



IDEA HUB : A Collaborative Platform For College Project Innovation

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Abstract: This Idea Hub is a unified web-based platform designed to simplify academic project management and enhance collaboration among students, mentors, and administrators. Traditional methods such as emails, messaging applications, and manual documentation often lead to inefficiencies, poor organization, and lack of transparency in communication. To overcome these challenges, Idea Hub integrates essential features like idea submission, team formation, mentor supervision, and progress tracking into a single, centralized system. The platform uses role-based access control to ensure structured communication and accountability among all users. It is built on a three-tier architecture, which supports scalability, modularity, and efficient system design. The application is developed using Flask as the backend framework, SQLite for data storage, and HTML, CSS, and JavaScript for a responsive user interface. Overall, Idea Hub provides a secure and organized environment, reduces unstructured communication, and offers flexibility for future enhancements such as real-time communication and analytics.

Keywords: Idea Hub, Academic Collaboration, Project Management System, Web Application, Innovation Platform.

1. Introduction

Academic projects represent a good opportunity for engineering students to put into practice their analytical skills, to learn about new technologies, and to develop teamwork skills. Most of the time, in the academic environment, projects are managed informally, without applying any methodology or using structured management tools. Teachers and students often use simple and unofficial communication tools to track the progress of their projects such as messaging applications and manual notes. As a result, valuable ideas are lost, teachers have to invest a lot of time to follow-up with all students' groups, and a lack of visibility and tracking of the project's progress is noticed. Idea Hub is an online platform for collaborative project management. Through Idea Hub, students can submit ideas, collaborate with their peers on project activities, get their projects peer reviewed and monitored. Similarly, faculty members can monitor the project activities, while administrators can keep a record of all project activities at the institutional level. Core aim with Idea Hub is to create an open and innovative academic environment. Idea Hub shall provide a structured way of working and that all activities are carried out in a secure

environment with access control to all data. Idea Hub shall also contribute to increased accountability and higher documentation standards. Idea Hub has been developed to be prepared for future functions such as the use of AI and cloud-based infrastructure.

2. Literature Survey

A number of studies have assessed the use of online programming platforms, collaborative learning systems, secure web applications, and project management tools for use in academic settings.

Chen et al. performed a study that investigated programming students' acceptance of online judge systems. They analyzed the influences of perceived usefulness, perceived ease of use, and perceived reliability as factors that affect a student's adoption of the online judge system. The authors found that structured automatic feedback, transparent grading systems, and the ability to track performance had a positive impact on both student engagement and learning effectiveness associated



with using the online judge system. They identify the need for digital evaluation systems to have usability and trustworthiness in their implementation.[1]

Paiva et al. proposed an automated assessment system to conduct practical programming exams using an automated assessment system. The proposed system automatically evaluates the correctness of student submitted source code submissions by comparing them against predefined test cases. This process reduces the grading burden on faculty by automating most evaluations of student submissions, ensuring fairness and consistency in grading practices. The authors state that auto- mated assessment systems can provide scalable and efficient methods to evaluate a student population by using automated assessments.[2]

Watanobe et al. described both their online judge systems architecture and operational experiences when using an online judge system. Their description focused on building modularly designed systems that are capable of load balancing across- multiple web servers and efficiently managing the execution of programs submitted to the online judge system. They state that using a layered architecture provides for improved maintainability and reliability of the educational platform.[3] Verma et al., 2023 developed an online coding competition platform that allows students to improve their problem-solving and evaluation of skills through structured problem-solving. This platform contains systems of ranking, automated judging and user performance analytics, which are used to help students practice in a competitive environment [4].

Additionally, Chandru et al., 2023 developed an interactive online coding platform that helps students to develop their programming skills by using real-time evaluation with structured exercises. This study investigated how an interactive environment promotes the engagement of students while providing immediate feedback to students [5]. Lastly, Jaime et al. 2023 studied the development and sharing of lessons learned from blogging as part of collaborative project-based learning environments. The importance of collaborative knowledge sharing, reflective learning and documentation of projects in academic success was at the core of this study [6]. In a collaborative effort, John and Moveh developed and implemented a web-based student project management system for tracking documentation, monitoring of progress, and centralized submission of completion of project activities; therefore, they integrated academic work processes into one platform to create an easier way for academics to complete their projects and reduced administrative burden by providing an all-inclusive project activity tracking system [7].

The authors Nadar et al created a project management system that enables students to structure documentation, monitor milestones and communicate with team members

and instructors. By providing students with a central location where they can keep records of their projects, the system has lessened the communication barriers between team members, instructors and students and enhanced the transparency of supervisors overseeing academic projects [8]. Many studies on the use of online coding platforms, automatic evaluation tools, collaborative learning, secure access control, and cloud-based infrastructure, have not included the complete solutions of submitting project ideas for mentorship, evaluating them in a structured way, tracking collaboration between students and mentors, and managing the institutional aspects of all of these components on one unified platform. Thus, the proposed Idea Hub is intended to provide a single, secure, modular system to support all of these academic project management functions.

3. System Architecture

The proposed Idea Hub platform uses a three-tier, structured architecture for modularity, scalability, and maintainability. The architectural design uses an MVC-inspired architecture that separates the presentation layer, application logic, and data management components of the system. This separation of concerns enhances system organization, reduces dependencies among modules, and simplifies future enhancements.

There are three major layers in the architecture: the View Layer, Controller Layer, and Model Layer. Each layer has a distinct purpose and can communicate with the other layers via established interfaces. This layered architecture ensures that changes to one layer do not directly impact other components; hence improving stability and flexibility of the system.

3.1. View Layer

The View Layer is the User Interface (UI) of the system and allows for user interaction. This layer is built with a combination of technologies such as: HTML, CSS, Bootstrap, and Jinja templating. Role-based dashboards are provided for the different roles in the system (i.e., student, mentor, and administrator) to allow them to submit project proposals, create teams, create events, evaluate submissions, and assess the progress of projects. The use of Jinja templates for dynamically rendering content will enable the display of information from the back end to the UI based upon authenticated user roles. This responsive design of the UI will support multiple devices (e.g. desktops, tablets, and smartphones). By separating the presentational logic from the back-end processing, the View Layer increases ease of use while providing structure at a high level.



3.2. Controller Layer

The system's core processing engine is its Controller Layer, which has been developed using the Flask web framework. It handles routing, request processing, authentication, session management and application logic. As soon as a user takes an action (project idea submission or team creation) the request is processed by the Controller functions. The Controller validates input, implements business rules and interacts with the database through the Model Layer. It returns the appropriate response back to the View Layer. Access Control Based on Roles is enforced during this phase to ensure that only the appropriate users have access to authorized functions. The structured request-response cycle provides for a smooth execution of work and the reliability of the system.

3.3. Model Layer

The data model layer serves to manage how data is stored and interacted with by the database. This project will use SQLite to serve as our relational database management system (RDBMS) for storing structured data such as user credentials, project details, teams, mentor evaluations, and events. The database schema has been designed using the appropriate primary and foreign keys to uphold referential integrity. Normalization techniques have been applied to normalise the logical structure of the database, thereby reducing data redundancy and improving data consistency. The model layer will perform CRUD (create, read, update, and delete) actions when the controller layer makes those requests to it. Separation of data management from the presentation logic and business logic will provide enhanced maintainability of the overall system and improve the security of the data.

3.4. Architectural Workflow

A structure-based request/response system has created the overall flow of the system as follows: Users will place their forwards through the View Layer to request items from the Controller Layer, which will process the user's request, do any data lookups, modify the data if needed, and return the final product back to the View Layer to display to the user. Interacting with different layers through this method will improve scalability due to the ease of integrating advanced modules in the future, such as cloud deployment, analytics dashboards and an AI-based recommendation system. The layered architecture supports expanding the modular system into larger, more advanced systems than what is currently used to the small-scale institutionally level use cases.

3.5. Role-Based Architectural Design

The Idea Hub platform has a unique architecture because Jack Sparrow Publishers © 2026, IJRDES, All Rights Reserved www.jacksparrowpublishers.com

of its organization around user roles. An Administrator manages the complete system; Mentors have access to review proposals and provide assistance; and Students have limited access as they can submit ideas, join or create a team, view prior student projects or participate in educational events. By using different user roles to separate users from one another, the Idea Hub platform can provide additional security, greater accountability, and ensure a more orderly execution of academic activities.

3.6. Data Flow and Interaction Model

The Idea Hub platform is designed with a user role-based architecture, making it unique from most other platforms. The Administrator is responsible for managing the entire system; Mentors can review and offer support for proposals; and Students are limited in that they can only submit proposals, join or create a team, view student-created projects from the past, as well as participate in educational events [Figure. 1]. There are many different types of user roles, separating the users from one another on the Idea Hub platform, that allow for increased security, improved accountability and a more orderly implementation of academic activities.

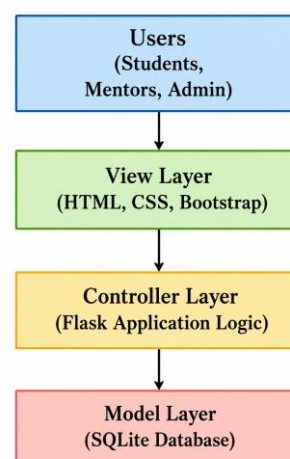


Figure. 1 System Architecture of Idea Hub

4. System Implementation

Idea Hub is a web-based solution that covers all aspects of managing the project life cycle in an orderly manner. The way the application is developed allows each activity undertaken by the user to follow a predetermined order, thereby allowing seamless collaboration among the student, mentor, and administrator.

4.1. Frontend Implementation

User experience and interface will be determined through the front end design process. Upon opening the program, a user will first be directed to either the

login page or the registration page. Once logged into the system using valid credentials, their profile and assigned role are determined, directing them to the correct dashboard. From the student dashboard, a user may submit an idea for a new project, complete with the relevant information, including the title of the project, its description, and required technologies. Students are able to create or join teams, as well as browse old projects and attend events. Mentors use another type of interface from which they can see all the project proposal submissions made. They get to go through the projects, comment on them, and accept or reject them accordingly. The interface shows an updated status of the project on the frontend side for monitoring purposes by the students. The administrator uses his/her own interface from which all the functions of the management of the system are performed. He/she can make changes like adding or deleting users, making arrangements for the events, maintaining project details, and tracking all the activities.

4.2. Backend Implementation

All processing takes place in the backend. When users perform any actions, such as submitting a project or becoming part of a team, their requests are passed through the backend. Firstly, it validates whether the input data is complete and valid. Secondly, it ensures that the user has the authority to execute that request. Only students can make submissions, and only mentors have the authority to approve them. Once the backend validates the request, it accesses the data in the database. When a submission request is executed, the details are stored in the database. When a mentor reviews a submission, it updates the database entries. Furthermore, the backend manages the entire flow of the application process. The process should go according to the sequence, where the students submit their ideas, which are then reviewed and approved by the mentors, and the whole procedure is overseen by the administrators. There is a link between all of these stages, making sure that any changes made by one individual are updated accordingly. Moreover, security will be provided via login authentication and authorization based on user roles, allowing each individual to access specific modules of the software.

4.3. System Workflow

Idea Hub is a structured workflow-based system that includes user interaction elements; back-end processing features; and, data management capabilities combined to achieve one unified experience. Users log in to Idea Hub securely, and then authenticate themselves based on their assigned role (student, mentor or admin). Once this process has been completed, users will be directed to their respective dashboards. Students can submit project idea(s), create teams, and/or participate in academic activities to

enhance their educational experience. When a student submits a project idea(s), the system will validate the data that was entered, and it will automatically insert this data into the database with a pending status until a mentor reviews it.

Mentors will access the submitted project(s) through their dashboard, review how the project(s) are processed within the system, and then provide either approval or feedback regarding the submitted projects. In both cases the project's status will be updated dynamically based on the mentor's actions. Administrators manage all administrative portions of the system. Admins manage users and events and monitor the activity of projects throughout the system. All user actions are processed by the backend, validated against role-based access control, and stored in the database. Newly updated information is then displayed in real-time on the user interface so that users have a continuous and orderly workflow through the application.

5. Testing and Evolution

Evaluation was carried out for the Idea Hub system to ensure its effectiveness, reliability, and efficient operation during the management of academic projects. The main criteria for evaluation included confirmation of functionality, usability, and system stability.

Algorithm 1 Idea Hub System Workflow

1. Start
2. User accesses the system
3. Display login page
4. User enters credentials
5. if credentials are invalid then
6. Display error message
7. else
8. Identify user role (Student / Mentor / Admin)
9. end if
10. if role = Student then
11. Submit project idea
12. Validate input data
13. Store data in database with status = Pending
14. Create or join team
15. end if
16. if role = Mentor then
17. View submitted projects
18. Review and provide feedback
19. Update project status (Approved / Rejected)
20. end if
21. if role = Admin then
22. Manage users and events



23. Monitor project activities
24. end if
25. Process request through backend
26. Perform database operations (Insert / Update / Retrieve)
27. Display updated results on dashboard
28. End

5.1. Functional Testing

Testing was done to confirm the functioning of all significant modules of the system. These include login, uploading projects, creating teams, reviewing by mentors, and managing events. Testing was done using varied inputs, and this confirmed that all functions work as intended, with correct data processing and workflow operations.

5.2. Usability Testing

The usability test was done in order to check how easy it is to use and comprehend the design by users in different positions. The students, mentors, and administrators used the system to accomplish their duties. Results obtained showed that the system is very easy to use since it is not complicated despite the roles assigned to the user.

5.3. Performance Evaluation

The performance of the system was evaluated by running different user actions including login, submitting projects, and accessing data. The system performed well with fast response times, showing that it can handle common university loads efficiently.

5.4. Security Testing

Simple security controls were considered, such as authentication, session management, and role-based access control. The application managed to deny access to any unauthorized personnel and allowed operations only within the limits of the role assigned to the user. Input validation played an important role in blocking erroneous input.

5.5. Result Analysis

The general assessment suggests that there is an improvement on the part of Idea Hub concerning the organization and management of academic projects relative to the conventional approach. There is less unorganized interaction, improved transparency between students and tutors, and centralized availability of information about the projects being done.

5.6. Results and Discussion

Implementing the Idea Hub Platform has produced a marked improvement in managing and collaborating on Academic Projects. The Idea Hub platform has created a centralized environment in which students, mentors, and administrators can easily communicate with one another. Each developed module (User Authentication, Submit Project, Form Teams, Manage Events, Interaction with Faculty) operates as designed and facilitates a structured workflow. By integrating all activities into one interface, the Idea Hub Platform decreases the reliance on disparate means of communication (i.e., multiple emails).

The performance metrics show that the transparency of the system has increased, offering real-time visibility into the progress of projects for both mentor organizations and the administration [Figure.2]. The organization of the repository has improved through the establishment of a well-defined structure for the projects, people, and academic events. Additionally, the role-based access control functionality (RBAC) provides secure and controlled ways in which to interact with colleagues (i.e., mentor vs. administrator).

Figure. 2 User Registration and Login Module of Idea Hub.

The picture above displays the User Registration screen for the Idea Hub Site. It is intended to provide a secure way for new users to register on the platform [Figure. 3]. This information can include (but is not limited to) Name, Email, Password, Role (Student/Mentor) and Department. The role the user has selected will determine which features they have access to on the platform.

Previous Year Projects						
Admin-created academic project archive for reference						
SL	PROJECT TITLE	ACADEMIC YEAR	TYPE	TECH STACK	UPLOADED BY	DATE
1	AI-Based Intrusion Detection		idea	Machine Learning (Random Forest / SVM), Python, TensorFlow (Deep Learning Framework)	System Admin	2025-02-11 17:30:46.830224
2	AI Magic for Memes	2024-25	major	Python, TensorFlow, OpenCV, Flask	System Admin	2025-01-01 00:00:00
3	Smart Finance Manager	2024-25	major	React, Node.js, Python, MongoDB, Machine Learning	System Admin	2025-01-01 00:00:00
4	SkinCare Ingredients Analyzer and Recommendation System	2024-25	major	Python, Flask, scikit-learn, NLP	System Admin	2025-01-01 00:00:00
5	Content Grabber: AI-Powered File Extraction and Organisation	2024-25	major	Python, AWS, OCR, Automation	System Admin	2025-01-01 00:00:00

Figure. 3 Previous Year Projects Archive Module.

This interface will provide an easy and intuitive way to allow users to register within the system [Figure. 4]. The image shows an academic project repository within the Idea Hub platform as the "Previous Year Projects" module, controlled by the administrator. The module displays and stores information about each project (e.g., title, academic year, type, tech stack used, and overall upload).

Users can utilize the Previous Year Projects module to look back at previously submitted projects, prevent duplicating projects they are working on, and gain inspiration when creating new projects.

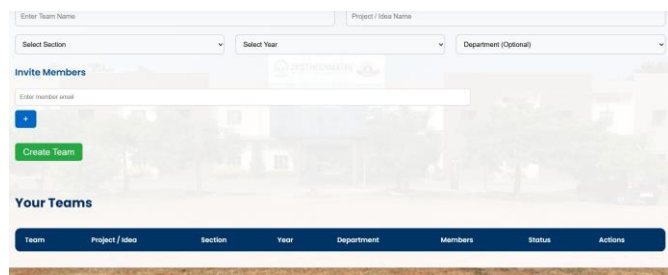


Figure. 4 Team Creation Module allowing project collaboration.

This illustration represents a mechanism called "Create New Team" within the Idea Hub platform that allows users to create a group to help them develop their project. In addition to identifying the project's, team's and member's particulars, the user can invite other members to join the team by sending them an invitation via email, thereby helping them work together cooperatively and effectively as a team.



Figure. 5 Campus Events and Spotlights Module.

This model visualizes the Capacity for the Events area of the Idea Hub. The figure shows upcoming and current institutional events [Figure. 5]. Each card associated with an event contains details such as an Event's Title, Type, Date, etc. Additionally, users can filter the list of all events by category (Technical, Cultural, Sports) when looking to browse and/or participate in those events.

The JITS platform, called Idea Hub, is a digital platform for innovation and collaboration located at Jyothishmathi Institute of Technology and Science. Students and faculty may present their ideas to the JITS community, participate in hackathons, work on collaborative projects with fellow

students and faculty members, and track their activity using an interactive dashboard.

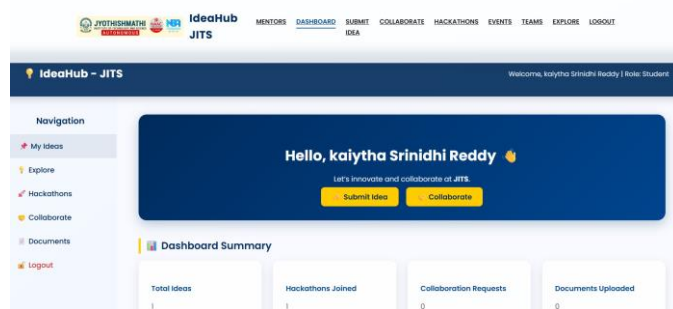


Figure. 6 Dashboard of Idea Hub

The JITS platform integrates different forms of idea management [Figure. 7] and collaboration to encourage creativity, teamwork, and applied learning within the institution.

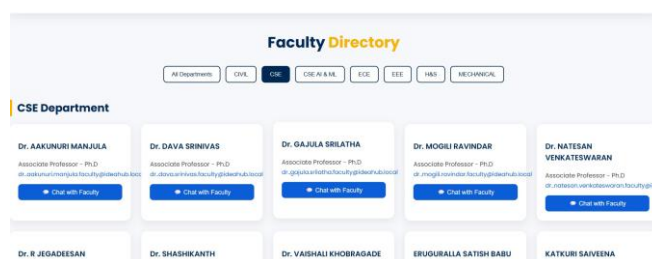


Figure. 7 Faculty Directory with Department-wise Filtering and Chat Option.

JITS Faculty Directory: The JITS faculty directory is an electronics listing of faculty members arranged by their respective departments containing their name, title, credentials and contact information. This listing has filtering capabilities to make it easier for the users to navigate through the list, and also has an interactive feature called "Chat With Faculty," which helps to increase both the accessibility and academic engagement of faculty members with users.

5.7. Limitations

- The system currently uses SQLite, which is suitable for small to medium-scale deployment but may not support large-scale users efficiently.
- Real-time communication features such as instant messaging and live notifications are not implemented.
- The platform relies on manual evaluation and feedback from mentors, which may cause delays in approval processes.
- Performance testing has been conducted only in a controlled environment and not under high user load conditions.



- The system does not yet include advanced features such as AI-based recommendations or automated project evaluation.

6. Conclusion and Future Scope

This paper presents Idea Hub, a centralized web-based platform designed to improve academic project management and collaboration within institutional environments. The system integrates essential functionalities such as project submission, team formation, mentor supervision, and event management into a unified framework, thereby reducing dependency on fragmented communication methods. The implementation demonstrates that the proposed system enhances transparency, improves coordination among stakeholders, and ensures structured workflow management through role-based access control. By providing a centralized repository and real-time monitoring capabilities, Idea Hub significantly reduces manual effort and improves accessibility to project-related information.

The modular architecture of the system ensures flexibility and supports future scalability. Although the current implementation is suitable for small to medium-scale deployment, it establishes a strong foundation for further enhancements such as real-time communication, cloud integration, and intelligent recommendation systems. Overall, the proposed system contributes to the development of a more efficient, transparent, and innovation-driven academic ecosystem, making it a practical solution for modern educational institutions.

Future Scope

While IdeaHub does currently fulfil its goal of creating a unified space for academic cooperation on projects between students & faculty, considerable opportunity exists for both enhancements as well as making it easier for others to use. Future possibilities could include migrating from SQLite to a more robust DBMS solution such as MySQL or PostgreSQL which would allow the application to support a greater number of concurrent users as well as serve their data in a timely manner. An additional important improvement would be incorporating real-time instant messaging capabilities between students & faculty through technologies such as Web Sockets or AJAX so there is no need for either group to continually refresh the page while communicating with each other during busy hours. This would allow for quick responses between all parties involved in the project and thus lead to more productive projects overall and better relationships/collaboration with each other because of less frustration due to waiting for replies when needed badly. Another useful feature would be to implement some type

of notification system that would provide information related to pending approvals from mentors, feedback from mentors after reviews have been completed, due dates, as well as reminders for scheduled events related to their projects. One potential way to enhance the platform would be to deploy it to a cloud server.

This would allow improved availability, reliability, and scalability of the platform. In addition to deploying to the cloud, adding analytics dashboards for mentors and administrators would aid in improving the efficiency of tracking student progress, project statuses, and overall performance. Furthermore, including basic AI-based capabilities, such as project recommendation systems or duplicate idea detection, could help students select more innovative topics and eliminate duplicate topic submissions. Additional enhancements in the future would further improve the robustness, scalability, and suitability of IdeaHub for use in large academic settings.

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