REBIL

A Project Report

Submitted by

Moju Kumar B L *20232MCA0192*

Under the guidance of

Mr. Sakthi S
Assistant Professor, Presidency School of Computer Science and Engineering

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of

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GAIN MORE KNOWLEDGE
REACH GREATER HEIGHTS

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CERTIFICATE

This is to certified that the University Major Project **"Rebil"** being submitted by ***Moju Kumar B L*** bearing roll number ***20232MCA0192*** in partial fulfillment of requirement for the award of degree of **Master of Computer Applications** is a Bonafide work carried out under my supervision.

Mr. Sakthi S.
Assistant Professor,
Presidency School of CSE,
Presidency University.

Dr. W Jaisingh
Head of the Department (PSIS),
Presidency School of CSE&IS,
Presidency University.

Dr. R Mahalakshmi
Associate Dean,
Presidency School of IS,
Presidency University.

Dr. Md. Sameeruddin Khan
Pro-VC and Dean,
Presidency School of CSE&IS,
Presidency University.

ABSTRACT

Human resource management, background verification (BGV), and vendor empanelment are critical processes that often involve redundant data handling, leading to inefficiencies in recruitment and verification workflows. This project aims to develop a web-based HR software using HTML, CSS, Bootstrap, and PHP to streamline these operations through an integrated platform. The system provides distinct logins for HR professionals, BGV companies, and vendors**,** enabling efficient document management, recruitment tracking, and vendor collaboration**.** The platform allows users to upload, search, and verify BGV documents**,** optimizing the hiring process by categorizing background verification statuses (available, not available, or processed within 24 hours). The recruitment module includes an applicant tracking system (ATS), candidate evaluation, offer management, and compliance handling, ensuring an efficient talent acquisition process. Additionally, the vendor empanelment system facilitates bench candidate sharing, direct HR-vendor collaboration, and subscription-based data access**,** enhancing industry networking.

By integrating automated document verification, recruitment analytics, and a structured HR community network**,** this system reduces operational delays, enhances data accessibility, and optimizes recruitment workflows. Future enhancements include AI-driven candidate profiling, block chain-based BGV security, and cloud-based data storage for improved scalability and security.

Keywords: HR Software, Background Verification, Recruitment Management, Vendor Empanelment, Applicant Tracking System, HR Networking, Document Management, Cloud Integration.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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Student Name	***ID Number***
Moju Kumar B L	***20232MCA0192***

CHAPTER-1
INTRODUCTION

The Human Resource Management System (HRMS) is a web-based platform developed using HTML, CSS, Bootstrap, PHP, and MySQL to automate and streamline core HR functions such as recruitment, onboarding, payroll, training, appraisal, and compliance. Designed with a user-friendly interface and role-based access control, it enables Administrators, HR Professionals, and Employees to interact with the system securely and efficiently. The Admin Module plays a central role by managing users and roles, configuring system settings, overseeing module operations, generating analytical reports, and enforcing system security through data encryption, access control, automated backups, and intrusion detection. The HRMS addresses common challenges found in manual HR processes—such as data redundancy, onboarding delays, payroll errors, and compliance risks—by centralizing information, improving process consistency, and supporting regulatory adherence. It enhances the employee experience with self-service tools while empowering HR teams with real-time data visibility and workflow automation, ultimately improving operational efficiency and data transparency across the organization.

1.1 Overview of Human Resource Management System (HRMS) Module

Human Resource Management is a critical function in any organization, responsible for managing employee lifecycle activities such as recruitment, onboarding, payroll, training, appraisal, and retention. Traditionally, these processes were managed manually using spreadsheets, paper records, and email communications. However, this manual approach is prone to inefficiencies such as data redundancy, errors, and delays in workflow processing.

To overcome these challenges, this project introduces a web-based Human Resource Management System (HRMS) developed using HTML, CSS, Bootstrap, PHP, and MySQL. The objective is to create a centralized digital platform that automates and streamlines HR and administrative tasks, enabling organizations to manage human resources more effectively and efficiently.

The system is designed with an intuitive interface and role-based access control to cater to different users such as Administrators, HR Professionals, and Employees. Each user role is granted specific permissions aligned with their responsibilities in the organization. The automation of repetitive and data-heavy tasks frees up valuable HR time for strategic decision-making and improves data transparency across the company.

The system is designed with an intuitive interface and role-based access control to cater to different users such as Administrators, HR Professionals, and Employees. Each user role is granted specific permissions aligned with their responsibilities in the organization. The automation of repetitive and data-heavy tasks frees up valuable HR time for strategic decision-making and improves data transparency across the company.

By segmenting access and functionality based on user roles, the system ensures both security and efficiency in operations. Administrators are empowered to configure organizational settings, manage system-wide access, and generate global reports, while HR personnel focus on tasks such as managing job openings, conducting performance reviews, and processing payroll. Employees, on the other hand, are provided with a personalized dashboard that allows them to manage their leave requests, view salary slips, and stay informed about company policies or announcements. This segregation not only protects sensitive data but also streamlines the user experience for each role.

Moreover, the system promotes collaboration and accountability by maintaining logs of all activities performed by users within the platform. This feature allows HR teams and administrators to track workflow progress, monitor user engagement, and identify bottlenecks in real-time. Notifications, alerts, and system-generated reports further enhance responsiveness and help ensure that important HR tasks—such as document submissions, appraisal deadlines, or policy acknowledgments—are not overlooked. This level of transparency fosters trust, improves communication between employees and HR, and supports data-driven human resource management.

Need for HRMS Automation

In today’s dynamic business environment, organizations must manage an ever-increasing volume of employee-related data, including recruitment records, payroll information, attendance logs, performance evaluations, and compliance documentation. As companies scale in size, the traditional manual methods of managing these HR functions—

typically through spreadsheets, physical documents, and emails—become inadequate and inefficient.

One of the most significant challenges is the difficulty in tracking applicant progress throughout the recruitment process. With multiple job openings and hundreds of applicants, HR personnel often struggle to monitor where each candidate stands—whether their resume has been reviewed, if they've been shortlisted for an interview, or whether an offer has been extended. Without a systematic approach, this results in lost opportunities, poor candidate experience, and delays in hiring.

The employee onboarding process also suffers under a manual system. Verifying documents, assigning onboarding tasks, and providing system access to new hires can take days or even weeks. Delays in onboarding lead to productivity losses and frustration for both the new employee and the organization. Similarly, tracking document submissions manually increases the risk of missing crucial records, which can have legal or compliance repercussions.

Another common pain point is payroll and leave management. Errors in calculating salaries, deductions, or leave balances are not only time-consuming to correct but also detrimental to employee trust. Manual tracking often leads to discrepancies in attendance records, miscalculated leaves, and inaccurate salary processing—issues that directly affect employee morale and the organization's credibility.

Furthermore, performance appraisals lack transparency when conducted manually. Without a centralized and standardized process, performance evaluations can be inconsistent and biased, leading to employee dissatisfaction. It becomes difficult for managers to access historical data, track progress over time, or document feedback effectively, all of which are essential for fair and data-driven appraisal systems.

Manual HR systems also pose significant compliance risks. Organizations must adhere to a variety of labour laws, tax regulations, and internal policies. Without an automated system to track policy acknowledgments, maintain up-to-date employee files, or flag non-compliance issues, the organization becomes vulnerable to legal penalties and reputational damage.

To address these challenges, the implementation of a custom, web-based HRMS offers substantial benefits:

- **Reduction in Manual Paperwork:** Automation eliminates redundant data entry, minimizes the use of paper, and centralizes information in a digital format that is easier to manage and retrieve.
- **Consistency and Timeliness:** Routine HR operations such as leave approvals, payroll runs, and application tracking are completed faster and with greater consistency.
- **Centralized and Secure Access:** All employee data is stored in a single, secure database with role-based access control, ensuring data confidentiality and availability.
- **Improved Employee Experience:** Employees benefit from quick access to their records, transparent appraisal processes, and prompt responses to HR-related queries, thereby improving satisfaction and engagement.
- **Regulatory Compliance:** Automated documentation and audit trails ensure that the organization adheres to legal obligations, reduces risks, and is prepared for inspections or audits.

1.2 Role of the Admin Module

The Admin Module is a central component of the HRMS, responsible for overseeing and controlling the entire system. The administrator has the highest level of access and is responsible for setting up and maintaining the platform's operational framework. The module's core functions include:

User and Role Management

- Create and manage user accounts for HR staff and employees.
- Assign roles (Admin, HR, Employee) and control access levels.
- Deactivate or delete users as needed.

System Configuration

- Set system-wide configurations such as company details, policy documents, working hours, leave policies, and appraisal cycles.

Module Oversight

- Monitor the functioning of recruitment, attendance, leave, payroll, and training modules.
- Perform data audits and track anomalies or unusual activity.

Reporting and Analytics

- Generate reports across various departments and metrics.
- Provide dashboards for KPIs (e.g., hiring rate, attrition rate, average leave days).

Security and Backup

- Manage system security, perform database backups, and monitor access logs.
- Ensure the system remains compliant with data protection regulations.
- Implement role-based access control to restrict sensitive data access to authorized users only.
- Use encryption protocols (e.g., HTTPS and hashed passwords) to protect data in transit and at rest.
- Schedule automated daily backups and store copies in secure off-site or cloud-based locations.
- Set up intrusion detection and alert mechanisms to identify suspicious activities in real-time.
- Conduct periodic security audits and vulnerability assessments to ensure system integrity.
- Regularly update software components and patch known vulnerabilities to prevent security breaches.

CHAPTER-2

LITERATURE SURVEY

The increasing reliance on digital systems for business process automation has spurred significant academic and industry research into Human Resource Management Systems (HRMS). These systems are recognized as essential tools for streamlining HR activities, enhancing decision-making, ensuring legal compliance, and improving employee satisfaction. This chapter presents a literature survey highlighting key studies, research findings, and developments relevant to HRMS, especially those focusing on recruitment automation, payroll management, compliance tracking, and administrative control through web technologies such as PHP, MySQL, Bootstrap, and HTML/CSS.

2.1 Summary of Key Studies

- **Kavanagh, M. J., Thite, M., & Johnson, R. D. (2015) – "Human Resource Information Systems: Basics, Applications, and Future Directions":**
    - This foundational work outlines how Human Resource Information Systems (HRIS) have evolved from basic personnel data record-keeping systems to comprehensive platforms that support strategic decision-making. The authors emphasize the need for integrating recruitment, onboarding, performance management, and compliance into a single digital ecosystem. This supports the implementation of a centralized, web-based HRMS as proposed in the current project.
- **Ball, K. S. (2001) – "The Use of Human Resource Information Systems: A Survey":**
    - Ball's survey of organizations implementing HRIS revealed significant benefits including faster access to information, improved accuracy, and enhanced productivity. However, it also notes challenges such as system complexity and lack of user training. The study supports the importance of intuitive UI/UX design and modular development in any HR system.

- **Hussain, Z., Wallace, J., & Cornelius, N. E. (2007) – "The Use and Impact of Human Resource Information Systems on Human Resource Management Professionals"**:
    - This study evaluates the real-world impact of HRIS on HR professionals, highlighting increased efficiency in recruitment, data access, and compliance tracking. It supports the inclusion of modules such as ATS, payroll processing, and document management in HRMS design.
- **Ghazal, B. & Naseem, A. (2019) – "Automation of Human Resource Management System using PHP and MySQL":**
    - This research-based implementation of an HRMS using PHP and MySQL reinforces the viability of using open-source technologies for HR automation. The authors successfully demonstrate a functional system with modules for leave, attendance, and employee data, using role-based access.

2.2 Relevance to the Proposed System

The reviewed literature supports the design and development of a modular, web-based HRMS with the following conclusions:

- **Modular Approach**: Most successful implementations use separate modules for recruitment, payroll, appraisals, and compliance, enabling targeted enhancements and maintenance.
- **Technology Stack**: PHP and MySQL are popular for developing web-based HR applications due to their open-source nature, ease of deployment, and database integration.
- **Security and Role Management**: Studies emphasize role-based access as a key feature to ensure data protection and user-specific access.
- **Admin Module Significance**: A powerful admin panel is necessary to oversee system configurations, user access, and module performance.
- **Automation and Reporting**: Automated workflows and built-in reporting tools support operational efficiency and strategic planning.
- **User Experience**: A user-friendly interface designed using HTML, CSS, and Bootstrap ensures better engagement and usability across user roles.

Reference No.	Year	Study of Tools/Technology	Focus Area	Key Findings
1	2019	Automation of HRMS using PHP and MySQL	Development of open-source HRMS	Practical implementation using PHP
2	2020	Design and Implementation of Recruitment Management System using Web Technologies	ATS-focused development	Enhanced recruitment tracking and reduced cycle times
3	2020	Management Information Systems	MIS in business functions	HRMS helps maintain data accuracy
4	2018	A Review on Web-Based HRMS using Open-Source Tools	HRMS tool comparison	Compared open-source solutions
5	2020	AI-Driven HR Management Systems for Efficient Recruitment	Data Privacy Concerns	Faster and Accurate Candidate Selection
6	2020	Integrating HR Software with Social Media Platforms for Talent Acquisition	Data Authenticity and Privacy Issues	Improved Talent Sourcing

7	2019	Cloud-Based HR Solutions for Enhanced Workforce Management	Integration with Legacy Systems	Easy Access and Cost-Effective Solution
8	2021	Blockchain Technology in Background Verification Systems	High Implementation Cost	Enhanced Security and Tamper-Proof Records
9	2022	Enhancing Employee Engagement Using Gamification Techniques	Employee Fatigue with Over-Gamification	Improved Motivation and Productivity

Table 2.1 **Literature Survey Content**

CHAPTER-3

PROPOSED METHOD

The proposed system is a web-based Human Resource Management System (HRMS) designed to automate and streamline core HR processes such as recruitment, employee management, document handling, compliance tracking, payroll, and performance evaluation. The system is developed using HTML, CSS, Bootstrap for frontend design, and PHP with MySQL for backend logic and database management. The design follows a modular, role-based architecture to ensure scalability, maintainability, and secure access.

3.1 System Architecture

The proposed HRMS is built on a three-tier architecture, a widely adopted software design pattern that separates the application into three distinct layers: Presentation Layer, Application Layer, and Data Layer. This separation enhances system modularity, scalability, security, and ease of maintenance.

3.1.1 Presentation Layer (Frontend)

Technologies Used

- **HTML (HyperText Markup Language):** Used for structuring the content of web pages.
- **CSS (Cascading Style Sheets):** Used for styling HTML elements and ensuring a consistent and visually appealing interface.
- **Bootstrap:** A powerful frontend framework used to create responsive, mobile-first designs with pre-built UI components like forms, buttons, tables, and navigation bars.

Functions

- Acts as the user interface of the system.
- Displays web pages to users based on their roles (Admin, HR, Employee).
- Captures user input via forms (e.g., login, application forms, leave requests).
- Ensures a seamless and interactive experience with a clean and responsive design.

Features

- Responsive design that adjusts to different devices (desktop, tablet, mobile).
- User role-specific dashboards.
- Real-time alerts, form validations, and error messages.

3.1.2 Application Layer (Business Logic)

Technology Used

- **PHP (Hypertext Preprocessor):** A server-side scripting language used to process user input, perform logical operations, and manage dynamic content.

Functions

- Acts as the brain of the system, handling logic between frontend and backend.
- Validates and processes data entered by users.
- Implements business logic such as:
    - Role-based access control.
    - Leave approval workflows.
    - Payroll calculation logic.
    - Recruitment status updates.
- Interacts with the database to fetch, update, insert, or delete records as needed.

Features

- Modular code structure using PHP files for different functionalities (e.g., login.php, employee_register.php, generate_payslip.php).
- Secure session management for user authentication.

3.1.3 Data Layer (Database Management)

Technology Used

- MySQL: A robust and widely-used relational database management system (RDBMS) that stores all organizational data in structured tables.

Functions

- Acts as the storage engine of the application.
- Stores all critical HR data including:

- Candidate records
- Job applications
- Attendance logs
- Application requests
- Salary details
- Uploaded documents

- Enables querying, filtering, and reporting on large datasets for decision-making and analytics.

Features

- Use of primary and foreign keys for relational integrity.
- Role-based data access via SQL queries.
- Secure storage with regular backups.
- Optimized queries for fast data retrieval.

Aspect	Benefit
Separation of Concerns	Each layer handles its own responsibility, improving maintainability.
Scalability	Layers can be upgraded independently (e.g., switch to a cloud database without changing frontend).
Security	Sensitive operations are performed on the server side (application layer), preventing exposure of business logic to the client.
Performance	Efficient processing due to logical separation of frontend display, backend logic, and data handling.
Flexibility	Easy to replace or integrate third-party services in one layer without affecting others (e.g., replacing MySQL with PostgreSQL).

Table 3.1 Benefits of the Three-Tier Architecture

3.3 User Roles and Access Control

The Human Resource Management System (HRMS) is designed with a robust Role-Based Access Control (RBAC) mechanism that ensures secure access and task delegation based on predefined user roles. This structure supports efficient workflow management while safeguarding sensitive organizational data by granting users access only to the information and functions necessary for their responsibilities.

Administrators have the highest level of access within the system. They are responsible for user management, including creating, updating, or removing user accounts. Additionally, they configure system-wide settings such as organizational policies, working hours, and performance appraisal parameters. Administrators can also generate comprehensive reports across all modules and conduct audits to monitor system usage and data integrity.

HR Professionals have access to all core functional modules that pertain to human resource activities. Their responsibilities include managing the recruitment process, maintaining payroll records, processing leave requests, scheduling training programs, and conducting performance appraisals. This access allows HR personnel to efficiently handle employee lifecycle activities while maintaining operational consistency.

Employees have limited access tailored to their individual needs. Through their personal dashboards, they can submit leave requests, download salary slips, and stay updated with company announcements or policy changes. This self-service model empowers employees while reducing the administrative burden on HR teams.

By implementing RBAC, the HRMS ensures that each user interacts with the system in a secure and purposeful manner, minimizing data breaches and enhancing organizational accountability. This granular permission system ensures that access rights can be finely tuned to align with evolving company structures and workflows. Furthermore, all access activities are logged and monitored through an audit trail, providing visibility into system usage and supporting compliance with internal policies and external regulatory requirements.

3.4 Key Modules and Functional Workflow

Admin Module

- System configuration: working hours, leave policies, appraisal cycles
- Backup, logs, and audit trails
- Dashboard with key performance indicators (KPIs)
- User account creation and role mangement

Recruitment Module (ATS)

- HR posts job openings via web form
- Applicants submit online applications
- System tracks application status (shortlisted, interviewed, hired, rejected)

Candidate Management

- Add/update candidate profiles with personal, educational, and professional details
- Track candidate status across recruitment stages (e.g., Level 1, C2H, Placed)
- Search, filter, and edit candidate data for quick evaluation and follow-up

Vendor and Offer Management

- Vendors submit candidate profiles and track job-wise placements
- HR reviews vendor submissions and updates offer status levels
- Monitor placement performance by vendor

Document and Compliance Management

- Upload and categorize employee documents (e.g., ID, contracts)
- Set document expiry alerts
- Store compliance checklists and audit logs

Appraisal and Feedback

- HR defines performance criteria
- Employees and managers submit feedback
- Ratings are calculated and stored

3.5 Benefits of the Proposed Method

Human Resource Management System (HRMS) delivers a wide range of benefits that significantly enhance organizational efficiency and employee engagement. One of its key advantages is the automation of repetitive and error-prone tasks such as attendance tracking, leave calculations, payroll processing, and document management. By reducing manual intervention, the system minimizes the chances of human errors and frees up HR personnel to focus on strategic and people-oriented tasks rather than administrative ones.

Another crucial benefit is enhanced data accuracy and real-time tracking. The system ensures that employee information, attendance records, and payroll data are updated instantly and consistently across modules. This real-time synchronization not only improves decision-making but also facilitates faster response times to HR-related requests and queries. With accurate data at their fingertips, HR professionals and managers can generate insightful reports and identify trends or anomalies promptly.

The platform also significantly improves employee satisfaction by offering a self-service portal. Employees can independently view their attendance history, submit leave requests, access salary slips, and stay updated with company announcements—all from a centralized dashboard. This reduces dependency on HR for basic queries and fosters transparency, trust, and a sense of ownership among staff.

From a compliance perspective, the HRMS ensures that all documentation—such as contracts, ID proofs, and appraisal reports—is securely stored, categorized, and time-stamped. Automated alerts, audit logs, and approval workflows help organizations meet regulatory requirements and prepare for audits without the stress of missing documentation or inconsistent records.

Finally, the system is designed to be scalable and customizable, allowing for the integration of advanced technologies such as AI-driven analytics and cloud-based storage. These future enhancements will further support intelligent talent profiling, predictive HR insights, and enhanced data security, making the HRMS a future-ready solution that grows with organizational needs.

In addition to operational efficiency and employee engagement, the HRMS plays a vital role in centralizing organizational knowledge. All employee-related information—from recruitment history to training records and performance feedback—is stored in a unified database, accessible based on role permissions. This centralized repository eliminates data silos between departments, reduces redundancy, and ensures consistency across HR functions. It also enables HR managers to gain a holistic view of an employee's lifecycle within the organization, which is invaluable for planning promotions, identifying skill gaps, or initiating training programs.

Furthermore, the system enhances organizational agility by enabling faster adaptation to policy or structural changes. For instance, if new government labor laws or internal HR policies are introduced, administrators can update the system settings and documentation in real-time, ensuring that all users are working with the most current information. Notifications and compliance acknowledgments can be automatically sent to employees, and audit trails ensure accountability. This responsiveness not only supports regulatory adherence but also allows organizations to remain flexible and competitive in a constantly evolving business environment.

CHAPTER-4

OBJECTIVES

The primary aim of this project is to develop a robust, web-based Human Resource Management System (HRMS) that simplifies and streamlines HR operations by automating manual processes and centralizing all employee-related data. With increasing organizational complexity and workforce diversity, a modern HRMS is essential to improve efficiency, support compliance, and enhance the overall employee experience.

This chapter outlines the specific objectives of the proposed HRMS, aligning the system's features and functions with organizational goals. These objectives are focused on improving productivity, accuracy, data security, transparency, and employee empowerment through a user-friendly and scalable software solution.

The Human Resource Management System (HRMS) proposed in this project is designed to address the growing need for automation, transparency, and efficiency in HR operations. Modern organizations face increasing challenges in handling employee data, ensuring compliance, and managing workforce activities such as recruitment, payroll, and performance evaluation. A web-based HRMS that supports centralized data handling, streamlined workflows, and user-specific access plays a critical role in overcoming these issues.

This chapter outlines the core objectives of the HRMS, categorized into system-level objectives, user-centric objectives, and testing and validation objectives, providing a clear roadmap for the development and successful implementation of the system.

4.1 System-Level Objectives

System-level objectives define the overall technical and functional goals of the HRMS platform, focusing on system architecture, scalability, automation, and security.

Develop a Modular Web-Based System

The HRMS should be developed as a modular web application using HTML, CSS, Bootstrap (for frontend), PHP (for backend scripting), and MySQL (for data

storage). Each module—recruitment, payroll, leave, appraisal, compliance, etc.—should function independently while interacting seamlessly with other components.

Enable Automation of Core HR Operations

The system must automate routine HR functions such as applicant tracking, leave approvals, attendance logs, payroll computation, and document handling to eliminate redundancies and improve processing time.

Centralized and Scalable Data Management

The system must store all employee records, job applications, and transactional data in a centralized database to allow consistent access and updates across the organization. It should be scalable to support additional users, departments, or future cloud migration.

Implement Secure Role-Based Access Control (RBAC)

The system should restrict access to sensitive data based on user roles (Admin, HR Professional, Employee). Each user should be provided only the permissions necessary for their responsibilities to ensure data privacy and integrity.

Maintain Audit Trails and System Logs

The system should track user activities, including login history, changes to records, approvals, and uploads. This supports accountability and facilitates auditing and compliance verification.

4.2 User-Centric Objectives

User-centric objectives are designed to enhance the experience, productivity, and satisfaction of all system users.

Personalized Dashboards

Each user should be provided with a customized dashboard that displays information and tasks relevant to their role—for example, pending approvals for HR, application status for employees, and system alerts for administrators.

Condidate Self-Service Portal

Each user should be provided with a customized dashboard that displays

information and tasks relevant to their role for example, pending approvals for HR, application status for employees, and system alerts for administrators.

Employees should have access to a secure portal where they can:

- Submit leave requests
- View attendance records
- Download payslips

Improved Communication and Notifications

The system should support internal notifications and automated alerts to inform users of important deadlines, policy changes, document expirations, interview schedules, or pending tasks.

4.3 Testing and Validation Objectives

Testing and validation ensure that the HRMS operates correctly, securely, and a efficiently under various use conditions before deployment.

Functional Testing

Each module (e.g., recruitment, payroll, leave management) will be tested independently to confirm that it performs as expected. Test cases will cover both standard and edge scenarios.

Integration Testing

Modules must be tested collectively to verify that data flows smoothly between components. For example, leave data must update payroll automatically and reflect on the employee's dashboard.

Usability Testing

The interface will be evaluated for user-friendliness, navigation flow, and accessibility. Feedback will be gathered from sample users (Admin, HR, and Employees) to refine UI elements.

Security and Access Control Testing

The role-based access model will be validated to ensure that:

- Users Cannot access unauthorized areas.
- Sensitive operations are Protected from cross-site scripting or SQL injection.

Performance and Load Testing

The system will be stress-tested to assess its performance under high loads (e.g., when multiple employees log in to download payslips simultaneously) and to identify potential bottlenecks.

Validation Againest Objectives

System outcomes will be mapped against initial goals. For example:

- Is the time taken for leave approval reduced?
- Are employees able to retrieve payslips without HR intervention?
- Are records being correctly timestamped and logged?

CHAPTER-5
METHODOLOGY

This chapter presents the structured methodology employed in the development of the Human Resource Management System (HRMS). The complexity of modern HR operations—ranging from recruitment and payroll to compliance and employee performance tracking—necessitates a carefully planned development strategy. A systematic approach not only ensures that technical and functional requirements are met, but also provides a clear roadmap for implementation, testing, and future scalability.

The methodology adopted for this project is based on the Waterfall Software Development Life Cycle (SDLC) model. This traditional yet effective model organizes the software development process into linear, sequential phases. Each phase must be fully completed before the next one begins. This structure is particularly well-suited for projects with clearly defined objectives and requirements, such as this HRMS, where the functional expectations were established during the early stages of planning.

The development began with an in-depth requirement analysis phase, during which the core features and user needs were identified—such as user role management, employee data centralization, and automated workflows. This was followed by the system design phase, which included the creation of architectural diagrams, database schemas, and UI wireframes. Each component was strategically planned to promote modularity, scalability, and ease of use.

Following design, the implementation phase focused on coding each module using HTML, CSS, Bootstrap, PHP, and MySQL. Particular attention was given to maintaining clean, reusable code and following best practices in both frontend and backend development. Integration of different modules was handled with care to ensure seamless data flow across the system. The testing phase was equally critical. Rigorous unit and integration testing were performed to verify the correctness of individual modules and their interactions. Usability testing was conducted to ensure the system met user expectations, while security and performance tests validated the robustness of the system.

By adhering to the Waterfall model, the project maintained clarity, consistency, and discipline throughout its lifecycle. The approach also facilitated proper documentation at each stage, enabling future developers to understand the system's architecture and maintain or upgrade it efficiently. Furthermore, this methodology provided a foundation for future enhancements, such as cloud integration and AI-based analytics, without disrupting the core functionality of the system.

Overall, the structured methodology and phased development cycle ensured the delivery of a reliable, secure, and user-friendly HRMS aligned with organizational goals and user expectations.

Throughout the development process, continuous feedback loops were established with potential end-users, such as HR managers and administrative staff, to ensure that the system design aligned closely with real-world workflows. Their input played a crucial role in refining features like the applicant tracking system, document categorization, and compliance alerts. These collaborative efforts not only increased user satisfaction but also minimized the risk of rework by catching potential usability issues early in the process.

In addition, proper version control and project management practices were employed using tools such as Git and Trello. These tools helped in tracking progress, managing tasks, and maintaining code integrity during the collaborative phases of development. The use of such tools further enhanced team coordination, ensured accountability, and allowed for smooth handovers or updates during later stages. Overall, the blend of structured methodology and modern development practices contributed significantly to the successful realization of a robust and maintainable Human Resource Management System.

To support long-term maintenance and adaptability, detailed technical documentation was created alongside the development process. This includes user manuals, database design specifications, API references, and module-wise implementation notes. Such documentation ensures that future developers or system administrators can easily understand, troubleshoot, and enhance the system without disrupting existing functionalities.

5.1 Development Approach

The system is developed using the Waterfall Model, a linear and structured development methodology ideal for projects with stable and well-documented requirements. Each phase in the Waterfall model is completed sequentially, allowing for thorough documentation, validation, and sign-off before progressing. This ensured tight control over development tasks, timelines, and deliverables.

5.1.1 Phases in the Model

Requirement Analysis

- Understand user needs and system expectations through research and feedback.
- Define key modules: recruitment, leave, payroll, compliance, document management, etc.
- Conducted meetings and interviews to gather requirements from end-users and stakeholders.
- Identified and documented functional and non-functional requirements.
- Defined core HR modules: Recruitment, Leave Management, Payroll Processing, Compliance Tracking, and Document Management.
- Created requirement specification documents as a foundation for the design phase.

System Design

- Design data models, UI layouts, and workflow diagrams.
- Prepare ER diagrams, use case diagrams, and data flow diagrams (DFDs).
- Structure database schema and backend logic.
- Translated requirements into system architecture using diagrams and modeling techniques.
- Designed UI wireframes and user flows to ensure usability and consistency across modules.
- Developed Entity-Relationship (ER) diagrams to represent database schema.
- Created Data Flow Diagrams (DFDs), Use Case Diagrams, and sequence diagrams to model system interactions.
- Defined data structures and logic flows for each module.

Implementation

- Develop each module using the selected tech stack.
- Frontend: HTML, CSS, Bootstrap.
- Backend: PHP.
- Database: MySQL.
- Chose a full-stack web development approach using open-source technologies.
- **Frontend Development:** Utilized HTML, CSS, and Bootstrap for designing responsive and interactive user interfaces.
- **Backend Development:** PHP was used to handle server-side scripting, user session management, and business logic.
- **Database Design:** MySQL was implemented for relational data storage, supporting all employee, payroll, and recruitment records.
- Each module was developed independently and integrated after individual testing.

Testing

- Perform unit testing, integration testing, and user acceptance testing.
- Fix bugs and validate system performance.
- **Unit Testing:** Validated each module (e.g., leave application, resume upload, payroll generation) to ensure functionality.
- **Integration Testing:** Verified data flow between modules (e.g., leave data updating payroll records).
- **User Acceptance Testing (UAT):** Conducted with end-users to validate whether system features met user expectations
- Fixed bugs and inconsistencies identified during test cycles.

Deployment

- Deploy on a local or live server.
- Ensure role-based access control is functioning correctly.
- Monitor system for post-deployment feedback.
- Deployed the application on a local development server (XAMPP) for internal.

- Ensured database connectivity and authentication mechanisms were functional.
- Verified that role-based access control (Admin, HR, Venders) was properly enforced.
- Deployed to a live environment upon successful testing.

Maintenance (Future Scope)

- Prepare for integration of AI modules and cloud infrastructure for long-term scalability.
- Regular maintenance tasks planned: performance monitoring, security updates, and data backups.
- Deploy on a local or live server.
- Ensure role-based access control is functioning correctly.
- Monitor system for post-deployment feedback.
- Deployed the application on a local development server (XAMPP) for internal testing.
- Ensured database connectivity and authentication mechanisms were functional.
- Verified that role-based access control (Admin, HR, Employee) was properly enforced.
- Deployed to a live environment upon successful testing.
- Fixed bugs and inconsistencies identified during test cycles.
- Prepare for integration of AI modules and cloud infrastructure for long-term scalability.
- Regular maintenance tasks planned: performance monitoring, security updates, and data backups.

5.2 Tools and Technologies Used

Component	Technology	Purpose
Frontend	HTML, CSS, Bootstrap	Interface design, responsiveness
Backend	PHP	Business logic and dynamic processing
Database	MySQL	Data storage and retrieval
Server	XAMPP/WAMP or Web Host	Local development or online deployment
Diagram Tools	Draw.io / Lucidchart	System and flowchart design
Browser	Chrome, Firefox	Testing user interface
Editors	VS Code / Sublime Text	Code development

Table 5.1 Tools and Technologies Used

5.3 System Architecture Overview

The System follows a three-tier architecture:

- Presentation Layer – User facing interface developed using HTML,CSS and BOOTstrap.
- Application Layer – PHP handles the business logic and server-side scripting.
- Data Layer – MYSQL manages all structured employee and process-related data.

This layered structure ensures separation of concerns, better maintainability, and enhanced performance.

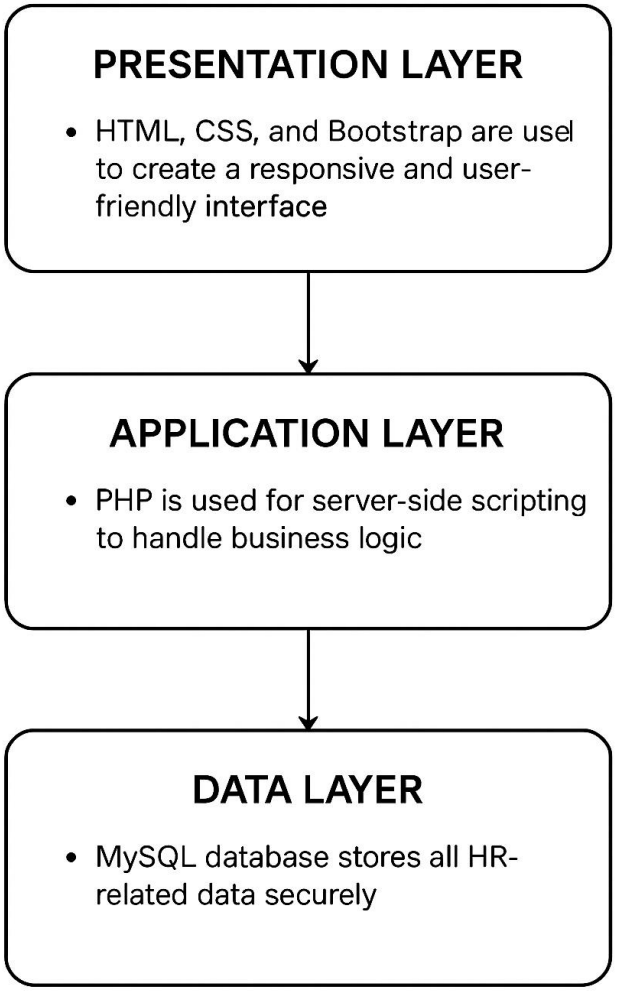

Fig 5.1 Architecture of the model

The Fig 5.1 illustrates a three-tier architecture consisting of the Presentation Layer, Application Layer, and Data Layer. The Presentation Layer uses HTML, CSS, and Bootstrap to design a responsive and user-friendly interface for end-users. Next, the Application Layer employs PHP for server-side scripting to process business logic and act as a bridge between the interface and the data. Finally, the Data Layer utilizes a MySQL database to store all HR-related information securely. This layered approach enhances maintainability, scalability, and separation of concerns in the application's design.

5.4 Module-Wise Development Strategy

Human Resource Management System (HRMS) is designed using a modular approach, where each component serves a specific purpose in the overall HR workflow. This structure allows for greater flexibility, maintainability, and scalability of the system. Below are the detailed descriptions of each module:

Admin Module

The Admin Module is the central control unit of the HRMS. It is designed for system administrators who are responsible for configuring global system settings, managing user accounts, and overseeing system-wide activities. Through this module, administrators can assign and modify user roles (e.g., HR, employee), monitor user actions via activity logs, and ensure that the system is running according to organizational policies. This module also allows the configuration of leave policies, working hours, and approval hierarchies. With complete control over the platform, administrators ensure security, operational continuity, and policy enforcement.

Recruitment Module

This module facilitates end-to-end automation of the hiring process. HR personnel can use it to create and publish job vacancies, manage applicant information, and track candidates through various recruitment stages. Applicants can submit their resumes via an integrated application form, which the system stores and categorizes. HR can screen resumes, shortlist applicants, schedule interviews, and generate offer letters—all within the system. The recruitment module ensures efficient tracking of hiring status, reduces paperwork, and speeds up the overall hiring cycle.

Candidate Module

The Leave and Attendance Module allows employees to apply for various types of leaves (e.g., casual, sick, earned) through an intuitive interface. HR managers receive notifications for approval and can review leave balances and history before making decisions. Attendance tracking can be managed manually or integrated with biometric systems. This module keeps a real-time record of daily attendance, working hours, and absenteeism. It ensures that employees' attendance data is accurately recorded and directly connected with payroll processing for precise salary calculations.

Payroll Module

The Payroll Module is responsible for managing the salary structure and computing monthly wages based on attendance, leaves, deductions, and allowances. It automates the generation of payslips, taking into account tax deductions, bonuses, overtime, and employee-specific configurations. The module also provides options for exporting financial reports and audit logs, which are essential for both HR and finance departments. By reducing manual calculations and minimizing errors, this module ensures timely and accurate salary disbursement.

Vendor Module

This module serves as a personal dashboard for employees. Each employee can log in to view and update their personal and professional details, apply for leave, view attendance history, and download payslips. It enhances transparency and self-service, allowing employees to stay informed about their status without relying heavily on HR. The system notifies users of upcoming appraisals, policy updates, and important announcements, helping improve communication between the organization and its workforce.

Document and Compliance Module

The Document and Compliance Module manages all employee-related documents and ensures adherence to company policies and legal standards. Employees can upload documents such as identification proofs, certificates, contracts, and tax forms. The system categorizes these documents by type, sets alerts for expiry or renewal, and keeps logs of policy acknowledgments and compliance checklists. This ensures that the organization remains audit-ready and legally compliant while reducing the risk of missing critical documentation.

The module also provides role-based access control, ensuring that only authorized personnel can view or modify sensitive documents. With a user-friendly interface, HR professionals can easily track document statuses, update records, and generate compliance reports as needed. Integration with email or SMS notifications further enhances timely action on expiring documents or pending acknowledgments. Overall, the Document and Compliance Module promotes transparency, accountability, and smooth regulatory operations within the organization.

5.5 Security Implementation

Security is a fundamental aspect of the HRMS to protect sensitive organizational and employee data. Several layers of protection were implemented to ensure the confidentiality, integrity, and availability of information.

Role-Based Access Control (RBAC)

This mechanism ensures that users only have access to the data and functions that are relevant to their designated roles. For instance, Administrators have full access to manage users and configurations, HR professionals can access employee records and manage payroll, and Employees can only view their personal data. RBAC reduces the risk of data breaches by strictly controlling access levels.

Input Validation

The system incorporates thorough input validation at both the frontend and backend levels to prevent malicious activities such as SQL injection and cross-site scripting (XSS). All user inputs are sanitized before being processed or stored in the database, ensuring that only valid and safe data enters the system.

Session Management

PHP sessions are used to securely manage user authentication and maintain user state throughout their interaction with the application. Sessions help prevent unauthorized access by ensuring that each user's identity is verified upon login and that session data is protected from hijacking.

Data Backups

To prevent data loss due to hardware failures, accidental deletion, or system crashes, the system performs regular backups of the MySQL database. These backups can be scheduled automatically and stored in secure locations, ensuring data recovery and business continuity in the event of a failure.

Together, these measures ensure that the HRMS operates securely, maintaining user trust and protecting the organization's critical HR data.

5.6 Workflow and User Interaction

The Human Resource Management System (HRMS) is designed with a user-centric interface and clearly defined workflows tailored to each role in the system. The interaction between users and the system follows a structured and secure pattern, ensuring clarity, efficiency, and accountability in every action performed. This section outlines the operational workflow and the way different users interact with the platform.

The system leverages role-based dashboards that provide personalized views and access controls. Each user role—Admin, HR Professional, and Employee—interacts with a specific set of modules designed to match their responsibilities. These dashboards present relevant data and actionable items in an intuitive layout, reducing the learning curve and increasing productivity. For example, while an Admin's dashboard displays configuration tools and system logs, an employee's dashboard focuses on leave balance, payroll summaries, and personal records.

Navigation throughout the system is seamless and consistent, achieved through a sidebar menu, top-bar alerts, and contextual links. Forms are used extensively for data input, with real-time validation and confirmation messages to guide user actions. Drop-downs, search filters, and calendar pickers enhance usability and reduce input errors. Users receive immediate visual feedback—such as status icons, color indicators, and pop-up messages—to confirm the success or failure of each transaction.

To ensure a smooth experience, automated alerts and notifications are integrated into the workflow. These notifications inform users about pending approvals, completed tasks, upcoming reviews, expiring documents, or important announcements. For instance, HR professionals are alerted when a new application is submitted or when a payroll cycle is due, while employees receive reminders about expiring leaves or uploaded payslips.

Additionally, the system is designed to log all critical actions taken by users for audit and security purposes. Each workflow—such as leave application, document upload, or recruitment update—generates a log entry, which can be reviewed by Admins to track activity and ensure compliance. This level of traceability promotes accountability and reduces the chances of unauthorized modifications or oversight.

Overall, the HRMS workflow prioritizes usability, transparency, and security. By aligning system behaviour with organizational hierarchy and functional roles, it creates an environment where users can efficiently perform their duties while minimizing manual intervention and ensuring data integrity.

Admin Workflow

- **Login**: Admin logs in with a secure, role-specific username and password.
- **Dashboard Access**: On successful login, Admin accesses the system dashboard displaying analytics, recent activities, and quick links to modules.
- **System Configuration**: Admin sets up leave policies, work timings, appraisal parameters, and department roles.
- **User Management**: Admin creates, updates, or deletes accounts for HR professionals and employees.
- **Monitoring**: Admin reviews audit logs, usage reports, and compliance checklists to ensure system integrity and policy adherence.

HR Professional Workflow

Login & Access: HR users authenticate themselves and are directed to the HR dashboard.

Recruitment Management

- Post job openings.
- Review submitted applications.
- Schedule interviews and record results.
- Generate and send offer letters.

Vendor Management

- Add or update vendor records.
- Assign roles, departments, and track status.

Leave & Payroll Processing

- Approve or reject leave applications.
- Use attendance and leave data to compute monthly payroll.
- Generate payslips and financial summaries.

Appraisal Input & Compliance

- Input performance ratings.
- Upload policy documents and gather employee acknowledgments.

Vender Workflow

Login & Dashboard: Employee logs in and accesses a personal dashboard showing profile info, leave status, salary slips, and announcements.

Application Requests:

- Submit applications with date ranges and reasons.
- Track approval status and leave balances.

Document Upload

- Upload identification or verification documents.
- Acknowledge company policies.

Payroll & Appraisal View

- Download monthly payslips.
- View appraisal outcomes and feedback.

Notifications

- Receive updates on leave approvals, interview schedules (for internal transfers), and policy changes.

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Overall, the HRMS workflow prioritizes usability, transparency, and security. By aligning system behaviour with organizational hierarchy and functional roles, it creates an environment where users can efficiently perform their duties while minimizing manual intervention and ensuring data integrity.

5.7 Security Considerations

Security is a critical component in the design and deployment of the Human Resource Management System (HRMS), as it handles sensitive and confidential data including employee records, payroll information, and organizational policies. To safeguard this information and maintain system integrity, several key security mechanisms have been implemented:

5.7.1 Role-Based Access Control (RBAC)

Role-Based Access Control ensures that each user can only access the parts of the system that are relevant to their assigned role. In this HRMS, there are three primary user roles: Admin, HR Professional, and Employee.

- **Admins** have full system access and can manage configurations, users, and reports.
- **HR Professionals** can access and manage recruitment, payroll, leave approvals, and compliance records.
- **Vendors** have limited access to view their personal data, apply for leave, and download payslips.RBAC significantly reduces the risk of unauthorized access and protects confidential data by restricting what each user can view or modify based on their responsibilities. It also helps enforce accountability by logging which user performed each action within the system.

5.7.2 Input Validation

Input validation is crucial in defending the system against common web-based attacks such as SQL injection and Cross-Site Scripting (XSS).

- SQL Injection occurs when malicious users attempt to manipulate database queries via input fields. The system sanitizes and escapes special characters in user inputs to ensure that SQL statements cannot be altered maliciously.
- XSS Attacks involve injecting malicious scripts into input fields, which can then be executed on another user's browser. To prevent this, the system implements HTML encoding and strict content filtering.

By validating and sanitizing all user inputs at both the client-side and server-side, the HRMS maintains data integrity and ensures that malicious scripts cannot be executed or injected into the database.

5.7.3 Session Management

To maintain a secure and personalized user experience, the system utilizes PHP sessions for authentication and session control.

- When a user logs in, a unique session ID is generated and stored securely.
- Session data helps verify the user's identity across all interactions during the session without requiring repeated logins.
- Sessions are configured to automatically expire after a set period of inactivity, reducing the risk of session hijacking.

This method ensures that each user session is authenticated and isolated, preventing unauthorized users from gaining access to another user's data.

5.7.4 Data Backups

To protect against data loss due to hardware failures, accidental deletions, or system crashes, the HRMS includes a data backup strategy:

- The MySQL database is regularly backed up at scheduled intervals.

- Backup files are stored securely in separate directories or servers, and can be restored in case of data corruption or loss

5.8 Future Enhancements

While the current version of the HRMS effectively automates core HR operations, several future enhancements can further improve its functionality, scalability, and intelligence:

- **AI-Powered Analytics** Integrating Artificial Intelligence (AI) and Machine Learning (ML) capabilities can enhance talent acquisition, employee retention, and performance management. Predictive analytics can help HR teams identify high-potential employees, assess attrition risks, and recommend personalized training paths.

- **AI-Powered Chatbots** Integrating AI-driven chatbots can provide instant support for HR-related queries, guide employees through processes like onboarding or leave applications, and reduce the HR department's workload.

- **Learning and Development (L&D) Integration** Embedding training modules, certification tracking, and e-learning platforms directly into the HRMS can help manage employee growth, track skill development, and promote a culture of continuous learning.

- **AI-Powered Chatbots** Integrating AI-driven chatbots can provide instant support for HR-related queries, guide employees through processes like onboarding or leave applications, and reduce the HR department's workload.

- **Employee Engagement Tools** Adding modules for feedback collection, surveys, recognition, and internal communication can help improve employee morale and foster a collaborative work environment.

- **Cloud Integration** Migrating the HRMS to a cloud-based platform will enhance scalability, remote access, and data availability. It will support larger user bases and facilitate seamless updates without requiring physical infrastructure upgrades.

- **Mobile Application Development** Developing mobile apps for iOS and Android platforms will increase accessibility for employees and HR managers on the go. It will support mobile notifications, on-the-fly leave requests, and real-time HR interactions.

- **Biometric and RFID Integration** Integrating biometric or RFID-based attendance systems can improve the accuracy of time tracking. This would eliminate manual entries and allow for automated syncing with the payroll module.

- **Multi-Language and Regional Support** To serve diverse workplaces, the system can be enhanced with multilingual capabilities and localization settings. This would help global companies adapt the HRMS for different regions.

- **Advanced Reporting and Dashboards** Future versions can include dynamic dashboards with real-time graphs, visualizations, and exportable reports for deeper insights into HR metrics and workforce analytics.

Integrating succession planning features into the HRMS can help organizations identify and prepare future leaders by mapping career progression paths and tracking skill development. By analyzing performance data, skill gaps, and employee aspirations, the system can suggest internal mobility opportunities and create tailored development plans. This not only ensures leadership continuity but also boosts employee engagement and retention through clear growth prospects.These enhancements will transform the HRMS from a process automation tool to a strategic HR intelligence platform that not only manages operations but also drives business growth through informed workforce management. Future HRMS versions can include wellness modules that allow employees to track their mental and physical health through integrated wellness programs, stress-level surveys, and activity logs. These tools can also provide HR with anonymized analytics to proactively support employee well-being and promote a healthier, more productive workforce. Providing a drag-and-drop workflow builder for automating routine HR tasks—such as onboarding checklists, document approvals, or exit procedures—can greatly reduce administrative burdens. Customizable workflows ensure that the system adapts to an organization’s unique processes without the need for complex coding or manual oversight.

CHAPTER-6
IMPLEMENTATION

6.1 Front-End Implementation

The front-end of the REBIL – Recruit Easy system was developed using HTML, CSS, and Bootstrap to ensure a clean, intuitive, and responsive user interface. Bootstrap's grid system and pre-designed components allowed for rapid prototyping of UI elements such as forms, buttons, tables, modals, and navigation bars. Each user role—Admin, HR, and Employee—has a dedicated dashboard tailored to their functionality, such as job postings for HR or payslip downloads for employees. The design prioritizes usability and accessibility, using consistent color schemes and typography that align with modern UI standards. Validation is incorporated at the form level to ensure correct data entry before submission. The interface is mobile-responsive and adapts seamlessly across various devices and screen sizes, thereby enhancing user experience.

In addition to responsiveness and usability, the front-end was designed with accessibility and modularity in mind. All user interface components were built as reusable blocks, allowing for consistent design patterns across different pages and reducing development time for future enhancements. Accessibility features such as proper labeling of form fields, keyboard navigability, and sufficient color contrast were incorporated to support users with varying needs. Icons and tooltips were added to guide users through interactive elements, reducing the learning curve for new users. This thoughtful approach to front-end design ensures that the platform is not only visually appealing but also inclusive and easy to use for all stakeholders in the organization.

To further enhance user engagement, interactive elements such as real-time feedback messages, confirmation modals, and alert notifications were integrated throughout the interface. For example, when a user submits a form, immediate visual feedback is provided through success or error messages, helping users understand the outcome of their actions without confusion. Dropdown menus, collapsible panels, and tab-based navigation were used to organize large sets of data efficiently, particularly in sections like job listings, applicant tracking, and employee records. These dynamic front-end components contribute.

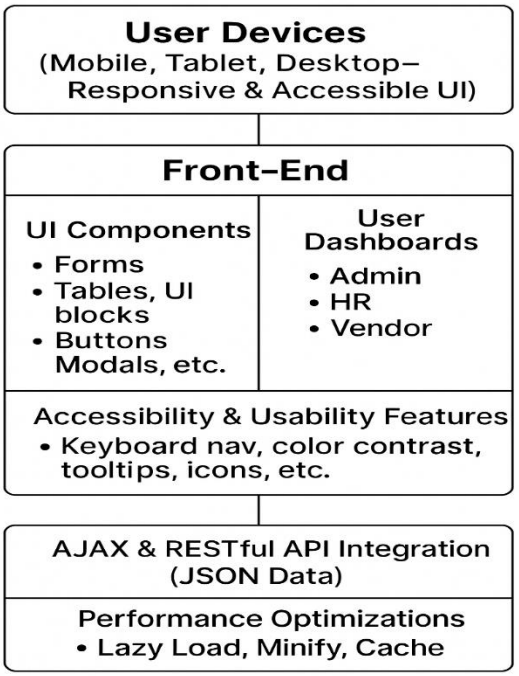

Figure 6.1 Front-End Implementation

Figure 6.1 The image illustrates the architecture of a responsive and accessible front-end system designed for web applications. At the top layer, users access the application through various devices such as mobile phones, tablets, and desktops. The user interface is designed to be responsive to different screen sizes and accessible to all users, including those with disabilities. The core of the front-end is built using HTML, CSS, and Bootstrap, which collectively provide the structure, styling, and responsiveness of the application. Within this layer, various UI components such as forms, tables, buttons, and modals are used to create interactive and functional user interfaces. Additionally, different user dashboards are available based on roles like Admin, HR, and Vendor each tailored to their specific needs.

The application emphasizes accessibility and usability, incorporating features like keyboard navigation, appropriate color contrasts, tooltips, and intuitive icons to enhance user experience. To enable dynamic content loading and interaction without full page reloads, AJAX is used along with RESTful API integration that exchanges data in JSON format between the front-end and back-end. Lastly, performance optimizations such as lazy loading, file minification, and caching are implemented to ensure the application runs efficiently and delivers a smooth user experience.

6.2 Back-End Implementation

The back-end logic of the system was implemented using PHP, a widely used server-side scripting language well-suited for dynamic content generation and form processing. PHP scripts handle user authentication, session management, role-based redirection, and communication with the database. Core business logic such as calculating payroll, updating leave balances, and tracking application statuses is implemented within modular PHP files. Secure session handling ensures that each user interaction is authenticated, and unauthorized access is restricted. Error handling and logging are incorporated to capture and manage run-time exceptions, ensuring reliability and maintainability.

In addition to core logic handling, the back-end architecture was organized using a modular coding approach, where each functionality—such as login, leave application, payroll processing, and job management—was developed as a separate PHP script or class. This structure promotes code reusability, easier debugging, and faster development when new features are added. For example, a common database connection script was created and included across all modules to maintain consistent and secure interactions with the MySQL database. By following clean coding practices and separating concerns, the system's back-end remains scalable and adaptable to evolving business requirements.

Moreover, database interactions were secured using prepared statements and parameterized queries to prevent SQL injection attacks. Inputs received from the front-end were validated and sanitized before being processed or stored, enhancing the security and integrity of the application. In workflows such as recruitment or compliance management, automated email alerts and status updates were triggered using server-side scripts to keep users informed about important events—such as application progress or document expiry. This automation not only improved the system's efficiency but also reduced the need for manual tracking and follow-up by HR personnel.

To support concurrent user interactions and ensure optimal performance, server-side caching techniques were employed in critical modules such as dashboard loading and report generation. Frequently accessed data, like organization-wide announcements or standardized dropdown lists, were temporarily stored in server memory to minimize repetitive database queries and reduce load times. This optimization significantly improves user experience during peak usage periods and reduces the overall server load.

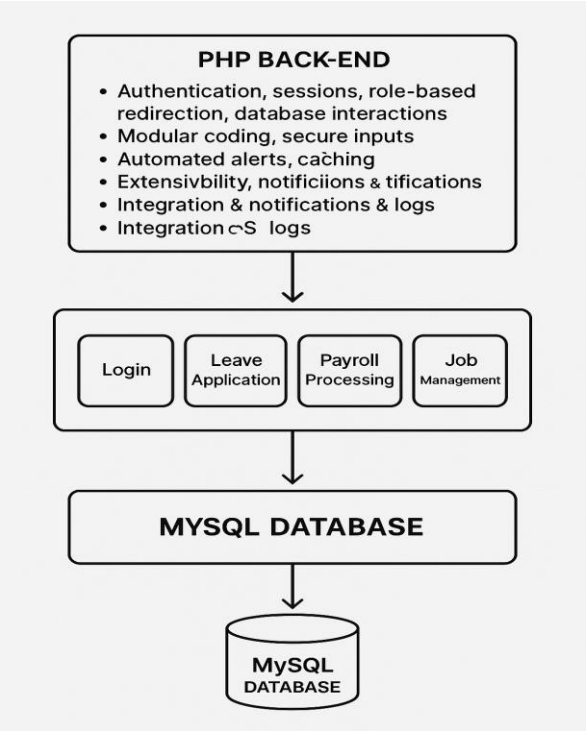

Figure 6.2 Back-End Implementation

Figure 6.2 illustrates the back-end architecture of a web application using PHP and MySQL. At the top, the PHP back-end handles several core functionalities including user authentication, session management, and role-based redirection. It also manages secure database interactions, modular coding practices, and input validation to ensure system security. Additionally, the back-end supports automated alerts and caching mechanisms to enhance performance. It is designed for extensibility and includes features for sending notifications and maintaining logs, which help in system monitoring and integration with other services.

Below the PHP back-end, the application offers key functional modules such as Login, Leave Application, Payroll Processing, and Job Management. These modules represent the core tasks users can perform in the system. All interactions from these modules are connected to a centralized MySQL database, which acts as the data storage layer. The MySQL database stores and retrieves data for the application, enabling smooth back-end operations and data-driven functionalities. This layered architecture ensures a robust, scalable, and secure web application structure.

This architecture showcases a clear separation of concerns, where the PHP back-end handles all logic, validation, and system-level processing, while the MySQL database

focuses solely on efficient data storage and retrieval. Each module Login, Leave Application, Payroll Processing, and Job Management is likely developed as an independent unit but remains tightly integrated through the back-end logic. The inclusion of features like modular coding and secure input handling not only enhances maintainability but also protects against common web vulnerabilities such as SQL injection or cross-site scripting. Furthermore, the integration of automated alerts and logging capabilities ensures that administrators can monitor system performance and user activities effectively. This setup provides a stable foundation for building scalable enterprise applications that prioritize security, functionality, and maintainability.

6.3 Database Implementation

The MySQL relational database was used to store all persistent data for the HRMS. Tables such as users, employees, applications, leaves, payroll, and documents were created to hold structured data and maintain relational integrity. Proper indexing, foreign keys, and constraints were implemented to ensure data consistency and efficient querying. For example, the employees table references the users table to link user accounts to employee profiles. Data retrieval and manipulation are conducted through optimized SQL queries integrated into PHP scripts. The database is configured to support automated backups and secure access, thereby reducing the risk of data loss and enabling recovery in case of failures.

To further enhance database performance and reliability, normalization techniques were applied during the design phase to eliminate data redundancy and ensure optimal storage efficiency. Each table was structured to represent a specific entity, with clearly defined primary keys and foreign key relationships that establish connections across modules—such as linking job applications to specific job postings and associating payroll records with employee IDs. Lookup tables were also introduced for managing fixed datasets like job roles, departments, and leave types, allowing for easy updates without affecting transactional data. These practices not only improve query speed but also support future scalability as the system grows.

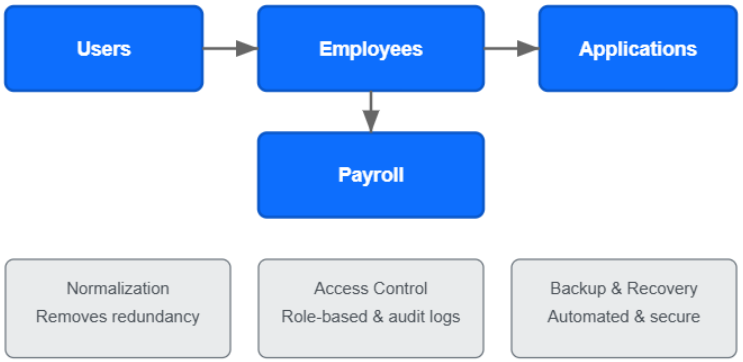

Figure 6.3 Database Implementation

Figure 6.3 shows the simple HRMS (Human Resource Management System) database diagram visually represents the core components and relationships within the MySQL database structure. It features four main tables: the Users Table, which stores user account information such as usernames and roles; the Employees Table, linking user accounts to employee profiles with details like names and positions; the Applications Table, managing job applications submitted by employees or candidates; and the Payroll Table, which handles payroll records, including salary information and payment dates.

The diagram illustrates the relationships between these tables, with lines indicating foreign key connections. For instance, the line between the Users and Employees tables signifies that each employee is linked to a user account, essential for managing access and permissions. Similarly, the connection from Employees to Applications shows that each application is associated with a specific employee, allowing for tracking of job applications. The line between Employees and Payroll indicates that payroll records are linked to specific employees, ensuring accurate salary processing.

Additionally, the diagram highlights three key features of the database design: Normalization, which emphasizes the elimination of data redundancy to improve data integrity; Access Control, which implements role-based permissions and audit logs to enhance security and accountability; and Backup & Recovery, focusing on automated and secure backup processes to ensure data resilience and business continuity. Overall, this diagram provides a clear overview of the HRMS database structure, illustrating how user accounts, employee profiles, job applications, and payroll records are interconnected while emphasizing critical features that enhance performance, security, and reliability.

6.4 Security Implementation

Security was prioritized throughout the implementation process. The system uses Role-Based Access Control (RBAC) to ensure that users only access functionalities relevant to their roles—Admins manage configurations, HR professionals handle recruitment and payroll, while Employees can view personal details and submit requests. All inputs are validated and sanitized to prevent SQL injection and cross-site scripting (XSS) attacks. Passwords are hashed using password_hash() for secure storage. PHP sessions are used to maintain user states and are configured to expire after inactivity, reducing the risk of session hijacking. Additionally, critical actions are logged to support auditing and compliance monitoring.

In addition to secure password storage and input validation, access control is enforced at both the front-end and back-end levels. Even if users attempt to manipulate URLs or HTML elements to access unauthorized features, server-side checks ensure that access is denied based on session roles. This layered security approach ensures that no user can bypass restrictions by tampering with the client-side code. Administrative interfaces and sensitive operations such as payroll modifications or user account deletion—are guarded with additional confirmation prompts and permission checks to prevent accidental or unauthorized actions.

The application also maintains comprehensive audit trails, capturing metadata such as the user ID, IP address, timestamp, and the action performed. These logs are stored securely and are accessible only to system administrators. Audit trails play a critical role in compliance, internal investigations, and system monitoring. They allow organizations to trace back changes to their source and ensure accountability for sensitive data modifications or access.

To reduce exposure to common web vulnerabilities, the application adheres to secure coding practices and undergoes regular security reviews. These include code audits, vulnerability scanning using tools like OWASP ZAP, and adherence to OWASP Top 10 security guidelines. Any identified risks such as insecure direct object references or broken authentication flows are prioritized and patched promptly to maintain a secure system environment.

Furthermore, data encryption is applied to sensitive fields within the database, such as government ID numbers, bank details, or performance appraisal comments. This ensures that even in the event of unauthorized database access, critical personal and financial information remains protected. Backup data is also encrypted during storage and transmission to prevent data leaks during backup operations.

Lastly, the system is built to be GDPR and data privacy compliant, incorporating user consent prompts, data access logs, and the ability for users to request data deletion or export. These features help organizations meet modern data protection regulations and build trust with users by being transparent and respectful of their personal information.

6.5 Module Integration

Each module of the HRMS—such as recruitment, leave management, payroll processing, document management, and compliance tracking—was developed independently and later integrated into a unified system. Data communication between modules was established using relational mappings in the database. For instance, when a leave request is approved, the attendance and payroll modules are updated accordingly. This integration ensures that information flows consistently across different parts of the application, reducing redundancy and improving accuracy. Each module shares a common design structure and navigation framework for uniformity and ease of use.

To maintain consistency and streamline the user experience, all modules were integrated with a centralized dashboard tailored to each user role. This dashboard acts as a control center, allowing users to access multiple modules from a single interface without navigating through separate systems. For example, HR professionals can monitor job applications, approve leaves, and generate payroll from within the same environment, while employees can view their attendance, submit requests, and download payslips through their own personalized dashboard. This cohesive integration not only enhances usability but also facilitates faster task execution, better data visibility, and improved coordination across different HR functions.

To further strengthen security, HTTPS encryption is enforced across all pages, ensuring that data transmitted between the client and server is protected from interception and tampering. Security headers such as Content-Security-Policy, X-Content-Type-Options, and X-Frame-Options were also implemented to prevent clickjacking, MIME-type sniffing,

and other browser-based threats. Login attempts are rate-limited, and CAPTCHA is enabled after multiple failed logins to prevent brute-force attacks. For added resilience, an optional two-factor authentication (2FA) mechanism can be integrated using time-based one-time passwords (TOTP) for high-privilege users like administrators and HR managers.

On the server side, file upload functionality is closely monitored to prevent the execution of malicious files. All uploaded documents such as resumes, ID proofs, and compliance documents are scanned for executable code, and only approved file types and sizes are allowed. Uploaded files are renamed using a secure hash and stored in non-executable directories to further reduce security risks. These controls ensure that user-uploaded content cannot compromise server integrity or application functionality.

Lastly, the reporting and analytics functionality was designed to pull data from all modules, offering a consolidated view of organizational performance. Customizable reports that span across recruitment, attendance, payroll, and training allow HR professionals and management to gain valuable insights and make informed decisions. The integration of data analytics ensures that the HRMS is not just a transactional tool but a strategic platform that supports workforce planning and optimization.

CHAPTER-7
TESTING

7.1 Unit Testing

Unit testing was performed during the development of each individual module. This involved testing smaller components such as user login, job posting, leave request submission, document uploads, and payroll generation. The main goal was to ensure that each function or form worked independently without logical or syntax errors. For example, the leave module was tested to ensure that it only allowed valid date ranges and correctly stored the data in the database. Similarly, the job application form was tested for proper input validation, file upload functionality, and email formatting.

To maintain code quality and prevent regressions, unit tests were integrated into the development workflow using modular test scripts that mirrored real-world scenarios. Each test case was designed to validate both typical and edge-case inputs—for instance, submitting overlapping leave dates, uploading files with unsupported formats, or entering invalid credentials during login. This approach helped uncover hidden issues early in the development cycle and ensured robust error handling for unexpected user behavior.

Test cases were also written to verify business logic against backend calculations, particularly in complex areas like payroll and attendance. For example, unit tests were used to check that salary deductions for late arrivals or unpaid leave were calculated correctly based on organizational policies. Similar logic checks ensured that leave balances were correctly updated after each request and that performance ratings were accurately recorded in employee appraisals.

Additionally, mock data and dummy accounts were used to simulate real operations across different user roles. These mock scenarios allowed developers to test access permissions and ensure that HR functionalities were not accessible to employees, and vice versa. This testing was particularly useful in validating the Role-Based Access Control (RBAC) logic, which is crucial for maintaining security and data integrity in a multi-user environment.

Automated unit tests were paired with manual exploratory testing to catch UI and usability issues that couldn't be identified through code-level validation alone. For instance, developers manually tested form behaviours, modals, and notifications to ensure responsiveness and smooth interactions across devices and browsers. This combination of automated and manual unit testing ensured that each component not only worked in isolation but also delivered a reliable user experience.

Lastly, test results were documented and tracked using version control and issue-tracking tools, allowing the team to monitor the progress of bug fixes and improvements. This documentation also served as a reference for future updates, enabling quicker debugging and re-validation of modules when changes are made.

7.2 Integration Testing

Following unit testing, integration testing was carried out to verify the interaction between various modules of the HRMS. Since the application follows a modular architecture, it was critical to ensure seamless data flow across modules. For instance, when a leave is approved by the HR user, the approved status should reflect in the payroll module to calculate salary deductions automatically. Similarly, job applications submitted through the recruitment module must be accessible through the HR dashboard for further action. Integration testing confirmed that all modules worked in coordination without any data mismatches or logic breakages.

To ensure data integrity and workflow continuity, test scenarios were designed to replicate end-to-end business processes involving multiple modules. For example, a full employee onboarding process was tested from job application submission, HR review, document upload, and offer letter generation, to the creation of the employee profile in the system. Each step was validated to ensure that data was correctly passed between modules, with no loss or misinterpretation of information.

Special attention was given to real-time synchronization and conditional logic flows. For instance, integration testing confirmed that if an employee updated their bank details in the self-service portal, the changes were immediately reflected in the payroll module before the next payment cycle. Similarly, changes to organizational policies (such as leave accrual rates or work hours) by the admin were tested to ensure they cascaded properly.

Test cases also covered negative scenarios and exception handling to check system behaviour when modules encountered missing or incorrect data. For example, if a job application was deleted mid-review or a leave request was submitted without required documentation, the system was expected to handle such cases gracefully, displaying appropriate error messages and preventing partial data from corrupting related modules.

The team used test logs and debugging tools to track data flow between modules, enabling quick identification and resolution of issues such as circular dependencies, unhandled exceptions, or asynchronous call failures. API calls and database transactions were closely monitored during these tests to ensure atomicity and consistency across all operations.

Lastly, user role interactions during integration testing helped validate the Role-Based Access Control (RBAC) mechanism across module boundaries. For instance, it was verified that an employee couldn't access payroll calculations directly, but could see updated salary slips after HR processing. These comprehensive integration tests ensured that the HRMS operated as a unified, dependable platform ready for production deployment.

7.3 System Testing

System testing was performed to ensure that the entire application functioned correctly as a whole. All workflows—such as the recruitment cycle from job posting to offer generation, leave application to approval, and payslip generation—were tested end-to-end. Each user role (Admin, HR, Employee) was tested with appropriate permissions to ensure that they could access only the features assigned to them. This phase also helped verify that the application met both the functional and non-functional requirements specified during the requirement analysis phase.7.2 Integration Testing

User Acceptance Testing was conducted in collaboration with actual users, including HR professionals, administrative staff, and a small group of employees. Test users were given access to the system with their respective roles to perform real-life HR activities. Their feedback was gathered regarding usability, navigation flow, system speed, and error handling. Based on the feedback, UI adjustments and minor bug fixes were made to improve user experience. UAT validated that the system fulfilled user expectations and was ready for deployment in a production environment.

Given the sensitive nature of employee data, special attention was paid to security testing. The system was tested for common vulnerabilities such as SQL injection, Cross-Site Scripting (XSS), session hijacking, and unauthorized access. All input forms were tested with malicious payloads to confirm that sanitization and validation measures were working as expected. Passwords were verified to be securely hashed in the database. Additionally, role-based access control was rigorously tested to ensure that users could not access restricted areas or perform unauthorized actions.

Performance testing was conducted to assess the system's behavior under typical and peak usage conditions. Load testing involved simulating multiple users logging in and accessing the dashboard simultaneously, particularly during payroll processing and report generation. The system was monitored for response time, database query speed, and memory consumption. The results indicated that the application could handle moderate traffic efficiently with optimal response times. Recommendations for scaling via cloud infrastructure were documented for future phases.

In addition to functional testing, compatibility testing was performed across different browsers (such as Chrome, Firefox, Edge, and Safari) and devices (desktop, tablets, and smartphones) to ensure consistent behavior and responsiveness. This was crucial for a system like HRMS where users access the platform from varied environments. Any inconsistencies in layout, interactive elements, or performance were identified and resolved to provide a seamless experience for all users regardless of their chosen device or browser.

Recovery and failover testing were also conducted to evaluate the system's resilience in the event of unexpected failures, such as server crashes, network interruptions, or power outages. Backup and restore procedures were tested to confirm data integrity and continuity. The system's ability to gracefully recover from such incidents with minimal data loss or downtime was validated, ensuring reliability and business continuity for critical HR operations.

During UAT, special emphasis was placed on accessibility testing to verify compliance with standards such as WCAG (Web Content Accessibility Guidelines). Users with disabilities tested the system using screen readers, keyboard-only navigation, and high-contrast modes. Feedback from these tests guided enhancements like improved form labelling, focus indicators, and alternative text for images, making the HRMS.

To complement security testing, penetration testing was performed by internal security experts to simulate targeted cyber-attacks on the system. This proactive approach helped identify potential vulnerabilities that automated tools might miss, including privilege escalation paths and business logic flaws. Remediation plans were put in place for any discovered risks, further strengthening the system's defence mechanisms before deployment.

Lastly, stress testing was conducted beyond normal peak loads to understand the system's breaking points and scalability limits. This involved simulating an unexpectedly high number of simultaneous users and transactions to observe system behaviour under extreme conditions. Findings from these tests informed infrastructure planning, emphasizing the need for scalable cloud services and load balancing to maintain performance and availability as user demand grows. To ensure smooth deployment, environment testing was conducted to verify that the application functioned correctly in different stages development, staging, and production. This process included validating configuration settings, database connections, and third-party service integrations in each environment. Automated deployment scripts were also tested to streamline future releases and minimize downtime during updates.

Backup and disaster recovery plans were established and tested as part of the system rollout. Regular automated backups were scheduled, and recovery drills were performed to confirm that data restoration could be completed within acceptable time frames. This proactive approach ensures that the HRMS can recover quickly from unexpected failures, minimizing operational disruptions and safeguarding critical employee information. Post-deployment, a monitoring framework was put in place to continuously track system health, user activity, and error logs. Tools such as application performance monitoring (APM) and centralized logging help detect issues early, enabling the support team to respond promptly. This continuous monitoring also provides insights into usage patterns that can guide future feature enhancements and optimizations. To maintain high system quality, a maintenance and support plan was developed. This includes scheduled updates for security patches, performance improvements, and feature enhancements based on user feedback. A dedicated support team was trained to handle user queries, troubleshoot issues, and facilitate ongoing training sessions to help users maximize the benefits of the HRMS.

Finally, comprehensive documentation was created for both end-users and technical staff. User manuals, FAQs, and video tutorials assist employees and HR personnel in navigating the system effectively, while technical documentation aids developers in maintaining and scaling the platform. This thorough documentation ensures sustainability and smooth knowledge transfer within the organization. To ensure a smooth transition and successful deployment, data migration testing was performed to accurately transfer existing records without loss or corruption, while cross-functional testing involved stakeholders from HR, finance, and compliance to validate end-to-end workflows. User feedback from UAT was analyzed to prioritize future enhancements, and a phased rollout strategy was implemented starting with a pilot group to monitor performance and user adaptation. Additionally, a comprehensive change management plan—including communication, training, and support was executed to ease the transition, promote user adoption, and minimize disruptions, ensuring the HRMS delivers maximum value across the organization. Additionally, a change management plan was put in place to support users during the transition. This included communication campaigns, training workshops, and helpdesk support to minimize resistance and encourage adoption. By managing change proactively, the organization aimed to maximize the benefits of the new HRMS while minimizing disruptions to daily operations.

CHAPTER-8

CONCLUSION

8.1 Conclusion

The methodology adopted for the development of the Human Resource Management System (HRMS) was carefully selected to ensure a systematic, scalable, and secure implementation of all HR functions. By employing the Waterfall Model, the project followed a disciplined and phased approach, which helped maintain structure, accountability, and clarity throughout each stage of development—from requirement analysis and design to implementation, testing, and deployment.

The use of a three-tier architecture and an open-source technology stack (HTML, CSS, Bootstrap, PHP, and MySQL) enabled modular development, easy maintenance, and cost-effective scalability. Each functional module—recruitment, leave and attendance, payroll, employee dashboard, and compliance—was built to address specific HR needs while ensuring interoperability and centralized data control.

Particular emphasis was placed on the Admin and HR modules, which form the backbone of the system's operations. The Admin Module provides overarching control of the platform, allowing administrators to configure global system settings, manage users, monitor logs, and enforce security policies. This ensures the platform remains compliant with organizational and legal standards while being customizable for diverse business environments.

The HR Module, on the other hand, focuses on executing day-to-day HR functions such as posting job openings, managing applicants, processing payroll, approving leaves, and tracking employee performance. It offers tools that enhance HR efficiency, reduce paperwork, and provide a seamless interface for managing employee lifecycles.

Comprehensive security measures, including Role-Based Access Control (RBAC), input validation, session management, and regular backups, were implemented to protect the integrity and confidentiality of employee and organizational data. Additionally, a forward-looking design approach has laid the groundwork for future enhancements, including AI-powered analytics, cloud hosting, mobile access, and improved user engagement tools.

APPENDIX

SCREENSHOTS

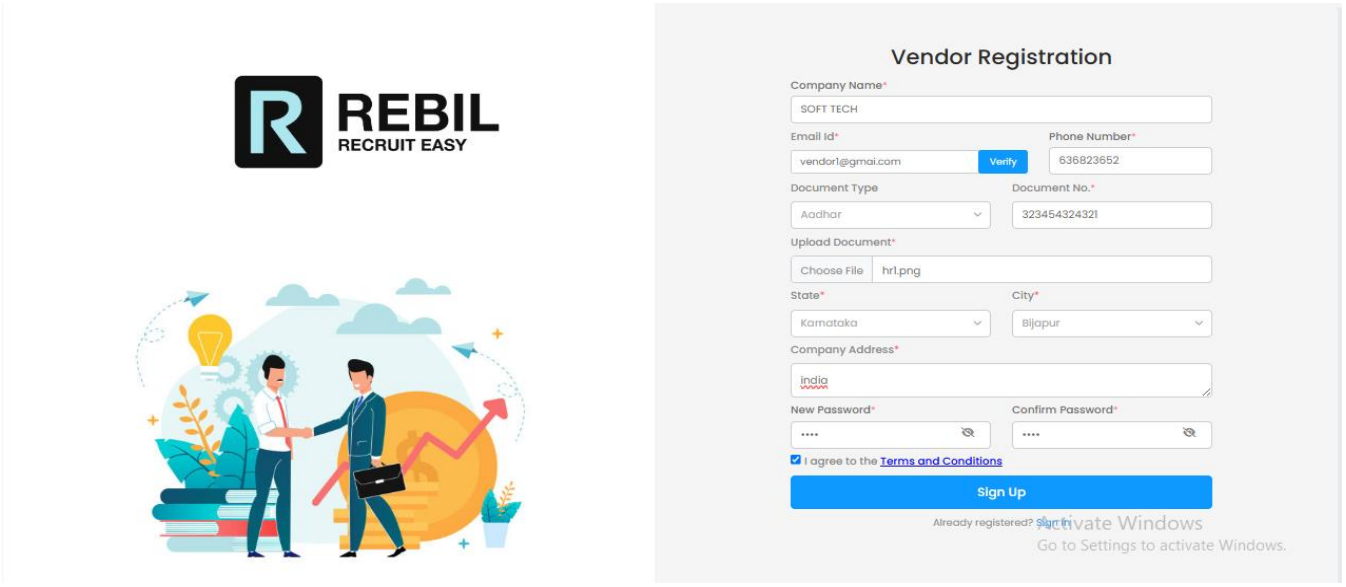

Fig A Vendor Registration Page

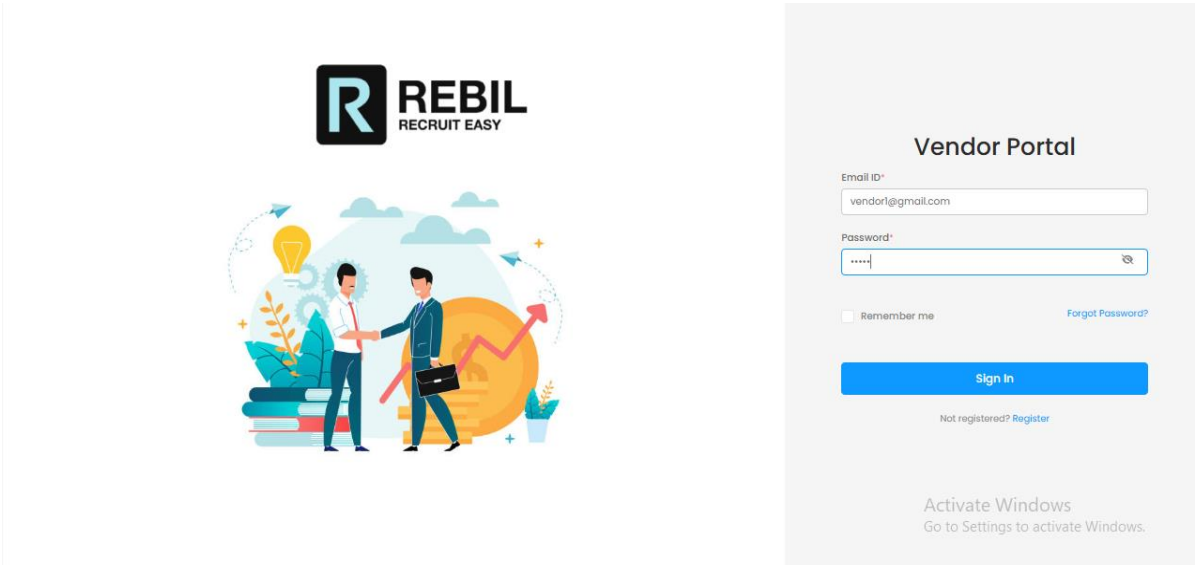

Fig B Vendor Login Page

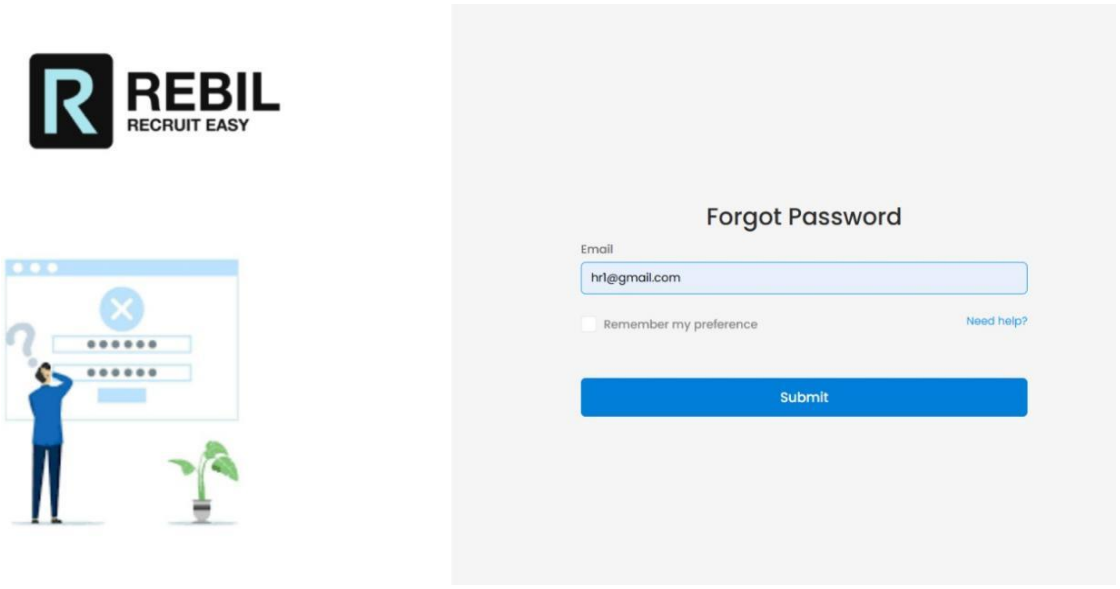

Fig C Forgot Password Page

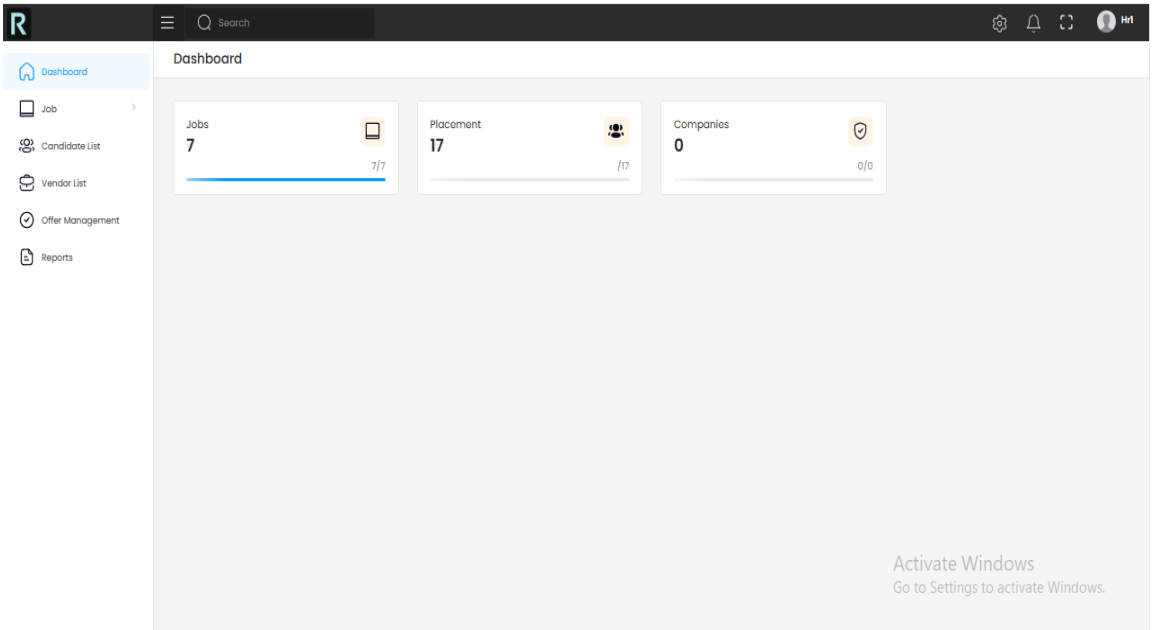

Fig D Vendor Dashboard Page

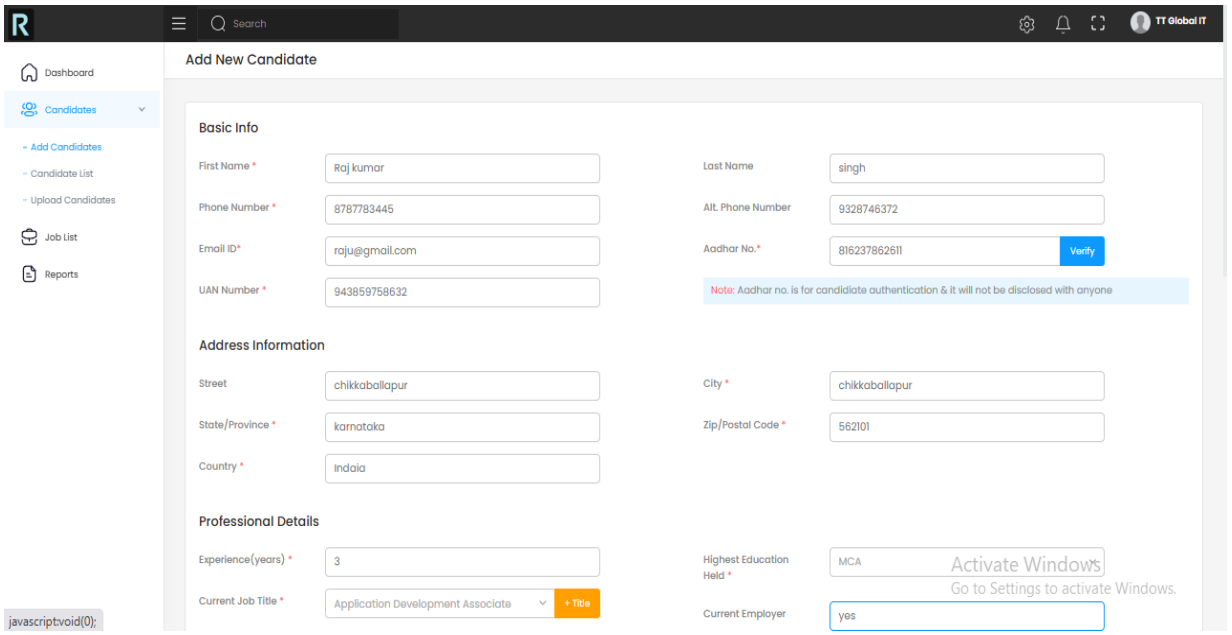

Fig E Add New Candidate Page

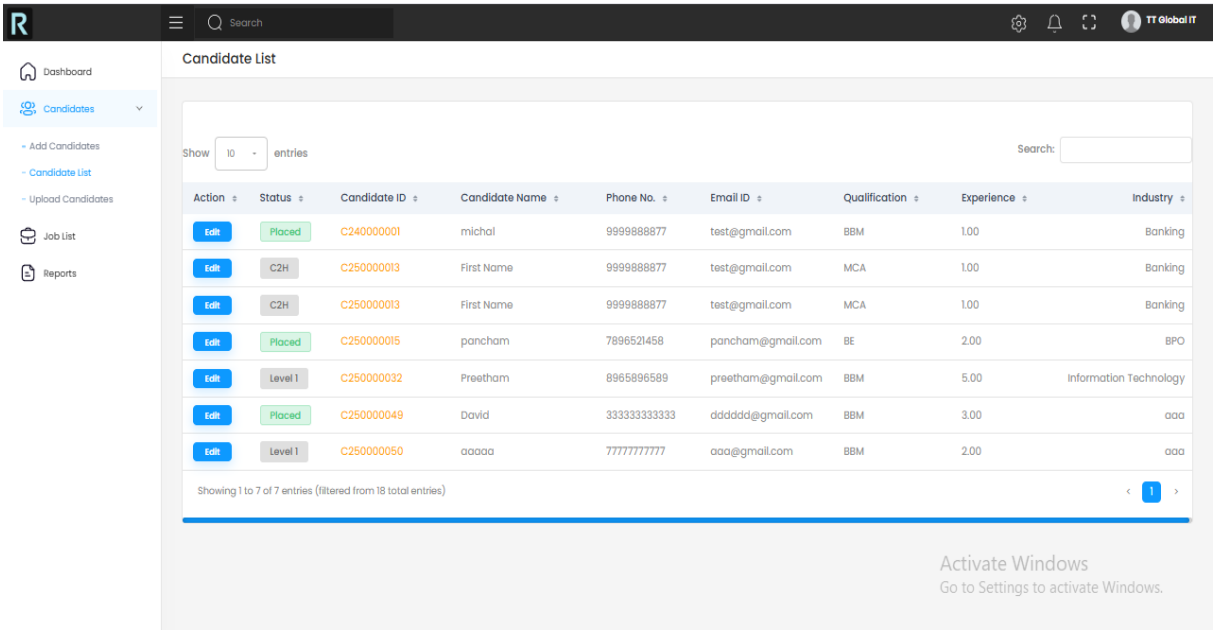

Fig F Candidate List Page

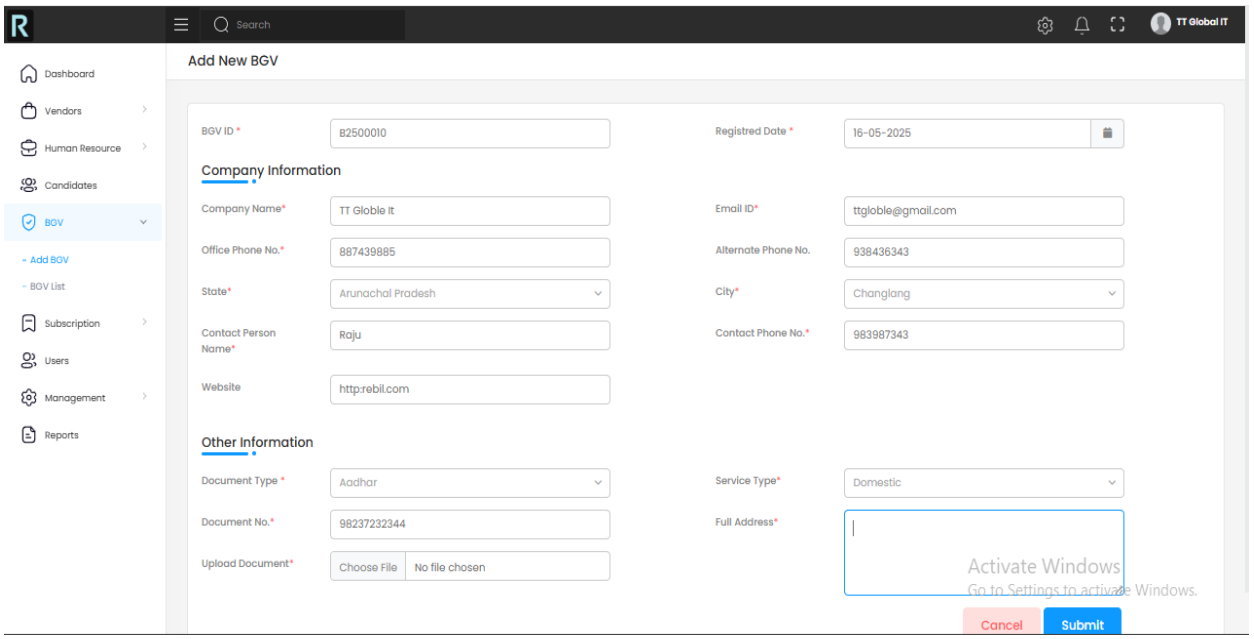

Fig G Adding New BGV Page

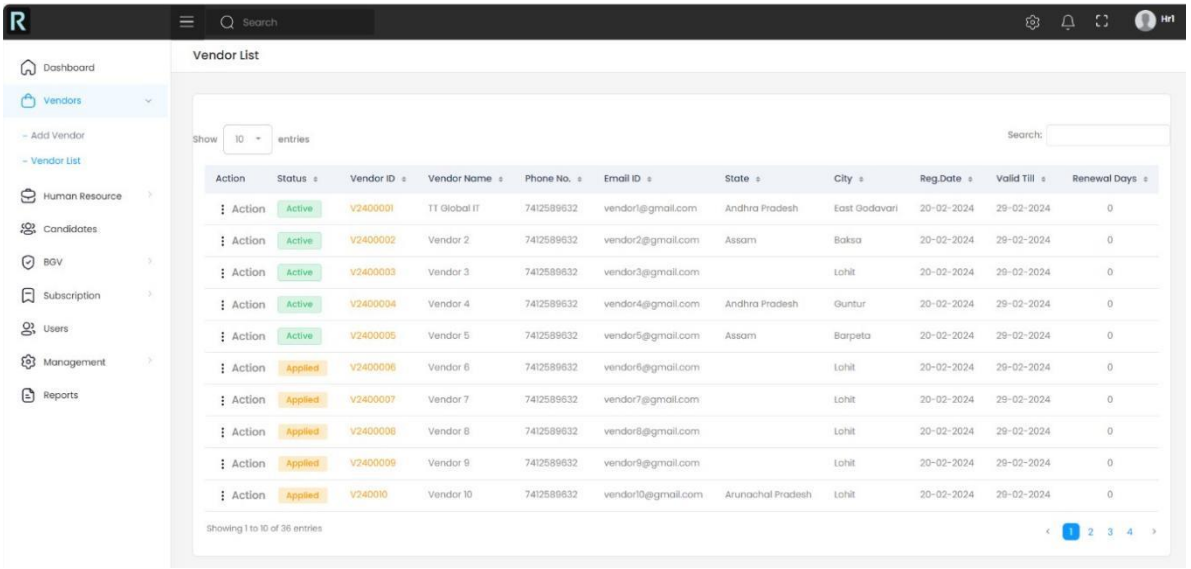

Fig H BGV List Page

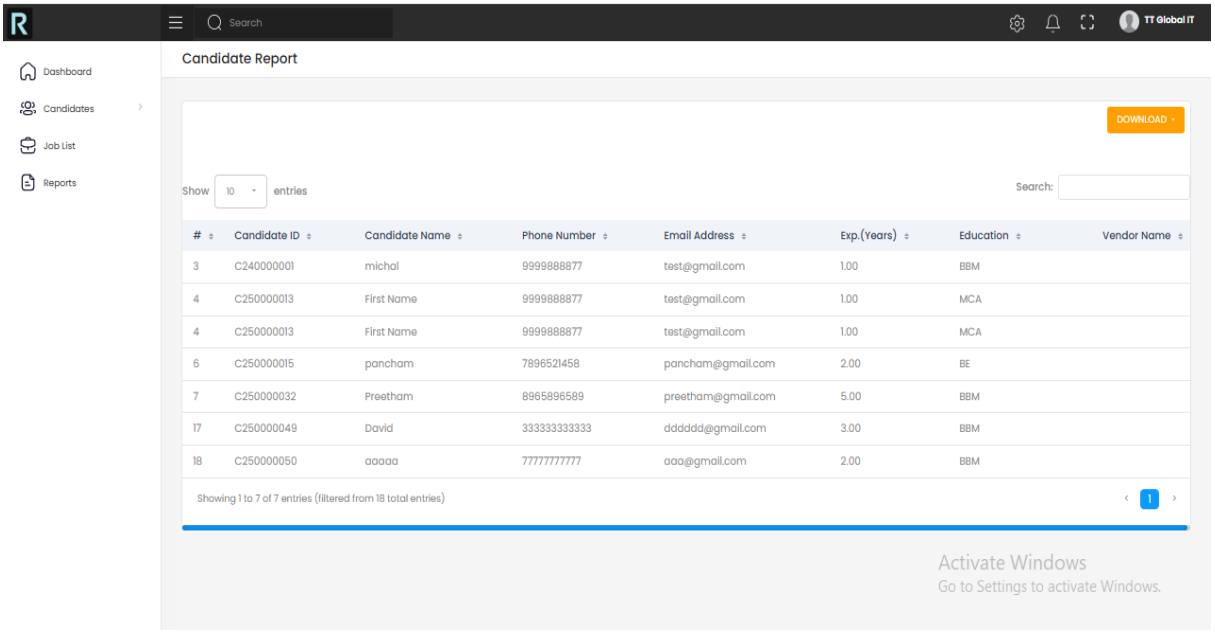

Fig I Candidate Report Page

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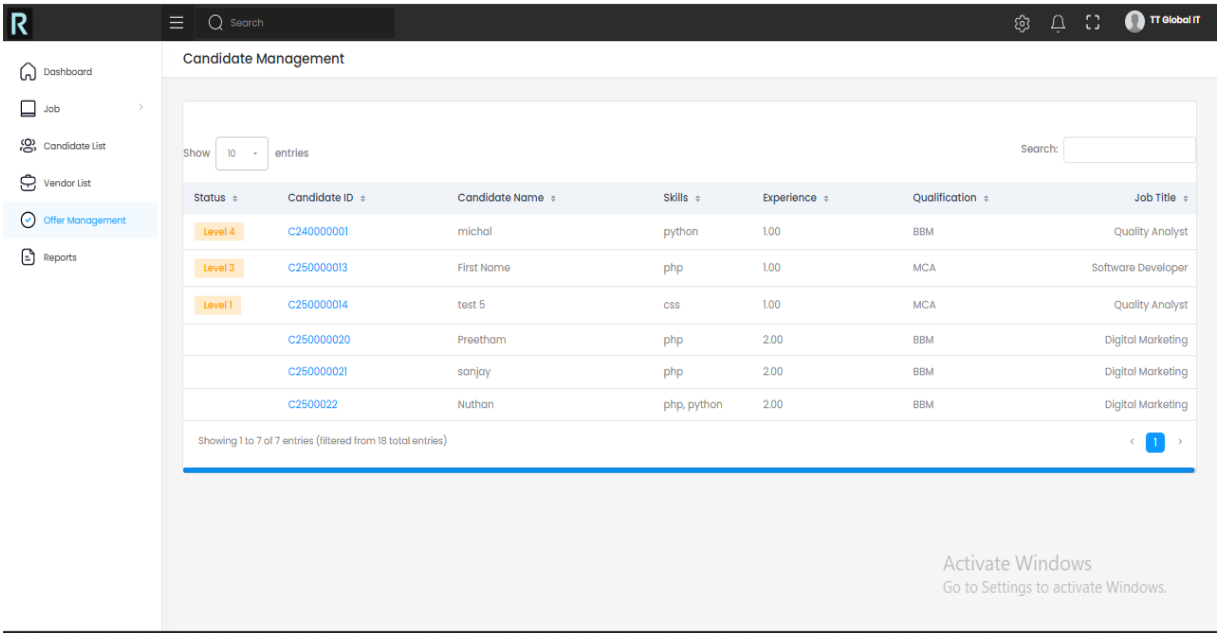

Fig J Offer Management – Candidate Management Page

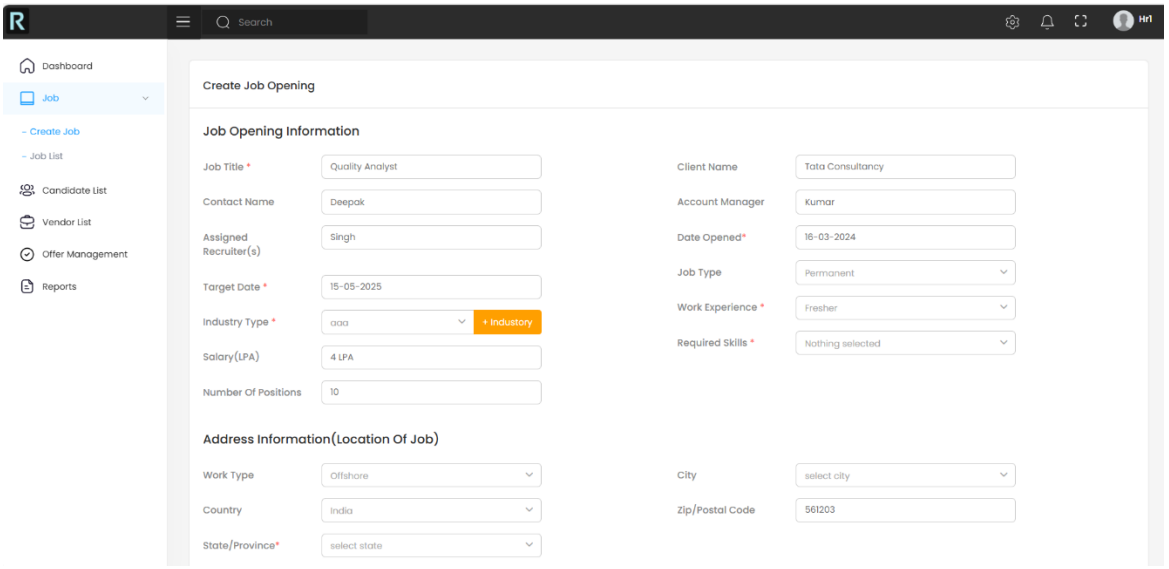

Fig K Job Opening Information

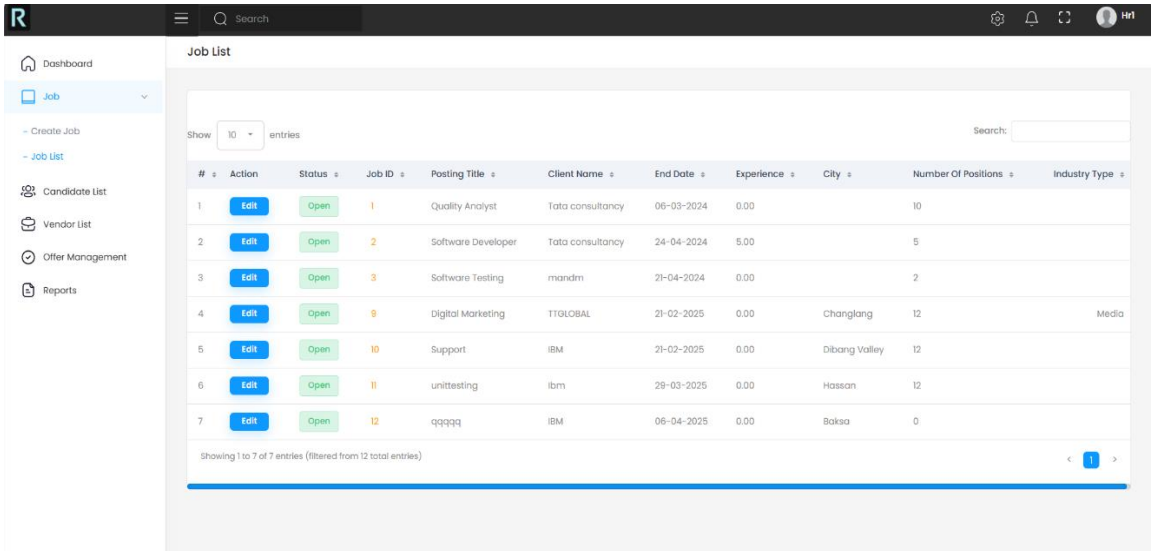

Fig L Job List

INTERNSHIP CERTIFICATE

TT GLOBAL IT

To

Date:24-02-2025

Moju Kumar B L
Bandahalli,(P) Mudenahalli,
(D)Chikkaballapura
Karnataka-562101

Dear Moju Kumar B L ,

We are pleased to offer you an internship with the Transcript Technology Global Infotech Pvt Ltd. This is an educational internship. Our goal is for you to learn more about Software Industry. your internship is expected to starts from 25-02-2025 To 25-05-2025

However, at the sole discretion of the Company, the duration of the internship may be extended or shortened with or without advance notice.

In this internship program you will be working as Software Development Intern and you will be working on Rebil project.

As an intern, you will not be a Company employee. Therefore, you will not receive a salary, wages, or other compensation. In addition, you will not be eligible for any benefits that the Company offers its employees, including, but not limited to, health benefits, holiday, vacation, sick leave, retirement benefits, or participation in the Company's plan. You understand that participation in the internship program is not an offer of employment, and successful completion of the internship does not entitle you to employment with the Company. During your internship, you may have access to confidential, proprietary, and/or trade secret information belonging to the Company. You agree that you will keep all of this information strictly confidential and refrain from using it for your own purposes or from disclosing it to anyone outside the Company. In addition, you agree that, upon conclusion of the internship, you will immediately return to the Company all of its property, equipment, and documents, including electronically stored information.

By accepting this offer, you agree that you will follow all the Company's policies that apply to non-employee interns.

This letter constitutes the complete understanding between you and the Company regarding your internship and supersedes all prior discussions or agreements. This letter may only be modified by a written agreement signed by both of us. Please indicate your acceptance of this offer by signing below and returning it to the company.

TT GLOBAL IT

I hope that your internship with the Company will be successful and rewarding. Please indicate your acceptance of this offer by signing below and returning it to the company

Very truly yours,

Navaneetha Krishna
Human Resource Manager
Transcript Technology Global Infotech Pvt Ltd

Acceptance Of Appointment Terms and Conditions

I agree that I have read, understand, and accept employment with Transcript Technology Global Infotech PVT LTD. Under the terms and conditions stated above.
(Please sign below to confirm that you agree with the terms and conditions stated in this offer)

Signature: _____

Printed Name : Moju Kumar B L

Date: 25/02/2025 Date of joining (if requesting an alternative date): _____

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