

NEXORA HCM



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Sustainable Development Goals

SDG No	Description of SDG	SDG No	Description of SDG
SDG 1	No Poverty	SDG 9	Industry, Innovation, and Infrastructure ✓
SDG 2	Zero Hunger	SDG 10	Reduced Inequalities
SDG 3	Good Health and Well Being	SDG 11	Sustainable Cities and Communities
SDG 4	Quality Education	SDG 12	Responsible Consumption and Production
SDG 5	Gender Equality	SDG 13	Climate Change
SDG 6	Clean Water and Sanitation	SDG 14	Life Below Water
SDG 7	Affordable and Clean Energy	SDG 15	Life on Land
SDG 8	Decent Work and Economic Growth	SDG 16	Peace, Justice and Strong Institutions ✓
		SDG 17	Partnerships for the Goals



Range of Complex Problem Solving

Range of Complex Problem Solving			
	Attribute	Complex Problem	
1	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering, and other issues.	✓
2	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	
3	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals based, first principles analytical approach.	✓
4	Familiarity of issues	Involve infrequently encountered issues	
5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	
6	Extent of stakeholder involvement and	Involve diverse groups of stakeholders with widely varying needs.	

	level of conflicting requirements		
7	Consequences	Have significant consequences in a range of contexts.	
8	Interdependence	Are high level problems including many component parts or sub-problems	
Range of Complex Problem Activities			
	Attribute	Complex Activities	
1	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).	
2	Level of interaction	Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues.	
3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.	✓
4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.	
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.	

Abstract

With the fast pace of technological advancement in the digital world, HR practices have been revolutionized, thus necessitating the creation of better strategies in the use of technology. The traditional HRM software possessed only basic capabilities that were unable to be automated or intelligent in the decision-making process by the management. In order to solve the above problem, Nexora HCM the AI Human Capital Management software – was invented, specifically tailored to suit the needs of the SMEs.

The Nexora HCM system provides a suite of services that enable the automation of the HRM process like personnel file management, attendance tracking, leave management, salary payment, recruitment, and performance evaluation. Unlike the traditional HR systems, Nexora HCM also includes the sentiment analysis and predictive analysis module through artificial intelligence. In our system we have Admin Dashboard and Employee Dashboard two interfaces. Admin Dashboard handles real time data do analytics make reports and do smart recommendations. Conversely, the Employee Dashboard had self-service facilities that enabled users to control activities, attendance, leave requests, and performance effectively. The added feature of an AI Assistant also contributed to the increased user interaction and the ability to get the necessary information with guidance and prompt response.

Nexora was implemented using Next.js as its frontend and Node.js as its backend, together with a relational database to provide security and organization of data. The technology stack used in this process involves the latest web technologies, thus ensuring reliability in its operation. Security measures implemented include role-based access control, secure login techniques, and secure API communications.

Dedication

The aim of this project is to dedicate it to our respected parents, who all through our studies have always been there for us, supporting us in all that we do. Our efforts towards achieving our aims have always been due to their faith in our abilities. We dedicate this research to our respected teachers and guide, who with their valuable knowledge guided us to finish this project.

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CHAPTER 1

INTRODUCTION

1 Introduction

To sustain productivity and operational efficiency in the present organizations, human resource management is necessary. Old HR systems may lean towards manual processes or a stand alone tool, which can cause inefficiencies, data inconsistencies, and inability to support decision-making.

This project showcased Nexora HCM, an AI based Human Capital Management tool created to offer a centralized means of HR operation management. The system incorporated major modules like employee management, attendance, leave management, payroll, recruitment and performance evaluation in one platform.

Besides the typical HR capabilities, Nexora HCM also featured AI-based functionalities like sentiment analysis and predictive analytics to support decision-making and give insights into employee behaviors and organizational trends. The system comprises the Admin Dashboard, which makes organizational actions easy, and the Employee Dashboard, which makes personal activities easy. Overall, the project strives to create a dependable, scalable, and user-friendly system that could assist in improving HR processes and handling employees.

1.1 Motivation

The inspiration behind this application stems from the drawbacks associated with traditional HR management systems that fail to incorporate their different elements, automate various HR activities, and adopt intelligent decision-making techniques. Existing software applications lack adequate functionalities and rely on multiple software applications to perform HR tasks, creating many inconveniences.

Therefore, there is a need for a comprehensive HR management system that allows its users to handle data, monitor attendance and vacations, compute

salaries, assess employee performances, and take intelligent decisions. Besides, most software applications available in the market today lack artificial intelligence (AI) functionalities, providing vast room for improvement in HR processes through predictions, sentiment analysis, and automation of routine tasks.

1.2 Objectives

The primary goal of the present project is the creation of the full-scale Human Capital Management System, which will automatize different HR activities in the company and make them more effective.

Creation of a system that will provide management of all activities connected with personnel, including keeping records about all employees, tracking their attendance, providing them with leaves, calculating their salaries, and evaluating their performance.

Creation of a module that will ensure the self-service capability allowing employees to solve their problems independently.

Application of artificial intelligence to evaluate the emotions of workers and predict some outcomes using the obtained data.

Ensuring security of all confidential information through role-based access and security login mechanisms.

Creation of an efficient and user-friendly system adapted to the needs of SMBs.

1.3 Main Contributions

Creation of the Integrated Smart Human Capital Management System.

- A centralized platform was created that incorporated various HR functionalities, such as managing employees, attendance and leave management, payroll, recruitment and performance appraisal.
- AI-related attributes like sentiment analysis and predictive analytics were

added to offer more insight and assist in decision making that is data-driven.

- The design of a dual-interface system was made, with the Admin Dashboard, to be used by the organization, and the Employee Dashboard, to be used by employees in self-service operations.
- The system enhanced efficiency through lessening of manual work and automating routine HR operations.
- A secure and scalable architecture was deployed with the modern web technology in order to make it reliable and extendable in future.

1.4 Report Organization

This report has the following structure:

- Chapter 2 will give the background study and literature review where the state of the art Human Capital Management systems, the current technologies in HR and the drawbacks of the traditional solutions will be discussed. It also brings to light the necessity of a combined and smart system such as Nexora HCM.
- Chapter 3 outlines the system requirements in a detailed manner with use case diagrams, use case tables, functional and non-functional requirement, external interface requirements, database requirement and project feasibility analysis. This chapter is a total realization of the manner in which the system is supposed to operate.
- Chapter 4: The system design entails the design approach, design constraints, and system architecture. It is also endowed with logical and dynamic perspectives of the system in the form of diagrams like class diagrams and sequence diagrams.
- Chapter 5. System implementation Chapter 5 discusses the tools and technologies employed, approach to development, and specifics of implementation of major modules, such as employee management, attendance, leave, payroll, and AI-based capabilities. It also gives the application workflow of the system.

- Chapter 6: Chapter 6 addresses system testing and evaluation such as testing strategy, various types of testing that are conducted, test cases and results that are obtained to ensure that the system is functioning and reliable.
- Chapter 7 is a conclusion of the report that summarizes the entire work, outlines the key contributions of the system, and proposes potential improvements and future advancements.

CHAPTER 2

BACKGROUND STUDY / LITERATURE REVIEW

2 Background / Literature Review

Human Capital Management systems are becoming imperative to organizations in their quest to manage their workforce effectively and automate HR processes. As technology has advanced, most organizations have moved away with manual processes to adopt digital to achieve accuracy, less workload, and decision-making.

Some of the current systems include Workday HCM, Zoho People, BambooHR, ADP Workforce Now and Gusto, which offer basic features of employee management, attendance, payroll, and performance assessment. Nevertheless, these systems do not necessarily have complete inter-module integration and can necessitate the need to use several tools to manage entire HR operations.

Moreover, most of the platforms have less support of AI-based functions like predictive analytics and sentiment analysis which are relevant in understanding employee behavior and enhancing organizational decisions. In certain cases, it is also limited in customization and flexibility, and it may be hard to adapt to the requirements of different organizations.

The Nexora HCM software has been created with these disadvantages in consideration. It is a centralized and smart solution that combines human resource management and artificial intelligence to optimize the process.

2.1 Key Concepts

The Nexora HCM software was created through the amalgamation of several HRM theories and some characteristics of modern software architecture.

Human Capital Management (HCM):

Human Capital Management involves the management of individuals within the organization in terms of recruiting, attending, payment, evaluation, and maximizing their capabilities.

Automation in HR:

Automation can be defined as a process through which a software tool undertakes repetitive tasks within the field of HR, including monitoring of employees' attendance, managing leaves, and payroll management, among other functions, thus ensuring precision and efficacy while executing HR functions.

Artificial Intelligence within HR:

Artificial intelligence technology was employed in analyzing data on the company's employees. Sentiment analysis and predictive analytics are some of the examples of these tools.

Centralized System:

In a central system the entire HR functionalities are incorporated into a platform which provides uniformity of data, simplified management as well as coordination of various modules.

2.1.1 Integration of HR Modules

Integration of various modules into the Human Capital Management becomes a necessity in order to increase the productivity of employees and ensure consistency of data. Unlike performing each process separately through an individual application, integration enables all the processes to be compatible among themselves.

The Nexora HCM employs a number of different modules which are connected through central database and workflow. This way, the information inserted into the specific module gets synchronized automatically with other modules, including those which are responsible for measuring the employee's attendance, payroll, and performance management.

2.2 Existing Systems and Limitations

There is a number of Human Capital Management systems that are already developed and available for use in the market. They have specific characteristics that can aid companies to cope with their HR tasks. These include Workday HCM, Zoho People, BambooHR, ADP Workforce Now, Gusto, and many more. The common functions include employee information tracking, timekeeping, payroll processing, performance assessment, and other.

Nonetheless, most HCM systems are characterized by specific deficiencies, although they provide a broad spectrum of capabilities. First of all, they cannot be considered as integrated tools since they need third-party software to control certain aspects. In addition, more sophisticated functions like artificial intelligence and analytics, sentiment analysis, and predictive insights may be not available or too primitive.

The last deficiency can be associated with the inflexibility of customization options, which allows adjusting the software to business-specific requirements..

2.2.1 Comparison of Existing Systems

However, the HCMS currently available offers all necessary HR functions; yet, there are significant disparities regarding customization and integration possibilities. Although these systems are primarily designed to focus on HR activities such as managing staff, tracking attendance, processing payroll, and evaluating employees' performance, these tasks are presented separately and do not have tight connections between one another.

Consequently, many organizations resort to using several programs to perform these tasks efficiently, thereby creating additional challenges for their workflow. In addition, the opportunity for customization and adaptation to specific requirements differs across the various software products used. Another point to highlight is the level of technological development of the currently available HR management systems.

While previously these solutions relied on storing data and producing reports, today's HCMs begin to integrate AI into its operation. However, in the current market, the number of platforms that fully utilize this technology is still limited. Thus, the analysis shows the need for designing a new platform to resolve the mentioned issues. The innovative approach proposed by Nexora HCM involves incorporating core HR functions into the system alongside AI.

2.3 Limitations of Existing Systems

While current models of HCM demonstrate good results, it seems hard to state that they have absolutely no drawbacks. Thus, one of the primary flaws of existing HCM solutions is that of integration since HR modules tend to operate independently rather than as a single tool.

One more significant drawback of the technology is related to smart capabilities. In particular, the majority of solutions do not allow for using such tools as predictive analytics or sentiment analysis as a result of which companies miss benefits derived from these technologies. This way, a business does not implement preventive strategies for managing HR but responds to certain issues.

Finally, most HCM systems do not feature customizability as an essential part of the product. At this point, it may be hard for a company to adapt the system for its operations. In this regard, low efficiency is bound to appear.

2.4 Need for Proposed System

From the analyses done on the existing HRM systems, it can be noted that there is a need for a more advanced method to address issues of HRM. Today's organizations not only require software for managing HR operations but also something intelligent which will help make decisions based on actual facts.

This is why we have developed Nexora HCM platform which combines all major functions related to HR. By utilizing AI, the efficiency of data processing is significantly increased and overall performance becomes better. The platform allows using various management tools as well as self

2.5 Conclusion

This chapter focused on the development of HCM systems along with the underlying principles and criticism of existing solutions. These strengths and shortcomings were discussed with special attention paid to lack of integrations provided, flexibility in customizing HCM tools, and using potential of artificial intelligence.

CHAPTER 3

SYSTEM REQUIREMENTS

3 System Requirements

3.1 Use Case Diagram

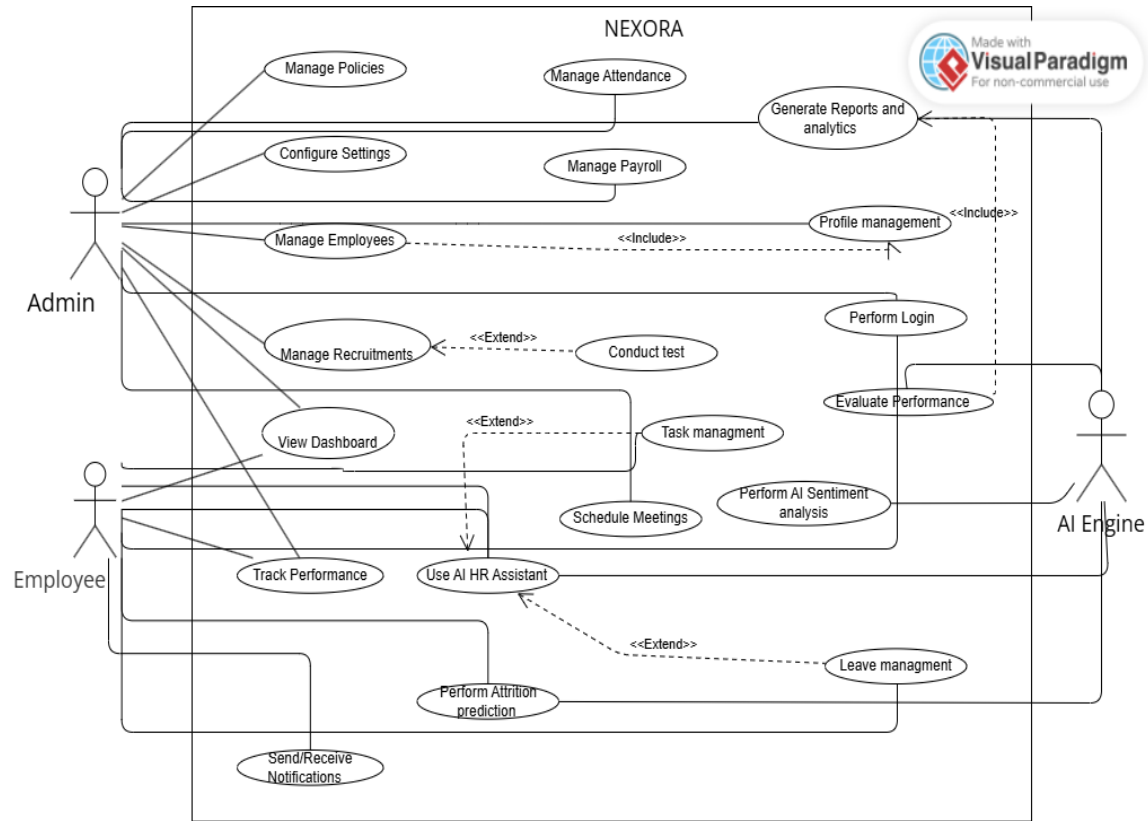


Figure 1 Use-Case Diagram

Use Case Explanation:

The use case diagram presented below shows a generalized view on the processes of interaction between all the participants needed to execute tasks related to human resources. System boundary and the relations between the use cases via «include» and «extend» relationship are highlighted below. The main participants in the system under review include the Admin

Admin Functionalities:

Admin executes a vast majority of processes in the system which means that the next processes are carried out by admins. These processes include employee data, recruitment, attendance, payment processes, policies settings, system settings, reporting/analytics dashboard, and much more. Additionally, there are some login and profile management processes executed by admin.

Employee Functionalities

Employees execute the largest portion of daily processes within the system. These processes include performance tracking, tasks management, meetings organizing, sending/receiving notifications and other. It is possible to use AI HR assistant module for some additional help in work execution. As for the leave management and trainings modules, they can be used optionally due to the «extend» relation between use cases.

AI Engine Functionalities

Speaking about «include» and «extend» relationships within the use case diagram, the first one is applied to basic mandatory processes while the second one represents optional process accessibility.

The diagram relies on the relationships of include that demonstrate the mandatory functions such as login and profile management, and extend relationships which are optional or conditional functions such as AI-based assistance and leave management. This is a structured system, which is modular, scalable and efficient, so that all other components can easily interact.

3.2 Functional Requirements

3.2.1 Functional Requirement # 1: Manage Employees

Table 1: Manage Employees

Use Case ID	UC5
Use Case Name	Manage Employees (Create / Update / Delete)
Actor(s)	Admin / HR
Pre-Conditions	Admin must be authenticated with admin role.
Priority	High
Basic Flow	Admin views employee list and can add, edit or delete employee records.
Actor Actions	System Response
1. Admin opens Employees page and selects Add, Edit or Delete on an employee.	2. System displays the employee form or delete confirmation.
3. Admin enters/updates details and confirms the action.	4. System validates data, updates the database and refreshes list with a success message.
Alternative Course	
Actor Action	System Response
3.	3.1 If validation fails (e.g., duplicate email), system shows error and does not save changes.

3.2.2 Functional Requirement #2: Leave Management

Table 2: Leave Managment

Use Case ID	UC6
Use Case Name	Approve / Reject Leave
Actor(s)	Admin / HR
Pre-Conditions	Admin is logged in; pending leave requests exist.
Priority	High
Basic Flow	Admin reviews a pending leave request and approves or rejects it; system updates status and notifies employee.
Actor Actions	System Response
1. Admin opens Leave Management page and selects a pending leave request.	2. System displays leave details with dates, type and balance information.
3. Admin chooses Approve or Reject and optionally enters comments.	4. System updates request status, adjusts leave balance if approved, and sends notification to the employee.
Alternative Course	
Actor Action	System Response

3.	3.1 If business rules fail (no balance or overlap threshold exceeded), system blocks approval and shows rule-violation message.
----	---

3.2.3 Functional Requirement #3: Review Attendance

Table 3: Review Attendance

Use Case ID	UC7
Use Case Name	Review Attendance & Corrections
Actor(s)	Admin / HR
Pre-Conditions	Admin is logged in; attendance records and correction requests are available.
Priority	Medium–High
Basic Flow	Admin reviews daily attendance and processes correction requests by approving or rejecting them.
Actor Actions	System Response
1. Admin opens Attendance page and selects date/department.	2. System displays attendance list with any linked correction requests.
3. Admin opens a correction request and chooses Approve or Reject .	4. System updates AttendanceRecord and request status, recalculates KPIs and logs the change.

3.2.4 Functional Requirement #4: Payroll Management

Table 4: Payroll Managemnt

Use Case ID	UC8
-------------	-----

Use Case Name	Generate Payroll & Payslip
Actor(s)	Admin / Payroll Officer
Pre-Conditions	Admin is logged in; salary, attendance and leave data for the period are finalized.
Priority	High
Basic Flow	Admin selects a period; system calculates salaries, generates payroll records and payslips.
Actor Actions	System Response
1. Admin opens Payroll module and selects month/pay period.	2. System retrieves required employee, salary, attendance and leave data.
3. Admin clicks Generate Payroll .	4. System computes salaries, creates Payroll and Payslip records and displays summary; payslips can be viewed/downloaded.
Alternative Course	
Actor Action	System Response
3.	3.1 If required data is missing (e.g., salary not set for some employees), system lists problematic records and does not finalize payroll until corrected.

3.2.5 Functional Requirement #5: Employee Login

Table 5: Employee Login

Use Case ID	UC1
Use Case Name	Employee Login & Dashboard
Actor(s)	Employee
Pre-Conditions	Employees must have a valid registered account.
Priority	High
Basic Flow	Employee enters credentials; system authenticates and loads the employee dashboard with key KPIs.
Actor Actions	System Response
1. Employee enters email and password and clicks Login .	2. System checks credentials; if valid, user is authenticated and Employee Dashboard is displayed.
3.	4. System loads profile, tasks, attendance and performance summary.
Alternative Course	
Actor Action	System Response
1.	2. If credentials are invalid, an error message is shown, and the login screen is redisplayed.

3.2.6 Functional Requirement #6: Apply Leave

Table 6: Apply Leave

Use Case ID	UC2
Use Case Name	Apply Leave
Actor(s)	Employee
Pre-Conditions	Employee must be logged in and have access to the Leaves section.
Priority	High
Basic Flow	Employee fills a leave form, submits it, and system stores the request as Pending and notifies admin.
Actor Actions	System Response
1. Employee opens Leaves page and clicks Apply Leave ; selects type, dates and enters reason.	2. System validates required fields and date range.
3. Employee clicks Submit .	4. System saves the leave request as Pending and sends notification to admin/HR.
Alternative Course	
Actor Action	System Response
3.	3.1 If validation fails (missing fields, invalid dates or no balance),

	system shows error and does not create the request.
--	---

3.2.7 Functional Requirement #7: Mark Attendance

Table 7: Mark Attendance

Use Case ID	UC3
Use Case Name	Mark Attendance
Actor(s)	Employee
Pre-Conditions	Employee is logged in; attendance window is open for that day.
Priority	High
Basic Flow	Employee taps Mark Attendance; system verifies using AI (face/location) and records attendance.
Actor Actions	System Response
1. Employee opens Attendance section and clicks Mark Attendance .	2. System captures face/location data and sends it to AI verification.
3.	4. If verification succeeds and no duplicate exists, system stores Attendance Record and updates today's status.

3.2.8 Functional Requirement #8: Sentiment Analysis

Table 8: Sentiment Analysis

Use Case ID	UC4
-------------	-----

Use Case Name	Submit Feedback & Sentiment Analysis
Actor(s)	Employee
Pre-Conditions	Employee is logged in and can access the Feedback/Sentiment page.
Priority	Medium
Basic Flow	Employee submits feedback text; system analyzes sentiment using AI and stores sentiment score in the database.
Actor Actions	System Response
1. Employee opens Feedback page, types comments and clicks Submit .	2. System validates text and sends it to the Sentiment Analysis module.
Alternative Course	
Actor Action	System Response
1.	1.1 If feedback text is empty or exceeds allowed length, system shows validation error and does not send it to AI.

3.3 Interface Requirements

This section outlines the external interfaces of Nexora HCM, which involves the way the system interacts with the users, hardware devices, the software parts as well as with the communication networks.

3.3.1 User Interfaces

The system offered web-based user interface that was responsive, user-friendly, and compatible with various devices. It was available in the current

web browsers and on desktop, tablet, and mobile platforms.

The Admin interface consisted of dashboards that contained key performance indicators, records management tables, and forms to perform the actions like creating, updating, and approving requests. It also added the features of filtering, sorting and reporting to make it more usable.

Employee interface had self-service features, which enabled the users to control their activities, check attendance, request leave, observe performance indicators, and produce reports. The interface was designed using a uniform structure and navigation buttons, input fields, messages and visual graphs to make it easy to use and enhance user experience.

3.3.2 Hardware Interfaces

Nexora HCM was built to be able to run on typical computing devices without any special hardware. Users were able to use the system via desktops, laptops, tablets or smart phones that have internet access.

The system was based on the conventional input and output devices like mice, keyboards, and touch screens. It was implemented on cloud-based servers and is available and scalable without relying on individual physical hardware at the user-side.

3.3.3 Software Interfaces

The system interrelated with various software parts to carry out its functions effectively. It was developed in Next.js as the frontend interface and Node.js as the backend services and data storage and management were in a relational database system (PostgreSQL/MySQL).

Secure authentication and session management were implemented through secure mechanisms that are based on JWT to keep access to system resources under control. The front end was connected to the backend services via the RESTful APIs, which processed data, validated it, and implemented business logic.

Moreover, the visualization of data, report creation and the addition of user interface elements were accomplished with the help of external libraries and

tools, which guaranteed good functionality of the system and made the experience of the user more enjoyable.

3.3.4 Communication Interfaces

All client-server interactions were carried out using HTTPS protocol only. The software used RESTful APIs where JSON was used as the medium for data exchange between the frontend and backend.

The authentication of the user login session was performed through tokens that guaranteed the transfer of all sensitive data via encrypted communication channel. This program was designed to work over ordinary Internet connections for effective data exchange and better performance.

3.4 Database Requirements

The database used for Nexora HCM application was based on a relational structure, where all organizational data were stored efficiently. The purpose of the database design was to help in performing HR operations such as personnel management, attendance, leaves, payroll, recruitment, and performance appraisals.

All organizational data were inputted in tables where unique relations existed between databases. Unique constraints were used to check if data inputted is valid and reliable as indicated by the requirement to give unique email IDs and correct attendance per day for individual. This system was based on a database management system (like PostgreSQL or MySQL) that was connected together using an Object Relational Mapping (ORM) tool to ease access and manipulation of the data. Primary and foreign key were used to maintain relationship between entities to maintain referential integrity.

The database also supported audit logs to monitor key actions in the system like creation, updates and deletion of records. The appropriate indexing procedures have been used to enhance query and efficient retrieval of the data.

The database was in general designed to be scalable, reliable and able to

accommodate more and more data of the organization without losing its security and efficacy.

3.5 Non-Functional Requirements

The non-functional requirements establish the quality attributes and restrictions the Nexora HCM system was working in. These were necessities that made the system efficient, secure and reliable when used in the field.

3.5.1 Performance Requirements

The system was made to give an easy and effective performance in the normal conditions of usage. Dashboard pages and lists of data should have loaded without any perceivable latency. Such standard processes like creation, updating and retrieval of records were streamlined to take an acceptable time to respond.

Large datasets could be efficiently handled by using pagination and filtering. Also, report creation and data export functionalities were introduced to take a reasonable amount of time without impacting the performance of the system.

3.5.2 Safety Requirements

The system provided safety of important HR information by adequately backing up and recovering the data. Data backup was done regularly to avoid loss of data in the event of system failure.

Only authorized users had access to sensitive information like payroll and employee records. Sensitive operations, such as payroll operations and bulk data updating, were to be confirmed to avoid the accidental modification. Audit logs were kept to monitor critical system activities.

3.5.3 Security Requirements

The system design was mainly concerned with security. Secure email and password authentication were introduced with passwords being stored in

encrypted form. Role-Based Access Control (RBAC) was used to ensure that access to certain modules within the system was limited to authorized users.

The server and the client communicated using the HTTPS protocols in order to ensure all the communication was secured. Authentication tokens, personal information, and other sensitive information were secured against unauthorized access. The system also made sure that any essential activities like data modification were duly validated and monitored.

3.5.4 Software Quality Attributes

The system was set up to ensure high quality of software. It was easy to use with a user-friendly interface to make it easy to use by the administrators and employees.

The system was reliable because it was capable of performing the normal operations without crashing and it was also able to perform consistently. Maintainability was supported through a modular architecture which made it possible to update and improve in the future without much effect on the old components.

Scalability was also taken into account to enable the system to be expanded when there is an increase in the number of users and data. The system was also portable, and it could run on the latest web browsers and cloud deployment platforms.

3.5.5 Business Rules

The system had a set of pre-defined business rules in order to guarantee appropriate operation of HR processes. Employees could access and manage their data, although only administrators could manage employee records and payrolls, as well as approvals. Approvals of leaves were done depending on the amount of leave and specified limits. Each day was considered as a separate attendance record and any amendments had to be approved by the administration.

3.6 Project Feasibility

The feasibility analysis of the project was performed in order to estimate the possibilities of the successful development and implementation of Nexora HCM within the specified limitations. The system was evaluated in terms of its technical, economical and operational feasibility.

3.6.1 Technical Feasibility

The project could be technically done since it used current and popular technologies like Next.js, Node.js, and relational database systems like PostgreSQL or MySQL. These technologies were very helpful in constructing scalable and secure web applications. The development team had the required knowledge and resources to implement the system effectively.

3.6.2 Economic Feasibility

The system was economically feasible as it was developed using open-source tools and technologies, minimizing development and deployment costs. The system did not need any expensive hardware or licensed software and was therefore cost-effective, particularly to small and medium-sized organizations

3.6.3 Operational Feasibility

It is evident that the Nexora HCM was easy to use due to its user-friendly design. In fact, the Nexora HCM program automatically performed a number of tasks that used to take a lot of time to accomplish. Therefore, we managed to make the application workable in a corporate environment through the use of appropriate interfaces and security techniques..

3.7 Analysis Models

The suggested models for the analysis phase discussed in this chapter provide a great way to model and understand the core flows of activities and interactions among objects within the Nexora HCM software system. According to the use case diagram discussed in Section 3.1, the system includes several actors like the administrator and employees who interact with the system via various modules.

3.7.1 Manage Employees Activity Diagram

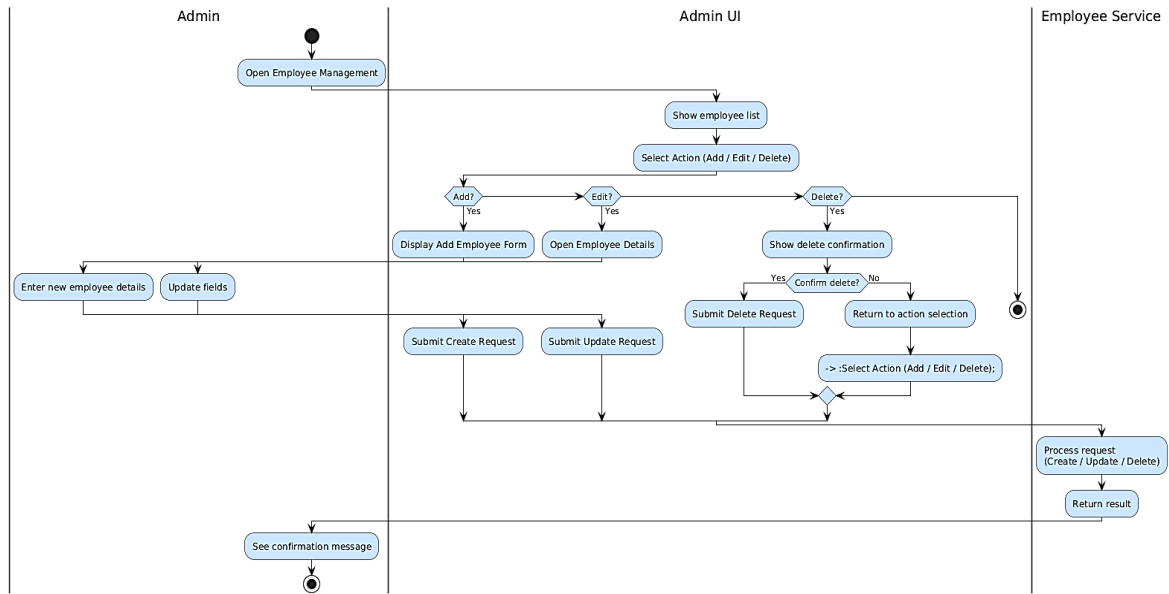


Figure 2 Manage Employees Activity Diagram

3.7.2 Leave Management Activity Diagram

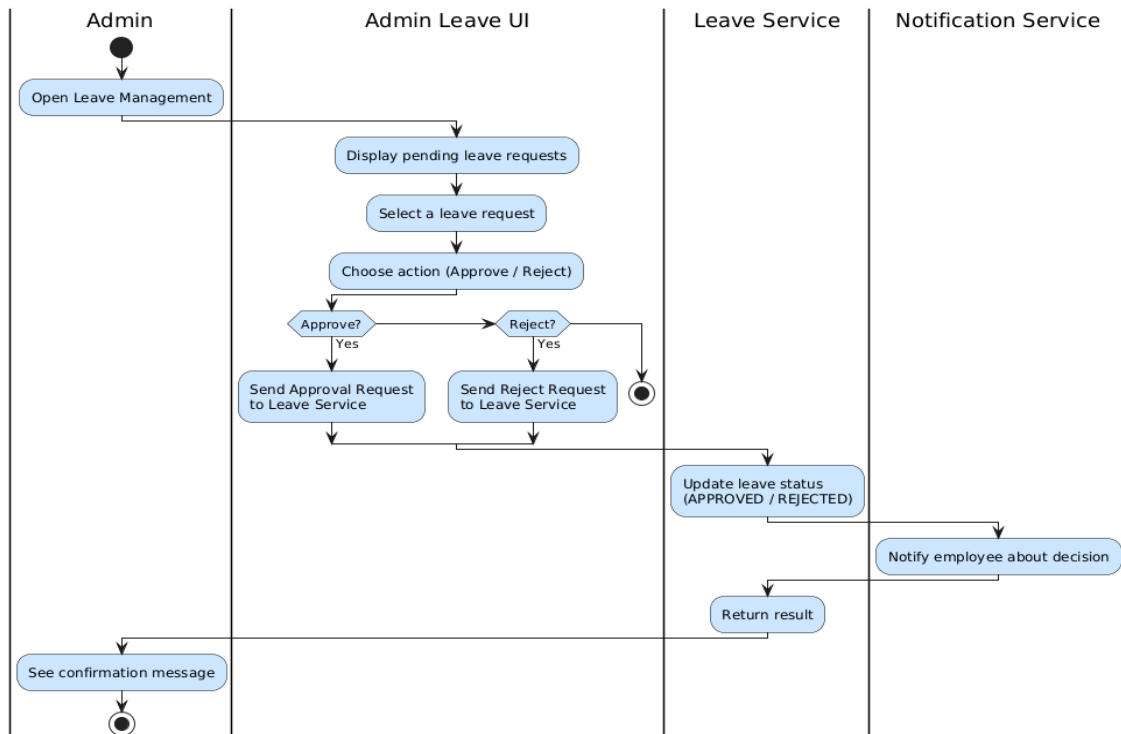


Figure 3: Leave Management Activity Diagram

3.7.3 Review Attendance Activity Diagram

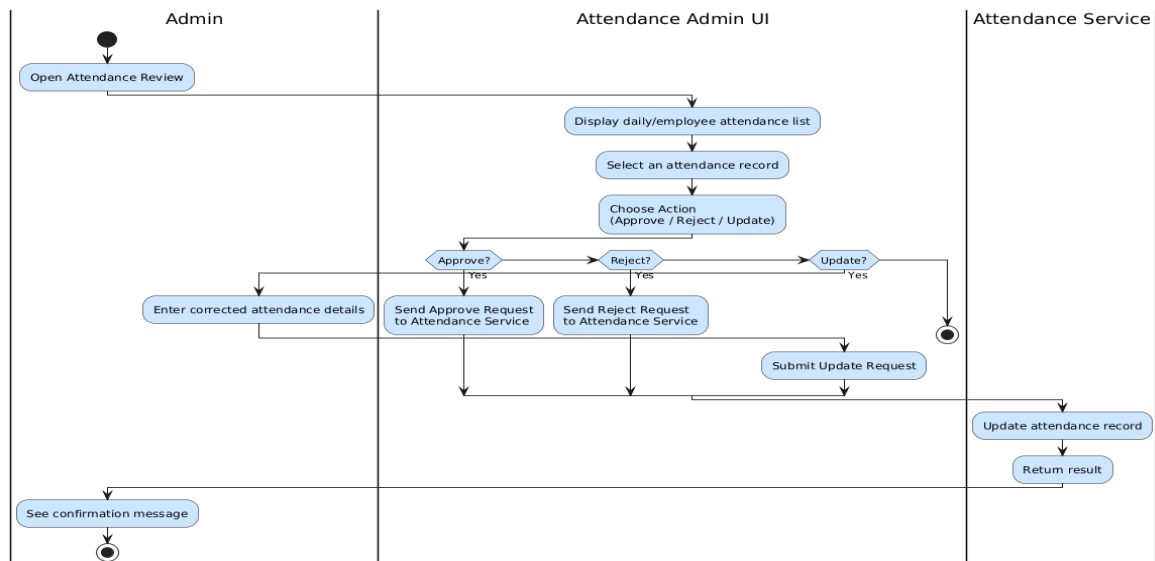


Figure 4: Review Attendance

3.7.4 Generate Payroll & Payslip Activity Diagram

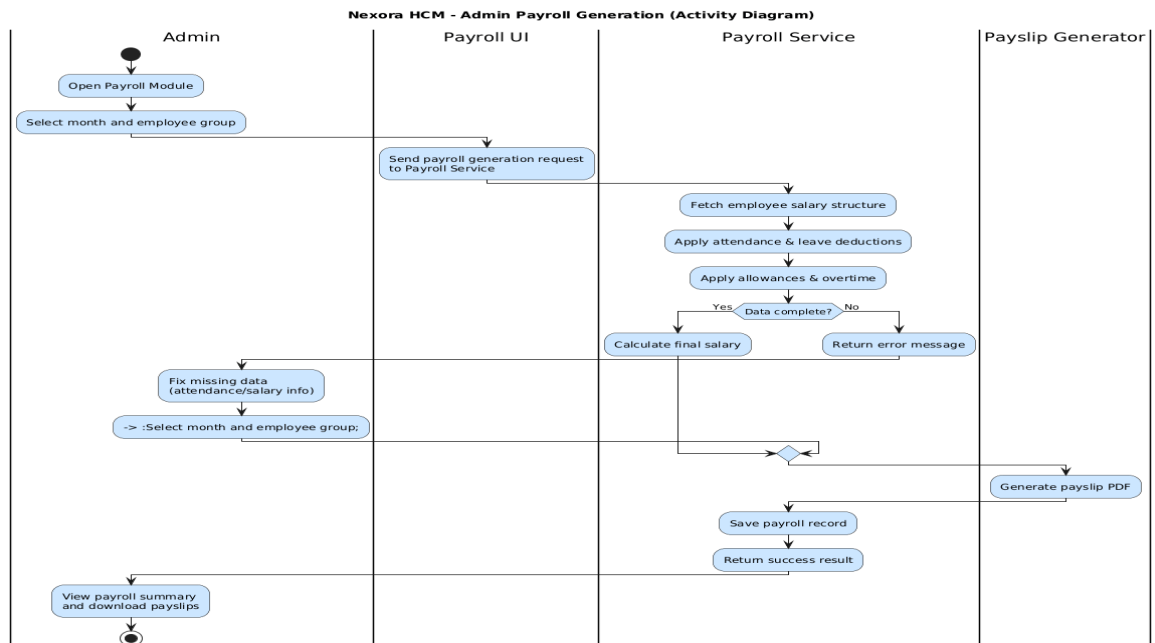


Figure 5: Payroll Management

3.7.5 Employee Login & Dashboard Activity Diagram

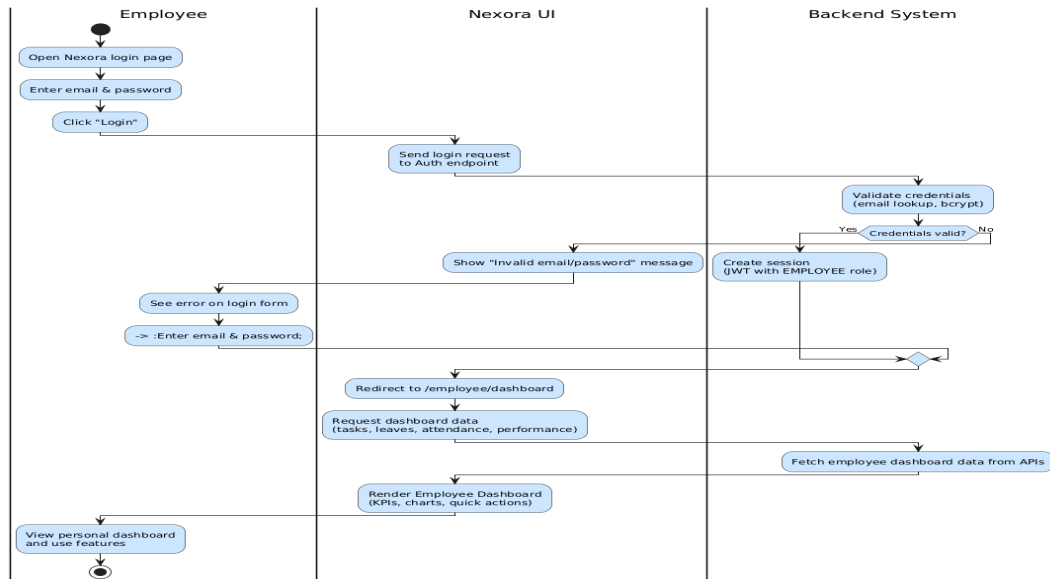


Figure 6: Employee Login

3.7.6 Mark Attendance Activity Diagram

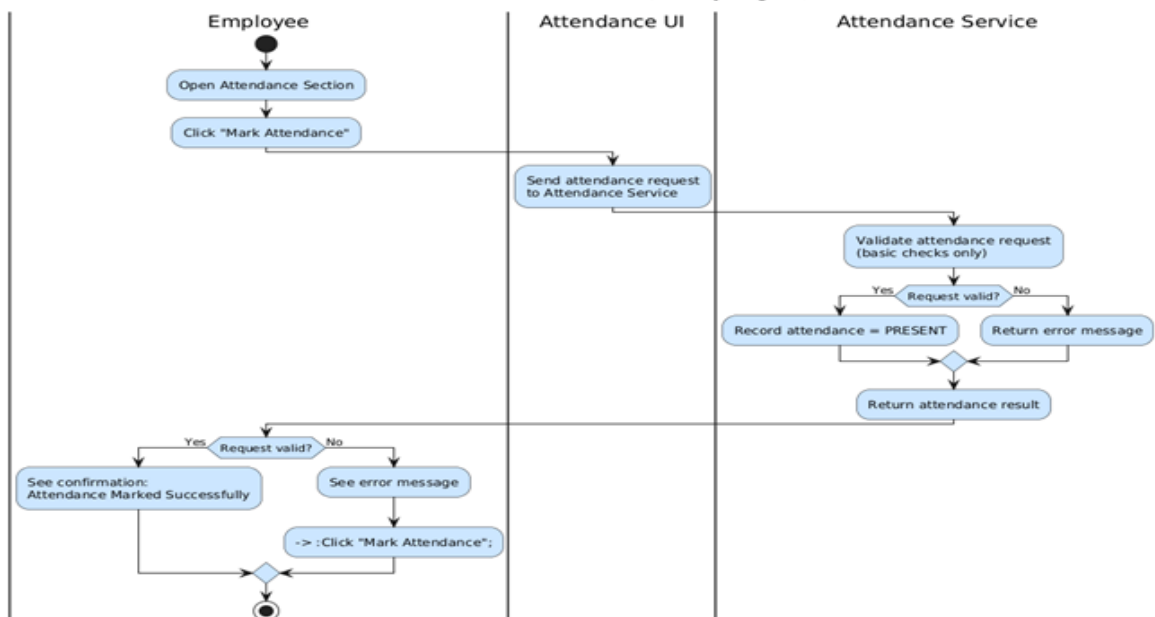


Figure 7: Mark Attendance

3.8 Conclusion

Nexora HCM Requirements have been discussed in this chapter. This has included use cases, use case tables, functional and non-functional requirements, and also external interface requirements. The requirements related to database and also the feasibility study of the system have also been discussed in this chapter.

It is clear from the specification that what can be expected of the performance of this system, and what will be its limitation. Overall, it is clear that this chapter has laid the groundwork for the efficient development.

CHAPTER 4

SYSTEM DESIGN

4 System Design

As part of the design process, the appropriate architecture of the system and implementation strategy have been developed. It is necessary to note that it is important to give particular attention to the organization of the system's modules, interaction between them, and the processes related to the transfer of data within the system.

In order to achieve efficient functioning of the system and maintain scalability and usability when changing requirements, a modular multi-level architecture is used in the Nexora HCM system. As mentioned above, the architecture is characterized by the separation of various layers (user interface layer, business logic layer, database layer). This approach allows developing more flexible systems, which are easier to maintain and provide better performance compared to monolithic architectures.

To show our concept of the system's operation, architectural diagrams and data models were prepared. Additionally, workflow diagrams were developed to clearly demonstrate the work process. All system modules (employee management module, attendance module, leave module, payroll module, recruitment module, and performance appraisal module) were designed as independent entities.

4.1 Design Approach

Modularity is the guiding principle behind the design of Nexora HCM, which will ensure flexibility, scalability, and the maintainability of the product. The design is modularized, and it has various components, including the user interface, application logic, and database.

During the design process of the user interface, a user-centered design philosophy was used in order to make sure that the user interface was made in such a way that it could satisfy the needs of the users. The interface of the

system has been designed in a simplistic fashion, which suits the needs of the users very well.

In the process of developing the software, we decided to use a systematic approach, which entailed developing various modules of the system separately before incorporating them in the system.

4.2 Design Constraints

Nexora HCM had several specific constraints according to the problem statement's requirements. The following constraints have been explored to ensure the construction of a feasible, workable, and effective solution.

Firstly, using a limited set of technologies such as Next.js, Node.js, and a relational database imposed some constraints in relation to the usage of other possible technologies. Simultaneously, it allowed developing the system consistently and straightforwardly. It is also vital to mention the constraint that the system should be web-based and therefore accessible through a regular browser and the Internet connection.

Speaking about the performance constraints, it is important to note that many functions, like filtering and sorting, need to be done at the client-side level. Thus, it was essential to develop the system capable of working efficiently under these circumstances.

It should be also mentioned that due to the security constraints, the system should offer role-based authorization, secure login/logout functionality, and data encryption.

Moreover, the constraint associated with the usage of open-source tools complicated some functions but allowed us to save money.

Thus, the described constraints helped create a viable system offering all possible opportunities for its users.

4.3 System Architecture

Architecture of Nexora HCM system will be represented in a three-layered layered structure, which will enable us to achieve separation of concerns, scalability, and efficient system management. This architecture will consist of three layers: Presentation Layer, Application Layer, and Data Layer. Presentation Layer provides user interaction with the system and presentation of data. Being based on modern web technologies, it will give possibility to implement responsive interface on both admin and employee sides of Nexora. Elements, which will be included in the Presentation Layer, are dashboard, forms, tables, and visualization. These elements will facilitate user work with the HR module. Application Layer processes requests from users, finds and resolves errors, implements business rules and controls interfaces and database communication. The layer will process all APIs ensuring flawlessly work of the system modules.

Finally, Data Layer implements management of data storage. A relational database will be utilized to store data about employees (file, attendance, leave records, salary, etc.). Thus, we can define adequate relations and normalization rules.

4.4 Logical Design

4.4.1 Class Diagram

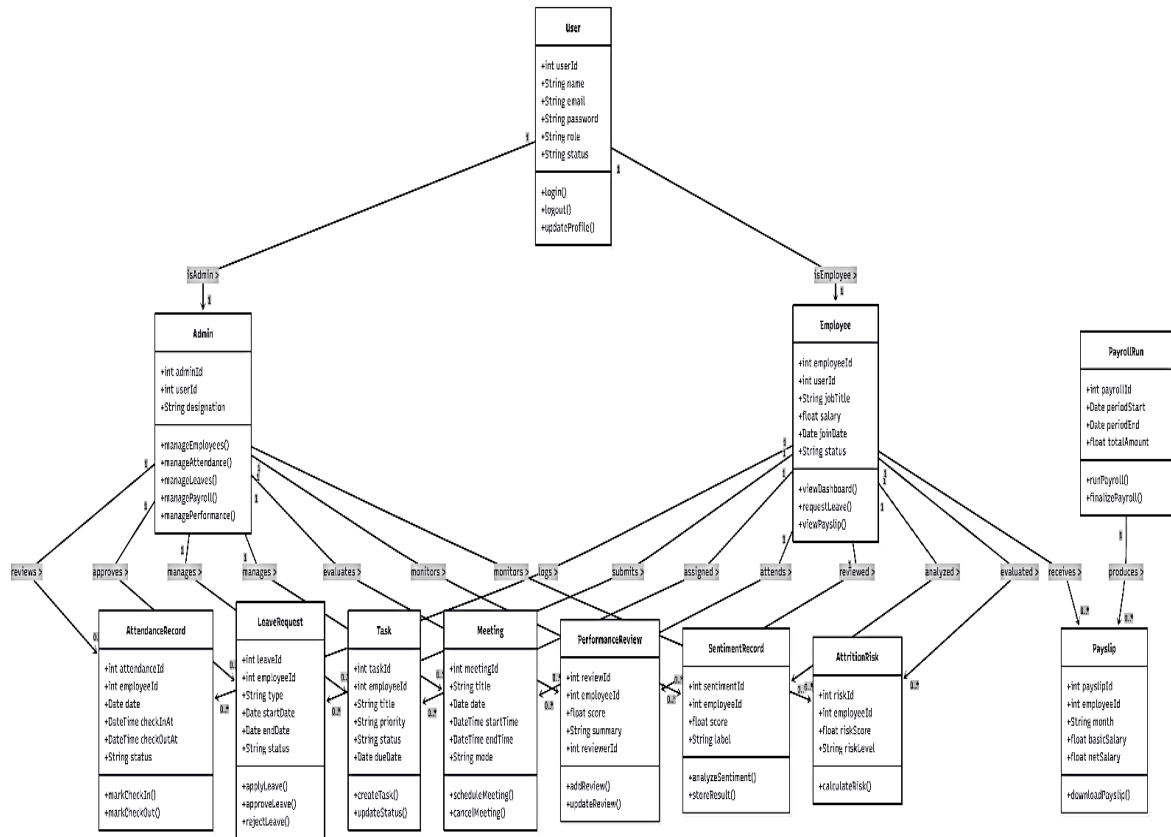


Figure 8: Class Diagram

The class diagram represents the static structure of the Nexora HCM system by showing the main classes, their attributes, and the relationships between them. It illustrates how entities such as Employee, Attendance, Leave, Payroll, and Performance are organized and interconnected within the system.

4.5 Dynamic View

4.5.1 Sequence Diagrams

4.5.1.1 Manage Employees

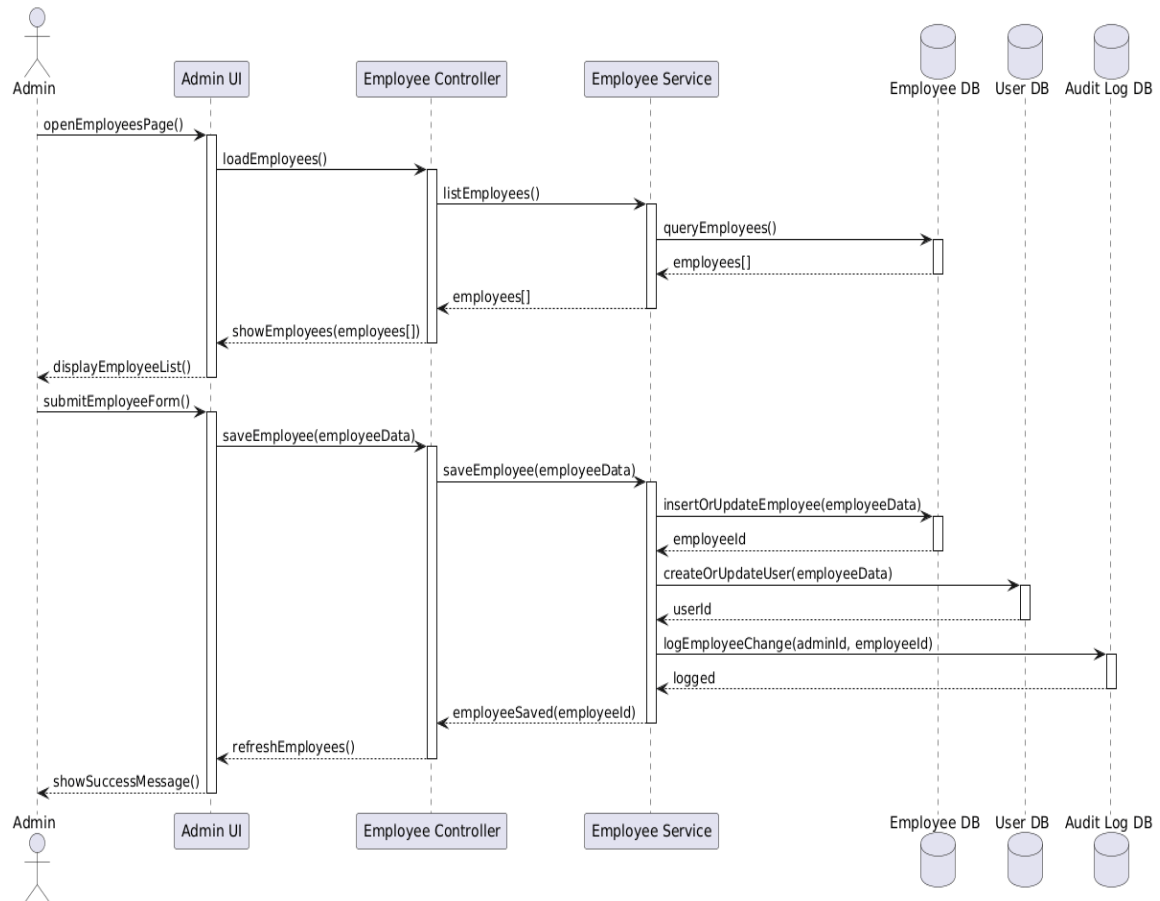


Figure 9: Sequence Diagram Manage Employee

The sequence diagram for Manage Employees illustrates the interaction between the admin, system, and database when creating, updating, or deleting employee records. It shows how requests are validated, processed, and stored in the database.

4.5.1.2 Leave Module

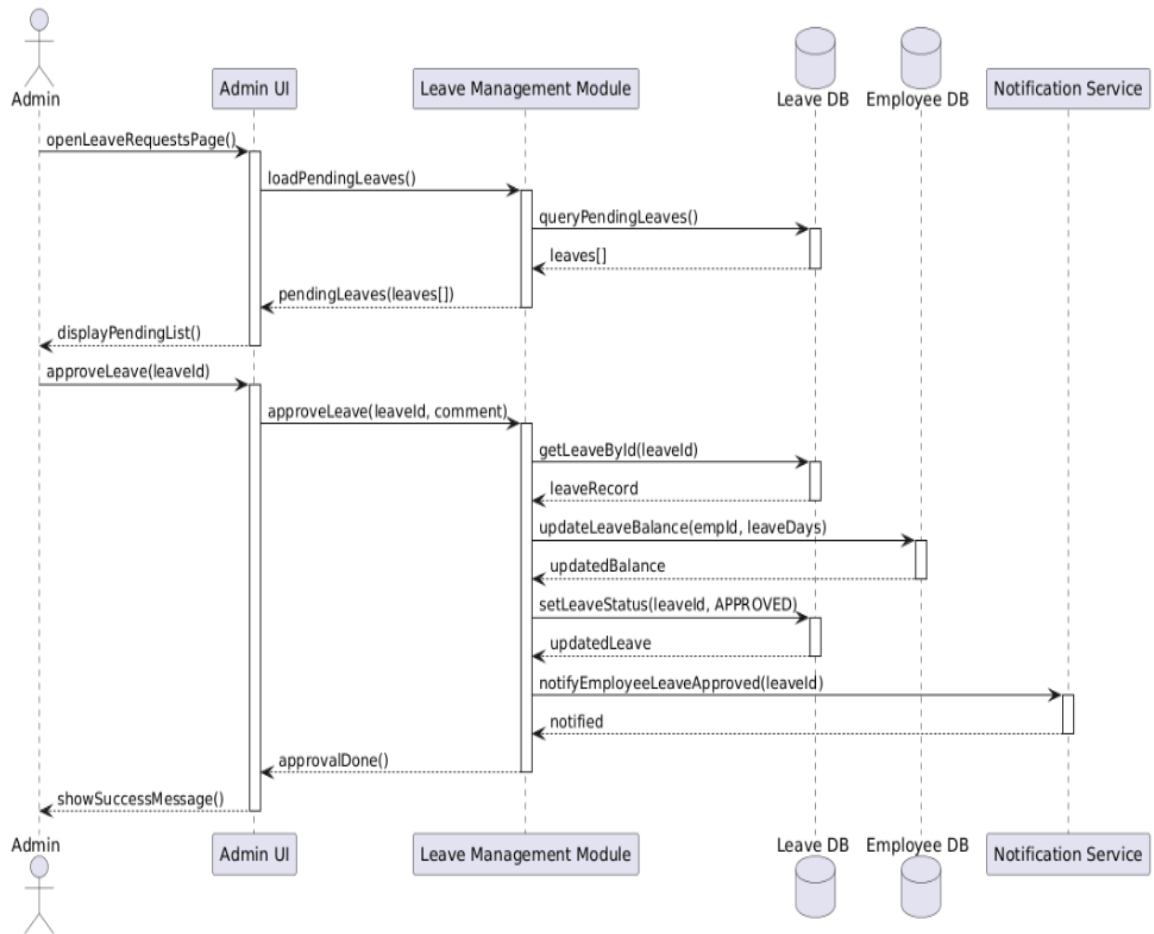


Figure 10: Sequence Diagram for Leave Module

The sequence diagram for the Leave Module shows how employees submit leave requests and how administrators review and approve or reject them. It highlights the validation and update of leave balances in the database.

4.5.1.3 Review Attendance

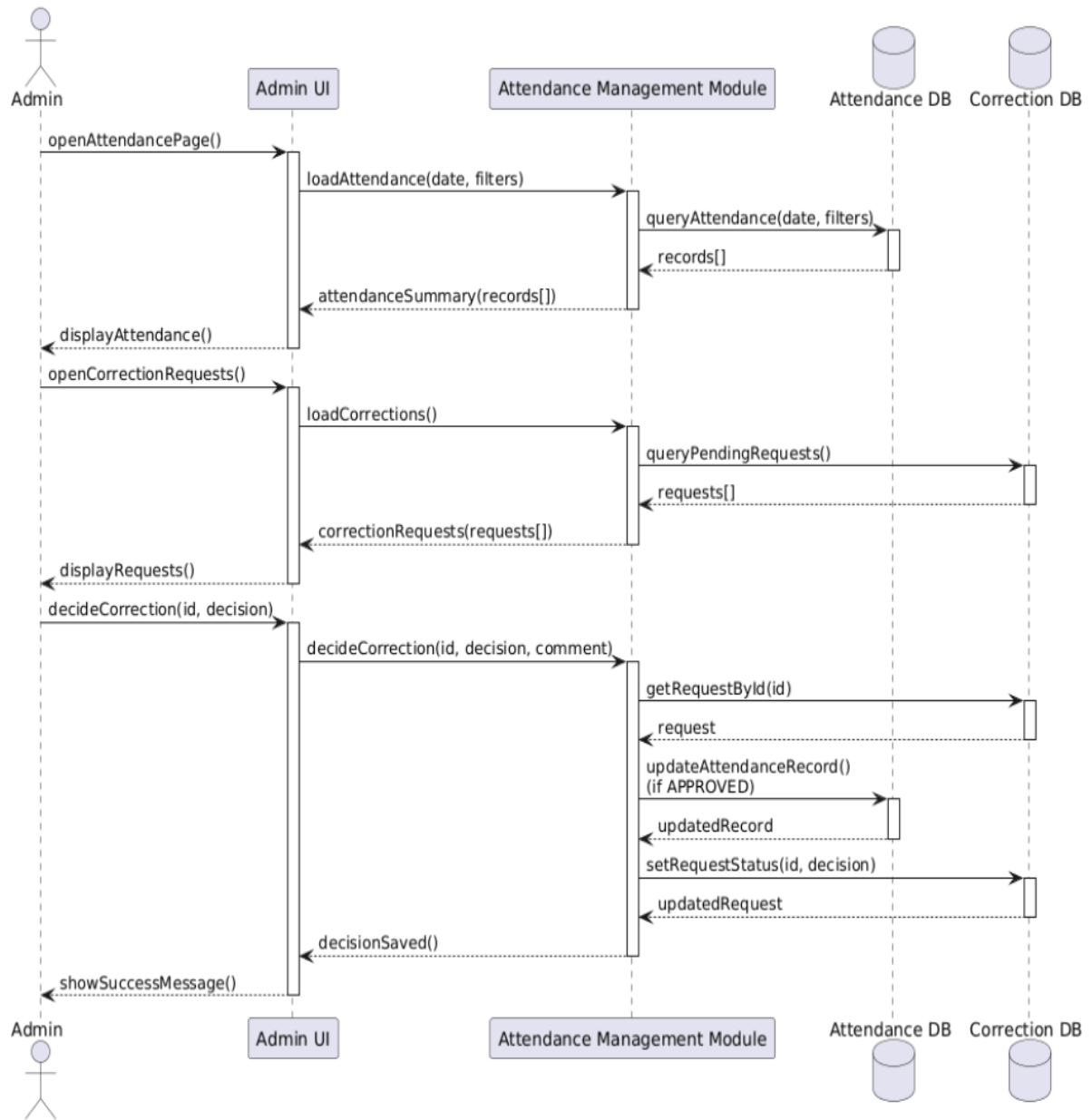


Figure 11: Sequence Diagram for Review Attendance

The sequence diagram for Review Attendance depicts how the admin retrieves attendance records and views daily or monthly summaries. It shows the interaction between the user interface, application logic, and database.

4.5.1.4 Payroll Management

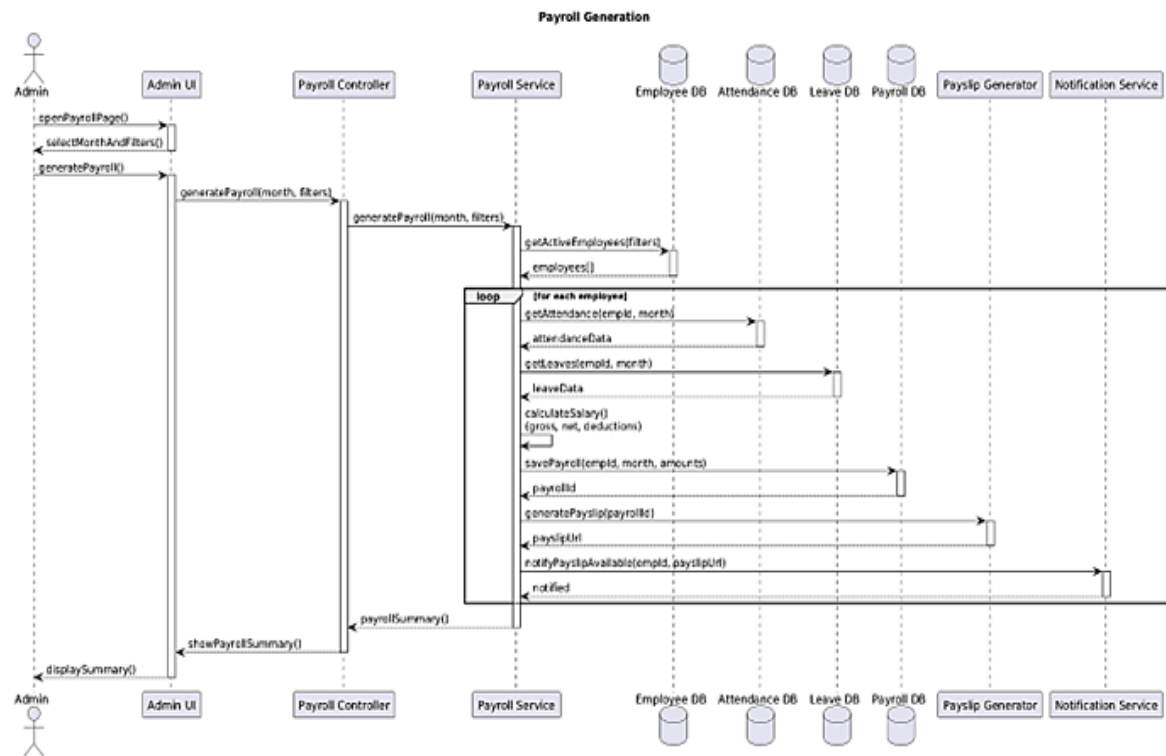


Figure 12: Sequence Diagram for Payroll Management

The sequence diagram for Employee Login illustrates the authentication process where the employee enters credentials and the system verifies them against stored user data. Upon successful validation, access to the dashboard is granted.

4.5.1.5 Employee Login

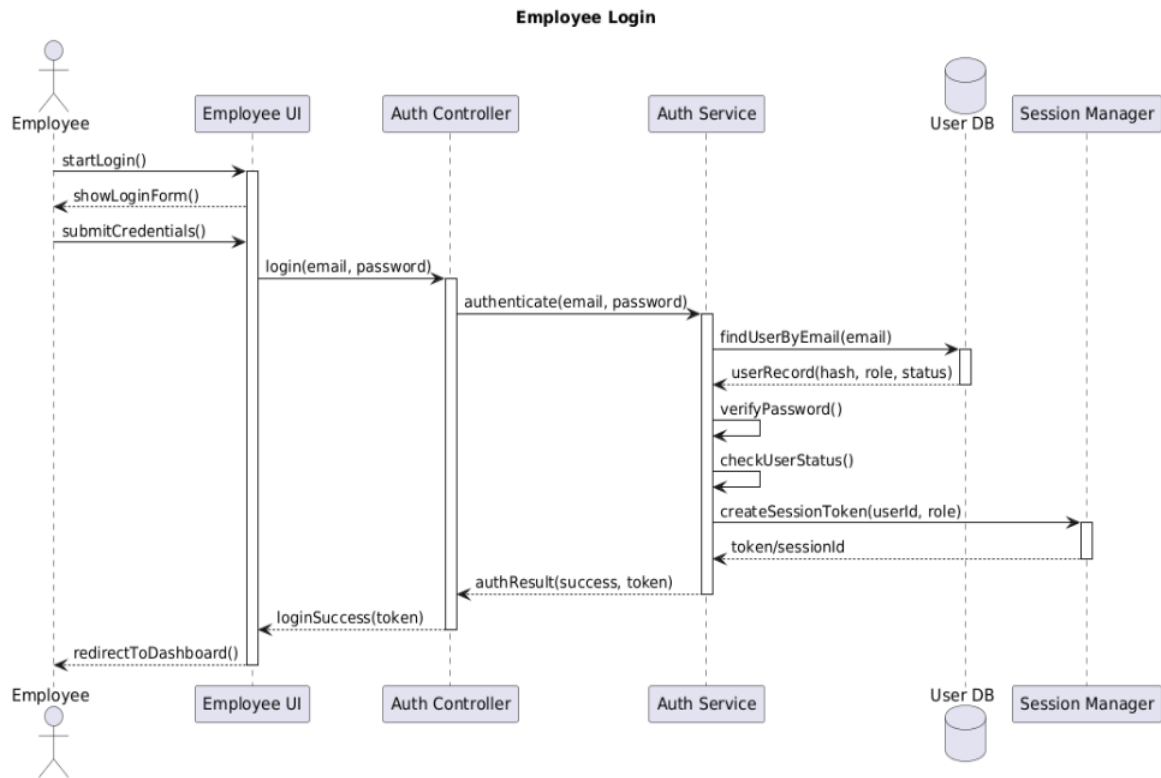


Figure 13: Sequence Diagram for Employee Login

The sequence diagram for Employee Login illustrates the authentication process where the employee enters credentials and the system verifies them against stored user data. Upon successful validation, access to the dashboard is granted

4.5.1.6 Apply Leave

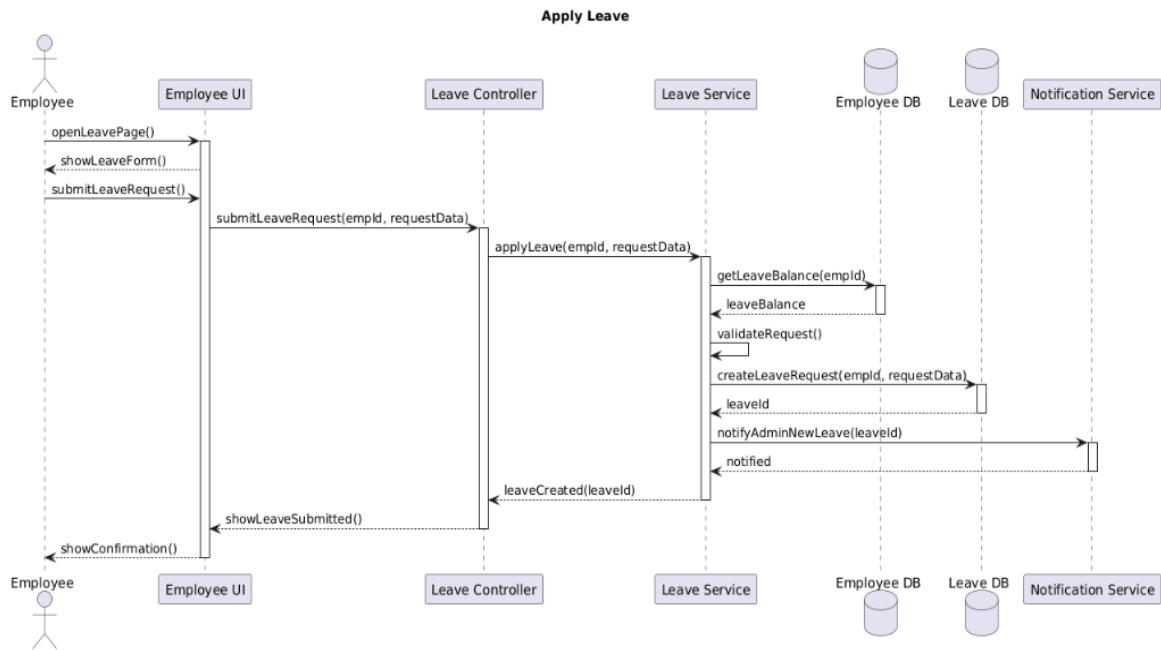


Figure 14: Sequence Diagram for Apply Leave

4.5.1.7 Mark Attendance

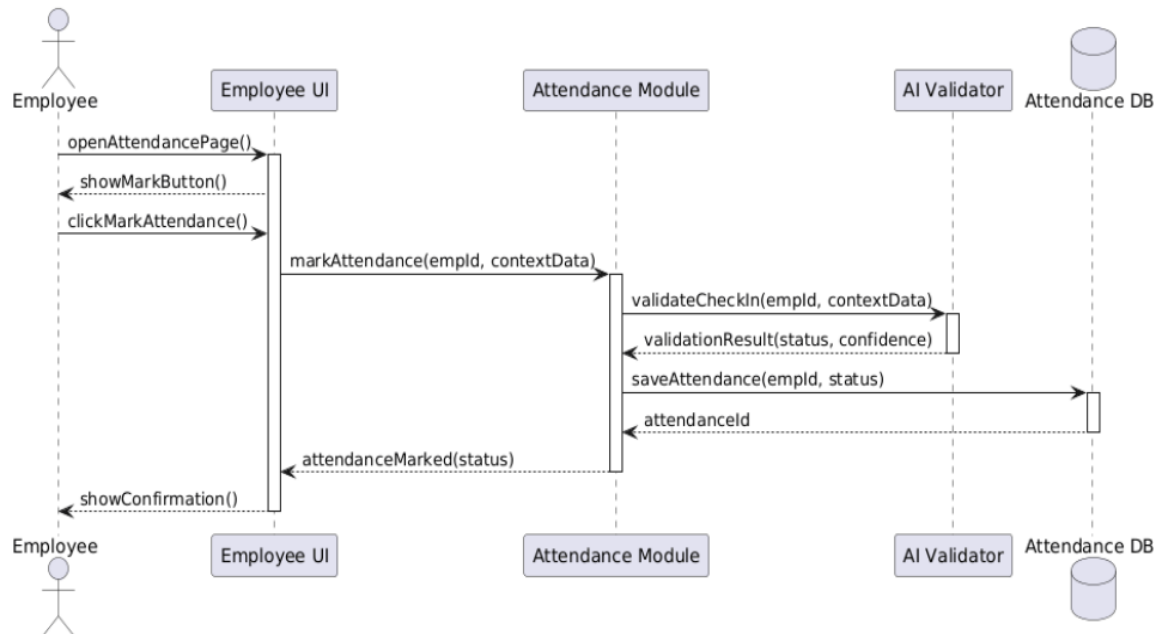


Figure 15: Sequence Diagram for Mark Attendance

4.5.1.8 Sentiment Analysis

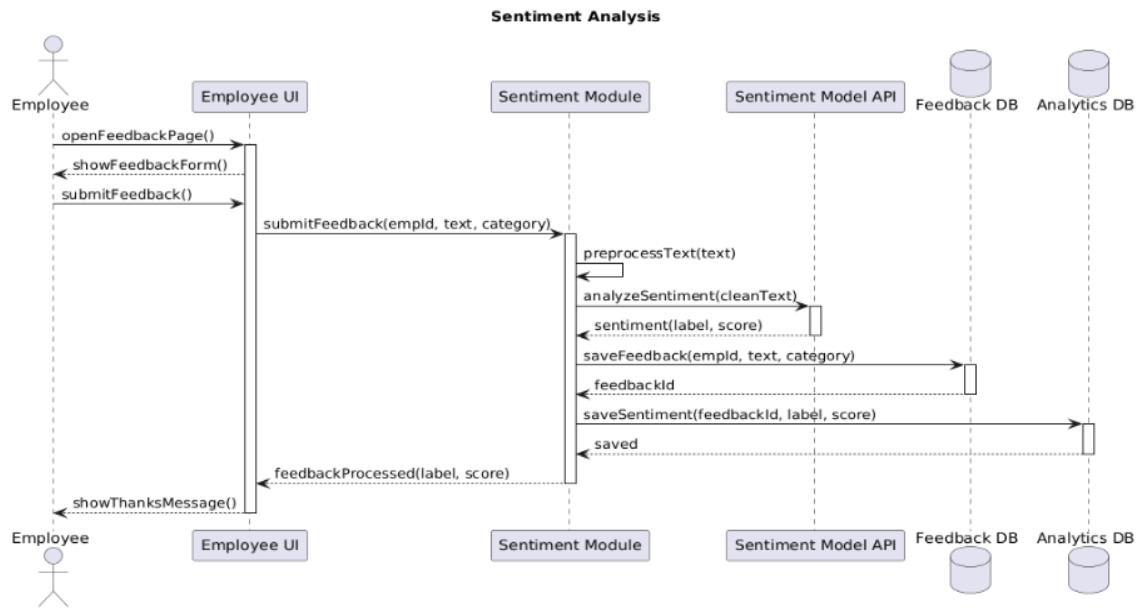


Figure 16: Sequence Diagram for Sentiment Analysis

The sequence diagram for Sentiment Analysis illustrates how employee feedback is submitted, analyzed by the AI module, and stored with a sentiment score. The results are then displayed to administrators for decision-making.

4.6 Component Design

4.6.1 Deployment View

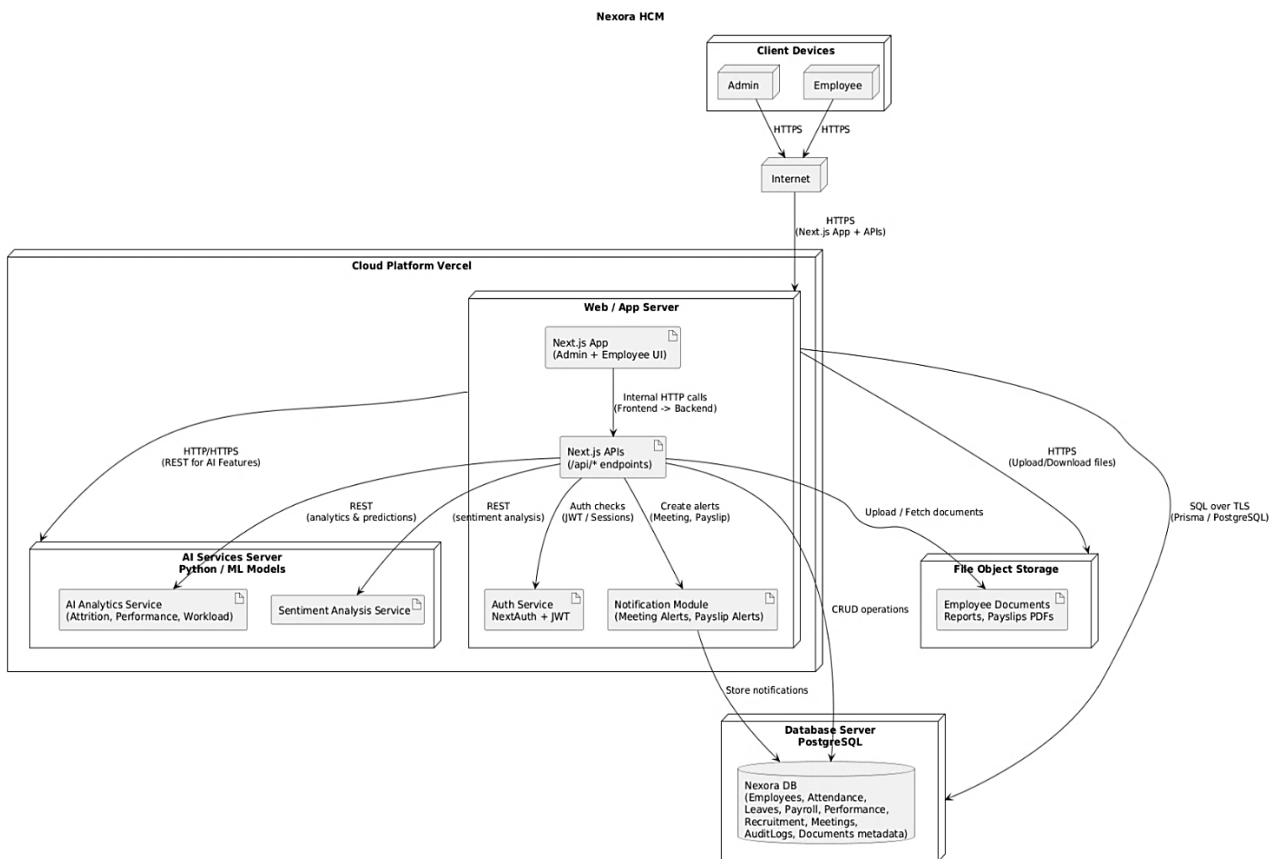


Figure 17: Deployment Diagram

The deployment diagram illustrates the physical architecture of the Nexora HCM system, including client devices, the web application server, and the database server. It shows how system components are deployed and communicate over the network to deliver the application services.

4.7 Data model

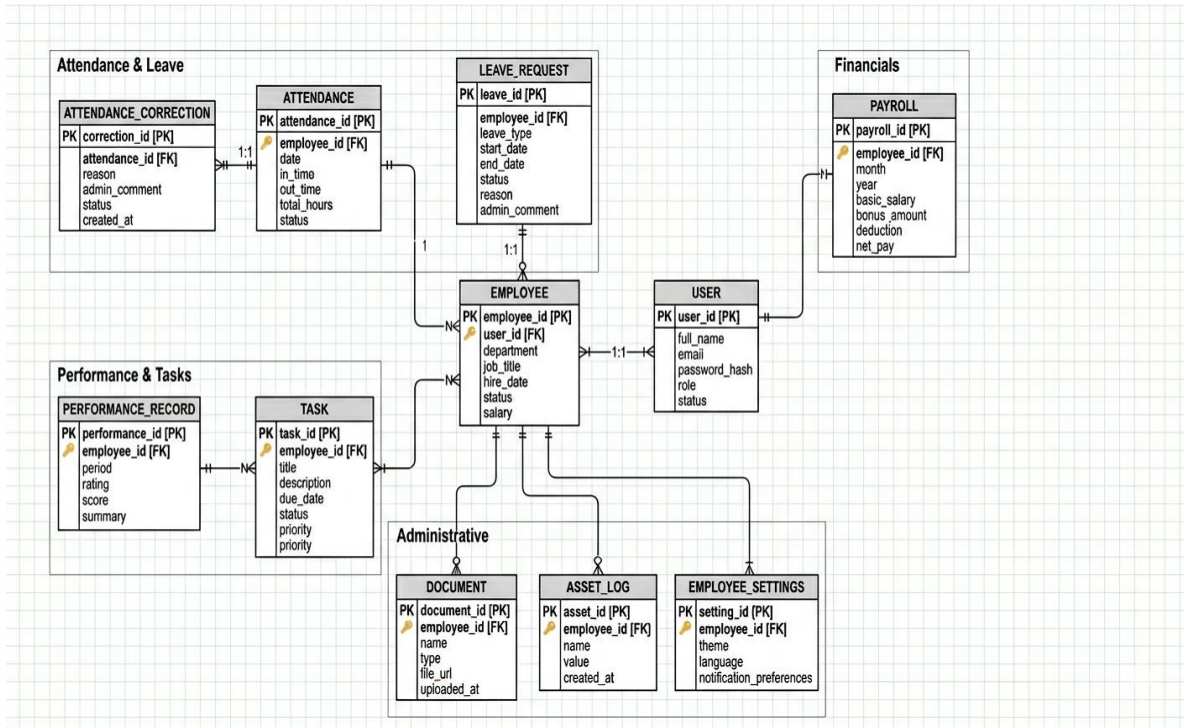


Figure 18: ER Diagram

The Entity Relationship (ER) diagram illustrates the database structure of the Nexora HCM system by showing the main entities and their relationships. It defines how data such as employees, attendance, leaves, payroll, and performance records are stored and connected in the database.

4.8 Interface Designs

4.7.1 login Page

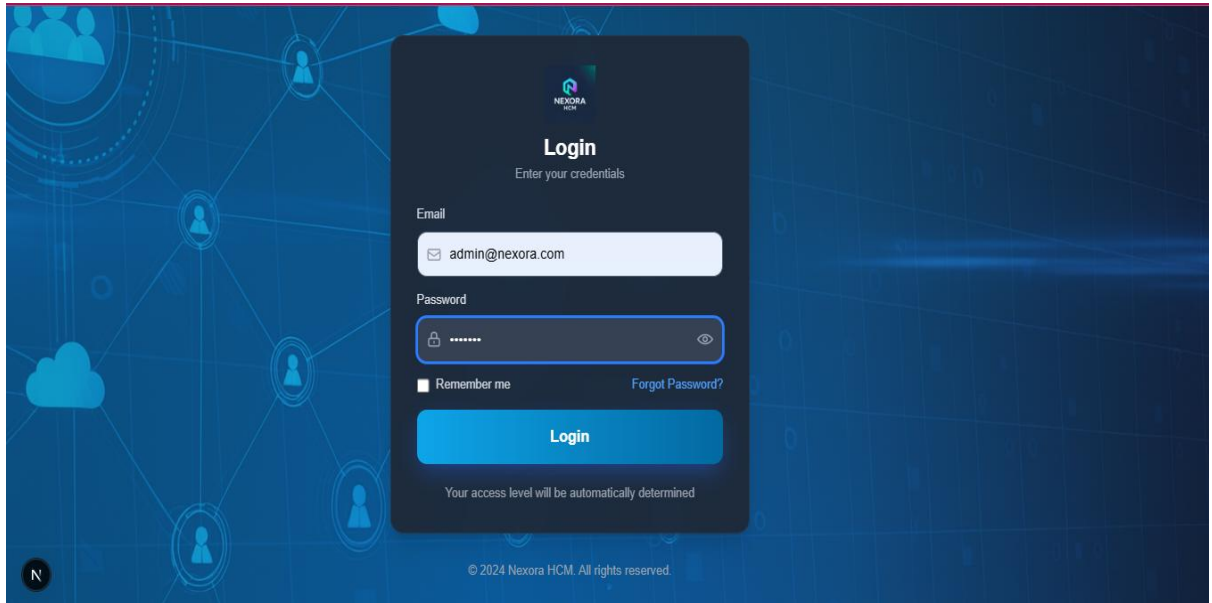


Figure 19: login Page

4.7.2 Admin Dashboard

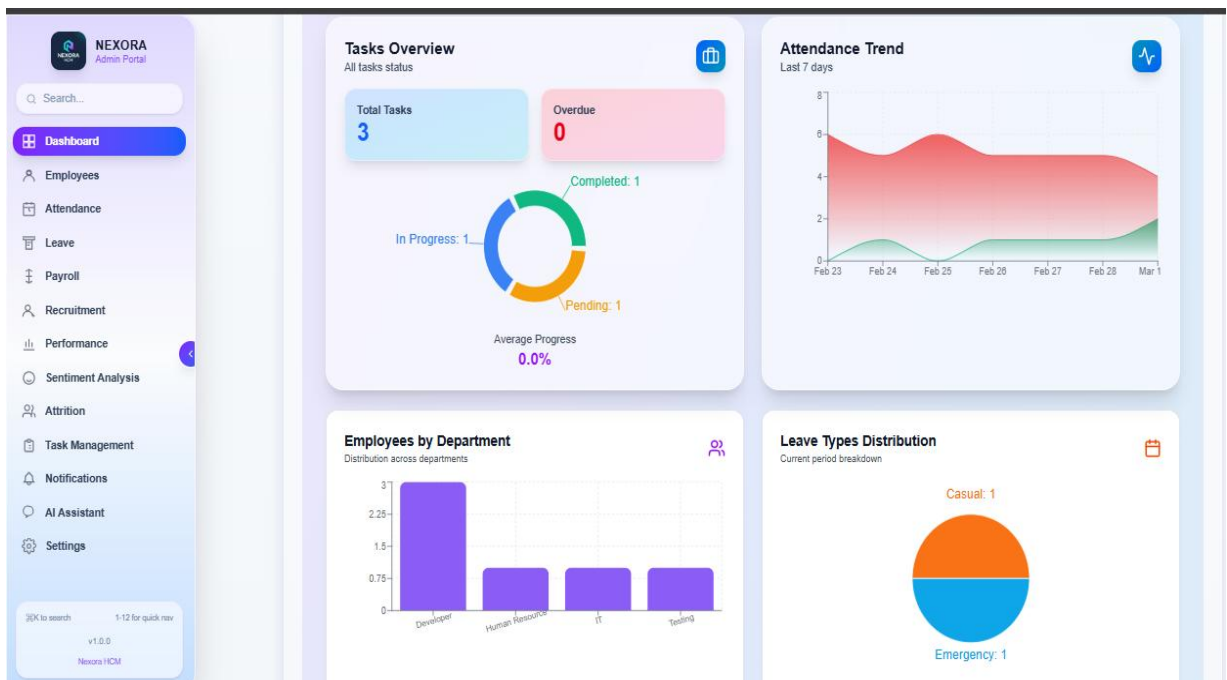


Figure 20: Admin Dashboard

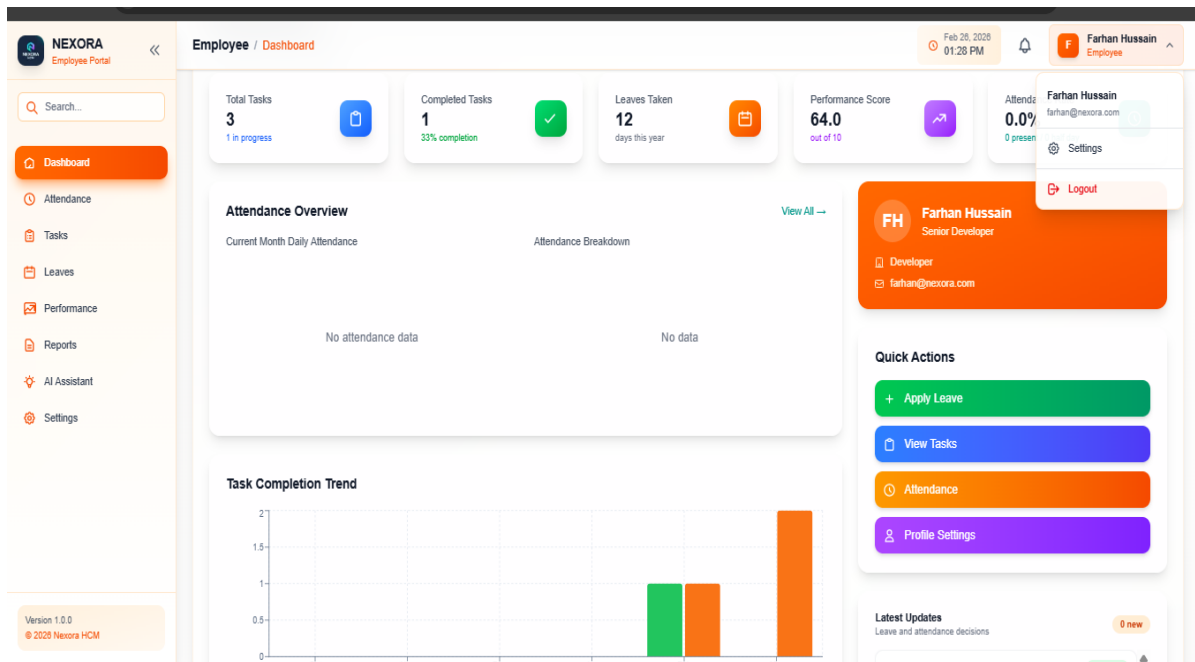


Figure 21: Employee Dashboard

4.7.3 Attendance Tracking

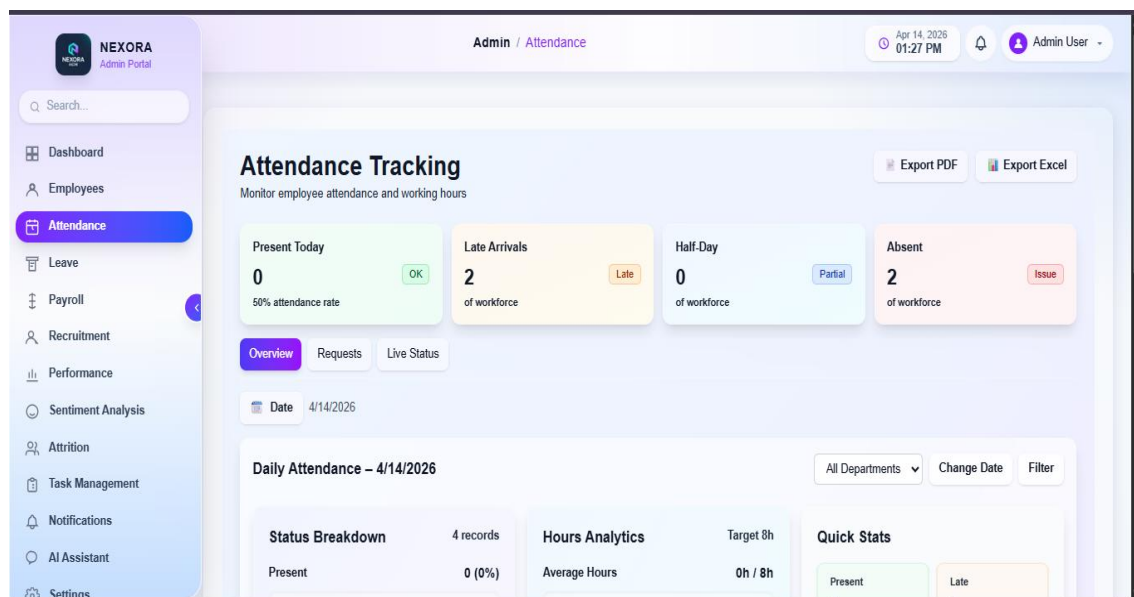
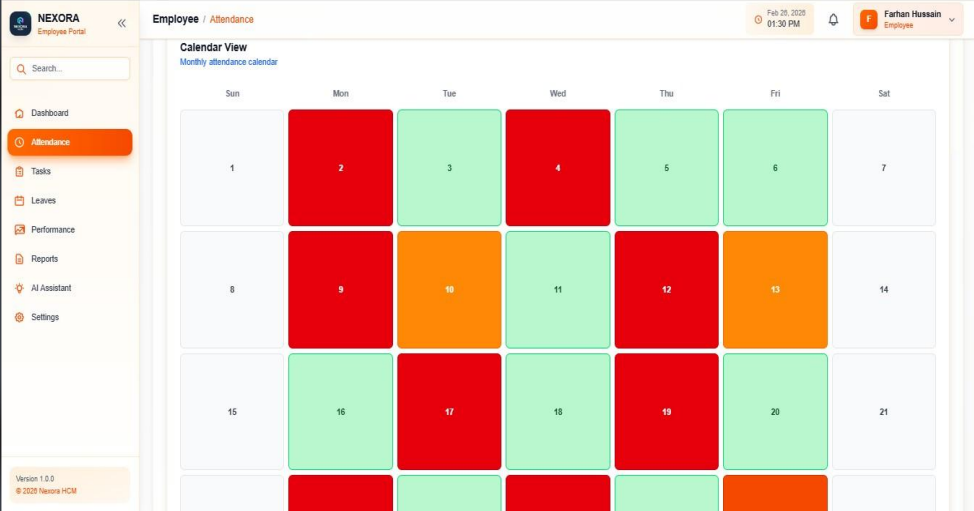


Figure 22: Admin Attendance

PROJECT DEMO



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Figure 23: Employee Attendance

4.7.4 Recruitment

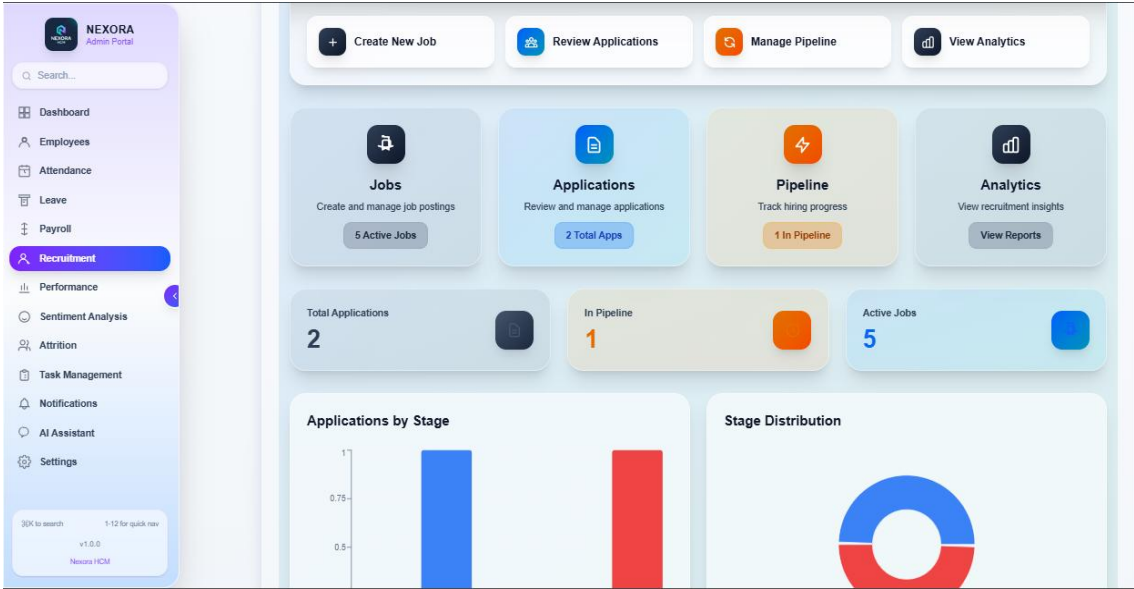


Figure 24: Recruitment Portal

4.7.5 Leave Management

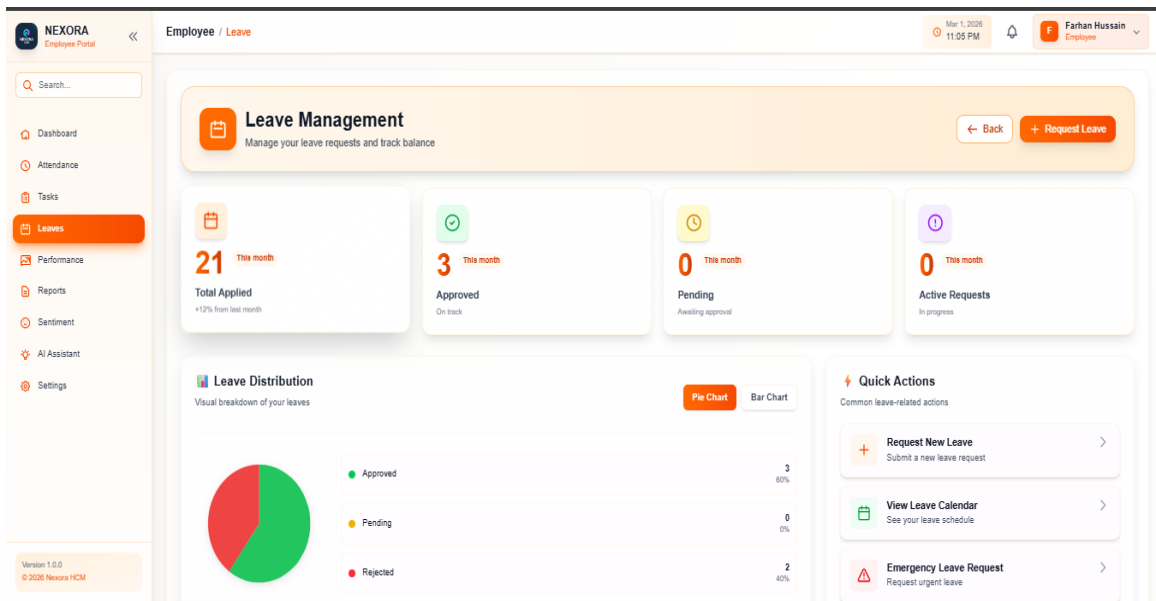


Figure 25: Leave Module

4.7.6 Reports and Analytics

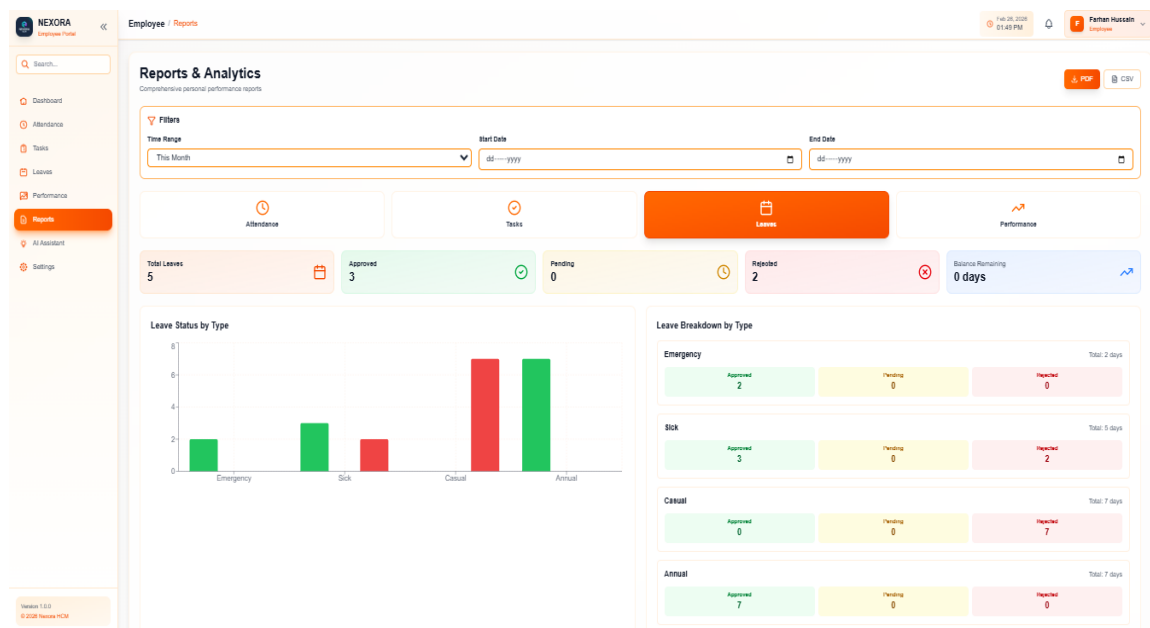


Figure 26: Reports and Analytics

4.7.7 Payroll Management

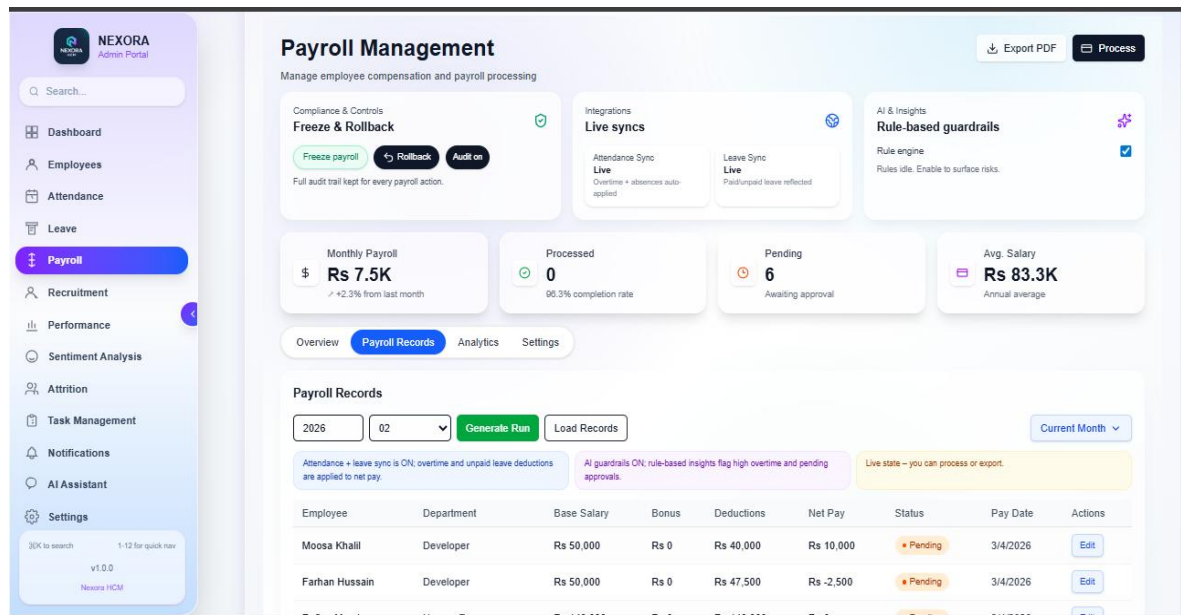
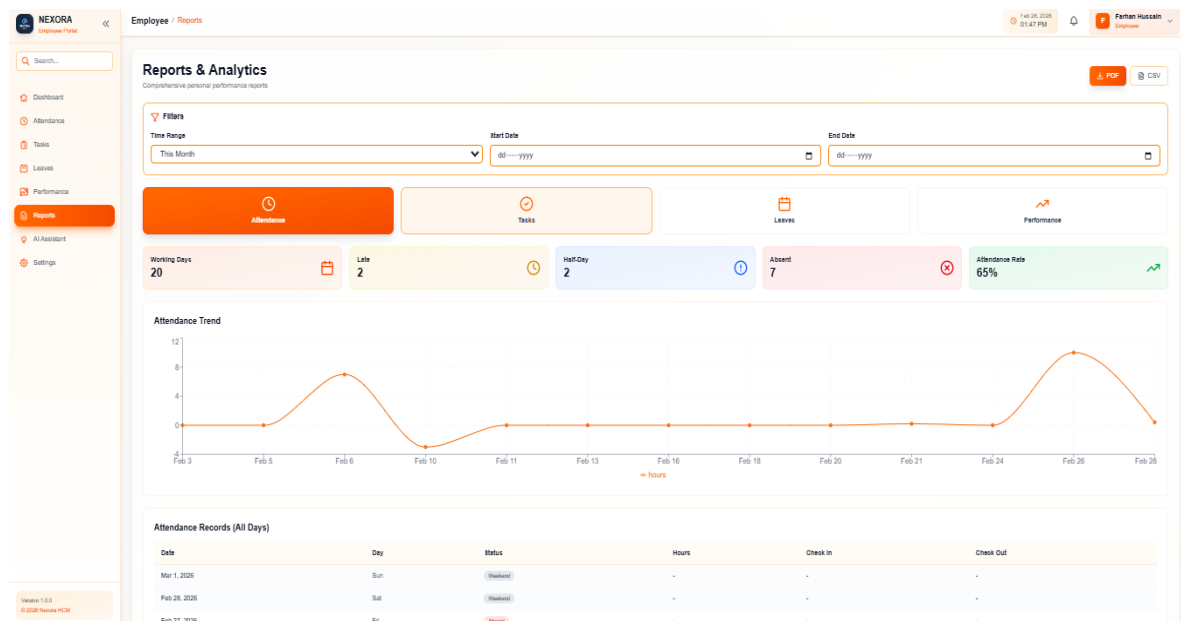


Figure 27: Payroll Management

4.7.10 Reports and Analytics



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Figure 28 Reports and Analytics Employee Side

4.7.8 Sentiment Analysis

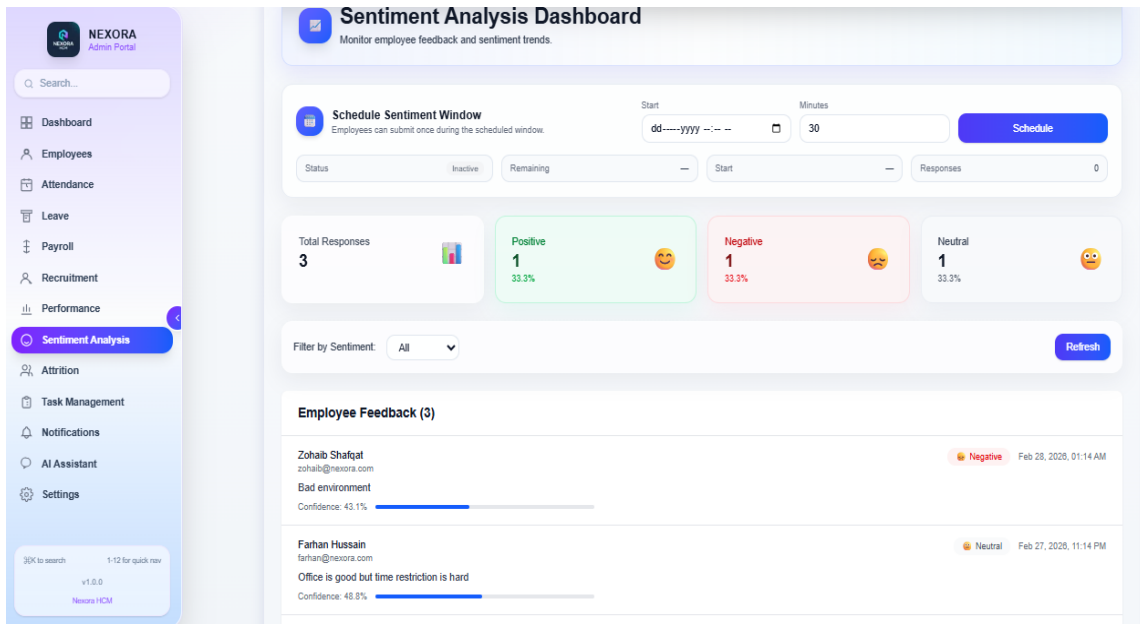


Figure 29 Sentiment Analysis

4.7.9 Attrition Prediction

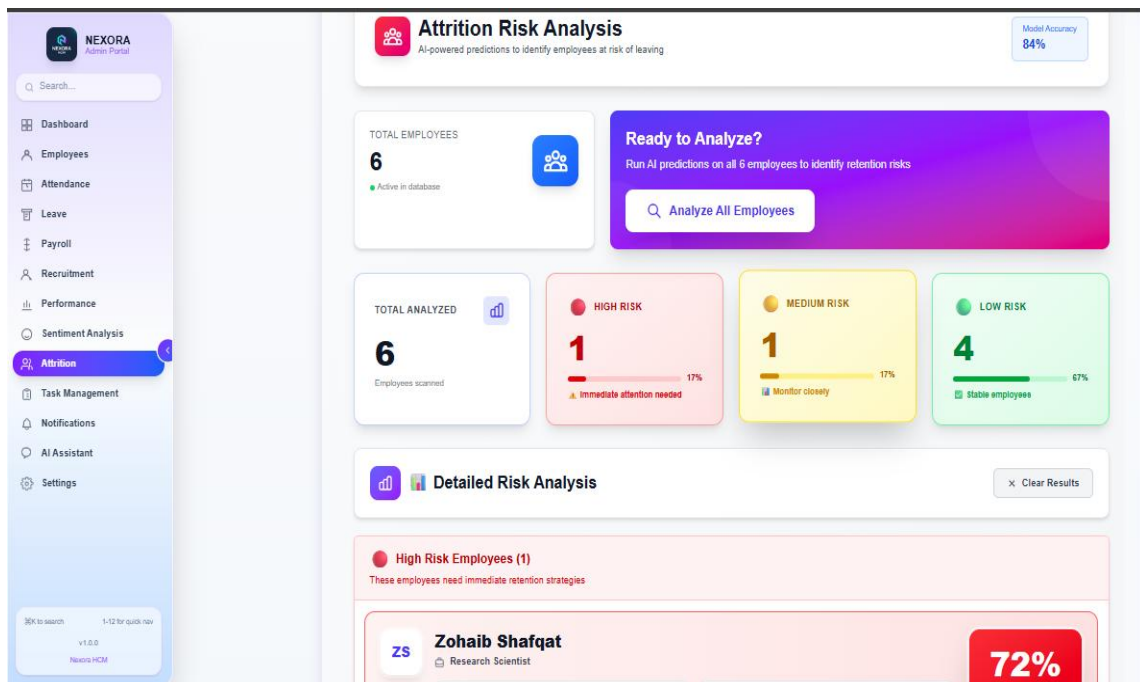


Figure 30 Attrition Prediction

4.10 Conclusion

The chapter showed the system design of Nexora HCM, design approach, constraints, and the general design of the system. It also defined the structural and behavioral features of the system in terms of logic and dynamic views.

The design provided the right structure of the system elements, the interaction between the modules, and the effective management of data. In general, the system design formed a good base of the implementation process and the system was easy to maintain, secure, and scalable.

CHAPTER 5

SYSTEM IMPLEMENTATION

5 System Implementation

5.1 Strategy

The implementation of Nexora HCM involved creating a completely functional version of the comprehensive Web-based Human Capital Management System according to our blueprint. We used cutting-edge technology in developing the product in order to be scalable, efficient, and secure.

5.2 Tools and Technologies Used

The interface of the project has been designed with the aid of a frontend framework called Next.js, which will aid in creating a responsive and interactive system. For the backend logic as well as API development, the technologies of Node.js have been used, and TypeScript will ensure that we create a robust and secure system.

For data storage purposes, a relational database system like PostgreSQL or MySQL has been used, and there has been the use of an ORM to aid us in implementing the process easily in the database. Moreover, Tailwind CSS has been used for UI designing purposes, and JWT systems have been introduced for authenticating users securely.

5.3. Development Process

The system was done in a modular way, in which the individual modules were done individually and then fitted to the entire system. This enabled it to be organized better, debugged easier and developed efficiently.

Major modules like employee management, attendance, leave management, payroll, recruitment and performance were made step by step. Once the modules had been developed, they were tested separately after which they were combined with other system parts.

5.4 Implementation of Feature

The data models that we designed were set up in a manner that will ensure efficient storage and handling of employee records through the use of the Employee Management module. APIs were established for the purpose of creating, deleting, and updating the employee records.

Concerning the Attendance and Leave Management module, the workflow was organized according to certain guidelines. The attendance is tracked on a daily basis while the leave application is managed by the administrative team.

We have also introduced the Payroll module which facilitates automatic calculations of salaries with the help of attendance and leave records. Through the data visualization and data aggregation tools, we introduced the Performance and Reports modules.

Lastly, the AI applications that we have introduced include sentiment analysis for the feedback collected from employees. The feedback from the employees was sorted and organized for the use of the leaders in making decisions.

5.5 Workflow and Process Implementation

A process was developed to make sure that there would be a workflow process which facilitates smooth running of activities within the HR process. Whereby, for example, in case of leave application, an employee applies for leave, the process is then analyzed, and finally either approved or not based on the policies set by the organization. Similarly, where correction of attendance is concerned, the process has to follow the same approach. Transfer of data communications was done through API usage. The modules of the application ran smoothly because of the synchronized processes within the application.

5.6 Conclusion

This chapter explained how Nexora HCM was implemented, including the tools and technologies involved, how it was developed, and the major functionalities of the system. It also provided the description of the workflow of application and how various modules were combined to obtain the intended results.

CHAPTER 6
SYSTEM TESTING &
EVALUATION

6 System Testing and Evaluation

Testing and evaluation represent a crucial step in the development of Nexora HCM. Testing makes it possible for the developers to ascertain whether the program can work well, accomplish the set tasks, and give desirable output. One of the goals of testing is to spot possible faults in the application, evaluate its performance, and check the interaction of its components.

The modules that the Nexora HCM has are Employee Management, Attendance, Leave, Payroll, Performance, and Reporting. The problem here is that each of these modules has been developed individually but then they have been integrated into one system; therefore, it is important to carry out a number of tests to verify individual modules and their interaction.

There were a few different types of testing done in developing Nexora HCM. Firstly, unit testing was performed to examine individual parts of the software like APIs and database operations. When it comes to component testing, it was done to test the performance of individual modules including Attendance and Payroll. Moreover, integration testing was needed to see how different modules interacted with one another, for instance, Attendance and Leave affect the Payroll module.

6.1 Test Strategy

Nexora HCM Testing Strategy had the purpose of guaranteeing proper functioning and meeting criteria set by the client. Testing took place gradually – firstly, each of the modules was tested separately, and secondly, the integrated system. The main idea was to make sure that all the characteristics of the system work accurately and efficiently.

Incremental testing method was used in our work. As soon as each of the modules, namely Employee Management, Attendance, Leave, Payroll, Reporting was developed, testing immediately followed.

The methods we used for testing were manual and functional. The former method allowed us to test how user-friendly the system is, evaluate its interface and navigation. The latter one was used to test whether all the characteristics of the system perform their functions properly. It means, for example, that it was required to test the proper functioning of the feature to record attendance, ask for leave, etc.

Besides, testing was carried out in normal operational mode. To do that, several usage scenarios were created, imitating user behavior when using the system. The point was to provide evidence that the system works properly and without any performance drops.

6.2 Component Testing

We decided to test the independent operation of each of the components of Nexora HCM system to ensure their independent performance. After development, we proceeded to test separate modules like employees, attendance, leaves, salary payments, and reporting, among others, to make sure that the internal processes were operating smoothly.

While testing the different components, we focused on all the functionalities of these components, their inputs, and outputs. For example, we made sure that the attendance component captures all the relevant data inputted and gives the summary as desired. We also made sure that the payroll component calculates salaries accurately. This was important to help us solve any problems within each component prior to integration.

This way, the result was that the tests confirmed the stability and readiness of the modules for integration.

6.3 Unit Testing

Unit testing was performed on individual units of the Nexora HCM system, such as individual functions, APIs, and database transactions. Unit testing

included testing individual elements to establish if they delivered the required output based on specific inputs.

During the testing process, we guaranteed that crucial functions such as validations, creation, read, update, and delete operations, as well as the responses to API calls, worked efficiently without errors. We could therefore find all possible errors and correct them before performing additional tests.

6.4 Integration Testing

Integration testing was performed to ensure that different modules of the software application work efficiently when integrated. In the testing process, we combined individual modules tested in isolation in an attempt to verify their performance when integrated

Some of the essential processes we examined included how attendance and leave details affect payroll calculations and how employee details show up in different dashboards and reports.

6.5 System Testing

The next step was to carry out system testing to check the entire Nexora HCM system as a single entity. Here, the entire system was tested to confirm that the software meets all the functional and non-functional requirements set out.

Several practical situations like managing employees, handling attendance, processing leave requests, generating payroll, and reports were designed to evaluate the system's performance. The system was tested thoroughly to guarantee that it produces the intended results while maintaining a process flow.

It was confirmed that the system worked precisely as expected under practical conditions.

6.6 Test Case Scenarios

6.6.1 Attendance

6.6.1.1 Mark Attendance Successfully (Positive Case)

Table 9: Test Case for: Mark Attendance Successfully (Positive Case)

Test Scenario ID	TS-001	Test Case ID	TC-001
Test Case Description	Verify that the employee can successfully mark attendance using the system		
Test Priority	High		
Prerequisite	Employee is logged into the system and attendance option is available		
Post-Requisite	Attendance is recorded and status is updated (Present)		
S. No	Action	Inputs	Expected Outcome

1	Navigate to Attendance section	None	Attendance screen opens
2	Click on “Mark Attendance”	Valid user session	System captures attendance request
3	System verifies via face/location	Valid verification data	Verification successful
4	System stores attendance	Verified data	Attendance recorded and status updated

6.6.1.2 Mark Attendance Failure (Negative Case)

Table 10: Mark Attendance Failure (Negative Case)

Test Scenario ID	TS-002	Test Case ID	TC-002
Test Case Description	Verify that attendance is not marked when verification fails or invalid data is provided		
Test Priority	High		
Prerequisite	Employee is logged into the system		

Post- Requisite	Attendance is not recorded and error message is displayed		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Attendance section	None	Attendance screen opens
2	Click on “Mark Attendance”	Invalid or missing verification data	System attempts verification
3	System verifies via face/location	Invalid face/location data	Verification fails and error shown
4	System processes attendance	Invalid data	Attendance is not recorded

6.6.2 Leave Management

6.6.2.1 Apply Leave Successfully (Positive Case)

Table 11: 6.6.2.1 Apply Leave Successfully (Positive Case)

Test Scenario ID	TS-003	Test Case ID	TC-003
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Test Case Description	Verify that the employee can successfully apply for leave		
Test Priority	High		
Prerequisite	Employee is logged in and has sufficient leave balance		
Post-Requirement	Leave request is submitted and recorded in the system		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Leave section	None	Leave page opens
2	Click on “Apply Leave”	None	Leave form is displayed
3	Enter leave details and submit	Valid dates, reason	System accepts request

		, leave type	
4	System processes request	Valid input data	Leave request stored and status updated (Pending/Approved)

6.6.2.2 Apply Leave Failure (Negative Case)

Table 12: Apply Leave Failure (Negative Case)

Test Scenario ID	TS-004	Test Case ID	TC-004
Test Case Description	Verify that leave request is rejected when invalid input or insufficient balance is provided		
Test Priority	High		
Prerequisite	Employee is logged into the system		
Post-Requisite	Leave request is not submitted and error message is displayed		
S. No	Action	Inputs	Expected Outcome

1	Navigate to Leave section	None	Leave page opens
2	Click on “Apply Leave”	None	Leave form is displayed
3	Submit leave form	Invalid dates / no balance	System shows validation error
4	System processes request	Invalid data	Leave request is not stored

Test Scenario ID	TS-005	Test Case ID	TC-005
Test Case Description	Verify that admin can successfully create a new employee record		
Test Priority	High		
Prerequisite	Admin is logged into the system		
Post-Requisite	New employee record is created and		

	stored in the database		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Employee Management section	None	Employee list page opens
2	Click on “Add Employee”	None	Employee form is displayed
3	Enter employee details and submit	Valid name, email, job title, department	System accepts data
4	System processes request	Valid input data	Employee record created and saved

6.6.3 Employee Management

6.6.3.1 Create Employee Successfully (Positive Case)

6.6.3.2 Create Employee Failure (Negative Case)

Table 13: Create Employee Failure (Negative Case)

Test Scenario ID	TS-006	Test Case ID	TC-006
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Test Case Description	Verify that employee is not created when invalid or duplicate data is provided		
Test Priority	High		
Prerequisite	Admin is logged into the system		
Post-Requirement	Employee record is not created and error message is displayed		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Employee Management section	None	Employee list page opens

2	Click on “Add Employee ”	None	Employ ee form is display ed
3	Submit employee form	Missing/duplic ate email or invalid data	System shows validati on error
4	System processes request	Invalid data	Employ ee record is not created

6.6.4 Payroll Management

6.6.4.1 Generate Payroll Successfully (Positive Case)

Table 14: Test Case for: Generate Payroll Successfully (Positive Case)

Test Scenario ID	TS-007	Test Case ID	TC-007
Test Case Description	Verify that admin can successfull y generate payroll for employees		

Test Priority	High		
Prerequisite	Admin is logged in and employee data (attendance, leave) is available		
Post-Requisite	Payroll is generated and stored successfully		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Payroll section	None	Payroll dashboard opens
2	Select employee(s) and generate payroll	Valid employee data	System processes payroll request
3	System calculates salary	Attendance, leave, salary data	Accurate salary calculated
4	System stores payroll record	Valid calculated data	Payroll saved and displayed

6.6.4.2 Payroll Generation Failure (Negative Case)

Table 15: Test Case for: Payroll Generation Failure (Negative Case)

Test Scenario ID	TS-008	Test Case ID	TC-008
Test Case Description	Verify that payroll is not generated when required data is missing or invalid		
Test Priority	High		
Prerequisite	Admin is logged into the system		
Post-Requisite	Payroll is not generated and error is displayed		

S. No	Action	Inputs	Expected Outcome
1	Navigate to Payroll section	None	Payroll page opens
2	Attempt to generate payroll	Missing attendance/leave data	System detects missing data
3	System processes request	Invalid/incomplete data	Error message displayed
4	System saves payroll	Invalid data	Payroll is not generated

6.6.5 Reports

6.6.5.1 Generate Report Successfully (Positive Case)

Table 16: Test Case for: Generate Report Successfully (Positive Case)

Test Scenario ID	TS-009	Test Case ID	TC-009
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Test Case Description	Verify that the employee can successfully generate reports		
Test Priority	High		
Prerequisite	Employee is logged in and report data is available		
Post-Requisite	Report is generated and displayed/exported successfully		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Reports section	None	Reports page opens
2	Select report type and filters	Validate range, report type	System processes request

3	Generate report	Valid input data	Report generated with correct data
4	Export report (PDF/CSV)	Valid report	File downloaded/exported successfully

6.6.5.2 Report Generation Failure (Negative Case)

Table 17: Test Case for: Report Generation Failure (Negative Case)

Test Scenario ID	TS-010	Test Case ID	TC-010
Test Case Description	Verify that report is not generated when invalid filters or data issues occur		
Test Priority	High		
Prerequisite	Employee is logged into the system		

Post- Requisite	Report is not generated and error message is displayed		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Reports section	None	Reports page opens
2	Select invalid filters	Incorrect date range / missing data	System detects invalid input
3	Generate report	Invalid input	Error message displayed
4	Export report	No valid report	Export not allowed

6.6.6 Authentication

6.6.6.1 Login Successfully (Positive Case)

Table 18: Test Case for: Login Successfully (Positive Case)

Test Scenario ID	TS-011	Test Case ID	TC-011
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Test Case Description	Verify that user can successfully log into the system with valid credentials		
Test Priority	High		
Prerequisite	User account exists in the system		
Post-Requisite	User is logged in and redirected to dashboard		
S. No	Action	Inputs	Expected Outcome
1	Open login page	None	Login page displayed
2	Enter credentials	Valid email and password	System validates credentials
3	Click login	Valid input	User authenticated successfully

4	System redirects user	Valid session	Dashboard is displayed
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6.6.6.2 Login Failure (Negative Case)

Table 19: Test Case for: Login Failure (Negative Case)

Test Scenario ID	TS-012	Test Case ID	TC-012
Test Case Description	Verify that login fails when invalid credentials are provided		
Test Priority	High		
Prerequisite	User attempts to log in		
Post-Requisite	User is not logged in and error message is displayed		

S. No	Action	Inputs	Expected Outcome
1	Open login page	None	Login page displayed
2	Enter credentials	Invalid email/password	System detects invalid credentials
3	Click login	Invalid input	Error message displayed
4	System processes request	Invalid data	User not authenticated

6.6.7 AI / Feedback Module

6.6.7.1 Submit Feedback Successfully (Positive Case)

Table 20: Test Case for: Submit Feedback Successfully (Positive Case)

Test Scenario ID	TS-013	Test Case ID	TC-013
Test Case Description	Verify that employee can submit feedback and system processes sentiment analysis		
Test Priority	Medium		

Prerequisite	Employee is logged in		
Post-Requirement	Feedback is stored and sentiment is analyzed		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Feedback section	None	Feedback page opens
2	Enter feedback text	Valid feedback text	System accepts input
3	Submit feedback	Valid data	System analyzes sentiment
4	System stores feedback	Valid input	Feedback saved with sentiment score

6.6.7.2 Feedback Submission Failure (Negative Case)

Table 21: Test Case for: Feedback Submission Failure (Negative Case)

Test Scenario ID	TS-014	Test Case ID	TC-014
Test Case Description	Verify that feedback is not submitted when input is empty or invalid		
Test Priority	Medium		

Prerequisite	Employee is logged in		
Post-Requirement	Feedback is not stored and error message is displayed		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Feedback section	None	Feedback page opens
2	Submit feedback	Empty or invalid text	System detects invalid input
3	System processes request	Invalid data	Error message displayed
4	System stores feedback	Invalid input	Feedback not saved

6.6.8 Performance Module

6.6.8.1 View Performance Successfully (Positive Case)

Table 22: Test Case for: View Performance Successfully (Positive Case)

Test Scenario ID	TS-015	Test Case ID	TC-015
Test Case Description	Verify that employee can view performance data and KPIs correctly		

Test Priority	Medium		
Prerequisite	Employee is logged in and performance data exists		
Post-Requirement	Performance data is displayed correctly		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Performance section	None	Performance page opens
2	Load performance data	Valid employee data	System fetches performance metrics
3	Display KPIs and charts	Valid data	KPIs and charts displayed correctly
4	View detailed performance	Valid selection	Detailed data shown

6.6.8.2 Performance Data Failure (Negative Case)

Table 23: Test Case for: Performance Data Failure (Negative Case)

Test Scenario ID	TS-016	Test Case ID	TC-016
Test Case Description	Verify that performance data is not displayed when data is missing or invalid		
Test Priority	Medium		
Prerequisite	Employee is logged into the system		
Post-Requisite	No data is displayed and error/empty state is shown		
S. No	Action	Inputs	Expected Outcome
1	Navigate to Performance section	None	Performance page opens
2	Load performance data	Missing/invalid data	System detects no data
3	System processes request	Invalid data	Empty state or error

			message shown
4	Display results	No valid data	No charts/data displayed

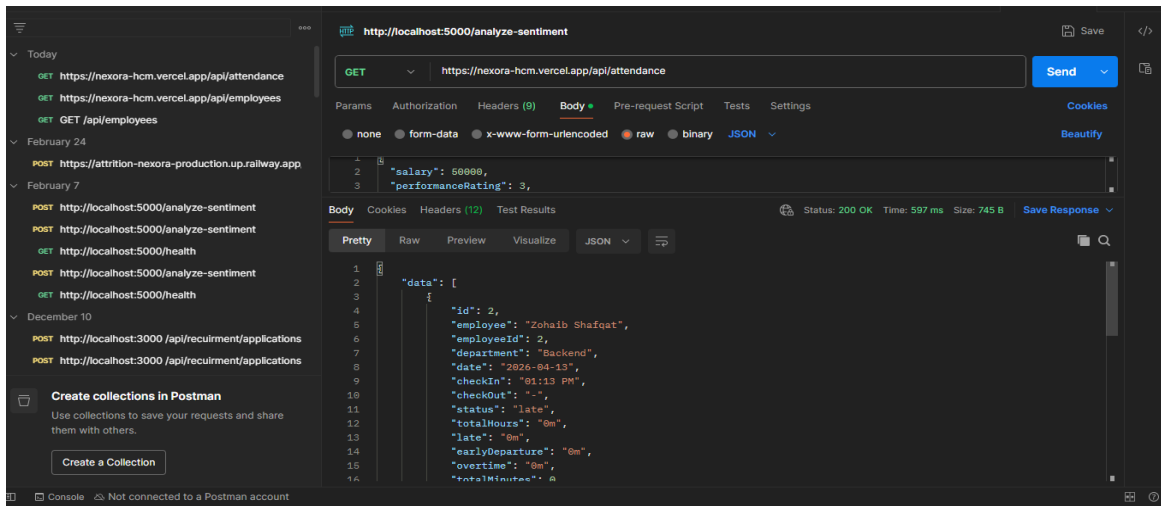
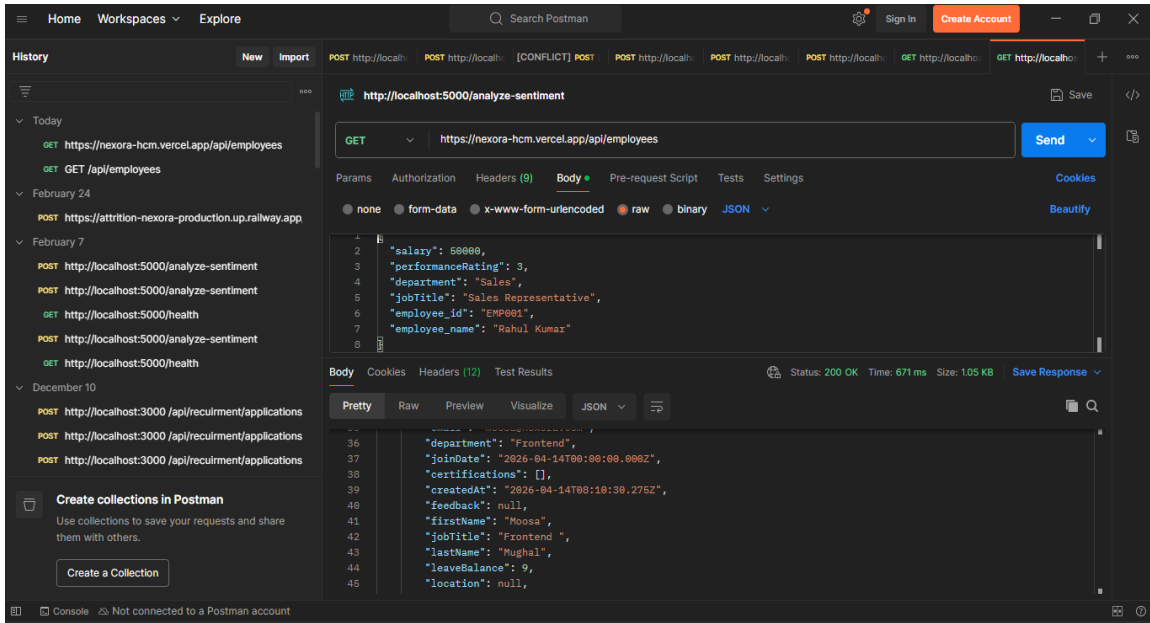
6.7 Results & Evaluation

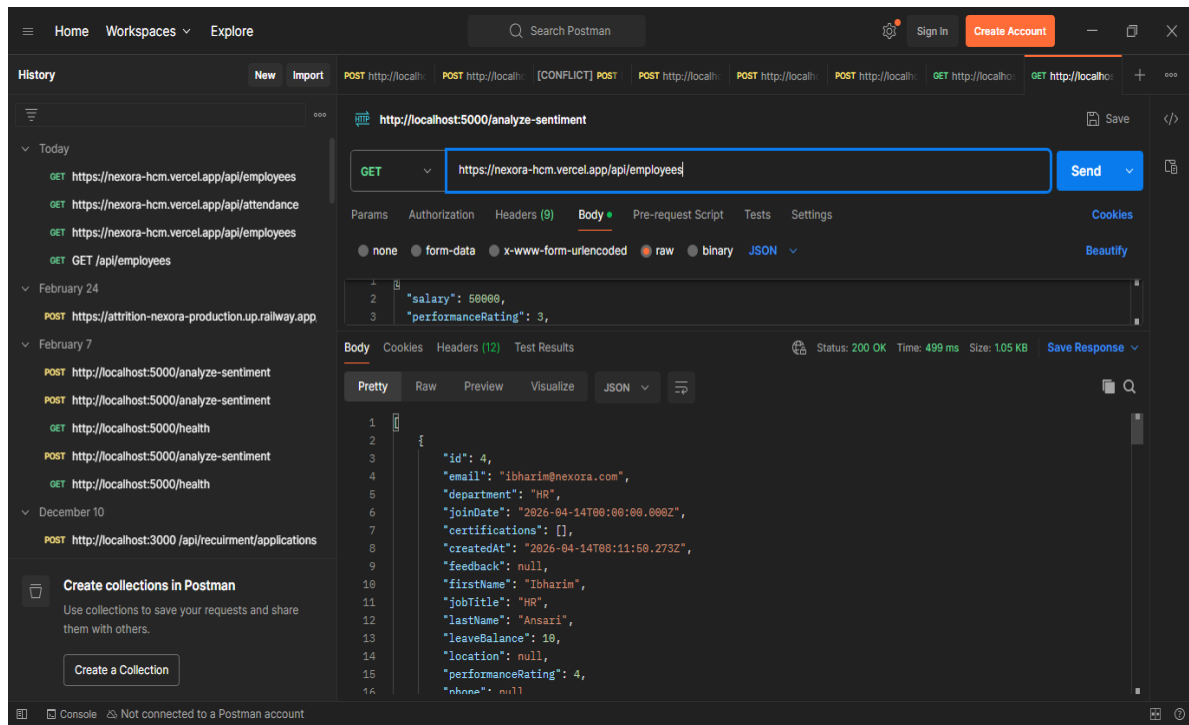
Based on the test results, the program meets the customer's requirements, and all criteria are fulfilled. In particular, all vital modules, including Employee Management, Attendance, Leaves, Payroll, and Reporting, proved to be flawless when tested. Thus, all the introduced functionalities revealed their efficiency and effectiveness. None of the serious flaws emerged during testing.

As the result of testing, Nexora HCM demonstrated sufficient efficiency and provided an opportunity to carry out the corresponding process. In other words, all processes such as attendance, leaves, payroll generation, and reporting were successfully executed without any technical problems. User experience will be positive because of the convenience of the interface.

Moreover, the data flow and processing were conducted efficiently without any data loss caused by possible bugs. Also, user input validation can be regarded as adequate because modules operate successfully together.

Finally, we performed testing for the API functionality of Nexora HCM. This feature provides sufficient opportunities for managing request-response flows in frontend and backend parts. Almost no mistake.





6.8 Conclusion

The testing process for Nexora HCM was extensively carried out in this chapter in order to check whether the application is functional and meets all the requirements set by the developers. Besides, various types of testing were performed, such as unit testing, component testing, integration testing, and system testing.

After performing the test, it turned out that Nexora HCM is reliable and efficient in all necessary modules, including those related to the management of employees, attendance, leaves, payroll, and reporting. The processes were performed successfully, and the software handled all user inputs flawlessly. After eliminating all minor bugs from the application, its reliability increased significantly.

Generally speaking, the testing process made it possible to prove the efficiency and stability of Nexora HCM.

CHAPTER 7

CONCLUSION

7. Conclusion

The creation of Nexora HCM was aimed at giving the possibility to have a powerful tool to manage human resources in a company in an effective way. This tool unites many functional elements like staffing management, time accounting, holiday management, payroll management, employee evaluation, and report generation, thus automating many processes, enhancing data processing precision, and increasing productivity.

A systemic approach has been applied throughout the entire development process when such steps as requirement analysis, system design, implementation, and testing have been carried out. Detailed planning of the functioning of every module along with their flawless work and integration into the system as a whole have been ensured. Advanced technologies have been used in order to develop the flexible platform that is capable of scaling. Among such technologies are Next.js, Node.js, and relational database.

After conducting the testing of the resulting software package, one may state that it will be possible to solve all human resources management tasks. Moreover, it possesses convenient administrative and employee interfaces that allow it to be used from any kind of devices.

Thus, Nexora HCM reaches the goals set in front of it successfully.

7.1 Contributions

The Nexora HCM system offers some significantly valuable contributions within the field of systems of human resource management especially to the small and medium enterprises (SMEs). The main output of this project is the creation of a centralized platform that will combine several HR functions into one platform. Nexora offers an integrated solution comprising of attendance, payroll, leave, and performance management tools, instead of utilizing separate tools and enhancing efficiency and complexity.

The other significant contribution is the introduction of smart features in the system. The integration of AI-built features, including sentiment analysis and smart insights, improves conventional HR systems by allowing to make decisions more effectively. These aspects enable the organizations to examine the employee feedback, performance trends and also regarding the form of possible problems like employee dissatisfaction. The system also plays a role in enhancing data management and accuracy. A database stores all the information related to the employees in a structured format and is therefore easily accessible. Robotic systems, including attendance management and calculation of wages save time and errors made by manually handling processes. Furthermore, Nexora HCM offers an easy-to-use and responsive interface to administrators and employees. The system will be available on all devices and therefore the users will find it very easy to perform duties like applying leave, reports, and other employee related tasks.

On the whole, the project is valuable because it provides an effective, efficient, and intelligent solution to HR management that can meet the real-life requirements of the organization and improve the overall productivity.

7.2 Reflections

The acquired experience during the creation of the Nexora HCM System proved invaluable, as it gave me an opportunity to apply my skills to real-world software development. As already stated above, the experience of working on this assignment brought along quite a number of difficulties; however, I managed to cope with some of them and refine my problem-solving and system-building skills.

Perhaps the most important aspect I have learned when working on this project is the necessity to properly prepare and analyze requirements before starting development. It became obvious that in order to make the process effective, it was required to compose a high-quality SRS, which would define the rules of the game and goals to achieve.

The experience of working with API, authentication, and processing the data increased my technical competence and helped me obtain a better understanding of full-stack development.

Last but not least, testing and debugging appeared to be very important during the development process, which could be seen during this project. Errors detected at different stages of the development process were fixed rapidly and effectively. Altogether, this project was helpful in terms of developing technical and analytical skills, as well as experience in teamwork, project management and real-life system development.

7.3 Future Work

However, even though this solution enables companies to implement all processes required from the HR side, there is still some potential to improve it in the future.

First, the next step to enhance the system further is integrating it with various external sources. For instance, in the future, this platform can become even more useful as soon as it becomes integrated with other applications, such as biometric sensors to track employee attendance or payroll systems to calculate salaries.

Furthermore, it could be helpful to improve the current design of the user interface. For instance, one could implement interactive dashboards, alerts, and, most importantly, a mobile application that will enable users to operate the platform while being away from their desks.

Last but not least, in the future, it will be necessary to make the system even more secure and scalable. For instance, one can increase the security level of the platform by implementing various multi-factor authentication techniques.

References

- [6] D. Flanagan, *JavaScript: The Definitive Guide*, 7th ed. Sebastopol, CA,

USA: O'Reilly Media, 2020.

- [7] Vercel Inc., “Next.js Documentation,” 2025. [Online]. Available: <https://nextjs.org/docs>
- <https://nextjs.org/>
- <https://vercel.com/new>
- □ Roger S. Pressman, *Software Engineering: A Practitioner's Approach*.
- <https://www.oracle.com/in/human-capital-management/what-is-hcm/>
- □ Ian Sommerville, *Software Engineering*, 10th Edition.
- <https://www.mapbox.com/blog/mapbox-geofencing-drives-operational-efficiency-and-revenue-growth>

Appendix I

Plagiarism Report

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Appendix II

Deployment Overview

Nexora HCM was implemented as a full web-based solution, incorporating the frontend, backend, and artificial intelligence features. It was deployed to turn it into a practically feasible product that people can use while performing routine tasks.

The frontend module was set up to function on cloud servers, ensuring rapid access and response by administrators and workers. The backend was deployed separately, carrying out its responsibilities regarding the management of all core actions associated with logins, data manipulation, and working with APIs. Also, AI elements were deployed, interacting with the backend server and analyzing the information to provide helpful insights. Therefore, the resulting solution became a completely functioning tool with interconnected components.

Deployment Architecture

The deployment architecture encompasses several layers, enabling proper management of all elements.

The frontend layer is composed of dashboards, forms, and reports, used for user interactions.

The backend layer takes care of business logic, data validation, and API actions. Each of these layers is joined by means of a secure API communication to guarantee the even flow of data across various sections of the system in a secure manner.

API Overview

In Nexora HCM, RESTful APIs are available for the integration between the frontend and backend components of the system. The role of an API is to act as a connection between the user actions and the processing of the system itself. Every

time a user executes any action on the platform, like applying for leave or logging into work, there is always an API that passes the information to the backend.

The APIs were created with the aim of allowing each module to operate independently despite being interconnected. For instance, the employee management, attendance, and payroll modules all interact with the platform via APIs.

Fundamental API Endpoints

Authentication APIs

- POST /api/auth/login - logs in a user.
- POST /api/auth/logout - to end the session.
- GET /api/auth/session - to get current user session.
- Employee Management APIs
- GET /api/employees- fetches records of employees.
- POST /api/employees - creates a new employee.
- PATCH /api/employees/:id -modifies employee information.
- DELETE /api/employees/:id- deletes the data of employees.

Attendance APIs

- POST /api/attendance/mark - marks daily attendance.
- GET /api/attendance - retrieves attendance information.
- PATCH /api/attendance/request/:id - works with corrections.
- Leave Management APIs
- GET /api/leave - fetching leave requests.
- POST /api/leave – applies for leave
- PATCH /api/leave/:id - approves or disapproves leave.

Payroll APIs

- GET/api/payroll- gets payroll information.
- POST /api/payroll/generate - creates wage records.
- AI & Analytics APIs

- POST /api/sentiment/ai-sentiment-analysis-employee-feedback – analyses employee opinions.
- GET /api/analytics/analytics - gives insight into the system.

AI Adoption.

Functionality of AI in Nexora HCM has been wholly implemented through the software. This means that the modules work together with the backend to form information based on employees' data.

This means that the sentiment analysis module assesses how the sentiments of the employees are. The prediction modules can identify patterns like employee performance or possible hazards.

Such functionalities of AI are carried out in real time and help in improving efficiency in making decisions.

Security and Deployment considerations.

When deploying the system, we took necessary precautions regarding security. Role-based access control is employed in the system, meaning that an admin will have different access levels compared to the employee. Necessary login authentication procedures are also considered through token usage.

All transactions made between the frontend and backend are secure. This is ensured to protect confidential information such as employees' personal details and payrolls. Proper API validation is also used to avoid improper access to any data.