: Conceptual Framework

The system is activated by users who provide login credentials, which are necessary for the purposes of authentication and authorization. Furthermore, users actively participate in enhancing the system's functioning by providing search queries and using keywords, phrases, or abstracts to get pertinent information from the extensive database. Administrators have a concurrent role in enhancing the system's knowledge base via the submission of capstone project material, which serves as a crucial input that passes a sequence of processing phases.

The inputs are processed by the system via a series of clearly defined phases. The primary objective of the user authentication procedure is to verify and authenticate user credentials, hence guaranteeing safe and authorized access to the system. Following this, the system utilizes sophisticated retrieval algorithms to thoroughly explore the database for relevant information in response to user search requests. The inclusion of the Rapid Application Development Software Development Life Cycle (RAD SDLC) should be emphasized, since it represents an agile and iterative development methodology that enables user input and prototype enhancement.

During the processing step, the system utilizes OCR technology to extract text from the submitted picture of the capstone project information. This extracted text is then subjected to thorough validation to ensure its integrity and security. Once validated and determined to be accurate the text is securely stored within the database, thereby contributing to the ongoing growth of the system's knowledge repository.

The last stage of this complex procedure is the unveiling of the interface for the Capstone Projects Information Management System, which is accessible only to authorized users. The presented output demonstrates the retrieved information or the particulars of submitted capstone projects, offering a user-friendly and informative interface. While the original material does not expressly include feedback systems, it is reasonable to assume that the system incorporates such mechanisms. These mechanisms would provide users and administrators with valuable insights regarding the effectiveness or current state of their interactions, and perhaps give suggestions for enhancing the system.

OPERATIONAL DEFINITION OF TERMS

Some of the key terms and concepts mentioned in the Capstone Projects Information Management System:

Administrator Access: The process for administrators to log in, gaining full control over ResearchHub, including adding and removing capstone project files.

Capstone Projects: Comprehensive research projects completed by students in the specified departments at the university.

Information Management System: A digital database platform designed for the efficient collection, storage, and retrieval of capstone project data from the Computer Engineering and Information Technology departments at Rizal Technological University.

OCR (Optical Character Recognition) Technology: The technology integrated into the system for extracting text from the image to automate the data entry of the capstone projects.

ResearchHub: A web-based repository where capstone project information is securely stored, categorized, and easily accessed.

Resource Management: The process of organizing and streamlining resources within ResearchHub, enhancing the research experience for students by providing a user-friendly interface and enabling administrators to manage resources efficiently.

Search and Retrieval Functions: Features enabling users to find specific capstone projects based on various criteria within ResearchHub.

CHAPTER II

THE REVIEW OF RELATED LITERATURE

This chapter provides an overview of the relevant literature and studies that were examined extensively by the researcher. The researcher categorizes the literature and studies topically, specifically focusing on tactics that enhance the vocabulary of learners at various proficiency levels.

FOREIGN LITERATURE AND STUDIES

Definition and Benefits of Information Management

There have been numerous kinds of systems that have been developed over the past several years. According to Medico et al. (2023), these information systems have helped to fulfill the needs and requirements of decision-making not only at the managerial but also at the operational level. Every organization develops its management information system (MIS) which is dependent on the personal needs of the organization. Medico also states that, the effective use of a information management system relies not only on the system itself, but also on the integration of human intellect, observation, and judgment with the information provided by the system in order to maximize its benefits. According to Altındağ et al. (2021), information management practices will aid in enhancing innovation through wider and unlimited cooperation, obtaining explicit and clear information, accessing information promptly, reducing technical information loss, accelerating productivity with built-in training, and increasing customer satisfaction by offering insightful information.

Information Management is important

According to Indeed.com (2023), Efficiently handling information is like a key building block for companies that rely on data. It helps them make smart decisions and reach their goals. Understanding why it's important can help the business use, protect, and store data better, leading to smoother operations.

Knowing the different roles of information management is crucial for businesses. It allows them to make the most of their data to achieve their strategic objectives. By managing information effectively, companies can improve their decision-making, keep their data safe, and ensure easy access to it when needed. In simple terms, a thorough approach to information management helps businesses work more efficiently and flexibly in today's data-driven world.

Information Management System improves efficiency

According to ITBriefcase (2018), the purchase of a top-notch information system ensures that a firm becomes more organized, enabling quicker decision-making and problem-solving. The key advantage lies in providing employees with easy access to comprehensive information, ultimately enhancing their productivity. Such a system empowers businesses to analyze stocks and evaluate past performance, facilitating the ability to anticipate and address potential crises. In contrast, relying on manual, hard-copy data storage methods would be time-consuming and cumbersome, making it challenging to locate specific information. An intelligent information system, on the other hand, streamlines data organization by date and time, simplifying the retrieval process.

Information Management System reduce costs and risks

The Grande et al. (2020) study's outlines how data management is a significant cost source for most organizations and how focused enhancements in data sources, design, governance, and consumption can help companies reduce yearly data spend by 5 to 15% in the short term. They also talk about deploying a data-cost-cutting program because some firms may want to apply the majority of their data cost savings to their bottom line whereas other companies may want to modernize their capabilities as soon as possible. According to Onwuegbuchulam et al. (2022), having centralized systems aids in cost and risk reduction. Information Management employs various procedures and systems in the form of life cycles that are adaptive to an organization to aid in the reduction of costs and risks associated with asset ownership while also identifying chances for growth. These procedures may differ from one company to the next, but they can be broadly classified as planning, procurement and scheduling, deployment and maintenance, and utilization and disposal. Managers can reduce costs and hazards at every stage of the cycle if suitable procedures are followed.

Form Fill Automation

According to Nesterenko (2023), Form fill automation presents a valuable solution for enhancing process management across various industries, including construction, renewable energy, aviation, and transportation. By replacing traditional paper-based methods with mobile forms, inspectors, field technicians, and deskless teams can streamline tasks and improve efficiency. Similarly, field technicians benefit from accessing pre-built templates tailored to specific equipment types, streamlining

routine maintenance checks. Through mobile devices, they can efficiently fill out forms, capture readings, and document observations, eliminating manual paperwork and reducing errors.

Transportation companies leverage form fill automation for deskless teams like drivers, who log vehicle inspections and maintenance issues via mobile devices. Real-time data transmission empowers fleet managers to monitor vehicle performance, schedule maintenance, and address safety concerns promptly, enhancing overall fleet management. The versatility of form fill automation extends to various processes such as audits, training, and contract negotiation, offering streamlined workflows and improved data accuracy across diverse sectors.

According to Jager (2019), where their study is dedicated to devising an automated workflow aimed at facilitating image digitization and subsequent creation of a dictionary containing pertinent information. The workflow unfolds in three sequential stages subsequent to the generation of OCR output, progressively enhancing the precision of key-value pair matches of field names and values. Initially, the raw OCR output is subjected to scrutiny for field name identification via exact string matching and for field-value extraction utilizing regular expressions sourced from an externally maintained repository. Subsequently, the introduction of index pairing augments the precision by aligning field-values with their respective field names based on their positional relationship within the document. Finally, approximate string matching is incorporated into the workflow, further refining accuracy. Through the implementation of these stages, the F-measure for key-value pair matching demonstrates a progression:

60.18% following the initial step, 80.61% upon integration of index pairing, and eventually reaching 90.06% post incorporation of approximate string matching. This investigation substantiates the feasibility of automatically extracting accurate, actionable data from images through the deployment of a structured workflow post OCR processing.

Use of OCR in Form Fill Automation

Vaidya (2019) The integration of Optical Character Recognition (OCR) technology in form automation has revolutionized administrative processes across various industries. By leveraging OCR engines, businesses can efficiently digitize and process vast quantities of forms, reducing manual data entry errors and streamlining workflows. OCR enables the extraction of textual information from scanned or photographed documents, converting them into editable and searchable formats. This automation not only accelerates data processing but also enhances accuracy and accessibility, enabling organizations to manage large volumes of forms with ease. From financial institutions automating loan applications to healthcare facilities digitizing patient records, the applications of OCR in form automation are vast and impactful. Furthermore, advancements in OCR algorithms, coupled with machine learning techniques like Convolutional Neural Networks (CNN), continue to improve the accuracy and efficiency of form processing systems, driving further adoption and innovation in this field. As businesses increasingly prioritize digital transformation, OCR stands as a pivotal technology in realizing the benefits of streamlined, automated form processing workflows.

According to Majumder (2019), Optical character recognition (OCR) encompasses the process of identifying and transcribing text from various sources such as scanned documents, billboards, number plates, and even subtitles overlaid on images during television broadcasts. It involves converting images or photographs containing typed, handwritten, or printed content, including alphanumeric characters and symbols, into machine-readable text format. This methodology facilitates the conversion of analog textual information into digital data, enabling computers and other devices to interpret and process the content. OCR technology finds extensive application in digitizing historical printed materials, as well as extracting textual content from books, magazines, and other printed media for computer-based storage and analysis.

According to Amitha (2020), a new approach to image processing for text conversion is introduced in this study, focusing specifically on its application in literacy education. The development of a web-based application aims to convert attendance register images into Excel format. The research includes a thorough review of existing methods for image-to-Excel conversion, identifying gaps in the literature, and proposing an improved methodology to address these deficiencies. The development process of the web application involves four primary phases: capturing, extraction, recognition, and conversion. Notably, Optical Character Recognition (OCR) algorithms are employed for character extraction and recognition, ensuring high accuracy in various environmental conditions. Users are able to upload images to the system, and the OCR algorithm promptly converts the text, displaying the extracted content on their screens. This proposed solution offers potential advantages for literacy education,

especially for teaching staff, as it provides a user-friendly tool for text extraction and conversion in diverse contexts.

LOCAL LITERATURE AND STUDIES

Organizations in the Philippines have implemented Information Management Systems

The goal of the study was for the students to be able to maintain an online site and automatically update their profiles from time to time. The administrator can easily manage these requirements and assign teachers and students based on their preferences. Children's Integrated School of Alta Tierra created a Web-Based Enrollment System with a Student Information System where profiling, registration, search, event management, scheduling, updating, and payment are being implemented.

The Filamer Christian University Alumni Information System focuses on gathering all data from FCU alumni for the university's purpose. It looks at the job trends and career development of recent graduates. The website is made to make it easier for system users to manage transactions and to keep up with activity related to alumni. The development of a school and its accreditation procedures must benefit from all the useful information that graduates have to provide.

For Book Latte, the system offers computerized sales, inventory, borrowing, and membership that will combine several business processes into a single application suite. The overall purchases and sales of food are provided by the sales and inventory. The borrowing module offers automatic book inventory updates, book borrowing and return transactions, and payment processing. The membership module gives members access to their personal information and keeps track of how many members are

currently enrolled in the café. The system also offers catering reservations, which are stored and tracked for either walk-in clients or a portion of the members. Keep track of every detail for the catering services to run more smoothly.

Government Agencies that have deployed Information Management Systems

To enhance the integration of public financial management information systems, the Philippine government has issued an executive order. Greater financial management and control of oversight and government agencies will be possible as a result of this. Additionally, strict adherence to existing appropriations laws, rules, and regulations as well as government accounting standards and policies will also be ensured. Additionally, treasury cash management will be significantly improved.

Eder et al. (2018) claims that the Philippine Red Cross finds it difficult to provide monthly reports since their records are disorganized and data retrieval takes a long time. The Philippine Red Cross Online Blood Bank Management Information System (PRCOBBMIS) was created as a solution to the problem. It is a web-based platform that offers effective data retrieval and management for profiling. It is a system made to handle blood stock questions over the internet and even through SMS. The system's use of the web architecture allowed for a more effective networking capability, which will aid PRC staff in efficiently profiling their donors, maintaining the data on their bloodstock, and producing statistical reports. According to Eder, PRCOBBMIS was able to:

1. Record laboratory results and blood donor information efficiently.
2. Data on donors and blood are shared among several PRC blood centers.

3. Use SMS and online blood stock inquiries.
4. To aid in planning and decision-making, produce statistics reports.

Information management systems vs Manual Paper Recording

According to J. Morales et al. (2020) research, manual calculation might take more time and place a strain on both consumers and staff. Using a POS system allows you to calculate rapidly and set pricing. The supporters created a point-of-sale system for Glenald's shop, which still uses manual logging of transactions. Their major goal is to develop a point-of-sale system that will aid in record keeping and accounting, which is an important element of the company since this is where sales and income are calculated. It has an impact on commercial decision-making. The system's supporters decided that following its development, the system is easy to use and assists the owner in successfully managing the firm, even with a tiny crew.

Dela Cruz et al. (2019) conducted research on Inventory Management Systems using POS. The traditional method of documenting data is to write in logbooks and manually create receipts, which is inefficient for business. A POS system is useful in company because it allows staff to conveniently save sales data and export it to generate sales reports. Nowadays, a POS system is a critical component of every organization. Handwritten sales and inventory management problems may be avoided by adopting a POS system. The study's researchers want to overcome the problem of storing and processing sales by designing and developing an inventory management system and implementing a point-of-sale system. The researchers found that the technique was effective and helped to eliminate the previous ways of entering sales in the logbook by

handwriting. It also performs the user's required operations and returns the desired results.

According to Magallanes et al. (2021) in his research Analysis and Design of a Sales and Inventory Management Information System for a Motorcycle Parts and Accessories Store. Having a POS (Point-of-Sale) system in the company may provide owners with peace of mind by allowing them to monitor sales and inventory when they are away from the shop. This may eliminate stock discrepancy caused by manual recording, which might lead to staff stealing goods. A POS system may help to keep employees productive. They concluded in their study that a sales and inventory management system significantly help businesses solve their problem with manual sales recording, which frequently results in lost sales, inconsistent sales reports, and inventory tracking, resulting in out-of-stock and product theft. Overall, the system reduces mistakes in sales and inventory tracking and minimizes excess and understocking of items, resulting in profit maximization.

In the research by Baylen et al. (2020), an evaluation of the inventory management systems put in place by a select group of small-sized restaurants in Quezon Province was done in order to serve as a foundation for the creation of an inventory system manual. An important component of running a restaurant, especially a small one, is managing the inventory. Resource optimization, cost-cutting, and efficient inventory management are essential for successful corporate operations. In order to better understand the distinct difficulties smaller restaurants in Quezon Province experience in comparison to bigger ones, Baylen's research concentrated on them.

Small-scale eateries often face constraints in terms of available funds, employee qualifications, and technological adoption. It is critical to identify areas for improvement since these limitations may have an influence on inventory management procedures.

Adherence of the system to the regulations outlined in the Intellectual Property Code of the Philippines

According to the Official Gazette of the Philippines, The Republic Act No. 8293, often known as the Intellectual Property Code of the Philippines, demonstrates a dedication to maintaining intellectual property rights while adhering to ethical standards and legal requirements. The system is a complete platform that enables the sharing and administration of capstone projects. It acknowledges the varied nature of intellectual contributions and protects the rights of contributors over their work.

The system will adhere to a rigorous methodology in compliance with the Intellectual Property Code when it comes to distributing capstone project papers. All users will have universal access to the fundamental elements of capstone projects, which are organized according to the IMRAD format (Introduction, Methodology, Results, and Discussion). This promotes a clear and open exchange of fundamental information, cultivating a cooperative and knowledge-sharing atmosphere that aligns with the ideals of intellectual property rights.

The system guarantees that contributors may establish and control access to their intellectual work by implementing comprehensive authorization settings. The capstone project management system is dedicated to upholding intellectual property

rights and promoting responsible and secure knowledge-sharing. This is done within the legal and ethical boundaries set by the Intellectual Property Code of the Philippines. This strategy not only encourages adherence but also enables contributors to freely share their unique thoughts while retaining authority over the distribution of their intellectual property.

Data Privacy for the Capstone Projects in Rizal Technological University

The proponents, being students at Rizal Technological University (RTU), have adopted the university's Privacy Policy for Students in alignment with Republic Act No. 10173, commonly known as the Data Privacy Act of 2012, along with its Implementing Rules and Regulations (IRR), and the issuances and policies set forth by the National Privacy Commission (NPC).

Within the Privacy Policy for Students, the terms "data" and "information" are used reciprocally, with a focus on the concept of "personal data," which encompasses information related to personal data, sensitive personal data, and protected data. Personal data and sensitive personal information are typically employed to uniquely identify individuals. It is important for students to understand that while the Policy utilizes examples to clarify its provisions, it does not encompass an exhaustive list of data processing procedures.

RTU reserves the right to utilize students' personal information to serve the legitimate interests of the university within the boundaries authorized by law, encompassing administrative, data collection, academic, statistical, and historical purposes.

As per the provisions outlined in lines 4 and 11 of the Privacy Policy for Students at Rizal Technological University (RTU), the university reserves the right to employ student data for the following purposes:

4. Record, archive, and grade student work, such as essays, presentations, theses, term papers, projects, dissertations, research papers, and seatwork activities.

11. Create reports and compile data for statistics and research objectives.

SYNTHESIS

The synthesis of scholarly works and empirical investigations accentuates the pivotal role assumed by Information Management Systems (IMS) in reshaping the operational dynamics and decision-making paradigms across diverse industries. Central to this discourse is the acknowledgment of adept information management as an indispensable cornerstone for organizational triumph, elucidated through its capacity to facilitate informed decision-making, foster innovation, and augment overall operational efficacy. IMS functions not merely as a conduit for data access, analysis, and utilization but also as a catalyst for intra- and inter-organizational collaboration and knowledge dissemination. Scholarly literature underscores the manifold benefits accruable from the adoption of robust IMS frameworks, encompassing heightened productivity, streamlined operations, bolstered data security, and enriched customer satisfaction. Furthermore, the integration of cutting-edge technologies, such as artificial intelligence and machine learning, into IMS architectures promises to unlock novel insights and propel further operational efficiencies. Moreover, the synthesis delineates the

substantial cost-saving potential associated with IMS integration, wherein centralized systems and optimized data management practices contribute significantly to resource optimization and risk mitigation. Concurrently, the automation of manual processes through form fill automation emerges as a transformative solution, particularly salient in industries typified by field-based operations like construction, transportation, and energy. The infusion of technological tools into educational institutions via web-based systems not only enhances administrative efficacy but also enriches the pedagogical experience for students, cultivating a culture of digital proficiency and adaptability. The foreign studies also illustrate the multifaceted applications and continuous advancements in Optical Character Recognition (OCR) technology across diverse domains. Jager (2019) introduces a systematic workflow for image digitization, emphasizing the iterative refinement of key-value pair matches post OCR processing. This research underscores the efficacy of OCR in automatically extracting precise data from images, underscoring its potential in data management and analysis tasks. Building upon this foundation, Vaidya (2019) explores the integration of OCR technology in form automation, highlighting its transformative impact on streamlining administrative processes across industries. By leveraging OCR engines, businesses can expedite workflows, minimize manual errors, and enhance overall efficiency and productivity. Additionally, Majumder (2019) provides an overarching view of OCR technology, emphasizing its adaptability in transcribing text from diverse sources into machine-readable format. This study underscores the pivotal role of OCR in digitizing historical materials and extracting textual content from various media, facilitating computer-based storage, retrieval, and analysis of information. Furthermore, Amitha

(2020) introduces a novel application of OCR technology in literacy education, demonstrating its utility in converting attendance register images into Excel format. By developing a user-friendly web-based application, this research showcases the potential of OCR in facilitating text conversion tasks for educational purposes, thereby enhancing accessibility and efficiency in educational settings. Collectively, these studies highlight the pervasive influence of OCR technology in automating data processing tasks, improving accuracy and efficiency across diverse domains, and underscore the continuous evolution and expansion of OCR applications through innovative research and development efforts.

The reviewed literature encompasses a range of Information Management Systems (IMS) implementations and associated research endeavors, offering distinct insights into the adoption of technological solutions across diverse organizational landscapes within the Philippines. Beginning with educational institutions, exemplified by the experiences of Children's Integrated School of Alta Tierra and Filamer Christian University, a trend towards integrating IMS to streamline administrative processes, such as enrollment, student profiling, and alumni data management, is evident. These systems not only bolster operational efficiency but also contribute to informed decision-making and enhanced services for stakeholders. Transitioning to the private sector, businesses like Book Latte illustrate the strategic integration of IMS to optimize sales, inventory management, and customer relationships. By automating critical processes like sales tracking and inventory updates, businesses stand to gain improved accuracy, productivity, and profitability, as underscored by studies by Morales et al., Dela Cruz et al., and Magallanes et al. Moreover, government agencies in the Philippines are

leveraging IMS to bolster public service delivery and financial management, as mandated by executive orders, thus ensuring greater transparency and adherence to fiscal regulations. Additionally, the application of IMS in addressing organizational challenges, exemplified by the Philippine Red Cross Online Blood Bank Management Information System (PRCOBBMIS), underscores its pivotal role in enhancing operational efficiency and service delivery. Furthermore, the literature accentuates the imperative of adhering to legal and ethical standards, particularly concerning intellectual property rights and data privacy, as evidenced by initiatives like the capstone project management platform at Rizal Technological University and the adoption of privacy policies in educational contexts, thereby ensuring the safeguarding of personal information and upholding individual privacy rights. In sum, the reviewed literature underscores the diverse applications and benefits of IMS across multiple sectors in the Philippines, advocating for the strategic adoption of technological solutions to augment organizational efficiency, service quality, and compliance with legal and ethical standards.

CHAPTER III

TECHNICAL BACKGROUND

This chapter contains the technical details used in the system's creation. In this discussion, the proponents will explore the precise technologies and methodologies used in constructing the system, and elucidate their synergistic functioning in attaining the intended result. This material will be particularly appealing to readers who are keen in delving further into the intricacies of the system or contemplating the development of comparable systems.

TECHNICALITY OF THE PROJECT

ResearchHub, a visionary capstone project with a strong technical foundation, holds the promise of becoming an indispensable resource for students seeking access to vital study materials and for administrators striving to streamline the intricate processes involved in managing capstone projects. This project's technical journey began with a rigorous phase of knowledge acquisition, followed by in-depth discussions to determine the most suitable technologies to be employed. In parallel, the project's proponents embarked on an exhaustive exploration of available tools and software options, with an unwavering commitment to leveraging the most appropriate and cutting-edge technologies and resources to facilitate and enhance the system's development.

The selection of technologies for ResearchHub has been a meticulous and well-informed process. The project's initiators, driven by an unyielding dedication to technical excellence, meticulously scoured the vast landscape of tools and software

solutions. Their mission was underscored by an insatiable desire to unearth and harness the tools and resources that best align with the project's technical requirements, all in service of expediting and enhancing the system's development process. This comprehensive investigation distinguished itself through a relentless focus on staying attuned to the latest industry trends and technological advancements, ensuring that ResearchHub would remain at the forefront of innovation and efficiency.

In essence, ResearchHub's technical evolution is rooted in the notion of empowerment, both for students and administrators. By adopting cutting-edge technologies and best practices, this capstone project seeks to revolutionize the way resources are accessed and capstone projects are managed. The commitment to perpetual technological vigilance underscores the project's dedication to delivering a solution that not only meets immediate needs but also lays the foundation for a forward-looking and sustainable approach to educational and administrative support. Armed with an unwavering focus on quality and innovation, ResearchHub is poised to usher in a new era in technical resource accessibility and capstone project facilitation.

DETAILS OF TECHNOLOGIES USED

Software Requirements

In the ambitious pursuit of developing a sophisticated web-based system, the project's dedicated proponents employed a diverse array of software tools and programming languages to realize their vision. These meticulously selected technologies, each contributing a unique facet to the project's technical landscape, are outlined below.

Visual Studio Code - a standalone source code editor used to develop computer programs, websites, web apps, web services, and mobile apps.

Figma - a web application used to create a layout for the system's user interface.

HTML - markup language used to structure a web page and its content.

CSS - a style sheet language used to describe documents written in HTML for the design and layout for the web.

PHP - a scripting language that is suited for web development.

PHPMyAdmin - a free and open-sources tool written in PHP intended to handle the administration of MySQL using a web browser.

Bootstrap - an open-source and free-to-use front-end framework for creating responsive modern websites and web applications.

In addition to these technologies, the project also made use of visual modelilng and design tools like Visual Paradigm, Draw.io, and Lucidchart. These tools enabled the creation of visual diagrams, flowcharts, and system design models, aiding in the planning and conceptualization of the project's architecture.

Hardware Requirements

Below are the minimal hardware specifications that have been defined to guarantee the successful completion of this project and its best performance.

Computer or Laptop: A modern computer or laptop with a multi-core processor (e.g., dual-core or higher) to support development tasks and system testing.

RAM: 8GB of RAM to ensure smooth performance while running development tools and testing the web-based system.

Storage: 256GB SSD (Solid State Drive) for faster data access and sufficient storage capacity.

Display: A monitor with a resolution of 1920 x 1080 pixels or higher for comfortable coding and design work.

Internet Connection: A reliable internet connection is required for accessing online resources, version control, and testing the web-based system.

Input Devices: A standard keyboard and mouse for data input and system navigation.

It's important to remember that these are just the minimal requirements and that higher hardware specs could be preferred for testing and development to go more quickly. Additionally, depending on the size and complexity of the project, different hardware configurations may be required.

HOW THE PROJECT WILL WORK

The project is primarily aimed at assisting researchers in their pursue for valuable resources to facilitate the development of their capstone projects. This initiative will provide a user-friendly platform for students, offering them the ability to efficiently search for pertinent materials, set specific year ranges, and seamlessly browse through the available resources.

To access the system, administrators are required to connect to the internet and log in using their respective login credentials. Upon successful verification of their information, the system will grant them access to its full suite of privileges. Administrators enjoy comprehensive control over the system, allowing them to add new capstone files and remove existing ones as needed.

This endeavor underscores the importance of efficient and organized resource management for the benefit of students working on their capstone projects. By providing a user-friendly interface and granting administrators the authority to manage resources, the proponents aim to streamline the research process and support students in their academic endeavors.

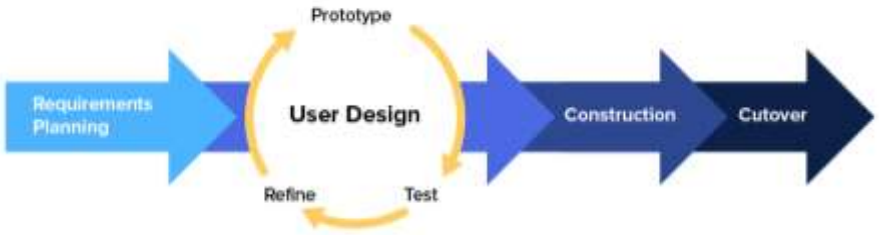

Figure 2. RAD - Software Development Lifecycle

Image source: https://kissflow.com/application-development/rad/rapid-application-development/

The use of Rapid Application construction (RAD) may provide advantages in the construction of a Capstone Project Information Management System via the provision of a fast and iterative methodology for software development. There are many

ways in which Rapid Application Development (RAD) might provide advantages in the development of Capstone Project Information Management System.

The adoption of RAD methodology for the development of the system presents several overarching benefits. RAD's iterative approach aligns seamlessly with the dynamic nature of capstone projects, allowing students to incrementally build and refine the IMS based on evolving requirements and stakeholder feedback. The emphasis on user involvement throughout the process ensures that the system meets the expectations of faculty advisors and end-users, facilitating real-time adjustments and improvements. RAD's flexibility accommodates changes in project scope or requirements, common in capstone projects as students gain deeper insights. Additionally, the efficient prototyping in the User Design phase enables students to quickly validate and visualize system features, contributing to the overall success of the project by providing a structured yet adaptable framework for development.

1. Requirements Planning:

   During the Requirements Planning phase, it is possible for proponents to engage in collaboration with various stakeholders, such as academic advisers and end-users, in order to establish and give priority to project requirements. This is consistent with the early phases of a capstone project, when the comprehension and documentation of requirements play a crucial role. The collaborative aspect of Rapid Application Development (RAD) facilitates a collective comprehension of the system's goals among the project team and stakeholders.

2. User Design (Prototype, Test, Design):

This phase has significant value within the context of a Capstone Project Information Management Systems. The use of an iterative prototyping approach enables the individuals involved to efficiently generate operational prototypes of the Information Management System. The prototypes have the potential to be shown to stakeholders, offering a concrete manifestation of the system at an early stage of its development. The iterative testing and design cycles in this phase are congruent with the cyclic nature of capstone projects, facilitating students in collecting feedback and progressively refining the system.

3. Construction:

The Construction phase is dedicated to the physical realization of the system, using the enhanced prototypes and feedback obtained during the User Design phase. In the context of a Capstone Project Information Management Systems, this particular phase encompasses the practical execution of the proposed features and functions. The Construction phase places a strong focus on cooperation and iterative development, allowing students to effectively respond to evolving needs and constantly improve the system.

4. Cutover:

The Cutover phase encompasses the process of transferring the system from the development environment to the production environment. Within the framework of a Capstone Project IMS, this

particular phase includes the conclusive testing, implementation, and optionally the provision of training to end-users or stakeholders. The methodical methodology used by Rapid Application Development (RAD) guarantees a seamless progression from the development phase to the deployment phase, therefore assisting students in efficiently overseeing the concluding aspects of the project.

The integration of Rapid Application construction (RAD) concepts into the construction of a Capstone Project Information Management System may facilitate the optimization of the development process, enable efficient adaptation to evolving needs, and provide a fully operational and user-centric system within the project's temporal limitations. Additionally, it offers students the opportunity to get familiarity with a software development strategy that adheres to industry standards.

CHAPTER IV

METHODOLOGY

This chapter will provide the research methodologies, including the environment, requirements documentation, requirement specification, development, system testing and prototype, system architecture, system design and the system implementation plan.

ENVIRONMENT

Locale:

Computer Department – Rizal Technological University

Population of the Study:

Students, Faculty, and the Department Heads

The central environment of this study is situated within the Computer Department of Rizal Technological University, serving as the primary focus of investigation. Within this institutional context, the study encompasses a population composed of students, faculty members, and department heads. Their respective roles and interactions within the educational setting provide critical insights into the dynamics and challenges inherent to the system. As active participants in shaping the academic landscape, these stakeholders contribute distinctive perspectives and experiences, thereby enriching the research inquiry. Through a systematic exploration of their perspectives and engagement, this study endeavors to clarify key factors of the academic environment, with the ultimate goal of informing evidence-based strategies

for enhancing educational practices and fostering continuous improvement within the Computer Department of Rizal Technological University.

REQUIREMENTS SPECIFICATIONS

In this part of the research, the proponents will be able to determine the system requirements needed for the development of the Inventory Management System by comparing the related systems, survey for the users, and conducting a task analysis. This strategy will help the proponents to understand more about how the system developed.

Operational Feasibility

This section evaluates the potential effectiveness of integrating the proposed system into existing operations. It assesses factors such as alignment with organizational processes, user acceptance, and adaptability to future needs. By considering these aspects, stakeholders determine the practicality of implementing the system within the operational context.

Fishbone Diagram

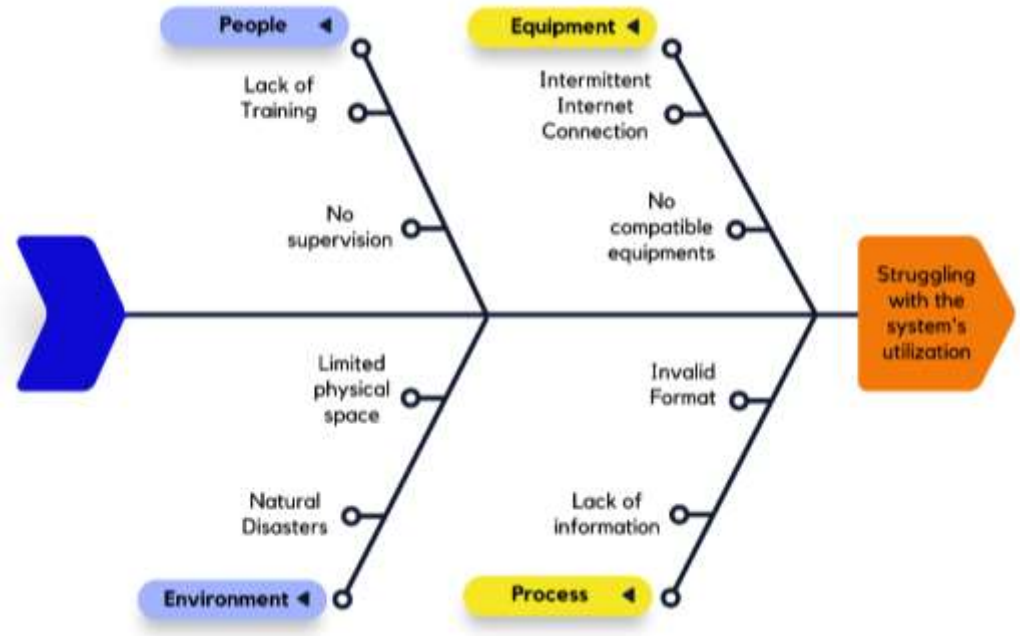

Figure 3. Fishbone Diagram

The proponents utilize a fishbone diagram, alternatively known as an Ishikawa diagram or cause-and-effect diagram, as a visual instrument for the systematic identification and analysis of potential causes underlying a problem or effect. Named for its resemblance to the skeletal structure of a fish, wherein the problem or effect is represented as the "head" and causes as the branching "bones," this diagram aids in categorizing potential causes. The central issue depicted in the diagram pertains to "Struggling with the system's utilization." Categories of potential causes illustrated in the diagram encompass "People," "Equipment," "Environment," and "Process." Within the "People" category, the absence of adequate training and supervision emerges as potential contributors, implying deficiencies in employee skills and oversight. In the "Equipment" domain, challenges such as intermittent internet connectivity and

equipment incompatibility are highlighted, both capable of disrupting workflow and task execution. Environmental considerations include constraints such as limited physical space and the threat of natural disasters, posing risks to operational efficiency and infrastructure integrity. Moreover, within the "Process" category, issues such as non-compliant document formats and information deficits underscore the necessity of standardized protocols and robust data management practices. Through systematic scrutiny of these potential causes, stakeholders can discern underlying issues and formulate targeted interventions, thereby alleviating the identified problem or effect.

Functional Decomposition Diagram

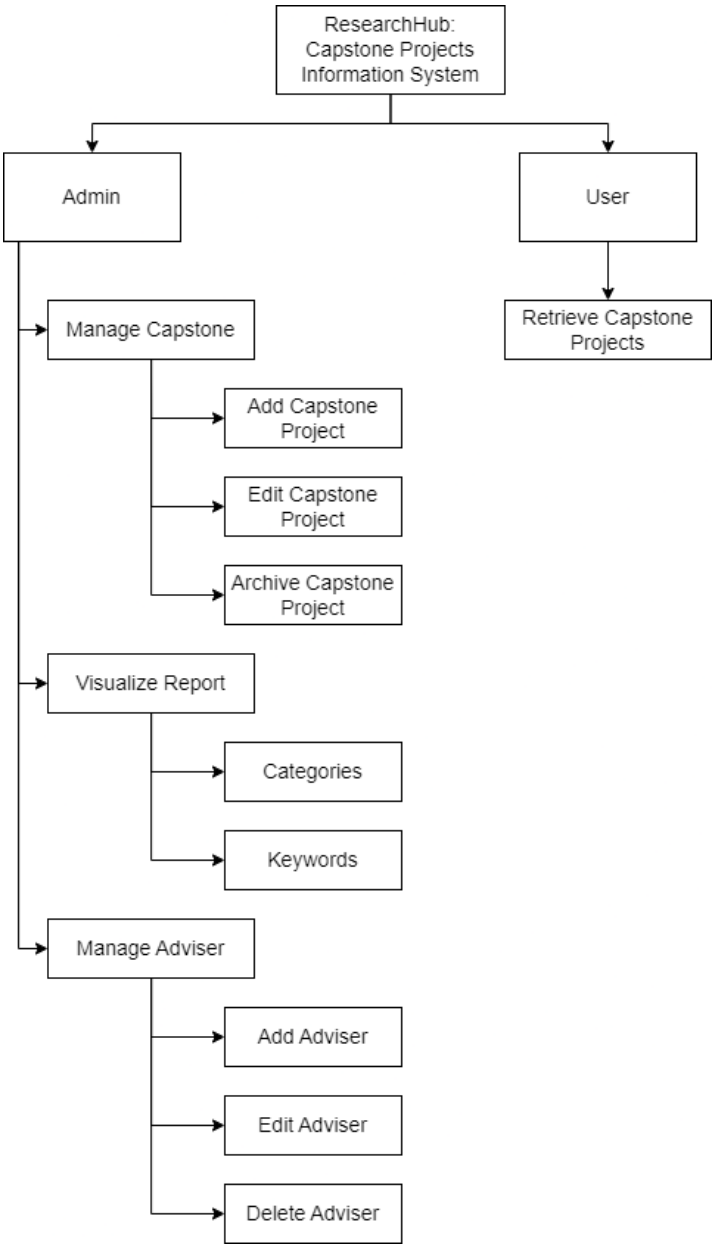

Figure 4. Functional Decomposition Diagram

A Functional Decomposition Diagram serves as a graphical representation of the various functions or tasks constituting a broader system. It facilitates the deconstruction of intricate systems into smaller, more comprehensible components,

thereby enhancing comprehension, design, and implementation processes. Positioned at the apex of the diagram, the principal function delineates between administrative and user-related functionalities. Under the administrative purview, the primary function encompasses "Managing Capstone Projects," "Visualizing Reports," and "Managing Advisers." These functions undergo further decomposition into discrete sub-functions, each delineated within corresponding boxes.

Add Capstone Project: This function allows users to add new capstone projects to the system.

Edit Capstone Project: This function allows users to edit the information for existing capstone projects.

Archive Capstone Project: This function allows users to archive capstone projects that are no longer active.

Visualize Report: This function allows users to generate reports on capstone project data.

Manage Advisers: This function allows users to manage the information for advisers who are involved in capstone projects.

Each sub-function corresponds to specific tasks within the administrative domain, thereby facilitating a detailed understanding of the system's administrative operations. Conversely, the user aspect is restricted to accessing essential information within Capstone Projects, reflecting a distinct set of functionalities tailored to user requirements. This delineation underscores the delineation between administrative

control and user access within the system, facilitating a structured depiction of functional responsibilities and capabilities.

Technical Feasibility

The technical feasibility assessment entails an examination of the requisite hardware and software necessary for the seamless operation of the system. Developers have meticulously deliberated upon numerous factors, including the availability of hardware, software, and other essential resources, alongside the requisite skills and knowledge indispensable for the implementation and sustained maintenance of the technology.

Compatibility checking

During the preliminary stage of assessing compatibility between hardware and software specifications for the Inventory Management System of ResearchHub, proponents conducted testing to guarantee seamless functionality. To effectively evaluate the system's performance, users or testers are advised to operate it on the designated specifications outlined below.

PC / Laptop	**Hardware Specification:** **Computer or Laptop:** multi-core processor (e.g., dual-core or higher) **RAM:** at least 8GB of RAM **Storage:** 256GB SSD

	Display: resolution of 1920 x 1080 pixels
	Software Specification: **OS:** Windows 10 or above
	Browser Requirements: • Google Chrome • Microsoft Edge (Chromium)
	Internet Connection: At least 30 Mbps of speed or above

Table 1. Compatibility Checking

Relevance of the Technologies

The significance of the technologies deployed for the Capstone Project Information Management System at Rizal Technological University lies in their capacity to address critical issues within the educational domain while harnessing the transformative capabilities of information management systems. Several key aspects underscore the importance of these technologies:

Enhancement of Efficiency: This efficiency improvement translates into time-saving benefits for both students and educational practitioners, allowing for more efficient resource allocation towards academic pursuits.

Promotion of Accessibility and Transparency: The system promotes accessibility by offering students a centralized platform to access past capstone projects. With user-friendly interfaces and search features, students can effortlessly navigate the repository,

promoting transparency in project selection and research. This inclusive approach ensures equal opportunity for all students to benefit from the system's wealth of knowledge.

Facilitation of Knowledge Sharing and Collaboration: The system encourages knowledge sharing and collaborative endeavors among students, faculty, and researchers. The system fosters interdisciplinary collaboration, enriching the academic environment and nurturing a culture of innovation within the institution.

Ensuring Data Security and Integrity: The adoption of specialized databases ensures the security and integrity of capstone project data, guarding against unauthorized access, loss, or tampering.

In essence, the technologies leveraged for the Capstone Project Information Management System serve as catalysts for innovation, efficiency, and collaboration within the academic sphere, empowering stakeholders to harness the full potential of information management systems for the betterment of academic endeavors and student achievement.

Schedule Feasibility

Assessing schedule feasibility involves evaluating the practicality of completing the project within the specified timeframe. This assessment encompasses a thorough examination of the project's timeline, considering factors such as resource availability, task dependencies, and potential risks. Developers carefully analyze the project schedule to ensure it aligns with organizational objectives and constraints, while also

anticipating any possible delays or setbacks. By conducting a comprehensive evaluation of schedule feasibility, developers can determine the project's likelihood of meeting its deadlines and objectives efficiently.

Project Timeline

This project timeline shows the chronological order of the development process of the project, indicated by the start of the project by brainstorming or sharing of ideas with other proponents, to continuous development process of the system through different stages of functions, and eventually to the deployment ang implementation of the system.

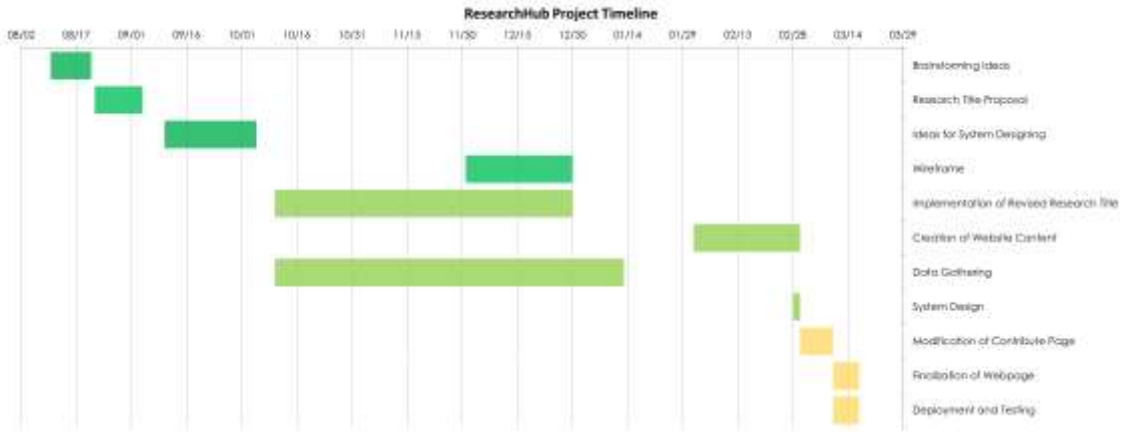

Figure 5. Project Timeline

Economic Feasibility

Economic feasibility evaluation involves a thorough examination of the financial viability and cost-effectiveness of the project. It encompasses an analysis of projected costs and potential benefits associated with system development and implementation. Developers assess various factors, including initial investment

requirements, ongoing operational expenses, and potential revenue sources or cost reductions. Through this comprehensive assessment, developers aim to ascertain whether the project's benefits outweigh its costs and align with the organization's financial objectives. This evaluation informs strategic decisions regarding resource allocation and investment in the project.

Cost and Benefit Analysis

The table below represents the cost and benefit analysis that determines the cost of developing and implementing the system and its possible benefits.

Item	**Price**
Desktop / Laptop	₱ 30,000.00 - ₱ 50,000.00
Web Hosting	₱ 0.00
Web Domain	₱ 0.00
Software Tools	₱ 0.00 - ₱ 5,000.00
Internet Service	₱ 18,000.00 / year
Total Costs:	₱ 48,000.00 - ₱ 73,000.00
Benefits	**Gain (Assumption)**
Automation efficiency	₱ 100,000.00 / year
Net Benefit:	₱ 27,000.00 - 52,000.00

Table 2. Cost and Benefit Analysis

Cost Recovery Scheme

The establishment of ResearchHub: Capstone Projects Information Management System within the academic realm is an innovative solution that can greatly benefit students and Computer Department of Rizal Technological University. A multifaceted approach to cost recovery can be envisioned, encompassing various strategies tailored to different user segments and revenue streams. Firstly, a subscription-based model could be structured to cater to institutional and organizational users, offering tiered subscription plans based on the scale of usage and specific requirements. This model would not only ensure a steady stream of revenue but also incentivize long-term commitment from subscribing entities. Secondly, forging strategic partnerships and sponsorships with academic institutions and industry stakeholders could serve as a significant revenue source. Grants, funding opportunities, and research sponsorships from governmental bodies and private organizations can further alleviate financial burdens. Additionally, exploring avenues such as advertising within the system and sponsorship arrangements for specific features or sections can supplement revenue generation efforts. Consulting services, training programs, and transaction fees for certain actions within the platform could also be explored as additional sources of income. Regular monitoring and evaluation of the cost recovery strategy, coupled with solicitation of user feedback and adaptation to evolving market dynamics, will be essential for ensuring the long-term viability and success of the ResearchHub initiative.

Requirements Modelling

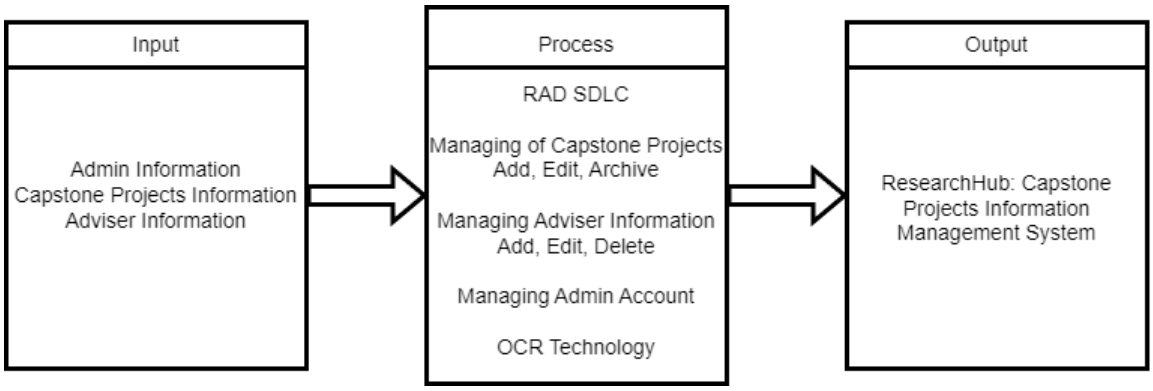

Figure 6. Requirements Modelling

The figure shows the inputs; Admin Information, Capstone Projects Information, and Adviser Information. Administrative data encompasses user credentials and permissions, capstone projects information includes project details such as titles and timelines, and adviser information comprises data on individuals involved in projects. The processes include Managing of Capstone Projects which is one of the main processes of the system. It involves several sub-processes, including the Add, Edit, archive this sub-process that allows admin to add new capstone projects, edit the information of existing projects, and archive completed projects. Managing Admin Account is a process where the Super admin approve a request for admin account creation. OCR Technology, this main process suggests that the system can extract information from image files, which might be useful for insertion of capstone project information. Managing Adviser Information, also one of the main processes that allows admin to add, edit, and delete information about advisers who are involved in capstone projects. Add, Edit, Delete, this sub-process likely allows admin to add new adviser, edit the information of adviser, and delete adviser. The system's primary output

ResearchHub: Capstone Projects Information which represents the overall management of capstone project information within the system.

Requirements Documentation

The requirements documentation functions as a comprehensive guide that delineates the parameters and goals of our project. The purpose, scope, and anticipated results of our project are outlined in this document, which captures its core. To ensure a comprehensive knowledge of the operational components of the project, this part includes functional requirements such as descriptions of user interactions, system functionalities, and necessary features. Ensuring that all stakeholders, including developers, testers, project managers, and clients, have a clear knowledge of what the program is expected to perform and behave like is the goal of requirements documentation.

Data and Process Modelling

A conceptual representation of data elements and their relationships inside a system is created through the process of data and process modelling. It entails identifying the pertinent data entities and attributes and drawing a diagram that illustrates their relationships. The purpose of this diagram, which is also known as an entity-relationship diagram (ERD), is to assist designers in comprehending the data requirements for the system and in developing a logical database schema. Additionally, flowcharts, context diagrams, data flow diagrams, and use case diagrams facilitate better understanding and facilitate communication between developers and clients.

Context Diagram

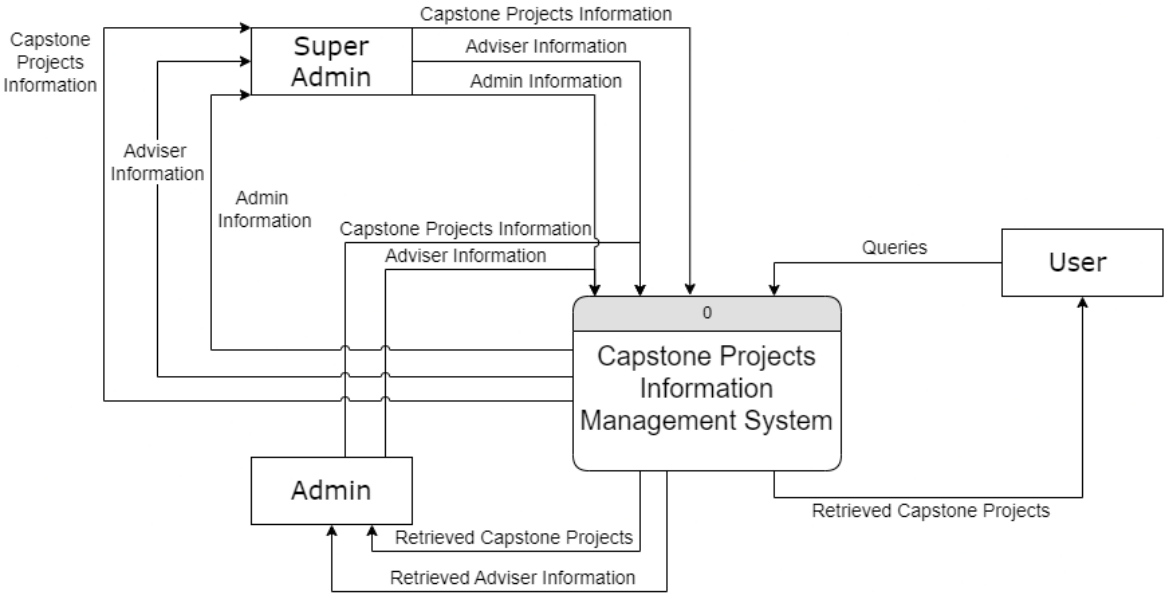

Figure 7. Context Diagram

An overview of the system and its interactions with external entities is given at a high level in this context diagram. It doesn't display any of the system's underlying workings, such as how information on capstone projects is stored and retrieved.

The context diagram for a Capstone Projects Information Management System shows the system's interactions with its external entities, which are users, admins, and the super admin. Users can submit queries to the system to retrieve specific capstone project information, then the system retrieves the information based on the users' queries. Admins are responsible for managing the capstone projects and its data and adviser's information. Same as the admin, the super admin manages the capstone projects, adviser's information and its unique function is to manage the admin accounts.

Data Flow Diagram

The following is a diagram that shows the procedures involved in how data moves through our system. It is a diagrammatic representation of the inputs, outputs, and processes that change the inputs into outputs for the system.

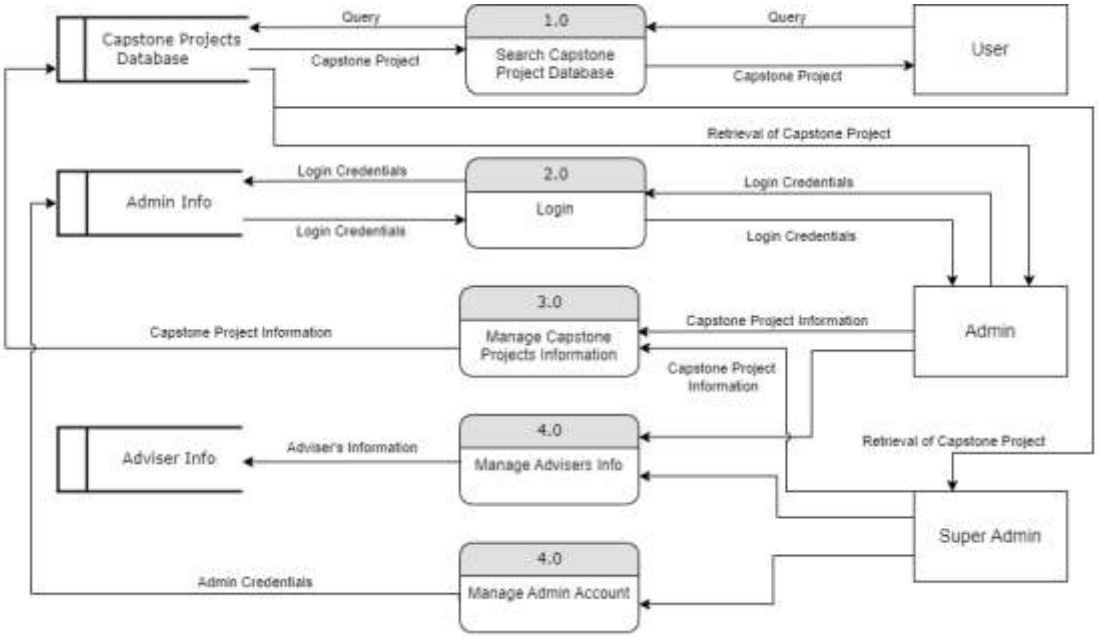

Figure 8. Data Flow Diagram - Level 1

The data flow diagram in the image shows a simplified overview of the flow of information between a Capstone Projects Database and an entity. The DFD includes four main elements: external entities, processes, data stores, and data flows.

The Capstone Projects Information Management System is a comprehensive platform designed to facilitate the efficient storage, organization, and retrieval of capstone project information. At its core, the system operates through a secure login mechanism, where administrators are granted privileged access upon authentication of

their credentials. Once logged in, admins assume responsibility for the meticulous management of the Capstone Projects Database, wielding the capability to add, update, or delete project data as necessary. This admins oversight ensures the integrity and accuracy of the database, allowing for seamless navigation and manipulation of project information. Admins can also add new projects, update existing entries, or archive outdated information guarantees that users have access to the most up-to-date and pertinent data available. While the users' interaction capabilities are limited compared to administrators, they are empowered to search the Capstone Projects Database using keywords or specific queries. Leveraging the system's search functionality, users can swiftly retrieve a list of capstone projects relevant to their interests, academic pursuits, or research objectives.

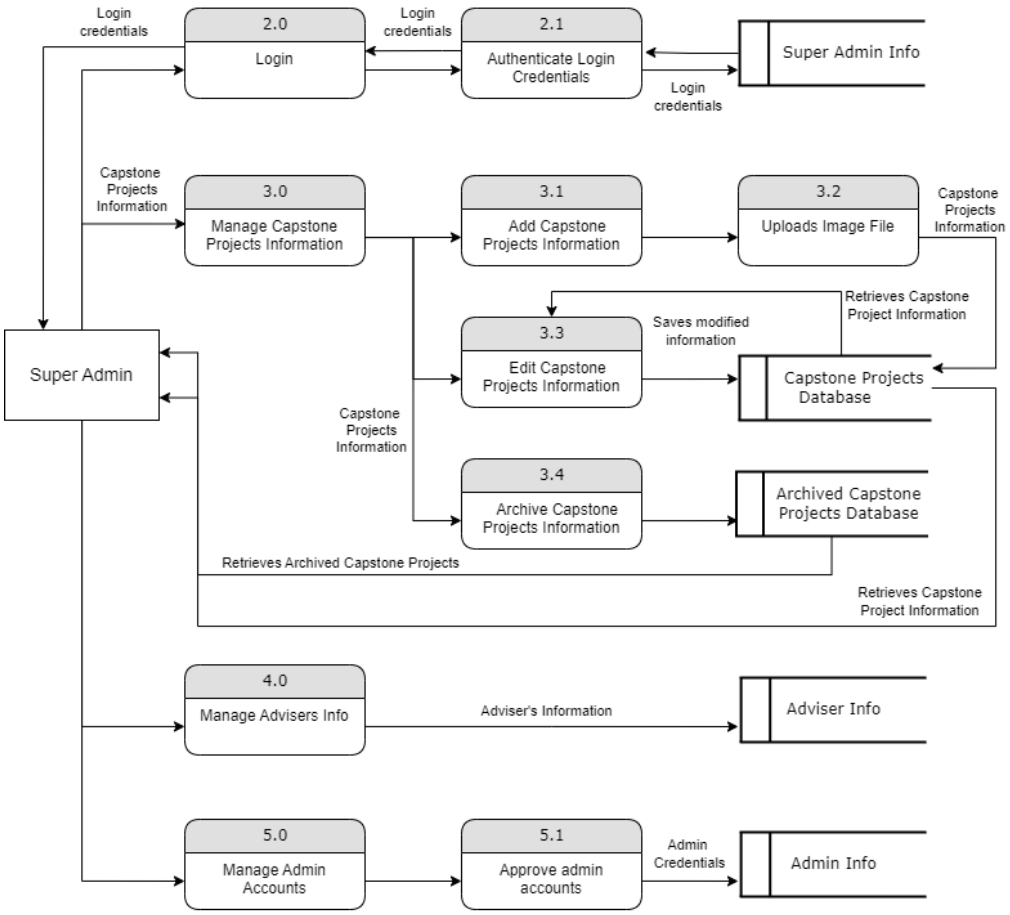

Figure 9. Super Admin Data Flow Diagram - Level 2

The DFD level 2 for the Super Admin offers an overview of the system's functionalities, emphasizing the pivotal role of the Super Admin in managing both Capstone Projects and Admin accounts. It commences with the Super Admin initiating the interaction through the login process (2.0), wherein the system undertakes authentication of credentials, permitting access upon successful verification. Subsequently, the focus shifts to Capstone Projects management (3.0), delineating various tasks such as adding new projects (3.1), editing existing ones (3.2), and archiving projects (3.4) when necessary. It's implied that modifications made during

the editing process are saved back into the Capstone Projects Database, ensuring data accuracy and consistency.

The diagram provides a comprehensive overview of Capstone Projects information management, details regarding the specific functionalities for managing Admin accounts (4.0) shows that the Super Admin have the authority in overseeing administrative accounts but details regarding this process will be further understood in DFD – Level 3.

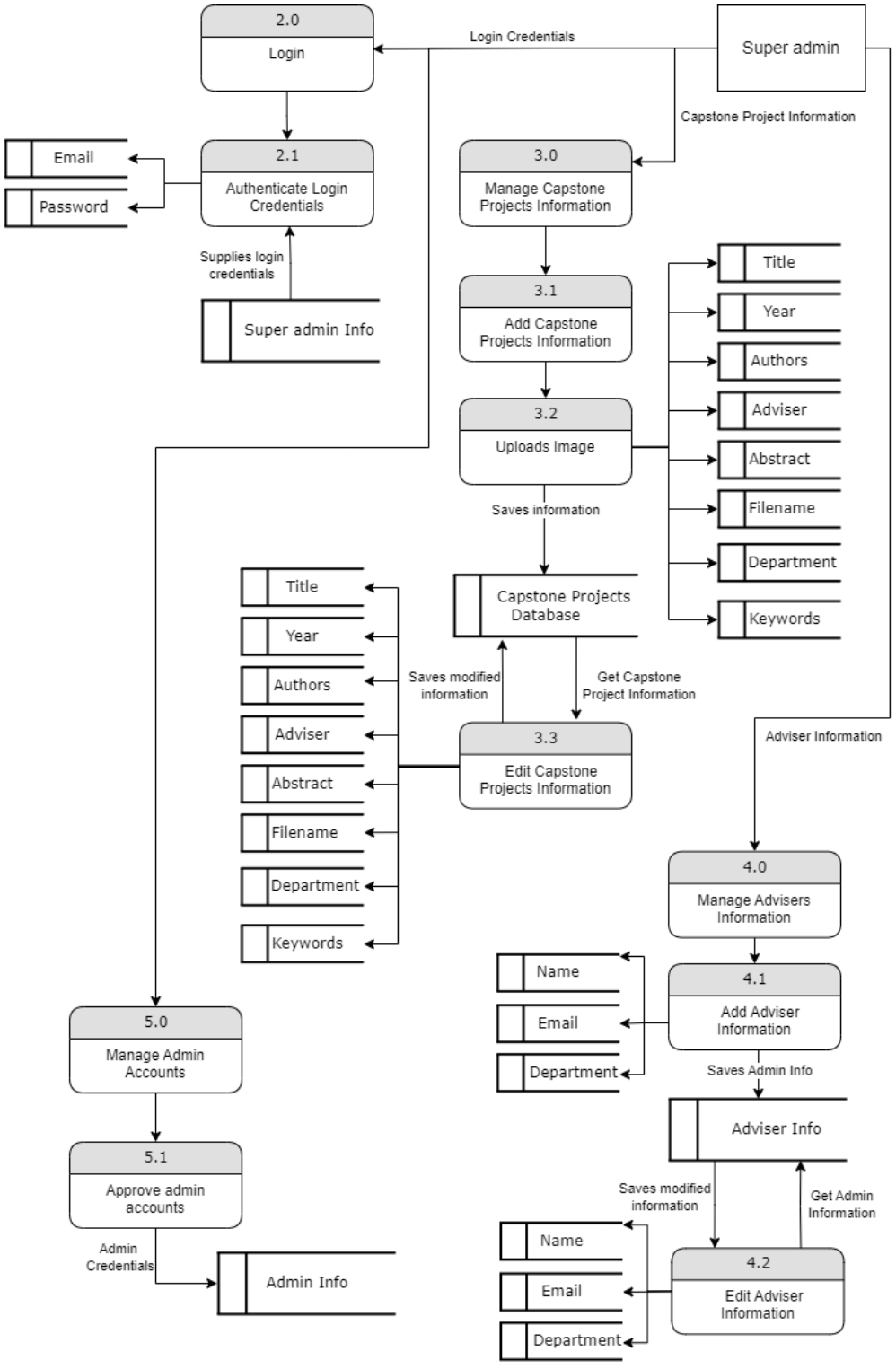

Figure 10. Super Admin Data Flow Diagram - Level 3

The DFD Level-3 for the Super Admin in the Capstone Projects Information Management System provides an extensive overview of the Super Admin's functionalities, primarily focused on managing Capstone Projects Information and extending to the management of Admin Accounts. The process begins with the Super Admin initiating login by entering credentials, authenticated against the Super Admin Login Credentials database, granting access to Super Admin functionalities such as managing Capstone Projects Information and Admin Accounts. Within the Capstone Projects Information management domain, the Super Admin can perform various operations, including adding new capstone projects and editing existing project details, entailing comprehensive input and validation before saving into the Capstone Projects Database. Editing involves retrieving relevant details, making modifications, and saving validated updates back into the database. Additionally, the Super Admin can archive capstone projects, with archiving inferred to involve selecting projects, retrieving their information, and likely transferring it to a separate archive database. This process potentially results in the deletion of original project information from the primary database. Furthermore, the level-3 DFD also incorporates functionalities for managing Adviser Information, allowing the Super Admin to add, edit, or delete adviser information within the Adviser Database, thereby ensuring comprehensive oversight and management of both Capstone Projects and Adviser Information within the system.

Moreover, the DFD Level-3 introduces functionalities for managing Admin Accounts, where the Super Admin can accept or decline admin account requests. This involves reviewing incoming requests, assessing their validity or relevance, and taking appropriate action to either approve or reject the request. The Super Admin maintains

control over the administration of accounts, ensuring the integrity and security of the system. This robust framework empowers the Super Admin to maintain data accuracy, relevance, and accessibility while effectively managing administrative accounts and overseeing the overall functionality of the system.

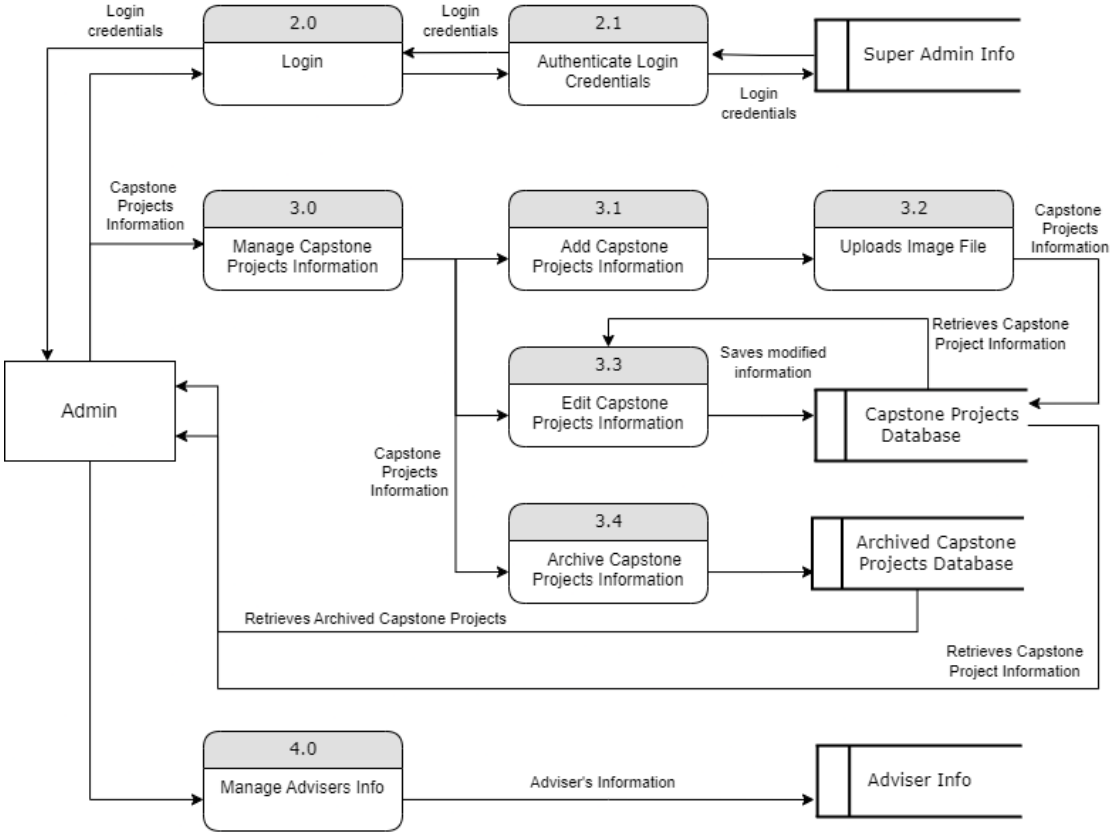

Figure 11. Admin Data Flow Diagram - Level 2

The DFD Level-2 for the Admin in the Capstone Projects Information Management System provides a concise yet comprehensive overview of the admin's key functionalities, which primarily revolve around managing Capstone Project information and the login process. The interaction commences with the admin entering their login credentials, subsequently validated against the Admin Login Credentials

database, leading to access being granted to Admin functionalities, specifically centered on managing Capstone Projects Information. Within this domain, the admin can execute various operations, including adding new capstone project entries, editing existing project information, and archiving projects as needed. The addition process involves providing detailed project information and possibly uploading associated image files, while editing entails retrieving, modifying, and saving updated details back into the Capstone Projects Database. Notably, the DFD Level-2 emphasizes the admin's role in managing Capstone Project information specifically, distinct from the Super Admin's additional functionalities for managing Admin accounts and other aspects of the system.

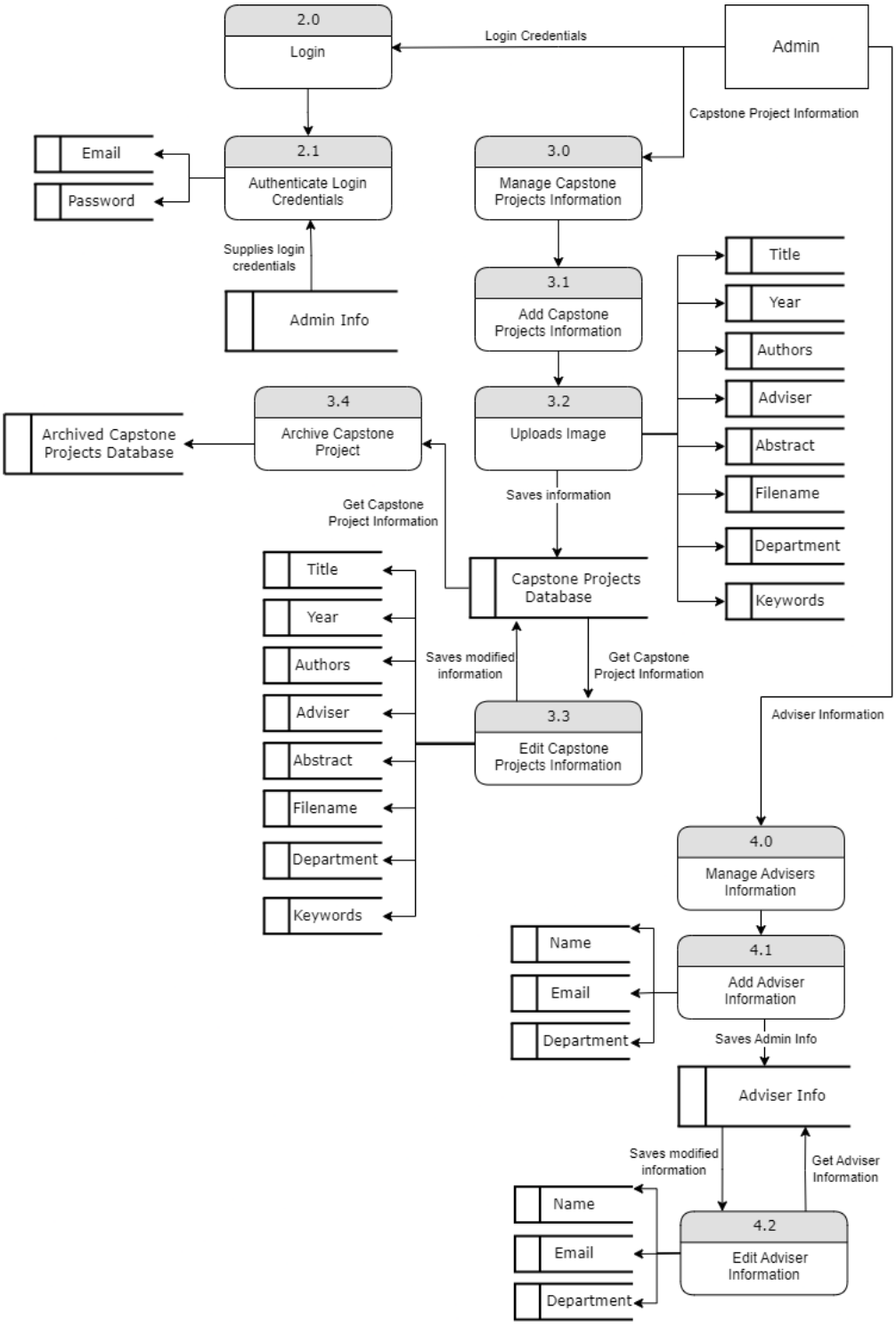

Figure 12. Admin Data Flow Diagram - Level 3

The DFD Level-3 for the Admin in the Capstone Projects Information Management System provides a detailed overview of the admin's functionalities, primarily centered around managing Capstone Projects Information. The process commences with the admin initiating login by inputting credentials, which are then authenticated against the Admin Login Credentials database, subsequently granting access to Admin functionalities such as managing capstone projects information, managing advisers' information. Within this domain, the admin can execute various operations, including adding new capstone projects and editing existing project details. The addition process entails providing comprehensive project information, including title, year, authors, adviser, abstract, uploading associated images, department, and keywords, followed by validating and saving the information into the Capstone Projects Database. Editing existing project information involves retrieving relevant details based on search criteria, making necessary modifications, and saving validated updates back into the database. Additionally, the Admin can archive capstone projects, although specific details of this process are not explicitly delineated. It can be inferred that archiving involves selecting projects, retrieving their information, and likely moving it to a separate archive database, possibly resulting in the deletion of the original project information from the primary database. Moreover, the DFD Level-3 introduces functionalities for managing Adviser Information, allowing the admin to add, edit, or delete adviser information within the Adviser Database. This comprehensive framework empowers the admin to effectively manage both Capstone Projects and Adviser Information within the system, ensuring data accuracy, relevance, and accessibility.

System Flowchart

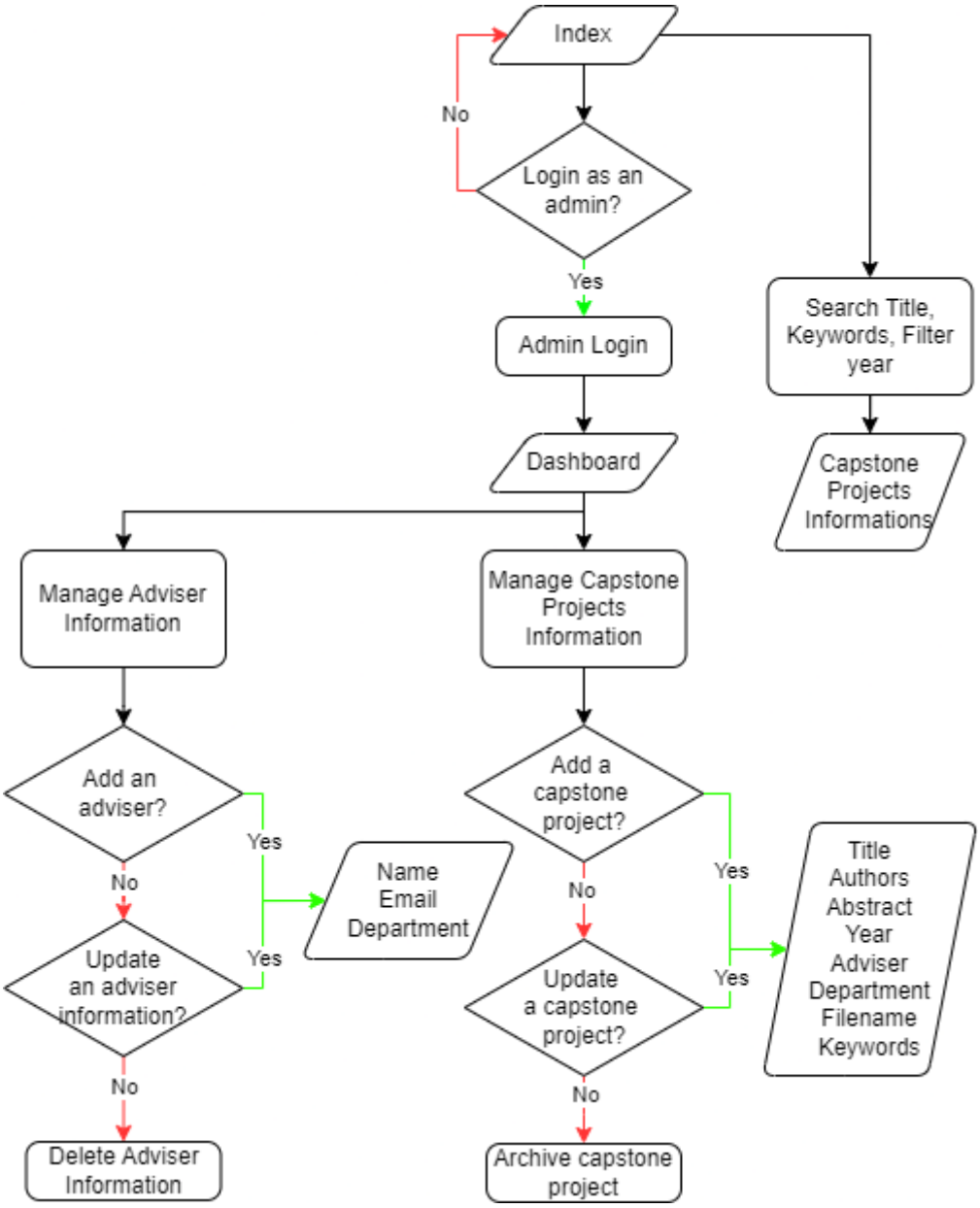

Figure 13. System Flowchart

The system flowchart of ResearchHub is being shown above. Upon commencing the procedure, the system validates the user's permission. In the case that a user does not possess administrative capabilities, the system will automatically return

them to the index page. This redirection serves as a security measure to prevent unauthorized access to project management features.

The system provides authorized users with a dedicated dashboard that is particularly intended for the purpose of managing capstone projects and managing advisers. To initiate the process of adding a project, the administrator selects the specified button labeled "Add Capstone Project." Upon being prompted for project information, the user conscientiously provides the project title, authors, abstract, year, adviser, department, filename (typically for associated images), and keywords. After the completion of the information input, the administrator proceeds to click the "Add Project" button in order to conclude the procedure.

In order to make modifications to a pre-existing capstone project, the administrator commences the update procedure by selecting the "Edit Capstone Project" button. Following this, the system proceeds to display a form that is pre-filled with the existing project information, therefore enabling the administrator to do the needed modifications. After making the necessary alterations, the administrator proceeds to choose the "Update Project" option in order to implement the changes inside the system.

The process of archiving a capstone project entails the activation of the "Archive Capstone Project" button. The system expeditiously archives the designated project, so essentially eliminating it from the list of relevant projects. The act of archiving acts as a method for organizing and preserving the project database inside the system.

The admin may also choose to manage the advisers in the system, they proceed to input advisor information, where they are prompted to enter requisite details such as name, email address, and optionally department affiliation. Following this, the system prompts the admin for confirmation regarding the addition of the advisor. Upon affirmative confirmation, the system duly saves the advisor information into the website's database, thereby establishing a comprehensive record for the new advisor within the system.

In summary, the system effectively supports the administration of capstone projects by offering a user-friendly interface and a well-defined procedure for the inclusion, modification, and preservation of projects. The integrity and security of project data are ensured by the implementation of validation tests and permission mechanisms inside the system. The flowchart presents a structured and streamlined process for both adding advisers and managing capstone projects, underscoring the system's capability to facilitate effective administration and organization of critical information within the website.

Program Flowchart

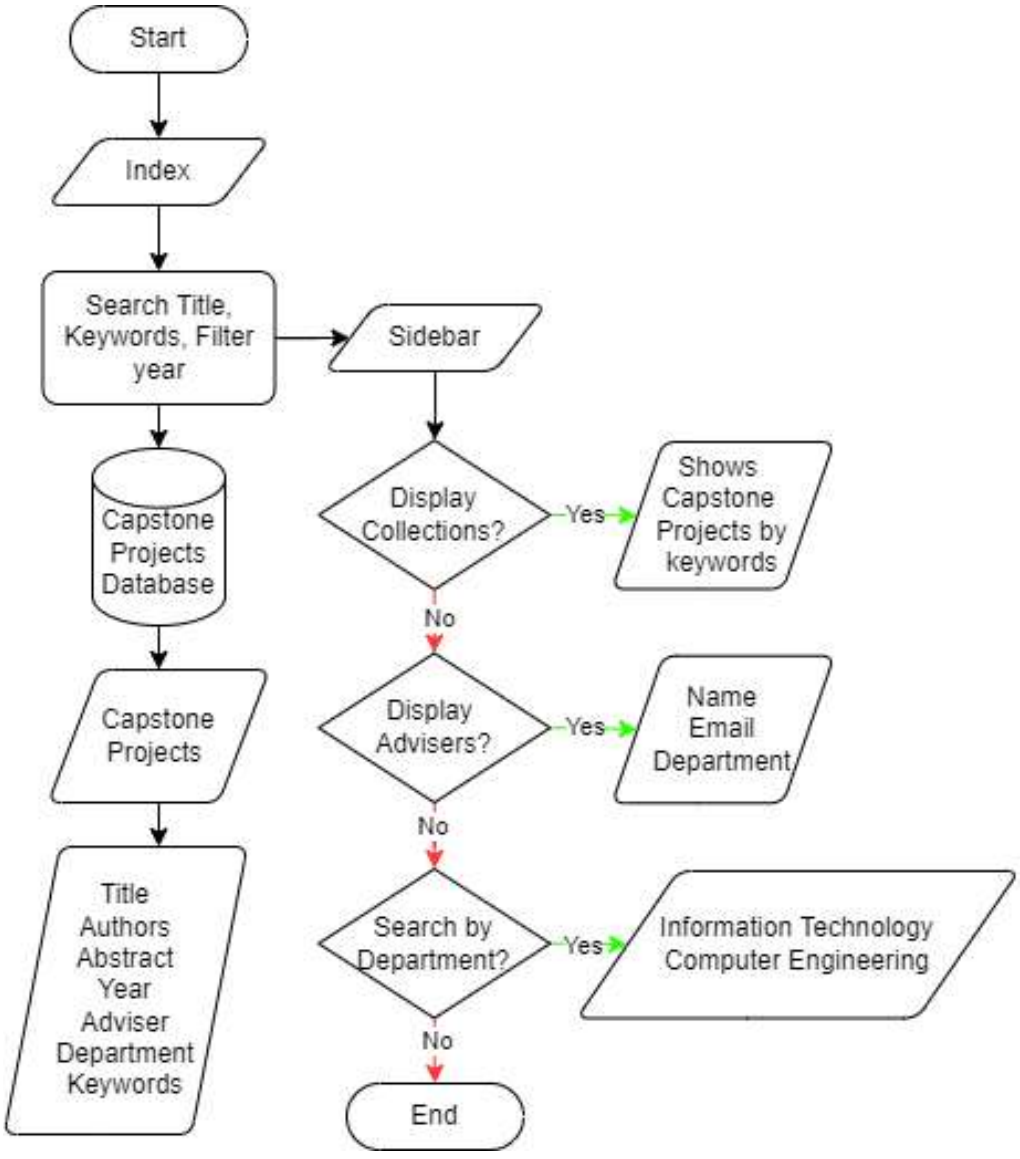

Figure 14. Program Flowchart

The system flowchart for users in the Capstone Projects Information Management System illustrates the user's interaction, primarily focusing on searching the Capstone Projects Database. The process begins with the user initiating a search for capstone projects, which leads to a decision point where the system prompts the user to

select from three search options: Title, Keywords, or Year. Users can choose one or combine multiple options to refine their search. Depending on the user's selection, the system proceeds accordingly to search the Capstone Projects Database based on the provided criteria. If the search yields multiple results, the system displays a list of matching projects for the user to review. Each project listing may include details such as title, authors, and a brief description. Conversely, if the search results in a single matching project, the system displays detailed information about that specific project, including title, authors, abstract, year, adviser, department, keywords, and possibly an uploaded image.

Additionally, the system's sidebar offers additional interactions for the user. Displaying collections allows users to view capstone projects grouped by keywords associated with them, providing a curated browsing experience. Displaying Advisers presents a list of advisers in the system along with their name, email, and department affiliation, offering users insights into the faculty involved in guiding capstone projects. Moreover, the Filter by Departments functionality enables users to refine their search further by displaying capstone projects associated with specific academic departments.

Overall, the flowchart underscores the user-centric approach of the system, providing intuitive search functionalities and supplementary features to enhance the user experience while interacting with capstone project information.

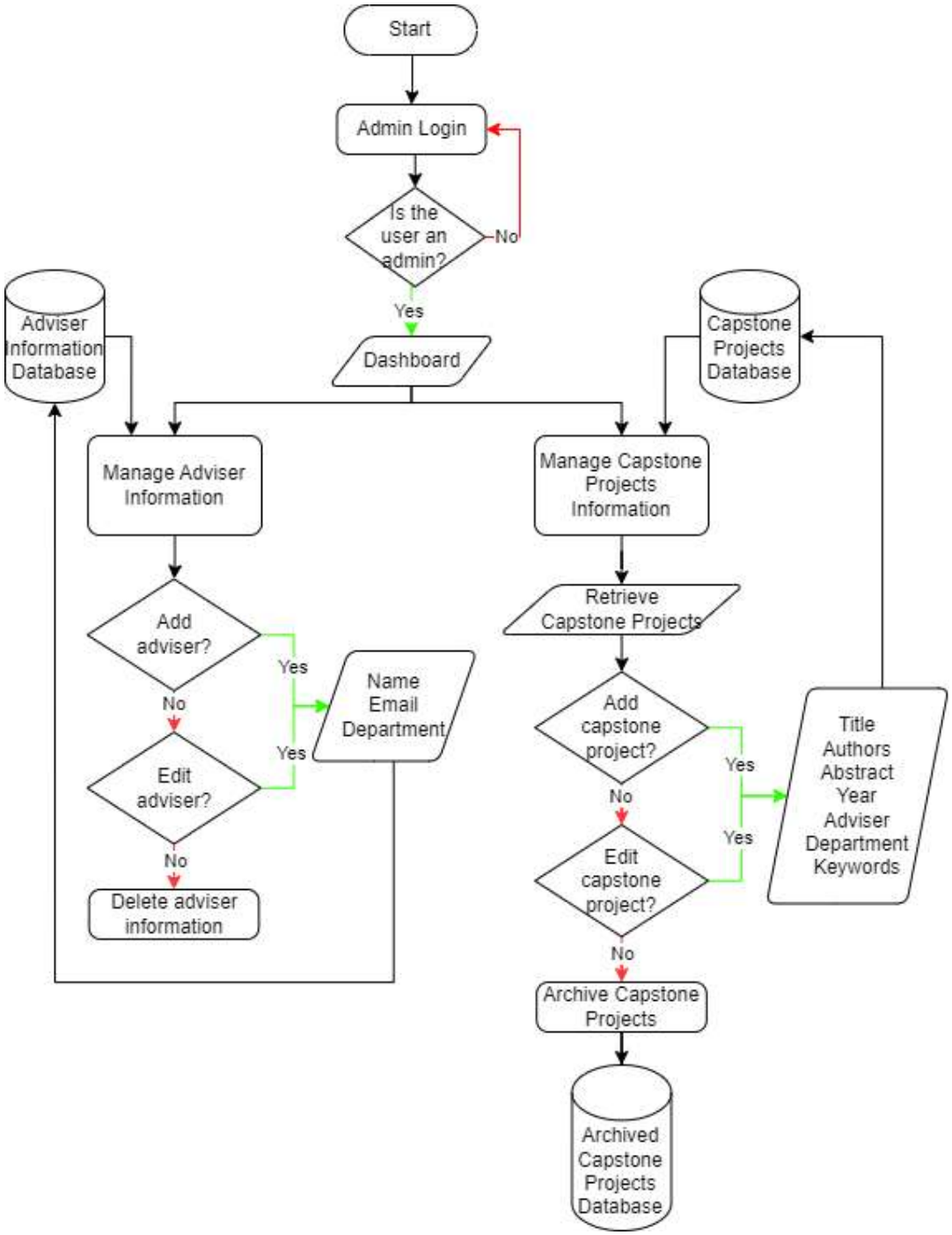

Figure 15. Admin Program Flowchart

In Figure 4, the ResearchHub system is showcased, with a specific focus on its functionality for administrators. The system has been meticulously designed,

commencing with a fundamental security measure that requires administrators to log in using their unique credentials. This initial step serves as a safeguard, verifying the authenticity and authority of the user. Upon successful completion of this authentication process, administrators are granted access to the expansive array of functions and features within the ResearchHub system.

Administrators, now has access to range of tasks, such as the capability to seamlessly add new capstone projects into the system, ensuring that the repository of projects remains up-to-date and comprehensive, to exercise control over the database by removing or deleting capstone projects, when necessary. This capability enables them to maintain a curated and relevant collection in line with the evolving needs and priorities of the educational institution.

Object Modelling

Object modelling is a fundamental approach in software engineering that was used in the creation of the Capstone Projects Information Management System. It aims to represent and understand complex systems by breaking them down into manageable objects and their interactions, ensuring a reliable and effective platform for managing capstone projects and academic resources.

Use Case Diagram

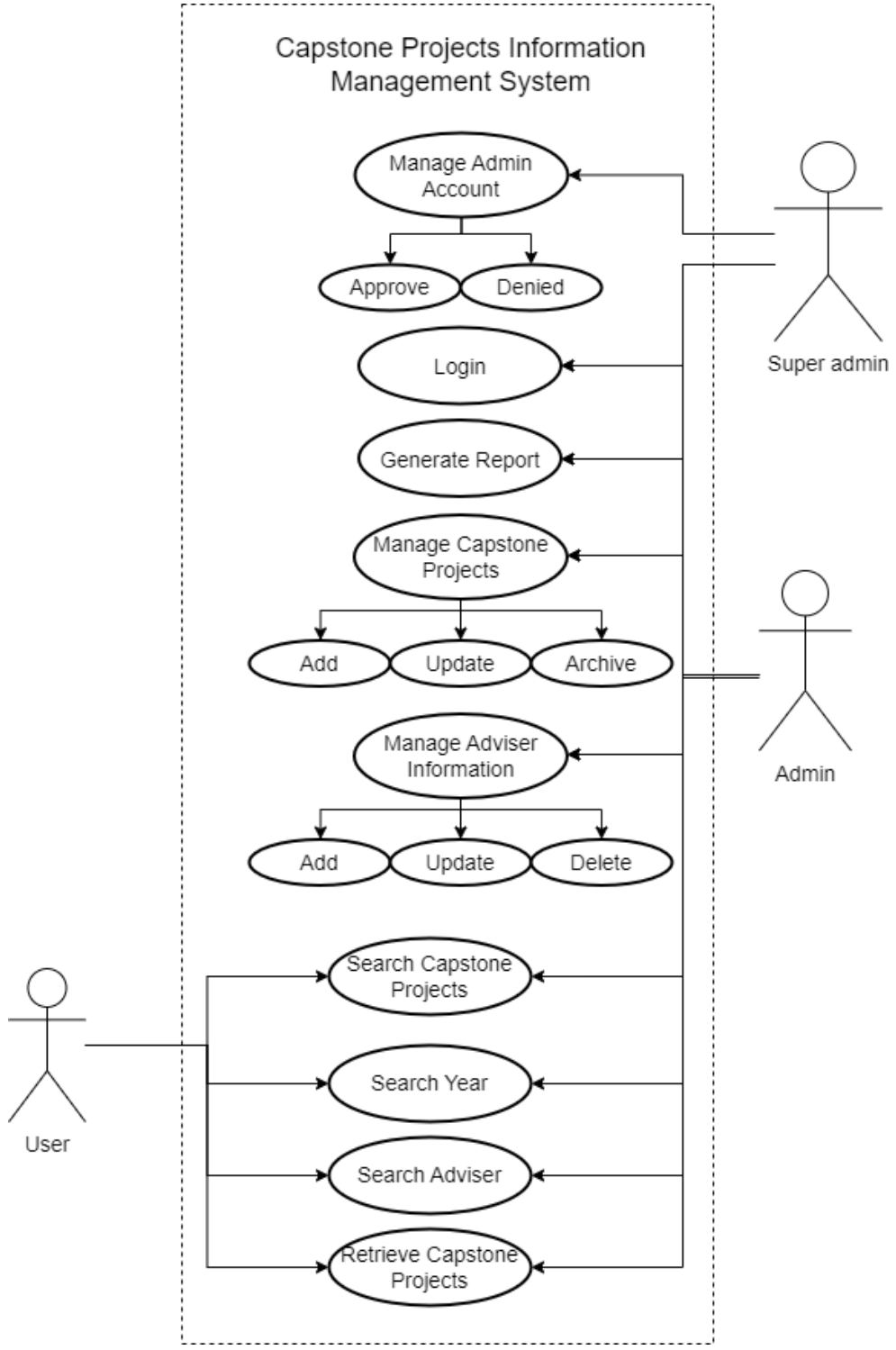

Figure 16. Use Case Diagram

The provided use case diagram offers a comprehensive overview of the functionalities and interactions within the Capstone Projects Information Management System, catering to three distinct user groups: Users, Admins, and Super Admin. Users are equipped with essential capabilities, starting with seamless authentication to access the system, ensuring a secure and user-friendly login process. Furthermore, users can efficiently search for capstone projects using various filters such as year or advisor, enabling them to pinpoint projects based on specific criteria of interest. Additionally, users have the ability to retrieve comprehensive information about the projects they're interested in, facilitating informed decision-making and exploration of capstone project details.

On the other hand, Admins possess a broader array of functionalities, reflecting their administrative role within the system. Their capabilities encompass managing capstone projects, which includes pivotal tasks such as adding, editing, and archiving projects to maintain the database's integrity and relevance over time. Admins also have the authority to approve projects, ensuring that only validated projects are accessible within the system. Moreover, the management of advisor information falls within the purview of Admins, allowing them to maintain an up-to-date repository of advisor details. Additionally, Admins can generate reports about capstone projects, facilitating data analysis and decision-making processes within the academic institution.

The relationships depicted in the use case diagram highlight the interconnectedness of these functionalities, emphasizing the seamless flow of actions within the system. Notably, managing capstone projects is intricately linked with

searching and retrieving them, underscoring the holistic approach towards project management within the system. Similarly, the searching and retrieving functionalities serve to enhance the capabilities of managing capstone projects, ensuring that users and admins alike can navigate the system efficiently and access the information they need with ease.

In addition to the admin role, the system also incorporates a Super Admin role, endowed with an extended range of critical functionalities essential for the efficient operation of the Capstone Projects Information Management System. The Super Admin, akin to the admin, possesses paramount capabilities such as managing capstone projects, encompassing tasks such as adding, editing, and archiving projects. This ensures the systematic organization and maintenance of the capstone project database, allowing for seamless access and retrieval of project information. Furthermore, the Super Admin also holds responsibility for managing advisor information, affording them the authority to add, edit, or delete advisor details within the system, ensuring that advisor information remains accurate and up-to-date. One of the pivotal aspects of the Super Admin's role lies in the management of Admin Accounts, where they possess the prerogative to review and approve/deny requests for account creation from prospective Admins. This functionality is crucial for maintaining the integrity and security of the system, ensuring that only authorized individuals gain access to administrative functionalities. By carefully scrutinizing and selectively approving account requests, the Super Admin plays a vital role in safeguarding the system against unauthorized access and potential security breaches, thereby ensuring the smooth and secure operation of the Capstone Projects Information Management System.

Risk Assessment / Analysis

The tabulated presentation outlines the risk assessment conducted for the system, explaining potential challenges that may arise upon its deployment. The table further explains on the likelihood of these issues occurring and assesses the magnitude of their potential impact. Additionally, the document outlines strategic approaches to mitigate the identified problems, thereby enhancing the system's resilience and minimizing the repercussions of potential setbacks.

RISK	LIKELIHOOD	IMPACT	MITIGATION
Hardware limitations	Moderate	High	Regular monitoring of hardware performance to identify potential issues early. Upgrade hardware components if necessary to meet system requirements.
Software compatibility issues	Low	Medium	Conduct thorough compatibility testing across different platforms and browsers during development. Ensure software updates and patches are applied promptly.
Development delays	Moderate	High	Implement agile development methodologies such as Scrum to break down tasks and track progress effectively. Regular communication and collaboration among team members to address any bottlenecks.

Security vulnerabilities	Low	High	Employ robust security measures such as encryption, access controls, and regular security audits. Stay updated on security best practices and address vulnerabilities promptly.
Data loss or corruption	Low	High	Implement regular data backups and disaster recovery plans. Utilize reliable storage systems with redundancy and fault tolerance features.
User acceptance issues	Moderate	Medium	Conduct user testing and gather feedback iteratively throughout the development process. Provide user training and support to facilitate smooth adoption of the system.
Performance bottlenecks	Moderate	High	Perform comprehensive performance testing to identify and address potential bottlenecks. Optimize code, database queries, and server configurations for improved performance.

Table 3. Risk Assessment / Analysis

DESIGN OF SOFTWARE SYSTEM PRODUCTS AND / OR PROCESS

This section showcases the different designs the proponents have produced includes the final stages of ResearchHub: Capstone Projects Information Management

System. The proponents discussed the input, process, and outputs that were included in the system. It also illustrates different interfaces for each system component.

Output and User-Interface Design

The design of the ResearchHub: Capstone Projects Information Management System considers the content that will be posted on the website, as its is intended primarily for researchers who are in need of capstone projects as their sources for their studies. The interface should be easy to use and the design theme should reflect the Computer Department. The web page design provides users with access to the capstone projects' information on their website.

Forms

The following figures are screenshot of all the forms used in the system. The figures are labeled for clarity for readers and researchers. A brief explanation is also provided following the screenshot.

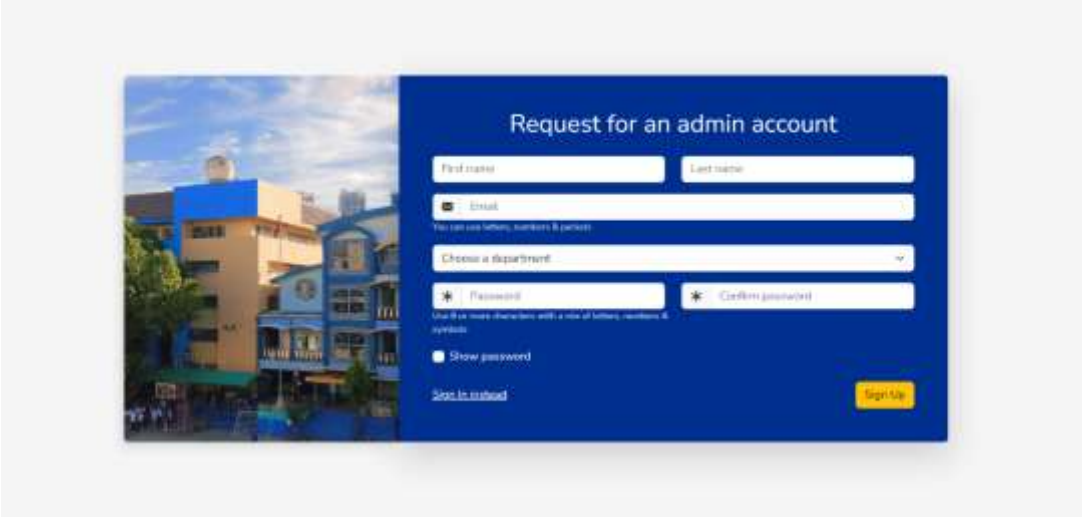

Figure 17. Request Admin Account

The figure shows the form for requesting an admin account. The admins must complete the form before requesting an admin account. The admin must provide their name, email address, department, and a password. The password must be confirmed to be the same as the initial password before submitting the request.

Figure 18. Admin Sign in

The figure shows the sign in form of the admin account. The admins must fill out the login form by entering their email address and password. Additionally, upon clicking the sign in button the system will then check their sign in credentials for security of the system.

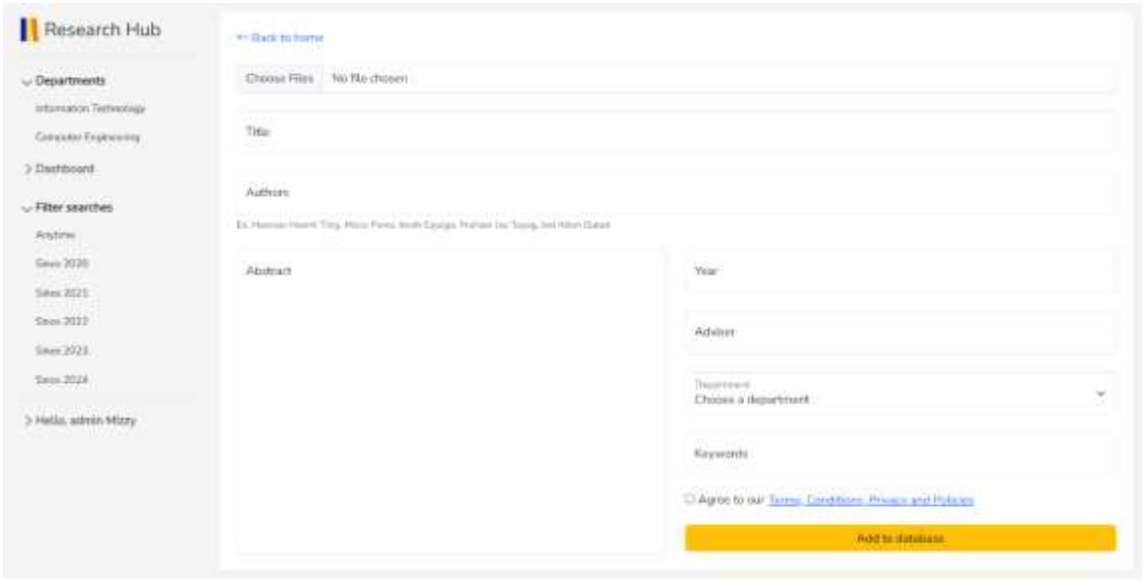

Figure 19. Contribute Form

The figure shows the contribute form that is only accessible by the admin account. Admins must upload the title page and abstract page of the capstone project they are trying to add in the system. The system uses OCR Technology that will automate the fill up of the forms. The input box is editable for any errors or changes that must be done. A tick box must be ticked for Terms, Conditions, Privacy and Policies before adding the system to the database.

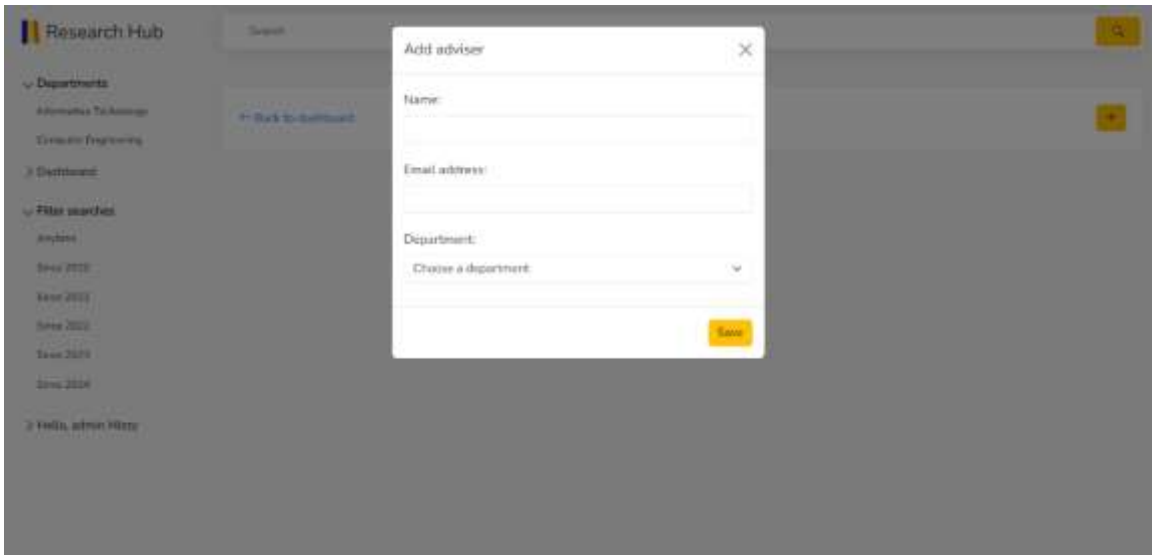

Figure 20. Add Adviser

The figure shows the adding of adviser and is also only accessible to the admin account. The adviser's name, email address, and department must be entered into the form by the administrators.

Reports

The following figures are screenshot of the reports generated in the system. The figures are labeled for clarity for readers and researchers. A brief explanation is also provided following the screenshot.

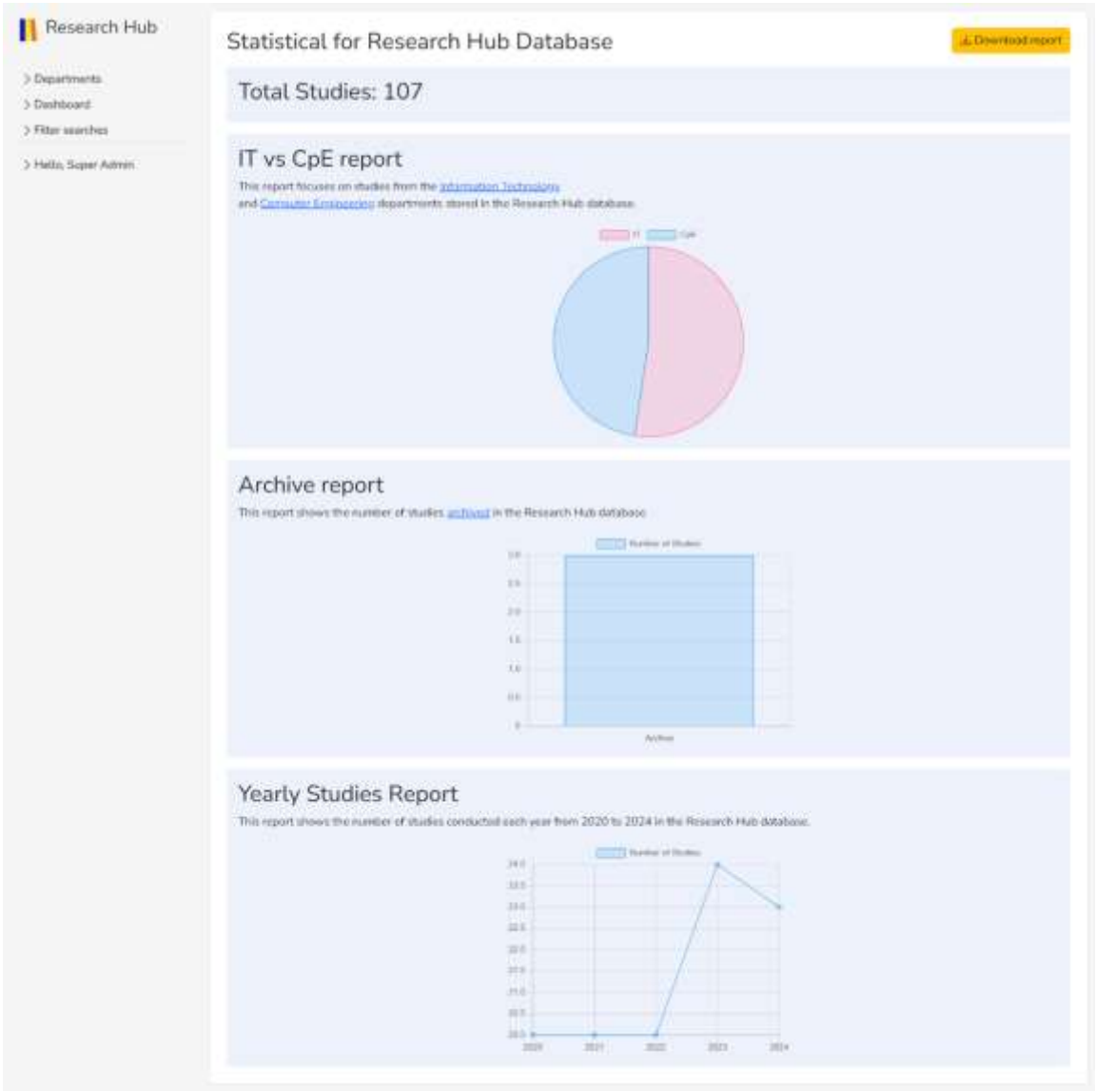

Figure 21. Reports

The figure shows the reports that is only accessible by the admin account. The pie chart shows the distribution of capstone projects by department. Archive shows the number of the archived studies in the database. Yearly Studies Report is represented by a line graph that shows the number of capstone projects added to the system by its year.

Data Design

It refers to the process of organizing and structuring data in a way that facilitates efficient storage, retrieval, and manipulation within a system or database. It involves defining the structure of data entities, their attributes, relationships between entities, and data integrity constraints. The goal of data design is to create a logical and efficient representation of data that supports the requirements and functionalities of the system. This includes designing database tables, specifying data types and constraints, and establishing rules for data manipulation and access. Effective data design is essential for ensuring data accuracy, consistency, and usability within an information system.

Data Dictionary

A data dictionary serves as a comprehensive reference guide within a database or information system, providing detailed documentation on the structure, organization, and characteristics of its data elements. It encompasses descriptions of data elements, attributes, entities, and their relationships, along with specifications of data types, lengths, formats, and constraints. This centralized repository aids database administrators, developers, analysts, and other stakeholders in understanding the database architecture and schema. By offering explanations of data elements, relationships, and usage guidelines, the data dictionary promotes consistency, accuracy, and effective database management, facilitating better system design, development, maintenance, and utilization.

Field Name	Data Type	Constraint	Description
id	int(11)	PRIMARY KEY	Capstone Project ID
title	varchar(100)	NOT NULL	Capstone Project Title
authors	varchar(500)	NOT NULL	Capstone Project Authors
abstract	varchar(2000)	NOT NULL	Capstone Project Abstract
year	varchar(5)	NOT NULL	Capstone Project Year Published
adviser	varchar(30)	NOT NULL	Capstone Project Adviser
dept	varchar(50)	NOT NULL	Capstone Project Department Submitted to
filename	varchar(255)	NOT NULL	Capstone Project Filename
keywords	longtext	NOT NULL	Capstone Project Keywords

Table 4. Data Dictionary – studies

Field Name	Data Type	Constraint	Description
id	int(11)	PRIMARY KEY	Super admin ID
name	varchar(100)	NOT NULL	Super admin ‘s Name
username	varchar(100)	NOT NULL	Super admin ‘s User Name
password	varchar(100)	NOT NULL	Super admin ‘s Department

Table 5. Data Dictionary - superadmin

Field Name	Data Type	Constraint	Description
id	int(11)	PRIMARY KEY	Adviser ID
name	varchar(30)	NOT NULL	Adviser’s Name
email	varchar(60)	NOT NULL	Adviser’s Email Address

dept	varchar(30)	NOT NULL	Adviser's Department

Table 6. Data Dictionary – advisers

Field Name	Data Type	Constraint	Description
id	int(11)	PRIMARY KEY	AdminID
fname	varchar(30)	NOT NULL	Admin's First Name
lname	varchar(30)	NOT NULL	Admin's Last Name
email	varchar(50)	NOT NULL	Admin's Email Address
dept	varchar(50)	NOT NULL	Admin's Department
pass	varchar(100)	NOT NULL	Admin's Password
vercode	text	NOT NULL	Verification Code
verified	tinyint(1)	NOT NULL	Verification of Account Status
rescode	text	NOT NULL	Reset Code
approval	tinyint(1)	NOT NULL	Approval of Super Admin

Table 7. Data Dictionary – admin

Field Name	Data Type	Constraint	Description
id	int(11)	PRIMARY KEY	Archived Capstone Project ID
title	varchar(100)	NOT NULL	Archived Capstone Project Title
authors	varchar(500)	NOT NULL	Archived Capstone Project Authors
abstract	varchar(2000)	NOT NULL	Archived Capstone Project Abstract

year	varchar(5)	NOT NULL	Archived Capstone Project Year Published
adviser	varchar(30)	NOT NULL	Archived Capstone Project Adviser
dept	varchar(50)	NOT NULL	Archived Capstone Project Department Submitted to
filename	varchar(255)	NOT NULL	Archived Capstone Project Filename
keywords	longtext	NOT NULL	Archived Capstone Project Keywords

Table 8. Data Dictionary - archive

System Architecture

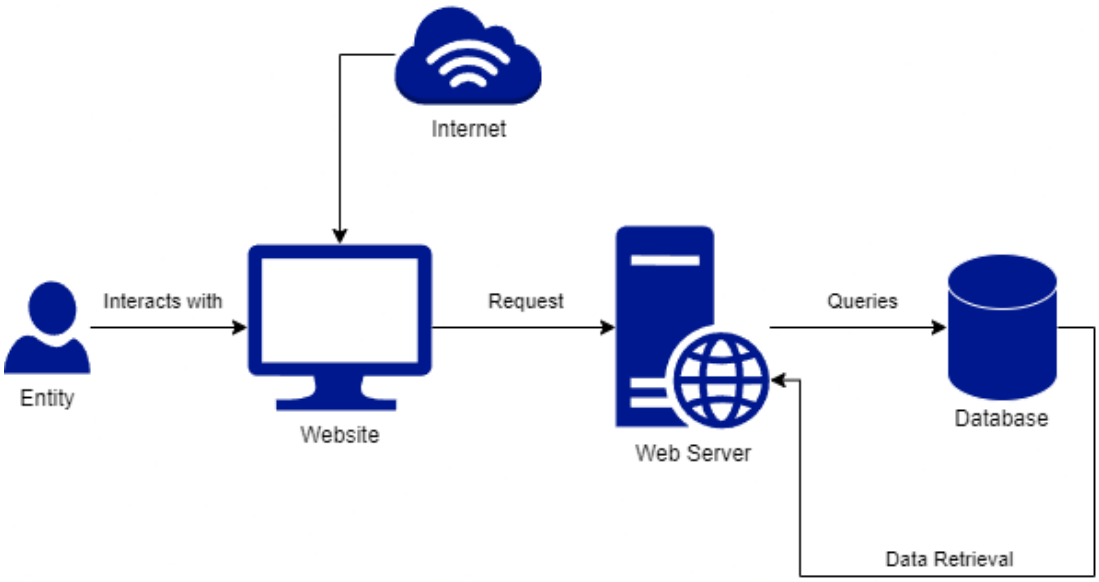

Figure 22. System Architecture

This framework shows the system architecture of ResearchHub, it consists of the service system, and the back-end system. The service system is the website where admin or user interacts with the system, user can search capstone projects while admin can manage the capstone projects. The back-end system is made up of the database and is in charge of managing the data.

Security

The security protocols implemented within the Capstone Projects Information Management System are designed to fortify data integrity, deter unauthorized access, and mitigate potential security threats. These measures encompass strict user authentication protocols aimed at verifying user identities prior to granting system access. Additionally, role-based access control mechanisms are employed to restrict user privileges in accordance with their designated roles, reinforcing system security. Furthermore, data encryption techniques are utilized to safeguard data during transmission and while at rest, shielding it from interception or unauthorized manipulation. To prevent common security vulnerabilities such as SQL injection and cross-site scripting, meticulous input validation procedures are enforced. Regular system updates and patching practices are strictly maintained to strengthen defenses against known vulnerabilities. Comprehensive security training and awareness initiatives are also conducted to educate users and administrators on effective security practices. In the event of a security breach or system failure, backup and disaster recovery protocols serve as crucial safeguards to prevent data loss.

DEVELOPMENT

The development phase of ResearchHub: Capstone Projects Information Management System was a pivotal stage marked by the integration of specific hardware and software specifications. As the proponents embarked on developing this project, they encountered challenges from the utilization of hardware characterized by limited capacity and capability. However, armed with an accurate selection of software specifications, the development process was pushed forward with precision and purpose. This part delves into the intricacies of the development phase, illuminating the academic groundworks that shaped the creation of ResearchHub.

Hardware Specification

The developers utilized specific hardware specifications to facilitate the development process of ResearchHub: Capstone Projects Information Management System. Throughout the development phase, the developers confronted significant challenges stemming from the utilization of hardware specifications characterized by minimal capacity and capability.

PC / Laptop	**Hardware Specification:** **Processor:** i5 4th Generation **RAM:** at least 4GB RAM **Storage:** 256GB SSD Monitor, Mouse, Keyboard

Table 9. Hardware Specifications

Software Specification

The development of ResearchHub: Capstone Projects Information Management System was underpinned by a comprehensive selection of software specifications meticulously chosen by the developers.

Web Development Tool	Visual Studio Code
Database	Xampp Server (3. 3. 0)
Web Server	MySQL

Table 10. Software Specifications

Programming Environment

This segment shows the essential resources and structural support for proficiently constructing the information management system. Through the utilization of this environment, developers advance the development procedure, guaranteeing dependability and efficacy. Constituting programming languages, development utilities, and integrated development environments, it facilitates the smooth unification of system elements.

Front End

The developers utilized and combines different front-end languages and frameworks in developing the ResearchHub: Capstone Projects Information Management System. These encompass HTML, CSS, JavaScript, and Bootstrap.

HTML, or Hypertext Markup Language, stands as a standard markup language intended for presentation within web browsers.

CSS, or Cascading Style Sheet, functions as a styling language, primarily employed to furnish style and layout to webpages.

JavaScript, another crucial component, imbues websites with dynamism and interactivity. It comprises distinct code blocks, each serving specific purposes within the website's functionality.

Bootstrap, a CSS framework utilized in web development, enhances the responsiveness and visual appeal of websites. Its user-friendly syntax and pre-designed templates facilitate easier and faster development processes.

Overall, the creation of the ResearchHub: Capstone Projects Information Management System encompassed the incorporation of diverse front-end languages and frameworks. The developers strived for the seamless amalgamation of these technologies to provide users with a comprehensive solution tailored to efficiently manage capstone projects while adapting to evolving needs.

Back End

The backend framework of the ResearchHub: Capstone Projects Information Management System relies on PHP and MySQL technologies. PHP functions as the server-side scripting language, facilitating the generation of dynamic content and interaction with databases. Conversely, MySQL serves as the relational database management system, enabling efficient storage, retrieval, and manipulation of essential

data for managing capstone projects. Together, PHP and MySQL constitute a sturdy backend infrastructure that supports vital functionalities like user authentication, data processing, and content management. This backend architecture ensures the system's reliability, scalability, and performance, providing users with seamless access to capstone project information while upholding data integrity and security.

Deployment Diagram

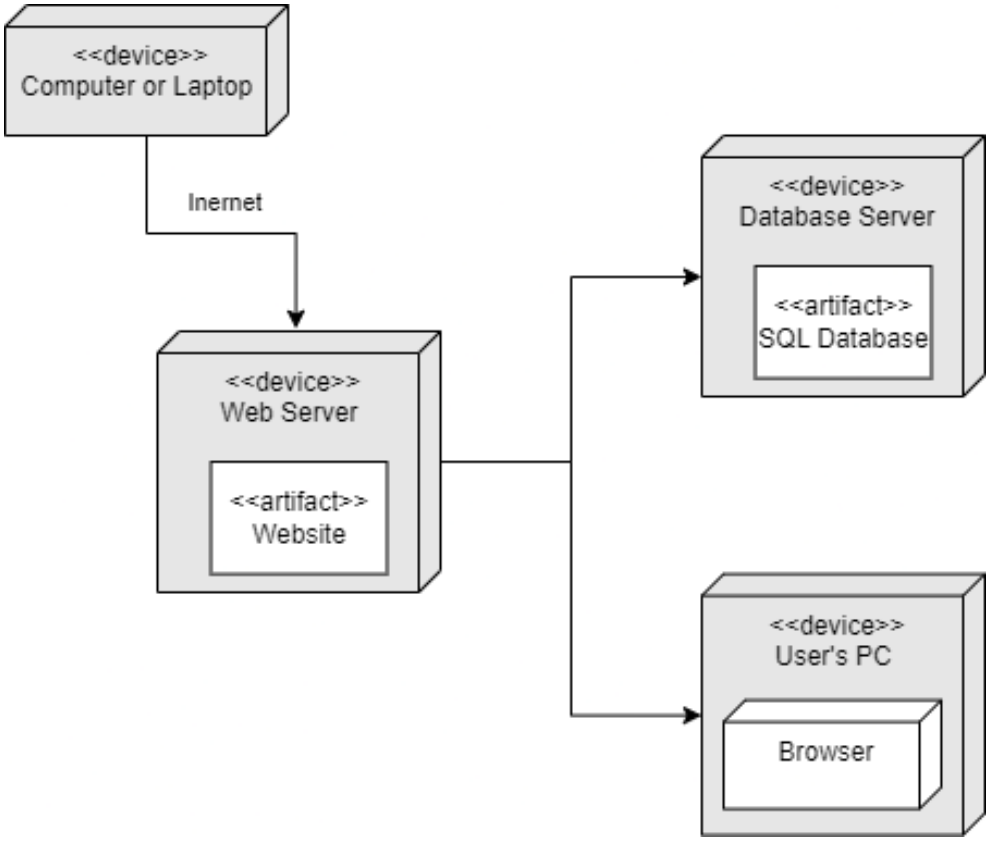

Figure 23. Deployment Diagram

The deployment diagrams presented depict the physical architecture of the ResearchHub: Capstone Projects Information Management System. This visual representation aids in comprehending how software components are distributed across

diverse hardware resources and their interrelations within the system. Employed during the design and implementation stages of software development, these diagrams serve to convey the deployment architecture to both stakeholders and development teams.

Test Plan

The ResearchHub: Capstone Projects Information Management System serves as an online platform facilitating access to past-year capstone projects for prospective researchers. The project proponents have opted for unit testing to ensure the proper functioning of the web page. Additionally, integration testing will be employed to assess the system's functionality, performance, and reliability requirements. Subsequently, system testing will be conducted following unit and integration testing to validate compliance with predetermined requirements. Acceptance testing will be the last step to ensure that the system fulfills mutually agreed-upon requirements.

TESTING

The testing segment provides crucial resources and structural support essential for validating the system's reliability and performance. It includes testing tools, frameworks, and methodologies tailored to verify functionality and efficiency.

Unit Testing

The initial phase of system testing will focus on Unit Testing, which involves evaluating each module of the web application independently. This meticulous process aims to ascertain the quality and correctness of each unit of code within the application, ensuring its seamless functionality. Despite encountering challenges, the developers conduct thorough testing of every component of the website to guarantee its quality.

White box testing is employed as the chosen testing methodology, enabling examination of the website's internal structure, design, and code to verify its integrity and functionality. White box testing, also known as clear box testing or structural testing, involves analyzing the internal logic and structure of the application's code. Testers have access to the source code and use their understanding of the program's internal workings to design test cases that ensure all paths and branches of the code are executed correctly. This approach allows for comprehensive testing of the application's logic, ensuring that it operates as intended under various conditions.

During this phase, an internal examination of each logical component of the system will be conducted to ensure its integrity. This thorough review will encompass all aspects of the web system's development, including checking for typographical errors and logical expression problems. Common faults such as incorrect controls and loops will be identified and addressed through this technique, ensuring the reliability and accuracy of the system.

Integration Testing

Integration Testing, the second phase of assessing the website's quality, involves testing modules in groups to identify any deficiencies or errors upon integration into the system. Top-Down testing method is employed, aligning well with our system's structure. This method simulates the behavior of lower-level modules that are yet to be integrated, progressing from top to bottom. High-level modules are initially tested, followed by the integration of lower-level modules at a higher level. This prioritizes

critical modules when errors are detected, ensuring that the system functions as intended.

System Testing

System Testing will be conducted to evaluate the specifications of the web information system comprehensively. As we have integrated every module of the system, this facilitates convenient observation and evaluation. Our assessment will encompass both internal and external components of the system to ensure correct interaction and flow. We will scrutinize the system's functionality and data interaction, focusing on input and output, without delving into the internal code structure or implementation details. This approach, known as Black box testing, aligns with our process as it is driven by software requirements and specifications. Given that not all team members are web development experts, this method ensures accessibility and understanding of the system's functionality without requiring web development expertise.

DESCRIPTION OF THE PROTOTYPE

The prototype of the ResearchHub website aims to furnish users with comprehensive insights into the capstone projects within the Computer Department of Rizal Technological University. Through this platform, users have the capability to navigate through various categories or conduct keyword searches to retrieve pertinent information. Additionally, users are equipped with filtering functionality, enabling them to refine search results to align with their specific requirements.

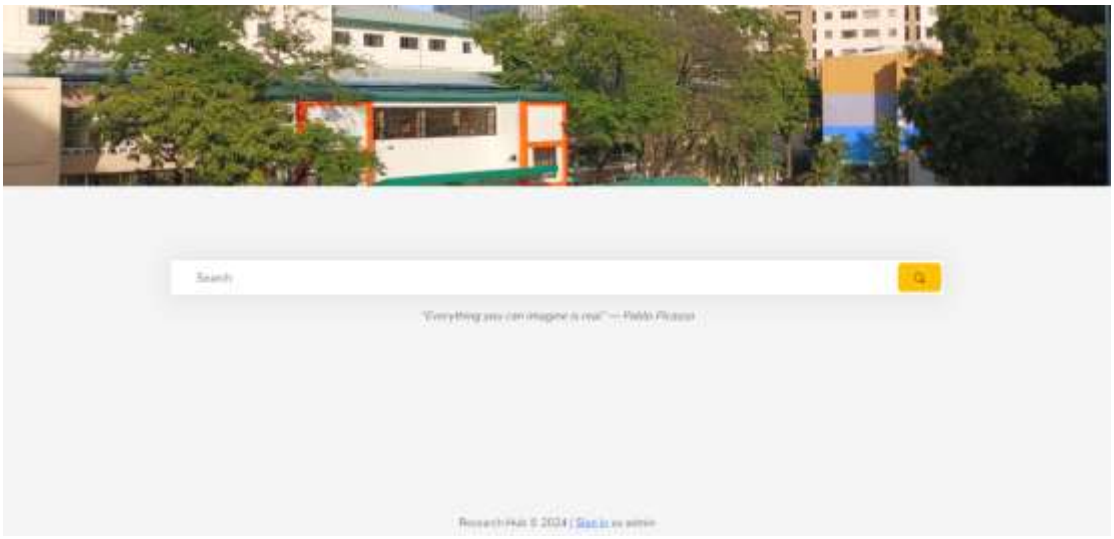

Figure 24. Home Page

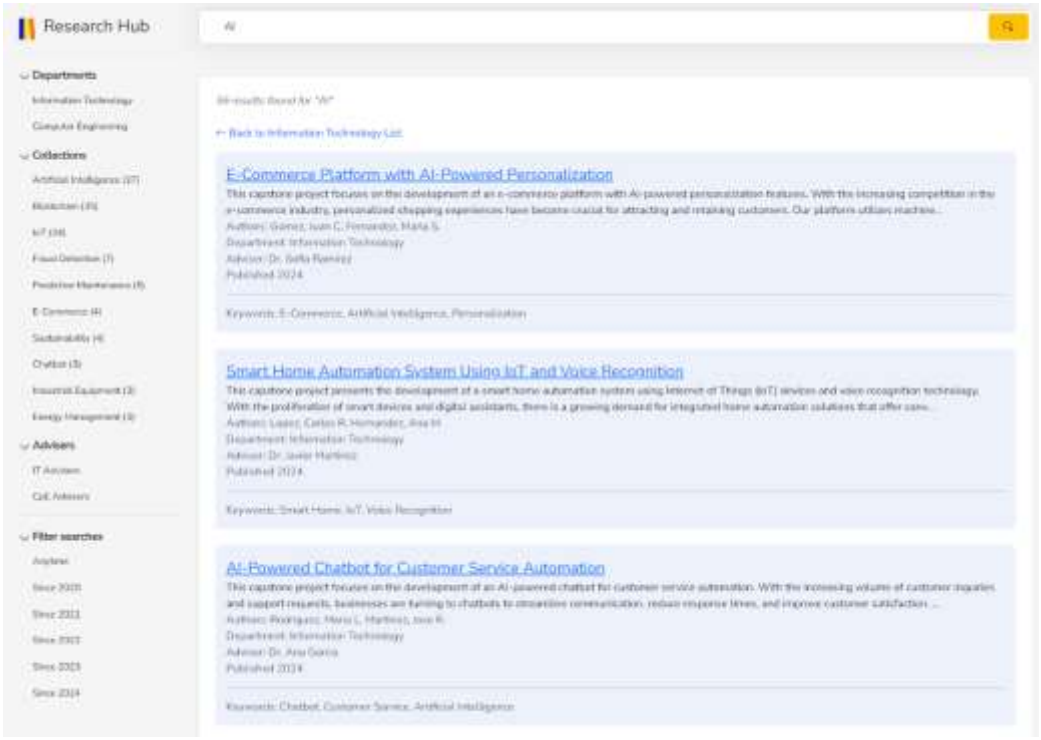

Figure 25. User Dashboard

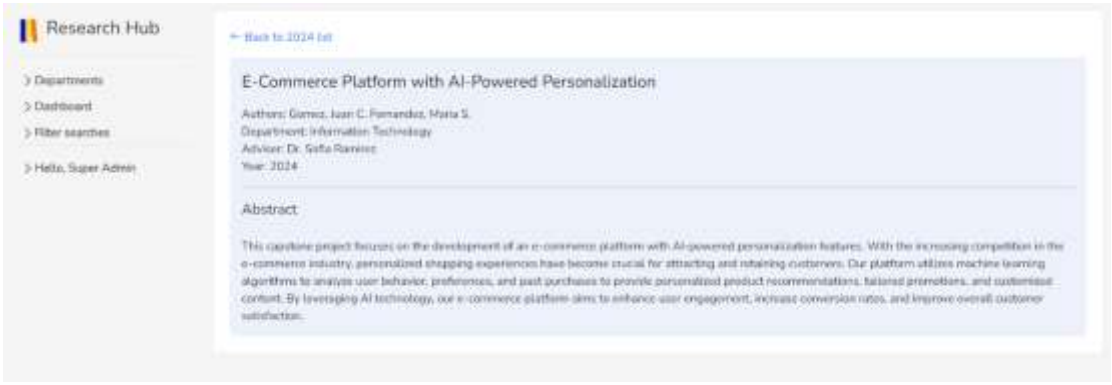

Figure 26. Display Capstone Project Information

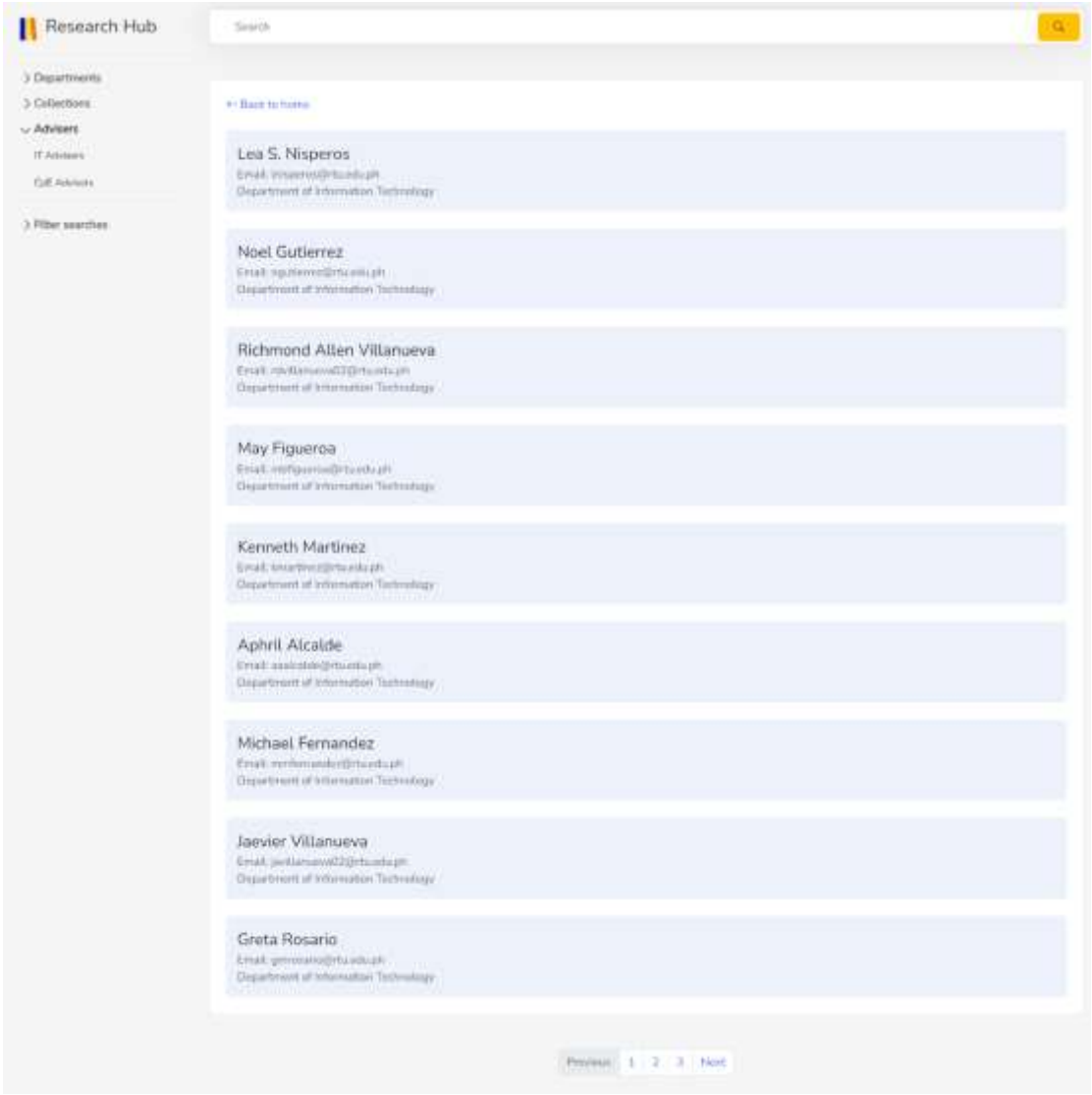

Figure 27. Display Adviser's Information

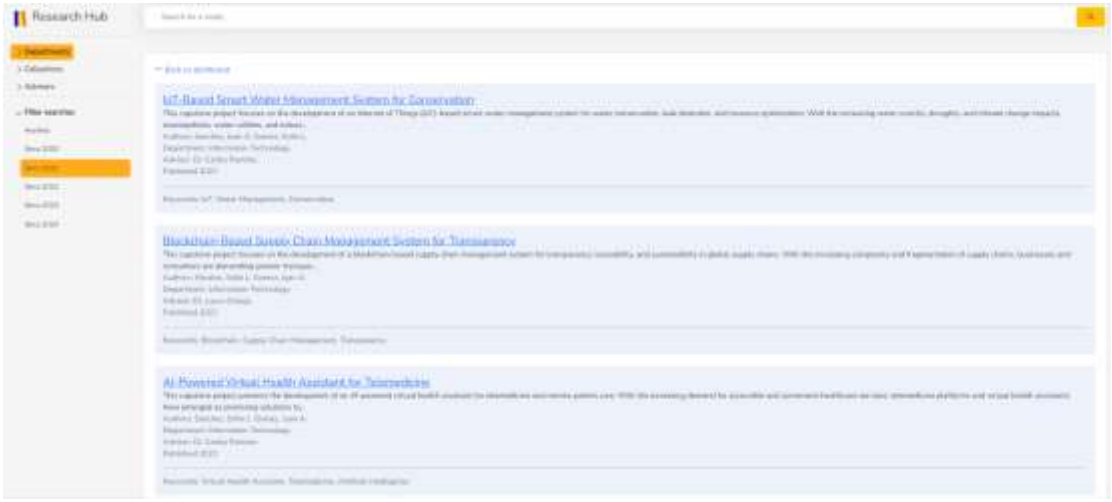

Figure 28. Filter Function by Year

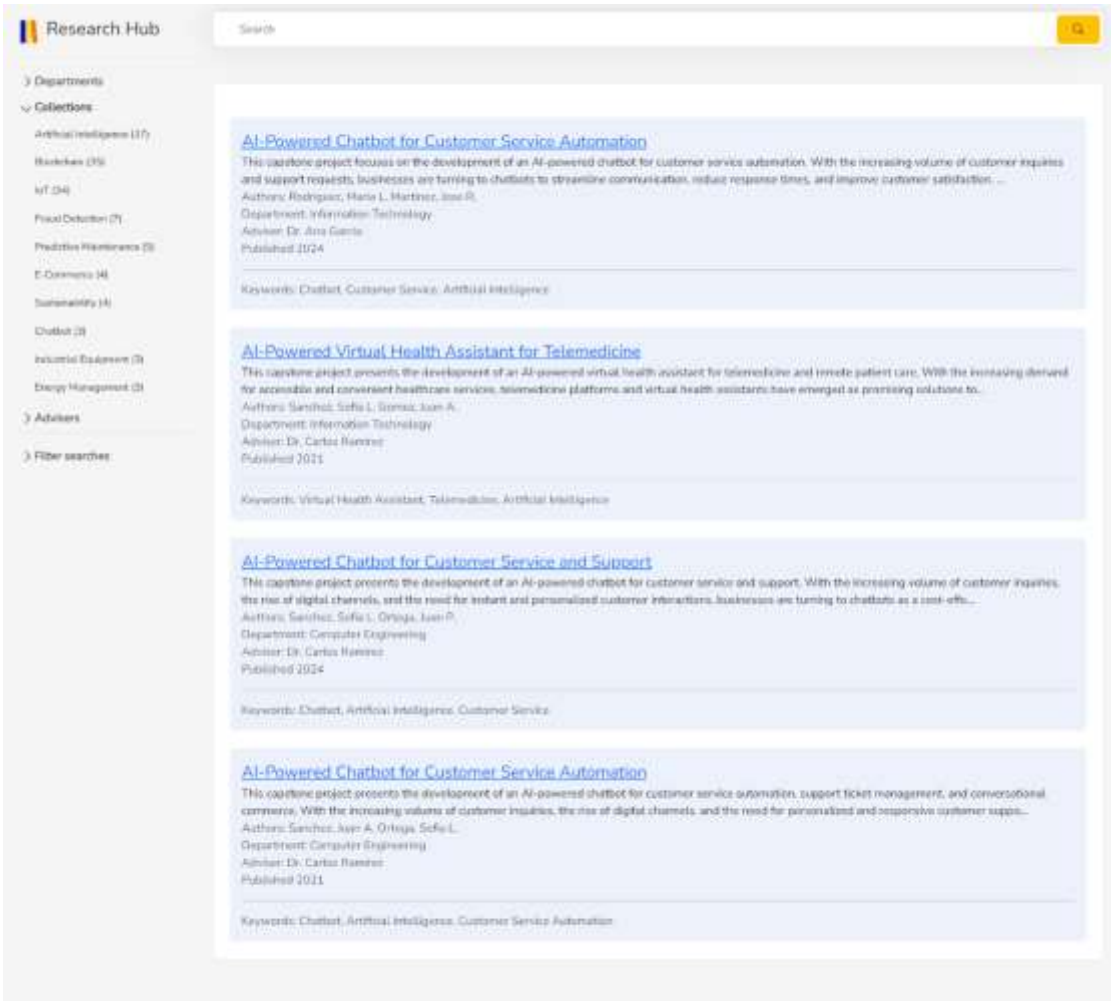

Figure 29. Filter function by Collections

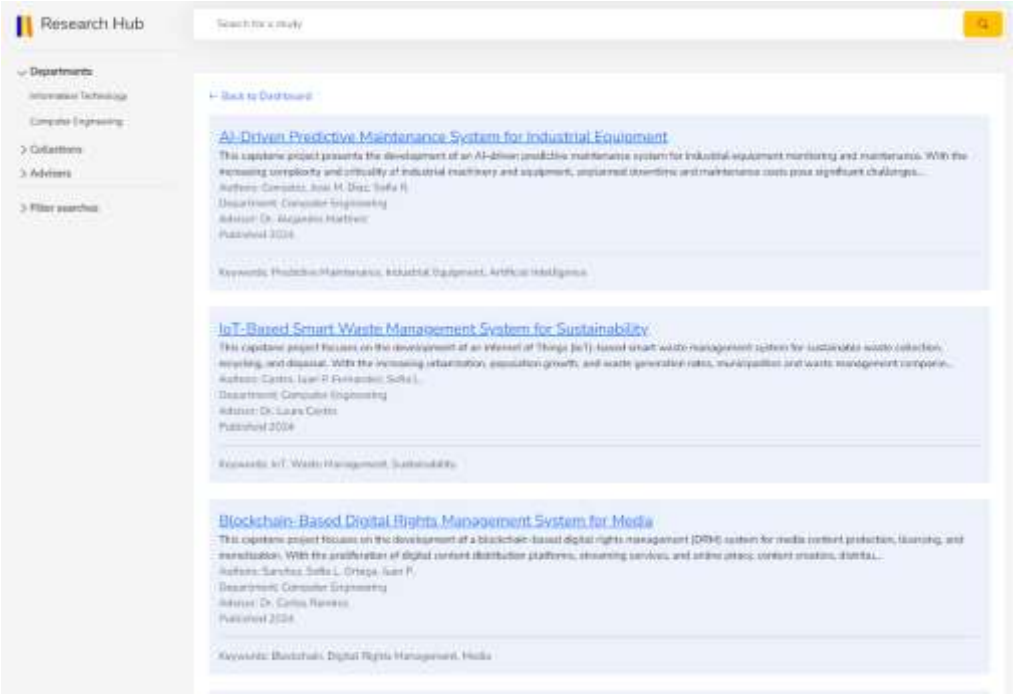

Figure 30. Filter Function by Department

PROGRAM PROPERTIES

In the development of the ResearchHub: Capstone Projects Information Management System, the utilization of Visual Studio Code for coding purposes was deemed essential. Visual Studio stands as an autonomous source code editor instrumental in the creation of a spectrum of applications ranging from computer programs to websites, web services, and mobile apps. Central to the development process, the Hypertext Preprocessor (PHP) emerged as the primary programming language employed for crafting the envisaged system. Renowned for its suitability in web development, PHP was chosen due to its cost-effectiveness, offering the advantage of being freely accessible for program creation and execution. Furthermore, MySQL was adopted for database implementation, facilitating the addition, manipulation, and retrieval of data through the utilization of Structured Query Language (SQL).

FUNCTION PROPERTIES

The function properties for the Capstone Projects Information Management System encompass several modules tailored to accommodate distinct user roles. For students, functionalities comprise browsing and searching for capstone projects, accessing project details, and viewing adviser information. Administrators possess additional capabilities, including managing capstone projects, overseeing adviser information, and generating comprehensive system-wide reports. Moreover, the super admin role entails similar functionalities as the admin, with the added responsibility of approving admin account creations. Each module is intricately crafted to meet the specific needs of users, ensuring smooth interaction and effective management of capstone projects across the academic institution.

IMPLEMENTATION PLAN

The implementation plan for the Capstone Projects Information Management System involves reviewing requirements, configuring infrastructure, and designing the database architecture. Development will proceed with building and integrating system modules, followed by thorough testing to identify and resolve any issues. Upon successful testing, the system will be deployed to users with accompanying training and support to facilitate a smooth transition.

Project Implementation Checklist

- ✓ Ideas for System Designing
- ✓ Wireframe
- ✓ Creation of Website Content

- ✓ Frontend System Design
- ✓ Creation of Website Content
- ✓ Backend functionalities
- ✓ Data Gathering
- ✓ Database Creation
- ✓ Identifying issues or bugs
- ✓ Testing of the system
- ✓ Finalization of Webpage
- ✓ Hosting with SSL Certificate and database

Implementation Contingency

In anticipation of potential challenges during the system implementation phase, this Implementation Contingency plan has been devised to ensure the project's seamless execution. This strategy encompasses several strategic components vital for the system's success:

1. **Technical Support:** A specialized technical support team will be readily available to address and resolve any technical issues encountered during implementation. This support infrastructure will extend assistance in software configuration, hardware setup, and network integration, ensuring swift resolution of technical impediments.
2. **Backup Resources:** Contingency measures will involve the identification and procurement of backup resources, including additional hardware components or alternative software solutions. This

proactive approach aims to mitigate risks associated with shortages or failures, ensuring uninterrupted progress throughout the implementation process.

3. **Training and Education:** Comprehensive training programs will be implemented to equip all stakeholders, including system administrators, end-users, and technical support personnel, with the requisite skills and knowledge. These training initiatives will empower personnel to proficiently deploy and utilize the system, enhancing overall efficiency and effectiveness.
4. **Communication Plan:** A healthy communication strategy will be established to facilitate transparent and timely exchange of information among stakeholders. Regular status updates, milestone reviews, and designated channels for issue reporting will be integral components of this plan, fostering collaborative problem-solving and informed decision-making.
5. **Contingency Budget:** An allocated contingency budget will be earmarked to accommodate unforeseen expenses or resource requirements arising during implementation. This financial reserve will provide the flexibility to address unexpected challenges without compromising project objectives or timelines.

Through the diligent implementation of these contingency measures, the project aims to mitigate risks effectively, ensuring the smooth deployment of the system within stipulated timelines and budgetary constraints.

Infrastructure/Deployment

The Infrastructure Deployment for the Capstone Projects Information Management System involves the strategic allocation of resources and establishment of necessary infrastructure components to support system functionality and performance. This plan encompasses several critical elements, including hardware configuration, network infrastructure, software configuration, data backup, disaster recovery, security measures, and scalability. Robust servers, network equipment, and software will be deployed to ensure optimal performance and reliability. The infrastructure will be designed with scalability and redundancy to accommodate growth and mitigate potential failures, ensuring uninterrupted system availability and performance.

Furthermore, the deployment process involves careful coordination and execution of tasks to ensure the smooth transition from development to production environment. This includes thorough testing of the system in a staging environment to identify and address any issues before deployment. Once testing is complete and the system is deemed ready for production, a deployment plan is executed, outlining steps for installation, configuration, and integration of the system components. System administrators oversee the deployment process, ensuring that all components are properly installed and configured according to specifications. User training and documentation are provided to facilitate the adoption of the new system, while ongoing support and maintenance activities are established to address any issues that may arise post-deployment. By following a structured deployment process, the system can be effectively implemented with minimal disruption to operations, ensuring a successful transition to the production environment.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

This chapter provides a comprehensive overview of the results and findings obtained from the survey conducted. It presents the conclusions drawn from the analysis of the survey data and provides recommendations for future actions based on these findings.

RESULTS AND FINDINGS

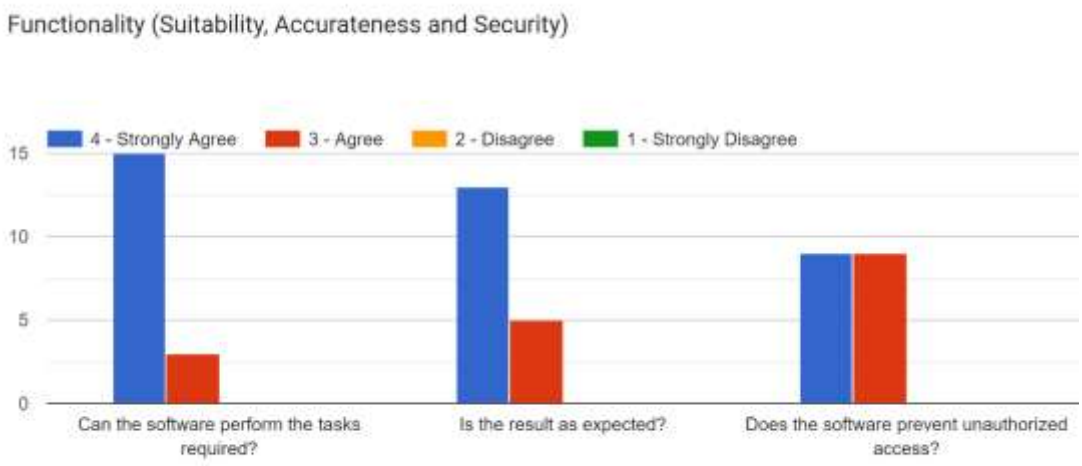

Figure 31. Result – Functionality

Based on the data, it can be concluded that the system functions as it requires to. The high level of satisfaction shows that the software is performing well and show the tasks required and displays results as their expectation of the system. Additionally, the data for the last set of columns somewhat agrees that the system prevent unauthorized access.

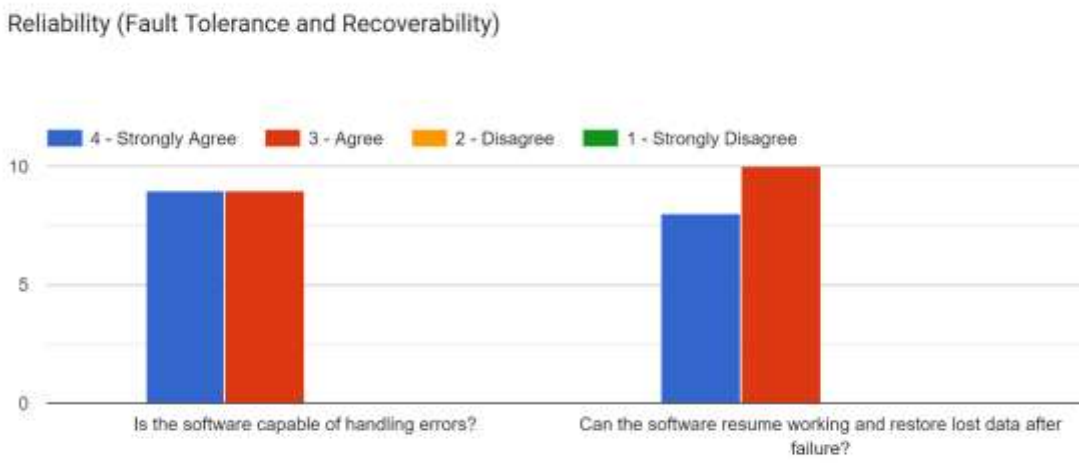

Figure 32. Result – Reliability

Based on the data, it can be concluded that the system generally exhibits reliability. The majority of the respondents agree that the system is capable of handling errors and resuming work after a failure.

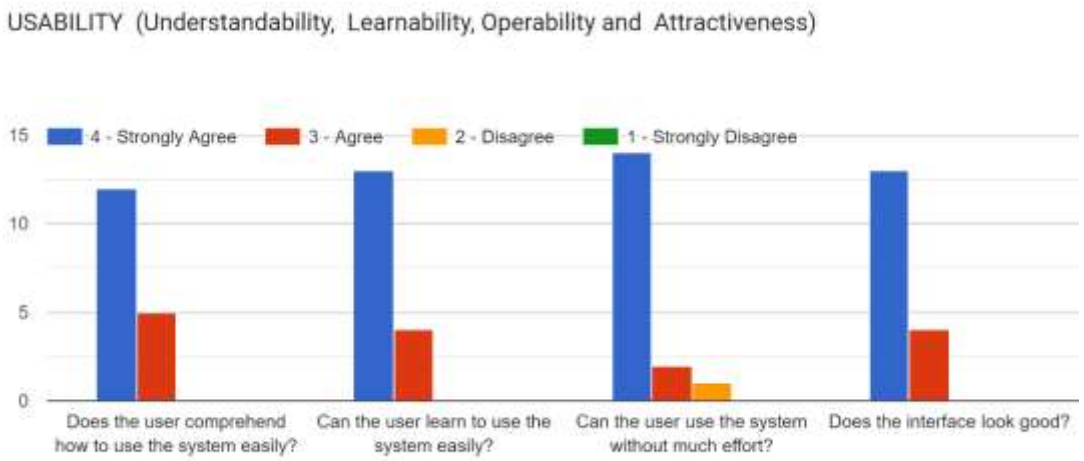

Figure 33. Result – Usability

Based on the data, it can be concluded that the system demonstrated generally good usability, The high level of satisfaction in of the all of the question shows that the system is easily comprehendible, easy to use, and that the system looks good. The

majority of the respondents strongly agree that users can easily comprehend how to use the system, learn to use it without much difficulty, and use it without much effort.

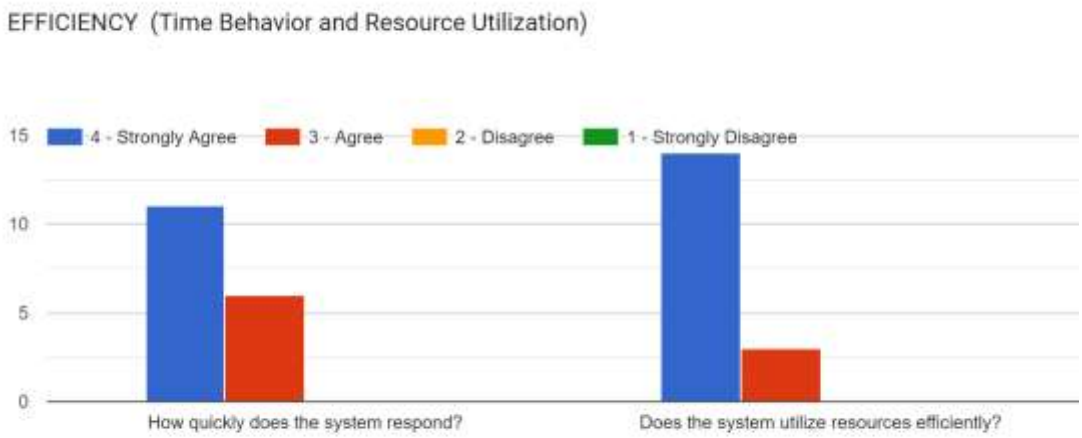

Figure 34. Result – Efficiency

Based on the data, it can be concluded that the system efficient. Most of the respondents strongly agrees that the system responds quickly and that the system uses resources effectively. This suggest that the system performs well in terms of response time and resource utilization.

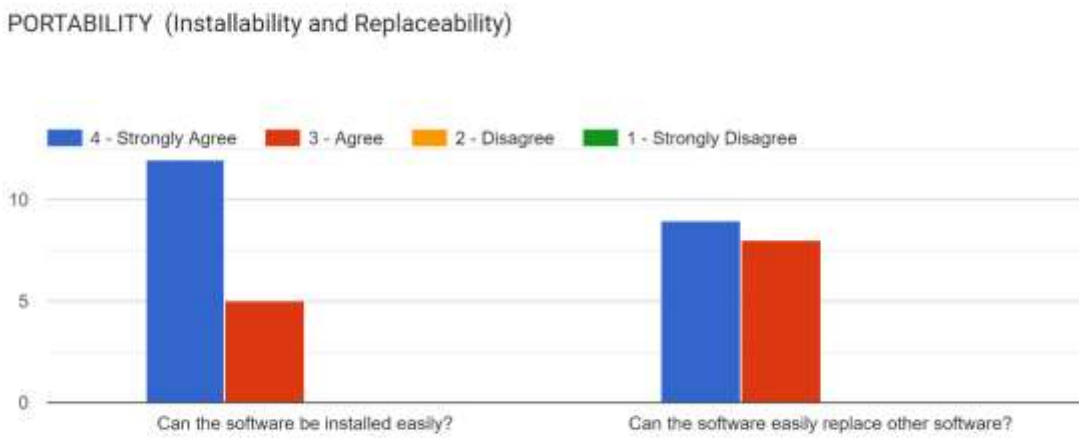

Figure 35. Result – Portability

Based on the data, it can be interpreted that the system is easily portable. Most of the respondents agrees that the system be installed easily and can replace other software without any problems. This means that the software is user-friendly and can work with different software.

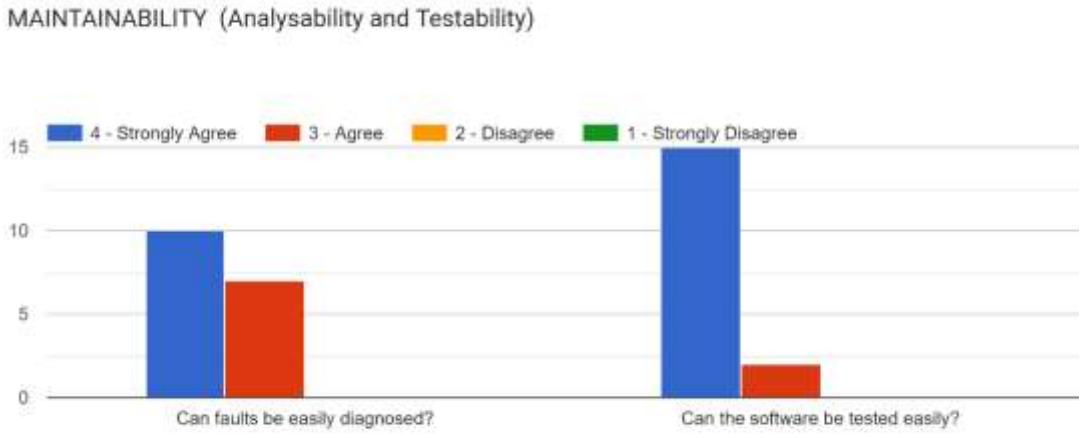

Figure 36. Result – Maintainability

Based on the results, it can be concluded that the system demonstrates satisfactory maintainability. Most of the respondents agrees that the system's faults can be easily diagnosed, indicating effective fault detection. Additionally, majority of the respondents believe that the system can be easily tested, highlighting its testability.

CONCLUSION

The ResearchHub: Capstone Projects Information Management System represents a significant advancement in facilitating access to past-year capstone projects within the Computer Department of Rizal Technological University. Throughout the development and testing phases, meticulous attention has been paid to ensuring the system's reliability, functionality, and user-friendliness. As this chapter draws to a close, it is imperative to reflect on the achievements, challenges, and future prospects of the system.

First and foremost, the successful implementation of the ResearchHub system underscores the dedication and expertise of the development team. From the initial planning stages to the final deployment, every aspect of the system has been carefully crafted to meet the needs of both researchers and administrators. The system's intuitive user interface, coupled with robust backend functionalities, promises to streamline the process of accessing and managing capstone projects, thereby enhancing the overall research experience within the academic institution.

However, despite the successes achieved thus far, it is important to acknowledge the challenges encountered during the development process. From hardware limitations to software compatibility issues, the team has faced numerous obstacles that required

creative problem-solving and resourcefulness. Yet, through perseverance and teamwork, these challenges have been overcome, reaffirming the team's commitment to delivering a robust and resilient system.

The evaluation of the system's functionality, reliability, usability, efficiency, portability, and maintainability reveals promising outcomes. In terms of functionality, the data suggests that the system adequately fulfills its intended tasks, with a high level of satisfaction among users regarding task performance and result presentation. Regarding reliability, the majority of respondents affirm the system's ability to handle errors and resume operations after failures, indicating a generally reliable performance. Usability assessments indicate that the system is easily comprehensible and user-friendly, with respondents expressing satisfaction with its ease of use and visual appeal. Efficiency evaluations reveal that the system responds promptly and utilizes resources effectively, suggesting optimal performance in terms of response time and resource management. Moreover, the system demonstrates portability, as users agree on its easy installation and compatibility with other software. Finally, assessments of maintainability indicate that faults can be diagnosed easily, and the system is perceived as easily testable, indicating effective fault detection and testability. Overall, these findings affirm the system's robustness and suitability for users across various dimensions.

In conclusion, the ResearchHub: Capstone Projects Information Management System stands as a testament to the power of innovation and collaboration in the realm of academic research. By providing a centralized platform for accessing and managing

capstone projects, the system empowers researchers, administrators, and stakeholders alike to engage more effectively in the pursuit of knowledge and excellence. As the system continues to evolve and mature, it is poised to make a lasting impact on the academic landscape, fostering a culture of discovery and inquiry for generations to come.

RECOMMENDATIONS

As proponents of the ResearchHub: Capstone Projects Information Management System, we highly recommend this innovative platform to students, faculty, the Computer Department, and Rizal Technological University (RTU) as a transformative solution for enhancing academic research endeavors. For students, ResearchHub offers invaluable access to a comprehensive repository of past-year capstone projects, serving as a rich source of inspiration, reference, and learning material for their own research pursuits. Faculty members stand to benefit from the system's streamlined management of capstone projects, facilitating efficient oversight, collaboration, and dissemination of academic work. The Computer Department, as the custodian of technological advancements, can leverage ResearchHub to showcase the department's scholarly achievements, foster collaboration among researchers, and promote the dissemination of knowledge within the academic community. Lastly, Rizal Technological University as a whole can harness the system's capabilities to bolster its reputation as an institution committed to academic excellence, research innovation, and technological advancement. By embracing ResearchHub, stakeholders at all levels can unlock new opportunities for academic growth, collaboration, and impact within the university ecosystem.

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