PUSL3190 Computing Individual Project

Final Report

Web-Base
HR Management System
for University Staff

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Introduction

Overview of the project

The HR Management System is a revolutionary program that aims to alter administrative and human resource activities in universities. It intends to overcome the limits of the current mobile-based system by incorporating cutting-edge web-based technology, significantly changing how university staff interact with HR operations.

At its core, this project represents a dedication to improving operational efficiency, encouraging collaboration, and maintaining regulatory compliance. The system will improve administrative operations, strengthen communication channels, and provide workers with self-service capabilities by utilizing intuitive interfaces, seamless integration, and rigorous security measures.

Driven by a vision of organizational modernization, the HR Management System is a significant step forward in educational institutions' digital transformation. Its comprehensive and user-friendly platform aims to foster a culture of efficiency, transparency, and empowerment among staff members. The system's goal is to increase productivity, support informed decision-making, and foster a sense of ownership and accountability by making tools and resources more available.

As the project continues, its impact will go beyond a simple technology improvement to reshape the entire fabric of HR administration in the university setting. With staff members given the tools they need to thrive and administrators empowered to lead effectively, the institution as a whole stands to profit from increased efficiency, collaboration, and long-term growth.

Motivation behind the project

The inspiration for the HR Management System project originates from an awareness of the inherent inefficiencies and limits of the current mobile-based system used by university employees. Despite its initial goal to improve HR processes, the current system falls short of fulfilling the changing demands and expectations of employees and administrators.

One of the main motivations is to improve operational efficiency in educational institutions. The current system's complexity and lack of integration make administrative duties time-consuming and wasteful. The project's goal is to centralise and automate numerous HR processes by offering a comprehensive web-based platform, thereby decreasing human labour and increasing workflow efficiency.

Another motivating factor for the initiative is the need to promote collaboration and connectedness among university staff. The existing system's restricted communication channels and self-service features create silos that impede effective collaboration between staff members and human resources departments. The HR Management System aims to break down these barriers by implementing easy interfaces and real-time collaboration capabilities that create a more connected and engaged staff.

Furthermore, maintaining compliance with rules and protecting sensitive employee information are top priorities for the project. The current system's absence of strong security protections and data protection policies poses considerable dangers to confidentiality and integrity. The HR Management System seeks to create trust in employees about the protection and privacy of their personal data by prioritizing strict security measures and adherence to industry best practices.

Objectives of the project

The HR Management System project's aims are guided by an overall approach aimed at tackling the various issues that university staff members and administrators face. At the forefront of these aims is the overarching goal of increasing operational efficiency in educational institutions. By centralizing and automating different HR activities such as leave management, document processing, and attendance monitoring, the system aims to expedite workflows and decrease administrative responsibilities. This goal is consistent with the requirement to maximize staff time and resources, allowing them to focus more on their main academic responsibilities while reducing the manual effort associated with regular HR chores.

In addition to enhancing operational efficiency, the project needs to promote collaboration and connectivity among university staff. The existing mobile-based approach frequently produces silos and communication hurdles, which impede efficient collaboration between employees and HR specialists. The HR Management System aims to break down these barriers by implementing intuitive interfaces, powerful communication channels, and real-time collaboration capabilities that create a more connected and engaged staff. This goal emphasizes the necessity of encouraging teamwork and knowledge exchange inside educational institutions, which will lead to a more unified and productive work environment.

Another essential project objective is to ensure compliance with regulatory standards and data protection regulations. With a greater focus on data privacy and security, universities must prioritize the protection of sensitive employee information. The HR Management System seeks to reduce risks and safeguard the confidentiality and integrity of employee data by implementing strict security measures and following industry best practices. This objective indicates the project's commitment to retaining employee trust and confidence in the security and privacy of their personal information.

Furthermore, the project aims to enhance the overall user experience for university workers by incorporating intuitive interfaces and user-friendly features. By emphasizing usability and accessibility, the system intends to provide employees with self-service capabilities and expedite their interactions with HR operations. This goal emphasizes the necessity of providing a seamless and efficient user experience that increases employee happiness and productivity. Furthermore, the project seeks to offer scalability and flexibility to support future expansion and changing needs inside educational institutions. The project ensures long-term viability and effectiveness by creating a system that can adapt to changing requirements and support a rising user base.

Summary of what to expect in the report

In the forthcoming report, readers can anticipate a comprehensive exploration of the HR Management System project, covering its inception, development, motivations, objectives, and expected outcomes. The report will delve into the current challenges faced by university staff and administrators, highlighting the inefficiencies of the existing mobile-based system and the pressing need for a more efficient and user-friendly solution.

The report will provide an in-depth overview of the project's objectives, which include enhancing operational efficiency, fostering collaboration, ensuring regulatory compliance, and improving the overall user experience. Each objective will be examined in detail, with insights into the rationale behind them and their significance in addressing the identified challenges.

Furthermore, readers can expect a detailed analysis of the project's development process, including the technologies used, the methodologies employed, and the key milestones achieved. The report will also discuss the anticipated impact of the HR Management System on university operations, emphasizing the potential benefits in terms of increased efficiency, enhanced communication, and long-term growth.

Overall, the report aims to provide a comprehensive understanding of the HR Management System project, its objectives, and its expected outcomes, offering valuable insights for stakeholders involved in HR management and organizational modernization within educational institutions.

Literature Review

Introduction:

The landscape of Human Resource Management (HRM) has witnessed a significant evolution, with technology playing a pivotal role in shaping how organizations manage their workforce. This literature review explores the transition from a web-based HR Management System to a mobile-based system, drawing insights from relevant research.

Web-Based Management Information System for HR in Universities (Vaman Haji):

Vaman Haji's research on a web-based management information system for HR in universities, particularly in Duhok Province, sheds light on the advantages of web-based solutions. The study highlights the centralization of HR functions, improved accessibility, and the integration of various HR modules. These findings underscore the importance of web-based systems in fostering efficiency and collaboration within academic institutions

HR Case Management System with Workflow Automation (B.R. Kumar):

B.R. Kumar's research on an HR Case Management System with Workflow Automation and Knowledge Management emphasizes the significance of streamlining HR processes through systematic case management. The study underscores the role of automation in enhancing HR efficiency, reducing manual interventions, and ensuring a structured workflow. These insights provide valuable considerations for the evolution of HR systems.

Benefits of Web-Base HR Management System (Dhule, 2017):

Research consistently demonstrates the benefits of web-based HR systems, such as improved data accuracy, streamlined communication, enhanced employee satisfaction, and increased administrative efficiency. These systems empower staff by providing user-friendly interfaces and self-service capabilities. (Dhule, 2017)

Integration of Mobile Technology in HR Management:

As organizations strive for increased flexibility and accessibility, the integration of mobile technology into HR Management Systems becomes a focal point. Studies show that mobile-based solutions empower employees with on-the-go access to HR functions, fostering a responsive and agile work environment. Mobile applications are found to enhance employee engagement and satisfaction by providing self-service options

The Need for Mobile Adaptation:

While web-based HR systems offer centralized control and robust features, the need for mobile adaptation becomes apparent in the modern workforce. Mobile-based HR systems extend accessibility, allowing employees and HR professionals to engage with HR functions anytime, anywhere. This aligns with the growing trend of remote work and flexible work arrangements.

Challenges and Considerations:

Despite the advantages of mobile HR solutions, challenges such as security concerns, device compatibility, and user experience variations arise. Research indicates that addressing these challenges is crucial for the successful implementation of a mobile-based HR Management System. Striking a balance between accessibility and security is essential in the mobile HR landscape.

Evolutionary Framework:

The transition from a web-based HR Management System to a mobile-based system represents an evolutionary framework in response to changing work dynamics. Integrating the strengths of both platforms ensures a holistic approach to HR management, catering to the diverse needs of a modern and dynamic workforce.

Research Gap

While existing literature acknowledges the advantages of both web-based and mobile-based Human Resource Systems (HRS), there is a notable gap in understanding the specific factors that make a web-based HRS superior to a mobile-based HRS in terms of overall efficiency, user satisfaction, and organizational impact. Further research is needed to delve into the unique strengths of web-based systems and identify the critical aspects that contribute to their superiority over mobile-based counterparts in the context of Human Resource Management. This research will provide organizations with valuable insights into why and how a web-based HRS might offer distinct advantages, informing decision-making processes during system selection and implementation. Despite the increasing prevalence of mobile-based HR management systems in universities, a noticeable research gap exists in evaluating the superiority of web-based systems over their mobile counterparts. While mobile applications offer on-the-go accessibility, limited screen real estate and potential constraints in handling complex HR processes may compromise overall efficiency. A focused investigation into the advantages of web-based HR management systems within the university context is essential, addressing the need for a comprehensive understanding of user experience, system functionality, and the potential impact on staff productivity and satisfaction. Closing this research gap will contribute valuable insights to inform strategic decisions in adopting the most effective HR management solution for university staff.

Methodology

Using Agile Methodology

My approach to generating the Web-Based HR Management System is based on Agile methodology, a collaborative and iterative framework based on adaptability, customer satisfaction, and continuous improvement throughout the software development lifecycle.

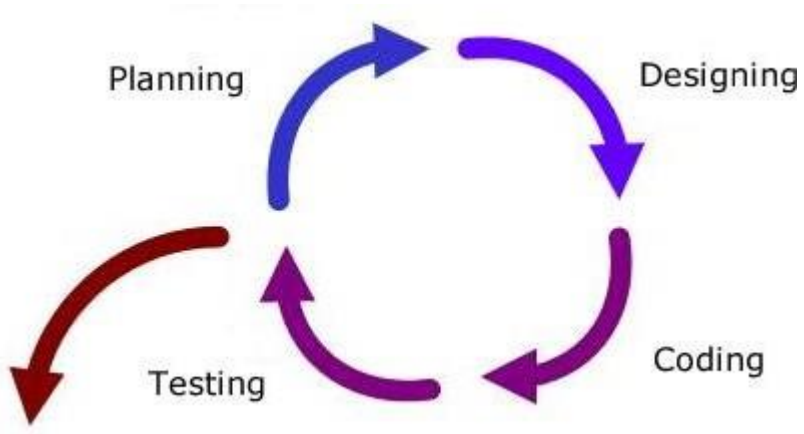

Figure01 Software Development Life Cycle

Agile methodology stands out by its iterative approach, in which the project is divided into smaller, more manageable iterations known as sprints. Each sprint has a set time frame and is used to develop, test, and deploy certain features or functionality. This iterative loop facilitates continual feedback and improvement, allowing the system to change incrementally in response to stakeholder input and changing priorities.

Flexibility is a key part of Agile methodology, allowing the development workforce to adjust quickly to changing needs, priorities, and market conditions. Unlike traditional waterfall approaches, which necessitate comprehensive advance preparation, Agile accepts change and uncertainty, recognizing that requirements may develop as stakeholders gain greater knowledge of their needs and preferences. This flexibility allows the workforce to respond rapidly to new information, priorities, or difficulties, ensuring that the project remains on track with the organization's goals and objectives.

Aspect	Agile Methodology	Waterfall Methodology
Flexibility to Adapt to Change	Agile provides for flexibility in responding to changing requirements and priorities throughout the project's lifecycle.	Waterfall involves a tight sequential method, which makes it difficult to accommodate modifications after the project has begun.
Iterative Development	Agile focuses on iterative development with frequent product increments, which allows for ongoing feedback and validation.	Waterfall takes a linear method in which needs are established upfront, resulting in delayed input until the end of the project.
Early & Continuous Delivery	Agile prioritizes the early and continuous delivery of valuable software to end-users, resulting in shorter time-to-market and greater user input.	Waterfall provides the full product at the conclusion of the development cycle, resulting in an extended time-to-market and delayed user input.
Collaboration & Communication	Agile allows cross-functional teams to collaborate and communicate by having regular meetings and platforms.	Waterfall's sequential design may result in divided communication and limited team collaboration.
Risk Mitigation	Agile helps to reduce project risks by breaking it down into smaller parts, allowing for early detection and resolution of problems.	Waterfall raises the possibility of late-stage project failures because faults may only be discovered during the testing phase.

Table01- Agile Methodology Vs Waterfall Methodology

Agile technique relies heavily on collaboration, which promotes communication and teamwork among cross-functional teams such as developers, designers, testers, and stakeholders. Regular meetings, such as daily stand-ups, sprint planning sessions, and sprint reviews, promote continuing collaboration and guarantee alignment with project objectives. This collaborative approach encourages transparency, avoids misconceptions, and instills a sense of responsibility and accountability in team members.

Customer satisfaction is an important component of the Agile approach, which can be achieved by frequent delivery of functional software and ongoing involvement with stakeholders. Agile makes sure that stakeholders have the opportunity to provide feedback on each iteration, allowing the development team to confirm assumptions, address difficulties, and implement changes based on real-world usage and user feedback. This customer-centric strategy ensures that the finished product fits the needs and expectations of its intended end-users, resulting in increased satisfaction and adoption rates.

Continuous improvement is built-in in Agile approach, with teams frequently reflecting on their processes, recognizing areas for improvement, and making adjustments as needed. Agile teams use retrospectives and other feedback methods to improve their processes, increase productivity, and deliver higher-quality software over time. This learning and adaptation culture ensures that the project remains responsive to changing requirements and conditions in the market, resulting in continuous innovation and success.

The use of Agile methodology has been critical in the development of the Web-Based HR Management System, giving me a flexible and controlled approach to project development. Embracing Agile concepts and practices has enabled me to work iteratively, adapting to changing requirements and assuring the project's success. Through this process, I am confident in my ability to produce a high-quality solution that is exactly suited to satisfy the needs of stakeholders, resulting in successful results for my specific project.

Steps in the development process

During the **Project Planning and Requirements Gathering** phase, I noticed a number of challenges with the existing mobile-based system, prompting the decision to develop a web-based alternative. To guarantee that the new system properly addressed these difficulties and met the demands of users, I conducted interviews with people who are already using the mobile-based system. Furthermore, I thoroughly used the current system personally to detect its weaknesses and establish the necessary modifications.

Following the initial identification of concerns with the current mobile-based system during the Project Planning and Requirements-gathering phase, I took proactive actions to guarantee that the development of the web-based alternative effectively addressed these issues and fulfilled user needs. To achieve this, I conducted interviews with current users of the mobile-based solution. In addition, I personally interacted with the current system to get firsthand experience and insight into its weaknesses.

In the interviews conducted with users, the following key questions were explored:

1. What are the primary tasks or functionalities you frequently perform using the current mobile-based HR system?
2. Can you describe any specific challenges or difficulties you've faced while using the mobile-based HR system?
3. How would you rate the overall usability and user experience of the current mobile-based HR system?
4. How do you typically communicate with the HR department through the mobile-based system, and have you encountered any obstacles or limitations in this communication process?

One of the major difficulties discovered was the mobile system's low capability and usability. Users noted issues with navigating the page, uploading documents, and accessing critical HR tasks. This affected their productivity and caused frustration among staff members.

Communication gaps were found between users and the HR department, notably surrounding document submissions. Users reported facing issues and errors while uploading documents, resulting in missing or incomplete submissions. This revealed a serious vulnerability in the system's document management capabilities, reducing the efficiency of HR activities.

Furthermore, the mobile-based system lacked comprehensive self-service features, which limited users' autonomy in managing HR-related tasks. Users requested additional capabilities such as leave management, document storage, and attendance tracking, which were not properly covered by the current system.

These challenges highlighted the critical need for a more comprehensive and user-friendly solution, resulting in the development of the web-based HR Management System. By gathering requirements through user interviews and firsthand experience with today's system, I gained knowledge about customer pain points and identified critical areas for improvement. This informed the development process and directed the design and execution of features that improved the system's weaknesses.

During the **Sprint Planning and Iterative Development** phases, I used an agile project management technique to ensure flexibility and responsiveness to developing needs. This iterative process involved splitting the project into smaller elements and prioritizing them based on user feedback and input from stakeholders. I focused on providing incremental upgrades and functionality to the web-based HR Management System.

Key activities during this phase

- Sprint Planning
- Task Breakdown
- Iterative Development

During the **Design and Prototyping** phase, I used Figma to construct high-level prototypes of the Web-Based HR Management System. High-level prototyping required creating a visual representation of the system's layout, navigation, and essential functions. High-level prototypes gave stakeholders a wide grasp of the user interface and workflow because they focused on the system's general structure and functioning.

In the high-level prototypes, I focused on essential design components including navigation menus, dashboard layouts, and feature placement. These prototypes acted as a road map for the development process, defining the system's core structure and flow. High-level prototypes helped stakeholders discuss and provide input on design concepts and usability by displaying visual representations of the system's interface and functionality.

In addition, high-level prototypes enabled early evaluation of design concepts and alignment with project specifications. By iterating on design concepts and incorporating stakeholder feedback, I was able to improve the prototypes and ensure that they accurately represented the intended user experience. This iterative method to prototyping assisted in identifying potential usability issues and design flaws early in the process, reducing the need for major adjustments later on.

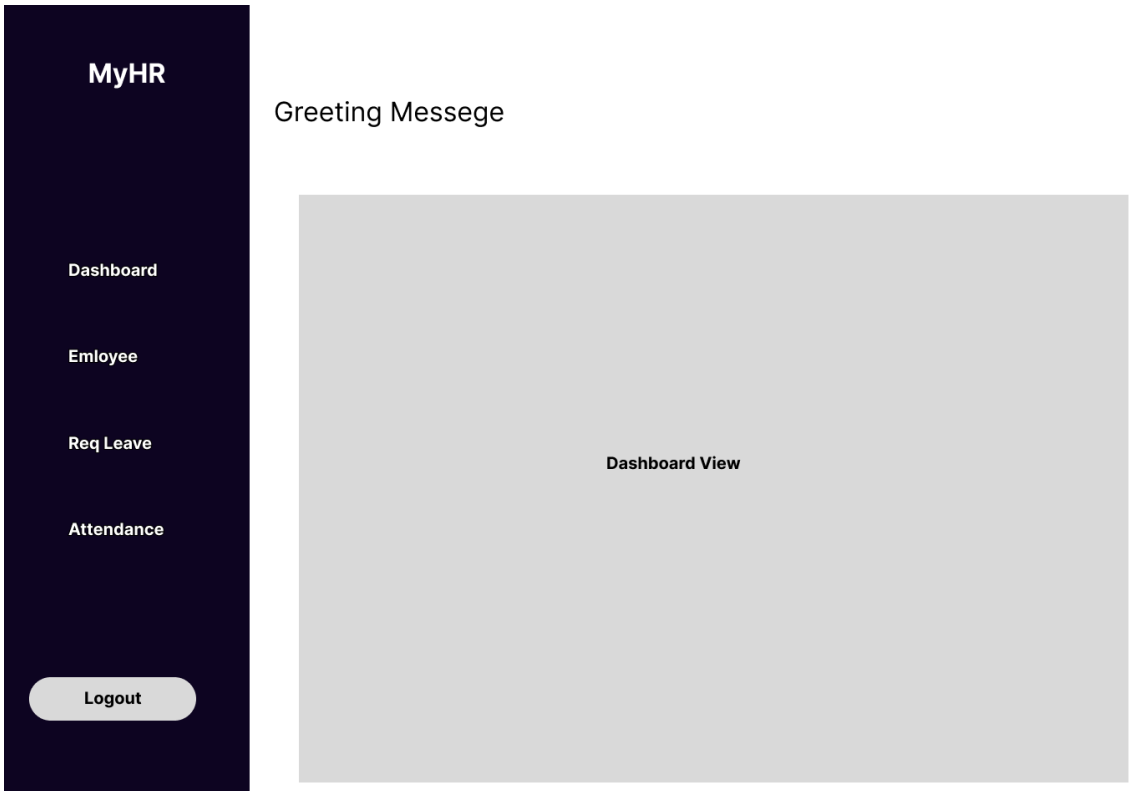

Figure02 Figma Design (Admin Dashboard)

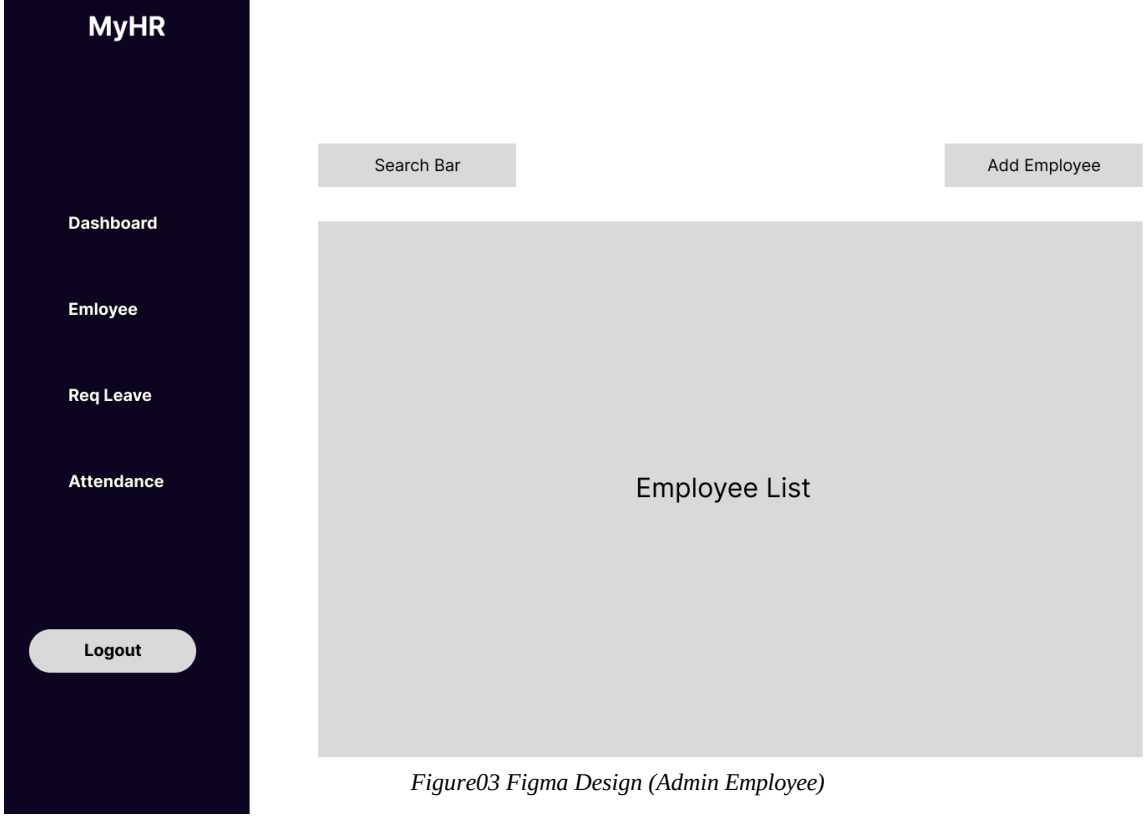

Figure03 Figma Design (Admin Employee)

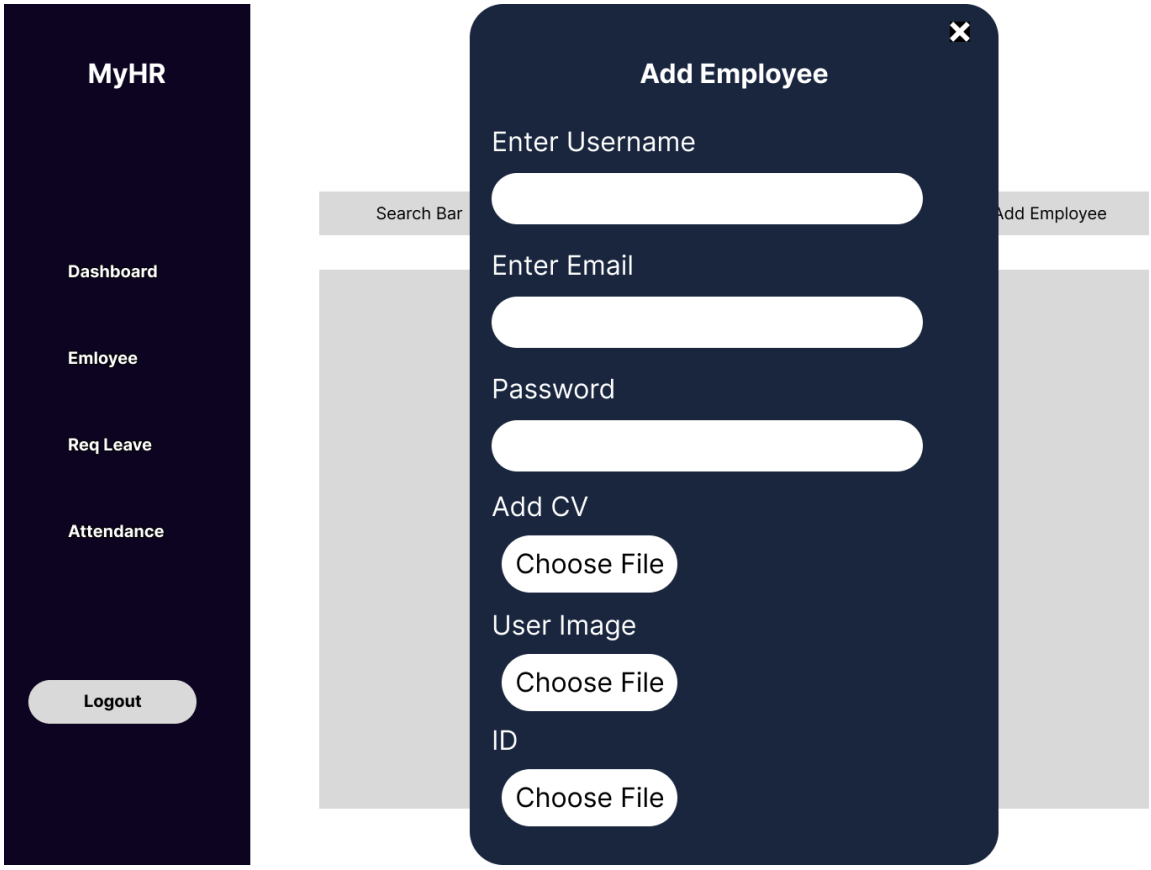

Figure04 Figma Design (Admin Add Employee)

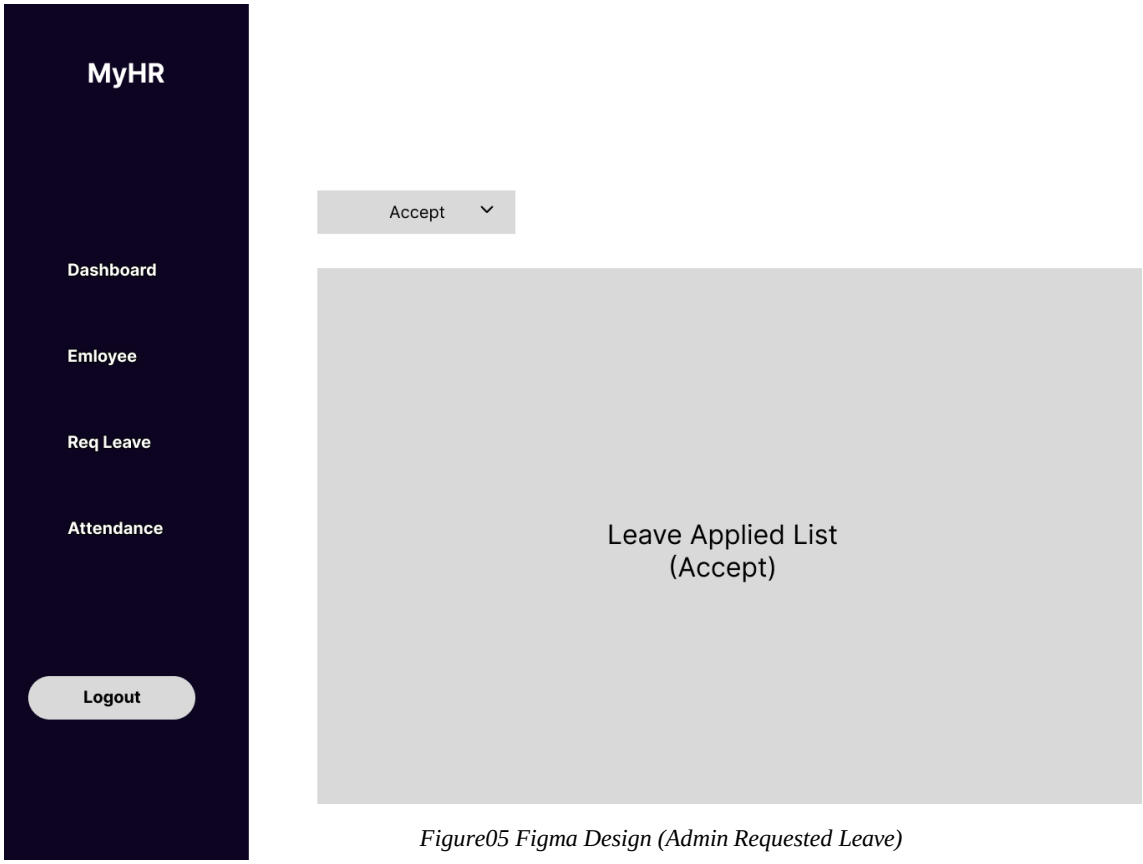

Figure05 Figma Design (Admin Requested Leave)

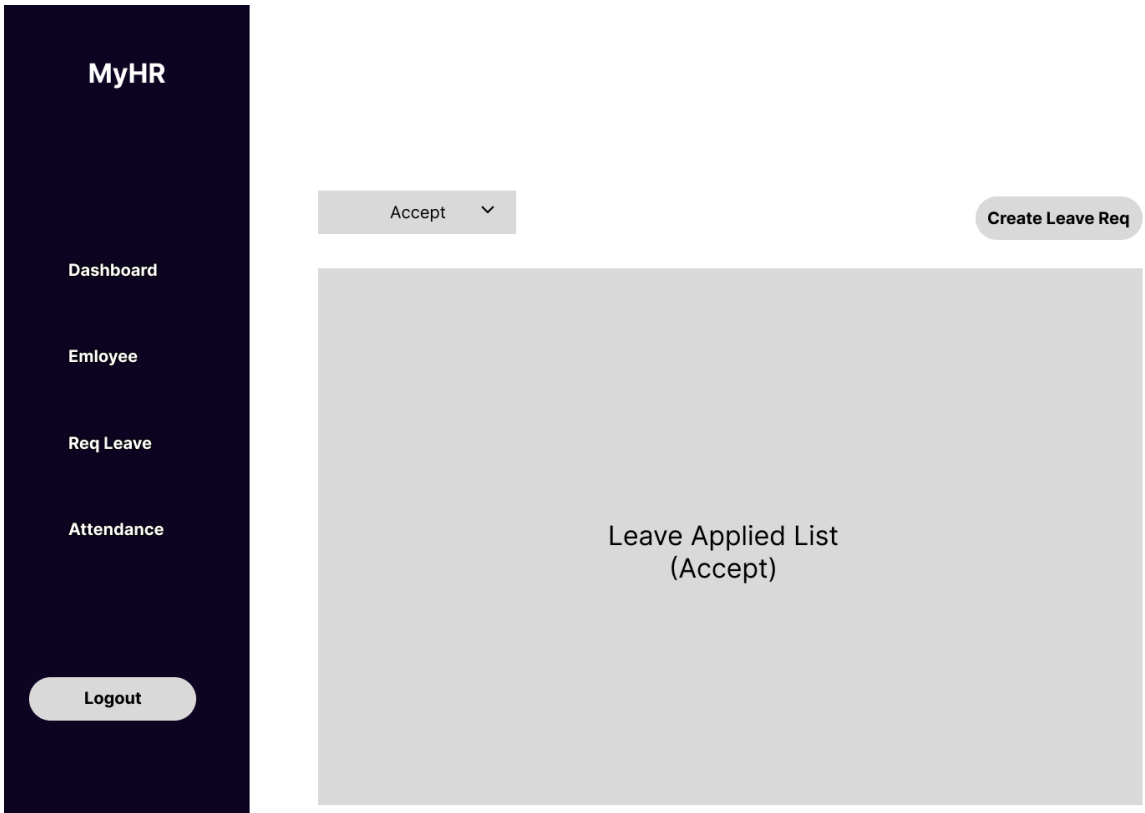

Figure06 Figma Design (User Requested Leave)

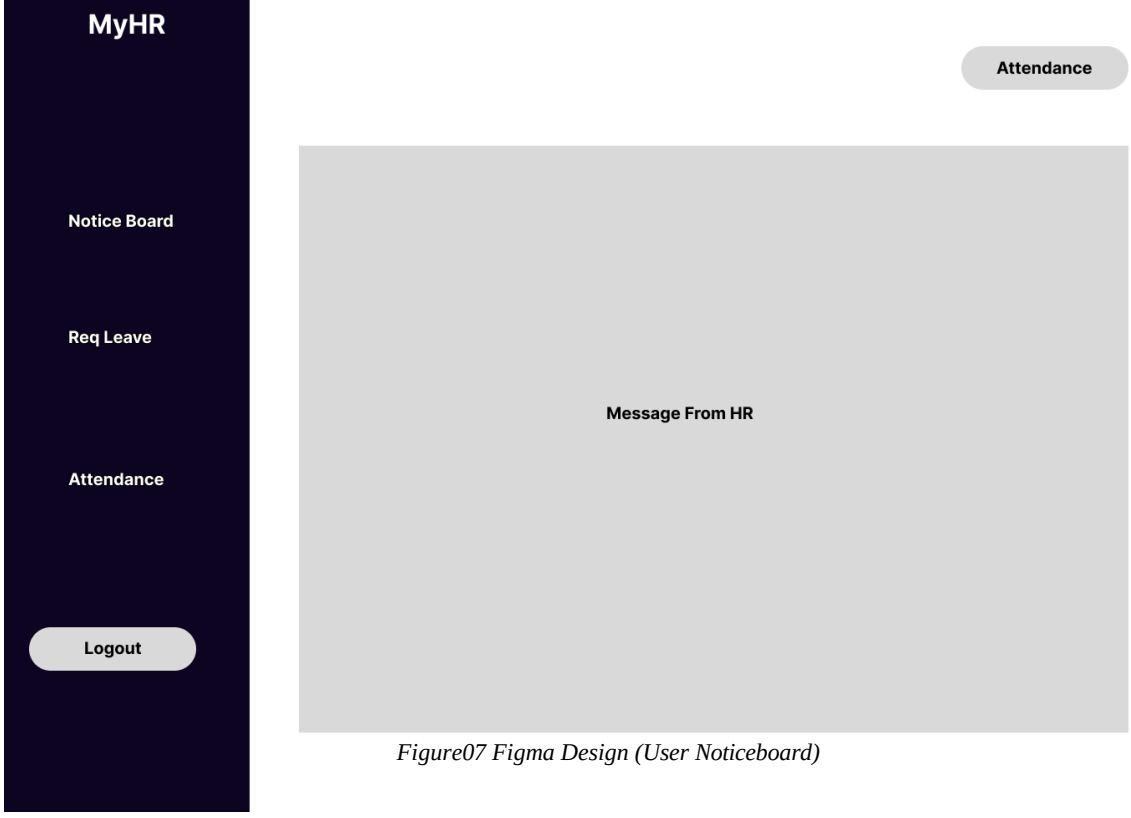

Figure07 Figma Design (User Noticeboard)

During the **Deployment and Continuous Improvement** phase, I set up MongoDB as the local database for the Web-Based HR Management System. This choice was made to allow for quick development and testing of the system in a controlled environment.

Setting up MongoDB on localhost offered various benefits. First, it made database access and management easier during the development process. By hosting the database locally, I was able to easily modify the schema, add sample data, and test without relying on external resources or internet connectivity.

Using MongoDB on localhost improved the security and privacy of the data processed by the system. Because the database was hosted locally, it was inaccessible to third parties, lowering the risk of unauthorized access or data breaches.

System Overview

System architecture

The system architecture of the Web-Based HR Management System is intended to assure scalability, reliability, and performance while responding to the different needs of users and stakeholders. The architecture is built around the MERN stack (MongoDB, Express.js, React, Node.js), which is a popular choice for developing modern web apps.

The front-end of the system is built with React.js, a JavaScript toolkit for creating user interfaces. React's component-based architecture allows for the building of modular, reusable UI components, resulting in a responsive and intuitive user experience. The front-end communicates with the back-end using RESTful APIs, allowing for seamless communication and data exchange between client and server.

On the back-end, the system leverages Node.js and Express.js to build a robust and scalable server-side architecture. Node.js provides a lightweight and efficient runtime environment for executing JavaScript code on the server, while Express.js simplifies the process of building web applications by providing a minimalist framework for handling HTTP requests and responses. Together, Node.js and Express.js enable the development of a fast, efficient, and scalable back-end infrastructure.

The system's data layer is powered by MongoDB, a NoSQL database that stores and manages unstructured or semi-structured data. MongoDB's flexible document-based approach supports the storing of various data structures, making it ideal for managing the HR Management System's diversified data requirements. MongoDB's storage of data as JSON-like documents allows for fast and efficient data retrieval and manipulation, improving the system's overall performance and scalability.

In terms of architecture patterns, the system uses a microservices architecture, in which distinct system components are built and deployed independently as discrete services. This strategy improves modularity, flexibility, and maintainability, making it easier to scale and upgrade specific components without affecting the whole system. Furthermore, the microservices architecture improves fault isolation and resilience, as failures in one service may not always affect the entire system.

The system architecture of the Web-Based HR Management System is designed to provide a scalable, reliable, and performant platform for managing HR processes in educational institutions. By leveraging the MERN stack, microservices architecture, and containerization technology, the system offers flexibility, modularity, and efficiency, enabling seamless integration, deployment, and continuous improvement of the HR Management System.

Data-Base Architecture

The HR Management System relies on MongoDB as the database management system, with a database named "hr_management_db" containing five essential tables: admins, employees, leave_applications, attendance_records, and notifications. While the data for most tables is generated or manipulated by the frontend or backend systems, the admins table requires manual entry as administrators are responsible for creating their accounts. MongoDB Compass, a graphical user interface tool for MongoDB, is utilized to facilitate the manual insertion of admin data into the admins table.

Admins Table:
The admins table stores information about system administrators who have access to privileged functions within the HR Management System. Each admin account consists of a username and a password, providing authentication credentials for accessing administrative functionalities. Administrators are responsible for managing employee data, handling leave applications, monitoring attendance records, and sending notifications.

Using MongoDB Compass, administrators can easily add their accounts to the admins table by following these steps:

1. **Open MongoDB Compass:** Launch MongoDB Compass and connect to the MongoDB server running on localhost.

2. **Select Database and Collection:** Choose the "hr_management_db" database from the list of available databases. Within the database, select the admins collection.

3. **Insert Document:** Click on the "Insert Document" button to create a new document representing an admin account.

4. **Enter Admin Details:** In the document editor, input the admin details including the username and password. Ensure that the username is unique and memorable, and that the password is secure and follows best practices for authentication.

5. **Save Document:** Once the admin details are entered, save the document to insert the new admin account into the admins collection.

By manually inserting admin data into the admins table using MongoDB Compass, administrators can establish their accounts and gain access to the HR Management System's administrative functionalities. This process ensures that only authorized individuals with valid credentials can perform administrative tasks and access sensitive HR data.

Benefits of Manual Admin Insertion:

Security: Manual insertion of admin data allows for stringent control over access to administrative functionalities, reducing the risk of unauthorized access or security breaches.

Customization: Administrators can customize their accounts according to their preferences, including choosing unique usernames and secure passwords that comply with organizational security policies.

Accountability: By requiring administrators to manually create their accounts, the system promotes accountability and transparency in administrative activities, as each admin is responsible for managing their own credentials.

Flexibility: Manual insertion allows for flexibility in the admin account creation process, enabling administrators to adapt to changing requirements or circumstances as needed.

Ease of Management: MongoDB Compass provides a user-friendly interface for managing admin data, making it straightforward for administrators to add, edit, or delete their accounts as necessary.

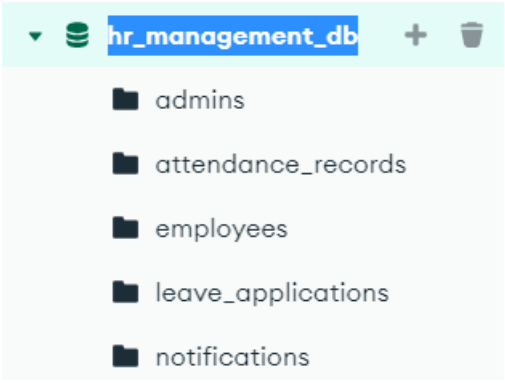

Figure08 DBStructure

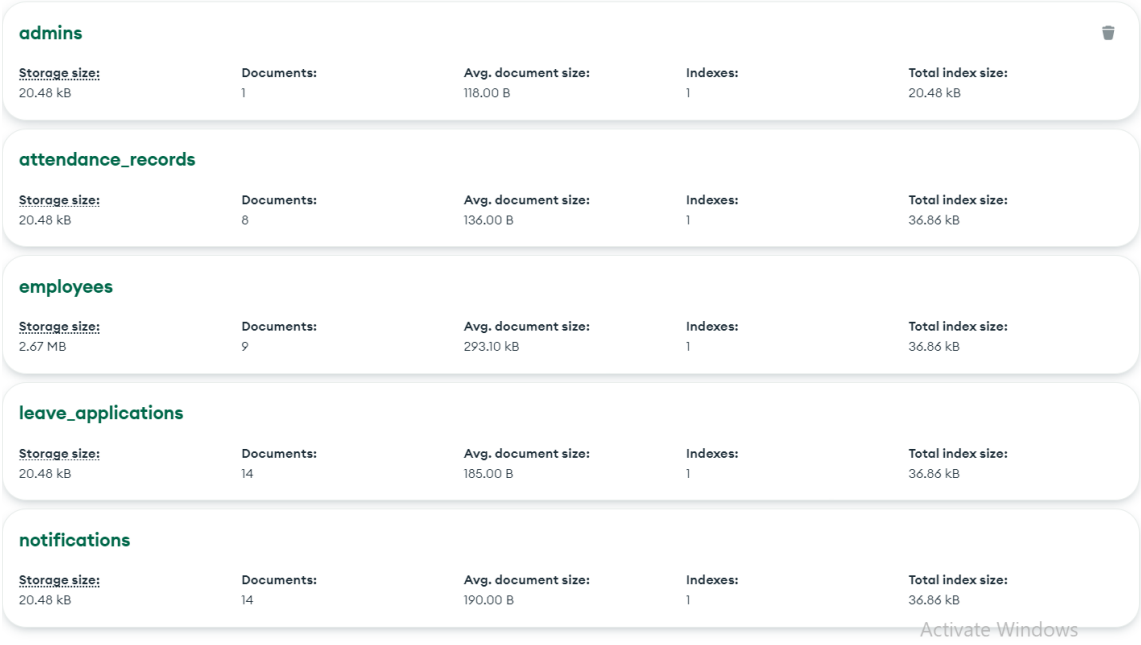

Figure09 DBTables

Functionalities of each component

The Web-Based HR Management System is made up of numerous components, each of which serves a specific purpose in ensuring effective HR procedures and pleasant user experiences. Let's get into the functionality of each component.

The Front-End Interface (React.js) displays the user interface to employees and administrators. It offers interactive interfaces for a variety of HR operations, including leave applications, document management, and attendance tracking. The front-end interface provides a seamless and engaging user experience because to its intuitive design and user-friendly interactions.

The back-end server (Node.js & Express.js) serves as the primary hub for processing requests and handling data. It manages authentication, authorization, and business logic to ensure that the client-side interface and database communicate securely and efficiently. The server maintains API endpoints, routing, and middleware via Node.js and Express.js, allowing for seamless integration with the front-end and data layer.

The HR Management System uses MongoDB to store employee profiles, leave records, document metadata, and other HR-related data. It offers a flexible and scalable database architecture that allows for the efficient storage and retrieval of both structured and unstructured data. MongoDB's document-based approach allows for efficient data organization and querying, meeting the system's diversified data requirements.

The Leave Management Module allows employees to apply for leave, and track the status of their requests. Administrators can examine and accept or reject leave requests, and administer leave policies. This module automates the leave approval process, streamlining administrative processes while guaranteeing correct leave tracking for payroll and compliance requirements.

Features and Functionalities

Key features of the system

The Web-Based HR Management System built on the MERN stack includes a number of essential features intended to expedite HR operations and improve user experience for university staff. These features are the result of a combination of user needs, technology capabilities, and best practices in HR management. The following are the system's main features:

Leave Management: Using an intuitive interface, employees can easily apply for leave requests. They can select durations, and justifications, which simplifies the leave approval process for administrators.

Document Management: The system allows users to securely manage vital documents such as CVs, profile images, and ID photos. This feature allows for easy access to key documents while also ensuring compliance with documentation requirements.

Attendance Tracking: The system allows employees to digitally record their attendance, reducing the need for manual attendance registers. Administrators may easily track attendance in real time and generate attendance reports.

Employee Management: Administrators can create, update, and manage employee profiles within the system. This tool improves the onboarding process for new employees and ensures proper personnel information management.

Leave Approval process: The system provides a systematic leave approval procedure, allowing administrators to easily examine and approve leave requests. Automated notifications update users about the status of their leave requests.

Role-Based Access Control: Role-based access control guarantees that users have the right access permissions for their positions and responsibilities. This feature increases data security and confidentiality by limiting access to sensitive information.

Scalability and Customization: The system's architecture is scalable, allowing for future growth and customization to meet changing company needs. Modular design concepts allow for the easy integration of additional features and modules as needed.

User interaction explanation

User interaction within the Web-Based HR Management System is intended to be intuitive, efficient, and user-friendly, allowing for seamless navigation and engagement with various HR functionalities. The system supports a variety of user roles, such as employees and administrators, each with their own set of tasks and responsibilities.

Employee engagement consists mostly of beginning various HR activities such as leave applications, document management, and attendance marking. They use the system to apply for leave, upload necessary paperwork, and digitally record their attendance. The system walks individuals through these processes, providing clear instructions, validation checks, and real-time feedback on their activities. Employees also benefit from tools that allow them to check the progress of their leave requests and receive alerts of approval or rejection.

Administrators, on the other hand, use the system to manage HR functions such as leave permission, personnel management, attendance tracking, and communication. They assess and approve leave requests, manage employee profiles, track attendance, and communicate critical information to the workforce. The solution gives administrators the tools and features they need to expedite HR operations, make informed decisions, and encourage employee participation.

The system's user interface is intended to empower both employees and administrators by providing them with simple functionalities, streamlined workflows, and effective

communication channels. The technology adds to the organization's overall success by making HR activities more efficient and boosting teamwork.

Benefits of the system

The Web-Based HR Management System provides many advantages to both employees and administrators, transforming the way HR operations are conducted within the organization. Here's a detailed look at the advantages:

Improved Efficiency: The solution streamlines HR operations by automating leave management, document handling, and attendance tracking. This lowers manual labor, streamlines paperwork, and accelerates administrative operations, resulting in overall time savings and enhanced production.

Enhanced Accessibility: A web-based platform allows employees to access the HR system from any location with an internet connection, whether they are in the office, working remotely, or on the go. This accessibility means that employees may easily manage their HR-related activities, increasing overall workflow efficiency.

Simplified Leave Management: The system offers employees an easy-to-use interface for applying for leave, and following the status of requests. Automated leave approval protocols make the process easier for administrators, eliminating delays and assuring prompt replies to leave requests.

Centralized Document Management: Employees may upload and manage documents including CVs, profile images, and ID photos directly in the system. Administrators have access to a central repository of employee records, making it simple to locate and manage critical information.

Efficient Attendance Tracking: The system allows employees to digitally record their attendance, reducing the need for manual attendance registers. Real-time attendance data is collected and securely kept, allowing administrators to gain reliable insights into staff attendance patterns.

Compliance with Regulations: The system is designed to follow regulatory requirements and data protection regulations, protecting employee data confidentiality and integrity. Built-in security safeguards safeguard sensitive data from unauthorized access or breaches, reducing compliance risks.

Employee Empowerment: By allowing employees to self-manage their HR-related duties, the system develops a sense of ownership and accountability among staff. This autonomy promotes proactive engagement with HR procedures and decreases reliance on administrative help.

Data-driven decision making: The system provides administrators with extensive HR analytics and reporting capabilities. Detailed information about leave patterns, attendance trends, and employee demographics enables informed decision-making and strategic workforce planning.

The Web-Based HR Management System provides a comprehensive solution for streamlining human resources tasks and increasing organizational efficiency. By automating procedures like leave management, handling of documents, and attendance monitoring, the system considerably lowers manual labor, streamlines paperwork, and speeds up operations. This saves time and increases productivity, allowing employees in human resources to focus on more strategic objectives.

Implementation

The creation of the Web-Based HR Management System includes the use of several third-party tools and libraries to improve functionality, optimize development processes, and maintain the system's dependability and security. These tools and libraries add essential resources and capabilities to the system's fundamental features, allowing developers to create a strong and feature-rich HR management solution. Let's look at some of the main third-party tools and libraries built into the system:

Express.js is an advanced online application framework for Node.js that makes it easier to create server-side apps. It offers a simple yet adaptable architecture for developing web servers and APIs, enabling developers to design scalable and efficient web applications. Express.js is utilized in the Web-Based HR Management System to manage routing, middleware, and request handling, allowing the client and server components to communicate seamlessly.

Facebook developed React.js, a JavaScript library for developing user interfaces. It enables developers to design reusable UI components and dynamic, interactive online apps. The frontend interface of the HR management system is built using React.js, which allows users to engage with the system's numerous features and functionalities. The component-based architecture allows for flexible development and quick rendering, resulting in a responsive and intuitive user experience.

MongoDB is a NoSQL database that offers a scalable, adaptable, and high-performance alternative for storing and managing data. It provides a document-oriented data model that is ideal for processing unstructured or semi-structured data. MongoDB serves as the database backend of an HR management system, containing employee information, leave records, attendance data, and other HR-related data. Its schema-free design enables for simple scaling and flexibility to changing data requirements.

Mongoose is a MongoDB object modelling tool that simplifies database interactions while also providing a schema-based solution for data validation and manipulation. It provides a simple API for building schemas, conducting CRUD actions, and executing queries, making it easy for developers to integrate MongoDB with Node.js applications. Mongoose is used in the HR management system to establish data schemas, build database models, and run database operations, all of which ensure data consistency and integrity.

Axios is a popular HTTP client package for JavaScript that allows you to do asynchronous HTTP queries. It offers a simple and easy API for sending HTTP requests and receiving responses, as well as capabilities like request and response interception, automatic JSON data transformation, and error handling. In the HR management system, Axios is used to communicate with external APIs such as authentication services, email servers, and third-party integrations, allowing for smooth integration with external systems and services.

Evaluation

Usability, performance, and reliability assessment

Usability, performance, and dependability are essential components of any software system, including the Web-Based HR Management System. A thorough evaluation of these elements is required to verify that the system satisfies user expectations, runs efficiently, and can be depended on to perform its intended functions consistently. In this examination, we will look at each of these factors in depth, seeing how they affect the overall user experience, system efficiency, and dependability.

Usability Assessment

Usability refers to the ease with which users can interact with the system and accomplish their tasks effectively. A user-friendly interface, intuitive navigation, and clear instructions are essential elements of a usable system.

Interface Design:
The system's interface was designed with simplicity and clarity in mind, featuring a clean layout, intuitive navigation menus, and easily identifiable buttons and controls. Feedback from users during the development process was incorporated to refine the interface and ensure that it met their needs and preferences.

Task Efficiency:
Users reported that the system enabled them to complete tasks more efficiently compared to the previous mobile-based system. Features such as streamlined leave applications, document management, and attendance tracking workflows contributed to improved task efficiency and productivity.

User Feedback:
Regular user feedback sessions were conducted throughout the development process to gather insights into usability issues and areas for improvement. Feedback was collected through interviews, and usability testing sessions, allowing us to identify pain points and make necessary adjustments to enhance the user experience.

> Feedback was received from users regarding an issue encountered when generating reports. Specifically, users reported instances where the system became corrupted or unresponsive when attempting to generate a large number of reports consecutively. This issue impacted the efficiency of users in completing their tasks, particularly those involving the generation of multiple reports within a short timeframe.

Accessibility:
The system was designed to be accessible to users with diverse needs and abilities. Features such as keyboard navigation, screen reader compatibility, and adjustable font sizes were implemented to ensure that all users could interact with the system comfortably.

Performance Assessment

Performance refers to the system's speed, reactivity, and general efficiency in processing user requests and data. A high-performance system should provide a consistent experience even under high load levels.

Response Time:
During testing, the system displayed satisfactory reaction speeds, with the majority of tasks completed within milliseconds. However, there were occasional delays during peak usage periods, showing the need for additional optimization to maintain consistent performance under all conditions.

Scalability:
The system's architecture is designed to scale horizontally, allowing it to handle an increasing number of users and data without sacrificing performance. Load testing was carried out to assess the system's scalability and identify any bottlenecks that could degrade performance under heavy loads.

Error Handling:
The system demonstrated robust error handling capabilities, with appropriate error messages displayed to users when issues occurred. Error logs were generated and monitored to track recurring issues and address them promptly to minimize disruption to users.

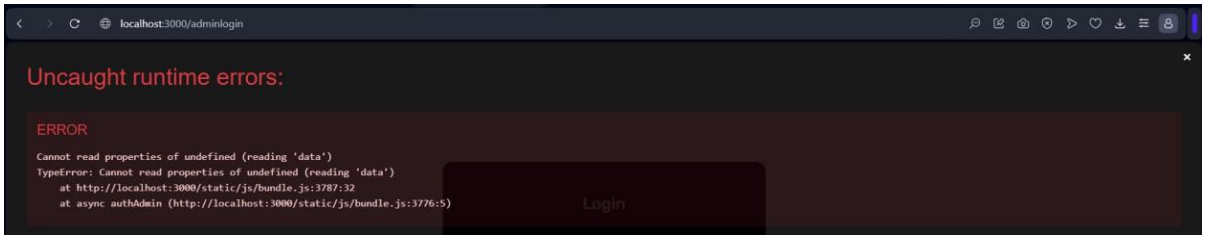

Figure10 Runtime Error

Reliability Assessment

Reliability is the system's ability to work consistently and accurately over time, with no unexpected downtime or data loss. A dependable system instills trust and confidence in users, assuring them that they can rely on it to meet their demands consistently.

Data Integrity:
Data integrity checks were added at several stages of processing to prevent corruption or loss. Backup and recovery processes were also designed to prevent data loss due to hardware failures or other unforeseen situations.

Compliance:
The system complied with relevant data protection regulations and industry standards, ensuring that user data was handled securely and in accordance with legal requirements. Compliance checks were conducted regularly to verify adherence to regulations and address any compliance issues promptly.

Testing

Testing is a critical phase in the development lifecycle of any software project, including the Web-Based HR Management System. It ensures that the system functions as intended, meets specified requirements, and performs reliably under various conditions. In the context of our project, testing encompasses a range of activities aimed at verifying the correctness, reliability, and usability of the system. This comprehensive testing approach involves multiple types of testing, including unit testing, integration testing, system testing, and user acceptance testing (UAT). Each type of testing serves a distinct purpose and contributes to the overall quality and robustness of the system.

Unit Testing:

Unit testing focuses on verifying the functionality of individual components or units of code in isolation. In our project, unit tests are written to assess the behavior of specific functions, methods, or modules within the system. These tests are typically automated and executed using testing frameworks such as Jest for JavaScript-based applications. Unit tests ensure that each component behaves as expected and performs its designated task accurately. By isolating units of code, developers can identify and fix defects early in the development process, promoting code quality and maintainability.

Integration Testing:

Integration testing evaluates the interactions and interfaces between different components or modules of the system. It aims to uncover defects that may arise due to the integration of individual units into larger subsystems. In the HR Management System, integration tests are conducted to validate the communication and data exchange between frontend and backend components, as well as the integration of third-party services such as MongoDB for database operations. Integration testing ensures that the system functions cohesively and that all components work together seamlessly to achieve the desired functionality.

System Testing:

System testing assesses the system as a whole to verify that it meets specified requirements and performs as expected in a production-like environment. It involves testing the system's behavior and functionality from end to end, simulating real-world usage scenarios and user interactions. In our project, system tests are performed to validate core functionalities such as leave management, document handling, attendance tracking, and user authentication. System testing covers various aspects of the system, including usability, performance, security, and compliance with regulatory standards.

User Acceptance Testing (UAT):

User Acceptance Testing (UAT) involves validating the system's readiness for deployment by end users or stakeholders. It focuses on ensuring that the system meets user expectations, fulfills business requirements, and delivers value to its intended users. In the HR Management System, UAT involves soliciting feedback from HR professionals, administrators, and employees to assess the system's usability, effectiveness, and overall satisfaction. UAT may include conducting user surveys, interviews, or usability tests to gather feedback and identify areas for improvement.

Automated Testing:

Automated testing plays a crucial role in ensuring the efficiency and effectiveness of the testing process. It involves the use of automated testing tools and frameworks to execute tests, compare actual outcomes with expected results, and report discrepancies. In our project, automated testing is employed for unit testing, integration testing, and regression testing to validate changes and detect regressions in the codebase. Automated testing accelerates the testing cycle, improves test coverage, and facilitates continuous integration and delivery practices.

Test Case Management:

Test case management is essential for organizing, prioritizing, and tracking the execution of test cases throughout the testing process. It involves creating test cases based on requirements, documenting test scenarios, and managing test execution results. In our project, test case management is facilitated using tools such as TestRail or Jira, which provide capabilities for creating test suites, assigning test cases to testers, and monitoring test progress. Effective test case management ensures comprehensive test coverage, traceability of requirements, and timely resolution of defects.

Testing is an integral part of the software development lifecycle, ensuring the quality, reliability, and usability of the Web-Based HR Management System. Through a combination of unit testing, integration testing, system testing, and user acceptance testing, we validate the system's functionality, performance, and user satisfaction. Automated testing tools and test case management practices enhance the efficiency and effectiveness of the testing process, enabling us to deliver a high-quality product that meets the needs of our stakeholders.

Test Case ID	Test Case Object	Pre-Requisite	Steps	Input Data	Expected Output	Actual Output	Status
TC001	users can log in with valid credentials.	Redirect to user notice board	Enter valid credentials	User Name, Password	Redirect to user notice board	Redirected to user notice board	Passed
TC002	log in with invalid credentials and receive appropriate error messages.	Redirect to user notice board	Enter invalid credentials	Invalid User Name, Invalid Password	Receive appropriate error messages	Runtime Error	Fail
TC003	System securely stores user credentials	Creating Account	Enter New User Credentials	Username, Password	Encrypted Password	Encrypted	Passed
TC004	Leave Management	User is logged in as an employee	1. Navigate to the leave page. 2. Click the 'Apply for Leave, button.	Leave type: Vacation, Start date: 2024-05-15, End date: 2024-05-17	Leave request submitted successfully.	N/A	Passed
TC005	Document Management	User is logged in as an employee /admin	1. Navigate to the document page. 2. Click the 'Upload Document.	Upload CV file, Upload photo	Document uploaded successfully	N/A	Passed
TC006	Attendance Tracking	User is logged in as an employee /admin	1. Navigate to the attendance page 2. Mark Attendance	Mark attendance for today	Attendance marked successfully	N/A	Passed
TC007	Report Generating	User is logged in as an admin	1. Navigate to the attendance page 2. Generate Report	N/A	Download All Reports	Error	Fail

Table02 Test Case

Future Work

Potential Enhancements Features

Moving the HR Management System to a cloud-based architecture has many benefits, including scalability, accessibility, and cost-effectiveness. By transferring the system to a cloud platform like AWS, Azure, or Google Cloud, we can improve dependability, availability, and security while lowering maintenance costs.

Implementing advanced reporting and analytics tools will provide more detailed insights into HR indicators like employee performance, attendance trends, and leave patterns. Administrators can build customizable reports and dashboards by connecting data visualization tools such as Power BI or Tableau, allowing for more data-driven decisions.

Integrating the HR Management System with other corporate systems, such as payroll software, ERP systems, and time-tracking solutions, would improve data sharing and system compatibility. This integration would remove manual data entry, minimize errors, and assure data consistency across numerous platforms.

Introducing an employee self-service portal where employees can update their personal information, view pay stubs, and access HR policies and resources independently will empower employees and reduce administrative overhead. This portal could also include features for training and development, performance evaluations, and peer recognition.

Limitations and Areas for Improvement

The current architecture may suffer scalability issues when the user base expands or while handling big amounts of data. To solve this constraint, future developments should prioritize improving database performance, providing caching methods, and building a microservices architecture for increased scalability and flexibility.

Despite efforts to develop an intuitive user interface, some users may find certain functionalities complex or difficult to use. Usability testing and receiving input from end users can assist discover pain points and areas for interface modification, resulting in increased user happiness and productivity.

Github_Link

https://github.com/VihangaSamarakoon/MyHR

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