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FusionHR

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Disclaimer

The following report has been authored by students Mohammad Aker and Yousef AbdulSalam from the Computer Engineering Department, Faculty of Engineering, An-Najah National University. The report has been through minimal modifications, limited to editorial corrections, and may still contain errors in language and content. It is important to mention that the opinions expressed within the report, including any conclusions and recommendations, solely belong to the students. An-Najah National University bears no responsibility or liability for any consequences arising from the utilization of this report for purposes other than its intended commission.

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Abstract

Varying in purpose and targeted segments, management systems have become increasingly popular in recent years. In streamlined companies that require a Human Resources (HR) department to manage employees and their affairs, specialized management systems specifically designed for HR departments have been developed to meet their needs.

The proposed project focuses on creating a system that splits the needs of an HR department into two types:

- Core needs: This represents what every HR department requires, such as attendance and leave recording to manage employees' working hours, role-based access to accommodate the needs of employees associated with the HR department, and payroll management, which takes into account taxes, working hours, and leaves. Many additional necessary tools are also provided.
- Add-on needs: These features focus on customization, packaging tools and features into modules that can be added when needed and customized accordingly. For example, hiring and recruitment tracking can be implemented to manage job openings and the hiring process, or a document management service to handle employee contracts. Many other possibilities can be explored depending on specific needs.

To elaborate, the system will be a desktop application with a toned-down mobile version, the desktop version will support all the features including modules management and customization, whereas the mobile version will be more straightforward to view new changes and notifications on the go, due to this versatility, the system will be built using Flutter as the Frontend technology and Springboot as the backend one, with utilizing tools such as google cloud for the many services it offers. In the end, recognizing the need for open sourcing and the need for specific and niche modules.

1. Introduction

Nowadays, enterprises and businesses face the issue of keeping track of their employees, managing their working hours, leaves and holidays, in addition to having the ability to add upon the system and custom-develop your specific needs into a system that is closed for modification but its open for extension.

FusionHR is an enterprise management platform designed to improve organizational efficiency by integrating core and customizable modules. These modules address various business needs such as attendance management, leave tracking, organizational hierarchy visualization, project management, and AI-powered resume parsing. Leveraging modern technologies like Spring Boot, Flutter, and Google Cloud, FusionHR ensures a scalable, secure, and user-friendly solution tailored for businesses of all sizes. The platform is a combination of robust backend systems, AI integration, and intuitive interfaces for web and mobile platforms.

This document outlines the design methodology, system architecture, and significance of the software while highlighting the challenges addressed in creating a modular, adaptive system.

1.1 Problem Statement

Organizations worldwide face significant challenges in managing their operations efficiently due to siloed tools, rigid systems, and the lack of modularity in existing enterprise software. Businesses often grapple with:

- Disjointed Systems: Separate tools for attendance, leave management, and project tracking lead to inefficiencies.
- Scalability Issues: Legacy systems struggle to scale with growing business needs.
- AI Integration Gaps: Traditional systems lack advanced features like resume parsing or automated workflows powered by AI.
- Data Security Concerns: Sensitive information often remains vulnerable due to inadequate security measures.
- Customization Needs: Businesses require solutions tailored to their unique processes, which many existing platforms fail to provide.

These challenges hinder operational efficiency, affecting decision-making, employee satisfaction, and overall productivity.

1.2 Objectives

The objectives of FusionHR are to provide a robust and flexible solution to address the challenges organizations face in managing their daily operations, recruitment, and project workflows. Here's what we aim to achieve:

1. **Streamlined Operations**:
   - Simplify daily workflows like attendance tracking, leave approvals, and project management by creating intuitive, interconnected core modules.
2. **Customizability and Flexibility**:
   - Offer modular components to allow companies to enable or disable features based on their needs.
   - Ensure each module works seamlessly, whether deployed alone or integrated with others.
3. **AI-Driven Recruitment**:
   - Use advanced AI tools to automate CV parsing and structure candidate data into meaningful insights.
   - Minimize the manual effort in screening resumes, enabling recruiters to focus on candidate potential.
4. **Scalability for Growth**:
   - Design a system that can scale with businesses, from startups to enterprises with thousands of employees.
5. **Cross-Platform Usability**:
   - Provide employees and administrators with seamless access across desktop and mobile devices using a unified interface.
6. **Enhanced Security**:
   - Protect sensitive employee and company data with role-based access control and industry-standard encryption protocols.

1.3 Scope of Work

FusionHR platform encapsulates:

1. **Core Modules:**
   - Attendance Management: Real-time check-in/out and attendance tracking.
   - Leave Management: Multi-tier leave approval and real-time balance tracking.
   - Organization Tree: A hierarchical view of the company structure for better management.
   - Employee and Company Management: Tools to edit employee and company details, assign roles, and manage supervisors.
2. **Customizable Modules:**
   - Project Management: Creating, assigning, and tracking projects and associated tasks.
   - Resume Parsing: AI-powered parsing of CVs into structured data for efficient recruitment.
3. **Advanced Technologies:**
   - Integration of Google Cloud for future scalability and database connections.
   - Use of llama LLM for natural language processing tasks like resume parsing.
   - MySQL and Hibernate ORM for efficient data management.

1.4 Significance

FusionHR stands out by offering:

1. **Flexibility**:
   - Modular design allows businesses to pick and choose functionalities based on their needs.
2. **Scalability**:
   - Supports both startups and enterprises by adapting to varying organizational sizes.
3. **AI Integration**:
   - Advanced resume parsing streamlines recruitment processes, saving time and resources.
4. **Enhanced Productivity**:
   - Unified access to attendance, leave management, project tracking, and recruitment tools.
5. **Cost-Effective Customization**:
   - Upon utilizing billing for the system, businesses could pay for what they use.

2. Constraints

1. **Data Integrity**:
   - Maintaining data consistency across multiple modules, users, and companies.
2. **Scalability**:
   - Designing for businesses with as few as five employees to enterprises with thousands.
3. **AI Model Performance**:
   - Ensuring accurate resume parsing for diverse CV formats.
4. **Real-Time Synchronization**:
   - Ensuring all modules update seamlessly without delays.
5. **System Complexity**:
   - Balancing advanced functionality with user-friendly interfaces.

3. Literature Review

Human Resource (HR) systems have undergone significant transformation over the last two decades, evolving from manual, paper-based processes to sophisticated digital platforms that streamline workforce management. In the early days, HR professionals relied heavily on spreadsheets and physical documentation to manage tasks such as attendance tracking, leave approvals, and payroll processing. These traditional methods, while functional, were fraught with inefficiencies, errors, and time-consuming manual labor. Organizations struggled with data consistency, transparency, and scalability, especially as workforce numbers grew.

The advent of Enterprise Resource Planning (ERP) systems marked the first major shift in HR management. Solutions like SAP and Oracle introduced centralized platforms that offered integrated tools for managing employee information, payroll, and compliance. However, these systems were designed for large-scale enterprises and often came with high implementation costs, complex configurations, and steep learning curves. This made them inaccessible to smaller businesses and startups that lacked the resources for such extensive investments.

Over time, the emergence of modern, cloud-based HR platforms revolutionized the industry. Tools like BambooHR, Workday, Zoho People, and Gusto brought user-friendly interfaces and cost-efficient solutions, catering to organizations of all sizes. These systems provided features such as real-time attendance tracking, streamlined leave management workflows, centralized employee records, and tools for performance evaluation and goal setting. The move to cloud-based systems also enabled remote access, making HR operations more flexible and adaptable to the needs of a distributed workforce.

Despite these advancements, modern HR systems still face challenges in addressing the growing complexity of workforce management. As businesses scale and evolve, the demand for modular, customizable systems has increased. Companies now require platforms that allow them to add or remove features as their needs change, whether it's the integration of AI-powered recruitment tools, project management capabilities, or advanced analytics for decision-making. Furthermore, with the rise of hybrid and remote work models, there is an increasing need for tools that enable seamless remote collaboration, flexible attendance tracking, and digital workflows.

One of the most pressing gaps in current HR systems is the integration of artificial intelligence into recruitment processes. The traditional methods of screening resumes and shortlisting candidates are no longer sufficient to manage the sheer volume of applications many organizations receive. Advanced AI tools, such as those used for

resume parsing, can automate this process by extracting key information and structuring it into actionable insights, saving recruiters time and improving the quality of hires. Despite this potential, many HR systems still lack such capabilities or fail to offer them in an accessible, integrated manner.

Another notable challenge is the rigidity of many existing HR systems. While they excel in core functionalities, such as payroll and compliance, they often lack the flexibility to adapt to unique organizational workflows or integrate with external tools. This rigidity can hinder innovation and limit an organization's ability to address specific business needs.

The evolution of HR systems reflects the increasing demands of a global, digital-first economy. Organizations are no longer satisfied with static systems that perform basic tasks; they require dynamic, scalable platforms that grow with them. FusionHR aims to fill these gaps by providing a customizable, AI-driven solution that addresses not only the core HR needs but also the unique challenges of modern organizations. By bridging the gap between functionality, flexibility, and innovation, FusionHR represents the next step in the evolution of HR systems.

4. Methodology

FusionHR is built with the goal in mind of providing organizations with a comprehensive and customizable human resource management system. To achieve this, FusionHR adopts a modular approach, dividing the application into core functionalities essential for every organization and customizable modules that cater to specific needs. This methodology ensures scalability, adaptability, and ease of deployment for various organizational setups.

4.1 System Architecture and Design

4.1.1 System Architecture

A layered architecture is utilized in the development process of FusionHR along side with a 3 tiered server as shown in the image below:

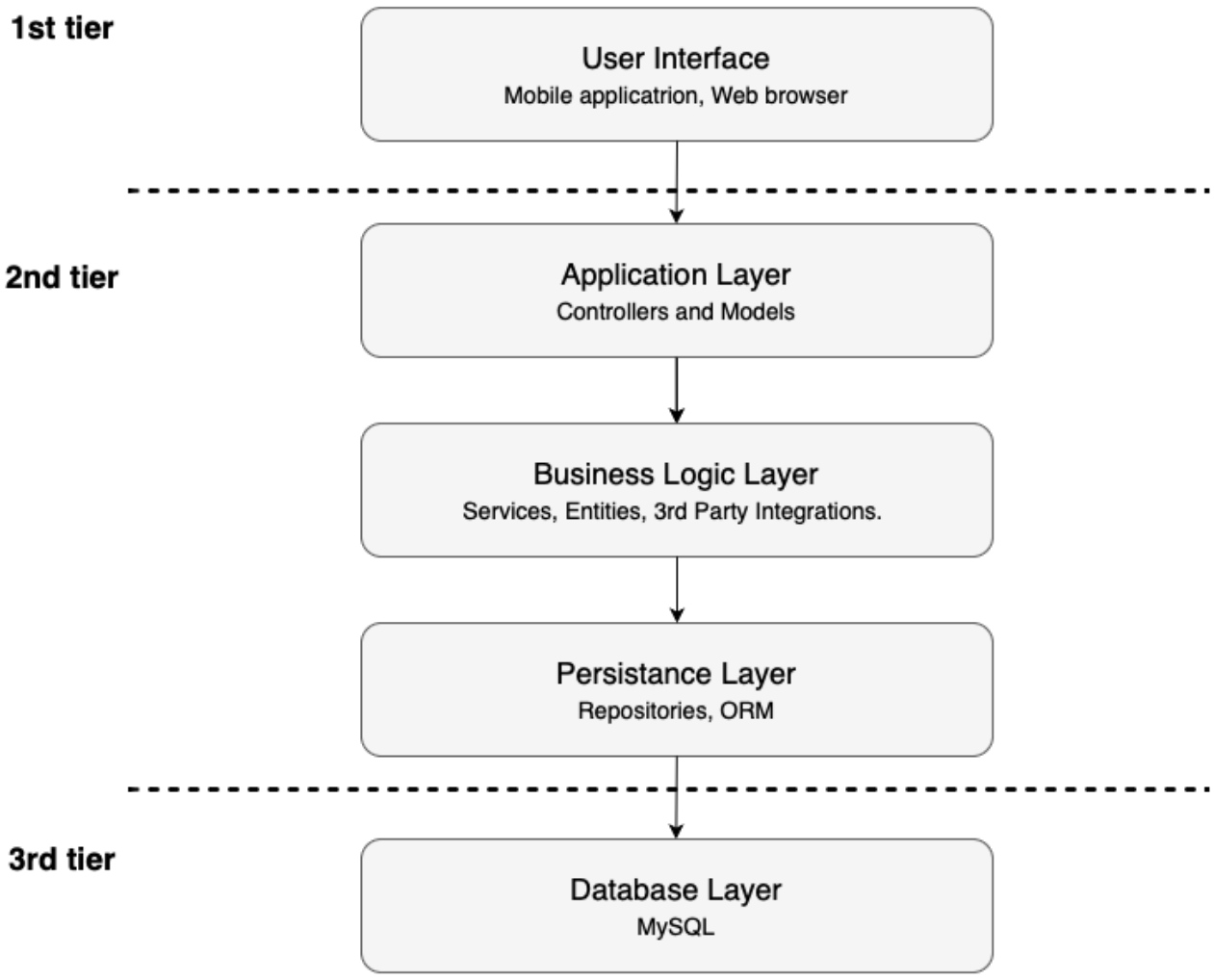


Figure (1): System Design

4.1.2 System Design

4.1.2.1 Application layer

A SPA Feature-Based architecture is used with client side rendering, which offers higher modularity and maintainability, alongside with a better performance because the browser is responsible for the pre-rendering of certain components.

4.1.2.2 Business Layer

As mentioned in the architecture section, FusionHR is a layered architecture system, but it is designed in a micro-service manner design, which is called a DDD microservice, of which is utilized in the business layer, where all services reside.

4.1.2.3 Persistence Layer

To support the micro-service architecture of FusionHR, we implemented the Repository Design Pattern, which ensures data consistency across multiple services while providing an abstraction layer between the business logic and database operations.

For each entity in the system, Spring Data JPA is used to create and manage repositories. The JPA Repository pattern provides a structured approach to handling database operations by encapsulating CRUD (Create, Read, Update, Delete) functionalities within dedicated repositories for each entity.

Each repository exposes common operations such as saving, deleting, and searching through predefined methods in JPARepository as well as custom queries using JPQL and Native SQL. This allows efficient data access without manually writing boilerplate SQL queries.

Additionally, Spring's transactional management ensures that each service operates within a separate transactional context, maintaining data integrity across the system. The EntityManager serves as the main access point to the database, enabling lazy loading, eager fetching, and caching strategies to optimize performance.

4.2 Technologies

4.2.1 Spring Boot

Spring Boot is a widely adopted Java-based framework that simplifies the development of web and enterprise applications. Built on top of the Spring Framework, Spring Boot streamlines the setup and configuration process by offering pre-configured templates and auto-configuration features, allowing developers to focus more on application logic rather than boilerplate setup. It facilitates rapid development by providing built-in tools such as embedded servers (Tomcat, Jetty) and seamless integration with third-party libraries. With its modularity and flexibility, Spring Boot is ideal for building scalable, maintainable micro-services architectures. It also includes robust support for REST APIs, security, and database interactions, making it a foundational technology for FusionHR.

Spring Boot is particularly suitable for handling the complex backend processes in an HR management system, such as attendance tracking, leave management, and employee data processing. Its ability to support modular architecture ensures that core and customizable modules can be developed, deployed, and maintained independently. Additionally, Spring Boot's comprehensive ecosystem integrates effortlessly with other tools like Hibernate for database management, enabling the creation of a seamless data layer for managing organizational information.

4.2.2 Flutter

Flutter is a cross-platform UI toolkit developed by Google that allows developers to build high-performance, visually appealing applications for multiple platforms, including iOS, Android, and the web, using a single codebase. Written in Dart, Flutter offers a rich set of pre-designed widgets that are customizable and optimized for rendering natively on various devices. Its hot-reload feature enables developers to see real-time changes, improving development efficiency and reducing debugging time. Flutter’s emphasis on delivering smooth, interactive user interfaces makes it a go-to choice for building front-end applications.

In the context of FusionHR, Flutter powers the frontend. It provides an intuitive and responsive interface for core functionalities like attendance marking, leave requests, and project management. With Flutter, the application ensures a consistent user experience across different platforms, making it accessible to all users on both Android and iOS devices. The framework also supports dynamic updates, enabling the integration of future features without requiring significant rewrites.

4.2.3 Google Cloud

Google Cloud is a comprehensive suite of cloud computing services that provide infrastructure, platform, and software solutions for modern applications. With its scalable storage options, high-performance computing capabilities, and robust security features, Google Cloud ensures that applications remain reliable and performant under varying workloads. Services like Google Cloud Storage, Compute Engine, and BigQuery allow organizations to manage and analyze data at scale while benefiting from built-in redundancy and disaster recovery capabilities.

FusionHR leverages Google Cloud for hosting its database, ensuring the secure storage of sensitive organizational data. Additionally, Google Cloud's global network ensures minimal latency and high availability, critical for a system supporting multiple organizations across different geographies.

4.2.4 MySQL

MySQL is a widely used open-source relational database management system (RDBMS) known for its reliability, scalability, and performance. It supports structured data storage, allowing for efficient querying and management of complex datasets. MySQL is well-suited for applications requiring transactional consistency and supports features such as indexing, replication, and advanced security protocols.

In FusionHR, MySQL serves as the primary database for storing employee records, attendance data, leave balances, and other organizational information. Its robust relational model ensures data integrity and simplifies the implementation of complex queries across different modules, such as generating payroll summaries or retrieving project-specific details. By using MySQL, the system achieves a balance between efficiency and scalability, ensuring smooth operations even with a growing dataset.

4.2.5 Hibernate (ORM)

Hibernate is an Object-Relational Mapping (ORM) tool for Java, simplifying database interactions by mapping Java objects to relational database tables. It eliminates the need for extensive SQL queries by allowing developers to manipulate data through Java objects using Hibernate's query language (HQL). Hibernate also provides features such as lazy loading, caching, and automatic schema generation, reducing development effort and improving application performance.

In FusionHR, Hibernate plays a critical role in bridging the gap between the Spring Boot backend and the MySQL database. It simplifies database operations, such as fetching employee details or updating leave balances, by abstracting complex SQL logic. Hibernate's ability to handle relationships between entities ensures seamless integration across different modules, such as linking employees with their supervisors or tracking assigned project tasks.

4.2.6 Llama

Llama, a family of large language models (LLMs), represents a cutting-edge approach to natural language processing (NLP) and machine learning. It is designed to perform a wide range of text-based tasks, such as language understanding, summarization, and classification, with high levels of accuracy. By leveraging advanced neural networks, Llama is capable of parsing unstructured data and converting it into actionable insights.

In FusionHR, Llama is employed for the CV parsing module, where it extracts meaningful information from resumes. The model converts raw text from uploaded CVs into structured JSON data, enabling recruiters to evaluate candidates efficiently. This automated process saves time, reduces manual errors, and ensures that critical information is not overlooked. Llama's adaptability and ability to handle complex language tasks make it a valuable asset in modernizing the recruitment process.

4.3 Sign-Up

4.3.1 Company Registration

The cornerstone of FusionHR begins with the company registration process. During onboarding, organizations provide essential details such as company name, email domains, and related data. This information allows the platform to tailor certain functionalities to the organization's specific needs. The admin account, created during this process, serves as the central authority to manage employees, configure organizational policies, and oversee operations.

Special attention was given to ensure the process is both secure and user-friendly. For instance, email domain verification prevents unauthorized users from accessing the system, and clear, guided workflows help admins set up departments, define roles, and establish reporting hierarchies effortlessly.

4.3.2 Employee Registration

Once a company is onboarded, employees can be added to the system either through invitations. Each employee is assigned specific attributes, such as their job title, department, work schedule, and supervisor. Employees are classified as full-time, part-time, or trainees, ensuring flexibility in organizational structuring. During registration, employees receive a secure email invitation, where they create their credentials and gain access to a personalized dashboard. Robust validation mechanisms ensure data integrity and security throughout this process.

4.4 Core Modules

4.4.1 Attendance Management

FusionHR's attendance module ensures real-time and accurate tracking of employee work hours. Employees log their attendance through a user-friendly web or mobile interface. The module automatically records check-in and check-out times, calculates total working hours, and flags inconsistencies like late arrivals or missed workdays. For added flexibility, employees can also log overtime or remote work hours, subject to approval by supervisors.

Integration with other modules, such as leave management, ensures comprehensive reporting. For example, employees marked as "on leave" are automatically excluded from attendance tracking for the day, eliminating manual oversight. This module also includes a reporting feature that allows HR personnel to generate detailed attendance analytics by employee, department, or time period.

4.4.2 Leave Management

The leave management module streamlines the leave request and approval process. Employees can request leaves via their dashboards, specifying the type of leave (annual, sick, or unpaid) and the duration. Supervisors and HR personnel review these requests, ensuring compliance with leave policies before approving or rejecting them.

Each employee's leave balance is dynamically updated, providing visibility into their remaining leave entitlement. A shared leave calendar helps supervisors manage overlapping leave requests, ensuring operational efficiency. Notifications for leave request updates ensure employees are kept informed at every step of the process.

4.4.3 Organization Tree

The organization tree is a visual representation of the company's hierarchical structure. It displays departments, teams, and reporting lines, making it easy for employees to identify their supervisors, subordinates, and team members. This feature is particularly valuable during organizational restructuring, allowing admins to seamlessly update the structure by adding, editing, or reassigning roles.

The tree is dynamically generated based on real-time data, ensuring accuracy. Additionally, it integrates with other modules such as attendance and project management, providing context to data like team performance or project assignments.

4.4.4 Edit Company and Employee Details

FusionHR provides a secure and intuitive interface for updating company and employee records. Authorized users can edit details such as department structures, employee roles, work schedules, and even personal information like skills and certifications. All changes are logged to ensure transparency and accountability. This module plays a critical role in maintaining up-to-date organizational data, which is essential for accurate reporting and analytics.

4.4.5 Supervisor Module

Supervisors are integral to FusionHR's workflow. This module provides supervisors with tools to manage their teams effectively, including the ability to approve or reject leave requests, monitor attendance, and assign projects or tasks. Supervisors also have access to team-specific reports, enabling them to track performance metrics and address any discrepancies.

Reassigning or removing supervisors is a straightforward process, ensuring that the organizational structure remains adaptable to changing needs.

4.5 Customizable Modules

4.5.1 Project Management

The project management module is designed to simplify task allocation and resource tracking. Employees or supervisors can create projects by providing details such as the project name, client information, and deadlines. Team members are then assigned to these projects, and specific jobs are created for each employee based on their role.

Employees can log their hours worked on specific projects, indicating whether the hours are billable or non-billable. This data integrates seamlessly with attendance records, ensuring consistency and accuracy. The module also includes a reporting feature that provides insights into project progress, resource utilization, and billable hours, enabling organizations to evaluate project efficiency.

4.5.2 Resume Parsing

The resume parsing module is a game-changer in recruitment processes, leveraging advanced AI-driven techniques to extract and organize data from resumes. Before designing this module, we conducted an extensive data collection process. Resumes from industries such as technology, finance, and insurance were analyzed to identify common fields and patterns. Using this data, we developed a structured approach to extracting information from resumes, which includes fields like education, work experience, skills, and certifications.

When a recruiter uploads resumes for a specific position, the module uses a Large Language Model (LLM) to parse the resumes into structured JSON. The system sends the resume's extracted text and a tailored instruction prompt to the LLM. The LLM processes the content and returns a well-organized JSON structure. This parsed data is stored alongside the original resume in the database, enabling recruiters to view and evaluate candidates efficiently.

The inclusion of this module significantly reduces the time and effort required for candidate screening. By automating data extraction, recruiters can focus on making informed decisions rather than spending time manually analyzing resumes.

4.5.2.1 Training the AI for Resume Parsing

An important aspect of developing the resume parsing module was ensuring that the AI could handle the diversity and complexity of resumes. To achieve this, we collected a small dataset of resumes across multiple industries. This dataset provided insights into common resume structures, language styles, and field requirements.

Using this information, we crafted a detailed instruction prompt for the LLM, guiding it to extract all relevant fields while handling missing or ambiguous data. The model's performance was rigorously tested with resumes from different fields to ensure accuracy and consistency. The result is a robust parsing system capable of delivering high-quality structured data for even the most unstructured resumes.

By adopting these methodologies, FusionHR delivers a scalable and efficient HR management platform tailored to meet the diverse needs of organizations. Each module is designed with a focus on usability, security, and modularity, ensuring that businesses can adapt the system to their unique requirements without compromising performance or functionality. The flexible architecture ensures seamless integration between core and customizable modules, providing a unified platform for managing all HR-related activities.

5. Results & Outcomes

5.1 Security Configuration

The security configuration for FusionHR utilizes JWT authentication and authorization; it works as follows: The process begins when a customer or client sends an HTTP request to our backend system, which runs on a Spring Boot container using an embedded Apache Tomcat server.

As a reminder, the first thing executed in a Spring application is the filter. Whenever you create a filter, note that it will always be the first component to execute. In this case, the JWT Authentication Filter is executed first. This filter runs once per request and is responsible for validating and checking the JWT token.

❖ **Process Overview:**

1. **Token Check:**
   The filter first checks if the JWT token is present. If the token is missing, a 403 response is sent to the client with the reason "Missing JWT."
2. **Token Validation:**
   If the token is present, the validation process begins. The filter uses the User Details Service to fetch user information from the database. This is done using the user's email, which is extracted from the JWT token (referred to as the "subject" in JWT terms).
3. **User Verification:**
   Once the user details are fetched, the filter performs checks:
   - If the user does not exist, a 403 response is sent to the client.
   - If the user exists, the token validation process continues.
4. **Token Validation Mechanism:**
   The JWT token is validated against the user for whom it was generated. This is done by calling a JWT Service, which takes the user and the token as parameters.
5. **Validation Outcomes:**
   - If the token is invalid (e.g., expired or not for the specified user), a 403 response is sent with the reason "Invalid JWT."
   - If the token is valid, the Security Context Holder is updated to indicate that the user is authenticated. This informs the rest of the filter chain that the user is authenticated for the request.

6. **Authority Check:**
   After the token is validated, the system checks if the user has the required authority to access the requested endpoint or resource. The user's authorities are included in the JWT token claims. If the user does not have the necessary permissions, a 403 response is returned with the reason "Insufficient Authority."
7. **Company Access Check:**
   The system also verifies if the user belongs to the company associated with the requested data. The user's company ID is included in the JWT token claims. If the user does not belong to the company, a 403 response is returned with the reason "Unauthorized Company Access."
8. **Request Dispatch:**
   Once all security checks pass (token validation, authority check, and company access check), the request is dispatched to the Dispatcher Servlet, which forwards it to the appropriate controller. The controller executes the necessary logic (e.g., calling services, accessing the database) and sends a response (e.g., a new JWT token or an HTTP 200 status).

❖ **Key Claims in the JWT Token:**

1. User ID: Unique identifier for the user.
2. Email: User's email address (used as the token subject).
3. Authorities: Roles or permissions assigned to the user.
4. Company ID: Identifier for the company the user belongs to.

This enhanced security configuration ensures that only authenticated users with the correct permissions and company access can interact with the requested resources or endpoints. the image below shows how the above works.

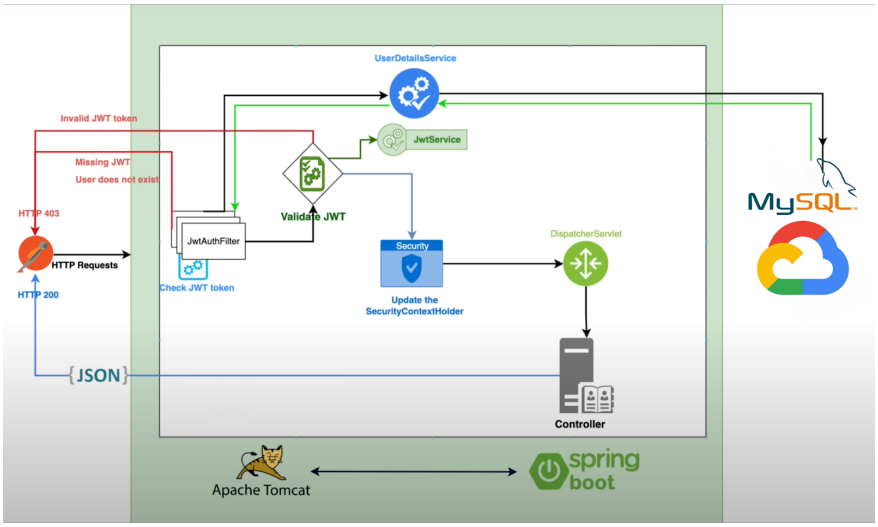


Figure (2): JWT Springboot Authentication Infographic

5.2 Authorities

One of the main selling points of FusionHR is the diversity and custom authority; the system has no hard-coded nor embedded roles in it, and it thrives on customizability and the freedom of its users. With over 20 authorities, the system dynamically checks the token required for authentication and authorization to determine whether the user can access the requested API endpoint, view a resource, or even access a page.

Each request (except for login/signup) has a PreAuthorize annotation from Springboot, which checks if the user has the authority required to access the resource or perform a request.

The image below shows the authorities currently present in the system; these authorities are assigned to each work title, thus inherited by each employee having that title, this process will be detailed in the next sections

1	21	ADD_EMPLOYEE
2	33	ADD_HOURS_INTO_PROJECT
3	28	APPROVE_REJECT_LEAVES
4	17	ATTENDANCE
5	24	CREATE_ANNOUNCEMENT
6	43	CREATE_POSITIONS
7	31	CREATE_PROJECT
8	23	EDIT_COMPANY
9	22	EDIT_EMPLOYEE
10	20	EDIT_PROFILE
11	34	EDIT_PROJECT
12	26	PAYROLL
13	27	REQUEST_LEAVE
14	25	VIEW_ANNOUNCEMENTS
15	41	VIEW_ATTENDANCE
16	29	VIEW_LEAVE
17	18	VIEW_MONTHLY_ATTENDANCE
18	30	VIEW_ORGANIZATION_TREE
19	19	VIEW_PROFILE
20	32	VIEW_PROJECT
21	42	VIEW_RESUMES

Figure (3): System Authorities

5.3 Sign up

5.3.1 Company Sign Up

This symbolizes the first step in our system: to enter your company details, the implementation at hand was to create a multi-stage sign-up for the company, the data includes -but is not limited to - The company name, creator email in case anyone wants to refer to him, email domains that the employees emails will contain, a list of key-value representing the tax codes and countries in which the company operates in, a list of leave types and departments that contains the work titles that all will be discussed later on, and finally a start and end time of a work day.

Below shows the multi-stage process:

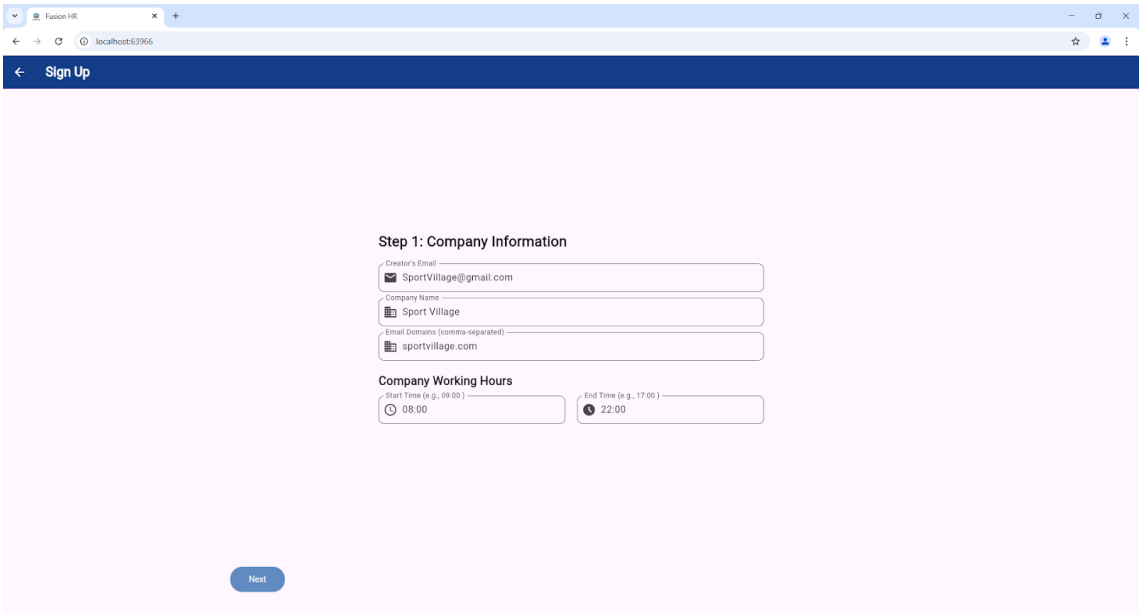


Figure (4): Company Sign Up (Stage 1)

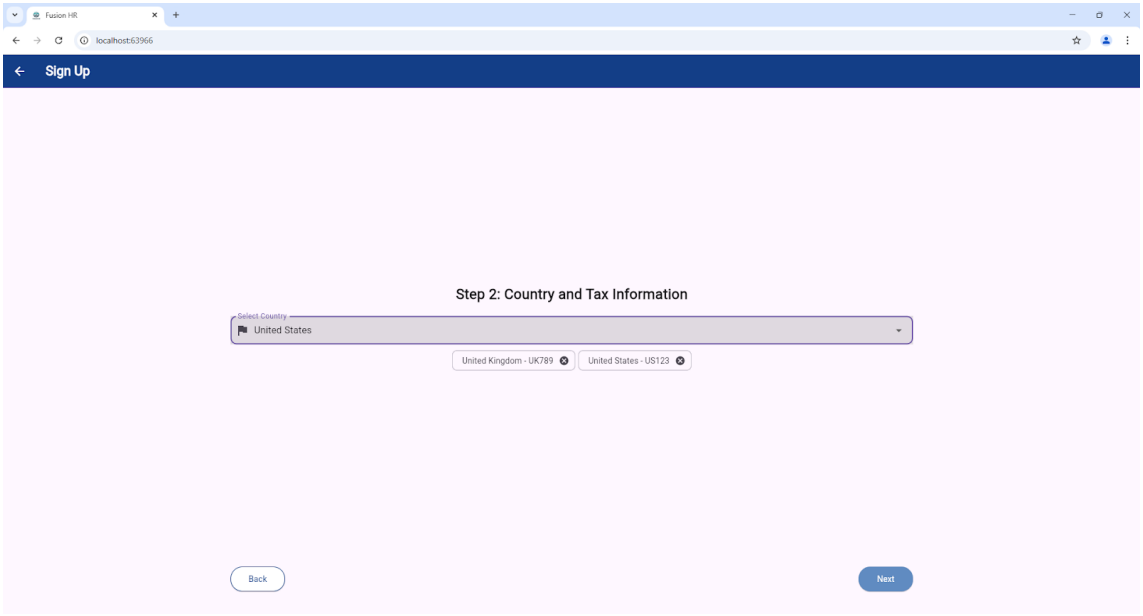


Figure (5): Company Sign Up (Stage 2)

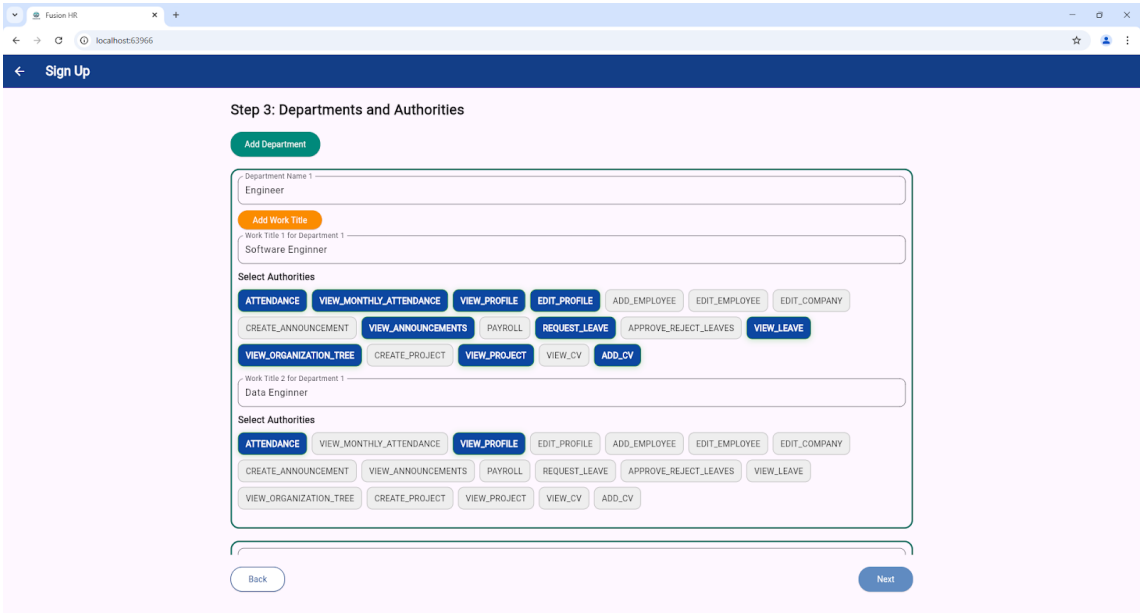


Figure (6): Company Sign Up (Stage 3)

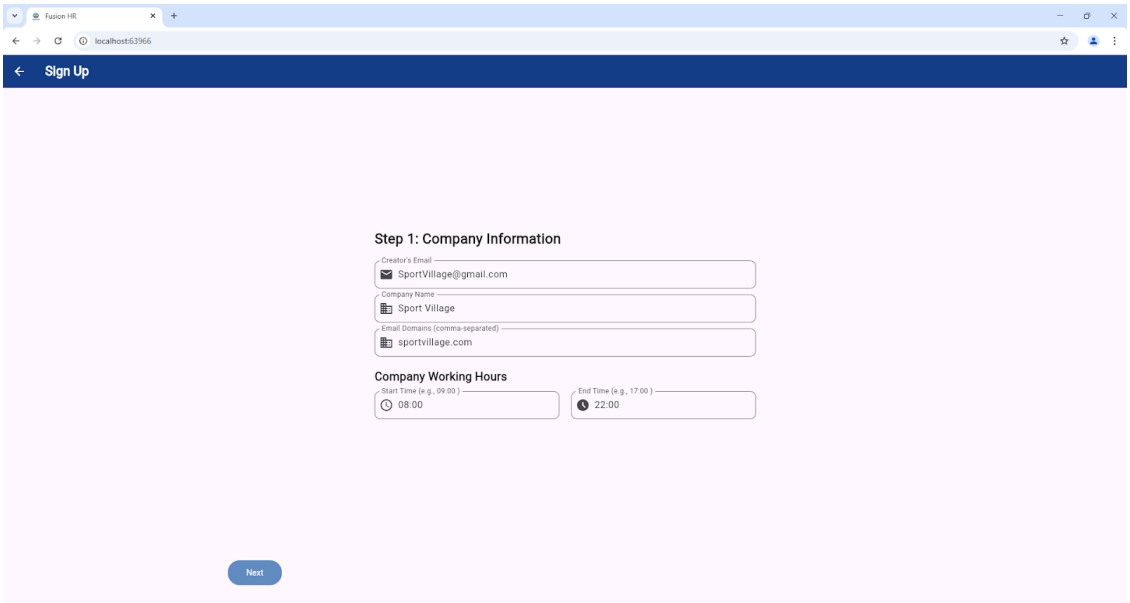


Figure (7): Company Sign Up (Stage 4)

5.3.2 Employee Sign Up

An employee can not sign himself up for the system; he gets invited to it via his company if the employee's email domain is not the same as one of the domains registered in the system for this specific company, then the invitation fails, the data required for the employee to be invited other than the email are his name, employee internal ID (the internal ID and the email are a composite primary key), phone number, address, skills, an enumeration employee type that could have one of the values (TRAINEE, FULL_TIME, PART_TIME), a supervisor (a reference to another employee) an encrypted password that no one knows other than the employee himself, a work schedule enumeration that has one of two values (SUNDAY_TO_THURSDAY and MONDAY_TO_FRIDAY) and finally, an employee status flag that displays if the employee checked in or not, or if he's on a leave. After confirming all data, an email is sent to the employee with the password.

The image below shows the screen where an employee is invited.

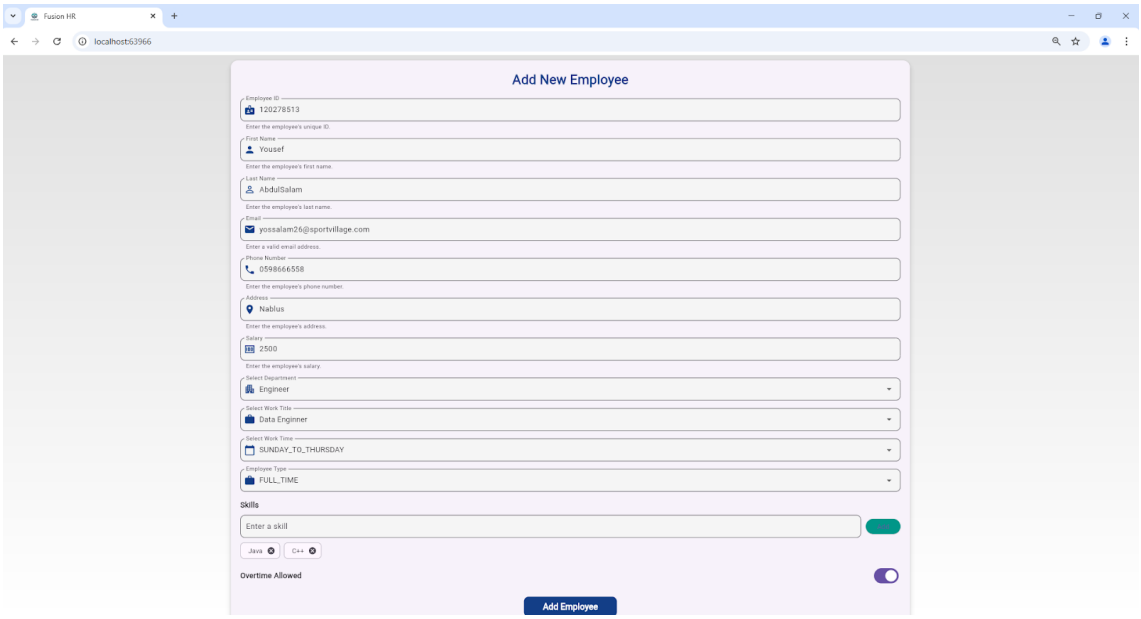


Figure (8): Employee Sign-Up Page

5.4 View/ Edit Company & Employee

5.4.1 View Company & Employee

Upon having the correct authorities, a user can view the information of a company or an employee as shown below:

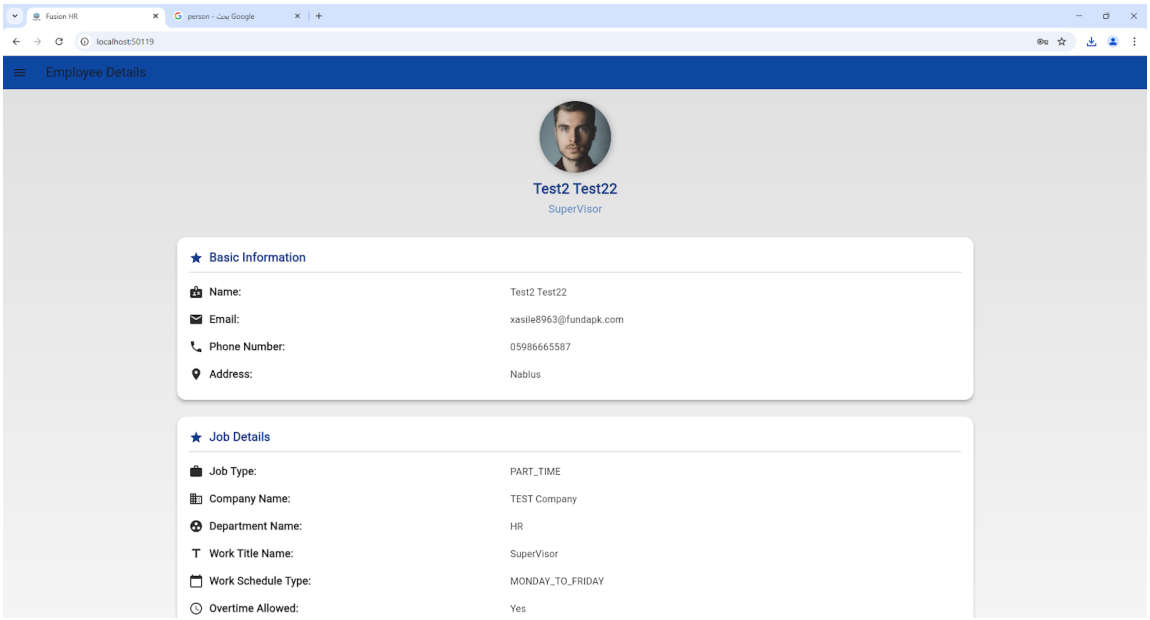


Figure (9): View Employee Profile

5.4.2 Edit/Update Data

If the employee has the required authority, an employee can edit the information of a company, add/delete departments, work titles, and tax codes/countries.

An employee can edit his profile if he has the authority to do it and can change his profile picture if he wants to do that.

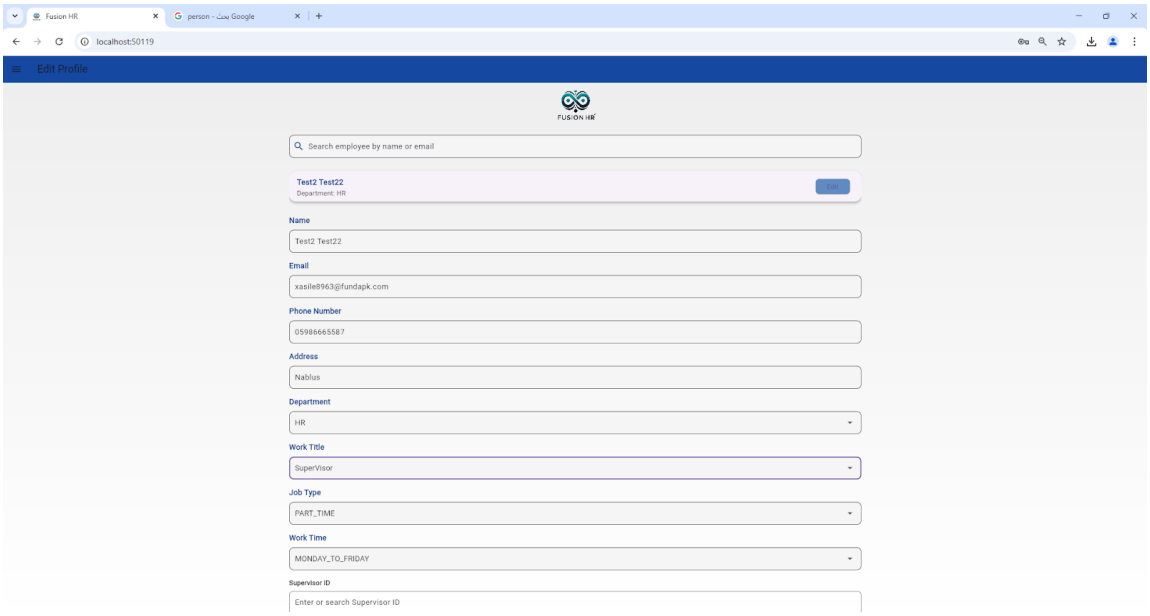


Figure (10): Update Employee Data

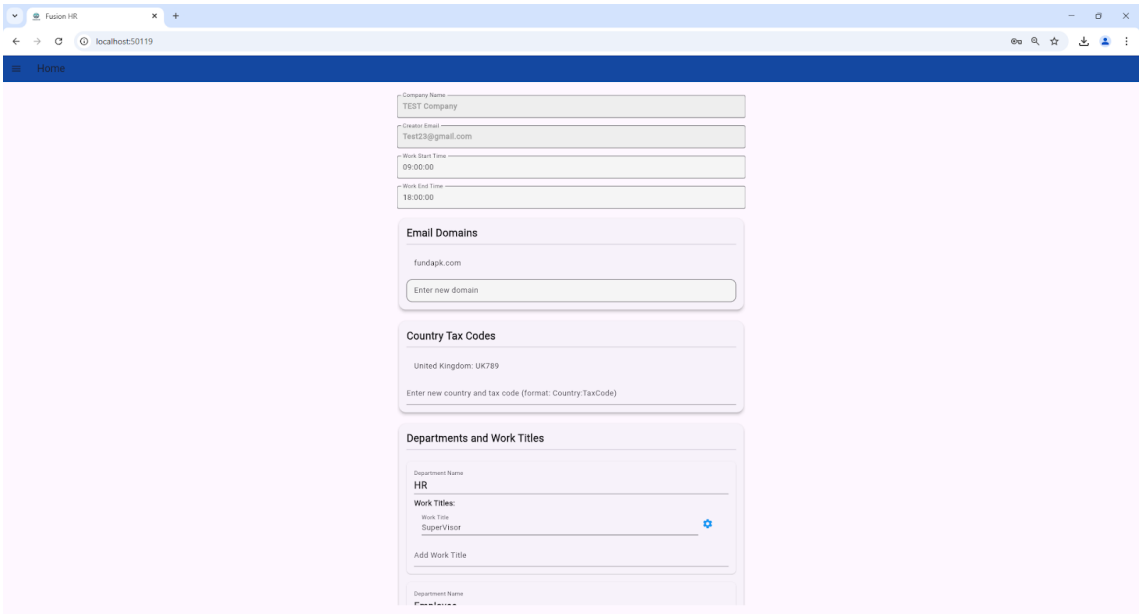


Figure (11): Edit Company Data

5.5 Core modules

5.5.1 Departments Work-titles

As key entities in any organization/company, having steady departments and work titles reinforces the company's hierarchy, here is how they work:

Every department belongs to only one company and has multiple work titles, each one of the latter has authorities associated with it that allow each employee to perform operations according to their work title, and each work title has minimum hours required weekly for each employee to work, in addition to a salary to allow for a payroll functionality.

Employees must be assigned a department and a work title that belongs to this department, this is allowed via the auto-select in the "invite employee" window shown earlier. Upon the deletion of a department or work title, it must be empty of all employees, or it won't be deleted.

5.5.2 Countries, Tax Codes, and Payroll

Payroll and taxes are a bit tricky, we tried to implement them at our best but were not in a presentable state. Our implementation focuses on the possibility of the company having multiple offices around the globe, thus needing a way to calculate the salary of the employees based in different regions, so the approach at hand was that each company chooses its ideal tax code that is paired with its associated country, and at payroll, the employee with the financial manager authority will have the ability to manage it by occurring the salary of the employee via the work title and applying income taxes according to the tax code at hand.

The image below shows a static page following this approach:

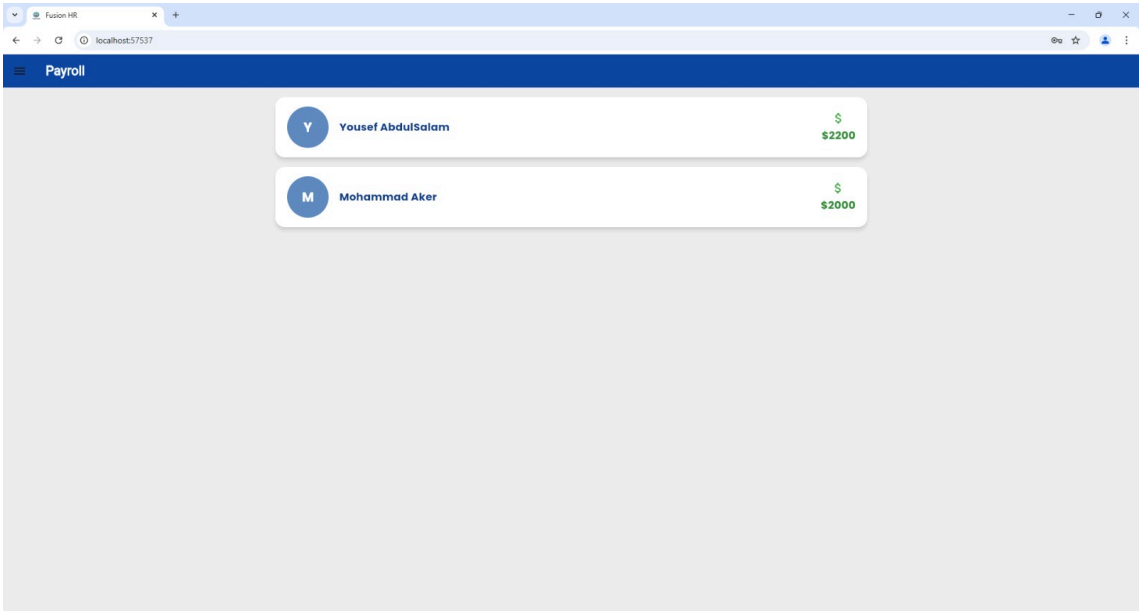


Figure (12): Payroll Page

5.5.3 Attendance

Attendance and employee presence are key features in any HR system; every employee has a status according to his attendance (CHECKED_IN, CHECKED_OUT, ON_LEAVE, ABSENT), this status changes according to certain actions and requests that the employee performs, we have divided these actions into the following:

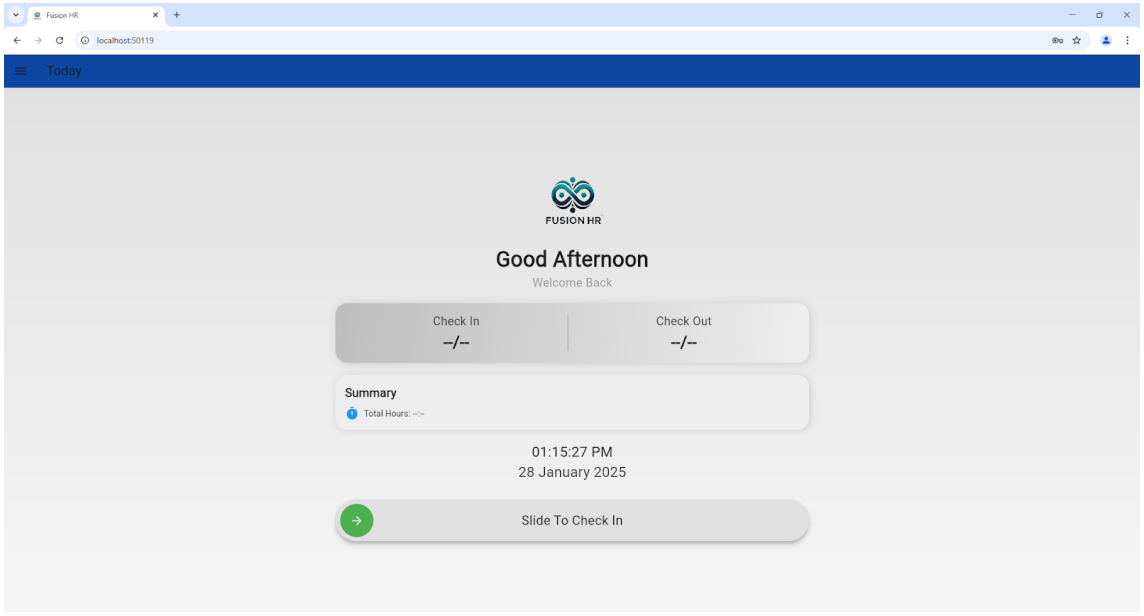
5.5.3.1 Check-in

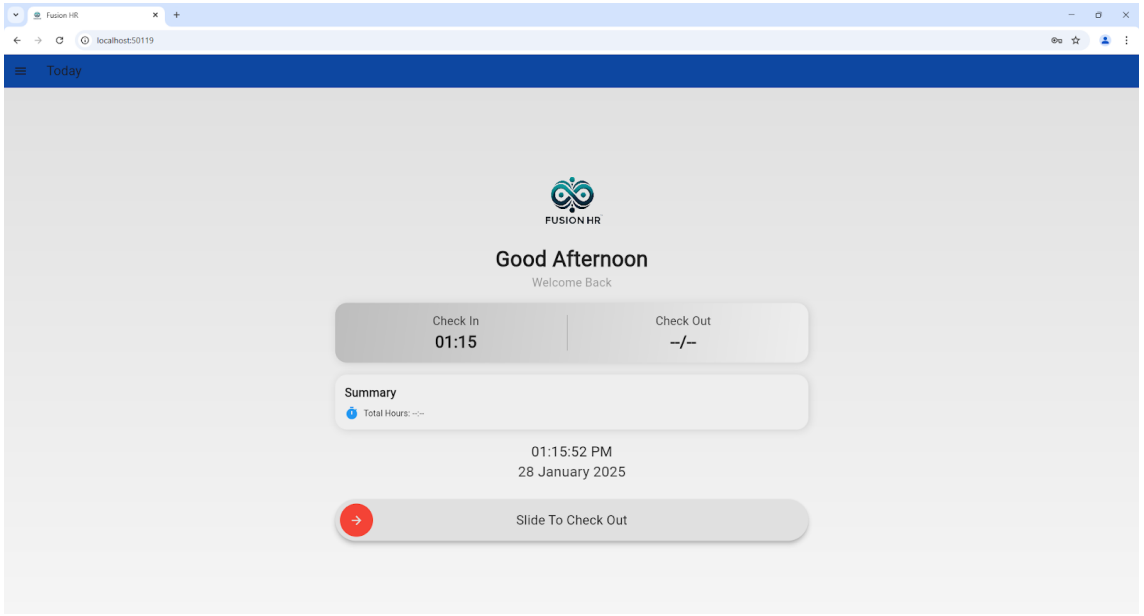
This is the "starter" action that succumbs to 2 conditions: whether this day is one of the days of the work schedule of the employee, if not, then check if the employee is eligible/approved for overtime by his superior, if any of these conditions are not met, then the employee can not check-in. When an employee successfully checks in, an attendance record is created in the database to reference the employee's shift with a timestamp for checking in.

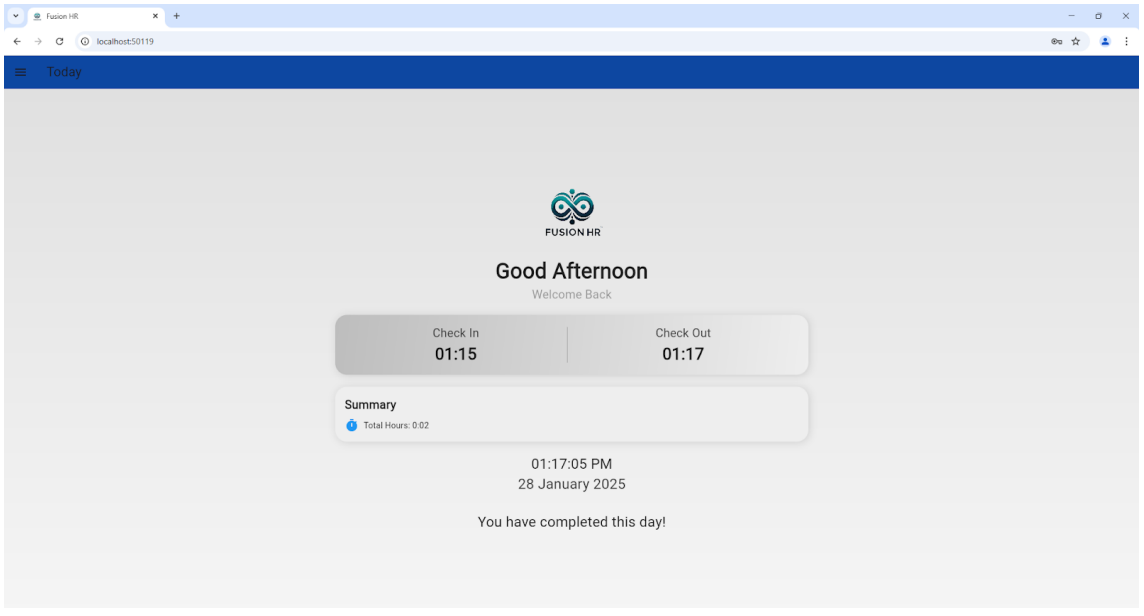
5.5.3.2 Check-out

Upon checking out, the attendance record is updated, a timestamp for checking out is added, and the duration of the shift is added and displayed for the employee to see. In the backend, it is determined if the shift is overtime or not so that it can be added to the employee's monthly hours.

Every day at midnight, the status will reset to ABSENT for all employees except those that are approved for a leave, it will be set as ON_LEAVE.


Fusion HR
localhost:50119
Today
FUSION HR
Good Afternoon
Welcome Back
Check In
--/--
Check Out
--/--
Summary
Total Hours: --:--
01:15:27 PM
28 January 2025
Slide To Check In


Fusion HR
localhost:50119
Today
FUSION HR
Good Afternoon
Welcome Back
Check In
01:15
Check Out
--/--
Summary
Total Hours: --:--
01:15:52 PM
28 January 2025
Slide To Check Out


Fusion HR
localhost:50119
Today
FUSION HR
Good Afternoon
Welcome Back
Check In
01:15
Check Out
01:17
Summary
Total Hours: 0:02
01:17:05 PM
28 January 2025
You have completed this day!

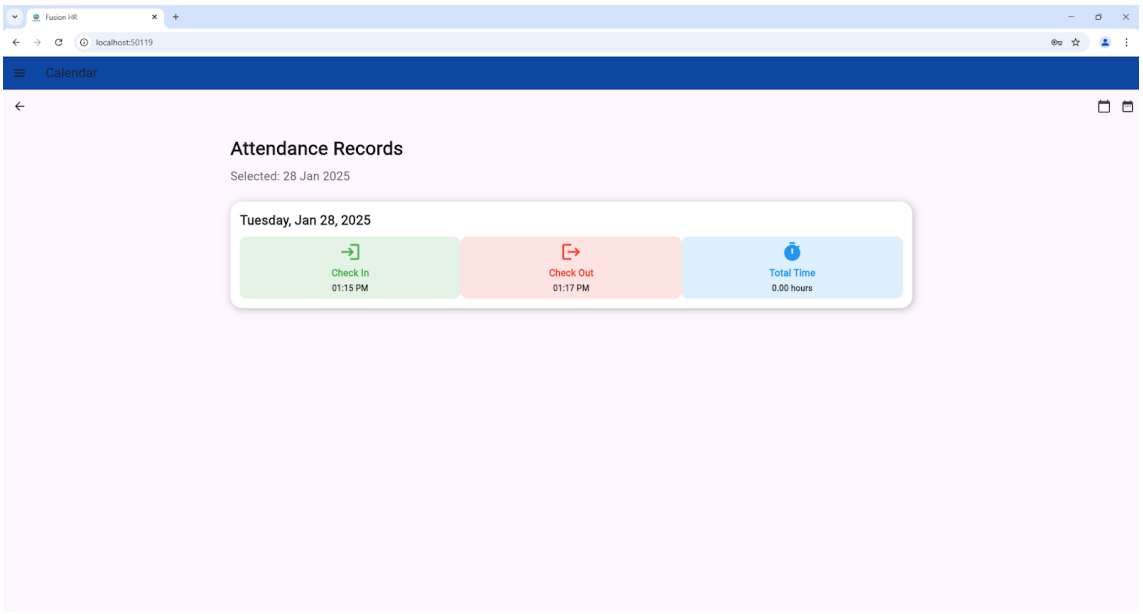


Figure (16): Attendance Record View

5.5.4 Leaves

5.5.4.1 Leave Types

With creating each company, the creator is prompted to create leave types for his company and set the maximum allowed days for this leave and if it is paid or not, this ensures that the dynamic and customizable nature of FusionHR.

5.5.4.2 Leave Balance

Upon creating each employee, an employee leave balance is created for each leave type the company has to keep track of the remaining days an employee has on each leave, going this way ensures no cross-contamination regarding leaves occurs, and no multi-layer data is created.

5.5.4.3 Leave Requests

An employee could choose one of the available leave types, and an internal check kicks in to see if the user has any credit for the requested leaves left, an error shows up if anything is faulty on the user's end.

5.5.4.5 Leave Requests Approval

Upon the submission of a leave request, it will appear to 2 types of users:

1- To those who have the authority to approve leaves.

2- To the employee's supervisor.

The approval and rejection depend on those 2 types of users, if the employee does not have a supervisor, then only one approval from a user with the required authority will suffice, if he does, then he will need an additional approval from the supervisor to mark the leave as approved. When it is approved, the credit will be subtracted depending on the approved amount.

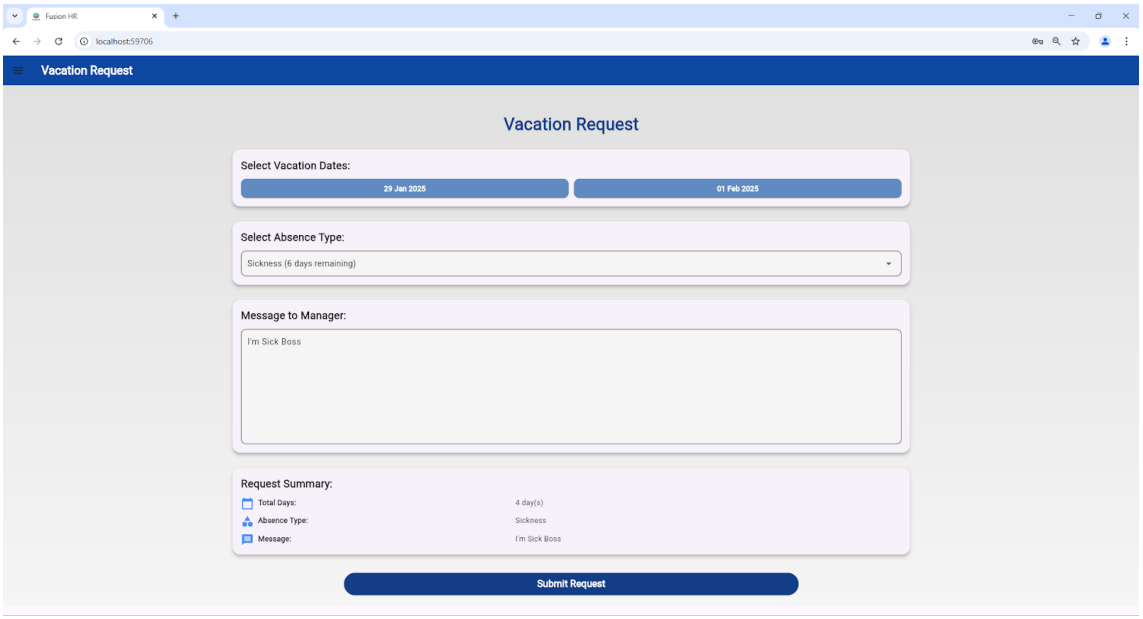


Figure (17): Leave Request Page

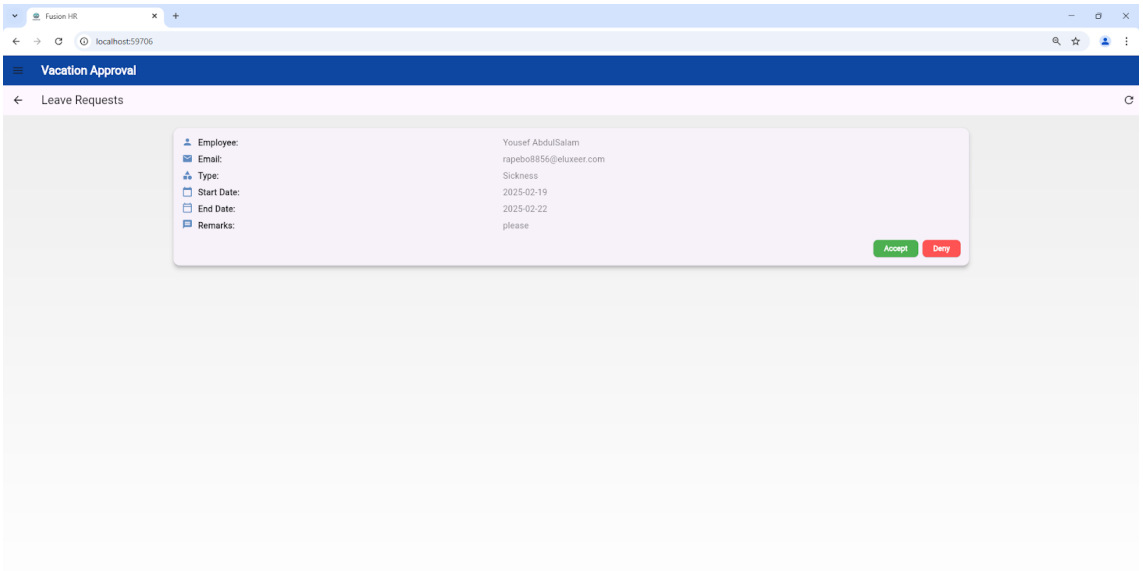


Figure (18): Approve/Reject Leave Request Page

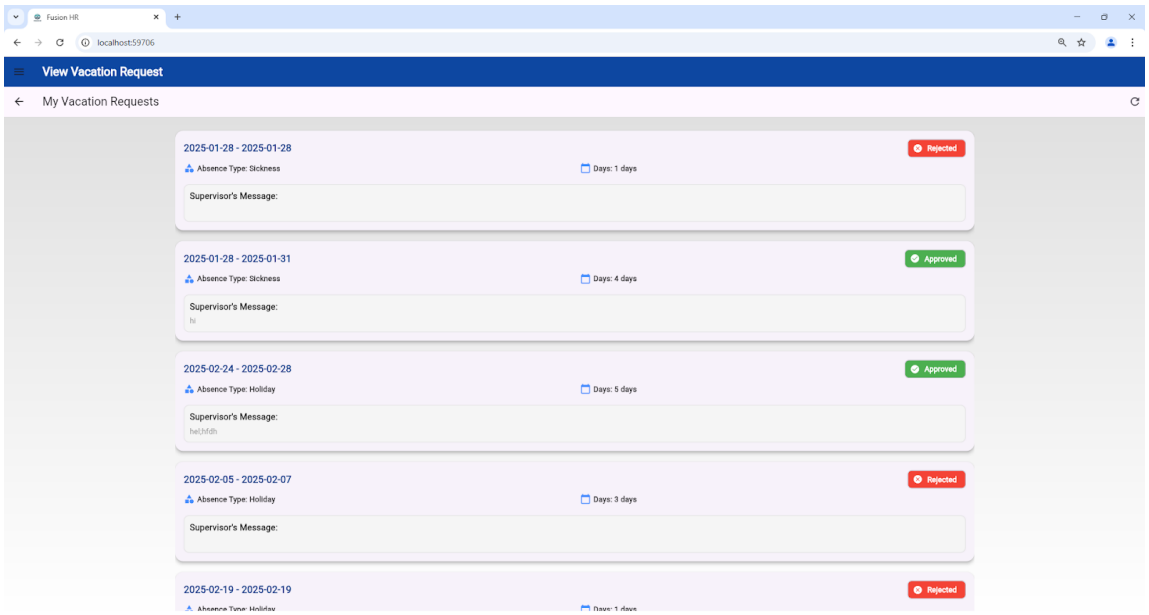


Figure (19): Leave Requests Status Page

5.5.5 Announcements

Announcements play a crucial role in internal communication within a company. The announcement feature in FusionHR allows HR representatives, managers, and authorized employees to share important updates with their teams. Each announcement is linked to a specific company and includes essential metadata such as a title, content, timestamp, and the creator's details.

From a technical perspective, announcements are stored in the database and retrieved based on company association, ensuring that employees only see relevant updates from their own organization. When an announcement is created, the system automatically logs the creator's ID and timestamp, preventing unauthorized edits. To optimize performance, announcements are retrieved in reverse chronological order, displaying the latest updates first.

Employees can view all announcements related to their company through a structured API that ensures proper access control. To prevent data breaches, the system verifies that users only retrieve announcements linked to their company. If an unauthorized request is made, the system returns an appropriate 403 Forbidden response.

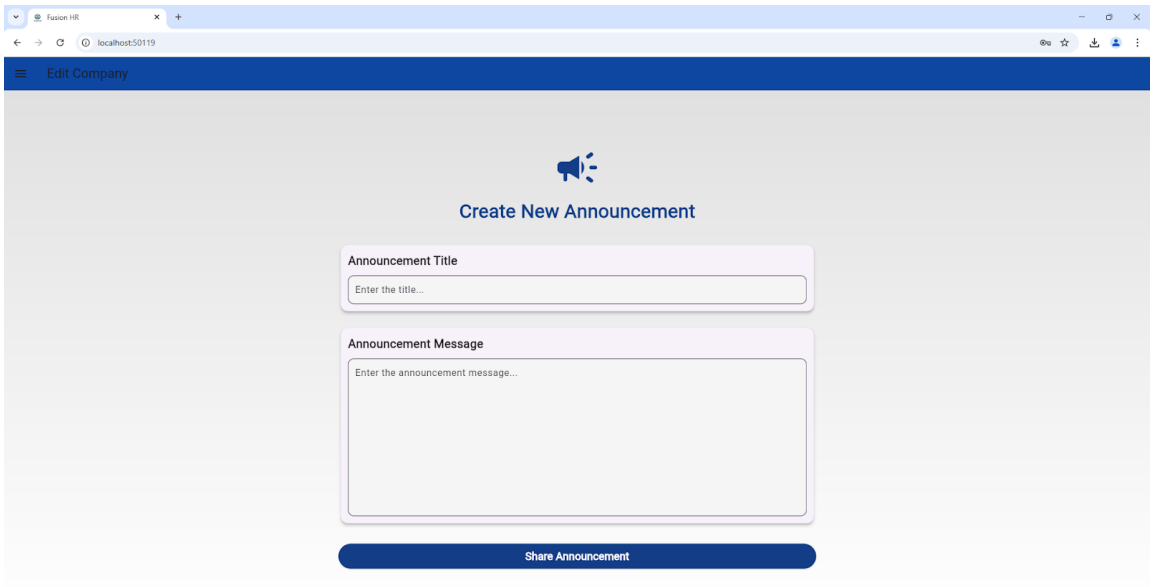


Figure (20): Create Announcement

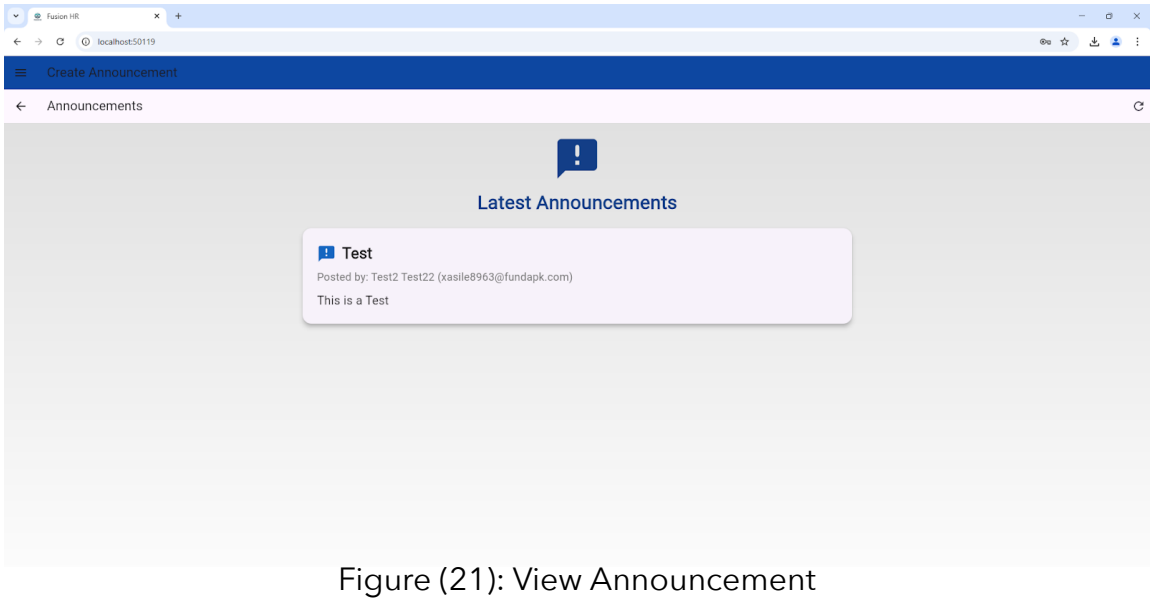


Figure (21): View Announcement

5.6 Customizable Modules

5.6.1 Project Management Module

The Project Management Module enables companies to track projects, assign employees to specific jobs, and log working hours. This module enhances team coordination by allowing managers to define projects, assign specific employees, and monitor their progress in real time.

Each project is uniquely identified and linked to a company and its creator. Employees assigned to a project are stored in a many-to-many relationship, ensuring flexibility in assigning multiple employees to multiple projects. Within each project, specific jobs can be created and assigned to individual employees. These jobs contain details such as job responsibilities, required skills, and deadlines, allowing clear role assignments.

To ensure accurate work tracking, employees log their working hours within the system. When logging hours, employees must select the project and the job they worked on, specify the number of hours, and indicate whether the work is billable to a client or non-billable. This information is critical for payroll calculations and project cost analysis. The system also includes restrictions to prevent employees from logging hours for projects they are not assigned to, maintaining data integrity and accuracy.

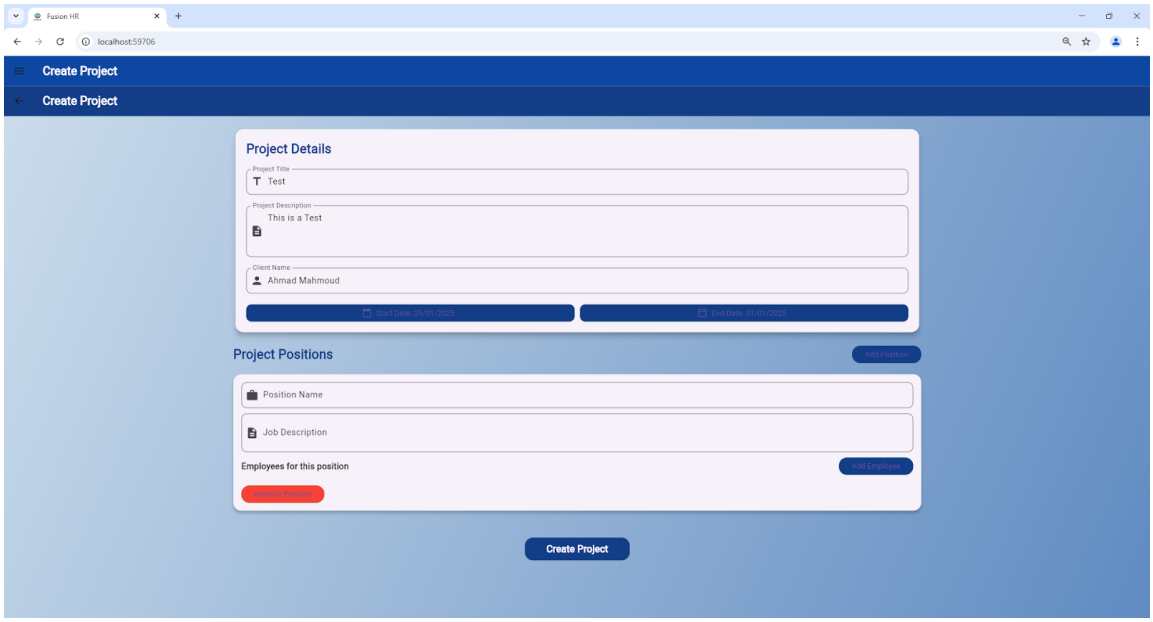


Figure (22): Create Project

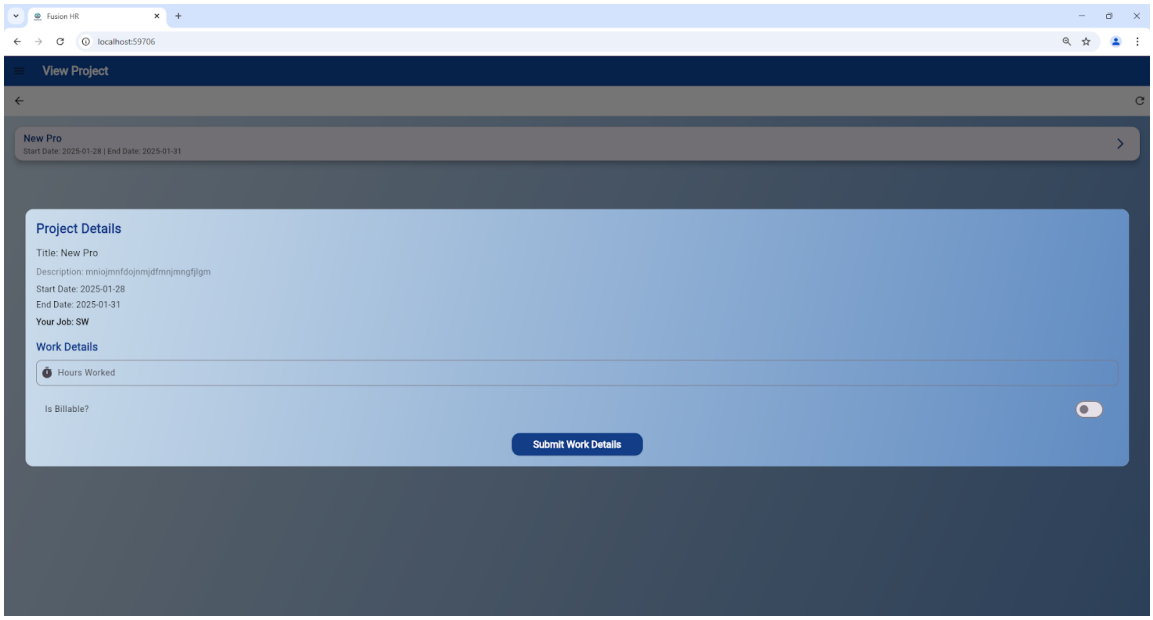


Figure (23): Assign Hours to Project

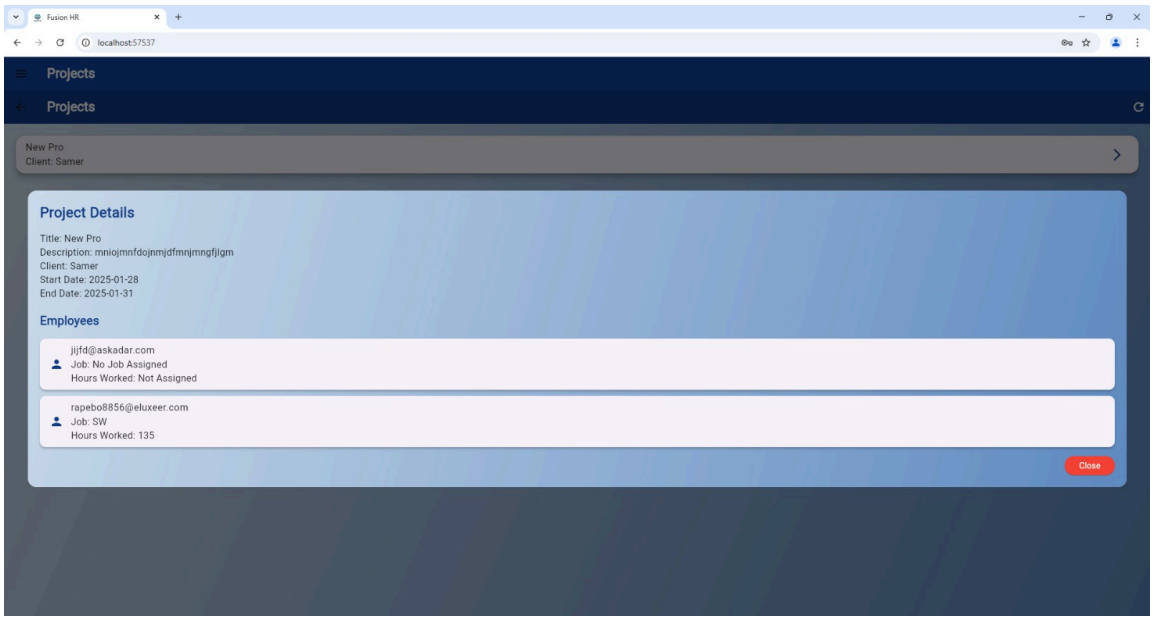


Figure (24): View Project Details

5.6.2 Resume Parsing Module

The Resume Parsing Module streamlines the recruitment process by allowing recruiters to upload resumes, extract structured data, and associate candidates with job positions. Traditionally, HR teams spend a significant amount of time manually reviewing resumes and extracting key details such as education, experience, and skills. With FusionHR's automated approach, this process is significantly accelerated.

When a resume is uploaded, the file is stored as binary data (BLOB) in the database, ensuring that the original document remains accessible for download. The system then extracts text from PDF resumes using Apache PDFBox, an advanced text extraction tool. This extracted text is formatted into a structured JSON template before being sent to Reasoner v1, a locally hosted AI model optimized for structured information extraction.

The Reasoner v1 model is specifically trained to analyze resume text and categorize it into predefined sections such as education, work experience, projects, skills, and certifications. Unlike traditional keyword-based parsers, Reasoner v1 employs natural language processing (NLP) to understand context and structure, ensuring a high level of accuracy.

To enhance performance, the system was fine-tuned using resume samples from multiple industries, including technology, finance, and insurance. This allows it to recognize industry-specific terms and structures, making it adaptable to different recruitment needs.

Once parsing is complete, the structured resume data is stored alongside the original resume and is available for search and filtering. Recruiters can search for candidates based on specific criteria, such as years of experience, technical skills, or education level. This significantly reduces the time required to identify suitable candidates for a job position.

Additionally, HR teams can retrieve original resume files directly from the system, rather than receiving resumes as raw data. This ensures that both structured and unstructured resume data remain available, providing full transparency and flexibility in the recruitment process.

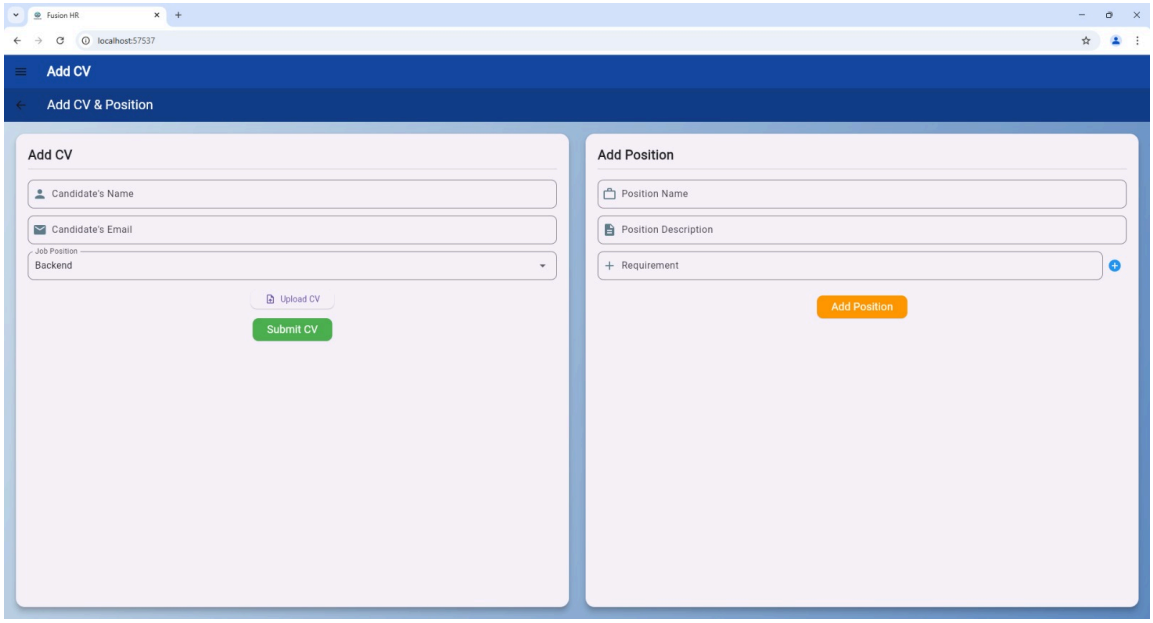


Figure (25): Resume Parsing Main CV

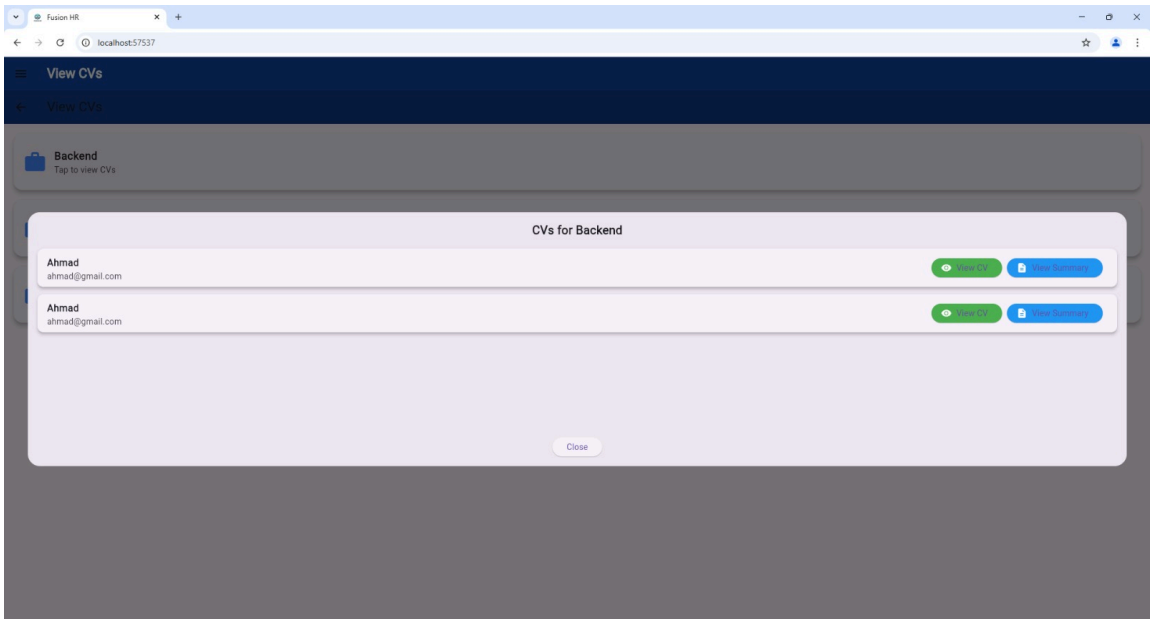


Figure (26): View Positions & Candidates

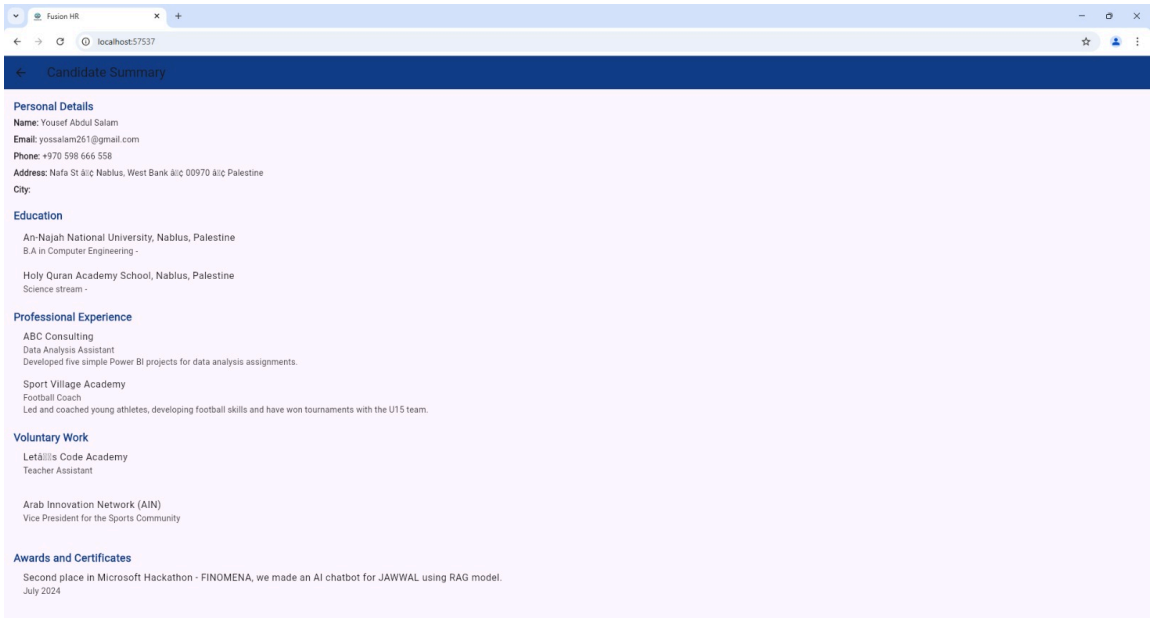


Figure (27): Parsed CV

5.6.2.1 Model Training and Customization

A key feature of the Resume Parsing Module is the ability to fine-tune and customize the AI model to adapt to an organization's hiring needs. Initially, the system was trained using a diverse set of resumes from multiple industries, allowing it to generalize well across different domains. However, organizations can further improve parsing accuracy by uploading additional resumes specific to their field, effectively enhancing the model's ability to extract relevant industry-specific information.

The Reasoner v1 model used in FusionHR is instruction-tuned to extract structured information from resumes based on a predefined JSON template. Instead of manually defining rigid rules for text extraction, the system relies on contextual understanding and natural language inference to identify key resume components.

This adaptive approach ensures that the model remains effective across varying resume formats, even when processing resumes with unconventional structures or non-standard layouts. Furthermore, since the model runs locally, organizations maintain full control over their data, ensuring privacy and security compliance.

5.6.2.2 Job Position Management

Recruiters and HR managers can create job positions within the system, specifying details such as job title, description, and required qualifications. Each position is linked to a company and a creator (HR or recruiter). Once a position is created, resumes can be uploaded and associated with it, enabling an organized recruitment pipeline.

When reviewing a job position, recruiters can see all associated resumes in a structured format. They can filter candidates based on parsed resume data, allowing them to quickly identify the most qualified applicants.

Additionally, the parsed resume data can be exported for further analysis or integrated with other HR systems, providing seamless data transfer across recruitment workflows.

5.7 Miscellaneous and Mobile screens

This section contains login screen, landing page, and mobile screenshots with the same functionality explained above.

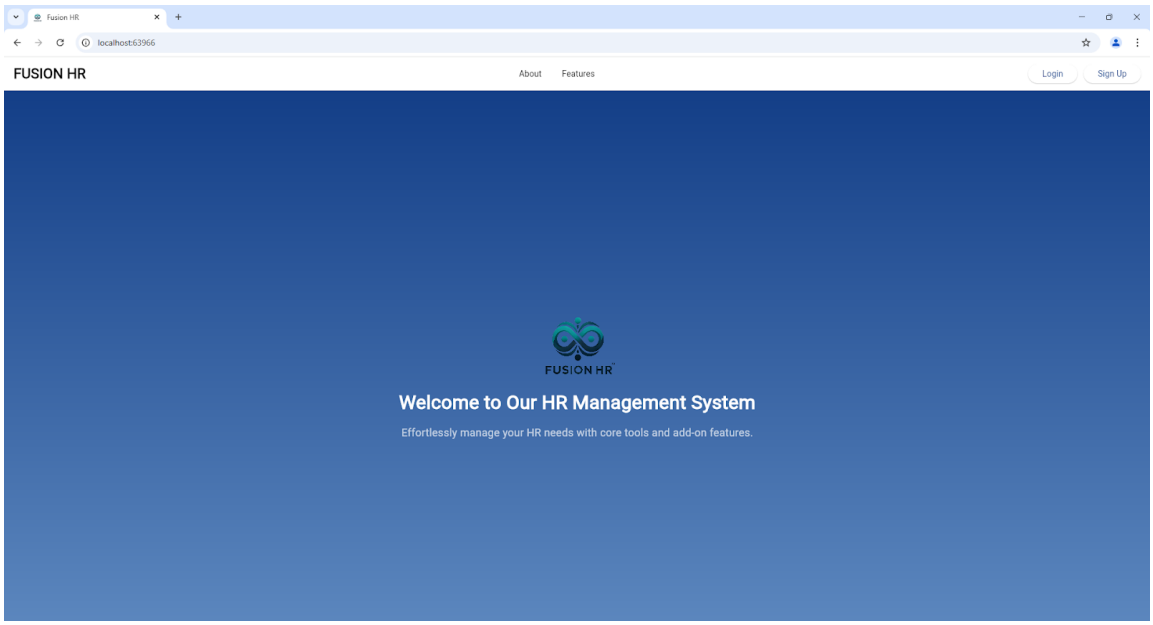


Figure (28): Landing Page (1)

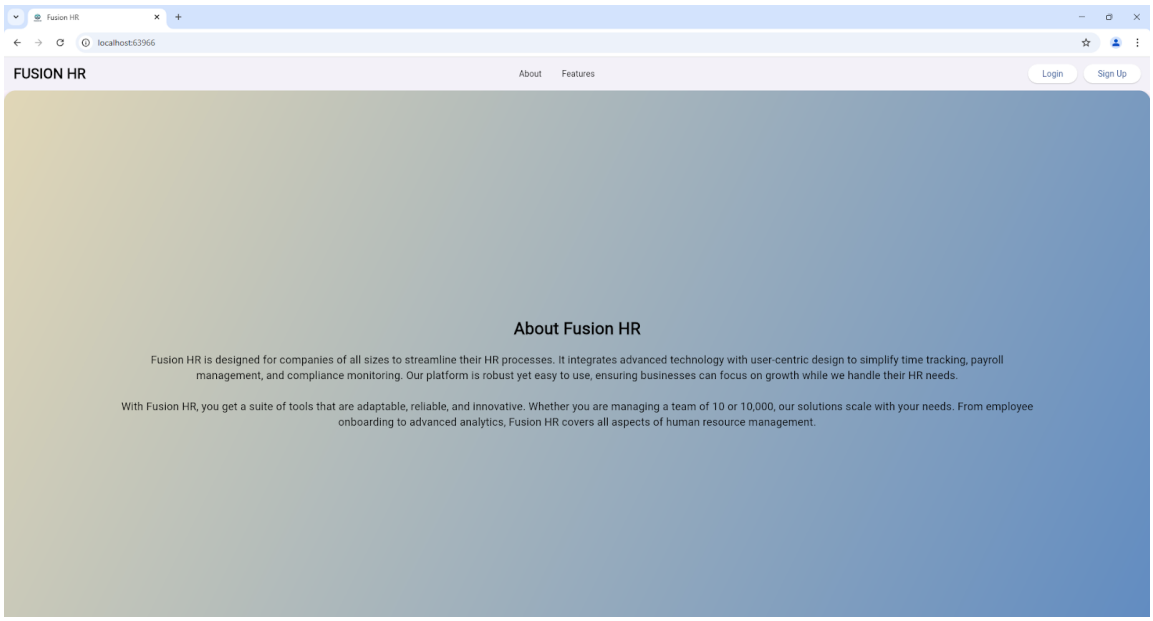


Figure (29): Landing Page (2)

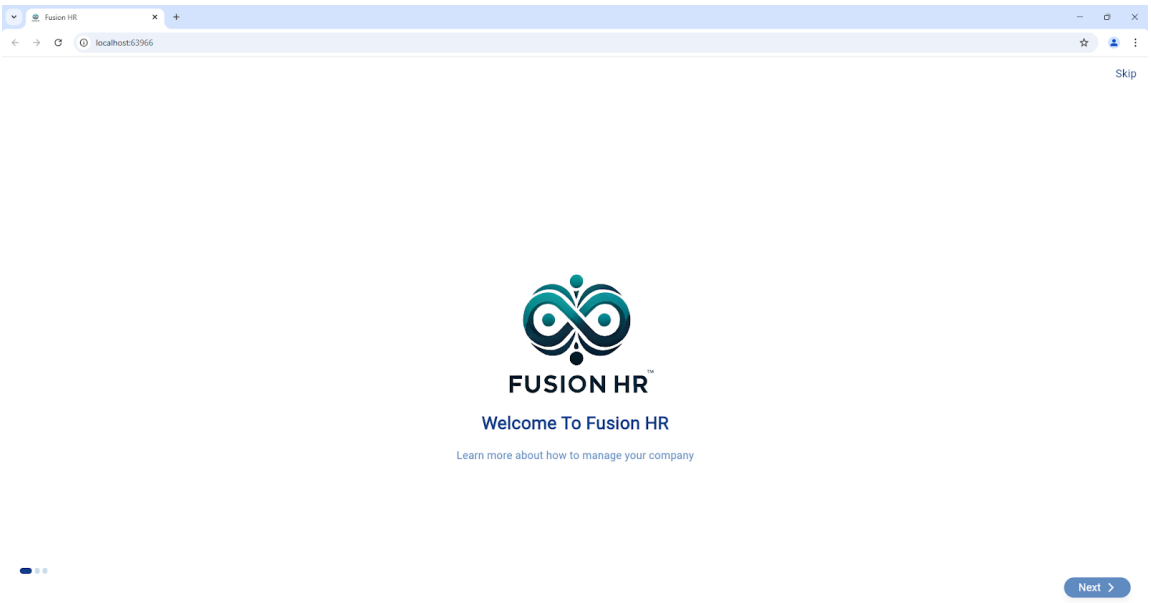


Figure (30): Staging Page (1)

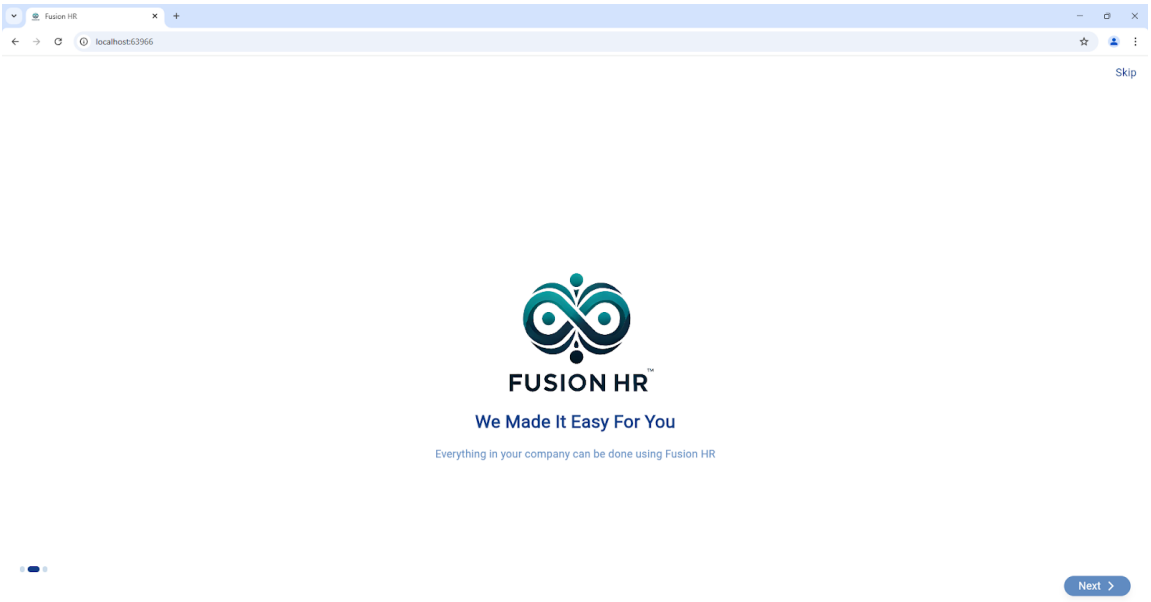


Figure (31): Staging Page (2)

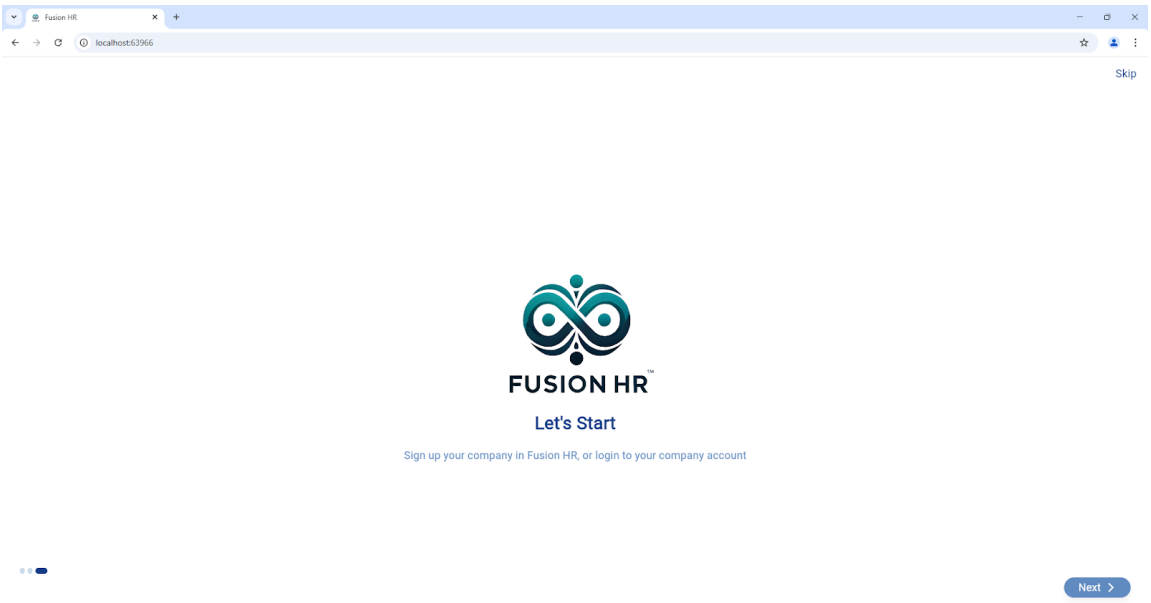


Figure (32): Staging Page (3)

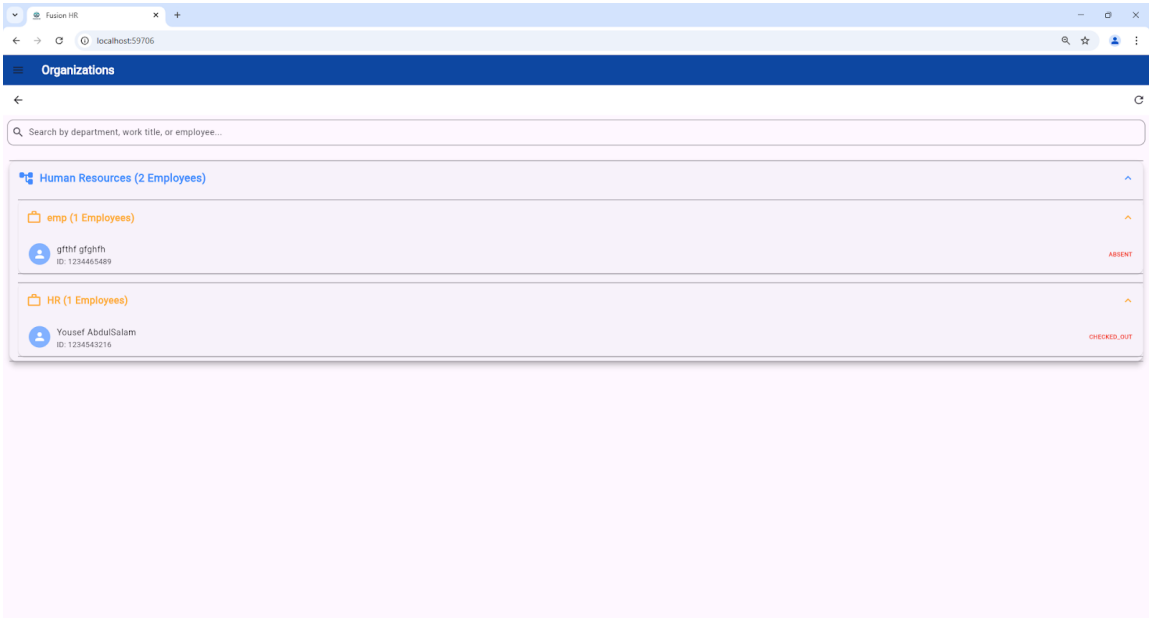


Figure (33): Organization Tree

Figure (34): Mobile Landing Page (1)

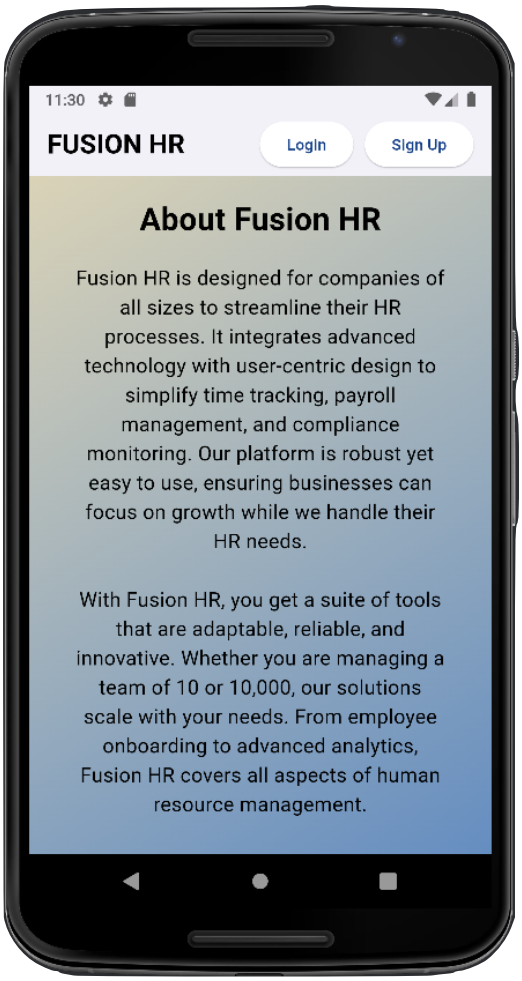


Figure (35): Mobile Landing Page (2)

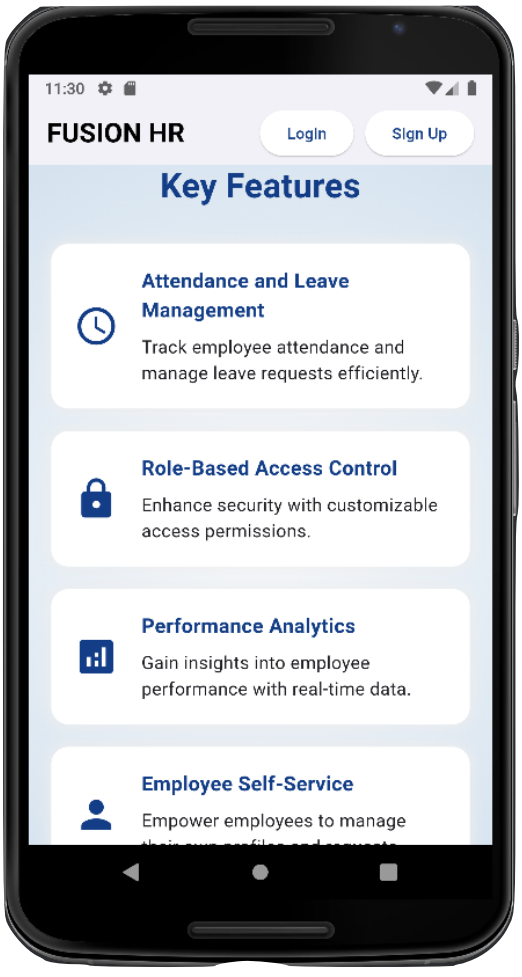


Figure (36): Mobile Landing Page (3)

Figure (37): Mobile Staging Page (1)

Figure (38): Mobile Staging Page (2)

Figure (39): Mobile Staging Page (3)

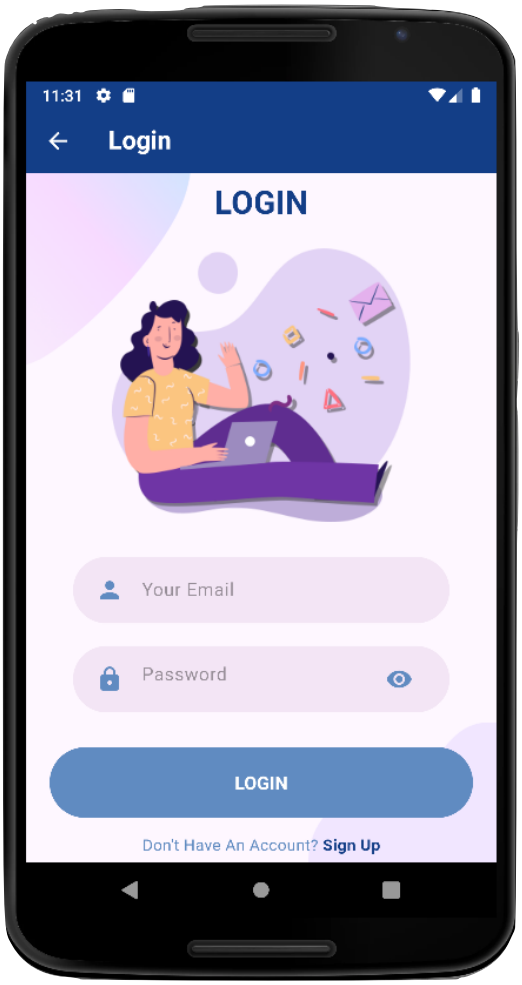


Figure (40): Mobile Log-in Page

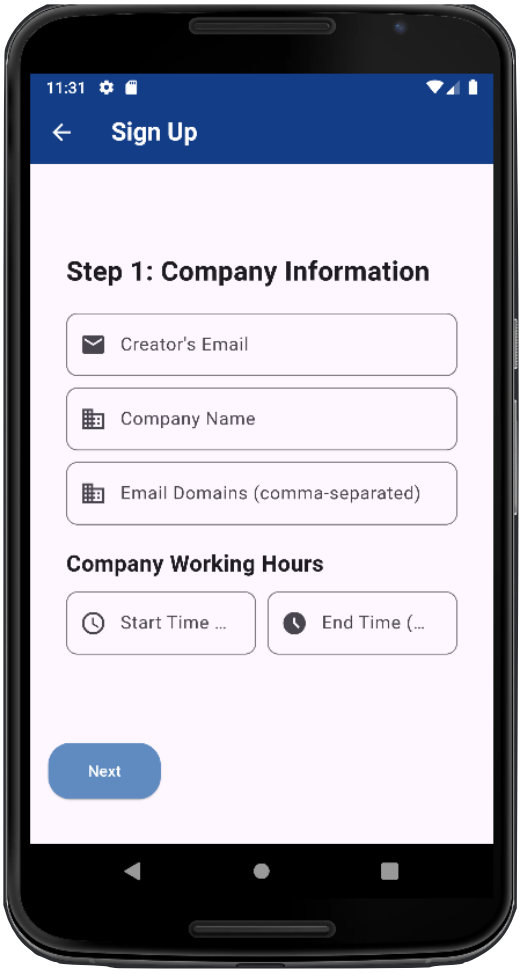


Figure (41): Mobile Company Sign Up (Stage 1)

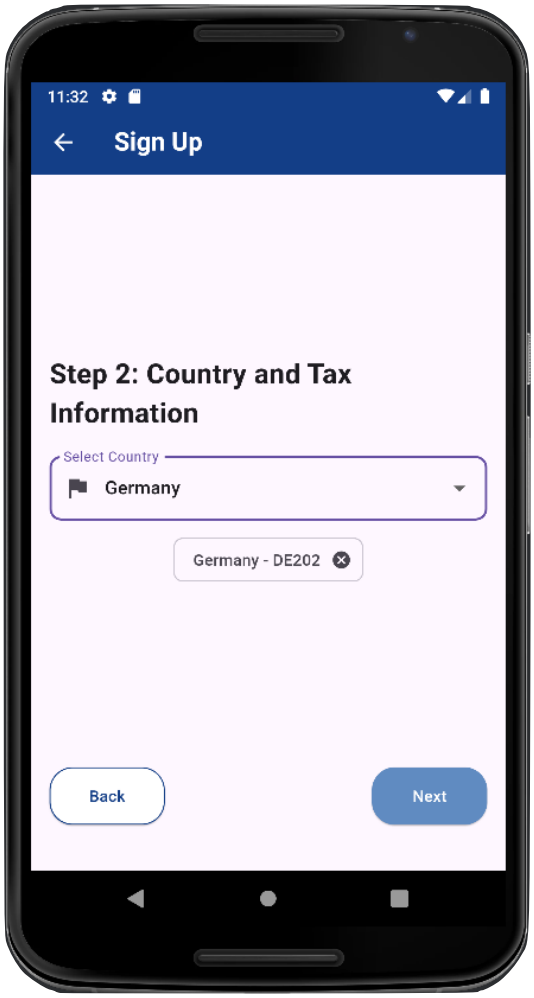


Figure (42): Mobile Company Sign Up (Stage 2)

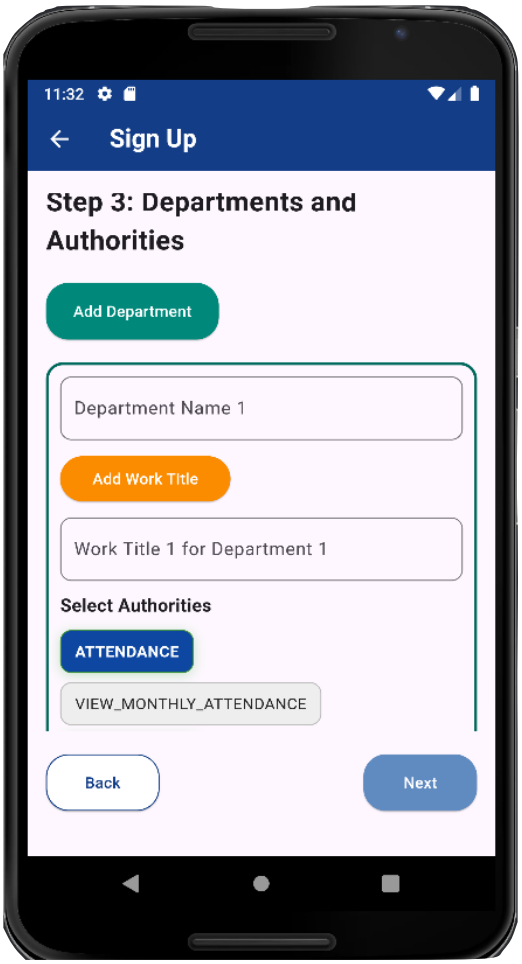


Figure (43): Mobile Company Sign Up (Stage 3)

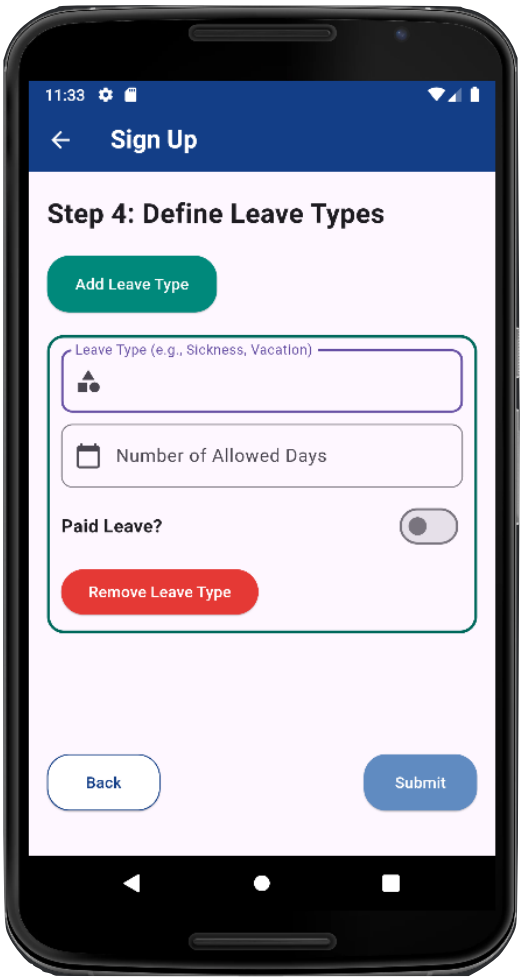


Figure (44): Mobile Company Sign Up (Stage 4)

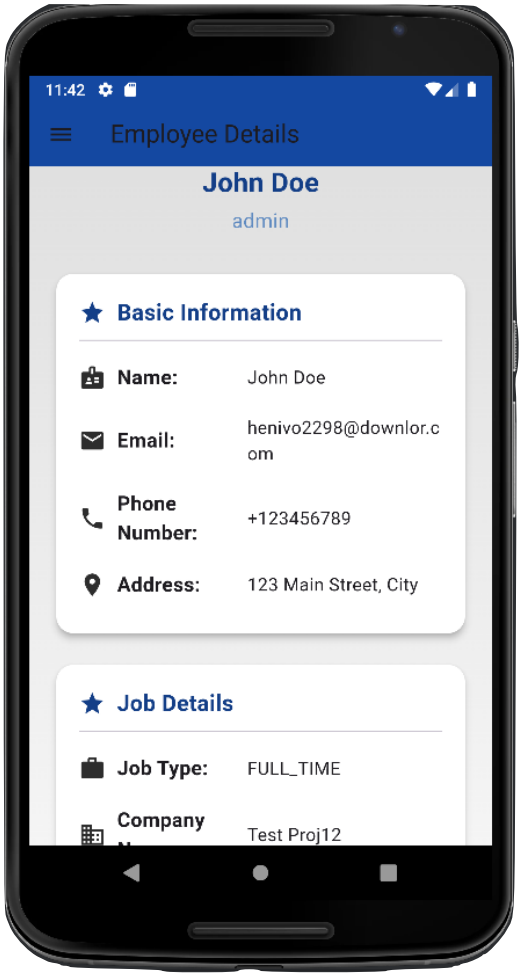


Figure (45): Mobile Employee View Profile Page

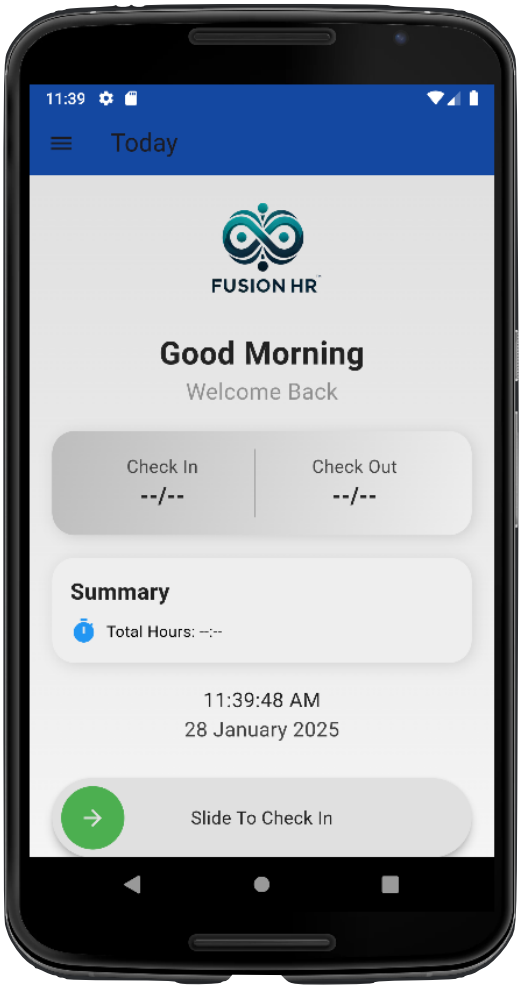


Figure (46): Mobile Check In Page

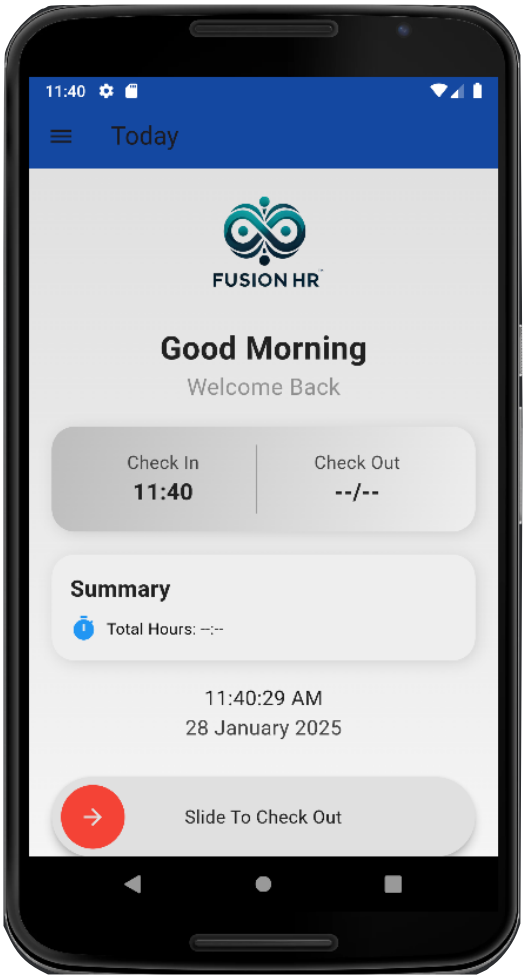


Figure (47): Mobile Check Out Page

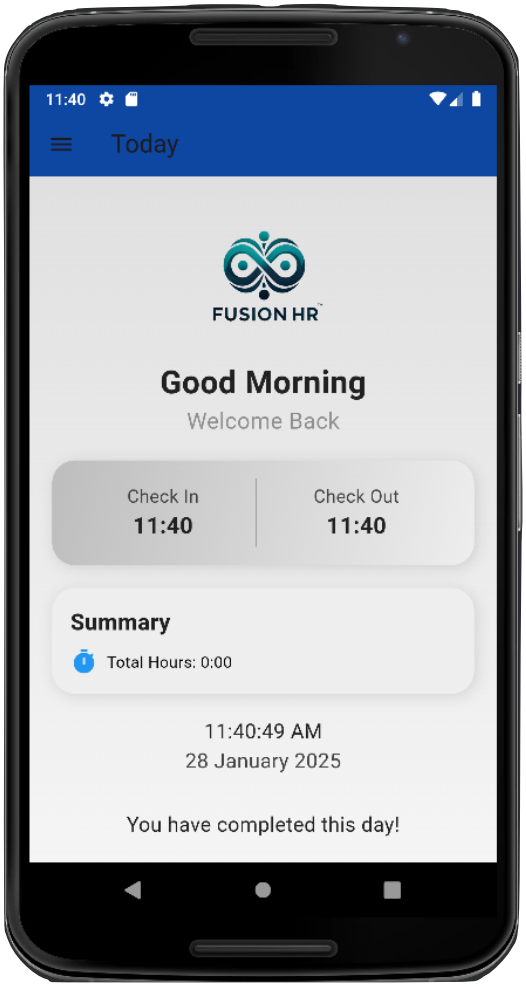


Figure (48): Mobile Shift Ended Page

Figure (49): Attendance Tracker Page

6. Conclusions & Future Work

6.1 Conclusions

FusionHR revolutionizes HR management by integrating core functionalities with customizable modules for project management and AI-powered resume parsing. Built using Spring Boot, Flutter, MySQL, Hibernate, and LLMs, it automates HR processes, reducing manual workload and improving efficiency.

The Resume Parsing Module, powered by Reasoner v1, enables automated candidate screening, extracting structured data for faster decision-making. The modular approach ensures scalability, allowing companies to adapt FusionHR to their specific needs. By merging automation, AI, and flexible design, FusionHR streamlines HR operations, enhancing productivity and decision-making.

6.2 Future Work

- Improved AI Resume Parsing – Expanding model training for better accuracy across multiple industries.
- Advanced Project Management – Adding tracking dashboards and automated reports.
- Employee Analytics – Introducing AI-driven insights for performance tracking.
- Third-Party Integrations – Connecting with payroll, ERP, and HR software.
- More Customizable Modules – Supporting performance evaluations and training programs.
- Enhanced Security & Compliance – Strengthening role-based access and audit logging.

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