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# Web Application for Managing and Preserving R&D Records

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## Abstract

The majority of academic institutions struggle with record management of journals, conferences, projects, patents, etc., that the faculty publish in engineering colleges, and they still depend on paperwork and manual procedures to track the information of interest. A web-based research and development (R&D) records management system will reduce the manual work by deploying centralized software incorporated with various loosely coupled services which interact with each other. The requirement of maintaining records on a calendar year, and academic year as well as generating the summary sheets whenever it is required. Manually, it takes a lot of time for research and development criteria faculties. This project aims to create an application that will automatically generate and save reports. This allows any faculty member to upload their research articles, projects, and patents, along with any supporting documentation and summary sheets, for access by the principal and other higher authorities. With this, the entire process of research, development, and maintenance will be made simpler.

## Keywords

Centralized software, Loosely coupled, Summary sheets

## Introduction

Creating a web application for maintaining R&D records using nanotechnology involves integrating data management capabilities with nanotechnology-specific features. Nanoscale components contribute to increased processing power within the web application. This allows for quicker analysis and retrieval of critical R&D data, facilitating faster decision-making processes. As the field of nanotechnology advances, the application could be updated to incorporate new features and capabilities.

The system was created and put into operation to serve institutes and colleges. The system will replace the current paper records by offering a thorough faculty information system and user interface. Through a safe web interface provided by the admin, the college staff uploads books, journals, papers, patents, and college alerts. How the college manages a faculty's records is described in the faculty management module. Every course that the college offers will have its subjects assigned by the courses and subject management module. The college administration has access to and can keep track of the faculty's information. Additionally, this will secure each faculty's data so that their transactions can be tracked. The system was created with the intention of serving colleges and universities. The system will offer a comprehensive faculty information system, and its user interface will take the place of the current paper records. College staff uses android devices to upload papers, journals, patents, books, etc., and college notifications through a secure web interface. Before any actual record alterations take place, all data will be recorded and verified on the college server. The system

has a faculty user interface that will let pupils access advice from their seniors.

On SQL servers overseen by the college administrator, all data is safely saved. The amount of paperwork and time required will be reduced by this system. to look up student records. Prior to this project, the college mainly relied on paper records, which had its own drawbacks. For the upkeep of faculty data, this system provides a simple user interface. It can be used by universities or other educational institutions to manage faculty records with ease. It is difficult to achieve this goal using a manual method because the data is scattered, and frequently redundant, and acquiring relevant information might take a long time. Our suggested system makes it a point to avoid these limitations. For colleges and institutions, software was developed. It makes it simpler to find out details about a given professor teaching a particular class. Another element is the feedback that the professors can provide. The employees, instructors, and principals benefit from handling all information on academically relevant reports, colleges, courses, batches, and other related information. This technology is intuitive and easy to use. It prevents any calculating errors because the database contains all the relevant data. It does away with the laborious procedure of keeping out-of-date, traditional files (paperwork), and even offers data updating capabilities. This makes it simple to get student information. The main use of this online portal is the ability to centrally store faculty data.

Arif et al. has proposed an 'Attendance Management System for Educational Sector: Critical Review'. The educational institution uses a manual or paper-based procedure to maintain publication records. Time and natural resources are wasted with this strategy. There is a need to switch outdated research paper tracking techniques to more effective ones. As a result, design an automated report system for analysis and development together a web application to manage research records. Technology research and significant revelations from the body of prior publications were the focus of our critical review [1].

Sharma et al. has proposed 'A growing College Automation System' to manage all aspects of college management on a single platform. This system is similar to our concept; however, it lacks email management and a framework for managing reports. A college needs a website to keep its publications as technology develops. To that goal, we created a web application that automatically sends email notifications and also stores publications [2].

Landage et al. has proposed a 'Student Management System' which presents the creation of a website that compiles all student data in one place. Information on students can be updated, deleted, and added as needed by administrators and faculty members. However, for our project, we created a website to manage faculty papers. Since our website doesn't yet have a summary report system, we are working to develop one. Information in the research records can only be added, removed, or edited by the principal and administrator. The requirement for manual operations where employee data is recorded in excel sheets would decrease as a result of this [3].

Bhor et al. has proposed a 'College Management System'. It oversees the management of the college's information, including student, placement, and event management. Here, we solely keep track of staff publications for our own institution. To do this, we gather organization IDs from various sources and categorize them based on the publications they have made, such as patents, journals, conferences, and books [4].

Dalke et al. developed 'Web Based Staff Management System'. A computer-based system employing JSP, and a MySQL-designed database has been developed. With this system in place, a trustworthy report on employee profiles will be available to support management, planning, and decision-making. Similar circumstances are present in our project, however, we are developing a computer-based email notification and maintaining a report in a graphical format so that college management can quickly see the data broken down by years. They can also effectively advance a college rank [5].

Muhardi et al. proposed 'Design of Web-Based Learning Management System'. Since there is a shortage of time, space, and opportunities for teacher-student interaction, there are many issues that go unresolved. The learning management system seems to be the answer. In order to address issues that frequently crop up throughout the learning process, learning management systems as tools in the process provides a number of benefits. Using the Waterfall Model Method and the PHP programming language, a web application management system was created based on the constrained meeting frequency and duration. The end result has been the creation of a web management system for SMAN 1 Kampar Kiri Hilir with features for subject matter distribution, assignment distribution, and student discussion forums [6].

Al-Fedaghi proposed a system for 'Developing Web Applications'. Converting high-level business models into a composition language that uses web services to implement business operations is the process for developing web applications that are service-oriented. The software development process frequently makes use of object-oriented analysis and design as well as UML-based diagrams. In this study, they suggested that the knowledge of web service activities be underpinned by the fundamental idea of flow. Through the introduction of a conceptual model as a framework for design, we explore the development of business processes. In this article, we examine the modeling currently being utilized in transformation approaches before introducing a flow-based conceptualization of services through case studies and high-level business descriptions [7].

Jayastri and Ambikapathy developed 'Automation Management System', a straightforward user interface for maintaining student information is offered in the model. It is used by educational institutions or colleges to keep records of students. This system deals with all types of student data, academic reports, college, and its course details, curriculum, batch information, placement information, and other resource-related information as well. Additionally, it includes a database about the faculty, students, and higher authorities and frequent updates in the academic announcements made by the administration to the personnel and students [8].

Tambaoan et al. proposed 'Student Academic Record

Management System Framework Using Oracle Apex'. In all academic institutions, but particularly in technical and higher education, the student academic record system is a crucial component. Making a variety of academic decisions with regard to academic reports presents very significant difficulties for the administrator and management. In several instances, the system was unable to adequately address a number of issues, including incorrect course registration, the monitoring of advised courses, and inaccurate mark calculation owing to human entry. The approach presented in this research offers an alternative [9].

Selfa et al. developed 'A Database and Web Application Based on MVC Architecture'. The limits, time commitment, and a number of unanticipated problems associated with utilizing traditional approaches to design a web application are significant. As a result, several businesses have developed new technology to address these problems, such as MVC pattern frameworks. In this study, author demonstrated the design and implementation of a web-based application that allows other parties to purchase goods from online stores and e-commerce sites. To do so, author employed the Laravel framework. According to the findings of this study, the development was standardized, non-business logic linkages were automatically processed, and there were a lot of scalabilities, and this gave us more efficiency in terms of implementations [10].

# Methodology

## Languages

### Hypertext markup language (HTML)

HTML is used as a mechanism for structuring content that has been downloaded from the internet. Each retrieval unit is known as a webpage. A webpage's structure is described in HTML. A text file marked as HTML should be read as such by a computer and a web server because it follows specific syntax, file, and naming conventions. Both Cascading Style Sheets (CSS) and JavaScript (JS) can be externally linked to the HTML page using hyperlinks. Additionally, JS enabled website designers to incorporate more dynamic features like pop-up windows and image sliders. Tags known as class attributes are used to tone with HTML elements to their corresponding CSS and JS.

### CSS

CSS is used as a style sheet language. When used in other media, such as speech or paper, CSS specifies how elements should be presented. Page layouts, colors, and fonts are all presented with CSS syntax, which helps in styling web pages. While HTML is used to structure a web document. The '.html' file will then be connected to your style sheet, where all of the CSS rules will then be applied to the linked '.html' pages. Internal style sheets are CSS rules that are immediately included in a given '.html' page's header.

### JS

The original purpose of JS was to "bring online pages alive". It is a lightweight, interpreted compiled programming language. The dynamic features of JS include the creation of runtime objects, variable parameter lists, function variables, dynamic script creation (through eval), object introspection (through for...in and object utilities), and source-code recovery (JS functions store their source text and can be retrieved through function to String()).

The environment that JS operates in has a significant impact on its capabilities. In-browser JS can handle anything related to webpage alteration, user interaction, and web server interaction. At least three notable features of JS include: (i) complete HTML/CSS integration, (ii) Simple tasks are carried out simply, and (iii) supported and turned on by default in all popular browsers. The only browser technology that combines all three features is JS.

### Bootstrap

For quicker and simpler web creation, Bootstrap is used, and it is a free front-end framework. In addition to optional JS plugins, Bootstrap comes with HTML and CSS design templates for forms, buttons, tables, navigation, modals, picture carousels, and many other things. Bootstrap also enables you to quickly construct responsive designs. Additionally, a number of JS elements that are part of Bootstrap can be utilized independently of other frameworks like jQuery. Additionally, they provide dialogue boxes, tooltips, progress bars, dropdown menus, and carousels.

### Hypertext pre-processor (PHP)

PHP is an open-source language, PHP files are saved by ".php". PHP is an object-oriented language that works on the server side. It is used to develop web applications and dynamic pages are available on windows, Linux, and Unix operating systems. It can be embedded within HTML, and script tags.

### MySQL

Before studying MySQL, it is crucial to comprehend the database. An application that keeps the categorized collection of records is known as a database. The user may quickly access and manage it. In order to locate the necessary data fast, it enables us to organize data into tables, rows, columns, and indexes. For conducting database tasks including generating, managing, accessing, and finding the data it keeps, each database has a unique API. There are numerous databases accessible nowadays, including MySQL, Sybase, Oracle, MongoDB, PostgreSQL, SQL Server, etc. MySQL operates in accordance with a client-server architecture.

This paradigm is made to allow end users, referred to as clients, to use network services to obtain resources from a single machine known as a server. In this case, the server will produce the desired output as soon as the clients' requests are matched. This is done through a graphical user interface. The client-server model process is the same in a MySQL context.

### Xampp

Xampp's full form is cross-platforms: Apache, MySQL, PHP, and Perl. Xampp acts as a server to connect our web application to the database. In Xampp, by switching between MySQL and Apache we can get database access. Xampp is useful for the working model of the web, with the help of the

Xampp we can record the values. Xampp is an open-source package. Figure 1 describes the outline of Xampp connectivity with local host and database.

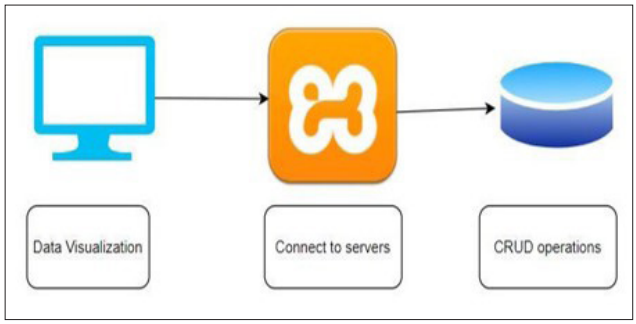



**Figure 1:** Xampp connectivity.

## Working of web application

A web application on a computer system is a client-side and server-side software program that the client requests or executes in a web browser. The website is used to progress a particular business, boosting output and efficiency while cutting down on waiting times and making online applications simple to use and understand. The three main roles in the project are the heads of departments, faculty, and an administrator. The application performs a number of functions in accordance with the role involved. The administrator is in charge of adding, removing and keeping track of the research and development records that are placed into the database, and they have the authority to manage the profiles used in the web application and can generate the summary of necessary records. He manages all needs and is the cornerstone of the web application's operation. Login security is improved by the fact that each member has a unique id that is encrypted and kept in the database. The faculty's primary responsibility is to upload their own research studies to the website, which are then processed and kept in a database for later retrieval and visibility.

Published materials like documents are gathered, which stand as their work proof. All formats are accepted when requesting and uploading documents using the web application. The document's size is restricted to prevent crashes and uploaded files are checked using the extension and PHP to make sure they don't contain viruses or compromise sensitive data. When other users submit a request, the data is saved in the tables with a unique id and then delivered to them by being fetched from the database. When visiting the hod's page, each hod has the ability to create the overall general report as well as access the publications of their own department. They can also check the bios of every faculty member in their department. They get exclusive access to the department summary as well. This is the overall implementation and working of the project.

## Architectural diagram

As shown in the architectural diagram in figure 2, two-way communication is established between web browsers and users (Head of the Department, Faculty, and Admin). Whereas a web browser interacts with the database in the form of queries by generating requests and receiving responses. With-

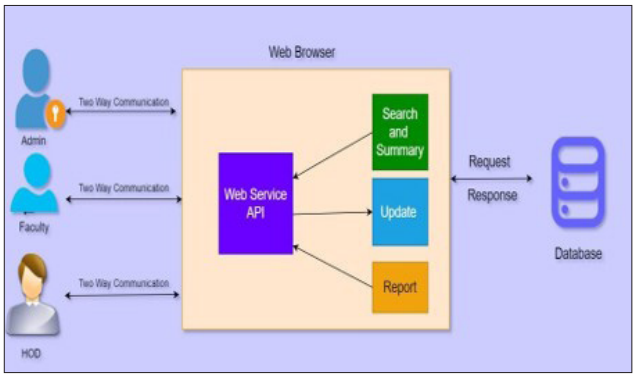



**Figure 2:** Architecture diagram.

in the web browser, a web service API is present which handles all the browser data and interface.

## Use case diagram

As shown in figure 3, the use case diagram summarizes the user's (Head of the Department, Faculty) major interactions with the system. The same goes with admin along with database access.

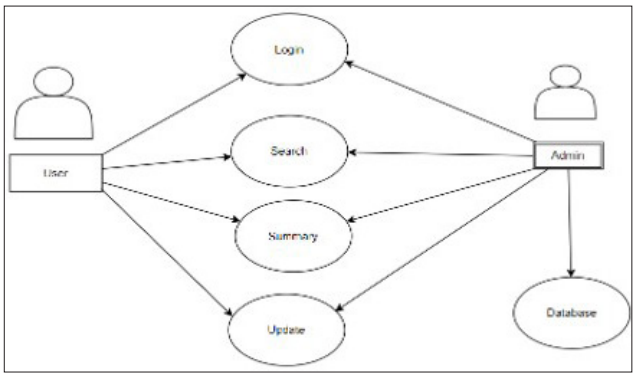



**Figure 3:** Use case diagram.

# Results and Discussion

The primary goal of this project is to create a tool for managing a publication's research and development records. With this web application, managing research and development records is handled less manually, which minimizes paperwork and boosts efficiency and retrieval accuracy. Additionally, it gives the submitted documents the very minimum security and protects the confidentiality of their credentials. Faculty, administrators, and hod's can generate generic reporting track data with the use of this web application.

When faculty members are logged into their personal pages, they can check their uploads and have the option to add new documents. Head of the Departments have access to examine their own department uploads and keep meticulous records of each one. Here, an admin is responsible for managing all the webpages and has the right to delete the records and can generate summary sheets. He can view all the records and can categorize them separately department-wise. These are the responsibilities of an administrator. Snapshots of the web browser are provided in figure 4 to figure 8.

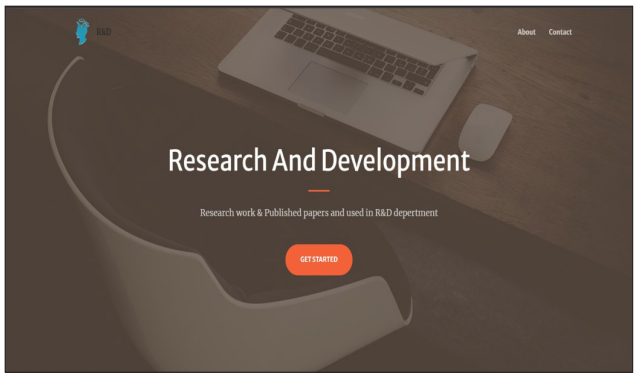



**Figure 4:** Landing page.

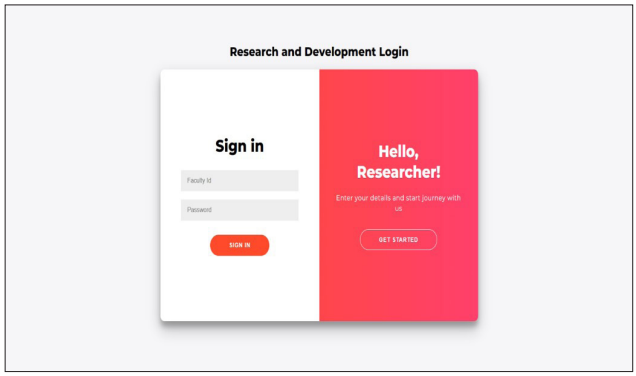



**Figure 5:** Login page.

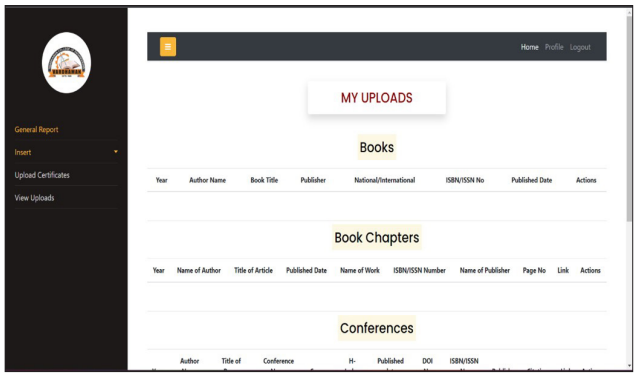



**Figure 6:** Faculty's own uploads.

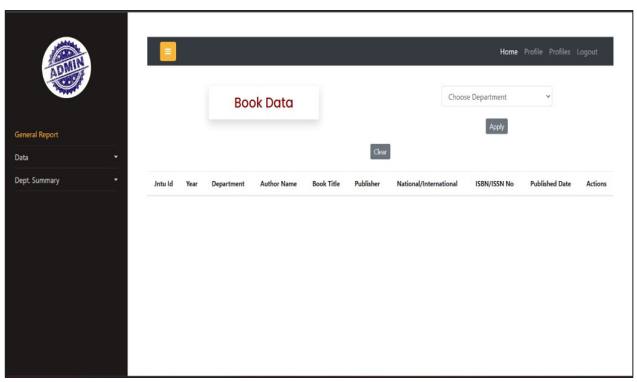



**Figure 7:** Admin's view of book data.

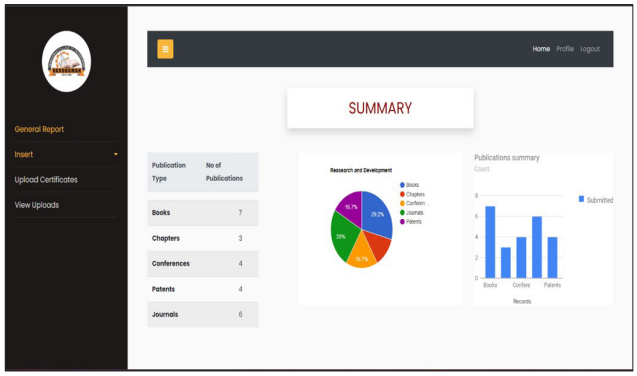



**Figure 8:** Statistics of uploaded records.

## Conclusion

Our website is designed to decrease paperwork and boost automation system processes. This is helpful for enhancing security and also gives teachers a reminder to submit their data, such as patents, journals, books, and publications. Low information recall, poor information precision, and lengthy query times are issues with the conventional college education and faculty management information system. As a result, this study developed a web-based information system for managing faculty and college instruction. The design concept of the system and the structure design of the faculty management information system are realized through the analysis of the needs of the faculty management information system, and the management process for the faculty management information system is developed. In order to significantly enhance the system's processing efficiency, the complexity of faculty management information is calculated and used to decide the priority of query information. Last but not least, the relational database model is created to fulfill the idea of a faculty management information system.

## Acknowledgements

None.

## Conflict of Interest

None.

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