MICROFINANCE MANAGEMENT SYSTEM: HUMAN RESOURCE 3 ("SKILL DEVELOPMENT, RECRUITMENT ANALYTICS, HR DATA ANALYTICS WITH PREDICTIVE ANALYTICS USING PYTORCH")

A Capstone
Presented to the Faculty of
The College of Computer Studies
Bestlink College of the Philippines

In Partial Fulfillment
Of the Requirements for the Degree of
Bachelor of Science in Information Technology

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2024

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ACKNOWLEDGEMENT

The researchers would like to express their heartfelt thanks and gratitude to the following persons who, in one way or another, has contributed much, and extended willingness and support needed to make this research possible:

Dr. Maria M. Vicente, President/CEO, Bestlink College of the Philippines, for her generosity and kind heart in establishing this institution and giving opportunities to those less fortunate students to continue their studies and pursue their dreams;

Ms. Edith M. Vicente, Executive Vice President, for providing the needed information to complete this research;

Dr. Charlie I. Cariño, Vice President for Academic Affairs, for his support and encouragement to make this thesis writing possible;

Engr. Diosdado T. Lleno, Vice President for Administration and Finance, for his words of encouragement and motivation;

Dr. Joy Evelyn A. Ignacio, Director,Center for Research and Development, for her good heart to extend her help needed by the researchers.

Dr. Rosicar E. Escober, Dean, College of Computer Studies of Bestlink College of the Philippines, for providing a guideline documentation in capstone project.

Mr. Rommel J. Constantino, Program Head, Bachelor of Science in Information Technology, for the constant supervision as well as providing necessary information regarding the project and also for his support in completing this project

Mr. Ronald G. Roldan Jr., Research Coordinator, for helping us in improving our research and guiding us in completing this project.

Rommel J. Constantino, Capstone Adviser, for giving us suggestions and ideas to improve our research and guiding us in completing this project.

Panelists, who extended their effort and time to be able to constructively criticize this thesis and share their knowledge with them to deepen and widen their needed information.

Families and Friends, for all the financial and moral support that have enabled the researchers to triumph all the challenges, especially during the lowest time that served as their inspiration to complete this study; and

Above all, to the **Almighty God**, for the strength and knowledge that were used for the accomplishment of this research journey.

THE RESEARCHERS

DEDICATION

This business research study is wholeheartedly dedicated first and foremost to the researchers, for executing dedication, time, effort, motivation, sacrifice, and courage to make this conducting study a fruitful and successful piece of work.

To our beloved parents who have been our inspiration and gave us strength when we thought of giving up, which continually provide their moral, spiritual, emotional and financial support.

To each sibling and circle of friends who shared their words of advice and encouragement to finish this study.

To the research advisers and professors, for extending help by giving guidance, supervision, time and wisdom to the researchers in conducting this business research study.

And lastly, above all, to our Almighty God, for giving guidance, strength, power of mind, protection, skills and for giving us a healthy life. All of these we offer to you.

THE RESEARCHERS

ABSTRACT

Title: **MICROFINANCE MANAGEMENT SYSTEM: HUMAN RESOURCE 3 ("SKILL DEVELOPMENT, RECRUITMENT ANALYTICS, HR DATA ANALYTICS WITH PREDICTIVE ANALYTICS USING PYTORCH**

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Major: **Information Management, Information Security, Network Administrative**

Date of Completion: **2024**

This project aims to develop a Microfinance Management System (MMS) that improves Human Resource (HR) practices, focusing on skill development, recruitment analytics, and HR data analytics using predictive analytics with PyTorch. Microfinance Institutions (MFIs) provide essential financial services to underserved communities, but they often struggle with managing their workforce effectively.

One major challenge is tracking employee skills. Many MFIs lack systems to monitor employee growth, making it hard to provide the right training and support. Additionally, the recruitment process can be slow and inefficient, leading to higher turnover.

This project addresses these issues by introducing a system that combines modern HR tools with data analysis. It will allow MFIs to track employee progress and offer personalized training programs, helping employees grow and stay motivated. For recruitment, the system will use analytics to improve hiring decisions by analyzing past hiring data. This means MFIs can find suitable candidates more quickly.

The project will also focus on HR data analytics to support better decision-making. By using predictive analytics with PyTorch, the system will help MFIs understand workforce trends and plan for future staffing needs.

Overall, this project is important because it helps MFIs attract and retain talented employees, making them more efficient and effective in serving their clients. It benefits employees, organizations, and clients while providing insights for future research on using AI in HR management.

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Chapter 1

INTRODUCTION

1.1 Background of the Capstone Project

Microfinance Institutions (MFIs) provide essential financial services, such as small loans, savings, and insurance, to underserved and unbanked populations. These institutions operate in regions lacking traditional banking infrastructure, helping individuals and small businesses achieve financial inclusion and economic growth. While the primary focus of MFIs is on financial products, there is an increasing need to integrate modern human resource management techniques, predictive analytics, and skills development into their operations. Microfinance has also become a key financial innovation in recent decades, significantly contributing to economic development, poverty reduction, and job creation worldwide. It targets low-income populations, aiming to enhance financial inclusion and provide necessary financial services to the poor.

In an era of rapid technological advancements, Microfinance Management Systems (MMS) are no longer limited to managing financial transactions. MFIs are now exploring how data analytics, Artificial Intelligence (AI), and Machine Learning (ML) can be leveraged to streamline human resources (HR), improve recruitment, and foster skill development among their workforce. Digitalization presents significant opportunities for MFIs in terms of

improved productivity and outreach to unserved clientele. With digital technologies, MFIs can expand their services, reach more individuals, and introduce various financial offerings that promote financial inclusion and sector sustainability. However, digital transformation also presents challenges, such as security concerns, infrastructure gaps, and limited access to technology, which must be addressed to fully capitalize on these opportunities.

HR data analytics, combined with predictive analytics, can help institutions make better decisions about hiring, training, retention, and resource allocation, thereby boosting overall efficiency and impact. This chapter introduces a comprehensive approach to enhancing the efficiency of microfinance institutions by incorporating skill development, recruitment analytics, and HR data analytics into a Microfinance Management System. With the addition of predictive analytics using PyTorch, this system will support both financial and human resource management, ensuring MFIs can effectively attract, develop, and retain talent.

1.2 Context and Scope

This document addresses the HR practices of Microfinance Institutions (MFIs), which operate with limited financial resources and cater to specific communities. It focuses on cost-effective HR strategies that align with the financial constraints and operational goals of MFIs,

without competing with larger corporations or organizations. These practices aim to attract, develop, and retain talent within these limitations.

MFIs typically work within localized communities, requiring an understanding of the unique social and cultural dynamics of these areas. This context informs HR practices such as community engagement, where employees may be involved in outreach or development programs. Compensation packages must be sustainable and competitive, often including essential benefits like healthcare and retirement plans that are attractive to employees while remaining within the institution's financial means.

1.3 Problem Statement

The Microfinance Management System has three main parts: Skill Development, Recruitment Analytics, and HR Data Analytics using PyTorch. Each part has its own challenges:

- Skill Development: The system doesn't have automatic tracking for employee growth and training. This makes it harder to see real-time skill progress, which slows down employee learning and complicates personal development plans.

- Recruitment Analytics: The system doesn't use predictive analytics to help HR with hiring. Without it, predicting recruitment needs, evaluating candidates quickly, and improving the hiring process becomes more difficult.

- HR Data Analytics: Although data is collected, the system isn't using advanced tools to analyze it properly. Without predictive analytics, spotting trends and improving decisions based on workforce data is limited.

Fixing these problems will help better track skill growth, improve hiring strategies, and use data more effectively in decision-making.

1.4 Objectives and Goals

The main objective of this capstone project is to design a Microfinance Management System (MMS) that improves human resource (HR) management, including skill development, recruitment analytics, and predictive analytics. The system aims to support Microfinance Institutions (MFIs) in effectively managing their workforce, improving overall operations, and contributing to their mission of serving underserved communities.

These are the objectives and goals of the project:

- Skill Development

    Objectives:

    1. Track and improve employee skills over time.

    2. Provide personalized training programs based on employee needs.

    Goals:

    1. Help employees develop key skills that are important for their roles.

    2. Offer tailored training to make sure employees grow and stay motivated.

    3. Make it easy for managers to monitor employee progress in real time.

- Recruitment Analytics

    Objectives:

    1. Use data to improve hiring decisions and find the right candidates faster.

2. Reduce the time and cost of recruiting by predicting the success of the candidates.

Goals:

1. Match the candidates to job openings more accurately using past hiring data.

2. Cut down on employee turnover by selecting better-suited candidates

3. Make recruitment process quicker and more efficient with data-driven insights.

- HR Data Analytics

   Objectives:

   1. Analyze employee data to make better decisions about staffing, training, and retention.

   2. Use predictive tools like PyTorch to spot trends and improve HR planning.

   Goals:

   1. Predict staffing needs and skill gaps to help plan for future workforce demands.

2. Track employee performance and satisfaction using data to improve HR decisions.

3. Help HR teams make smarter, faster decisions about hiring, promotions, and training.

The system will help MFIs not only manage their financial services but also ensure they can attract, develop, and retain talented employees, making them more competitive and sustainable in the long run.

1.5 Significance and Relevance

This study is significant because it presents effective solutions to the typical HR challenges encountered by Microfinance Institutions (MFIs). By implementing recruitment analytics, MFIs can more efficiently select suitable candidates, and an emphasis on skill development prepares employees to adapt to industry changes, enhancing both their performance and job satisfaction. In an increasingly data-driven environment, MFIs must embrace modern HR technologies to stay competitive. Utilizing advanced tools like PyTorch for predictive analytics offers innovative approaches to recruitment, employee development, and workforce planning.

- Faster and Smarter Hiring: The system helps MFIs find the right candidates quickly, saving time and money. This also ensures that the people hired are a good fit for the job.

- Better Employee Training: The focus on skill development means employees can keep up with changes in the industry, making them better at their jobs and more satisfied.

- Planning for Future Workforce Needs: Using predictive analytics with PyTorch, MFIs can predict their future staffing needs, spot any missing skills, and make decisions based on real data.

- Saving Costs: By improving hiring and keeping employees longer, MFIs can save money. These savings can then be used for other important areas, like expanding their services to reach more people.

- Higher Employee Engagement: Personalized training and early detection of issues help keep employees happy and engaged, which reduces turnover.

- Using Data for Better HR Decisions: The system allows MFIs to use data to make better decisions about hiring, promotions, and training.

- Staying Competitive: By adopting modern HR tools, MFIs can remain competitive in the market and attract top talent.

The study will benefit the following groups:

- Employees: Employees will receive customized training that improves their skills and job satisfaction, while also helping them feel more secure in their roles.

- Organizations: MFIs will hire more effectively, lower costs, reduce employee turnover, and keep talented staff by using data-driven HR decisions.

- Managers: Managers will have better insights into employee performance and skills, making it easier to allocate resources and plan for growth.

- Clients: Clients will benefit from better services provided by a more skilled and engaged workforce, improving their overall experience with MFIs.

- Future Researchers: This study will give future researchers insights into how AI and predictive analytics can be used in HR, helping other industries adopt similar methods.

1.6 Structure of the Document

Chapter 1: Introduction

- Background of the Capstone Project: This section describes the overall project and its main purpose.

- Context and Scope: This part outlines the project's limits and focus areas.

- Problem Statement: Here, the key issues that the project aims to tackle are identified.

- Objectives and Goals: This section lists the goals that the project intends to achieve.

- Significance and Relevance: This part explains the importance of the project and its impact.

- Structure of the Document: This section provides a roadmap of the document's content.

Chapter 2: Related Studies and Literature Review

- Agile Scrum Methodology Overview: This section introduces Agile and Scrum concepts.

- Enterprise Architecture Concepts: This part explains the basic ideas of enterprise architecture.

- Microservices Architecture: This section discusses the principles and benefits of microservices.

- DevOps and CI/CD: This part reviews DevOps practices and the concepts of continuous integration and deployment.

- Relevant Studies and Research: This section summarizes key studies related to the project.

- Integration of Information Systems in Enterprise Environments: This part discusses how information systems fit into businesses.

Chapter 3: Methodology

- Agile Scrum Methodology in the Project: This section describes how Agile Scrum is used in this project.

- Roles and Responsibilities: This part outlines the team members and their specific tasks.

- Sprint Cycles: This section details the sprint process and timeline.

- Scrum Artifacts: This part lists important documents and tools used in Scrum.

- Microservices Architecture: This section explains the chosen microservices model in detail.

- DevOps Implementation: This part discusses how DevOps practices are applied to the project.

- Innovation Integration: This section explains how new ideas and technologies are included.

Chapter 2

RELATED STUDIES AND LITERATURE REVIEW

2.1 Agile Scrum Methodology Overview

Agile Scrum is a way for project teams to work efficiently, especially in fast-paced areas like software development. It divides projects into "sprints," short cycles that usually last two to four weeks. Each sprint has a specific set of tasks, and at the end, the team reviews their progress to see what worked and what didn't. This routine of planning, doing, and reviewing helps teams stay flexible and deliver smaller parts of the project faster. According to Hayat et al. (2019), the sprint structure in Scrum helps teams get frequent feedback, making it easier to adapt quickly to changes.

Scrum has three main roles: the Product Owner, Scrum Master, and Development Team. The Product Owner decides what tasks the team should work on first. The Scrum Master helps the team follow Scrum rules and removes obstacles in their way. The Development Team handles the actual work, like building and designing. Hema et al. (2020)

highlight that each role keeps the project running smoothly and helps the team focus on their goals.

Regular check-ins are a big part of Scrum, including daily meetings where team members quickly share what they did yesterday, what they plan to do today, and any issues. Shastri et al. (2021) explain that these short meetings help the team stay connected and spot issues early. Binboga and Gumussoy (2024) also mention that regular communication in Scrum keeps everyone on track and focused on shared goals.

Scrum is flexible, which makes it great for projects that might change along the way. It allows teams to shift their focus based on what matters most to users. Sandstø and Reme-Ness (2021) note that this flexibility is helpful in fast-changing environments. In our project, this flexibility lets us adjust based on user feedback, keeping our goals in line with what users need. This approach strengthens teamwork and ensures we deliver value regularly.

2.2 Enterprise Architecture Concepts

Enterprise Architecture (EA) is essential for connecting various aspects of a business, especially in areas like HR Data Analytics,

Recruitment Analytics, and Skill Development. According to Wati et al. (2019), EA helps in integrating different HR systems, such as analytics and recruitment tools. This integration allows for better data sharing and analysis, leading to improved hiring practices and employee performance. Having a unified view of data from both HR analytics and recruitment systems enhances decision-making processes.

EA also promotes the standardization of processes across HR functions. Saleem and Fakieh (2020) highlight that this standardization reduces complexity and ensures that all parts of the organization operate harmoniously. It is particularly important for managing skills development and performance evaluations consistently. By using the same frameworks and tools, organizations can streamline their operations and improve efficiency.

Effective EA fosters better communication and collaboration between teams and departments. Niemi and Pekkola (2020) note that creating a shared framework allows different teams, like HR and IT, to understand how their work impacts each other. This collaboration leads to improved project outcomes and efficiency, making it easier to achieve common goals.

One of the key benefits of EA is its flexibility. Organizations can adapt their HR modules to meet changing needs without disrupting the entire system. Kaur et al. (2024) explain that this means new features can be added or existing ones updated smoothly, allowing the organization to stay responsive to changes and improve its overall effectiveness.

Finally, implementing EA can lead to significant transformation within an organization. Hermawan and Sumitra (2019) assert that EA not only aligns IT with business goals but also enhances overall performance. This transformation is crucial for organizations looking to modernize their HR practices and leverage data analytics effectively.

2.3 Microservices Architecture

Microservices architecture is a way of building software where each part of the system is divided into small, independent services. Each service focuses on a specific function and operates on its own, but they all work together to form a complete system. This setup makes it easier to develop, maintain, and scale the application.

Microservices architecture is becoming increasingly important in modern software development, especially for enhancing human resource

management systems. According to Li et al. (2021), understanding the quality attributes of microservices architecture is crucial. Their systematic literature review highlights that microservices can improve scalability, flexibility, and maintainability of applications. This flexibility is particularly beneficial in HR operations where different functions, such as recruitment and performance management, can operate independently but still integrate smoothly.

Surianarayanan, Ganapathy, and Pethuru (2019) discuss the essentials of microservices architecture, including the paradigms and techniques that enable effective application development. They emphasize that adopting microservices allows organizations to deploy updates quickly and reduce downtime. This is essential in HR settings where organizations need to be agile and responsive to changes, such as new regulations or shifting workforce needs.

In the context of HR, Herrera and Peña (2024) highlight how AI-powered microservices can enhance workforce management. By integrating AI with microservices, organizations can analyze employee data in real-time, improving decision-making and overall efficiency. This approach enables HR departments to tailor their services to better meet the needs of employees and the organization as a whole.

Castillo and Restrepo (2024) also explore the intersection of artificial intelligence and microservices in HR management. They argue that this combination drives innovation, allowing HR teams to develop smarter processes and improve the employee experience. For example, automated processes powered by AI can help in streamlining recruitment, onboarding, and training activities.

Mustafa and Hameed (2024) provide a comprehensive analysis of how integrating AI with microservices architecture can make HR operations more agile. They emphasize that this integration allows HR departments to adapt quickly to new challenges, improving overall responsiveness. By leveraging these technologies, organizations can create a more dynamic HR environment that effectively meets the demands of a changing workforce.

2.4 DevOps and CI/CD

DevOps is a way of working that combines development (Dev) and operations (Ops) teams to deliver software faster and with better quality. It breaks down the barriers between these teams, making sure they work together from planning to deployment. This helps in quicker releases and fewer issues with software, as problems are identified and fixed early.

In our system, DevOps helps make sure that all parts, like HR Data Analytics or Recruitment Analytics, are continuously developed, tested, and deployed. With DevOps, changes made in one module can be integrated and deployed without waiting for the whole system to be updated. This saves time and keeps our system running smoothly.

CI/CD (Continuous Integration and Continuous Delivery) is a key part of DevOps. Continuous Integration (CI) means that developers frequently add new code to the shared system. Each time new code is added, it's automatically tested. This catches problems early, so we can fix bugs before they become bigger issues.

For our system, CI ensures that updates to the Skill Development or Recruitment Analytics modules are checked immediately. This means we can spot issues before they affect the whole system.

Continuous Delivery (CD) takes over once the code passes the tests. It ensures that the code is always ready to be deployed to production, it means that it can go live at any time without manual intervention. In our system, this would mean that new features in the HR Data Analytics module, for example, can be pushed live quickly and safely. This reduces the time between developing a feature and making it available to users.

In summary, DevOps and CI/CD help our system stay up-to-date, allowing us to make frequent improvements while ensuring stability. They keep the development cycle fast and smooth, allowing each module to evolve without disrupting the others.

2.5 Relevant Studies and Research

This section highlights the important role of human resources in microfinance institutions (MFIs). It shows how good HR practices, like skill development and hiring strategies, can improve both financial and social results. As microfinance adapts to new technologies, using data and predictive tools is essential for better decision-making. This brings together different studies and research on HR practices in microfinance, highlighting how these strategies can lead to greater success for MFIs.

Skill Development

Skill development is crucial for personal and professional growth. According to Chu et al. (2021), inquiry-based learning can help students develop key skills such as critical thinking and problem-solving. This approach makes learning more active and engaging, which is beneficial in

various educational settings. Similarly, Lussier and Achua (2022) discuss different leadership theories and their real-world applications, showing that understanding these theories can improve individuals' leadership skills and effectiveness in organizations. Additionally, Sousa and Rocha (2019) explore how playing games can aid in developing leadership skills through game-based learning, making training sessions more interactive and enjoyable. They also discuss the importance of digital learning in preparing workers for changes in technology, highlighting the skills needed to succeed in a digital workplace.

Recruitment Analytics

Recruitment analytics is transforming how companies find and hire talent. Pessach et al. (2020) introduce a new approach that uses machine learning to analyze data for better recruitment outcomes. This method can help organizations identify the best candidates more efficiently. Bongard (2019) emphasizes how technology is reshaping recruitment processes, particularly through smart algorithms that predict which candidates will fit best within a company. This leads to quicker and more accurate hiring decisions. In addition, Albassam (2023) examines how artificial intelligence is currently used in recruitment, outlining various

strategies that companies employ to enhance their talent acquisition processes.

HR Data Analytics

HR data analytics offers significant advantages for organizations. Karmańska (2020) discusses how HR analytics can improve employee performance and lead to better hiring decisions. By analyzing employee data, businesses can gain insights that enhance management practices. Ekka (2021) further explains the importance of HR analytics today, emphasizing how it helps organizations better understand their workforce. Di Prima et al. (2024) look at how HR analytics can foster creativity within organizations by predicting future trends and needs. They argue that data-driven insights can lead to more innovative workplaces. Dahlbom et al. (2020) analyze the impact of big data on HR practices, discussing how organizations can leverage extensive data to enhance human resource management. Mohammed (2019) focuses on HR analytics as a predictive tool in decision-making, demonstrating how data can enhance management strategies. Fernandez and Gallardo-Gallardo (2021) identify key factors that affect the adoption of HR analytics in companies and the challenges they face during implementation. Edwards et al. (2024)

provide guidance on using predictive metrics in HR, outlining best practices for analyzing employee data to inform decision-making. Lastly, McCartney and Fu (2022) explore how HR analytics can positively impact overall organizational performance, discussing the appropriate times and methods for utilizing analytics to improve results.

PyTorch for Data Analytics

PyTorch is a powerful tool for data analytics and machine learning. Stevens, Antiga, and Viehmann (2020) provide an introduction to deep learning with PyTorch, covering essential concepts and real-world applications. This resource is useful for those looking to apply machine learning in various fields, including HR analytics. Ketkar et al. (2020) offer best practices for using PyTorch, explaining how to effectively create and train machine learning models. This knowledge is valuable for practitioners who want to harness the power of deep learning in their analytics efforts.

General Microfinance and HR Practices

In the context of microfinance, strong HR practices are key to organizational success. Barpanda and Bontis (2021) examine how HR practices impact performance in microfinance organizations, highlighting the importance of intellectual capital, such as knowledge and skills. Fomude et al. (2020) explore how HR management influences volunteer performance in microfinance institutions, finding that good HR practices lead to better outcomes for volunteers. Mwangi and Kombo (2023) focus on HR management practices that affect employee retention in microfinance organizations, identifying strategies that enhance employee satisfaction and engagement. Lastly, Barpanda (2021) discusses how human and structural capital, including skilled employees and effective organizational systems, influence performance in Indian microfinance institutions, demonstrating that effective HR practices can lead to improved results.

2.6 Integration of Information Systems in Enterprise Environments

Integration of Information Systems in Enterprise Environments focuses on using data to connect different business functions. One

application is predictive analytics, which helps improve human resources (HR) by identifying patterns in employee behavior, turnover, and hiring. This allows organizations to enhance their hiring process and workforce management by quickly finding skilled workers and reducing turnover.

For example, by analyzing performance data, HR teams can anticipate future staffing needs and develop strategies to retain employees. Predictive analytics also helps identify candidates who are likely to succeed in their roles, improving recruitment processes. Additionally, it supports performance management by offering data-driven insights to boost productivity and employee well-being.

In a microfinance system, these techniques could be applied to manage employee development and customer service, ensuring staff efficiency and maintaining client satisfaction. Integration enables seamless flow of information between HR systems and other business modules like finance and operations, creating a unified and efficient enterprise environment.

Chapter 3

METHODOLOGY

3.1 Agile Scrum Methodology in the Project

Agile Scrum is one of the most popular frameworks used to manage and develop complex projects, particularly in the domain of software development. It is part of the broader Agile methodology, which emphasizes collaboration, flexibility, and customer satisfaction through iterative development and frequent delivery of small, working increments of the final product. Scrum is specifically designed to improve the speed, efficiency, and adaptability of a development process, making it highly suitable for dynamic, evolving projects such as the development of a Microfinance Management System that integrates various complex modules like skill development, recruitment analytics, HR data analytics, and predictive analytics.

Component	Description
Agile Scrum Method	The framework used to manage and complete projects effectively.
1. Form a Team	Assemble a cross-functional team responsible for

	delivering the project.
2. Create a Product Backlog	List all tasks and features needed for the project, prioritized by importance.
3. Plan Sprints	Break the project into smaller, manageable chunks (sprints), usually lasting 1-4 weeks.
4. Daily Stand-up Meetings	Hold short daily meetings to discuss progress, challenges, and updates.
5. Review and Retrospective	At the end of each sprint, review completed work and discuss what went well and what can improve.

Table 1: Agile Scrum Method

Iterative and Incremental Approach	Benefits
- Build project step by step	Allows for regular updates and enhancements based on feedback.
- Respond to changes quickly	Flexibility to adapt to new requirements or insights throughout the project.

Table 2: Iterative and Incremental Approach

3.2 Roles and Responsibilities

In an Agile Scrum team, each member plays a crucial role in ensuring the success of the project. Understanding the specific responsibilities of each role helps the team collaborate effectively and meet project goals. Here's an overview of the key roles and their main responsibilities:

Roles	Responsibilities
Scrum Master	Guides the team in using Scrum practices, helps them improve their processes, and removes any obstacles that might slow down their work.
Product Owner	Works closely with stakeholders to gather and prioritize project requirements, ensuring that the most important features are delivered first.
Development Team	Collaborates to build, test, and deliver the product features, focusing on meeting the requirements set by the Product Owner.
Project Manager	Oversees the overall progress of the project, coordinates resources, and ensures that the team stays on track to meet deadlines and goals.
Programmer	Responsible for writing code and developing the

	software applications, ensuring they function properly and meet quality standards.
Data Analyst	Analyzes data to provide insights that support decision-making and help improve the project and its outcomes.
Document Analyst	Prepares and reviews all project documentation, ensuring it is clear and accurate for all team members and stakeholders.
Business Analyst	Identifies business needs, gathers requirements, and helps find practical solutions that align with project goals.
Scrum Team Member	Actively participates in team meetings, contributes to the work being done, and collaborates with others to achieve project objectives.

Table 3: Roles and Responsibilities

3.3 Sprint Cycles

Sprint 1: Foundation Setup			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Set up the infrastructure for HR data collection and analysis, and initial integration of PyTorch for predictive analytics.	- Define scope and objectives for Skill Development, Recruitment Analytics, and HR Data Analytics.	- Functional HR data warehouse for storage and future analytics.
		- Set up data collection systems from existing HR systems (e.g., Learning Management System, Applicant Tracking System).	- PyTorch installed and integrated for further development in upcoming sprints.
		- Install and configure PyTorch for predictive analytics.	- Data collection pipelines connected to HR systems.
		- Create initial HR	

		data warehouse structure to centralize employee data.	

Table 4: Sprint Cycle (Sprint 1)

Sprint 2: Skill Development Platform - MVP			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Develop the MVP (Minimum Viable Product) of the Skill Development module.	- Design and implement the Skill Mapping feature to capture current employee skills.	- Working MVP of LMS with basic skill mapping and training content.
		- Develop basic functionality for a Learning Management System (LMS) to host skill development content.	- Skill Gap Analysis dashboard (basic).
		- Integrate with external training platforms or design	

		basic training course offerings.	
		- Initial analytics on skill gaps to start mapping learning paths.	

Table 5: Sprint Cycle (Sprint 2)

Sprint 3: Recruitment Analytics - MVP			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Build initial recruitment analytics features.	- Integrate the Applicant Tracking System (ATS) with the HR data warehouse.	- Recruitment Analytics dashboard with candidate tracking.
		- Implement basic recruitment analytics to track applicant pipelines, job postings, and	- Basic predictive model for candidate success.

		candidate data.	
		- Develop a model using PyTorch for candidate performance predictions based on historical hiring data.	- Automated resume screening tool.
		- Automate basic resume screening based on keywords and fit.	

Table 6: Sprint Cycle (Sprint 3)

Sprint 4: HR Data Analytics - Predictive Models (Attrition Prediction)			
Duration	**Objective**	**Tasks**	**Deliverables**
3 weeks	Develop predictive models for key HR metrics like employee attrition.	- Use PyTorch to train a model on historical data to predict employee turnover.	- Predictive model for employee attrition.

		- Develop a dashboard for visualizing attrition risk and other key HR metrics (e.g., engagement levels, performance trends).	- Real-time dashboard with attrition risk indicators.
		- Test and validate models using HR data to ensure predictions are accurate and actionable.	

Table 7: Sprint Cycle (Sprint 4)

Sprint 5: HR Data Analytics - Sentiment Analysis & Employee Engagement			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Implement sentiment analysis on employee	- Collect employee feedback from surveys, reviews, and	- Sentiment analysis model for tracking employee morale.

	feedback and develop models to track engagement.	internal communication channels.	
		- Apply NLP techniques (using PyTorch) to analyze the sentiment of employee feedback.	- Engagement level dashboard.
		- Incorporate engagement metrics into the HR data analytics dashboard.	

Table 8: Sprint Cycle (Sprint 5)

Sprint 6: Advanced Skill Development & Custom Learning Paths			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Enhance the Skill Development module with custom learning	- Develop custom learning paths based on employee roles, skills, and future	- Personalized learning paths based on employee data.

	paths and data-driven recommendations.	goals.	
		- Use predictive analytics to recommend learning materials or courses for employees to enhance their skills.	- Recommendation engine for course suggestions.
		- Implement gamification elements (badges, levels) to boost employee engagement in learning.	

Table 9: Sprint Cycle (Sprint 6)

Sprint 7: Recruitment Analytics - Advanced Predictive Models			
Duration	**Objective**	**Tasks**	**Deliverables**
3 weeks	Refine the recruitment	- Refine candidate success predictions	- Advanced recruitment analytics

	analytics models for more accurate predictions and deeper insights.	using advanced algorithms.	with deeper insights.
		- Develop insights into time-to-hire, cost-per-hire, and candidate pipeline quality.	- Updated predictive models for candidate performance and recruitment efficiency metrics.
		- Expand predictive models to include long-term performance forecasting for hires.	

Table 10: Sprint Cycle (Sprint 7)

Sprint 8: Integration & Final Testing			
Duration	**Objective**	**Tasks**	**Deliverables**
2 weeks	Integrate all the components and finalize the system.	- Ensure seamless integration between the LMS, ATS, and HR data analytics	- Fully integrated Microfinance Management System ready for

		platform.	deployment.
		- Conduct user acceptance testing (UAT) with HR teams and key stakeholders.	
		- Gather feedback and make adjustments as necessary.	

Table 11: Sprint Cycle (Sprint 8)

3.4 Scrum Artifacts

Scrum Artifacts are important tools in Agile project management that help teams communicate and stay organized throughout a project. They provide a clear way to manage work and show progress. A key part of a successful team is the ongoing skill development of its members, which is essential for improving performance and reaching company goals.

3.4.1 Product Backlog

3.4.1.1 Skill Development

No	User Stories	Priorities	Revised Priorities	Status
1.	The HR Manager wants to keep track of staff training to ensure they follow their learning paths.	5		On Going
2.	The HR Manager wants to create personalized development plans for each employee based on their performance and	5		On Going

	goals.			On Going
3.	The HR Manager wants employees to see their development plans and know which courses they need to complete for their career growth.	4		On Going
4.	The Trainer wants to provide feedback on how employees are performing during training sessions.	4		On Going
5.	The HR Manager wants to track the completion rate of learning courses.	4		On Going
6.	The Trainer wants to assign different levels of training based on employee skills.	3		On Going
7.	The Employee wants to earn badges or certifications when	2		On Going

	completing training modules.			
8.	The HR Manager wants a dashboard to see which employees have completed mandatory training.	4		On Going
9.	The Employee wants a notification when new courses are added to the platform.	3		On Going
10.	The Trainer wants to upload new learning materials for employees to access online.	3		On Going

Table 12: Product Backlog (Skill Development)

3.4.1.2 Recruitment Analytics

No	User Stories	Priorities	Revised Priorities	Status
1.	The HR Manager wants	5		On Going

	to analyze recruitment data to improve hiring strategies.			
2.	The HR Manager wants to post job openings on various platforms to reach more candidates.	4		On Going
3.	The Recruiter wants to collaborate with team members on candidate evaluations.	4		On Going
4.	The Hiring Manager wants an easy way to review applications and schedule interviews with candidates.	5		On Going
5.	The Applicant wants to submit their application online and track its status.	4		On Going
6.	The Recruiter wants to automatically screen	4		On Going

	resumes based on keywords to save time.			
7.	The HR Manager wants to track the time-to-hire for each job posting.	3		On Going
8.	The Recruiter wants to organize candidate information for easy reference during interviews.	3		On Going
9.	The HR Manager wants to use predictive analytics to forecast which candidates will likely succeed in their roles.	4		On Going
10.	The Recruiter wants to rank applicants based on their qualifications and experience.	4		On Going
11.	The Applicant wants to receive an email update	3		On Going

	when their application status changes.			

Table 13: Product Backlog (Recruitment Analytics)

3.4.1.3 HR Data Analytics

No	User Stories	Priorities	Revised Priorities	Status
1.	The HR Manager wants to create reports on employee performance to make better decisions.	5		On Going
2.	The HR Manager wants to see patterns in staff leaving to improve retention.	5		On Going
3.	The HR Analyst wants to check how useful training is by comparing before and after results.	4		On Going
4.	The HR Manager wants to see how HR efforts	4		On Going

	affect the company's overall success.			
5.	The Employee wants to view their own performance data and set their development goals.	4		On Going
6.	The HR Analyst wants to track employee satisfaction using surveys and feedback.	3		On Going
7.	The HR Manager wants to monitor employee attendance to identify trends.	3		On Going
8.	The HR Analyst wants to forecast future staffing needs based on historical data.	3		On Going
9.	The HR Manager wants a dashboard to view all HR-related metrics in one	4		On Going

	place.			
10.	The HR Analyst wants to use predictive analytics to estimate which employees may be at risk of leaving.	4		On Going

Table 14: Product Backlog (HR Data Analytics)

3.4.2 Sprint Backlog

Sprint 1: Foundation Setup		
User Story	**Sprint Task**	**Estimated Time**
The Data Analyst wants to collect HR data for analysis.	Set up HR data pipelines from existing HR systems (LMS, ATS).	3 days
The Programmer wants to install PyTorch for predictive analytics.	Install and configure PyTorch for predictive models.	2 days
The Data Analyst wants to centralize all employee	Design and build the HR data warehouse structure.	4 days

data.		
The Scrum Team wants to define project goals for development.	Define scope and objectives for Skill Development, Recruitment Analytics, and HR Data Analytics.	2 days
The HR Manager wants to ensure accurate data integration from HR systems.	Test data collection pipelines to ensure integration.	2 days

Table 15: Sprint Backlog (Sprint 1)

Sprint 2: Skill Development - MVP		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to track training progress.	Develop a tool for tracking employee training progress.	4 days
The Employee wants to see their learning path and progress.	Create a dashboard for employees to view their learning paths.	3 days

The Trainer wants to give feedback after training sessions.	Implement feedback forms for trainers.	2 days
The HR Manager wants a system to map employee skills.	Build a Skill Mapping tool to capture current employee skills.	4 days
The Employee wants to request extra training in specific areas.	Add a feature for employees to request additional training.	2 days

Table 16: Sprint Backlog (Sprint 2)

Sprint 3: Recruitment Analytics - MVP		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to analyze recruitment data.	Build a recruitment analytics dashboard.	4 days
The Recruiter wants to track job applications.	Create a candidate application tracking tool.	3 days
The Hiring Manager wants automated resume screening.	Develop the automated resume screening feature.	4 days

The Applicant wants to submit job applications online.	Build the online job application portal.	3 days
The Hiring Manager wants candidate success predictions.	Implement candidate success prediction model using PyTorch.	5 days

Table 17: Sprint Backlog (Sprint 3)

Sprint 4: HR Data Analytics - Predictive Models		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to predict employee turnover.	Develop an attrition prediction model using PyTorch.	5 days
The HR Analyst wants to check training impact.	Build a tool to compare performance pre- and post-training.	4 days
The HR Manager wants to track absenteeism and engagement.	Add absenteeism and engagement tracking features.	3 days
The Data Analyst wants to	Test and validate prediction	3 days

validate prediction accuracy.	models using historical HR data.	

Table 18: Sprint Backlog (Sprint 4)

Sprint 5: Skill Development - Advanced Features		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants personalized development plans.	Build personalized development plans based on employee goals.	4 days
The Employee wants tailored course recommendations.	Implement a recommendation engine for training materials.	4 days
The Trainer wants to monitor real-time employee progress.	Create real-time progress tracking for employees.	3 days
The HR Manager wants gamification features for learning.	Add gamification (badges, levels) to learning paths.	3 days

Table 19: Sprint Backlog (Sprint 5)

Sprint 6: Recruitment Analytics - Advanced Models		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to predict long-term employee success.	Build advanced models for long-term success predictions.	5 days
The HR Manager wants to improve recruitment metrics.	Add insights for time-to-hire, cost-per-hire, and pipeline quality.	4 days
The Hiring Manager wants automated interview scheduling.	Implement an interview scheduling feature.	3 days
The Applicant wants interview notifications.	Add a notification feature for interview scheduling.	2 days

Table 20: Sprint Backlog (Sprint 6)

Sprint 7: HR Data Analytics - Sentiment Analysis		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to analyze employee	Build a sentiment analysis model using employee	4 days

feedback for sentiment.	feedback data.	
The HR Analyst wants to collect feedback from multiple sources.	Integrate feedback from surveys, reviews, and communication channels.	3 days
The HR Manager wants to detect employee burnout and low engagement.	Develop a burnout detection model using sentiment data.	4 days

Table 21: Sprint Backlog (Sprint 7)

Sprint 8: Integration & Final Testing		
User Story	**Sprint Task**	**Estimated Time**
The HR Manager wants to integrate all modules into a single platform.	Ensure seamless integration between Skill Development, Recruitment Analytics, and HR Data Analytics.	5 days
The Scrum Team wants to conduct final user acceptance testing.	Perform User Acceptance Training (UAT) with key stakeholders.	3 days
The HR Manager wants to	Implement changes based	3 days

adjust the system based on feedback.	on user feedback.	
The Scrum Team wants to deploy the complete system.	Deploy the integrated system for HR use.	4 days

Table 22: Sprint Backlog (Sprint 8)

3.5 Microservices Architecture

3.5.1 Microservices Diagram
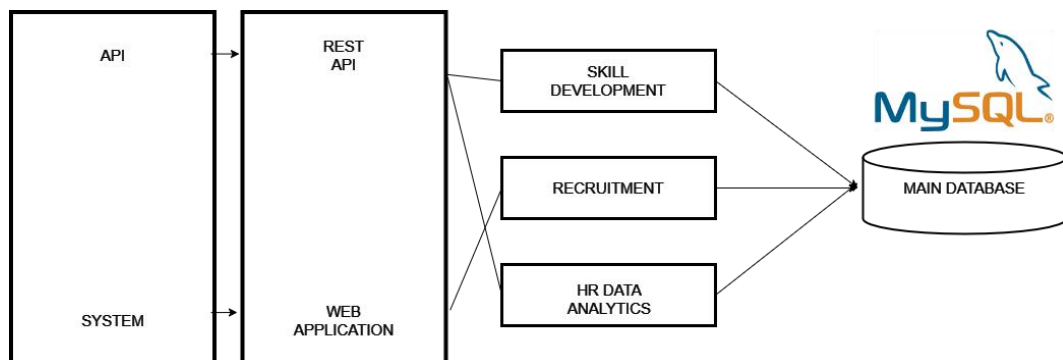
Figure 1: Microservices Diagram

3.5.2 Communication Patterns
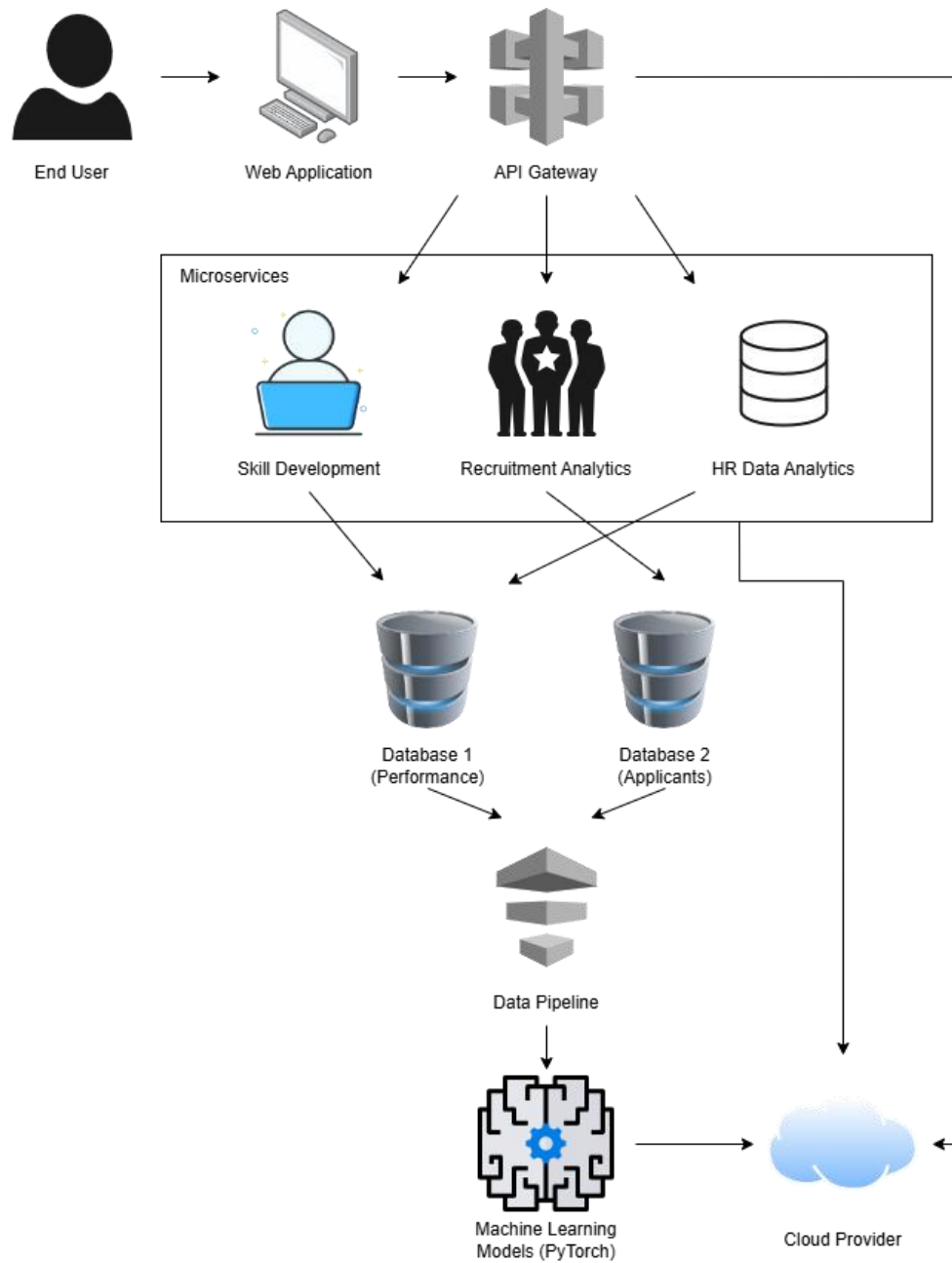
Figure 2: Communication Patterns

3.5.3 Data Flow Diagram

3.5.3.1 Skill Development
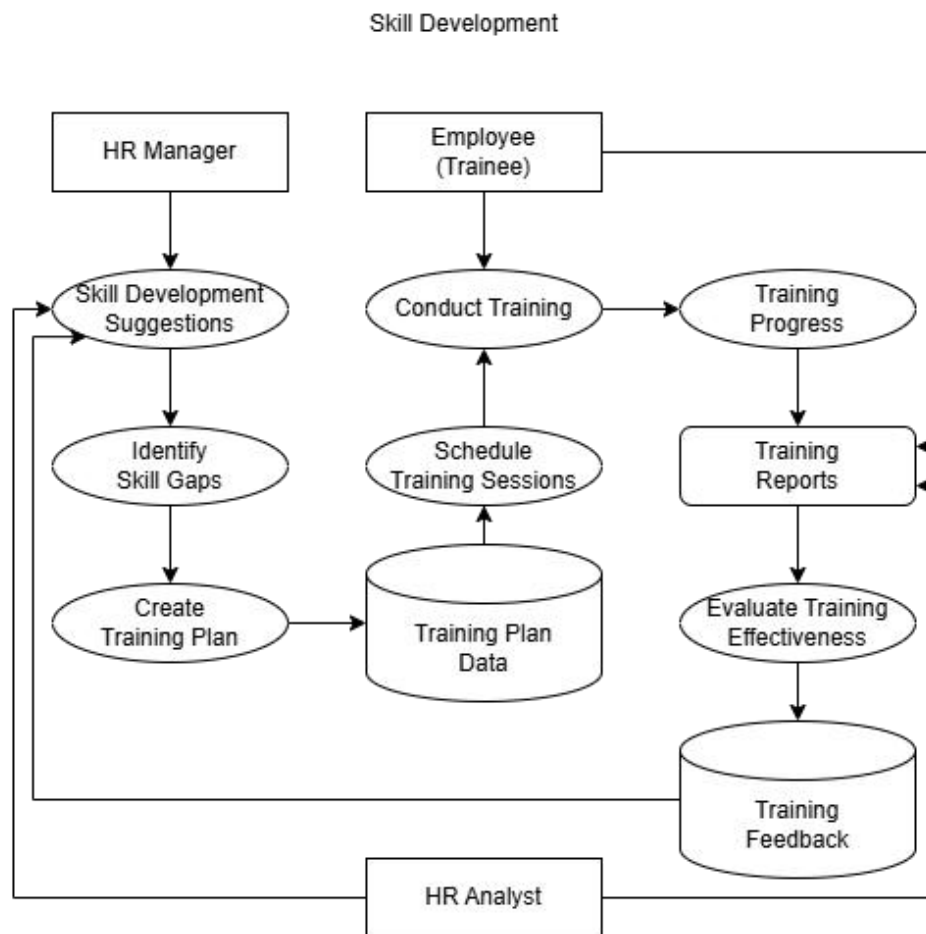
Figure 3: Data Flow Diagram (Skill Development)

3.5.3.2 Recruitment Analytics
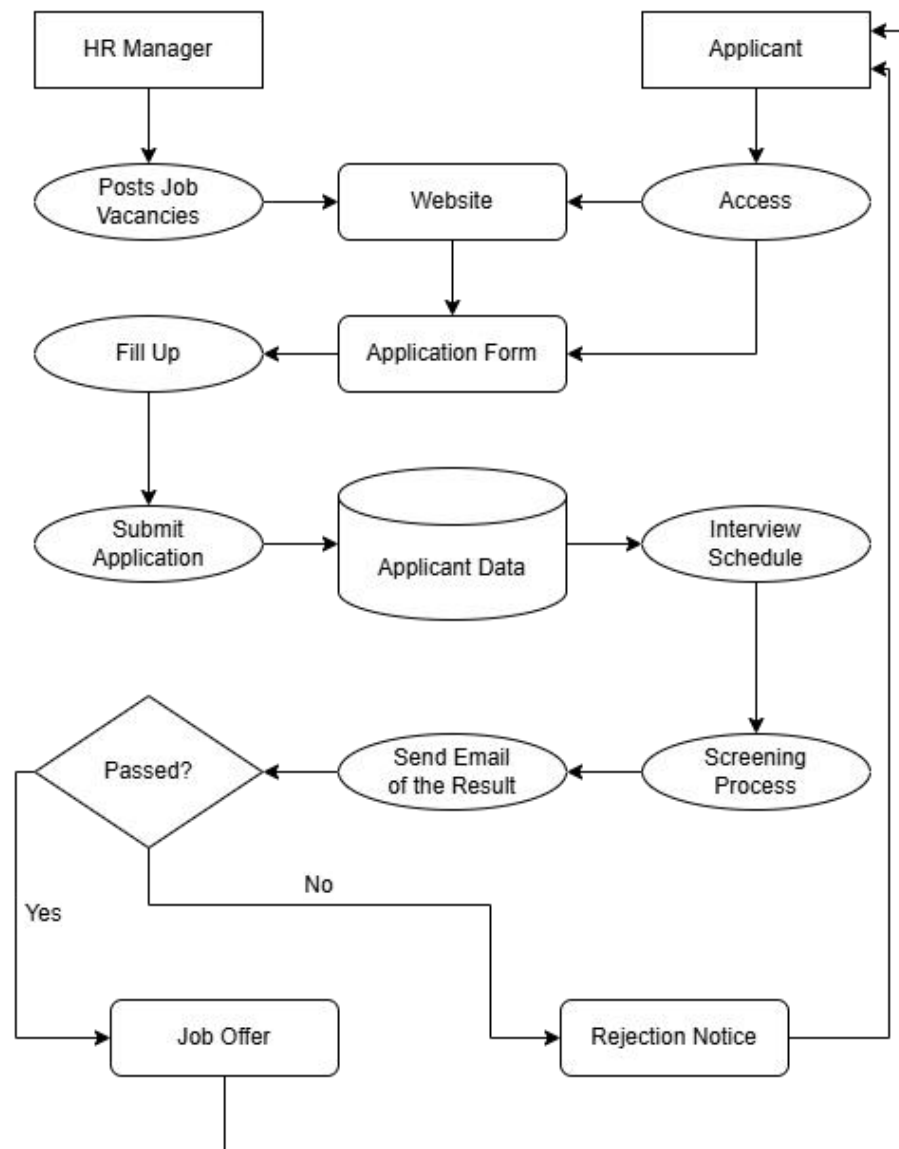
Figure 4: Data Flow Diagram (Recruitment Analytics)

3.5.3.3 HR Data Analytics
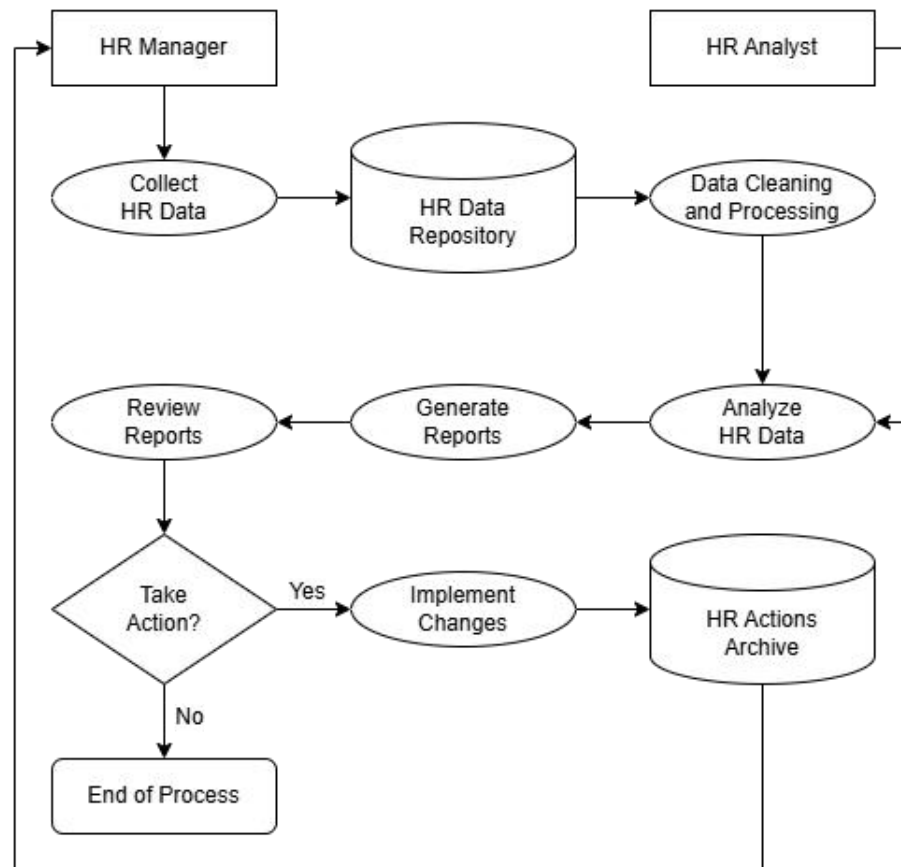
Figure 5: Data Flow Diagram (HR Data Analytics)

3.6 DevOps Implementation

3.6.1 CI/CD Pipeline
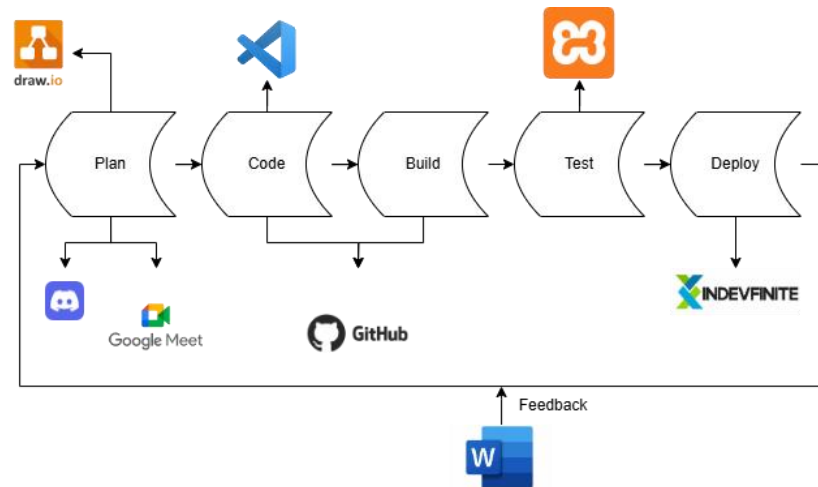
Figure 6: DevOps CI/CD Pipeline

3.6.2 Infrastructure as Code (IaC)
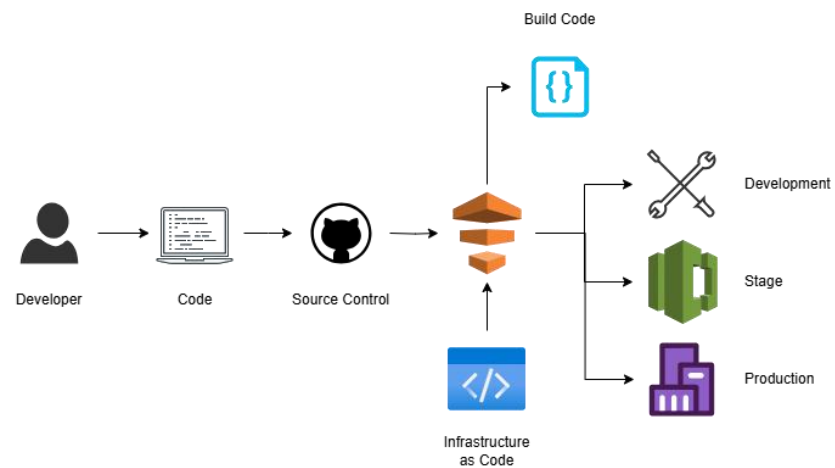
Figure 7: Infrastructure as Code

3.6.3 Monitoring and Alerting

Name	Description	Task
  User Access Control	User Access Control is a security method that regulates and limits access to particular resources, data, or systems based on set permissions. It ensures that only authorized individuals can view or alter specific information, safeguarding sensitive data and preventing unauthorized access.	User Access Control will handle permissions for different users, making sure that only the HR manager, HR analyst, super admin can access or modify sensitive information, including their employees data, recrui`tment status, HR reports and password. This process helps to secure the system by preventing unauthorized access, and it maintains data

		integrity by enforcing access restrictions based on verified user credentials. Through these measures, only authorized individuals can interact with specific data, enhancing overall security.
Application Performance Alerts	Monitoring application performance ensures the HR3 features work smoothly without delays, making the system efficient for users.	- Set Up Response Time Monitoring: Track how quickly key features (e.g., recruitment analytics, skill tracking) load and respond. - Monitor Error Rates: Set alerts for application errors or

		crashes to fix them quickly. - Track Usage Trends: Review which features are used the most to optimize resources. - Review Performance Reports: Use reports to identify and solve any common performance issues.
  Data Processing Alerts	Alerts for data processing ensure that the predictive analytics, skill tracking, and recruitment analytics run without errors. This keeps data	- Set Up Error Alerts for Data Flows: Configure alerts for any failed or slow data processing tasks. - Monitor Data Pipeline Performance:

	reliable for decision-making.	Check that data pipelines, especially those using PyTorch, are processing as expected. - Automate Data Integrity Checks: Ensure data is complete and accurate by setting automated checks and alerts for discrepancies. - Review Processing Logs: Regularly check logs to confirm that data processing meets the expected quality.

Table 23: Monitoring and Alerting

3.7 Integration

3.7.1 Integration Diagram
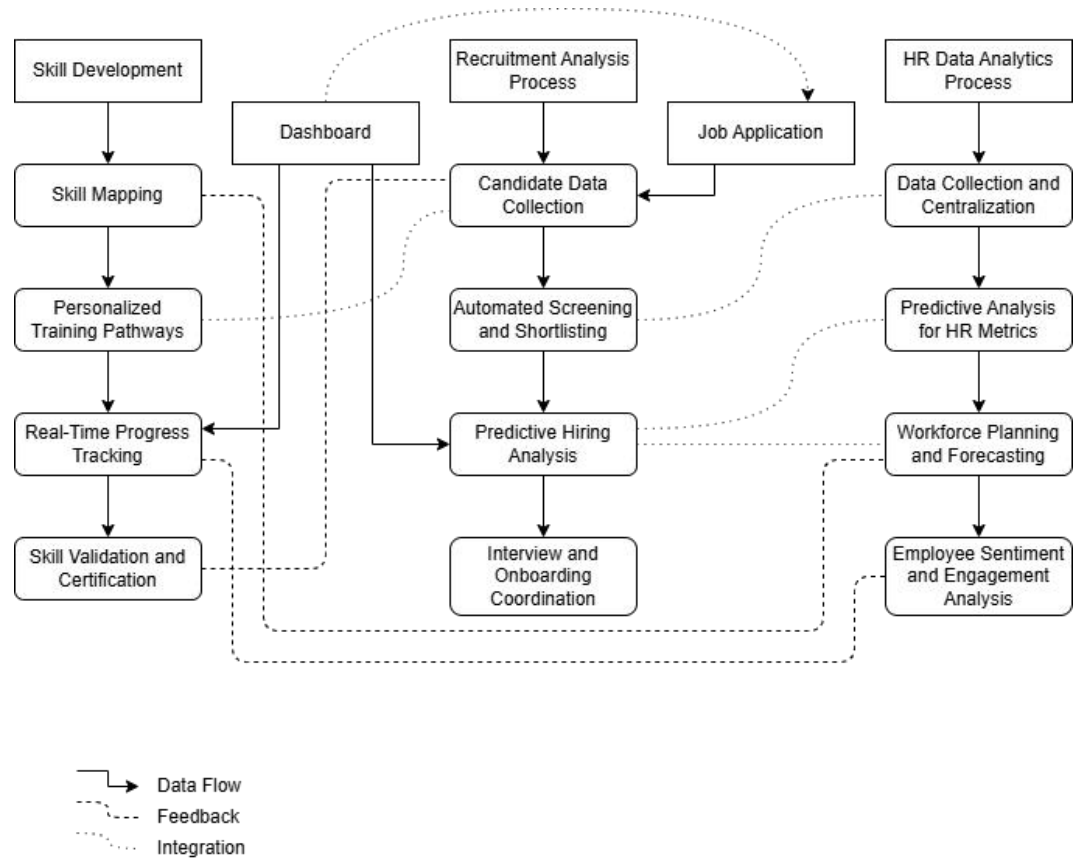
Figure 8: Integration Diagram

3.7.2 API Gateway
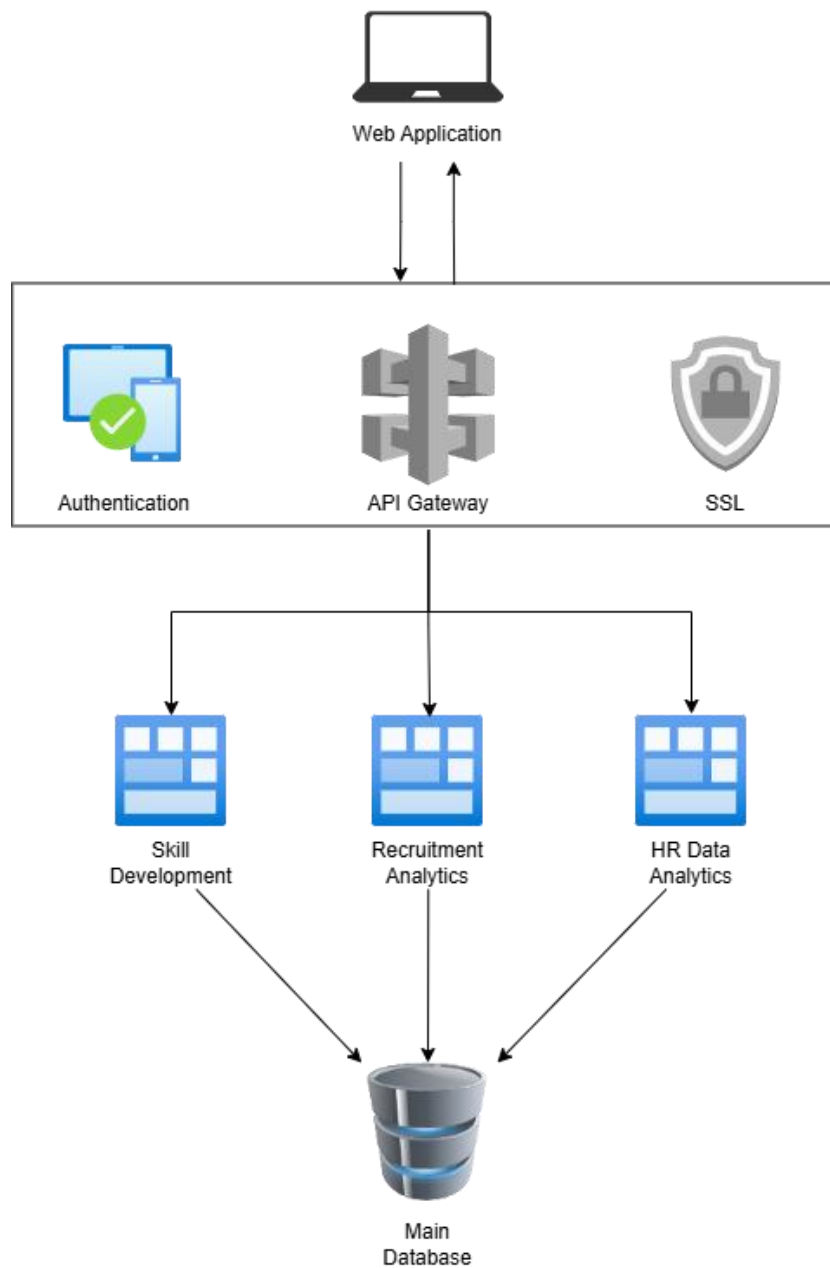
Figure 9: API Gateway

3.7.3 Data Flow Diagram
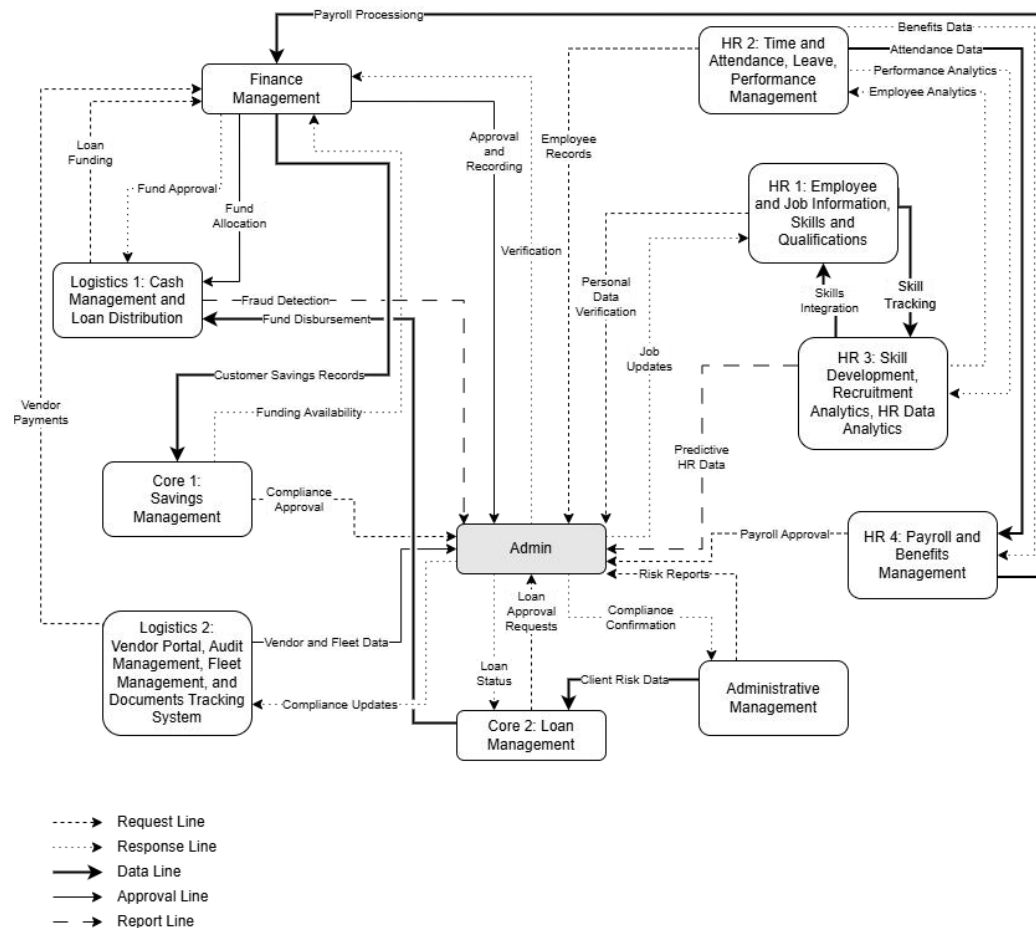
Figure 10: Data Flow Diagram (Microfinance Management System)

3.8 Additional Considerations

3.8.1 Use Case Diagram
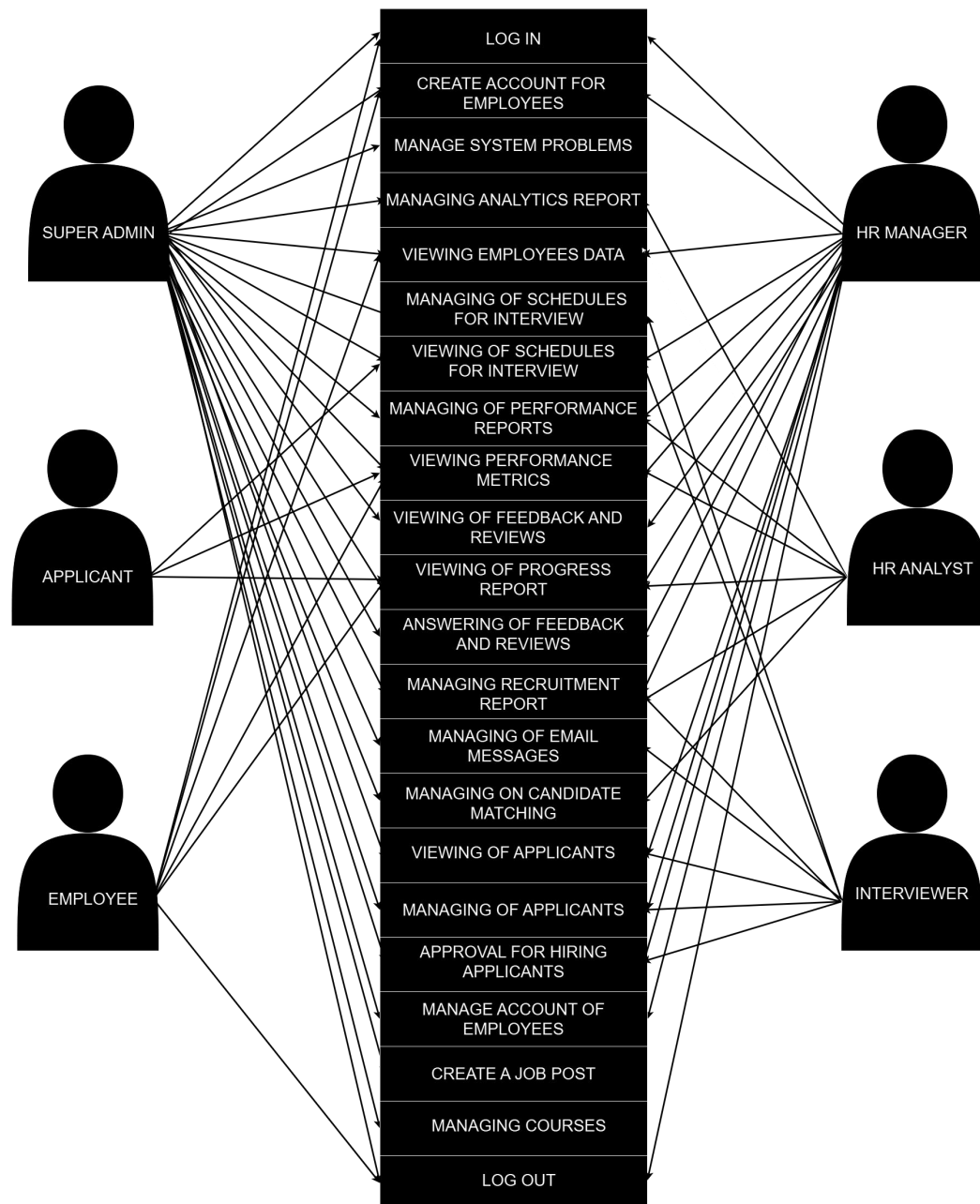
Figure 11: Use Case Diagram

3.8.2 Sequence Diagram
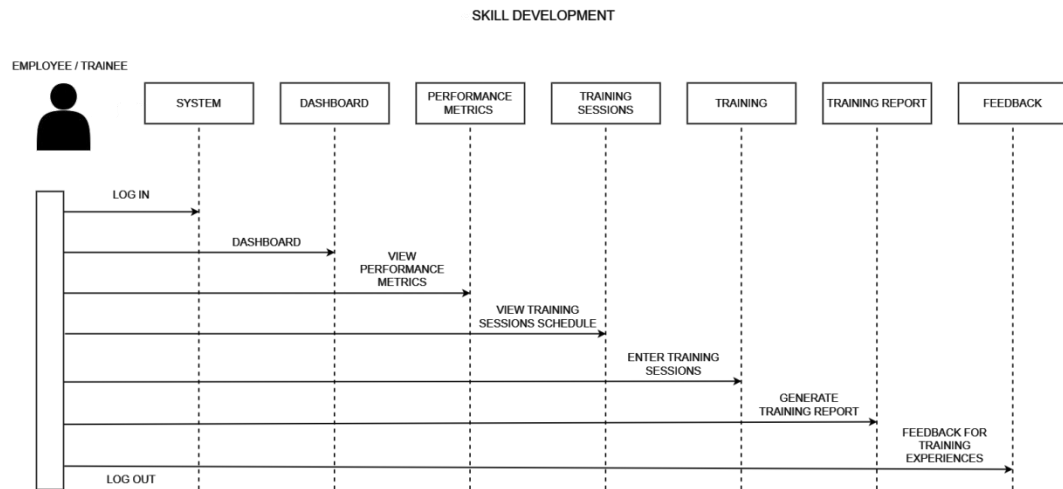
Figure 12: Skill Development (Employee/Trainee Sequence Diagram)
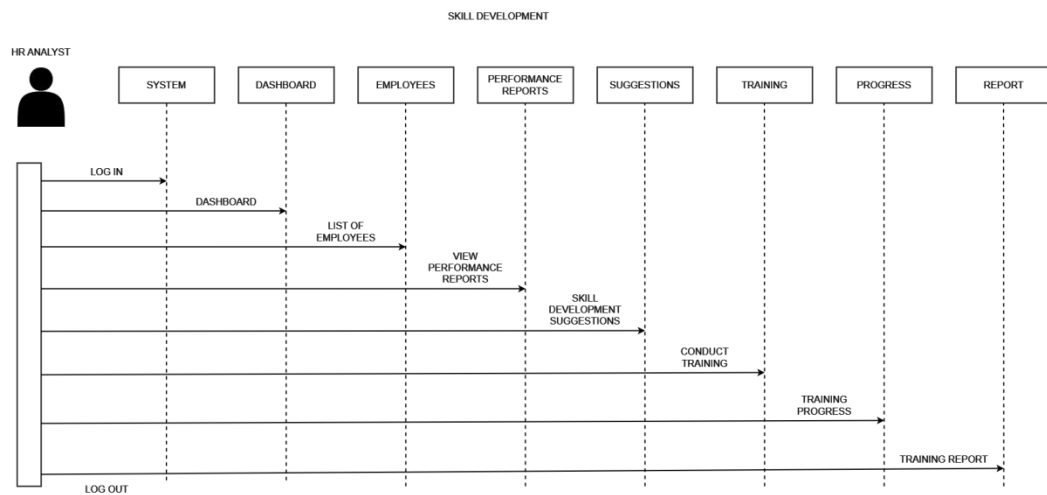
Figure 13: Skill Development (HR Analyst Sequence Diagram)
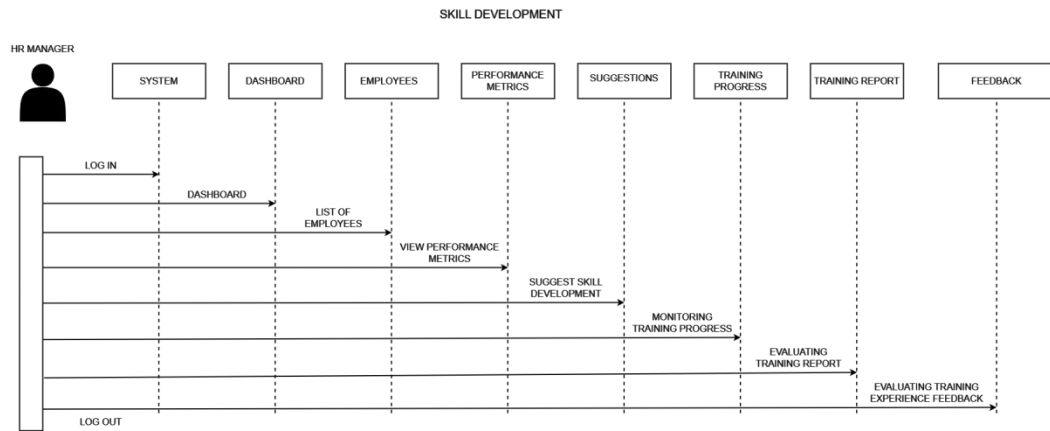
Figure 14: Skill Development (HR Manager Sequence Diagram)
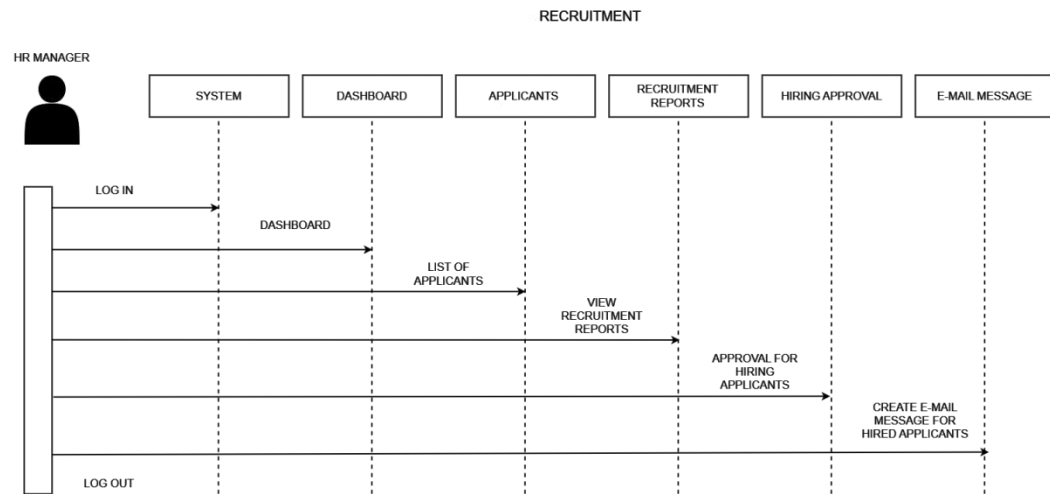
Figure 15: Recruitment (HR Manager Sequence Diagram)
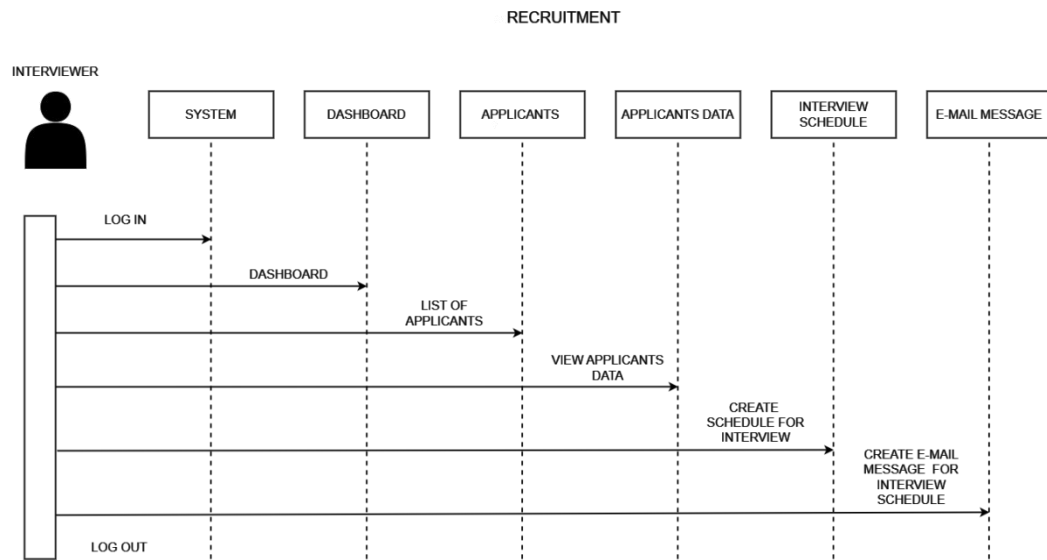
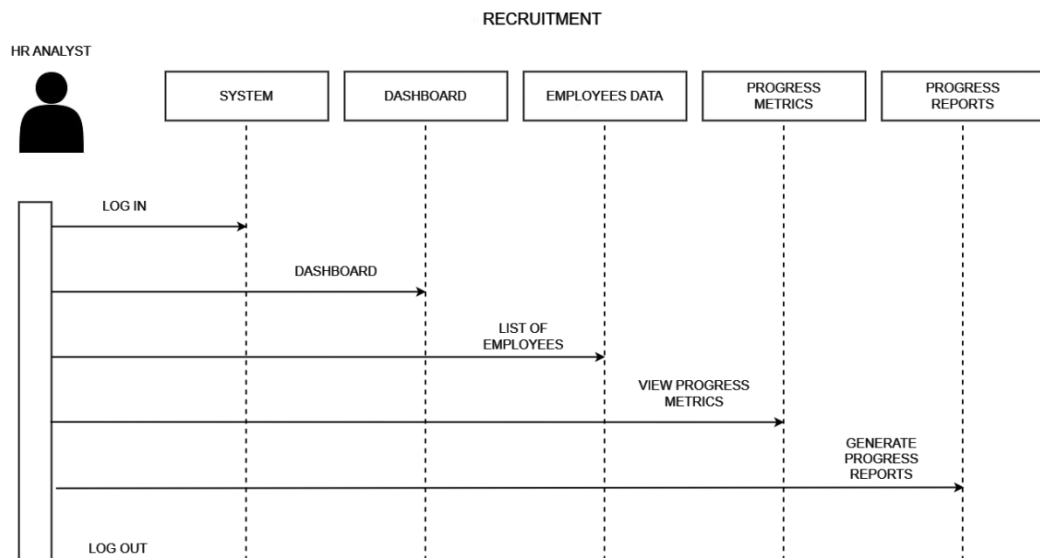*Figure 16: Recruitment (Interviewer Sequence Diagram)*

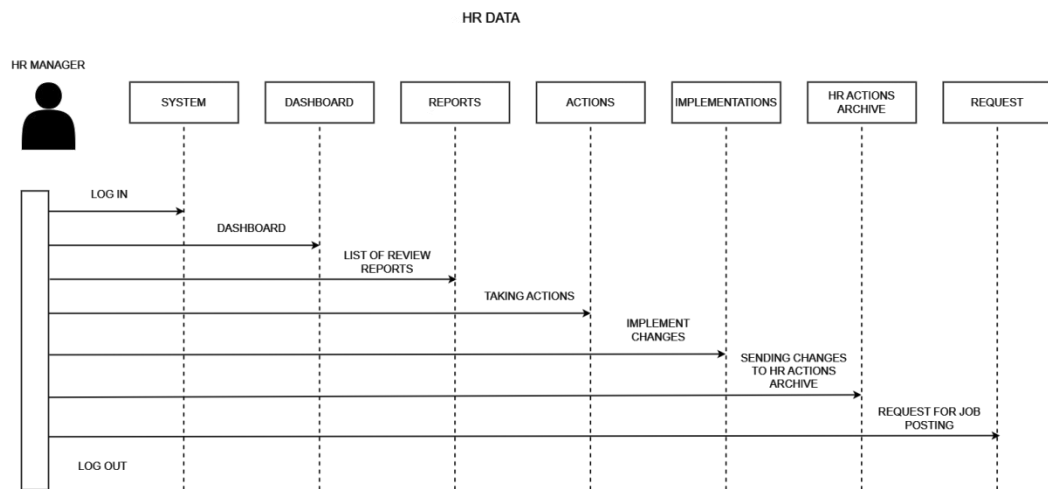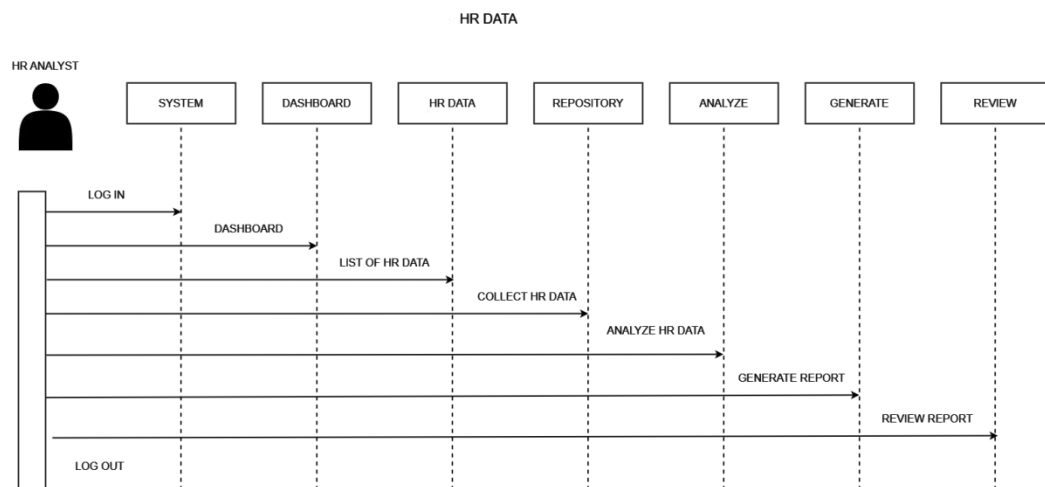*Figure 17: Recruitment (HR Analyst Sequence Diagram)*

Figure 18: HR Data (HR Manager Sequence Diagram)

Figure 19: HR Data (HR Analyst Sequence Diagram)