

BUSINESS ANALYSIS REPORT

Module Title: B9BA201 REQUIREMENTS ANALYSIS

Employee Performance and Retention Analytics (EPRA) System

Project Title:

A Comprehensive Requirements Analysis and Design Specification for a Predictive HR Analytics System (EPRA) to Mitigate Employee Churn at TechForward Solutions.

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Employee Performance and Retention Analytics (EPRA) System: Requirements Analysis and Design

1: Project Background

1.1 Introduction and Project Scope

This report outlines the Requirements Analysis and Design for the **Employee Performance and Retention Analytics (EPRA) System** for TechForward Solutions, a mid-sized IT consulting firm.

TechForward Solutions is experiencing a critical business challenge: a **high attrition rate** among high-potential employees. Their current Human Resources Information Systems (HRIS) operates in silos, providing historical reports but failing to deliver proactive insights. As a result, management struggles to identify *why* employees leave or *who* is at risk of leaving next.

The EPRA System is designed to integrate data from disparate sources (HRIS, project management tools, training logs) and leverage analytical models to provide **predictive and prescriptive insights**. The system's scope includes talent segmentation, churn prediction, and training gap analysis to enable the HR team to implement targeted retention strategies.

1.2 Goals and Objectives

Category	Goal (Long-Term Aim)	Objectives (Measurable Steps)
Retention	To reduce the overall employee turnover rate by 20% within the next fiscal year.	1. Implement a predictive model that identifies employees with a High-Risk of Churn (HRC) based on key behavioral and performance indicators.
Performance	To align employee training investments directly with identified skill deficiencies and business needs.	2. Analyze the correlation between training received and subsequent performance ratings to calculate a Training Return on Investment (ROI) .
Operational	To establish a single, reliable source for all HR performance metrics.	3. Design and deploy a real-time, role-based analytics dashboard for HR and Department Heads within six months.

1.3 Key Stakeholders

1. **HR Managers & Analysts (Primary Users):** Require dashboards, specific risk reports, and the ability to filter and drill down on employee data.
2. **Department Heads / Project Managers (Key Decision Makers):** Need insights into team capacity, skill availability, and talent distribution for project planning and promotion decisions.
3. **Senior Management (Strategic Users):** Require high-level Key Performance Indicators (KPIs) on talent pipeline health, overall cost of attrition, and system performance metrics.
4. **IT/Technical Team (Implementation & Maintenance):** Responsible for data security, system integration, scalability, and adherence to internal IT governance standards.

1.4 Need for Improved Analytical Capabilities

The deployment of a specialized Analytical Information System like EPRA is necessary because existing transactional HR systems lack the following advanced capabilities:

- **Predictive Modeling:** Existing tools only generate descriptive reports (*"Last quarter, 5% of employees resigned"*). The EPRA system must perform **predictive analysis** (*"These 15 employees show a 60% probability of resigning in the next quarter"*) by analyzing complex factors like salary band, time since last promotion, and project workload.
- **Data Aggregation and Correlation:** Employee data is currently fragmented. EPRA is required to aggregate diverse data sets (e.g., connecting a low performance score with a high number of declined salary hike requests) to identify non-obvious factors driving attrition.
- **Prescriptive Insight:** Beyond identifying a problem, the system must offer **prescriptive recommendations** (e.g., *"Offer a mentorship program or a project change to this employee to lower the churn risk"*). This capability is fundamental to the system's RO

2: Requirements Elicitation Plan

2.1 Plan and Timeline for Gathering System Requirements

The requirements gathering phase for the EPRA System will be structured over a four-week timeline to ensure a thorough and systematic collection of needs from all critical stakeholders.

Week	Activity	Stakeholders Involved	Deliverable/Goal
1	Project Kick-off & Scope Definition	HR Leadership, Senior Management	Finalise project scope and boundaries; Review existing HR process documentation and identify preliminary data sources.
2	Detailed Stakeholder Interviews	HR Managers, Dept. Heads, IT Team Lead	Conduct one-on-one sessions to gather detailed functional and non-functional requirements.
3	Joint Requirements Workshops	Cross-functional Team (HR, IT, Managers)	Facilitate group sessions to achieve consensus on high-priority features and collaboratively define key analytical

			metrics (e.g., churn score formula).
4	Consolidation and Validation	All Key Stakeholders	Draft and present the Requirements Specification Document for review; Obtain formal sign-off on the captured requirements.

2.2 Selection and Justification of Requirements Elicitation Techniques

To capture both the strategic vision and the granular, technical details of the EPRA system, two complementary elicitation techniques will be utilized: **Interviews** and **Facilitated Workshops**.

Technique	Description	Justification for EPRA System
Structured Interviews	One-on-one sessions using a pre-defined set of questions to gather specific, detailed, and often sensitive information from key decision-makers.	Essential for understanding confidential or sensitive requirements (e.g., specific salary bands, private performance review metrics) from HR Managers, which are not suitable for a group setting.

Facilitated Workshops	Group sessions involving a diverse, cross-functional team to collaboratively define, prioritize, and resolve conflicting requirements.	Ideal for achieving consensus on the analytical formulas and dashboards. It allows IT, HR, and Management to agree collectively on the format and content of the "Churn Risk Dashboard."
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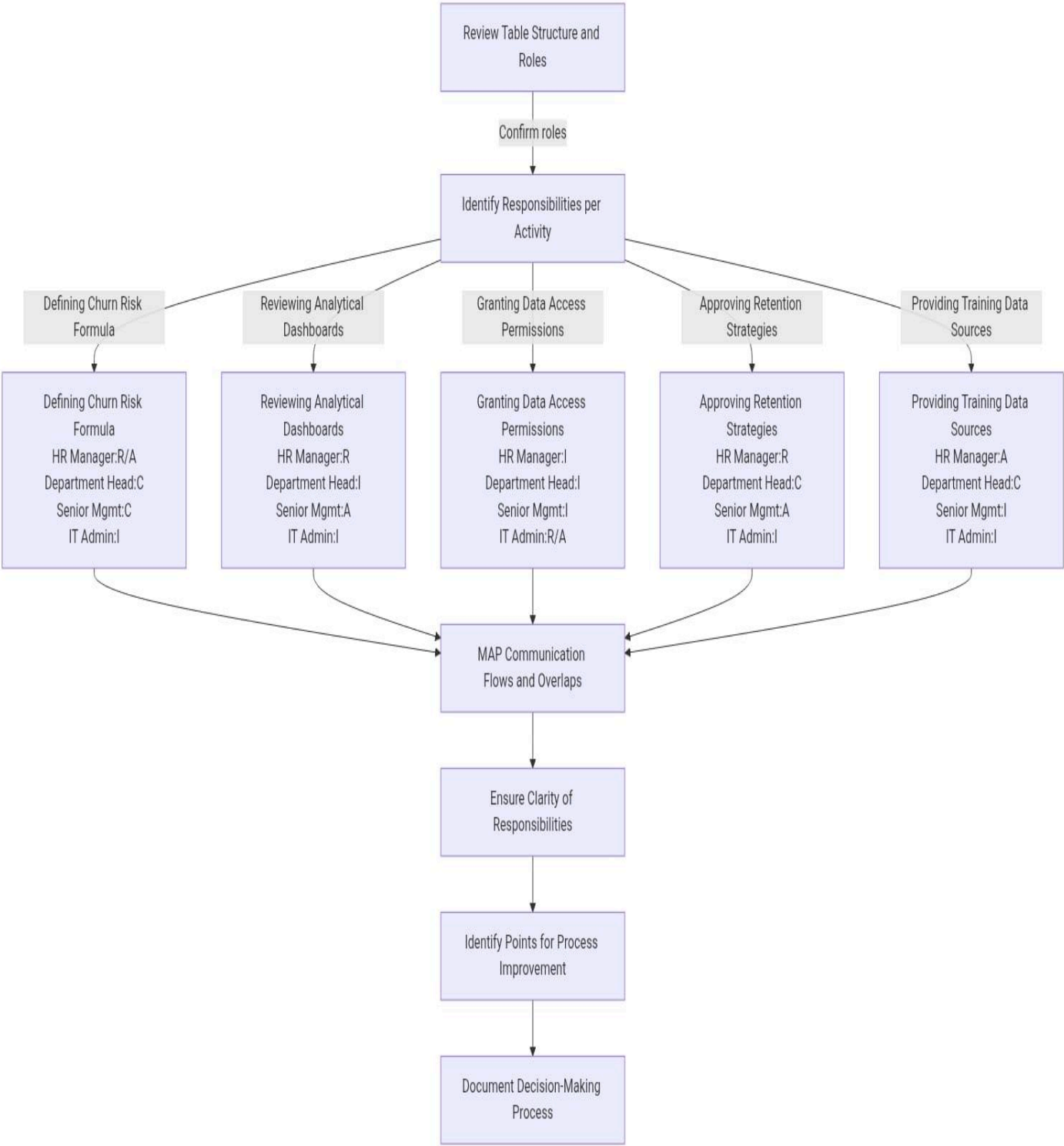
2.3 Sample Interview Questions for the IT Department

1. What is the current architecture of the Human Resources Information System (HRIS), and which specific APIs or data access methods (e.g., SQL direct access, RESTful APIs) are authorized for the EPRA system to extract data?
2. Can the current infrastructure support the non-functional requirement of **near-real-time data synchronization** required for the predictive models, or will data latency (delay) affect the system's analytical accuracy?
3. Given the sensitivity of the data (salaries, performance ratings), what are the absolute minimum **security standards** (e.g., encryption protocols, user access control matrix) the new data warehouse must adhere to?
4. What is the existing database platform (e.g., PostgreSQL, MS SQL Server) and what are the specific **data governance policies** regarding data residency and data masking that the EPRA system must comply with?
5. What are the technical constraints regarding **system scalability**, specifically in terms of supporting concurrent analytical queries from a projected 50-75 users and accommodating a 15% annual growth in employee data records?

2.4 Stakeholder Responsibility Matrix (RACI Chart)

The RACI (Responsible, Accountable, Consulted, Informed) Chart clarifies the roles of key stakeholders concerning major EPRA system activities, ensuring clarity during the requirements phase.

RACI CHART DIAGRAM :



EPRA System Activity	HR Manager	Department Head	Senior Management	IT Administrator
Defining Churn Risk Formula	R/A	C	C	I
Reviewing Analytical Dashboards	R	I	A	I
Granting Data Access Permissions	I	I	I	R/A
Approving Retention Strategies	R	C	A	I
Providing Training Data Sources	A	I	I	R

Section 3: Operational Data Schema

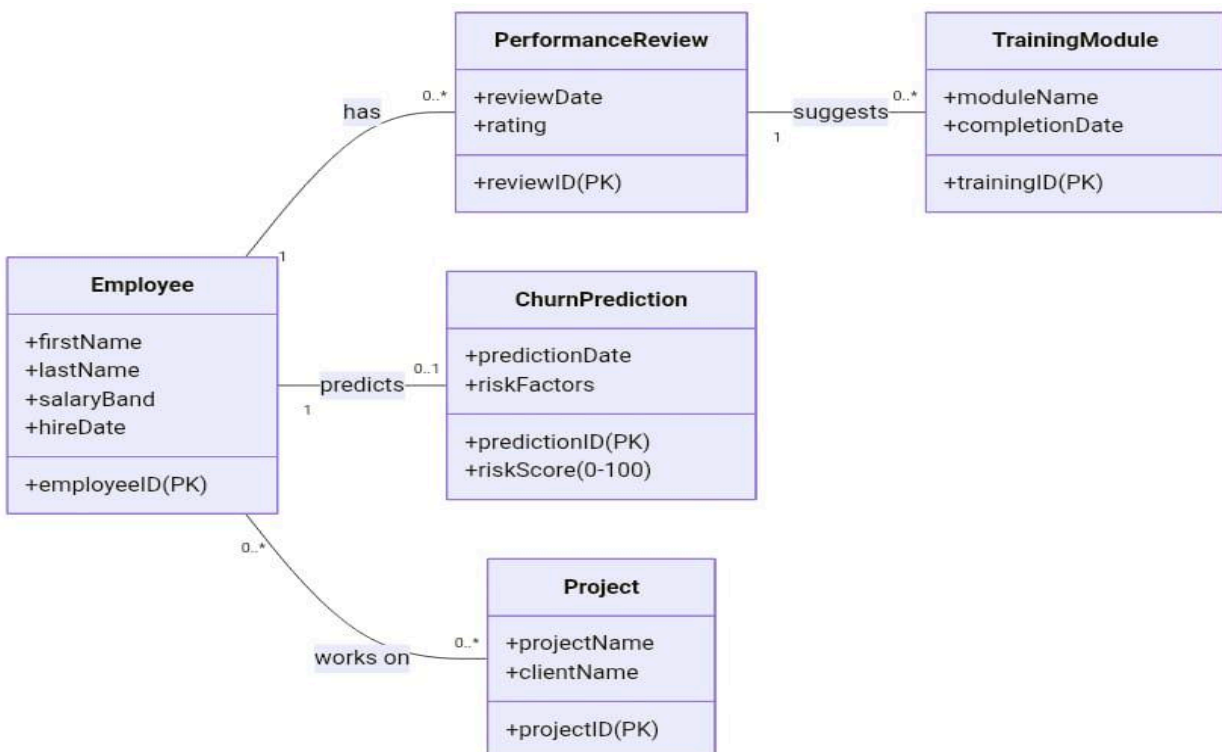
3.1 Unified Modeling Language (UML) Class Diagram

The UML Class Diagram models the conceptual structure of the EPRA System's data layer. It focuses on the key entities and their relationships, which are foundational for the analytical data warehouse.

Class (Entity Name)	Key Attributes	Relationships
Employee	employeeID (PK), firstName, lastName, hireDate, salaryBand, managerID, currentStatus	1:M relationship with PerformanceReview (One employee has many reviews).
PerformanceReview	reviewID (PK), employeeID (FK), reviewDate, rating, feedbackText, reviewCycle	1:M relationship with TrainingModule (A review might identify multiple training needs).
TrainingModule	trainingID (PK), moduleName, completionDate, cost, skillTaught	1:M relationship with Project (Training prepares an employee for many projects).

Project	projectID (PK), projectName, clientName, startDate, endDate, projectBudget	M:M relationship with Employee (Many employees work on many projects).
ChurnPrediction	predictionID (PK), employeeID (FK), predictionDate, riskScore (0-100), riskFactors, recommendation	1:1 relationship with Employee (One prediction per employee at a given time).

UML CLASS DIAGRAM :

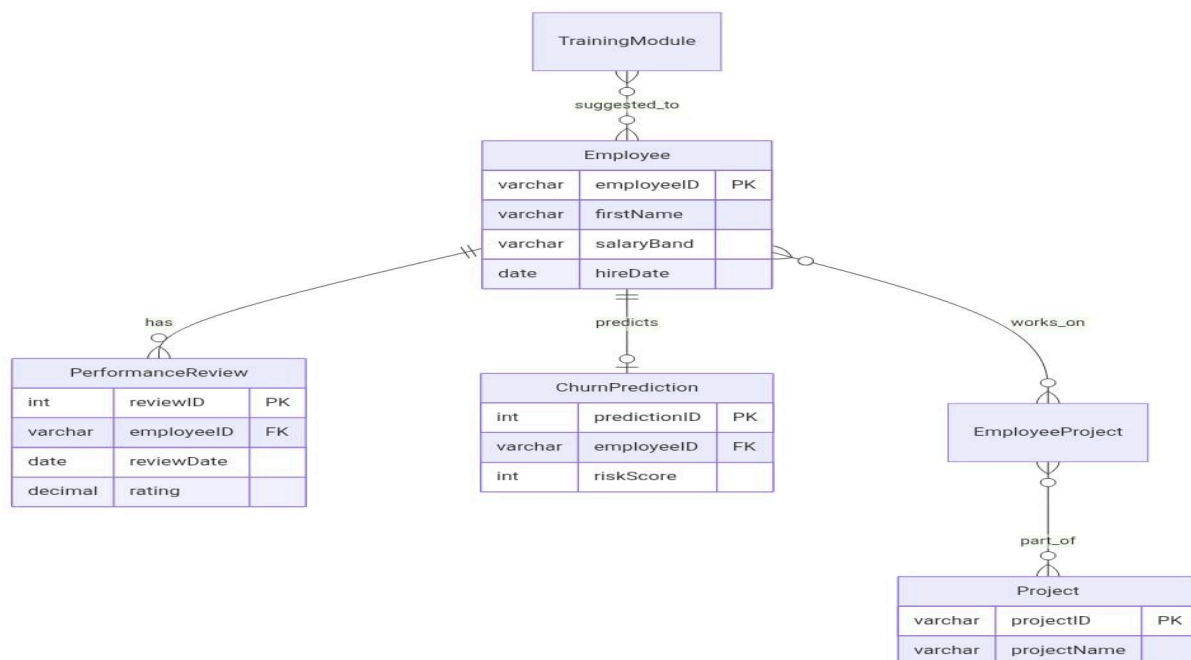


3.2 Entity-Relationship Diagram (ERD) as Logical Schema

The Entity-Relationship Diagram (ERD) visually represents the data entities within the EPRA system and the crucial relationships between them, primarily focusing on cardinality (one-to-one, one-to-many).

- **Employee Entity:** Contains demographic and stable employee data. `employeeID` is the Primary Key.
- **Project and Employee Relationship (M:N):** This requires a junction table, `EmployeeProject`, to track which employee worked on which project and for how long.
- **PerformanceReview and Employee Relationship (1:M):** Each review belongs to exactly one employee.
- **ChurnPrediction Entity:** This is a key analytical table, which links back to the `Employee` via `employeeID` (Foreign Key) to provide context for the risk score.

ENTITY-RELATIONSHIP DIAGRAM :

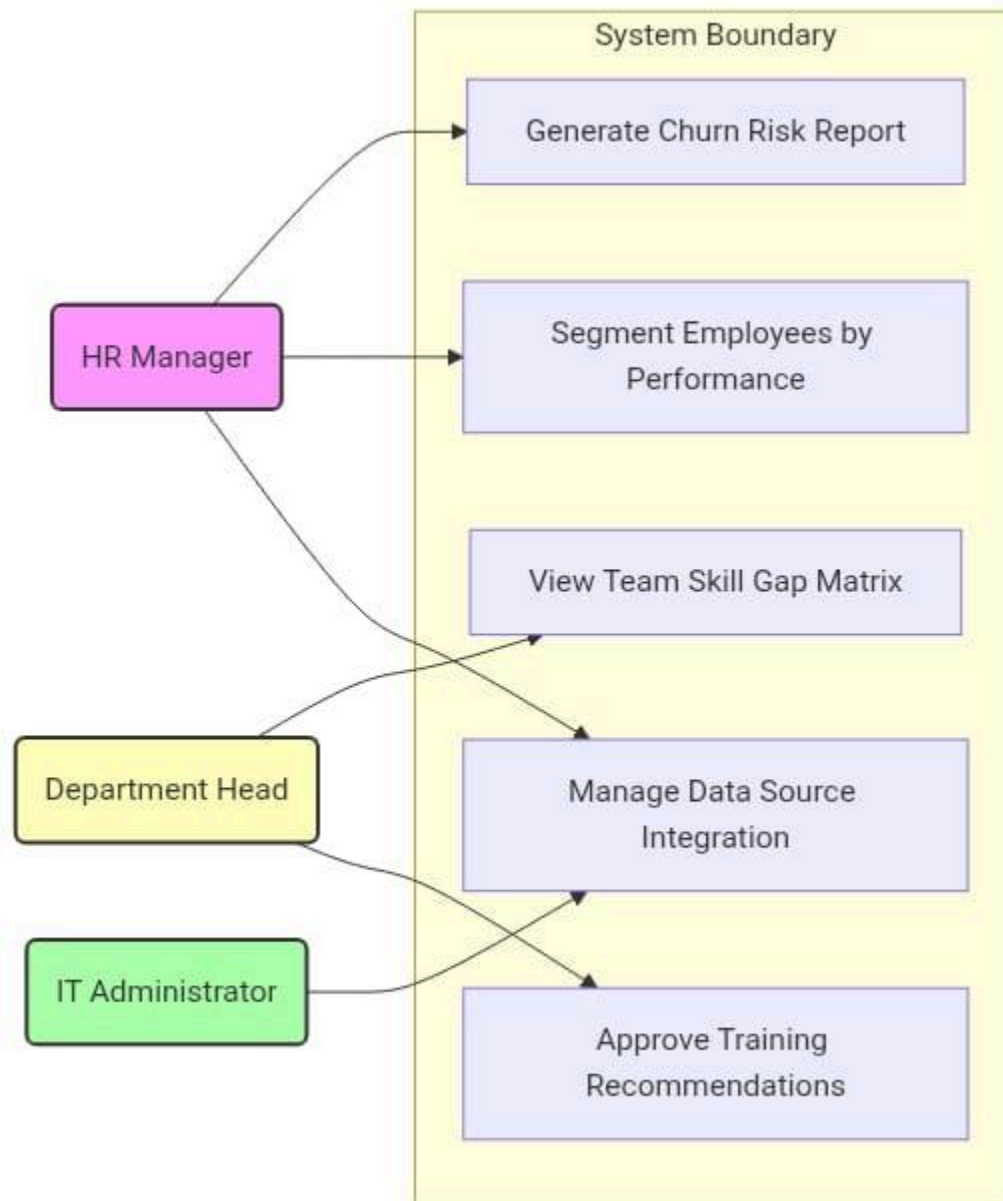


3.3 Use Case and Use Case Diagram

The Use Case Diagram defines the functional scope of the EPRA system by illustrating the key actors and the functions they can perform within the system boundary.

Actor Name	Key Use Cases (Functions)
HR Manager	1. Generate Churn Risk Report (The most critical function)
	2. Track Employee Training Progress
	3. Segment Employees by Performance
Department Head	4. View Team Skill Gap Analysis
	5. Approve Training Recommendations
	6. Search Employee Profile Data
IT Administrator	7. Manage Data Source Integration
	8. Monitor System Performance & Security

USE CASE DIAGRAM :



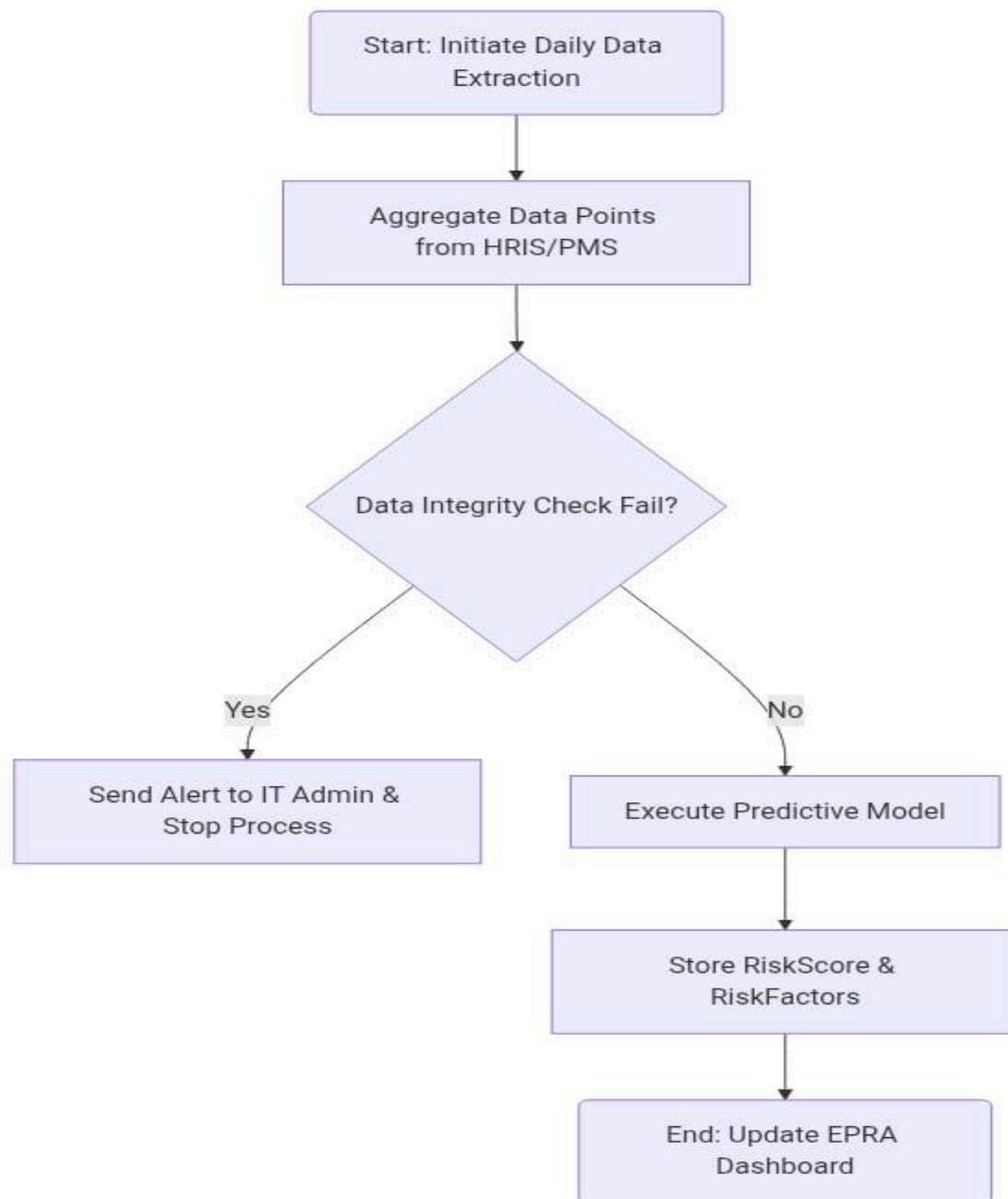
3.4 Workflow Process for Calculating Churn Risk Score (Activity Diagram)

This Activity Diagram models the automated, internal workflow for calculating and generating the Churn Risk Score for an employee, which is the heart of the analytical system.

Step	Action/Process	Description
1 (Start)	Initiate Daily Data Extraction	The ETL (Extract, Transform, Load) process begins at 1 AM.
2	Aggregate Data Points	Collect recent data on Salary, Performance, Project Load, and Time Since Last Promotion.
3 (Decision)	[IF] Data Integrity Check Fail?	Check if all required data fields are present and valid.
4 (Path A)	[Yes] Send Alert to IT Admin & Stop Process	An automated alert is sent, and the daily calculation is skipped.
5 (Path B)	[No] Execute Predictive Model	The validated data is fed into the Churn Prediction Algorithm.
6	Store RiskScore & RiskFactors	The resulting Risk Score (0-100) and contributing factors are saved to the ChurnPrediction table.

7 (End)	Update EPRA Dashboard	The UI dashboard is updated with the new scores, ready for the HR Manager.
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ACTIVITY DIAGRAM (for Churn Risk Calculation) :



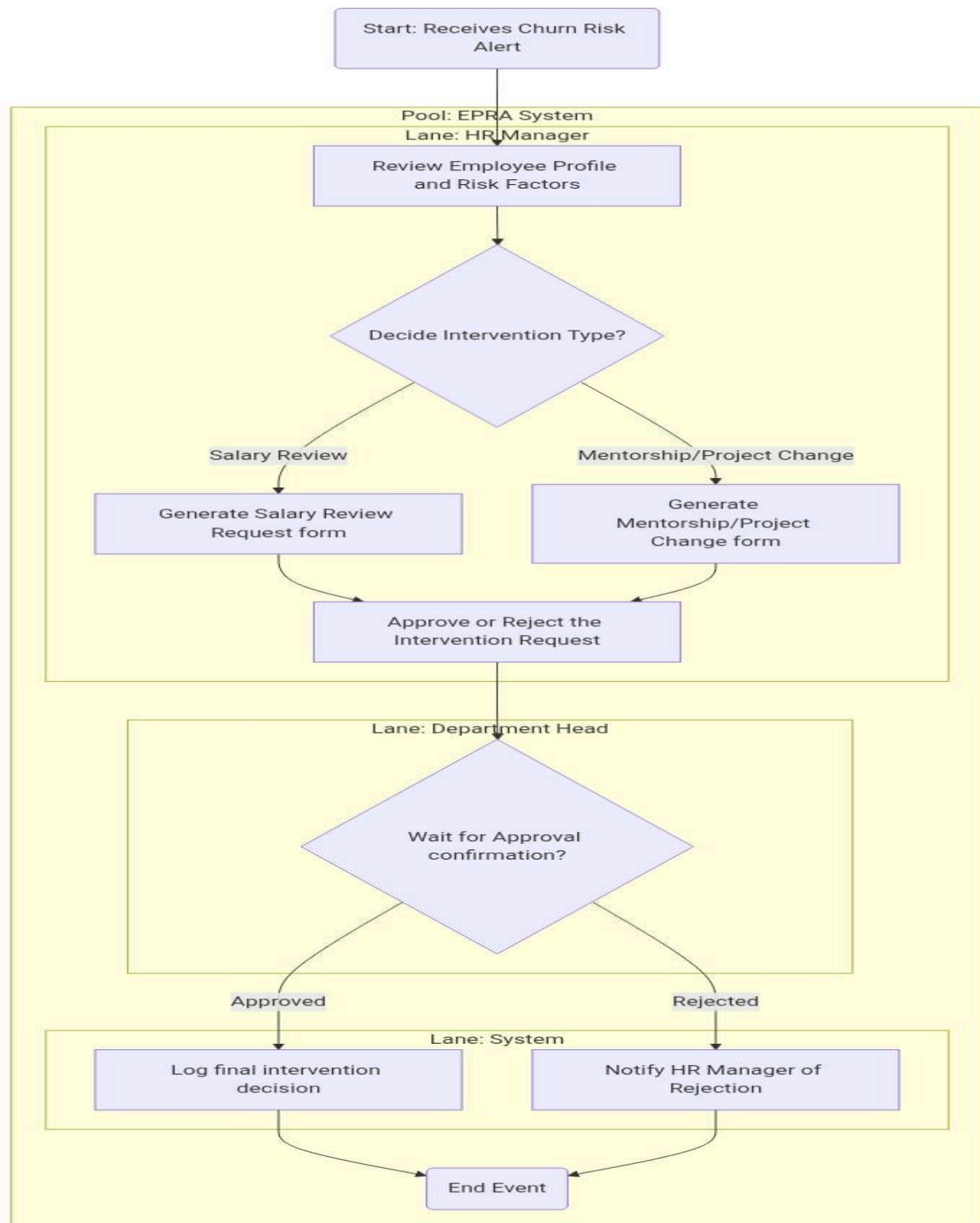
3.5 Workflow Process for Targeted Intervention (BPMN Scheme)

This BPMN (Business Process Model and Notation) scheme details the process flow when an HR Manager decides to initiate a retention intervention based on the EPRA system's Churn Risk Report.

BPMN Element	Role/Lane	Action/Task
Start Event	HR Manager	Receives Churn Risk Alert.
Task	HR Manager	Reviews Employee Profile and Risk Factors.
Gateway (Decision)	HR Manager	[Exclusive Gateway] Decide Intervention Type? (Salary Review OR Mentorship OR Project Change).
Task (Lane Change)	System	Generates required documentation (e.g., Salary Review Request form).
Task	Department Head	Approves or Rejects the Intervention Request.
Gateway (Decision)	System	[Inclusive Gateway] Wait for Approval confirmation from Department Head.

Task	HR Manager	Logs the final intervention decision in the EPRA system (for tracking ROI).
End Event	EPRA System	Intervention tracked and employee's risk score is temporarily suppressed.

BPMN DIAGRAM (for Targeted Intervention) :



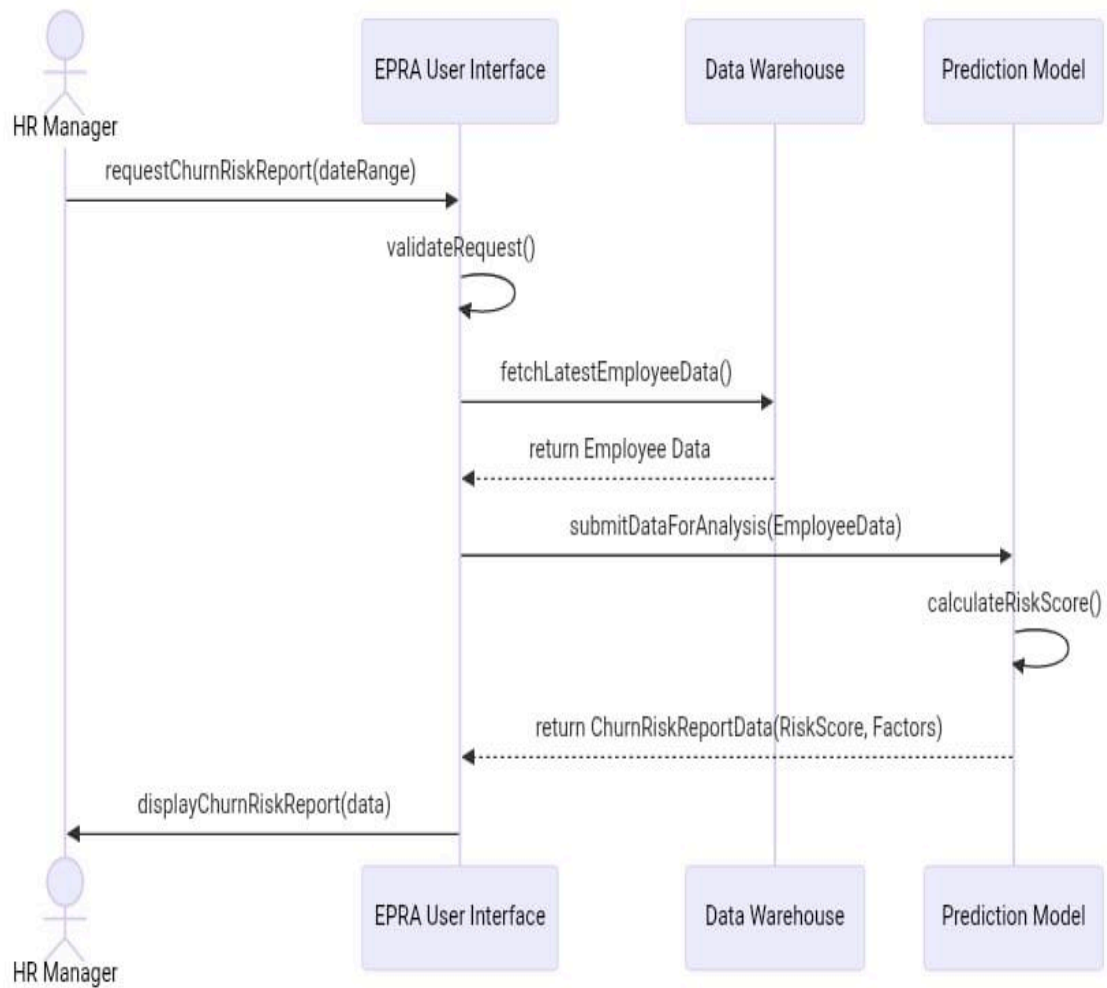
3.6 Sequence Diagram:

The Sequence Diagram illustrates the time-ordered interactions between objects to complete a critical system functionality. The following sequence details the process of the "**Generating a Churn Risk Report.**"

Step	Interaction / Message	Source Object	Target Object
1	requestChurnRiskReport(dateRange)	HR Manager	EPRA User Interface (UI)
2	validateRequest()	EPRA UI	EPRA UI
3	fetchLatestEmployeeData()	EPRA UI	Data Warehouse
4	return EmployeeData (Performance, Salary, Training)	Data Warehouse	Prediction Model
5	calculateRiskScore()	Prediction Model	Prediction Model

6	return ChurnRiskReportData (RiskScore, RiskFactors)	Prediction Model	EPRA UI
7	displayChurnRiskReport(data)	EPRA UI	HR Manager

SEQUENCE DIAGRAM :



Section 4: Requirements Documentation (35%)

The requirements for the EPRA System are documented using the Agile methodology via User Stories. The stories adhere to the **INVEST criteria** and focus on delivering business value.

4.1 Agile Requirements Documentation (User Stories)

ID	User Story	Acceptance Criteria (AC)
US-01	As an HR Manager, I want to generate a 'High Churn Risk' report, so that I can proactively implement retention strategies for at-risk employees.	AC-01.1: The report must dynamically filter employees with a Churn Risk Score > 75. AC-01.2: The system must show the top 3 contributing risk factors (e.g., Low Salary Band, No Promotion in 3 years) for each employee.
US-02	As a Department Head, I want to view a Skill Gap Matrix for my team, so that I can assess resource readiness for upcoming projects.	AC-02.1: The matrix must compare required skills for the role against the employee's verified skill score (e.g., 8/10 for Python). AC-02.2: The report must provide an aggregate skill gap percentage for the entire department.
US-03	As an Employee, I want to view my current Performance Review history and training	AC-03.1: Employees can only view their own data, not that of peers. AC-03.2: The system must clearly display a link to the recommended

	recommendations, so that I can understand my career growth path.	training modules relevant to their identified skill gap.
US-04	As an HR Analyst, I want to track the cost and completion rate of all training modules, so that I can calculate the Return on Investment (ROI) of the training budget.	AC-04.1: The system must allow filtering by date range and training vendor. AC-04.2: The ROI calculation must be displayed as (Performance Score Improvement / Training Cost) x 100.
US-05	As a Senior Manager, I want to access an Executive Dashboard, so that I can monitor the company-wide Churn Rate and Average Employee Tenure KPI.	AC-05.1: The dashboard must load within 3 seconds. AC-05.2: All KPIs must be filterable by business unit and geographic location.
US-06	As an HR Manager, I want the system to automatically flag employees whose current salary is below the market average for their skill set, so that I can initiate compensation reviews.	AC-06.1: The flag must trigger when the employee's salary is 5% below the external benchmark data in the system. AC-06.2: The system must send a notification alert to the relevant HR Analyst.

US-07	As a Data Administrator, I want the system to ingest new project assignment data from the Project Management System (PMS) daily, so that the Project Load metric for churn analysis is up-to-date.	AC-07.1: The data import process must complete successfully before 6:00 AM every business day. AC-07.2: Any data import failure must trigger an email notification to the IT Administrator.
US-08	As a Department Head, I want to drill down from a churn score to view the employee's detailed project history, so that I can assess if project overload is a risk factor.	AC-08.1: The project history view must include project name, start/end date, and employee utilization percentage (Billable Hours). AC-08.2: The drill-down operation must be initiated by clicking the employee's name on the report.
US-09	As an HR Analyst, I want to create custom talent segments based on multiple criteria (e.g., High Performer AND High Potential), so that I can target them with specific development programs.	AC-09.1: The tool must allow users to use Boolean logic (AND, OR) to combine up to three filtering criteria. AC-09.2: The system must allow the user to save the custom segment for future use.
US-10	As an HR Manager, I want the system to suggest proactive recommendations to mitigate churn risk, so that I have clear actions to follow up on.	AC-10.1: Recommendations must be actionable, such as "Recommend Mentorship", "Assign Low-Stress Project", or "Initiate Salary Review". AC-10.2: The system must allow the

		HR Manager to log the action taken against the recommendation.
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4.2 Non-Functional Requirements (NFRs)

Non-Functional Requirements define the quality attributes of the EPRA System and are essential for its operational effectiveness and compliance with TechForward’s internal policies.

Category	Requirement (NFR)	Metric/Standard
Security	Data Encryption: All personally identifiable information (PII) and sensitive analytical data (salary, risk scores) must be encrypted both in transit and at rest .	Must comply with AES-256 encryption standard.
Security	Access Control: All user access must be based on the Principle of Least Privilege (PoLP) and authenticated via TechForward’s internal SSO (Single Sign-On) protocol.	Role-Based Access Control (RBAC) must be enforced; employees cannot view peer performance data.
Performance	Query Response Time: The Executive and HR Analyst Dashboards, which aggregate data	95% of all analytical queries must return a result to the user within 4 seconds .

	across multiple sources, must load quickly.	
Scalability	Data Growth Handling: The system must be able to accommodate an increase in employee headcount and data volume without degradation in performance.	Must support a 20% annual growth in data records and an increase of up to 100 concurrent users.
Usability	User Interface (UI): The analytical reports and dashboards must be intuitive and follow established data visualization best practices.	The system must maintain a maximum Task Success Rate of 90% during user acceptance testing.

Section 5: SQL Code and Prototyping

5.1 SQL Code Implementation

The core of the EPRA analytical system relies on a structured data warehouse schema derived from the logical data model (Section 3). The following SQL structure and queries demonstrate how analytical insights are derived from the operational data.

A. Schema Definition (Simplified Tables for Analytical Queries)

SQL

-- Employee Table (Core data)

```
CREATE TABLE Employee (  
    EmployeeID VARCHAR(10) PRIMARY KEY,  
    FirstName VARCHAR(50),  
    LastName VARCHAR(50),  
    Department VARCHAR(50),  
    SalaryBand VARCHAR(10),  
    HireDate DATE  
);
```

-- Performance Review Table

```
CREATE TABLE PerformanceReview (  
    ReviewID INT PRIMARY KEY,  
    EmployeeID VARCHAR(10) REFERENCES Employee(EmployeeID),  
    ReviewDate DATE,  
    Rating DECIMAL(2,1) -- e.g., 1.0 to 5.0  
);
```

-- Churn Prediction Table (The Analytical Output)

```
CREATE TABLE ChurnPrediction (  
    PredictionID INT PRIMARY KEY,  
    EmployeeID VARCHAR(10) REFERENCES Employee(EmployeeID),  
    PredictionDate DATE,  
    RiskScore INT, -- 0 to 100  
    RiskFactors VARCHAR(255)  
);
```

B. Example Analytical SQL Queries (SELECT and JOIN)

Query 1: Identify High-Risk Employees who Lack Training Support (JOIN: Employee and ChurnPrediction)

SQL

SELECT

E.EmployeeID,
E.FirstName,
E.Department,
CP.RiskScore,
CP.RiskFactors

FROM

Employee E

JOIN

ChurnPrediction CP ON E.EmployeeID = CP.EmployeeID

WHERE

CP.RiskScore > 75
AND E.Department = 'Technology'

ORDER BY

CP.RiskScore DESC;

Query 2: Calculate Average Performance for a Specific Salary Band (JOIN: Employee and PerformanceReview)

SQL

SELECT

E.SalaryBand,
AVG(PR.Rating) AS AverageRating,

```
COUNT(E.EmployeeID) AS TotalEmployees
FROM
    Employee E
JOIN
    PerformanceReview PR ON E.EmployeeID = PR.EmployeeID
WHERE
    E.SalaryBand = 'Band 5'
GROUP BY
    E.SalaryBand;
```

Query 3: Find Employees with High Risk AND Low Performance (JOIN: ChurnPrediction and PerformanceReview via Employee)

SQL

```
SELECT
    E.EmployeeID,
    E.FirstName,
    CP.RiskScore,
    PR.Rating AS LatestRating
FROM
    Employee E
JOIN
    ChurnPrediction CP ON E.EmployeeID = CP.EmployeeID
JOIN
    PerformanceReview PR ON E.EmployeeID = PR.EmployeeID
WHERE
    CP.RiskScore > 50
    AND PR.Rating < 2.5
    AND PR.ReviewDate = (
```

```

SELECT MAX(ReviewDate)
FROM PerformanceReview
WHERE EmployeeID = E.EmployeeID
);

```

5.2 Prototyping (Wireframe Design)

A low-fidelity wireframe is presented for the **High-Risk Employee Intervention Dashboard**. This prototype is crucial for ensuring the system's usability (NFR) and delivering on the key requirement of proactive intervention (US-01).

Design Elements and Evaluation:

Element	Description	Purpose in Analytical System
KPI Cards	Top row displays Key Performance Indicators: Total Churn Rate (YTD) and Average Employee Tenure .	Provides immediate, high-level context for Senior Management (US-05).
Employee Risk List	The main section is a table listing employees sorted by highest RiskScore . Includes columns for Latest Rating and Last Promotion Date .	Directly supports US-01 by enabling HR Managers to identify the highest priority cases quickly.

Action Panel	A dedicated section for actionable buttons: "Generate Recommendation," "Schedule Meeting," and "Log Intervention."	Supports the goal of Prescriptive Insight (Section 1.4) and enables the HR Manager to log actions (US-10).
Risk Factor Visualization	A small bar chart/gauge next to each employee showing the breakdown of risk factors (e.g., Project Load: 40%, Low Salary: 30%, Low Performance: 30%).	Provides instant analytical justification for the risk score, helping the HR Manager understand the <i>why</i> .

PROTOTYPE/WIREFRAME DIAGRAM :

