

**RESEARCHTREE: RESEARCH MANAGEMENT WEB PORTAL FOR
RESEARCH MANUSCRIPT MONITORING, REVISION AND GRADING
OF THE LAGUNA STATE POLYTECHNIC UNIVERSITY – LOS BANOS
CAMPUS**

A Capstone Project presented to the Faculty, College of Computer
Studies Laguna State Polytechnic University Los Baños Campus
Los Baños, Laguna

In partial fulfillment of the requirement for the degree
Bachelor of Science in Information Technology
Specialized in Web and Mobile Application Development

Mayad, John Frankelin M.
De Torres, Daniel A.

Crisanto Gulay
2024

ACKNOWLEDGMENT

In this section, the researchers must acknowledge all the people to help them during the conduct of their study. Hence, they can also acknowledge the organization that lends them data or funding support. Acknowledging the university is optional, however, it is suggested to give appreciation to it.

DEDICATION

The researchers can give dedication to their family and love ones or include those who they will be dedicating the project.

TABLE OF CONTENTS

Preliminaries	Page
APPROVAL SHEET.....	i
ACKNOWLEDGEMENT.....	ii
DEDICATION.....	iii
ABSTRACT	iv
TABLE OF CONTENTS.....	v
DEFINITION OF TERMS.....	vii
 CHAPTER 1	
 INTRODUCTION.....	
Project Context.....	
Project Objectives	
Project Purpose.....	
Scope and Limitation of the Study.....	
 CHAPTER 2	
 REVIEW OF RELATED LITERATURE, STUDIES AND SYSTEMS.....	
Research Manuscript.....	
Web Portals.....	
Data Analytics.....	
Revisions.....	
Research Monitoring.....	
Grading.....	
Capstone Projects.....	

CHAPTER 3

METHODOLOGY.....	.
Project Development.....	
Product Backlog.....	
Sprint Planning.....	
Daily Scrum.....	
Sprint Execution.....	
Software Testing.....	
Unit Testing.....	
Integration Testing.....	
Acceptance Testing.....	
Project Testing.....	

CHAPTER I

INTRODUCTION

PROJECT CONTEXT

In modern era and even in old times, research manuscript is an essential component of the scientific process, allowing researchers to publish their work and have it assessed by peers in their field. It is an important way for researchers to share their discoveries, knowledge, and ideas with the scientific community (ASP, 2023).

On other hand, there have a studies about the keeping manuscripts that pointed out the problems related to the preservation of manuscripts in Southeast Asia like lack of awareness of the importance of manuscripts, lack of technical knowledge, lack of facilities, lack of funding (Agarwal, 2000). These represent original research conducted by students and scholars. By archiving them in libraries, universities ensure that this valuable research is preserved for future generations. It allows future researchers to access and build upon existing knowledge. This is why research manuscript is important to preserve in the library.

Today, most universities require to finish the final defense of students' research. That's why there's a growing number of research manuscripts in libraries because every year, approved research manuscripts are being added. The management of research manuscripts presents significant challenges in the fast-paced academic environment of today, especially when it comes manual management processing of research manuscript.

However, most universities also strict to approving research manuscript especially to that panelist that preventing plagiarism and error writings of the research manuscript. (Alfaki, 2015), conducted a study by selecting twenty random students from four different colleges and universities and were made to write a composition. Teachers found that the students' have various problems in their writings like language problems at the level of morphology and syntax, language usage errors, spelling, punctuation and capitalization mistakes, cognitive problems and graphomotor problems. As findings made by (Alfaki, 2015), the problems especially like syntax, punctuation, capitalization is commonly found in most of the universities, colleges and schools. Some of panelist need to revise the manuscript.

The College of Computer Studies at Laguna State Polytechnic University Los Baños Campus is renowned for its commitment to academic excellence and research innovation in the field of information technology and computer science. However, despite the notable achievements in research, the existing manuscript management processes within the college have encountered several challenges that hindered efficiency and effectiveness.

Traditionally, manuscript management involved cumbersome and fragmented procedures, often relying on manual methods for saving, revising, and tracking students' scholarly works. This approach, while familiar, proved to be labor-intensive, prone to errors, and lacking in centralized control. As a consequence, faculty members and students alike faced difficulties in ensuring the accuracy, clarity, and adherence to academic standards in their manuscripts. The assessment of student manuscripts posed another significant

challenge. Faculty members, tasked with grading and providing feedback, encountered problems in the process, leading to delays in evaluation.

Recognizing these challenges and the need for a comprehensive solution the researchers proposed this project titled "ResearchTree: Web and Web-based Research Management Portal for Manuscript Monitoring, Revisions, Grading, and Data Analytics" will greatly benefit the College of Computer Studies of Laguna State Polytechnic University Los Baños Campus. It will optimize the process of saving and revising students' manuscripts, reducing errors. Additionally, it will facilitate manuscript grading and utilize data analytics to visualize manuscript-related information.

The panelists are struggling to determine if a thesis already exists. Therefore, it would be helpful to develop a web portal research management system capable of monitoring all approved research manuscripts. This system would simplify the manual process of searching for manuscript projects, thereby saving time. Additionally, panelists using this system would have access to data visualizations of all research manuscripts, allowing them to monitor and track the status of research by year. ResearchTree, the proposed system, will addresses various writing issues including syntax, punctuation, capitalization, language usage, morphology, and syntax errors, spelling mistakes, and punctuation and capitalization errors. It provides manuscript revision features to correct these errors. The evaluators traditionally conduct evaluations manually, inputting each detail of the students and their projects into a spreadsheet, and providing ratings and remarks on paper. Recognizing the inefficiency of this method, researchers conceived the idea of automating the process. Hence, the creation of ResearchTree: A Web-based Research

Management Portal for Manuscript Monitoring, Revisions, Grading, and Data Analytics at the College of Computer Studies of Laguna State Polytechnic University Los Baños Campus, the portal promises to optimize workflows, improve academic assessment practices, and unlock valuable insights from manuscript-related data.

PROJECT OBJECTIVES

The main objectives of this project is to develop a web based system to help the college of computer studies of laguna state polytechnic university – los banos campus for manuscript monitoring, revisions, grading and data analytics.

Specifically, the project aims the following:

1. Design and develop a system for manuscript submission, enabling students to upload, edit, and monitor the progress of their manuscripts.
2. Implement a revision tracking feature, grading module and use data analytics for track.
3. To evaluate the acceptability of the system using ISO 25010 and TAM

PROJECT PURPOSE

The purpose of the "ResearchTree" project is to transform research management processes within the College of Computer Studies of Laguna State Polytechnic University Los Baños Campus, by implementing a web-based portal specifically tailored for manuscript management. The project aims to simplify the handling of student manuscripts, enhance academic assessment

capabilities, and introduce data analytics functionalities to provide valuable insights into manuscript-related information.

The following are the beneficiaries of the project:

- 1. Students:** Students will benefit from ResearchTree by experiencing a more efficient and user-friendly platform for manuscript submission, revision, and grading. The system simplify processes will save students time and reduce the likelihood of errors, ensuring that their scholarly work meets academic standards. Additionally, the availability of manuscript grades and feedback through the portal will offer students clearer insights into their academic performance, facilitating their growth and improvement.

- 2. Adviser:** Advisers will benefit from ResearchTree as the system will save their time by providing streamlined processes for manuscript management, revision tracking through ResearchTree, advisers can efficiently monitor the progress of research manuscripts, access submission histories. The system automates routine tasks such as document organization and communication, allowing advisers to focus more on substantive feedback and mentorship. Additionally, ResearchTree's analytics capabilities provide insights into adviser workload, manuscript trends, and performance metrics, enabling informed decision-making and resource allocation. Overall, ResearchTree optimizes advisor efficiency, enhances collaboration with researchers, and facilitates more effective mentorship in the academic community.

3. Faculty Members: Faculty members will benefit from ResearchTree by gaining access to advanced tools for manuscript management and assessment. The portal's centralized platform will simplify the process of tracking revisions and assigning grades, allowing faculty to provide timely feedback and monitor student/researcher progress more effectively. By reducing administrative burdens associated with manuscript handling, ResearchTree will enable faculty to allocate more time to other academic endeavors, such as research and teaching.

4. University Administration: The university administration will benefit from ResearchTree through improved data analytics capabilities, enabling them to gain insights into manuscript-related trends and performance metrics. These insights can inform strategic decisions related to curriculum development, research initiatives, and resource allocation, ultimately enhancing the university's academic reputation and competitiveness.

5. Research Community: The implementation of ResearchTree will benefit the wider research community by fostering interdisciplinary dialogue and knowledge sharing. The portal's data analytics functionalities will facilitate the visualization of manuscript-related information, enabling researchers to identify emerging trends, collaborate on projects, and contribute to the advancement of knowledge in their respective fields.

SCOPE AND LIMITATION OF THE STUDY

The implementation of the "ResearchTree" project holds significant promise for enhancing the research management processes within the College of Computer Studies of Laguna State Polytechnic University Los Baños Campus. By introducing a web-based portal specifically designed for manuscript management, College of Computer Studies stands to gain several notable advantages.

Firstly, the system's ability to simplify the process of saving and revising students' manuscripts presents a substantial improvement over traditional methods. In academe, manuscript revision is a critical aspect of scholarly work, ensuring accuracy, clarity, and adherence to academic standards. By providing a centralized platform for manuscript storage and revision tracking, ResearchTree simplifies the workflow for both students and faculty. This optimizing not only saves time but also reduces the likelihood of errors or version control issues that may arise when managing manuscripts through disparate systems or manual processes.

Furthermore, the inclusion of manuscript grading functionality within ResearchTree represents a significant enhancement to the College of Computer Studies assessment capabilities. With the portal facilitating the assignment and tracking of manuscript grades, faculty/panelist can more effectively evaluate student/researcher work, provide feedback, and monitor progress over time. This not only benefits students by offering them clearer insight into their academic performance but also enables faculty to more

efficiently manage the grading process, freeing up valuable time for other academic endeavors.

Additionally, the integration of data analytics capabilities within ResearchTree introduces a new dimension to manuscript management. By leveraging data analytics tools, the portal can generate insights and visualizations regarding manuscript-related information. This may include trends in research topics, citation patterns, or student performance metrics. Such insights can be invaluable for informing strategic decisions within the university, identifying areas for curriculum improvement, or guiding research initiatives. Moreover, the ability to visualize manuscript-related data in intuitive formats can enhance communication and collaboration among researchers, facilitating interdisciplinary dialogue and knowledge sharing.

One limitation of the "ResearchTree" project could be the potential challenge of user adoption and adaptation to the new system. Despite its many benefits, introducing a web-based portal for manuscript management represents a significant change in the college's research management processes. Faculty and students accustomed to traditional methods of manuscript handling may initially face a learning curve in navigating and utilizing the new platform effectively.

Furthermore, resistance to change from some stakeholders within the university community could hinder the successful implementation and uptake of ResearchTree. Faculty members, in particular, may express concerns about the perceived complexity of the system or the additional time required to familiarize themselves with its features. Similarly, students may encounter

difficulties in adjusting their workflows to align with the requirements of the new platform, potentially leading to initial frustration or resistance.

Addressing these challenges will require comprehensive training and support initiatives to ensure that all users are equipped with the necessary skills and knowledge to utilize ResearchTree effectively. Additionally, ongoing communication and feedback mechanisms will be essential for identifying and addressing any usability issues or concerns that arise during the transition period.

CHAPTER II

THEORETICAL FRAMEWORK OF THE PROJECT

REVIEW OF RELATED LITERATURE, STUDIES, AND SYSTEMS

Research Manuscript

Research is defined as an activity aimed at obtaining knowledge and applying it to solve scientific problems or concerns. On the other hand, management is a set of actions that are meant to move an activity forward and make it happen. As a result, research management can be defined as an institutional endeavor aimed at exploring, understanding, and interpreting reality, as well as systematizing and transmitting obtained knowledge in order to meet needs and contribute to the resolution of societal difficulties Nader (2020). This is the main reason why submitting and reviewing manuscripts for academic journals, conferences, and other research-focused publications can be difficult.

According to Teodosiu (2019), Writing a manuscript is an excellent challenge for students. Research is a subject already offered even at the senior high school level. In Tertiary schools, research writing has been integrated into their courses regardless if it is a board exam or non-board exam course. In higher education, writing research is a must nowadays to the extent of having them published in reputable journals at the local or international level. In terms of knowledge in writing a research paper, the IMRaD format is one of the most basic and standard forms.

IMRaD requires sound knowledge, especially of its main parts, structuring its sections, using appropriate language and conducting improvements before

submitting to a journal. Writing its contents is tricky and sometimes very challenging, depending on the study type one intends to achieve. Many young researchers need help writing research articles since there needs to be specific training for this in their curriculum. Therefore, it is an excellent opportunity for students to have this additional knowledge since they will need this skill in the future. (Shankar & Arun, 2022).

Web Portals

The World Wide Web (WWW) has turned into an important part of human life. As the quantity of information on the Web grows exponentially, web portal services become indispensable to WWW users.

In addition, web portals focus on offering more diverse services and resources to attract more web users. Imagine that a massive quantity of web content information is stored in many different web sites, and a web portal serves as a map that guides users to find the products (knowledge) they need. Without such a map, regardless of how abundant information the virtual world boasts, users cannot transform that information to build knowledge they need in a fast and convenient way. It is thus evident that web portals provide essential directions to users to browse the Internet.

The study focuses on vertical portals and aims to develop a web portal system that integrates various web content information into a single web page, analyzes the relationship of the content information, and rearrange it into a consistent, integrated web portal page. This study uses the three concepts of information extraction (IE), information retrieval (IR), and heuristic algorithm (HA) to make the system more intelligent. The framework and rudiments

developed by this study are called "Intelligent Web Portal System"(IWPS). (Tsai et al, 2005)

A portal is a website that is specifically designed to bring together information from different sources in a uniform manner. "Web Application on Student Portal" (WAOSP) is a web application that focuses primarily on students who are trying to learn and teachers who are trying to teach. The members of this portal can exchange information in various formats such as videos, images, PDFs, etc. This application is very useful for students to stay up-to-date with the latest information and to communicate with learners from all over the world. The Online Student Portal provides services such as online bookshops, online courses, forums, communities, study materials, news, and events. (Mandal, 2023)

Web Portals as Tools to Support Information Management in Higher Education Institutions. Pinho, 2018 research is about web portals as tools to support information management in higher education institutions. Studies shows the importance of web portals as tools to support decision-making within the higher education institution (HEI). These web portals enable decision-makers to attain a comprehensive view of HEIs, their available resources, and their utilization, thus streamlining the management process within such institutions. The effective management of information is facilitated by the adoption of a web portal tailored to the specific needs of HEIs. (Pinho, 2018).

To improve the efficacy and efficiency of research management in universities, portals for tracking research activities and results have been

created. These portals offer sections for registering, tracking, monitoring, reporting, and grant applications (Marzukhi et al., 2019).

Data Analytics

In the study of Data Analytics, Innovation, and Firm Productivity they examine the relationship between data analytics capabilities and innovation using detailed firm-level data.. They find that data analytics capabilities are more likely to be present and are more valuable in firms that are oriented around process improvement and that create new technologies by combining a diverse set of existing.

Overall, the results suggest that firms that have historically focused on specific types of innovation process innovation and innovation by diverse recombination may receive the most benefits from using data analytics. (Wu, 2019),

The educational datasets, in particular, contribute to the evolution of learning theories, learning support, learning design, learner feedback, and the development of future learning support systems. Over the past decade, rapid developments in the field of big data and analytics have led to an increased interest in educational data analytics (Baker and Inventado, 2014; Nguyen, Gardner, and Sheridan, 2018b). Several researchers have reviewed and analyzed the features and applicability of big data and analytics in education (Arnold and Pistilli, 2012; Dahlstrom, Brooks, and Bichsel, 2014; Chaurasia et al., 2018).

Revisions

Efficiency in managing research papers is important for the progress of scientific research. The use of efficient Progressive web applications and systems can help streamline the process and avoid delays and confusion. These papers highlight the need for efficient tools and systems in managing research papers, from collecting contributor information to evaluating and editing manuscripts (Kovacs et al., 2021).

The rising number of manuscript submissions and the complexity of research topics make it challenging for editors and reviewers to manage the process efficiently. Moreover, the traditional paper-based review system often leads to errors, causing delays and inconsistencies in evaluating and grading manuscripts.

While manual checking excel at uncovering intricate or specialized scenarios that automated tests might overlook, their limitation lies in their inability to achieve comprehensive coverage due to the overwhelming number of necessary test cases. Nonetheless, technological advancements have propelled the rising popularity of automatic testing in recent times. The merits of automated testing are evident in heightened testing efficiency, enhanced test coverage, and the concurrent reduction in testing time and costs, according to the study of Bhanushali (2023).

Monitoring

Monitoring the advancement of research projects requires effective research management. It makes it possible to manage research and

development activities effectively, guaranteeing the accuracy and effectiveness of research outputs. Furthermore, a comprehensive research project progress monitoring management system integrates various systems to promote resource and information sharing, resolving issues like tracking revisions and preventing redundancy and confusion (Raphael & Suteja, 2020).

Grading

Capstone serves as a significant component of the curriculum as it enables the evaluation of engineering students' preparedness for the professional world. Although conventional letter grades offer a reasonable means of evaluating pupil performance, they are not commonly employed for employee evaluations in the business world. By creating a new grading system, their research bridges the divide between industry-based and conventional academic evaluations.

The performance evaluation metrics that are widely utilized in the industry have been integrated into the specifications-based assessment scheme of the new system. In order to delineate the criteria that must be met in order to satisfy each specification, rubrics were born. Student surveys were distributed in both the pre-grading and post-grading phases. Students reacted favorably to the industry-based grading system on the whole. The students' response was overwhelmingly positive, as the majority agreed that they were evaluated equitably and were more motivated to exert effort on their project with the assurance of receiving a high letter grade.

In addition, the majority of students recommended that future course offerings utilize the same industry-based evaluation metrics that were favored

by the majority. In addition, evaluations by students during the 2020-21 academic year indicated that the capstone assessments were well received both prior to and subsequent to the implementation of rubrics (Gargac 2022).

Capstone Projects

A capstone project promotes creativity, critical thinking, and advanced problem-solving skills. Capstone projects allow students to demonstrate their abilities, skills, and complete a substantial project within their profession. Capstone projects in Computer Science Bachelor degrees significantly impact overall student learning results. Students' capstone projects are a great way to see how well they met learning goals and used what they learned in school. But grading a capstone project is hard because it involves research and you have to look at all of the student results. The tool has a set of criteria and signs, detailed rubrics to back them up, and ends with a summarized statistical collection. At the end of the paper, we talk about the measurement rubrics and statistical methods used to rate student success and SO attainment.

Several studies have been done to show how to set up, structure, and grade Capstone Project courses effectively in computer science and engineering schools. A course structure with a prerequisite course on project management and set milestones, assessment using a holistic rubric, a unified framework for good evaluations of student performance and Capstone Project qualities, and a framework made up of criteria and indicators supported by thorough analytical rubrics are some of these. (Salem, 2020)

Synthesis

The synthesis of the reviewed literature highlights the multifaceted landscape of research management and academic progress tracking in higher education. Research management involves navigating the intricate processes of manuscript submission and review, which are integral to advancing scientific knowledge. This endeavor is further compounded by the need for efficient tools and systems, such as web portals, to streamline the management process and ensure efficacy in handling the increasing volume and complexity of research topics.

Moreover, the synthesis underscores the pivotal role of data analytics in enhancing innovation and firm productivity, particularly in leveraging big data for educational purposes. The integration of data analytics capabilities facilitates informed decision-making and supports the evolution of learning theories and instructional design in educational institutions.

Efficiency in managing research papers is imperative, necessitating the adoption of progressive web applications and automated testing to mitigate delays and errors inherent in traditional review systems. Concurrently, effective research monitoring mechanisms are essential for overseeing project advancements and ensuring the accuracy and effectiveness of research outputs.

Grading methodologies, particularly in capstone projects, are evolving to bridge the gap between academic evaluation and industry standards, thereby fostering equitable assessment and student motivation. Capstone projects serve as platforms for students to showcase their creativity and problem-solving

skills, with structured evaluation frameworks ensuring fair and comprehensive assessment of student performance.

In essence, the synthesis underscores the dynamic interplay between technological advancements, educational methodologies, and institutional practices in shaping the landscape of research management and academic evaluation in higher education.

LITERATURE MATRIX

Table 1. Literature Matrix

Author/Year	Title	Findings
Dáher Nader	Research management in the faculty of sciences. International journal of research (2020)	This study highlights the importance of research management in addressing scientific problems. It emphasizes the role of institutions in exploring, understanding, and systematizing knowledge. The findings suggest that effective research management is crucial for addressing societal challenges and improving the submission and review process for academic publications.
Teodosiu, M.	Scientific writing and publishing with IMRaD. Annals Of Forest Research (2019)	The study shows that writing a manuscript is a significant challenge for students. It notes that research writing is introduced even in senior high school and is integrated into tertiary education courses, whether they lead to board exams or not. In higher education, writing

		research papers and getting them published in reputable journals is increasingly essential. The IMRaD format is highlighted.
Shankar, S.,& Arun, H.	Writing Manuscripts Better: Part I (2022)	The findings of this study indicate a widespread need among young researchers for assistance in writing research articles, highlighting a gap in specific training within their curriculum. Consequently, providing students with additional knowledge in this area presents an excellent opportunity to equip them with a crucial skill for their future endeavors. Additionally, research has shown that even graduate student
Samrat Mandal	Web Application on Student (2023)	The findings reveal that "Web Application on Student Portal" (WAOSP) serves as a dedicated platform for students and teachers to exchange information in diverse formats, facilitating global communication and access to updated educational resources, including online bookshops, courses, forums, communities, study materials, news, and events.
Pinho et al	Web Portals as Tools to Support Information Management in Higher Education Institutions (2018)	In this research highlight the crucial role of web portals in supporting information management within higher education institutions (HEIs), emphasizing their significance in facilitating decision-making processes. These portals provide decision-makers with a comprehensive view of HEIs

		and their resources, thereby enhancing management efficiency. Access to relevant and timely in format
Syahaneim Marzukhi et al.	eRMS for Research Management and Monitoring at Universiti Pertahanan Nasional Malaysia (UPNM) (2019)	This study found that universities have created portals to better manage research. These portals help with registering, tracking, and reporting research activities and grant applications, aiming to improve efficacy and efficiency.
Wu, Lynn	Data Analytics, Innovation, and Firm Productivity (2019)	The findings of the study on Data Analytics, Innovation, and Firm Productivity indicate that firms oriented around process improvement and diverse recombination of existing knowledge are more likely to benefit from data analytics capabilities, which enable them to expand their search space for new technologies. However, data analytics appears to be less effective for developing entirely new technology
Arnold, K. & Pistilli, M. D.	Course Signals: Using Learning Analytics to Increase Student Success. In Proceedings of the 2nd International Conference on Learning Analytics and Knowledge, 267–270, ACM (2012).	This study finds that educational datasets contribute to the advancement of learning theories, support, design, feedback, and future learning systems. Recent years have seen growing interest in educational data analytics due to advancements in big data and analytics. Researchers have reviewed and analyzed the features and applicability of these technologies in education.

Kovacs, M., Holcombe, A., Aust, F., & Aczel, B.	Tenzing and the importance of tool development for research efficiency. Information Services & Use (2021)	The study emphasizes the importance of efficiency in managing research papers for scientific progress. It suggests that using progressive web applications and systems can streamline the process, preventing delays and confusion. The findings underscore the need for efficient tools and systems to manage various aspects of research papers, including collecting contributor information and evaluating.
Bhanushali, Amit.	Impact of Automation on Quality Assurance Testing: A Comparative Analysis of Manual vs. Automated QA Processes. International Journal of Advances in Scientific Research and Engineering.	The study found that manual testing is good for uncovering complex situations missed by automated tests, but it's limited because it can't cover all possible cases. However, automated testing is becoming more popular due to technological advances. Automated testing offers benefits like increased efficiency, better coverage, and reduced time and costs for testing.
Raphael, Y., & Suteja, B. R.	Perancangan Sistem Manajemen Sekolah Berbasis Progressive Web Apps. Jurnal STRATEGI - Jurnal Maranatha (2020)	The study finds that effective research management is crucial for monitoring project progress. It ensures accuracy and effectiveness in research outputs. Additionally, a comprehensive management system integrates different systems to promote resource and information sharing, addressing issues like tracking revisions and

		avoiding redundancy and confusion.
Joshua Gargac	Incorporating Industry-based Metrics into a Specifications (2022)	The findings indicate that the implementation of an industry-based grading system for capstone assessments effectively bridges the gap between conventional academic evaluations and industry standards, as evidenced by overwhelmingly positive student responses and recommendations for future course offerings to adopt similar evaluation metrics. Additionally, evaluations conducted during the 2020-21
Fatima Abu Salem	Effective Assessment of Computer Science Capstone Projects and Student Outcomes	The findings highlight the role of capstone projects in promoting creativity, critical thinking, and advanced problem-solving skills among students, particularly in Computer Science Bachelor degree programs. These projects provide an opportunity for students to showcase their abilities and skills while completing substantial projects within their field. However, grading capstone projects presents

Conceptual Framework

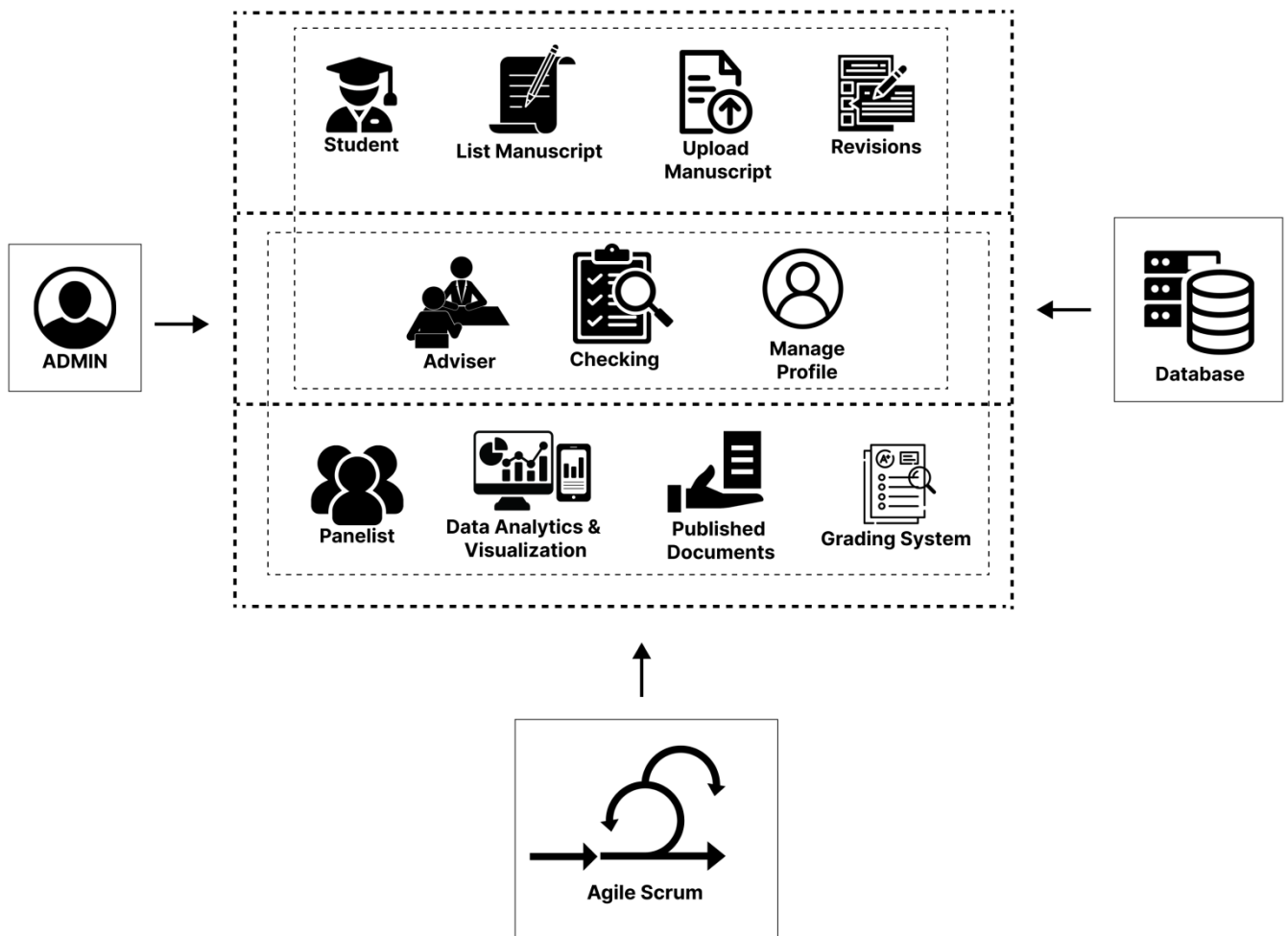


Figure 1. Conceptual Framework

This is the visual representation of the Research Management Portal conceptual framework, which shows the main features, processes and methods the developer will use. It presents the administrator, panel's, adviser's and student's access to features in the Research Portal. While it also shows the administrator's responsibilities on the overall system. The developer's will also apply the set methods on the phase of the development

CHAPTER 3

METHODOLOGY

This chapter showed the systematic analysis of the methods that were used in the study. For the development of the web application, a variety of methodologies as a guide and a methodical approach were used. The project design, project development processes, testing, and evaluation procedures were all included in this chapter.

Project Design

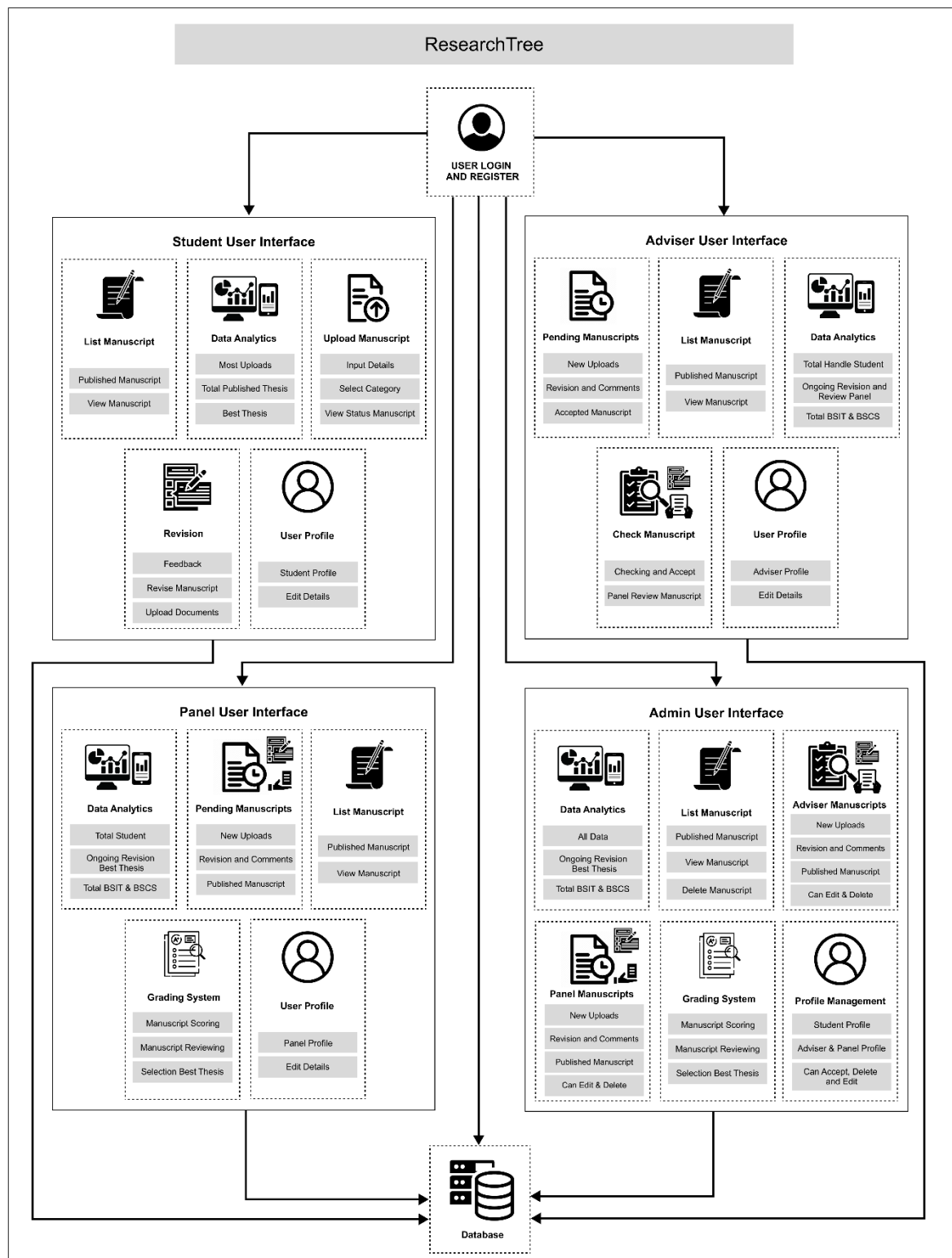


Figure 2. System Architecture

In this figure, shows the student dashboard, users create accounts and log in. They can view three main elements: all published manuscripts, trend analysis provided by data analytics and visualization, and my manuscripts for uploading and editing. Manuscripts move to panel review upon adviser approval.

Advisers access their system by registering and logging in through the adviser dashboard. They can view statistics, browse uploaded papers, and approve manuscripts for panel review. Approved manuscripts proceed directly to the panel for assessment, and advisers have access to the published manuscript list to efficiently supervise student research projects. For the panel dashboard, users register and log in to view data analytics and visualization, published articles, and feedback. They can also access advisor-approved papers for review and revision, as well as a list of published manuscripts approved by relevant panels. The admin, particularly the research coordinator, manages the entire system through the admin dashboard, overseeing adviser, panelist, and student registrations.

Materials

The hardware and software tools utilized to construct the project are displayed in this section

Software

The software that the developers utilized to create the Web based system is listed below, along with its features and justifications.

Express.js – Express.js, a minimalist Node.js web application framework, simplifies building robust web applications and APIs by providing a lightweight structure for handling HTTP requests and responses. It's ideal for developing scalable server-side applications. As the backbone of your Research Manuscript Management Portal's backend infrastructure, Express.js offers powerful features such as routing, middleware support, and seamless database integration, essential for managing manuscript submissions, revisions, grades, and data analytics. Leveraging Express.js enables efficient user authentication, data workflow management, and seamless communication between web platforms.

MongoDB - MongoDB is a popular NoSQL database management system that offers a flexible and scalable approach to storing and querying data. Unlike traditional relational databases, MongoDB uses a document-oriented model, where data is stored in JSON-like documents. This allows for greater flexibility in representing complex data structures and relationships. MongoDB is well-suited for applications with large volumes of unstructured or semi-structured data, such as web-based system, social media platforms, and content management systems. Its features include support for ad-hoc queries, indexing, replication, and sharding, making it ideal for building high-performance and scalable database solutions. With its ease of use, flexibility, and scalability, MongoDB is a popular choice for modern application development.

Plotly.js – Plotly.js, a JavaScript library, empowers developers to craft interactive visualizations for web applications, offering a diverse array of chart types, from scatter plots to heatmaps, all customizable to suit specific needs. By integrating Plotly.js into the research manuscript management portal, users at Laguna State Polytechnic University of Los Baños can benefit from dynamic and informative charts showcasing manuscript submission trends, peer review feedback, grading statistics, and other research analytics. This integration not only provides stakeholders with valuable insights but also facilitates decision-making and enriches the overall user experience of the system, enhancing its effectiveness in research management.

JavaScript - JavaScript is a high-level programming language primarily used for creating dynamic and interactive Research Manuscript pages/contents. It is often embedded directly into HTML documents to enhance the functionality and user experience of Research Manuscript pages. A user-friendly, data-rich mapping system that is specifically designed to meet the needs of ResearchTree plus people to be created with JavaScript's adaptability, interactivity, and dynamic content capabilities, making it an indispensable tool for creating the system.

Cascading Style Sheet (CSS) – CSS is a style sheet language that controls the presentation of HTML documents, separating content from visual aspects like layout, colors, and fonts. It's crucial in creating ResearchTree by specifying the visual appearance, layout, responsiveness, accessibility, and user interface customization of the Research Manuscript-based mapping

system. Developers utilize CSS to design an inclusive, user-friendly, and performant interface, addressing the requirements of Research Manuscript user

Tailwind (CSS) - Tailwind's responsive design capabilities ensure that the portal is accessible and functional across various devices and screen sizes, catering to both web platforms seamlessly. Additionally, Tailwind promotes consistency in styling and layout, reducing the need for custom CSS and ensuring a cohesive user experience throughout the portal. Overall, Tailwind CSS accelerates development, improves consistency, and enhances the user interface of ResearchTree, ultimately benefiting users and stakeholders at Laguna State Polytechnic University of Los Baños.

Node JS - Node.js, a potent JavaScript runtime environment, empowers building scalable server-side applications with its non-blocking, event-driven architecture. It's perfect for the core logic of your Research Manuscript Management Portal, handling user requests, data management, real-time collaboration, and integration with databases and services. Its asynchronous nature enhances responsiveness, while its vast ecosystem streamlines development. With Node.js, manage complex workflows for manuscript management efficiently, ensuring scalability and reliability for Laguna State Polytechnic University of Los Baños.

Visual Studio Code (VS Code) - Visual Studio Code (VS Code), a lightweight yet robust source code editor from Microsoft, boasts an intuitive

interface, powerful debugging tools, and built-in support for multiple programming languages and frameworks. Its vast extension ecosystem allows for customization to suit diverse project needs. For your research manuscript management portal, VS Code offers streamlined collaborative development through features like Git integration and Live Share. Its extensive array of extensions enhances productivity by providing tools for frontend and backend development, database management, and project management.

React JS - React JS, a potent JavaScript library for UI development, enables efficient creation of interactive web-based with its component-based architecture. Leveraging React's declarative syntax and virtual DOM streamlines interface design for both platforms. Its efficient state management supports seamless handling of manuscript workflows and data visualization.

API - An API (Application Programming Interface) serves as a bridge between different software applications, enabling them to communicate and share data efficiently. For your project, integrating APIs can streamline various functionalities. You can utilize APIs for user authentication, document management, revision tracking, grading algorithms, and data analytics. By leveraging APIs, you can enhance the interoperability of your system, simplify development efforts, and offer a seamless user experience across web platforms.

Libraries - Libraries offer invaluable resources for research, providing access to academic journals, papers, and scholarly materials. Integrating library services into the Research Manuscript Management Portal for Laguna State Polytechnic University of Los Baños enhances research quality and depth. Access to current information streamlines monitoring, revision, grading, and data analytics processes, enriching scholarly pursuits.

Hardware

To complete the project, the developers and stakeholders utilized their computer with sufficient specifications, ensuring smooth development and usage of ResearchTree. These are the following computer specifications utilized to develop and usage the system:

Developer Computer 1	
Processor (CPU)	Intel® i5-12500H (16CPUs) – 3.1Ghz
Memory (RAM)	16.00 GB RAM
Storage	512GB SSD
OS	Windows 11
Graphics Card	NVIDIA GeForce RTX 3050 4G

Table 1. Developer Computer 1 Specification

Table 1 shows the developer 1 uses a personal laptop that meets

ResearchTree's requirements. It has a powerful CPU for fast development, enough RAM for multitasking, a 512GB SSD for quick file access, and a modern operating system (OS) that works with many tools and makes system building easy.

Developer Computer 2	
Processor (CPU)	Intel® i5-11 th Gen (8CPUs) – 2.50Ghz
Memory (RAM)	16.00 GB RAM
Storage	512GB SSD
OS	Windows 11
Graphics Card	Intel® Iris® Xe Graphics

Table 2. Developer Computer 2 Specification

The developer 2 uses a personal laptop meeting ResearchTree's minimal requirements: a capable CPU for efficient development, sufficient RAM for multitasking, a 512GB SSD for fast file handling, and a modern OS for tool compatibility and system building ease.

Desktop / Laptop	
Processor (CPU)	Intel i3 – i5 or AMD A6 or higher
Memory (RAM)	4GB RAM – 8 GB RAM
Storage	HDD or SSD
OS	Windows 10 or Windows 11
Graphics Card	Intel UHD Graphics 620 or AMD Radeon

Table 3. Stakeholders Computer System Requirements

In this table 2, our stakeholders need reliable computing options, whether desktop or laptop. Our backlog specifies Intel i3 15 or AMD A6 CPUs, 4GB Radeon or Intel UHD Graphics 620 are acceptable graphics devices.

Project Development

To effectively develop and design the Research Manuscript -based system. The researcher utilize Agile Software Development Life Cycle methodology.

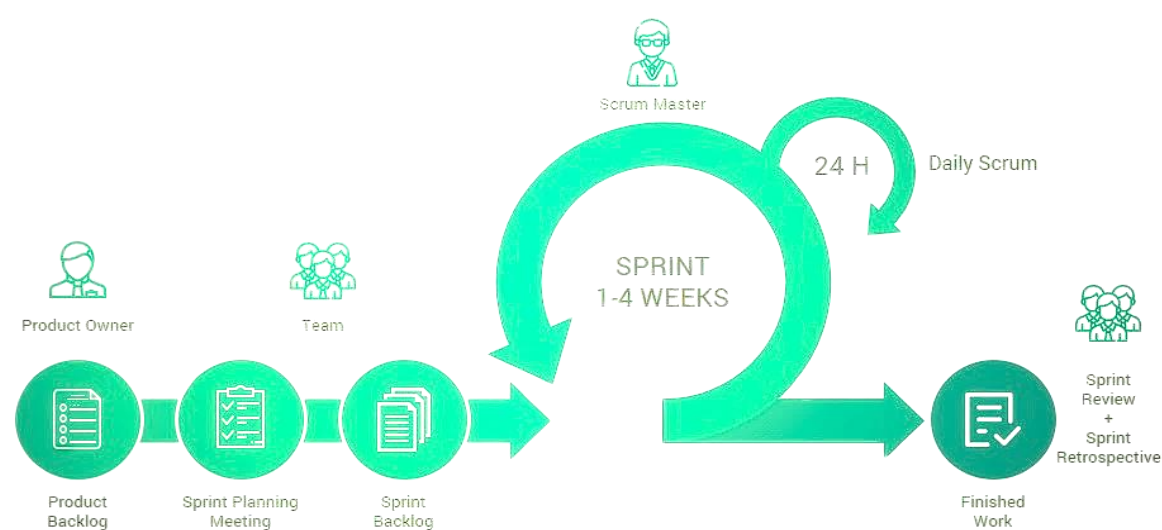


Figure 3. Agile Scrum Model

In the Agile model for ResearchTree development, the process starts with the Product Backlog, a list of features ranked by priority. During Sprint Planning, tasks are selected for the upcoming sprint, forming the Sprint Backlog. Daily Scrums are held throughout the sprint to discuss progress and plan work. The Scrum Master facilitates these meetings, ensuring adherence

to Agile principles. After each sprint, a Sprint Retrospective is conducted to reflect on successes and areas for improvement. Completed tasks meet sprint goals and criteria, constituting Finished Work. Finally, the Sprint Review gathers feedback from stakeholders, aligning with project objectives.

Product Backlog

In this table, the researchers determine the requirements and features of the system, which contains the list of that needs to develop this system and begins with the project's product backlog. This is the list of steps need for creating the software.

STUDENT		
PRIORITY	ITEMS	ESTIMATED TIME
1	As an Student, I want to register	1 Hours
2	As an Student, I want to login or logout	1 Hours
3	As an Student, I want to see list of published manuscript and mine	4 Hours
4	As an Student, I want to upload the documents	2 Hours
5	As an Student, I want to delete the documents	1 Hours
6	As an Student, I want to see feedback adviser and panellist for revision	3 Hours
7	As an Student, I want to see the notification for checked adviser and approved manuscript from panellist	4 Hours
8	As an Student, I want to see feedback adviser and panellist	3 Hours

9	As an Panel, I want to manage profile	2 Hours
---	---------------------------------------	---------

Table 1. Student Product Backlog

The table for the product backlog arranges tasks and features, giving precedence to their significance and estimated completion duration.

ADVISER		
PRIORITY	ITEMS	ESTIMATED TIME
1	As an Adviser, I want to log in	1 Hours
2	As an Adviser, I want to login or logout	1 Hours
3	As an Adviser, I want to see the flow of data analytic	2 Hours
4	As an Adviser, I want to see list of published manuscript	2 Hours
5	As an Adviser, I want to see list of new upload student manuscript	2 Hours
6	As an Adviser, I want to see list of ongoing revise student manuscript	2 Hours
7	As an Adviser, I want to see list of accepted student manuscript	2 Hours
8	As an Adviser, I want to revise the manuscript	5 Hours
9	As an Adviser, I want to grade the manuscript	4 Hours

10	As an Adviser, I want to provide feedback	4 Hours
11	As an Adviser, I want to edit and delete the manuscript	1 Hours
12	As an Adviser, I want to manage profile	2 Hours

Table 2. Adviser Product Backlog

The product backlog table provides a structured overview of the tasks and features to be addressed in the ResearchTree project, prioritized based on their importance and estimated time for completion. Each item in the backlog represents a specific task or feature that contributes to the overall.

PANEL		
PRIORITY	ITEMS	ESTIMATED TIME
1	As an Panel, I want to log in	1 Hours
2	As an Panel, I want to login or logout	1 Hours
3	As an Panel, I want to see the flow of data analytic	2 Hours
4	As an Panel, I want to see list of published manuscript	4 Hours
5	As an Panel, I want to see of list upload manuscript	2 Hours
6	As an Panel, I want to see of list revision manuscript	2 Hours

7	As an Panel, I want to see of list pending publish manuscript	2 Hours
8	As an Panel, I want to select best thesis on student manuscript	2 Hours
9	As an Panel, I want to revise the manuscript	5 Hours
10	As an Panel, I want to grade the manuscript	4 Hours
11	As an Panel, I want to provide feedback	4 Hours
12	As an Panel, I want to edit and delete the manuscript	1 Hours
13	As an Panel, I want to manage profile	2 Hours

Table 3. Panels Product Backlog

The product backlog table provides a structured overview of the tasks and features to be addressed in the ResearchTree project, prioritized based on their importance and estimated time for completion.

ADMIN		
PRIORITY	ITEMS	ESTIMATED TIME
1	As a Admin, I want to log in	2 Hours
2	As a Admin, I want to see the flow of data analytic	2 Hours
3	As a Admin, I want to see list of published manuscript	4 Hours
4	As a Admin, I want to upload the format of manuscript	2 Hours
5	As a Admin, I want to see list of new upload manuscript in student on adviser	2 Hours
6	As a Admin, I want to see list of ongoing revise manuscript in student on adviser	2 Hours
7	As an admin, I want to see list of accepted manuscripts by advisers.	2 Hours
8	As a Panel, I want to see of list revision manuscript	2 Hours
9	As a Panel, I want to see of list pending publish manuscript	2 Hours
10	As a Panel, I want to select best thesis on student manuscript	2 Hours
11	As a Admin, I want to revise the upload manuscript .	2 Hours
12	As a Admin, I want provide feedback.	2 Hours
13	As a Admin, I want to grade the manuscript .	2 Hours
14	As a Panel, I want to edit and delete the manuscript	1 Hours
15	As a Admin, I want to see the list of panellist.	2 Hours
16	As a Admin, I want to accept and declined the panel profile.	2 Hours
17	As a Admin, I want to see the list of adviser.	2 Hours
18	As a Admin, I want to accept and declined the adviser profile.	2 Hours
19	As a Admin, I want to add,edit and delete the Panel profile.	2 Hours
20	As a Admin, I want to add,edit and delete the Adviser profile.	2 Hours
21	As a Admin, I want to see the list of Student profile	2 Hours
22	As a Admin, I want to add,edit and delete the Student profile.	2 Hours

Table 4. Admin Product Backlog

In this table it presents the product backlog system for the administrator

which prioritizes the list with contains the estimated time for the system.

Sprint Planning

In the scrum process, sprint planning marks the beginning of the sprint.

The goal of sprint planning is to specify what can be completed in a sprint and how it will be done. The entire team collaborates on sprint planning.

STUDENT			
PRIORITY	ITEMS	TASKS	ESTIMATED TIME
1	As a Student, I want to register to access the system	Develop and design the register form	4 Hours
2	As a Student, I want to login and logout by entering and exits in the system	Develop and design the login form	4 Hours
3	As a Student, I want to 'Forgot Password' allowing to reset my password via email.	Develop and design the forgot password form	5 Hours
4	As a Student, I want to see the data analysis and visualization	Develop and design the data analysis for student	8 Hours
5	As a Student, I want to see list of published manuscript	Develop and design the list of published documents page	8 Hours
6	As a Student, I want to upload manuscript	Develop and design the uploads form	10 Hours
7	As a Student, I want to view notification for approval, not or pending published	Develop and design the notification	12 Hours
8	As a Student, I want to see my manuscript if approved or need to revise and see suggestions and comments of panellist	Develop and design the manuscript approved and revise w/ feedback	14 Hours
9	As an Student, I want to manage my profile to see details	Develop and design the profile account page	7 Hours

Table 5. Student Sprint Planning

The student's sprint planning is shown in this table, along with the programmer's time spent on the ResearchTree system and its steps and functions.

ADVISER			
PRIORITY	ITEMS	TASKS	ESTIMATED TIME
1	As a Adviser, I want to register to access the system	Develop and design the register form	5 Hours
2	As a Adviser, I want to login and logout by entering and exits in the system	Develop and design the login form	3 Hours
3	As a Adviser, I want to 'Forgot Password' allowing to reset my password via email.	Develop and design the forgot password form	5 Hours
4	As a Adviser, I want to see the data analytics and visualization of students and etc	Develop and design the data analysis for student page	7 Hours
5	As a Adviser, I want to see list of published manuscript	Develop and design the list of published documents page	10 Hours
6	As an Adviser, I want to see list of new upload student manuscript and give feedback	Develop and design the list new uploads page	14 Hours
7	As an Adviser, I want to see list of ongoing revise student manuscript and give feedback	Develop and design the list ongoing revision page	14 Hours
8	As an Adviser, I want to see list of accepted student manuscript	Develop and design the list accept student docs page	14 Hours
9	As a Adviser, I want to delete and edit manuscript	Develop and design the delete and edit	8 Hours
10	As an Adviser, I want to manage my profile to see details	Develop and design the profile account page	7 Hours

Table 6. Adviser Sprint Planning

This table "presents the adviser sprint planning, including the

programmer's allocated time for the ResearchTree system.

PANEL			
PRIORITY	ITEMS	TASK	ESTIMATED TIME
1	As an Panel, I want to login in to the system	Develop and design the login form	2 Hours
2	As an Panel, I want to login and logout by entering and exits in the system	Develop and design the login form	3 Hours
3	As an Panel, I want to see the flow of data analytic by visualizing or generating the data reports	Develop and design the data analytic page	15 Hours
4	As an Panel, I want to see list of published manuscripts	Develop and design the list of manuscript	10 Hours
5	As an Panel, I want to see of list upload manuscript, list revision and pending publish	Develop and design the list uploads checked, revision and pending publish on page	15 Hours
6	As an Panel, I want to select best thesis on manuscript, revise, give grades and provide feedback	Develop and design the select best thesis, revise, give grades and feedback	15 Hours
7	As an Panel, I want to edit and delete the manuscript	Develop and design the edit and delete manuscript	3 Hours
8	As an Panel, I want to manage profile account	Develop and design the profile account page	4 Hours

Table 7. Panel Sprint Planning

This table shows the sprint list for the panelist. It includes the programmer's time on the ResearchTree system, its steps, and how it works.

ADMIN			
PRIORITY	ITEMS	TASK	ESTIMATE D TIME
1	As a Admin, I want to login in to the system	Develop and design the login form	3 Hours
2	As a Admin, I want to manage the student profile	Develop and design the student profile page	5 Hours
3	As a Admin, I want to manage the panel profile	Develop and design the profile panel page	5 Hours
4	As a Admin, I want to manage the adviser profile	Develop and design the profile panel page	5 Hours
5	As a Admin, I want to see the flow of data analytics	Develop and design the data analytic page	14 Hours
6	As a Admin, I want to see list of published manuscript	Develop and design the list of published documents page	10 Hours
7	As an Admin, I want to see list of new upload student manuscript and give feedback	Develop and design the list new uploads page	14 Hours
8	As an Admin, I want to see list of ongoing revise student manuscript and give feedback	Develop and design the list ongoing revision page	14 Hours
9	As an Admin, I want to see list of accepted student manuscript	Develop and design the list accept student docs page	14 Hours
10	As an Admin, I want to see of list upload manuscript, list revision and pending publish	Develop and design the list uploads checked, revision and pending publish on page	15 Hours
11	As an Admin, I want to select best thesis on manuscript, revise, give grades and provide feedback	Develop and design the select best thesis,revise, give grades and feedback	15 Hours
12	As an Admin, I want to edit and delete the manuscript	Develop and design the edit and delete manuscript	3 Hours
13	As an Admin, I want to select best thesis on manuscript, revise, give grades and provide feedback	Develop and design the select best thesis,revise, give grades and feedback	15 Hours

Table 8. Admin Sprint Planning

This table shows the sprint backlog of admin and how long the programmer did the system ResearchTree, the step by step processs, and how the system works.

Use Case Diagram

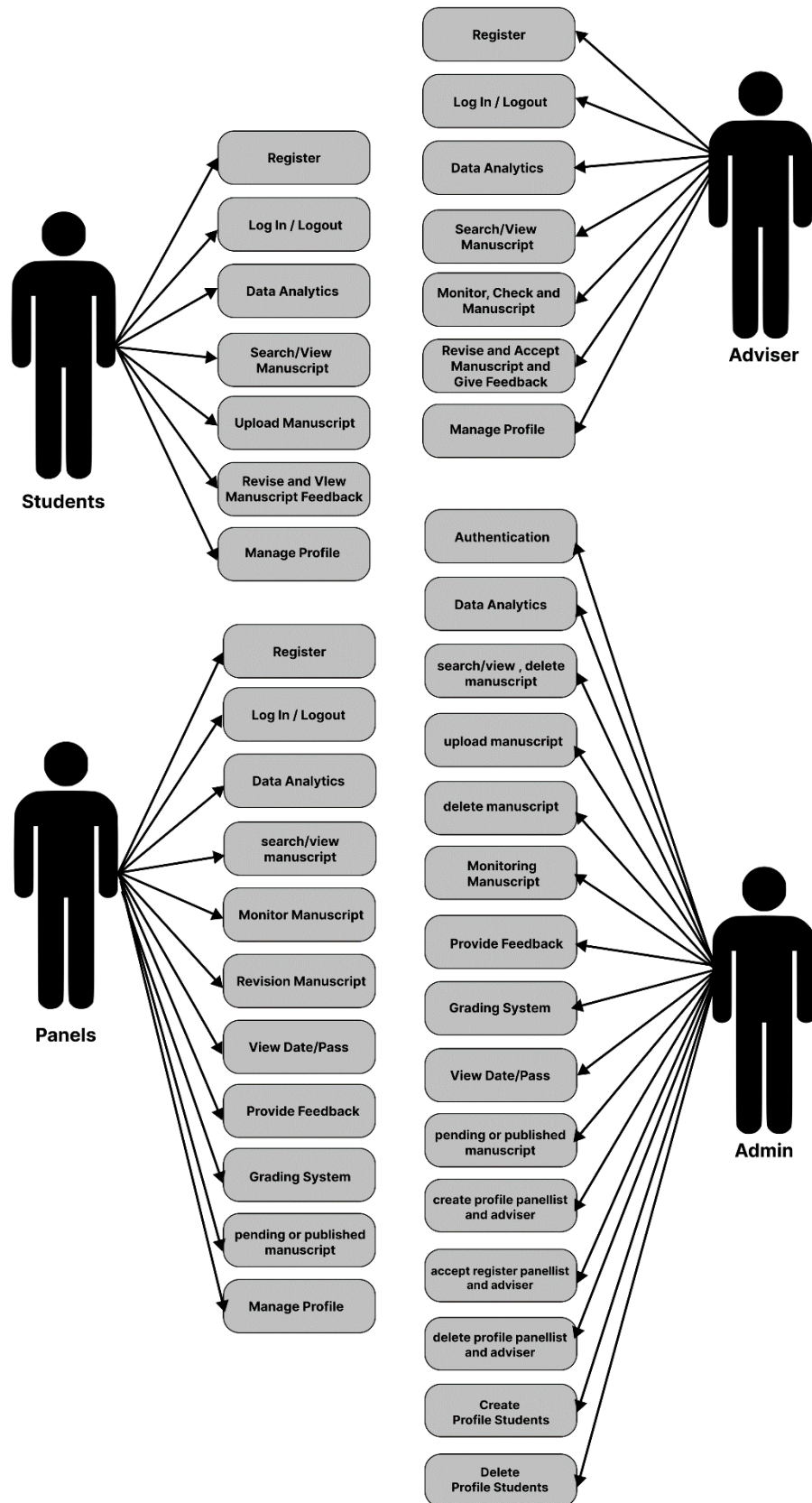


Figure 1. Use Case Diagram

Students must register to use the system. Logging out lets students search/view panelist manuscripts. They can manage their profiles and post manuscripts for advisers to review and publish on panels. To use the system, advisers must register. Advisers can use data analytics to visualize data, search/view manuscripts, monitor and check manuscripts, revise and accept manuscripts, provide feedback to students' writings, and manage profiles after admin approval. Dashboard access in the panel system requires account creation. Admin approval is required for system access after account creation. After approval, panels can search/see published manuscripts, publish student manuscripts, amend, view dates/passes, provide criticism, assign grades, and manage their accounts. Accessing the admin system requires login. This system is only accessible to admins, especially the research coordinator. Admins can access student, adviser, and panel systems here. They can comment, grade, publish, and conduct other administrative activities.

Student Flowchart

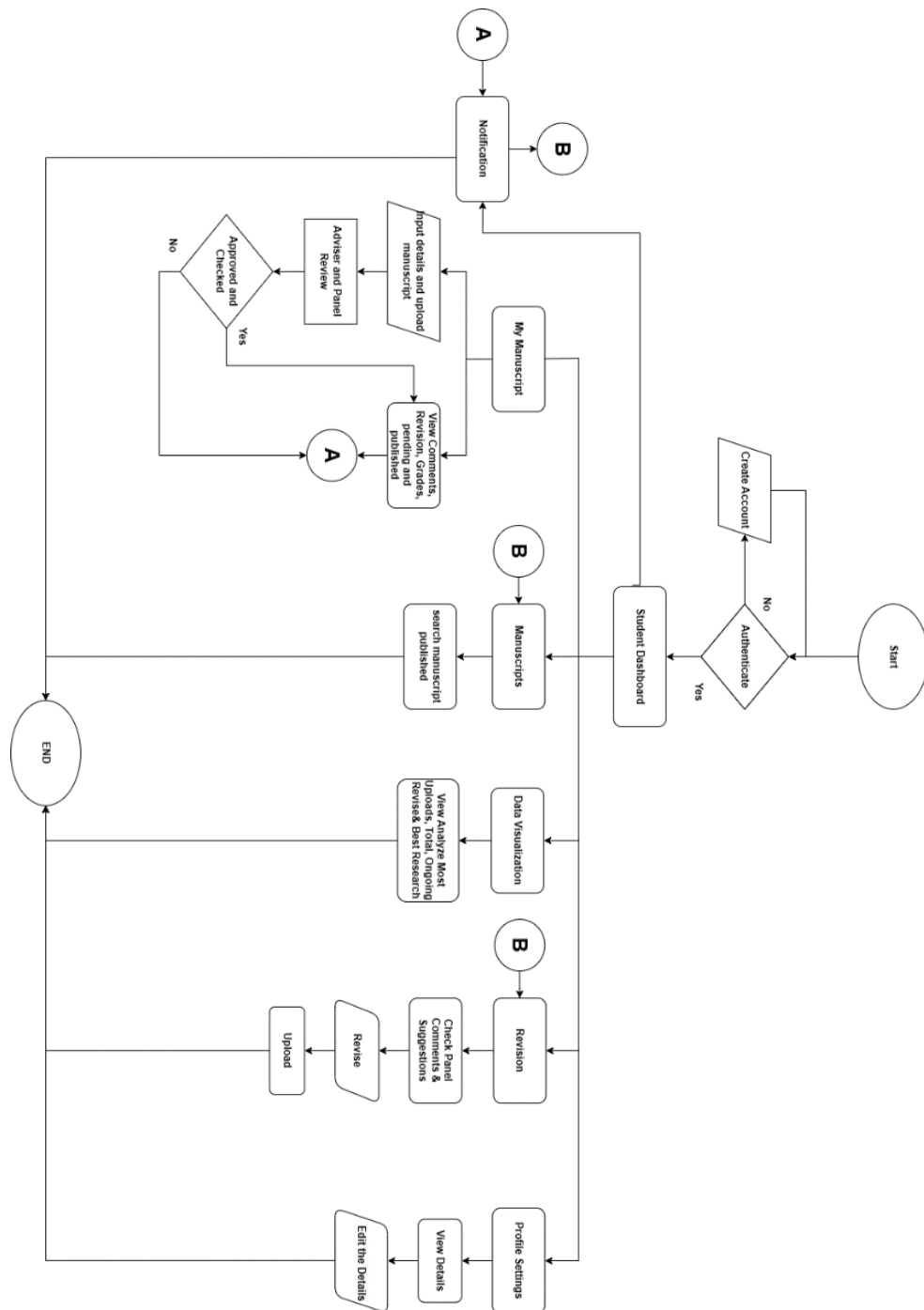


Figure 2. Student Flowchart

This student flowchart shows the system's main functionalities. Students have five dashboard components: "My Manuscripts," "Manuscripts," "Data Visualization," "Revision," and "Profile Settings." To begin, in "My Manuscripts,"

you can check adviser and administrator comments, revisions, grades, pending, and published results. Upload your manuscript and enter details in the sidebar. Second, "Manuscripts," contains panelist manuscripts. Thirdly, "Data Visualization," lets you track most uploads, total ongoing, revisions, and finest research. Fourth under "Revision," you can view your manuscripts and panelist comments. Finally, in "Profile Settings," you can modify your personal information.

Adviser Flowchart

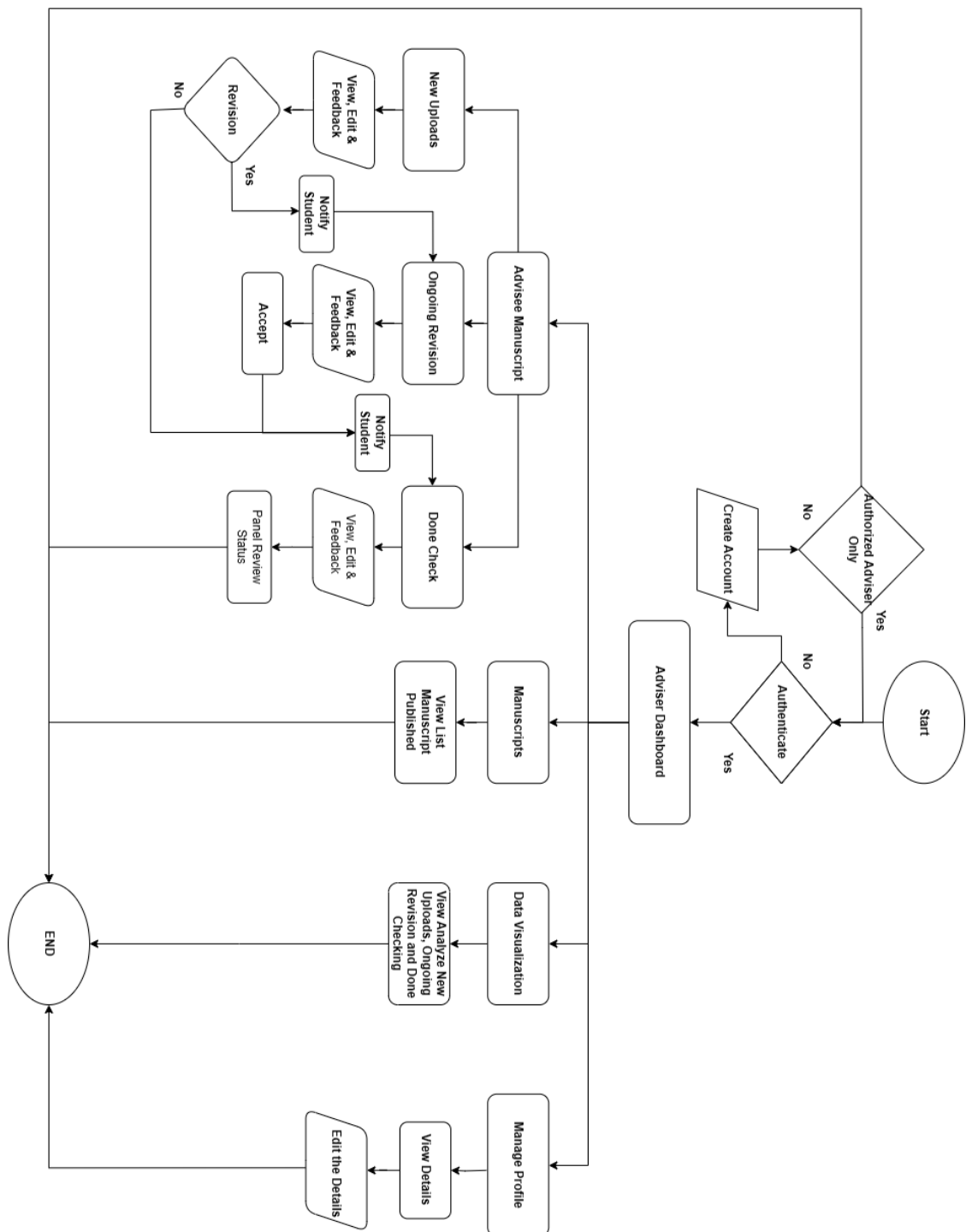


Figure 3. Adviser Flowchart

In this figure, the Panel flowchart illustrates the core functions within the system. The panel dashboard consists of four parts The panel dashboard has

four parts. In "Adviser Manuscript," there are three subsections: "New Uploads," "Ongoing Revision," and "Done Checked." Here, advisers can evaluate students' manuscripts and move those that need editing to ongoing revision. They are marked as done checked to alert panelists that advisers have reviewed the manuscripts. The second section is "Manuscripts," listing panelists' published works. Next is "Data Visualization," which shows student uploads, revisions, and the finest BSCS and BSIT theses. Finally, the fourth component lets users examine and change details.

Panel Flowchart

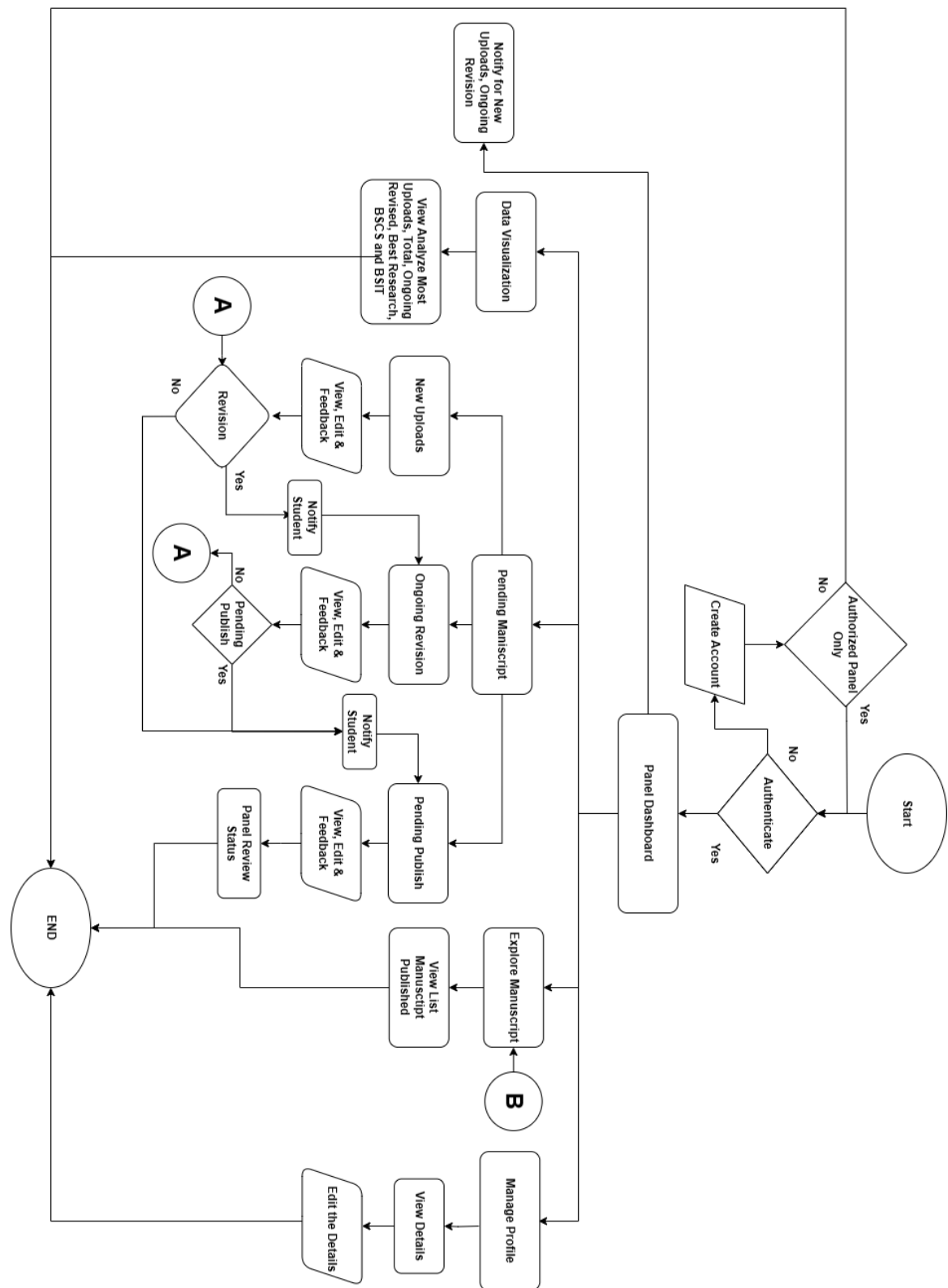


Figure 4. Panel Flowchart

In this figure illustrates the Panel flowchart, outlining the core functions within the system. First is "Data Visualization," shows student uploads, revisions, and the finest BSCS and BSIT theses. "Pending Manuscript," the second component, has three panelist sub-components. "New Uploads," where adviser-checked manuscripts await grading, are examples. Their status changes to "Ongoing Revisions," allowing real-time tracking during student edits. After reviewing, panelists can publish in "Pending Publish" and integrate the work into "Explore Manuscripts." "Explore Manuscripts," the final component, displays panelist manuscripts. The fourth component lets users examine and change details.

Admin Flowchart

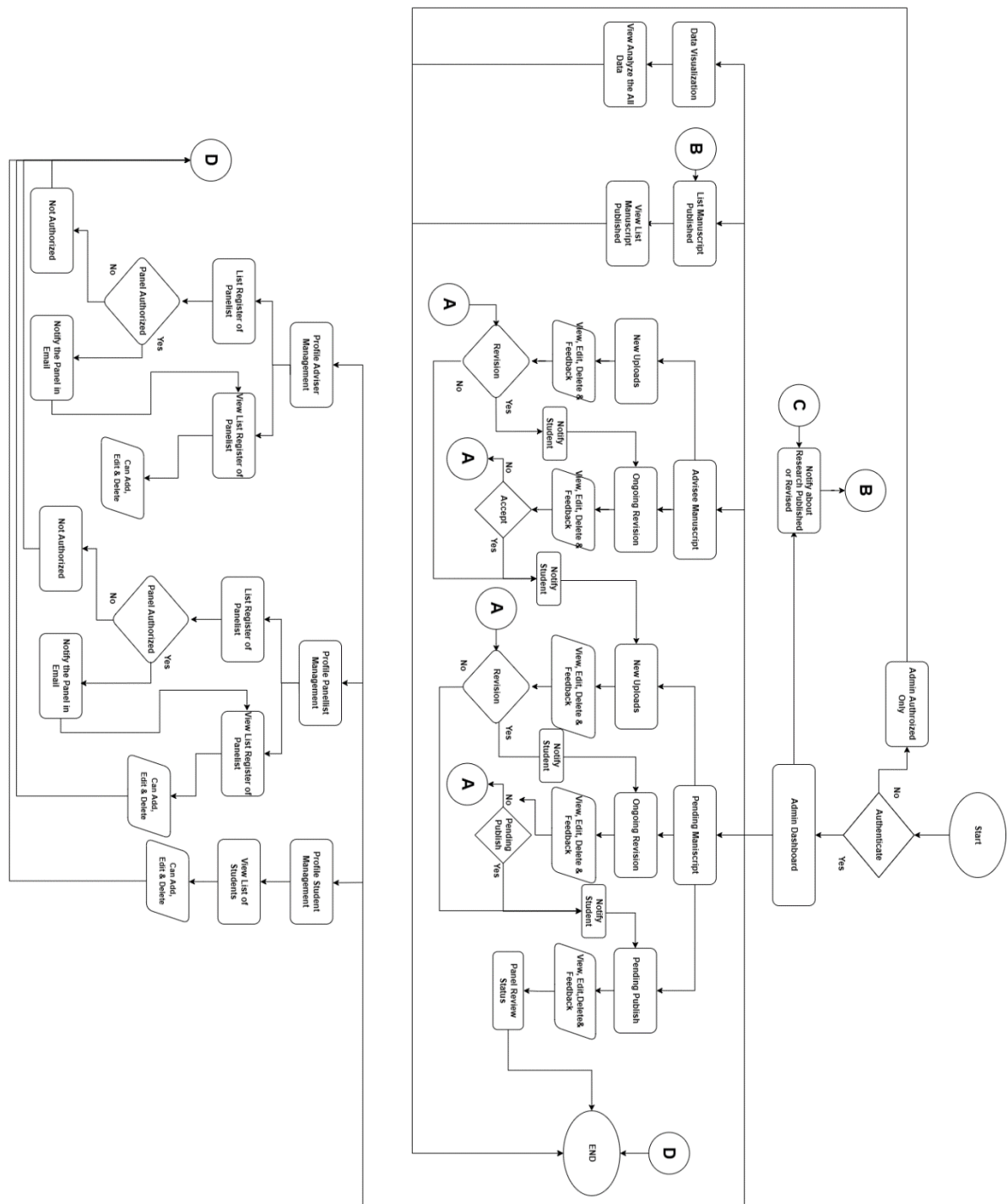


Figure 5. Admin Flowchart

In this figure displays the admin flowchart illustrates the functionalities within the system. There are seven major components make up this administrator system. First is data visualization, which displays all data. The

second section, list of published manuscripts, features panelist works. Next, adviser manuscripts have new uploads and ongoing revisions. student manuscripts are reviewed by advisers and revised here. Panelists examine manuscripts and notify students after approval. Panelists pending manuscripts section has three parts: new uploads, ongoing revisions, and pending publish. advisers check manuscripts in new uploads. they move to ongoing revisions for real-time student revision tracking. After evaluation, panelists can publish under pending publish, adding them to the list of published manuscripts. additionally, the system offers profile adviser management, profile panelist management, and profile student management. here, administrators approve or deny adviser and panelist users since system access is unique to these jobs. In the meanwhile, students can create system accounts directly.

Software Testing

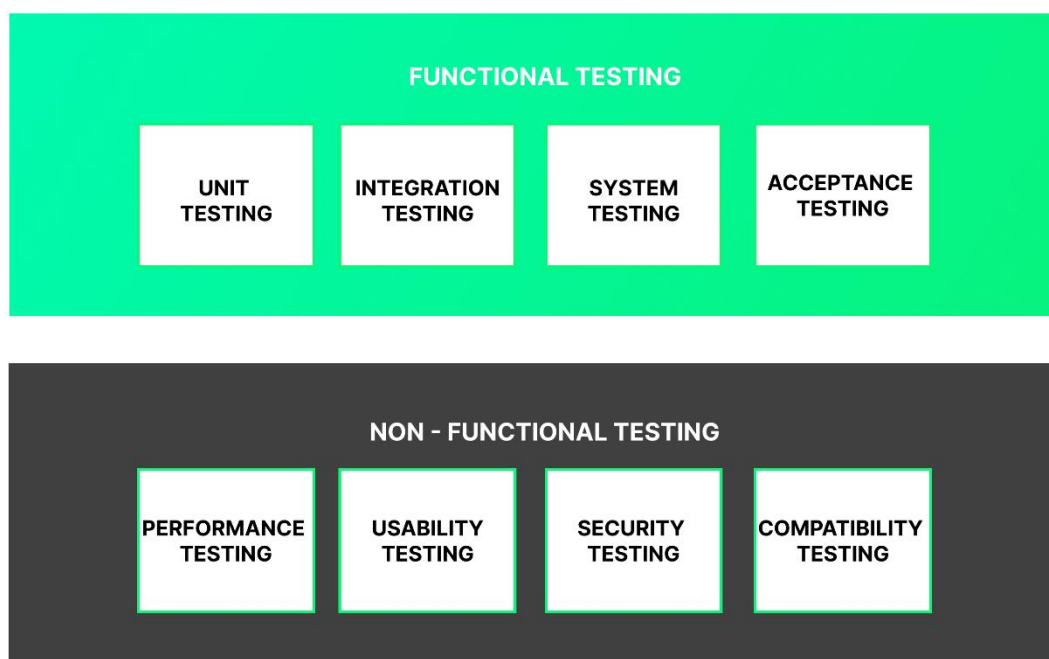


Figure 6. Levels of Testing

The purpose of the various stages of software testing is to evaluate the software's performance. Unit testing, which is Level 1, focuses on testing individual components. Level 2 integration testing examines integrated component functionality. The third level of system testing looks at the system as a whole. Finally, acceptance testing at level 4 ensures that the final system satisfies all requirements. The purpose of these various levels of software testing is to evaluate the software's performance at various stages of development.

Unit Testing

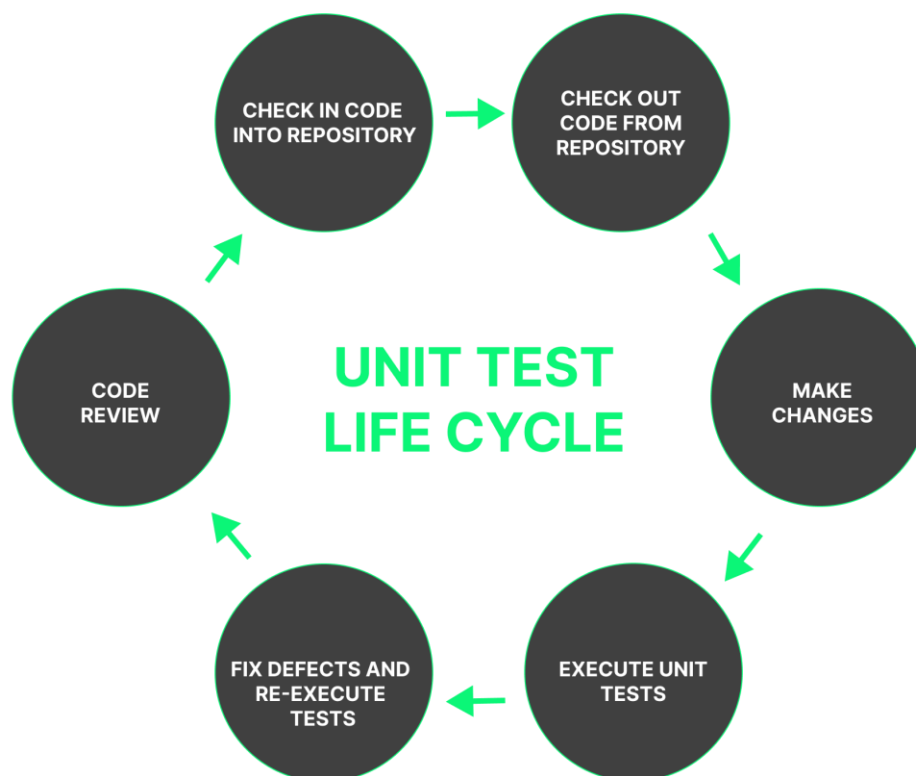


Figure 7. Unit Testing

In this testing, the researchers will test the system if all the commands are working and functioning 100%. In this way, the researchers can verify that the outcome/ result of the system was a success or, there are some bugs, errors and changes that needs to be fixed.

Integration Testing

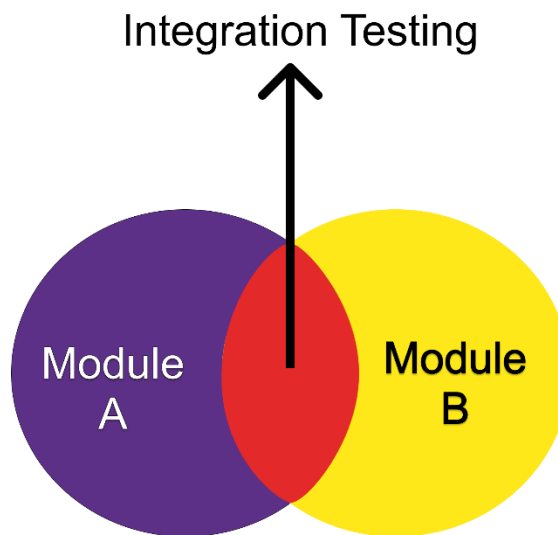


Figure 8. Integration Testing

In Integration Testing, the various modules or units are tested together to see if there is a problem with how they interact with one another. When

integration testing was used in the project, it was simpler for the developer to find communication problems between the various modules.

Acceptance Testing



Figure 9. Acceptance Testing

The researchers will present the proposed web-based system in order to check the capability, and functionality of the system on how it will perform prior to its deployment in the production environment. This procedure ensures that it meets the documented requirements and is compatible with their current requirements.

Evaluation Procedure

SOFTWARE PRODUCT QUALITY								
FUNCTION SUSTAINABILITY	PERFORMANCE EFFICIENCY	COMPATIBILITY	INTERACTION CAPABILITY	RELIABILITY	SECURITY	MAINTAINABILITY	FLEXIBILITY	SAFETY
FUNCTIONAL COMPLETENESS FUNCTIONAL COMPLETENESS FUNCTIONAL COMPLETENESS	TIME BEHAVIOUR RESOURCE UTILIZATION CAPACITY	CO-EXISTENCE INTEROPERABILITY	APPROPRIATENESS LEARNABILITY OPERABILITY USER ERROR PROTECTION USER ENGAGEMENT INCLUSIVITY USER ASSISTANCE SELF DESCRIPTIVENESS	FAULTLESSNESS AVAILABILITY FAULT TOLERANCE RECOVERABILITY	CONFIDENTLY INTEGRITY NON-REPUDATION ACCOUNTABILITY AUTHENTICITY RESISTANCE	MODULARITY REUSABILITY ANALYSABILITY MODIFIABILITY TESTABILITY	ADAPTABILITY SCALABILITY INSTALLABILITY REPLACEABILITY	OPERATIONAL CONSTRAINT RISK INDENTIFICATION FAIL SAFE HAZARD WARNING SAFE INTEGRATION

Figure 10. Quality Characteristics of ISO 25010

The quality model is the cornerstone of a product quality evaluation system. The quality model determines which quality characteristics will be taken into account when evaluating the properties of a software product. The quality of a system is the degree to which the system satisfies the stated and implied needs of its various stakeholders, and thus provides value. Those stakeholders' needs (functionality, performance, security, maintainability, etc.) are precisely what is represented in the quality model, which categorizes the product quality into characteristics and sub-characteristics.

The product quality model defined in ISO/IEC 25010 comprises the nine quality characteristics shown in figure 10.

Functional Suitability: This characteristic represents the degree to which a product or system provides functions that meet stated and implied needs when used under specified conditions.

Performance Efficiency: This characteristic represents the degree to which a product performs its functions within specified time and throughput parameters and is efficient in the use of resources (such as CPU, memory, storage, network devices, energy, materials...) under specified conditions.

Compatibility: Degree to which a product, system or component can exchange information with other products, systems or components, and/or perform its required functions while sharing the same common environment and resources.

Interaction Capability: Degree to which a product or system can be interacted with by specified users to exchange information in the user interface to complete specific tasks in a variety of contexts of use.

Reliability: Degree to which a system, product or component performs specified functions under specified conditions for a specified period of time.

Security: Degree to which a product or system defends against attack patterns by malicious acts and protects information and data so that persons or other products or systems have the degree of data access appropriate to their types and levels of authorization

Maintainability: This characteristic represents the degree of effectiveness and efficiency with which a product or system can be modified to improve it, correct it or adapt it to changes in environment, and in requirements.

Flexibility: Degree to which a product can be adapted to changes in its requirements, contexts of use or system environment.

Safety: This characteristic represents the degree to which a product under defined conditions to avoid a state in which human life, health, property, or the environment is endangered.

Population of the study

The target population for this research defined to include the Dean, Panels, 3rd year and 4th year CCS Students of Laguna State Polytechnic University Los Banos Campus that engaged in research activities.

Sampling Design

In our research, purposive sampling involves deliberately selecting participants who possess specific characteristics or meet certain criteria relevant to our study objectives. Rather than randomly selecting participants from the entire population, we will use our judgment to choose individuals who can provide valuable insights into the effectiveness and usability of ResearchTree. We purposefully select the (1) Research Coordinator, (16) CCS Panelist, and (20) 3rd year and 4th year CCS students from Laguna State Polytechnic University – Los Baños Campus who are actively engaged in research activities and familiar with the Research Tree platform.

By targeting these specific groups, we aim to gather their experiences that are most relevant to our research questions.

Data Collection Instrument

To collect data for our research project evaluating the effectiveness of ResearchTree, a web based research management portal, we will first conduct prototype testing using a mock-up of ResearchTree created on Figma. Participants will be invited to interact with the prototype via a Figma link, providing valuable insights into the usability and functionality of the platform. Following the prototype testing phase, we will utilize Google Forms as our primary data collection instrument.

Participants will be invited to complete a comprehensive survey designed to assess various aspects of their experience with ResearchTree. The survey, accessible via a unique link generated through Google Forms, will include a mix of Likert scale questions, multiple-choice items. Participants will be asked to

rate the usability, satisfaction, and perceived value of ResearchTree, as well as provide feedback on specific features and functionalities. Additionally, they will have the opportunity to share suggestions for improvement and any challenges encountered while using the portal. The use of Google Forms offers a convenient and user-friendly platform for participants to provide their feedback, ensuring efficient data collection and analysis for our capstone project.

Statistical Treatment

The frequency of each response was determined based on how many respondents answered that specific item. The Likert Scalar method was used to reflect the respondents' insights. The data was organized and processed using Microsoft Excel once it had been collected to calculate the Mean and the Standard Deviation, which was used for further interpretation.

The set of questions on the assessment can be answered with one of four impressions or replies, which are ranked from highest to lowest as follows: four (4) - Strongly Agree, three (3) - Agree, two (2) - Disagree, and one (1) - Strongly Disagree. This is crucial for evaluating the questionnaire responses provided by the respondents. The responses were summarized using mean and standard deviation. The composite mean was computed to get the overall perception of the respondents.

RATING	INTERPRETATION	RANGE
4	Strongly Agree	3.25 – 4.00
3	Agree	2.50 – 3.24
2	Disagree	1.75 – 2.49
1	Strongly Disagree	1.0 – 1.74

Table 4. Likert Scale Method

Table 6 shows the Likert Scale that was used as a survey method to gauge how satisfied users were with the application. The respondents' evaluations are measured using a percentage technique. The formula is as follows:

Where:

$$\frac{\text{Highest Score} - \text{Lowest Score}}{\text{Highest Score}} = \frac{4 - 1}{4} = \frac{3}{4} = 0.75$$

References

- Dáher Nader, J. E., Panunzio, A. P., Navarro, M. I. H., & Moya, M. A. R. (2020). Research management in the faculty of sciences. *International journal of research -granthaalayah*, 8(2), 93–99. <https://doi.org/10.29121/granthaalayah.v8.i2.2020.189>
- Teodosiu, M. (2019). Scientific writing and publishing with IMRaD. *Annals Of Forest Research*, 62(2), 201–214. <https://doi.org/10.15287/afr.2019.1759>
- Cláudia Pinho, Mário Franco, Luis Mendes, Web portals as tools to support information management in higher education institutions: A systematic literature review <https://doi.org/10.1016/j.ijinfomgt.2018.04.002>
- Syahaneim Marzukhi, Che, E., Hafizah Ariff, Zainudin, A., Latif, A., Nurul Fatehah Roslan, & Ayuni Akmal Ramlee. (2019). eRMS for Research Management and Monitoring at Universiti Pertahanan Nasional Malaysia (UPNM). *Lecture Notes in Computer Science*, 611–619. https://doi.org/10.1007/978-3-030-34032-2_54
- Shankar, S., & Arun, H. (2022). Writing Manuscripts Better: Part I (The introduction, methods, results, and discussion format). *Indian Journal of Rheumatology*, 17(2), 292-297. <https://doi.org/10.4103/0973-3698.364670>
- Mandal, Tanim (2023). Web Application on Student Portal <http://suspace.su.edu.bd/handle/123456789/559>
- Wu, Lynn; Hitt, Lorin; Lou, Bowen (2019). Data Analytics, Innovation, and Firm Productivity. *Management Science*, (), mns.2018.3281–. doi:10.1287/mns.2018.3281

Nguyen, Andy & Gardner, Lesley & Sheridan, Donald. (2020). Data Analytics in Higher Education: An Integrated View. *Journal of Information Systems Education*. 31. 61-71.

[\(PDF\) Data Analytics in Higher Education: An Integrated View \(researchgate.net\)](#)

Kovacs, M., Holcombe, A., Aust, F., & Aczel, B. (2021). Tenzing and the importance of tool development for research efficiency. *Information Services & Use*, 1–9. <https://doi.org/10.3233/isu-210109>

Bhanushali, Amit. (2023). Impact of Automation on Quality Assurance Testing: A Comparative Analysis of Manual vs. Automated QA Processes. *International Journal of Advances in Scientific Research and Engineering*. 26. 39.

Raphael, Y., & Suteja, B. R. (2020). Perancangan Sistem Manajemen Sekolah Berbasis Progressive Web Apps. *Jurnal STRATEGI - Jurnal Maranatha*, 2(2), 327–336. <https://strategi.it.maranatha.edu/index.php/strategi/article/view/184>

Joshua Gargac. (2022) Incorporating Industry-based Metrics into a Specifications Grading System for Capstone Assessment. [Gargac SpecificationsBasedGrading CDC22.pdf \(capstonedesigncommunity.org\)](#)

Abu Salem, F., Damaj, I., Hamandi, L., & Zantout, R. (2020). Effective Assessment of Computer Science Capstone Projects and Student Outcomes. *International Journal of Engineering Pedagogy (iJEP)*, 10(2), pp. 72–93. <https://doi.org/10.3991/ijep.v10i2.11855>