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# AI-Powered Research Engineering Portal for Academic Contributions

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**ABSTRACT:** Managing academic research activities manually is time-consuming and often leads to inefficiencies in tracking submissions, reviews, approvals, and overall documentation. Traditional systems rely on emails, spreadsheets, and paper-based records, which can cause delays, miscommunication, duplication of work, and difficulty in maintaining accurate archives. To overcome these challenges, this project presents an **AI-Powered Research Management Portal** designed to automate, centralize, and simplify the complete research workflow within an academic institution.

The portal provides a secure, web-based platform with structured role-based access for students, faculty members, Heads of Department (HOD), and administrators. Users log in using institution-specific credentials to ensure data security and accountability. Students can submit research proposals, upload supporting PDF documents, edit submissions, and track approval status in real time. Faculty members review proposals, evaluate abstracts, provide feedback, and approve or reject submissions through dedicated dashboards. HODs monitor departmental research progress using analytical reports, while administrators manage users, departments, and system configurations to ensure smooth operation.

Artificial Intelligence techniques, including Natural Language Processing (NLP), are integrated to analyse research abstracts, extract keywords, classify research domains, and generate meaningful insights. The AI module assists reviewers by summarizing content and supporting faster, more objective evaluation, thereby reducing manual workload and improving consistency in the review process.

The application is developed using React for the frontend to provide a responsive and user-friendly interface, Supabase for backend services including authentication and secure data storage, and AI APIs for intelligent analysis. By digitizing and automating research management, the system enhances efficiency, transparency, and accessibility while reducing administrative burden. Ultimately, it fosters a structured, scalable, and data-driven research ecosystem that encourages continuous academic engagement and institutional growth.

**KEYWORDS:** Artificial Intelligence, Research Management System, Natural Language Processing, Workflow Automation, Role-Based Access Control, Academic Research Portal.

## I. INTRODUCTION

In today's academic environment, research activities play a crucial role in measuring institutional growth, innovation, and scholarly contribution. However, in many institutions, research management is still handled through manual processes such as emails, spreadsheets, and paper-based documentation. These traditional methods make it difficult to track research submissions, monitor approval workflows, manage reviewer feedback, and maintain organized records of research outputs. As the number of research proposals, journal articles, and conference papers continues to grow, the absence of a centralized system often leads to delays, miscommunication, duplication of records, and lack of transparency in the research management process.

The project "**AI-Powered Research Management Portal**" aims to address these challenges by providing a centralized digital platform that streamlines and automates the entire research management workflow within academic institutions. The system enables students and researchers to submit research proposals, upload relevant documents, and track the progress of their submissions in real time. Faculty members can review submissions, provide structured feedback, and

approve or reject proposals through dedicated dashboards, while Heads of Departments (HODs) and administrators can monitor departmental research activities through analytical reports and performance insights.

The major objectives of this project are:

- To provide a centralized platform for submitting and managing research proposals and documents.
- To automate the research approval workflow between students, faculty, and administrators.
- To enable secure document upload and organized storage of research records.
- To track the status of research submissions in real time.
- To assist reviewers by analyzing research abstracts using Natural Language Processing (NLP).
- To provide dashboards and analytical reports for monitoring research performance.
- To improve transparency, efficiency, and communication in the research management process.

By addressing these challenges, the AI-Powered Research Management Portal reduces administrative workload, improves research tracking, and enhances collaboration between students, faculty, and institutional administrators, ultimately creating a more organized and efficient research ecosystem.

## II. LITERATURE SURVEY

The concept of a research management system has evolved gradually with the need for digital repositories in higher education. Traditional Current Research Information Systems (CRIS) and platforms like Shodh-Chakra or IRINS were initially designed for large universities to record research publications and metadata. However, these systems lack adaptability for smaller institutions and are often limited to data storage rather than workflow automation.

Researchers like Casalnuovo et al. (2020) discussed the significance of centralized research systems but pointed out limitations in accessibility, usability, and cost-effectiveness. Other models such as Google Scholar and ResearchGate focus on publication visibility rather than institutional analytics. Therefore, the proposed system bridges the gap by combining features of research repositories, performance dashboards, and workflow automation into a single integrated platform.

Furthermore, literature indicates that most academic management systems do not support real-time analytics or AI-driven recommendations. By integrating these capabilities, the proposed system can help predict trends such as publication frequency, department productivity, and funding utilization. It thus enhances institutional transparency and promotes a culture of data-driven research planning.

## III. EXISTING SYSTEM

In most academic institutions, the process of managing research contributions—such as journal publications, conference papers, workshops, and project submissions—is handled manually. This traditional system creates several challenges that affect accuracy, transparency, and efficiency. The major existing problems are:

- 1. Fragmented and Redundant Data:** Research records are stored separately across departments using spreadsheets, emails, and physical files. The same information is often entered multiple times, leading to data duplication, inconsistencies, and difficulty in maintaining updated records.
- 2. Time-Consuming Manual Validation:** Every research submission requires verification through emails or physical approval forms. This manual workflow causes significant delays, slows communication between students and faculty, and increases the possibility of human error.
- 3. Difficulty in Data Retrieval:** When reports are needed—for NAAC, NBA, or internal reviews faculty must manually compile records from various sources. This process is slow, error-prone, and inefficient, especially when handling large volumes of data.
- 4. Lack of Real-Time Tracking:** Students and faculty often have no visibility into the status of their submissions. Without automated tracking, they must rely on repeated reminders or follow-ups, which leads to delays and frustration.
- 5. High Risk of Data Loss:** Dependence on physical documents, personal laptops, and email threads increases the chances of losing important research records due to accidental deletion, system crashes, or staff turnover.

#### IV. PROPOSED SYSTEM

The AI-Powered Research Engineering Portal replaces the manual system with a centralized, automated platform that enables users to easily submit, review, and approve research projects through a secure, user-friendly interface.

##### 1. Centralized Management

All research data, publications, and project details are stored in a single integrated database, ensuring easy access and consistency across departments.

##### 2. Automation

The system automates workflows for project submission, approval, and reporting, reducing manual effort and time delays.

##### 3. Role-Based Access

Different types of users—students, faculty, HODs, and administrators—have specific access privileges based on their roles to ensure data privacy and accountability.

##### 4. Real-Time Analytics

Built-in dashboards and analytical tools provide real-time insights into departmental research performance, funding utilization, and publication trends.

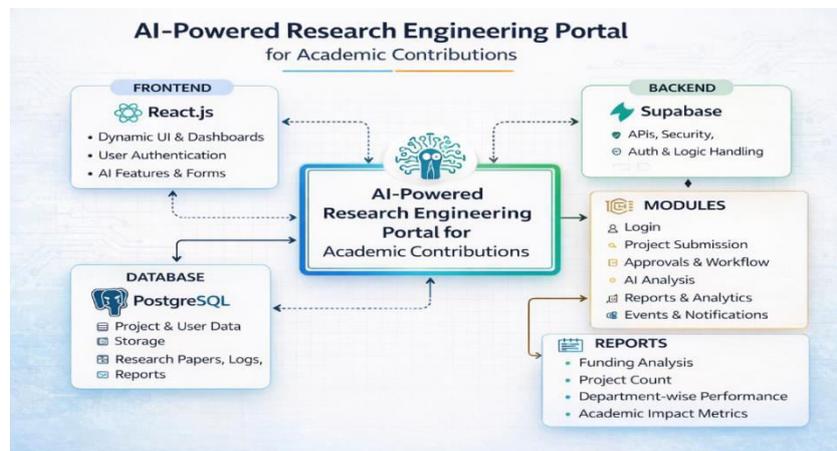
##### 5. Enhanced Security

Secure authentication and encryption ensure that all user data and research records remain protected from unauthorized access or loss.

##### 6. Improved Collaboration

The system promotes transparency and collaboration among departments by providing shared access to approved research data and publications.

#### V. METHODOLOGY



**1. Frontend (User Interface Development):** The system is developed using React to create a responsive, interactive, and user-friendly web interface. The frontend enables students, faculty, HODs, and administrators to log in securely, submit research proposals, upload PDF documents, track approval status, review submissions, and access analytical dashboards. It communicates with backend services through secure APIs to ensure smooth real-time interaction and data updates.

**2. Backend and Authentication (Supabase Services):** The application uses Supabase as the backend platform, which provides authentication, database services, and API management. Supabase handles secure user login using institution-specific credentials, role-based access control, request processing, and secure data communication. It ensures that only authorized users can access specific modules.

**3. Database Management:** The system utilizes Supabase PostgreSQL for structured and reliable data storage. It maintains records of user profiles, research proposals, uploaded documents, approval statuses, feedback comments,

departmental data, and reports. Built-in database policies and SQL queries ensure data integrity, consistency, and secure access control.

**4. Role-Based Module Integration:** The portal consists of integrated modules such as Login & Authentication, Proposal Submission, Review & Approval Workflow, Feedback System, Reports & Analytics, and Administration Panel. Each module functions independently but is connected through Supabase APIs. Role-based access ensures that students submit proposals, faculty review them, HODs monitor progress, and administrators manage the overall system efficiently.

**5. AI Integration and Natural Language Processing (NLP):** Artificial Intelligence APIs are integrated to enhance research evaluation. NLP techniques analyse submitted research abstracts to extract keywords, classify research domains, summarize content, and generate meaningful insights. This AI module assists reviewers in faster and more consistent evaluation while reducing manual effort.

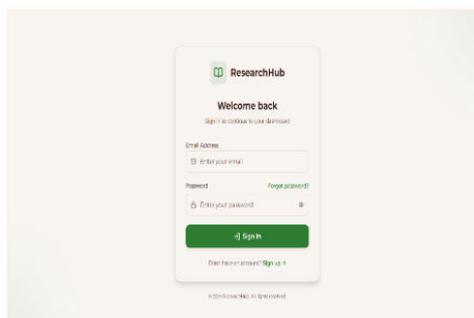
**6. Reports and Analytical Dashboard:** The system generates real-time analytical insights such as department-wise research count, approval rates, domain distribution, and submission trends. Interactive dashboards present visual summaries that help HODs and administrators monitor research progress and make data-driven decisions effectively.

**7. System Security and Data Protection:** The portal ensures secure communication using HTTPS protocols and Supabase authentication tokens. Role-based access control, encrypted credentials, and database security policies prevent unauthorized access. Secure file storage mechanisms are used for managing uploaded PDF documents, ensuring confidentiality and reliability.

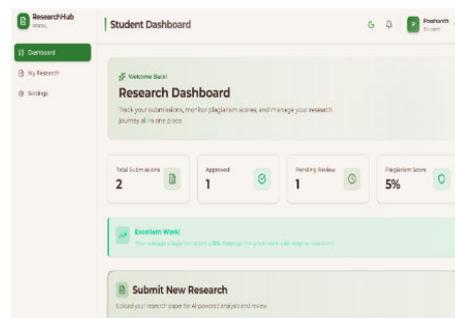
**8. Output and Workflow Transparency:** Final outputs, including proposal status updates, reviewer feedback, AI-generated summaries, and analytical reports, are displayed through structured dashboards. Users can track progress in real time, download reports, and maintain proper documentation. This ensures transparency, efficiency, and streamlined research workflow management.

## VI. EXPERIMENTAL RESULTS

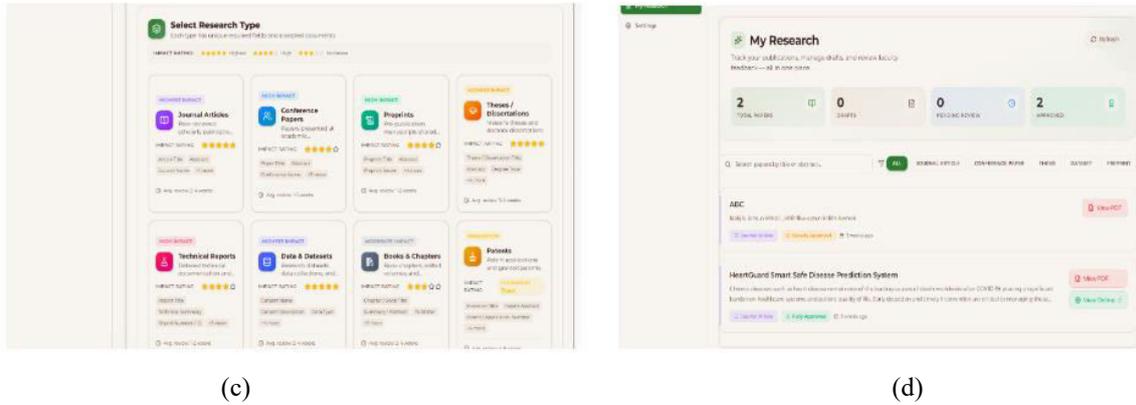
The figures show the outputs of the **AI-Powered Research Management Portal**, illustrating the workflow from research submission to approval. The initial figures display the **student interface**, where users log in, access the dashboard, select the research type, and submit research details. These figures show how students can manage and track their research submissions.



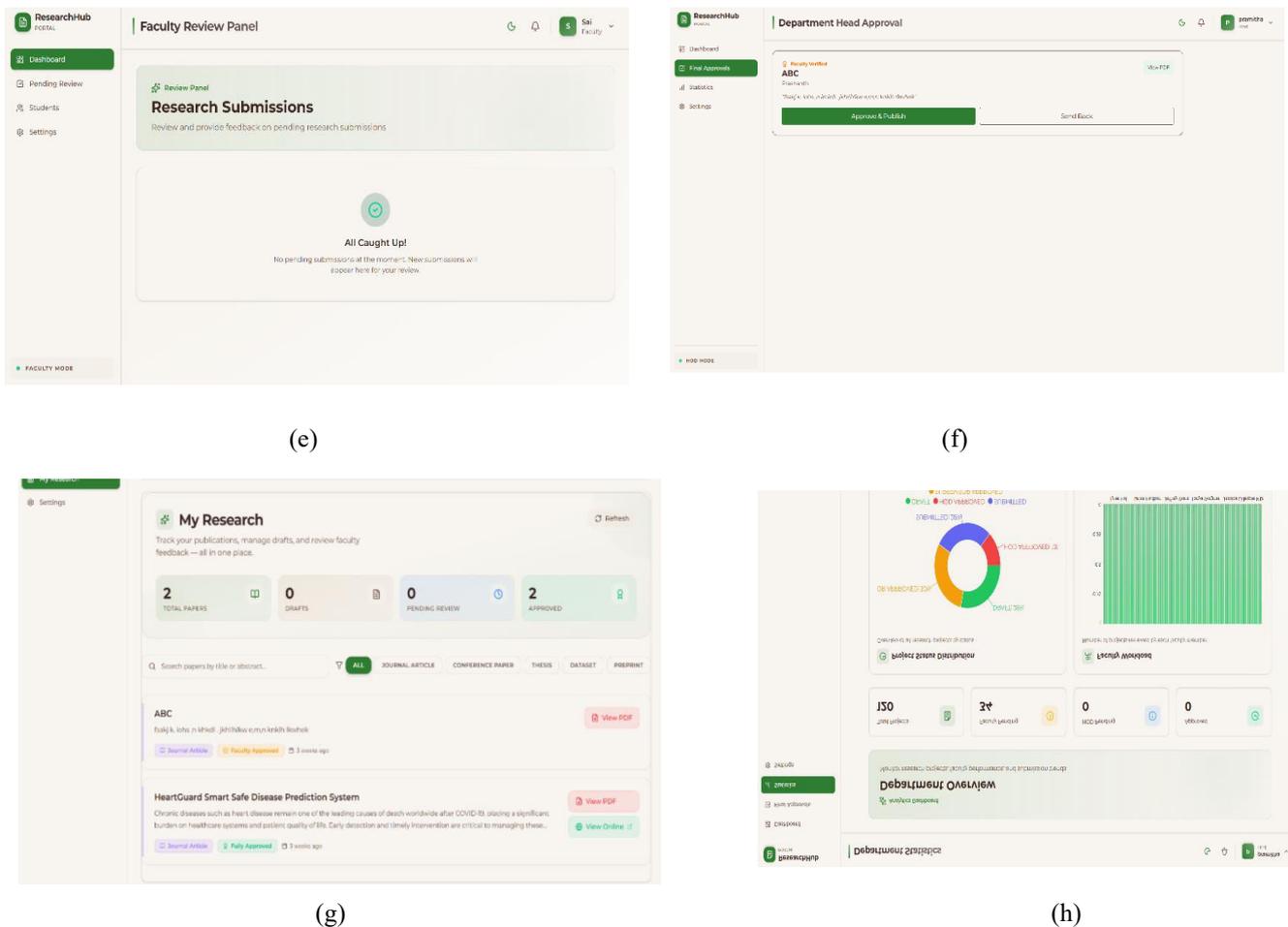
(a)



(b)



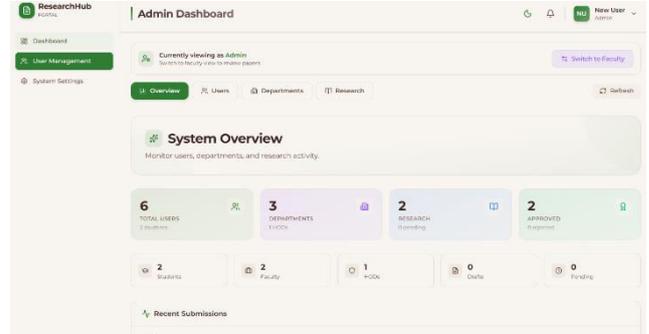
**Fig. 1. AI-Powered Research Management Portal Workflow:** (a) User login page (b) Student dashboard (c) Research submission interface (d) Research review and approval dashboard.



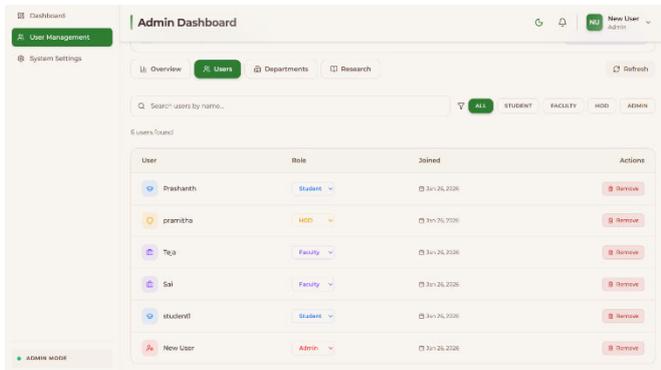
**Fig. 2. AI-Powered Research Management Portal Workflow:** (e) Research status tracking page (f) Department research statistics dashboard (g) Monthly research submission trends (h) Admin dashboard for user and research management.



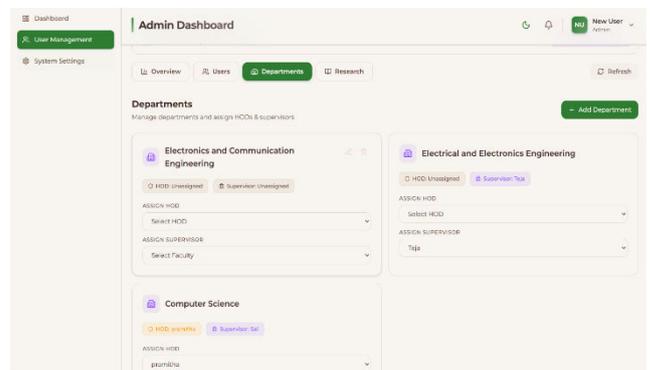
(i)



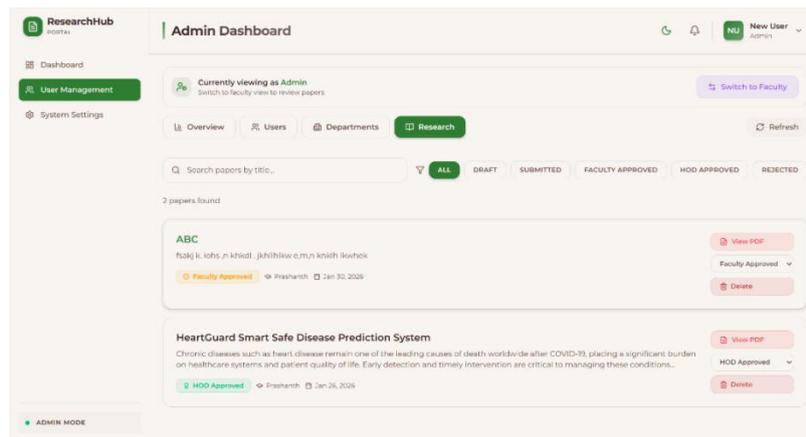
(j)



(k)



(l)



(m)

**Fig. 3. AI-Powered Research Management Portal Workflow: (m) Overall system analytics and research performance overview dashboard.**

## V. CONCLUSION

The **AI-Powered Research Engineering Portal for Academic Contributions** successfully addresses the limitations of the existing manual documentation and approval system used in most academic institutions. By integrating centralized data management, role-based authentication, automated workflows, and AI-assisted support, the portal ensures transparency, accuracy, and efficiency in managing research activities.

The system provides a unified platform where students can easily upload their research work, faculty members can review and approve submissions, and administrators can monitor departmental performance through real-time dashboards. The inclusion of modern technologies such as React.js, Node.js, and PostgreSQL ensures scalability, reliability, and secure data handling. Furthermore, this portal lays the foundation for future expansion into AI-driven functionalities such as automatic categorization of research works, predictive analytics, reviewer recommendations, and intelligent publication suggestions.

Overall, the project contributes to a more organized, data-driven, and technologically advanced academic ecosystem that enhances productivity and promotes research excellence. It also improves communication between students, faculty, and administrators by providing a structured and transparent research workflow. In addition, the portal reduces administrative workload and ensures efficient management and tracking of academic research activities within the institution.

In addition to improving research management, the system also enhances the research culture within educational institutions by encouraging proper documentation and easy accessibility of academic contributions. By maintaining a centralized digital repository of research papers, proposals, and project reports, the platform ensures that valuable research knowledge is preserved and easily accessible for future reference. This helps students and researchers build upon existing work and encourages continuous learning and innovation.

The portal also supports data-driven decision-making by providing administrators with detailed insights into research productivity, faculty contributions, and student participation in research activities. Through analytical dashboards and performance metrics, institutions can evaluate research progress, identify active research areas, and allocate resources more effectively. These insights play a significant role in improving academic planning and promoting research-oriented development within the institution.

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