Summer Internship Report On

“HR Analytics Dashboard integrated with Alerts and Chatbot”

Submitted in the partial fulfilment of the requirements for the award of the degree of

MASTER OF BUSINESS ADMINISTRATION (BUSINESS ANALYTICS)

By

BODDAPATI KANCHANA

(24MBMB02)

MBA 2024-26

Under the esteemed guidance of

ASSOC. PROF. DV SRINIVAS KUMAR

SCHOOL OF MANAGEMENT STUDIES

UNIVERSITY OF HYDERABAD

SCHOOL OF MANAGEMENT STUDIES, UNIVERSITY OF HYDERABAD, Prof. CR Rao Road
Gachebowli, Hyderabad, Telangana, 500046

DECLARATION

I, Boddapati Kanchana (Roll No: 24MBMB02), hereby declare that the Internship Report entitled **"HR Analytics Dashboard integrated with Alerts and Chatbot"** submitted to School of Management Studies, University of Hyderabad in partial fulfillment of the requirements for the award of the degree of Master of Business Administration in Business Analytics, is a record of original work carried out by me during my Summer Internship at Innodatatics, Hyderabad.

I further declare that this report is the result of my own efforts and has not been submitted to any other University/Institute for the award of any degree, diploma, or fellowship. All sources of information used have been duly acknowledged in the references.

Place: School of Management Studies

University of Hyderabad

Date:

Signature of the Student

Boddapati Kanchana

Roll No: 24MBMB02

School of Management Studies

University of Hyderabad

CERTIFICATE

School of Management Studies
University of Hyderabad

This is to certify that the project titled **"HR Analytics Dashboard integrated with Alerts and Chatbot"** is a bona-fide work done by Ms. BODDAPATI KANCHANA, bearing Registration No: 24MBMB02 in partial fulfilment of requirements for the award of the M.B.A. (Business Analytics) degree under my supervision and submitted to the Department of School of Management Studies, University of Hyderabad.

Place: School of Management Studies
University of Hyderabad

Dr. DV Srinivas Kumar
Associate Professor
University of Hyderabad

Date:

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CERTIFICATE of COMPLETION

This certificate is presented to

Boddapati Kanchana

for successfully completing the Internship Project on

"HR Analytics Dashboard with Alerts and Bot."

through emerging technologies consulting firm

"Innodatatics - USA" from Jun 12, 2025 to Jul 15, 2025

Code: IDA-IN/25/Q3/07/1221

24-Jul-2025
Date

Shirish G Kumar
Founder & CEO

Address: #2-56/2/19, 3rd Floor, Vijaya Towers, near Meridian School, Ayyappa Society 100ft Road, Madhapur, Hyderabad, Telangana 500081.
Telephone-+91- 076739 55077, website: https://innodatatics.ai/

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Executive Summary

This Summer Internship Project (SIP), namely "HR Analytics Dashboard integrated with Alerts and Chatbot", was conducted at Innodatatics, Hyderabad, as a part of the MBA (Business Analytics) course at the University of Hyderabad. The research was undertaken to develop an interactive HR Analytics Dashboard with real-time alerts and an NLP-based chatbot, thus converting conventional HR reporting into an intelligent and proactive decision-support system.

Background of the Study

Human Resource Management has evolved from an administrative task to a business-driving function. Yet, most organizations continue to use static reporting and manual methods, causing lagged decisions and inadequate visibility into retention risks. To address this, the internship emphasized creating a dynamic, data-driven HR analytics tool that allows HR managers to track important workforce metrics, flag high-risk employees, and engage with data via natural language queries.

Objectives

The project was established with the following objectives:

- To create a dynamic dashboard to visualize workforce information like employee demographics, tenure, performance, and retention risks.
- To create a manual email alert system that notifies HR managers of high attrition risk cases in a controlled way.
- To include real-time visual alerts that show dashboard refresh status and email delivery confirmation.
- To have advanced filter options for in-depth workforce analysis.
- To create an NLP-driven chatbot to handle self-service HR questions, so that the non-technical users can easily access insights.

Methodology

The project took a structured methodology:

1. **Requirement Analysis:** HR KPIs and technical requirements identification.
2. **Data Collection & Preparation:** Cleaning, transformation, and formatting of employee data.
3. **Dashboard Development:** Initial prototype in Power BI; final one in Python Dash for ease and automation.
4. **Alerts Implementation:** Manual and automated alerts on retention risk and dashboard refresh.

5. **Chatbot Integration:** Creation of an NLP-powered bot for predefined and custom HR questions.
6. **Testing & Validation:** Functionality testing, user input, and repeat enhancements.

Key Findings & Insights

The dashboard produced actionable insights, which included:

- High chances of retention risks in areas like Finance and Customer Support (avg. risk ~98%).
- Plateauing of performance after first few years, indicating the importance of ongoing learning programs.
- Pay-performance mismatches in some departments, indicating scrutiny of reward mechanisms.
- Moderate job satisfaction (mean of 3/5), varying at department levels.
- Fair distribution of remote work and projects, reflecting justice in the workload allocation.

Comparison of Tools

Power BI was good for quick prototyping and visualization but not flexible in automating and integrating chatbots.

Python Dash allowed for complex interactivity, real-time notifications, and chatbot capabilities, making it a more scalable long-term platform for HR analytics.

Challenges

Major challenges involved the management of dirty datasets, creating significant KPIs, debugging Python, integrating real-time notifications, and training the chatbot to effectively manage queries. These challenges gave good exposure to iterative dashboard development and practical problem-solving.

Outcomes & Contributions

The project was able to achieve the scalable HR Analytics Dashboard that:

- Delivers interactive and real-time insights into workforce analytics.
- Improves decision-making time with alert and update notifications.
- Enhances accessibility of data through chatbot-based self-service analytics.
- Has a modular framework that can be expanded into predictive analytics and coupled with real-time HRMS data in the future.

Suggestions & Future Scope

- Coupling with live HRMS/ERP systems for real-time information updates.
- Extending chatbot functionality to voice-based and multi-language inquiries.

- Hosting on cloud platforms to achieve scalability and reachability.
- Integration of predictive models for attrition and performance prediction.

Personal Learnings

The internship added technical proficiency in Power BI, Python Dash, Pandas, Plotly, and NLP, as well as professional skills in data storytelling, team collaboration, time management, and stakeholder communication. It was an eye-opening experience that reaffirmed interest in HR tech and analytics-driven decision-making.

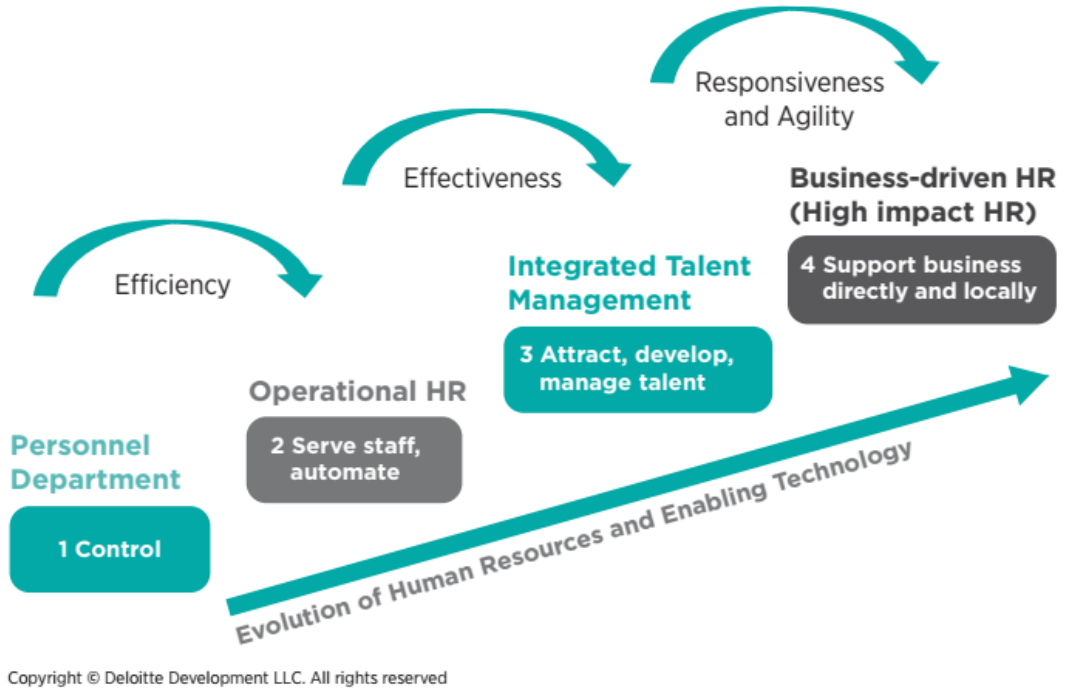
In conclusion, this internship filled the gap between theory and practice by creating an HR analytics solution that integrates visual dashboards, automatic alerts, and chat-based AI. It showed the potential of HR analytics to transform from descriptive reporting to predictive, proactive, and user-friendly workforce management.

CHAPTER 1: INTRODUCTION

1.1 Background of the Study

Human Resource Management has witnessed a significant transformation over the past decade, shifting from an administrative function to a strategic business partner. One of the most influential forces behind this shift is the increasing significance of data-driven decision-making through HR Analytics. Organizations today are recognizing the potential of using data to not only manage talent effectively but also to drive business outcomes.

HR Analytics, also referred to as People Analytics or Workforce Analytics, involves collecting, analyzing, and interpreting HR data to improve processes such as recruitment, employee engagement, retention, and performance management. In the age of digital transformation, companies are looking for smarter, real-time solutions to understand workforce trends and make proactive decisions.



1 Bersin by Deloitte, *High-impact HR*, http://www.bersin.com/Practice/Detail.aspx?id=17743

Despite the availability of large volumes of employee data, many HR departments still rely on static reports and manual processes, which often leads to delayed decision-making and overlooked issues such as high attrition risks or skill gaps. To address this challenge, enterprises are now embracing interactive dashboards, automated alert systems, and AI-powered chatbots that can process data in real-time and deliver actionable insights.

This internship study was conceived in response to this industry demand. The study focused on building an integrated HR Analytics Dashboard with Alerts and Bot that enables HR

professionals to monitor key metrics, receive timely alerts, and interact with data using natural language. This study not only enhances decision-making efficiency but also reduces the dependency on technical personnel for routine HR queries

1.2 Review of Literature

Literature review for this research was taken from real-world and up-to-date sources like YouTube guides, Google news, OpenAI platforms, and observations from team meetings and mentor advice, and not just academic journals. This helped keep the literature review very much in line with recent industry trends and the actual tools being employed within business settings.

HR Analytics and Decision-Making

Web sources like industry blogs and explainers brought out the increasing importance of HR analytics in reshaping workforce management. Real-world examples showed how companies are utilizing dashboards to monitor metrics like attrition, employee satisfaction, and diversity, bringing data more within reach for decision-makers. Conversations with mentors stressed that HR analytics is not just limited to static reports anymore but should provide real-time, actionable information.

HR Monitoring Dashboards

YouTube tutorials and forums on Power BI and Python Dash played a significant role in learning the way in which dashboards can make HR data visualization easy. These resources provided case studies of firms utilizing dashboards for visualizing KPIs like headcount, retention risk, and salary trends. Team discussions emphasized the need for clear and interactive visualizations that enable the identification of patterns rapidly without technical complexity.

Alerts and Automation in HR

Articles and practitioner blogs emphasized that automation of HR analytics like email alerts or real-time notifications assists HR managers in quickly reacting to risks such as high attrition. Discussions with mentors also made it clear that manual management of control over alerts is needed to avoid over-communication and ensure stakeholders only see significant notifications.

Chatbots and Conversational Tools

YouTube examples and OpenAI-powered learning offered real exposure to conversational AI in HR settings. These illustrated how chatbots can respond to routine questions like leave balance, headcount, or salary averages, freeing up the workload of HR professionals. Teammate insights highlighted that while chatbots enhance employee experience, they also push for self-service analytics, particularly for non-technical HR users.

Practical Insights on Predictive Analytics

Advanced prediction models were not the main concern in this project, but online platform resources and mentor commentary emphasized employee retention through the application of predictive analytics. Practically applied examples discussed in webinars and industry reports demonstrated how straightforward statistical techniques and trend analysis could be combined in dashboards to forecast workforce issues.

Summary

Literature in this research, though not based on scholarly articles, was based on pragmatic, industry-sourced expertise from the internet, AI platforms, and collaborative forums. All these stressed the shift of HR analytics from descriptive reporting to interactive, automated, and conversational approaches, justifying directly the requirement for an HR Analytics Dashboard with Alerts and Bot.

1.3 Scope of the Study

The goal of this project is to design, construct, and demonstrate an HR analytics system using Python (Dash) for more complex features like chatbot integration and email alerts, and Power BI for dashboard visualization.

1.3.1 Functional Scope:

- The system collects and displays HR data, including performance distribution, tenure analysis, department-by-department attrition, and employee demographics.
- User-defined thresholds serve as the basis for alert rules. For instance, an alert is set off if a department's retention rate is higher than 3 (on a scale of 1 to 5).
- A chatbot with rudimentary NLP (Natural Language Processing) skills allows users to get information through text-based questions.

1.3.2 Technological Scope:

- Data modeling, KPI cards, slicers, drill-through reports, bookmarking, and PDF export are all features of Power BI.
- Callbacks for dynamic interactivity, chatbot integration, interactive visualizations, and adaptable layout using Dash Bootstrap are all features of Python Dash.
- For processing datasets and creating a variety of charts (donut, scatter, heatmap, line, bar, and box), use Pandas & Plotly Express.
- NLP and speech recognition libraries: For interpreting voice and text queries from chatbots.
- Gmail App Passwords (SMTP): For safe email notifications.

1.3.3 Exclusions:

- The chatbot does not support voice-based interaction and is restricted to predefined query categories.
- As of right now, the alert system is email-based and excludes in-app notifications and SMS.
- Although it may be expanded in the future, machine learning-based predictive modeling is not the project's primary focus.

This scope guarantees that the project stays concentrated on producing a workable, useful prototype that truly improves HR operations and can be improved in response to corporate requirements.

1.4 Need for the Study

The role of human resources in the modern workplace has changed from being largely administrative to playing a strategic role in accomplishing business goals. A greater dependence on data analytics to comprehend worker dynamics, foresee problems, and put proactive remedies into action has resulted from this growth.

1.4.1 Critical challenges of HR operations

- Reliance on static reports causes a delay in accessing precise workforce insights.
- Absence of interactive, centralized tools for tracking various HR metrics
- Time-consuming, manual procedures for creating and disseminating reports; unable to promptly identify retention risks
- Restricted data access for HR staff who are not technical
- By creating a dynamic HR Analytics Dashboard with alerts and a bot, this project fills in these gaps.
- Update status notifications, manual yet regulated email alerting for retention hazards, real-time data visualization, and sophisticated filtering features are all integrated into a single platform by the solution.

1.4.2 The need for this study arises from the following key drivers:

- **Proactive Talent Management:** Reducing turnover and the expenses that come with it is made possible by the capacity to identify high-risk personnel before they depart.
- **Improved Decision-Making Speed:** HR decisions are made using the most recent data thanks to real-time dashboards and update notifications.
- **Effective contact:** Targeted contact with stakeholders is made possible by manual trigger-based email alerts, which spare them from receiving pointless messages.

- **Data Accessibility:** Chatbot integration and filters enable all HR team members, irrespective of technical proficiency, to obtain pertinent information promptly.
- **Scalability for Future Use:** The dashboard's modular design makes it simple to modify for other HR tasks or integrate with real-time HRMS data in the future.

Therefore, this study is crucial to bridging the gap between unprocessed HR data and useful workforce intelligence, thereby enhancing the usability and strategic effect of HR analytics.

CHAPTER 2: CONCEPTUAL FRAMEWORK OF THE TOPIC

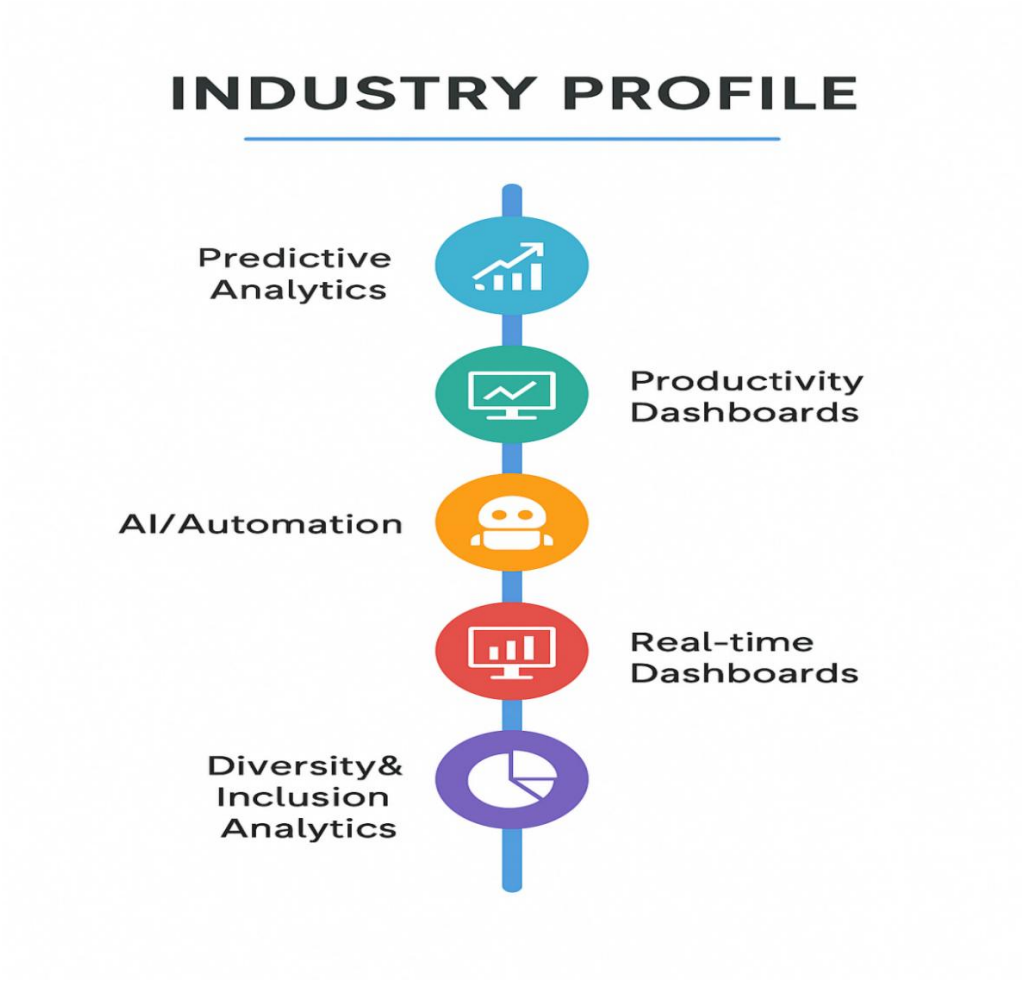
2.1 Industry Profile

The Human Resources analytics industry is a fast-emerging sector under the larger umbrella of business intelligence and data analytics. It deals with the systematic measurement, analysis, and interpretation of data about the workforce for enhancing organizational performance.

Historically, HR functions used to be dependent on manual reporting and descriptive statistics. But with the improvement in data visualization tools, machine learning algorithms, and cloud computing, HR analytics has become a proactive, strategic role.

2.1.1 Current trends in industry

- **Predictive Workforce Analytics:** Utilizing past employee data to predict attrition, performance patterns, and skill shortages.
- **Automation and AI Integration:** Applying bots, chat assistants, and automated notifications to minimize manual intervention in HR processes.



- **Self-Service Analytics:** Equipping HR staff to create insights independently without relying on IT staff.
- **Diversity and Inclusion Metrics:** Measuring and enhancing workforce diversity using analytics-based hiring and retention initiatives.
- **Real-Time Dashboards:** Providing decision-makers with real-time access to current workforce metrics.

Internationally, HR analytics usage is fueled by the growing imperative to control turnover, enhance employee engagement, and streamline hiring. Here, dashboards with built-in alerts and bots stand as essential tools for contemporary HR functions, filling the gap between unprocessed data and actionable information.

2.2 Dashboard Concept and Design Principles

A dashboard is a unified, graphical interface presenting data in a structured and interactive form, allowing decision-makers to easily interpret trends, patterns, and anomalies. In HR analytics, dashboards show the important workforce metrics — including employee demographics, retention risk rates, hiring patterns, and departmental allocation — in an accessible as well as actionable way.

2.2.1 Development Process in This Project:

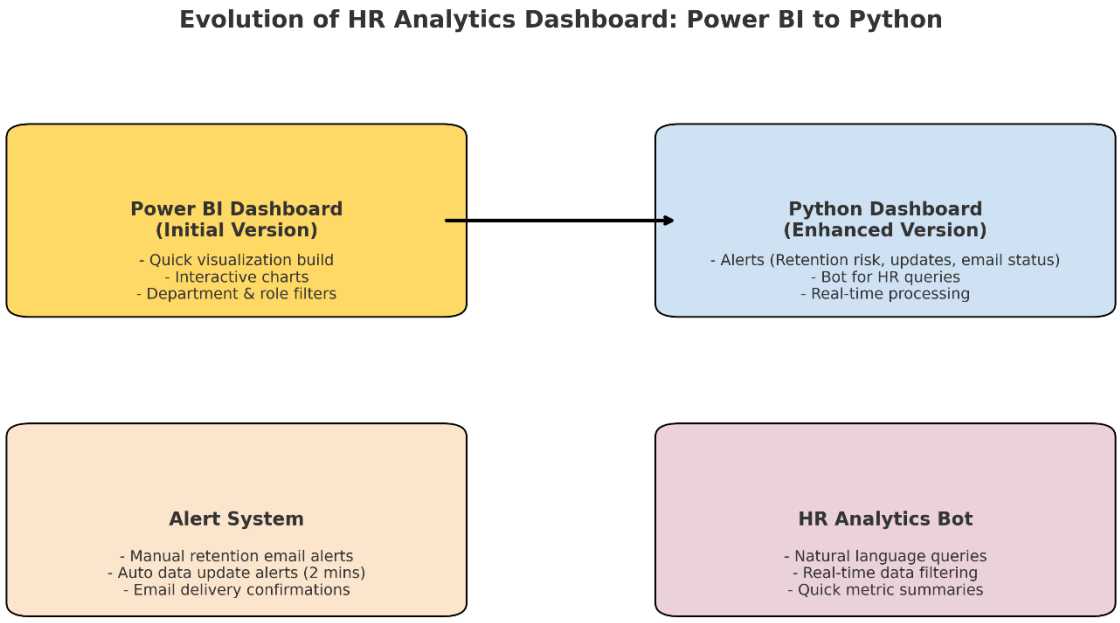
The initial version of the HR Analytics Dashboard was designed in Microsoft Power BI. This version prioritized rapid visualization development, leveraging Power BI's strong capabilities in connecting to multiple data sources, building interactive charts, and applying dynamic filters. It allowed HR teams to gain instant insights into employee data without complex setup.

But with changing project needs, two new functionalities were added — manual and automated alert systems and conversational bot interaction. The native Power BI environment restricted innovation in these aspects, so the dashboard logic was shifted to Python. With Python libraries like Plotly Dash, Pandas, and Flask, a bespoke dashboard was built that had all the visual aspects of the Power BI one, but added new interactive and automation features.

2.2.2 Key Design Principles Applied:

- **Clarity & Readability:** KPIs and charts were designed to be uncluttered, with easy-to-understand color coding for rapid interpretation.
- **User-Centric Relevance:** Only HR decision-support metrics were presented, for example, retention risk and employee breakdown by department.
- **Interactivity:** Department, gender, hire date, and job title filters were provided to facilitate customized analysis.

- **Real-Time Awareness:** An automatic status update alert every 2 minutes was added, indicating if the data shown is up-to-date.
- **Platform Flexibility:** Shifting from Power BI to Python offered greater flexibility, specifically in alert and bot integration.
- **Action Orientation:** The dashboard was not only meant to present information but also to aid decision-making by emphasizing high-risk cases.



The transition from Power BI to Python exemplifies the flexibility of the dashboard idea — beginning with a strong BI platform for rapid deployment and subsequently evolving into a completely personalized, automation-optimized solution.

2.3 Alerts and Bot Ideas in HR Analytics

2.3.1 Alerts in HR Analytics

Alerts are focused notifications that notify stakeholders of major fluctuations or occurrences in employee data, enabling timely action. There were three alert systems in this project embedded in the Python dashboard:

- **Retention Risk Email Alerts:** Manually triggered by clicking the "Send Email" button by the admin. This delivers a formal report to specified recipients regarding employees with high retention risk, avoiding unwanted automated emails and making sure that the alerts are meaningful and purposeful.

- **Dashboard Update Status Alerts:** Automatically created every 2 minutes to notify users whether the dashboard data source has been refreshed. This assists HR teams in ensuring decisions are being made on current information.
- **Email Delivery Status Alerts:** Give confirmation on whether retention risk alert emails were delivered successfully or if there were errors in the process.

The manual trigger mechanism makes sure that email notifications stay high-value communications rather than becoming background noise, while real-time update and delivery status notification keeps data monitoring transparent.

2.3.2 Bot Ideas in HR Analytics:

An HR analytics bot is an automated helper that enables users to engage with the dashboard using natural language queries. In the Python implementation of this project, the bot was programmed to:

- Provide HR-specific questions in text format (i.e., "List employees in the Marketing department who were hired after 2020").
- Implement real-time data filtering without the need for manual chart browsing.
- Abstract metrics like gender diversity, department headcount, and retention risk distribution.

With the integration of the bot with the alert system, the dashboard is no longer a passive data viewer but becomes an active decision-support tool. The bot enables HR personnel to retrieve information without acquiring expertise in advanced technical skills, while alerts notify them of significant workforce developments at the appropriate time.

2.4 Integration of Chatbot in HR Analytics

The incorporation of a chatbot into HR analytics converts the dashboard from a fixed visualization tool to an interactive digital aide. Rather than having to navigate several charts, users can just type or voice out questions in natural language and immediately get corresponding insights.

2.4.1 Reason for Chatbot Integration:

- To allow non-technical HR personnel to derive data-driven information without involving manual filtering or extensive navigation.
- To deliver an interactive and quick method of interacting with workforce metrics, lowering the reliance on analysts.
- To automate repetitive tasks like searching for employee records, reviewing retention risk lists, or grouping diversity statistics.

2.4.2 Functionalities in This Project:

The chatbot was integrated within the Python-driven dashboard and directly tied to the same sets of data driving the visual interface.

Natural Language Queries: Users can ask for data like "Show employees in Sales with retention risk greater than 70%" or "List hires subsequent to January 2022 in IT".

Real-Time Filtering: Department, gender, hire date, and job title filters can be applied in real time, according to user requests, without manually fiddling with drop-down menus.

Automated Summaries: The bot can generate on-the-fly summaries like overall headcount, retention risk distribution, or hiring patterns over time.

Accessibility Across Devices: The chatbot is a part of the same web-based dashboard, enabling use from desktop or mobile without extra installations.

The chatbot integration gives a more human-oriented analytics experience, enabling HR professionals to spend more time on decision-making instead of navigating data.

2.5 Tools and Techniques Used

The creation of the HR Analytics Dashboard, as well as its alerts and chatbot, called for the integration of data processing tools, visualization platforms, and automation methods. These tools were chosen for their adequacy to handle interactive analytics, alert management, and conversational interface development.

2.5.1 Core Tools Utilized:

- **Power BI:** Employed for the first dashboard prototype because of its quick visualization ability, inherent connectors, and drag-and-drop-friendly interface.
- **Python:** Chosen for the improved version to enable complete customisation, high-level automation, and inclusion of alerting and chatbot functionality.
- **Pandas:** Used to clean, transform, and filter data.
- **Plotly Dash:** Used to create the interactive web-based dashboard UI.
- **Email Automation (SMTP & Python Libraries):** Used to send retention risk alerts to the admin upon triggering.
- **Scheduler Functions:** Used to execute periodical checks every 2 minutes to check whether dashboard data is current.
- **Natural Language Processing (NLP) Libraries:** To support interpretation of chatbot queries and conversion of plain-text user input into database queries.

2.5.2 Techniques Used:

- **Data Filtering:** Multi-criteria filtering based on department, gender, hire date, and job title to enable focused insights.
- **Conditional Alerting:** Manual trigger on retention risk email alerts to prevent excessive automated notifications.
- **Real-Time Update Verification:** Automatic checking for status to ensure displayed data is up-to-date and accurate.
- **Conversational Query Processing:** User query parsing and dynamically modifying dashboard graphics or delivering text-based output.

By fusing business intelligence principles with bespoke-coded automation and conversational artificial intelligence, the project provides a product that is both visually sophisticated and operationally astute, a contemporary example of how HR analytics can be pushed to address actual decision-making requirements.

CHAPTER 3 COMPANY PROFILE

3.1. Innodatatics

Innodatatics is a Hyderabad company specializing in analytics and artificial intelligence (AI) solutions with a mission to empower organizations in converting raw data into valuable insights. It is headquartered at T-Hub Phase 2, Inorbit Mall Road, Madhapur, Hyderabad, Telangana – 500081, which is India's one of the largest innovation centers. This being its ecosystem enables Innodatatics to work alongside startups, enterprises, and institutions of academia to fuel data-driven innovation.

Innodatatics offers a wide range of services across sectors, allowing businesses to embrace the practice of smarter decision-making and operational efficiency. With expertise in data science, machine learning, and business intelligence, Innodatatics enables organizations to lead in the face of growing competition and technological advancements.

3.1.1 Leadership

The firm is guided by Mr. Shirish Kumar Gonala (Shirish G), the Founder and CEO of Innodatatics. He has played an integral role in formulating the firm's overall strategy and spearheading its growth as a credible organization for AI and analytics services. Innodatatics, under his leadership, has become renowned for providing pragmatic, high-impact solutions suited to various industries.

Shirish G's leadership philosophy centers around innovation, agility, and research-based problem-solving, and this has made the company earn recognitions like being one of the "20 Most Promising Data Analytics Solution Providers" in 2018. His tenure as a CEO speaks to a vision of marrying technology with practical applications and turning Innodatatics into a significant pillar in India's data analytics and AI value chain.

3.1.2 Vision, Mission & Values

Vision

Be ahead and keep searching for the most futuristic trends and possibilities & to develop world-class Solutions.

Mission

To be among the best go-to partners for companies in solving simple to complex problems.

Values

Besides solving business issues, work hard to leave a positive social impact and help drive the change in society

3.1.3 Core Service Areas

1. **Machine Learning and Artificial Intelligence (AI) Analytics**
   Innodatatics creates AI models and machine learning algorithms to assist organizations to forecast trends, automate processes, and make better decisions. These solutions enhance efficiency and lessen costs, thus making organizations more responsive to changes in the market.
2. **Business Intelligence (BI) Analytics**
   Through BI tools and structures, Innodatatics enables customers to see through data and track important performance measures. The information aids in efficient strategy development and business planning, which makes organizations develop their operations around lasting objectives.
3. **Retail Analytics**
   The firm empowers retail companies, particularly small and medium-sized companies, with a 360-degree view of shoppers. Through big data and analytical thinking, Innodatatics supports retailers in deepening their understanding of customers, optimizing stock, and making the shopping experience smoother.
4. **Life Sciences and Healthcare Analytics**
   Innodatatics brings domain-specific analytics to healthcare and life sciences. This encompasses solutions that enhance the care of patients, assist clinical research, and optimize operations, ultimately leading to healthier outcomes.
5. **Internet of Things (IoT) Applications**
   The firm develops and crafts IoT-enterprise and consumer applications. The solutions involve smart devices and sensors that allow businesses to utilize real-time data for improved operations, predictive maintenance, and customer interaction.
6. **Social Media Analytics**
   Using text mining and natural language processing (NLP), Innodatatics examines unstructured data from social media. These insights assist organizations in monitoring customer sentiment, brand reputation tracking, and formulating effective marketing strategies.
7. **Finance and Insurance Analytics**
   Innodatatics assists insurance and finance institutions with analytical solutions that segment customers, identify risks, and enhance decision-making. The services deliver improved customer experience coupled with enhanced regulatory compliance as well as financial performance.

3.1.4 Market Position and Strengths

Innodatatics has established itself as a maverick and innovation-led provider of analytics. By providing solutions that span industries including retail, healthcare, finance, and technology, the company shows its capability to apply analytics to practical problems. Its presence in Hyderabad's T-Hub ecosystem also solidifies its competitive edge, as it allows collaboration with some of the most progressive companies and innovators in India. The primary strengths of the company are its capacity to implement data-informed strategies, AI-based solutions, and sector-specific insights that enable long-term organizational development.

3.2 Internship Division

I was assigned to Innodatatics' Business Analytics division, within the HR Analytics team, for the duration of the internship. This department is dedicated to harnessing the power of data to enhance best human resource management practices in client organizations through actionable insights concerning employee engagement, performance, and retention.

The HR Analytics team consists of data scientists, business analysts, and domain experts from HR who work together to conceptualize and develop analytics solutions that drive HR decision-making. The team leverages sophisticated tools like Power BI for dashboard development and Python frameworks like Dash for bespoke interactive visualizations and alerting systems.

I was mentored and guided by experienced practitioners during my internship, with regular team sessions to review project progress, issues, and feedback. This teamwork allowed me to put theoretical concepts in practice while learning from hands-on experience with actual HR data issues.

3.3 Internship Role and Responsibilities

While working as an intern at Innodatatics, I was placed in the HR Analytics team with a chief role of creating and developing an interactive HR analytics dashboard coupled with automated notifications and a chatbot. My task was a combination of data analysis, dashboard designing, coding, and testing tasks.

3.3.1 Major responsibilities included:

- **Data Preparation and Cleaning**
  I worked intensively with employee datasets to preprocess and clean the data, fixing missing values, data inconsistencies, and formatting problems to provide accuracy and reliability for analysis.

- **HR Key Performance Indicators (KPIs) definition:**
  Working with HR specialists and team members, I assisted in determining and calculating key HR figures such as employee retention risk scores, attrition rates, and performance measures that underlay the dashboard.
- **Plan and Design Dashboard Layout**
  I helped conceptualize the structure of the dashboard by choosing the most applicable visualizations like bar charts, pie charts, and heatmaps to deliver insights effectively to HR managers and stakeholders.
- **Development of Alerts System:**
  With Python and email automation technologies, I designed automatic and manual alert systems for informing HR staff about important employee risks and milestones. That involved creating SMTP email triggers and combining alert logic with dashboard information.
- **Chatbot Integration:**
  I created a natural language processing (NLP)-powered chatbot on the dashboard that was capable of responding to user questions pertinent to HR metrics. This meant writing the chatbot logic, training it on example questions, and making it capable of resolving both common and bespoke questions.
- **Testing and Documentation:**
  I conducted intensive testing to ensure the correctness of data visualizations, alert triggers, and responses from the chatbot. I also developed thorough documentation explaining the dashboard structure, codebase, and user guide to ensure smooth future maintenance.

I worked closely with team members during the internship, engaged in sprint reviews, and integrated feedback to improve the functionality and usability of the dashboard continuously.

CHAPTER 4 RESEARCH METHODOLOGY

4.1 Problem Statement

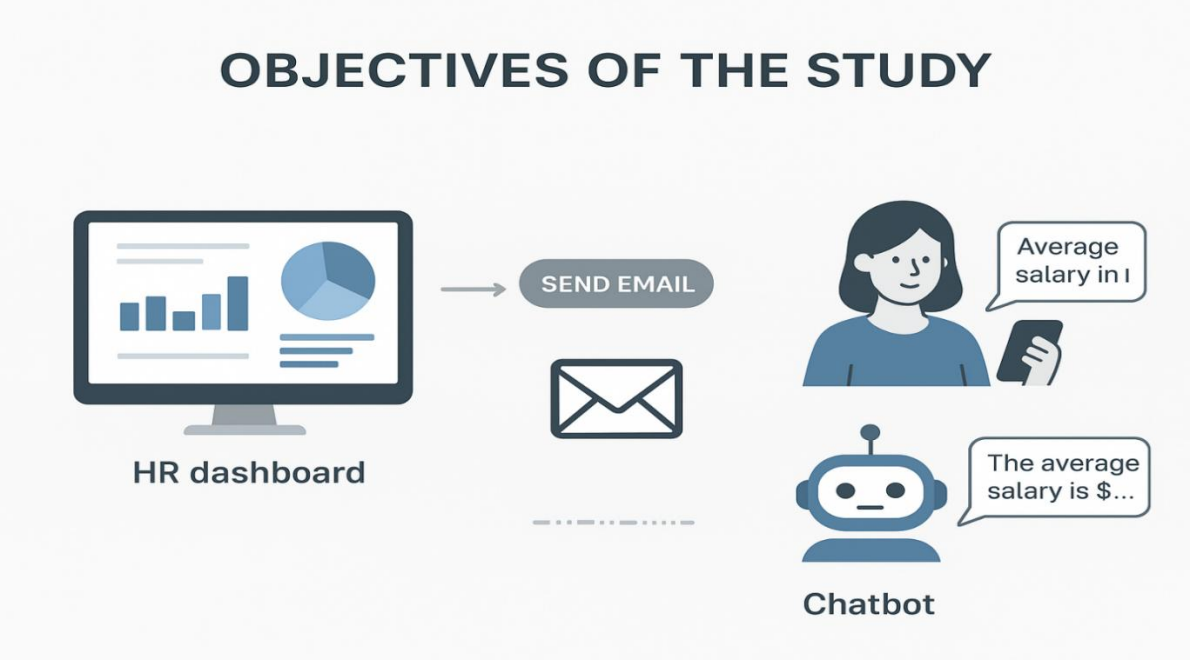
Innodatatics' HR department needed a predictive and interactive analytics solution that would be able to move beyond static reporting. Classical HR dashboards were delivering historical information but without real-time alerts and prediction-driven insights required to drive proactive decision-making. Moreover, HR managers also required a conversational interface to instantly ask questions about data without having to manually switch through several reports. The objective was to create a comprehensive HR Analytics Dashboard with alerts and chatbot capabilities embedded within it to enhance employee retention initiatives, workforce planning, and HR overall efficiency.

4.2 Objectives of the Study

The core objective of this internship study is to design and develop an HR analytics dashboard that simplifies workforce data interpretation, empowers HR decision-making, and facilitates meaningful interaction through alerts and conversational tools. The study titled “HR Analytics Dashboard integrated with Alerts and Chatbot” concentrates on building a smart, scalable system that enables effective data monitoring and communication.

The specific objectives of the study are as follows:

1. **To design and develop a dynamic HR analytics dashboard for visualizing key workforce metrics:** Important HR data, including staff numbers, departmental distribution, gender composition, job titles, recruitment dates, and retention risk levels, are displayed in an interactive and informative manner on the dashboard. The HR team may see trends and anomalies in different areas of the company with the use of these representations.
2. **To implement a manual email alert system to notify high retention risk cases instead of sending automatic alerts:** The HR administrator can manually initiate an email by using the user-controlled "Send Email" button on the dashboard. A carefully selected list of workers who have been determined to have a high likelihood of attrition is included in this email. This method allows the administrator complete control over when alerts are sent, guarantees intentional communication, and prevents needless alerts.



3. **To incorporate real-time visual alerts for dashboard refresh and email status:** To show whether the dashboard data is current, the system has an automated visual alert that runs every two minutes. To ensure transparency in the alerting process, an alert also verifies whether the manual email was sent successfully or if there were any problems.

4. **To enable advanced filter functionalities for detailed analysis:** Several slicers and filter options are supported by the dashboard, enabling users to refine results according to parameters like: Department, Gender, Date of Hire, Job Title, Retention Risk Level . With the help of these filters, users can perform in-depth analysis and obtain more individualized insights.

5. **To integrate a smart chatbot for conversational data access:** A built-in chatbot on the dashboard understands customer inquiries in natural language and provides data-driven responses. It covers standard HR inquiries such as:

    a. Total Employees in each department

    b. List top 5 employees with highest performance.

    c. Average salary by job title.

    This feature promotes self-service analytics inside the HR staff and makes it simple for non-technical users to study data.

4.3 Methodology

The study's methodology describes the methodical steps required to create, develop, and deploy the HR Analytics Dashboard integrated with Alerts and Chatbot. The following stages comprised the project's execution:

4.3.1 Analysis of Requirements

- Key HR variables, including staff demographics, department distribution, recruitment dates, job titles, and retention risk levels, were identified and will be incorporated into the dashboard.
- Outlined the functional needs for chatbot capabilities, complex filters, update status notifications, and manual email alerts.
- Reviewed the technologies and tools that are available for integration, including as Python for automation tasks and Power BI for visualization.

4.3.2 Data Collection and Preparation

- Collected anonymized or simulated HR datasets to preserve data privacy but allow realistic testing.
- Cleaned and converted raw data for accuracy, uniformity, and integration with dashboard tools.
- Organized datasets to contain necessary columns for filters and analytics (e.g., department, gender, hire date, job title, retention risk).

4.3.3 Dashboard Design and Development

- Constructed an interactive dashboard structure in Power BI, grouping metrics logically and navigating intuitively.
- Tuned advanced filters (department, gender, job title, hire date, level of retention risk) to perform extensive analysis.
- Designed visualizations like bar charts, pie charts, and KPIs to tell effective data stories.

4.3.4 Alert System Implementation

- Implemented a manual email alert feature in Python, coupled with the dashboard to send high retention risk employee information when the Send Email button was clicked.
- Set up update status notifications that update every 2 minutes to reflect if the data source has been updated.
- Set up email status alerts to verify success or signal errors upon sending notifications.

4.3.5 Chatbot Integration

- Created a Python-based chatbot with natural language query support to retrieve HR insights directly from the dataset.
- Trained the chatbot using predefined HR-related questions for quicker and relevant answers.

4.3.6 Testing and Validation

- Performed functionality testing to verify correct display of metrics, alert functioning, and accuracy of responses by the chatbot.
- Confirmed email delivery and status alerts for various situations.
- Gathered user feedback to improve dashboard usability and alert workflows.

4.3.7 Documentation and Finalization

- Generated detailed documentation for system design, functionality, and usage instructions.
- Assembled the internship report to reflect the objectives, methodology, and findings of the study.

This systematic approach allowed the project to be designed in a systematic, effective, and quality-oriented process, producing a tool that reflects HR operational requirements.

CHAPTER 5: DATA ANALYSIS AND FINDINGS

5.1 Dashboard Development Process

The creation of the final dashboard took a systematic, step-by-step process in order to be accurate, functional, and easy to use.

Step 1: Data Preprocessing

- Extracted employee data from the HR system, covering demographics, performance, department, salary, and tenure.
- Sanitized and standardized datasets by eliminating duplicates, addressing missing values, and maintaining uniform formats.
- Utilized data transformation methods to ready the data for visualization as well as machine learning models employed for retention risk forecasting.

Step 2: Building HR KPIs

- Selected pertinent performance indicators applicable to HR like Attrition Rate, Average Tenure, Employee Satisfaction Scores, Training Hours, and Retention Risk Scores.
- Aligned KPIs to the organization's HR goals to make insights actionable.

Step 3: Dashboard Layout Designing

- First created a prototype dashboard in Power BI to display HR KPIs and solicit stakeholders' feedback.
- Redesigned the dashboard in Python (Dash framework) based on feedback to support detailed customizations, real-time alerts, and integration with a chatbot.
- Designed a clean and user-friendly layout divided into two sections:
- On the Top: Alerts and Chatbot
- Then: KPIs and charts

Step 4: Alerts Logic Implementation

- Developed conditional logic to flag high-risk employees for attrition using predictive model outcomes.
- Developed automatic alerts (triggers when thresholds are reached) and manual email alerts to HR managers.
- Embedded alerts panel within the dashboard so that all warnings became conspicuous.

Step 5: Integrating Chatbot

- Installed a Natural Language Processing (NLP)-driven chatbot into the dashboard.

- Allowed the chatbot to respond to pre-defined HR questions (e.g., "List top 5 performers in Sales") and process dynamic queries with aggregation, filtering, and ranking.
- Linked chatbot responses to real-time datasets, providing real-time responses.

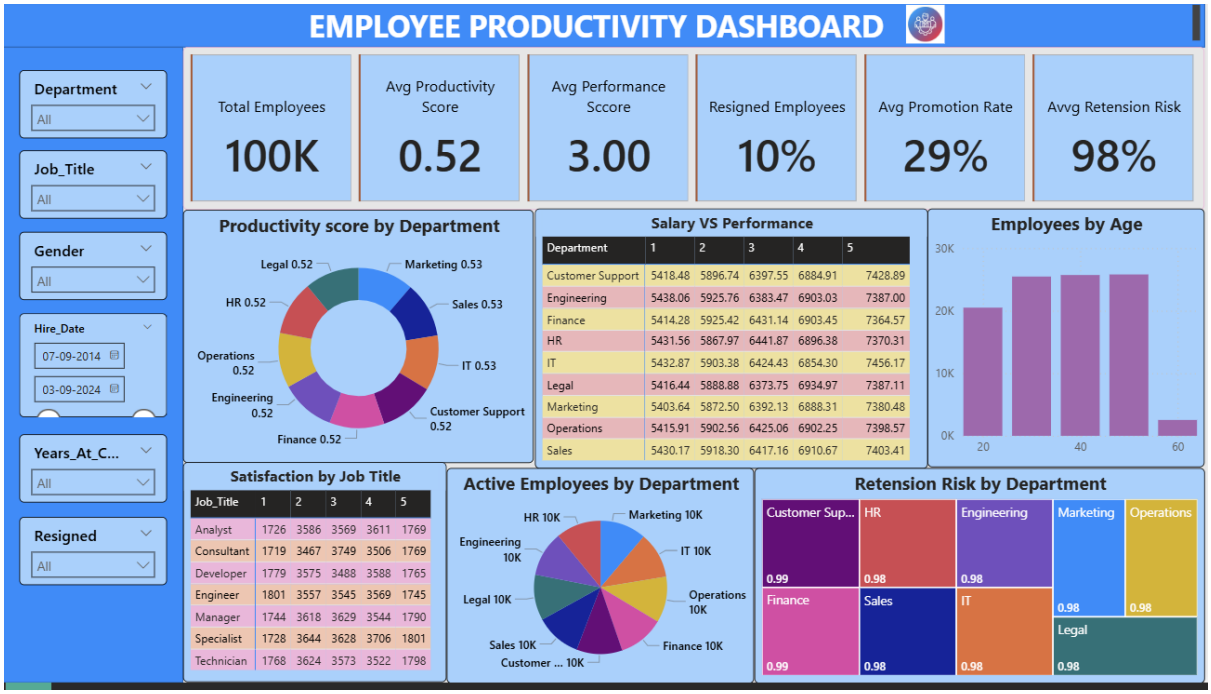
5.2 Final Dashboard Key Features

The final HR Analytics Dashboard had various advanced features added to make it more usable and decision-making-friendly:

1. **Real-Time Visualizations**
    - Interactive graphs and metrics dynamically refreshing with the most recent HR data.
    - KPI drill-down feature for department-wise and employee-level data.
2. **Indicators of Retention Risk**
    - Visual indicators on employees who are identified as at-risk via predictive analytics.
    - Risk scores divided into low, medium, and high ranges for rapid prioritization.
3. **Alerts Panel**
    - Shows all generated alerts in one place.
    - Facilitates manual examination and automatic emailing of the alerts to the concerned HR staff.
4. **NLP Chatbot**
    - Provides support for both pre-defined queries and user-defined input.
    - Deals with intricate HR-related queries such as "Average salary of the employees in the IT department with over 5 years of service."
    - Serves as a conversational interface, saving time spent on browsing through several reports.

5.3 Screenshots & Key Findings

5.3.1 Initial Dashboard in Power Bi



5.3.1.1 Insights Derived from the Dashboard

The initial Power BI dashboard provided valuable insights into the workforce, highlighting both organizational strengths and areas that required urgent managerial attention. The following findings emerged from the analysis:

1. **Overall Workforce Snapshot**

   The company has almost 100,000 workers spread across different departments and job positions. With a mean productivity rating of 0.52 and mean performance level of 3.0, the employees reflect average efficiency. Yet, the rate of resignation at 10% indicates a persistent rate of attrition that cannot be ignored.

2. **Retention Risk Patterns**

   Retention policy showed concerning findings, with the mean retention risk even reaching up to 98%. Some departments, like Customer Support and Finance, consistently reflected higher risks (0.99), while some others, like Legal and Operations, also reflected some vulnerability. The above results highlighted the necessity for prospective and predictive retention strategies.

3. **Departmental Productivity and Performance**

   Productivity was fairly stable by department (~0.52–0.53). Interestingly, Marketing (0.53) had slightly more robust results than others. Still, incompatibilities between salary and performance occurred. For example, while salaries for Customer Support were positively aligned with performance, departments like HR and IT had weaker

correlations, which could indicate a lack of alignment between employee rewards and efforts.

4. **Demographic Trends**

   The age structure revealed that most workers were massed in the 30–50 years age range, indicating a consistent mid-career population. In contrast, the 60+ category had very little representation, which is indicative of little late-career presence and potentially inadequate knowledge transfer arrangements.

5. **Job Satisfaction Insights**

   Job satisfaction scores analysis revealed differences by role. Managers and Analysts had mid-to-high levels of satisfaction, while Consultants and Specialists had differing patterns. This variation indicated the impact of factors unique to roles on employee engagement and satisfaction.

6. **Employee Distribution**

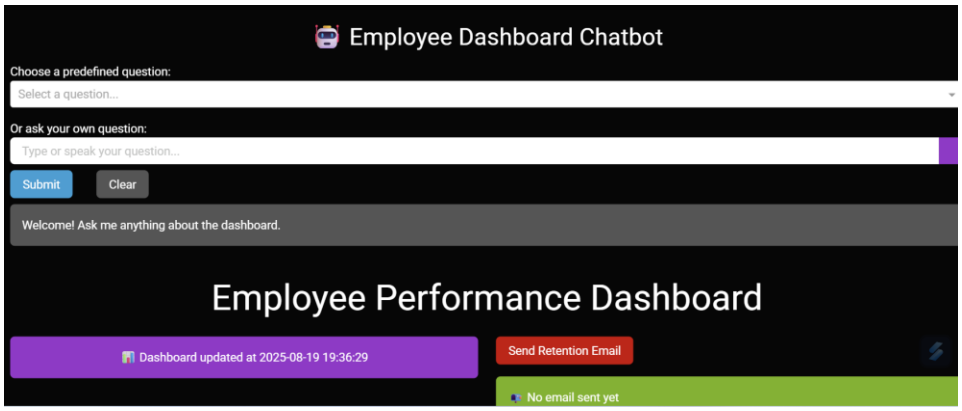
   Worker strength looked evenly distributed among departments (~10,000 workers each). Although this provided equal workforce distribution, it also meant that attrition or underperformance in any one department could have a large-scale influence on overall organizational performance.

5.3.1.2 Overview of Findings:

The dashboard illustrated how, although organizational levels of productivity remained steady, the retention risks, pay-performance inequalities, and role-based satisfaction disparities were key HR issues. Such findings formed the basis to include predictive warnings and chatbot-enabled interactivity to facilitate improved decision-making.

5.3.2 Python Dashboard

5.3.2.1 Chatbot and alerts at initial stage



Insights

At the first level of the Python HR Analytics Dashboard, the addition of both a chatbot interface and alert features added more interactivity to the visualization compared to the static Power BI dashboard.

Chatbot Interface:

A separate chatbot panel was brought in with the capability to accept both predefined and custom queries. This made it possible for HR managers to either choose from a list of standard questions or type in their own queries for personalized insights. The conversational welcome message, "Ask me anything about the dashboard", facilitated user engagement and minimized the need for manual filter navigation.

Dashboard Update Alerts:

The system featured a real-time update notification showing the last refresh date time (e.g., Dashboard updated at 2025-08-19 18:36:20). This helped ensure that HR professionals were constantly notified of the recency of the data, thus minimizing the risks of decision-making using stale data.

Retention Email Trigger:

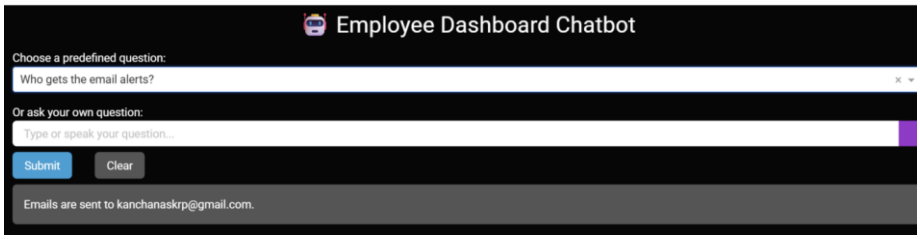
A manual email notification button ("Send Retention Email") was provided, which enabled the administrator to selectively send communication about high retention-risk employees. The extra control meant that email notifications would be sent only when necessary, preventing spam.

Email Status Transparency:

A green status bar in a clear manner showed whether or not an email had been sent (e.g., "No email sent yet"). This functionality enhanced responsibility and provided users assurance that retention alerts were properly enacted when triggered.

The first phase emphasized the dashboard's transformation from being a static analysis tool to an interactive, dynamic platform, wherein HR users were notified about data changes, were able to deal with email notifications effectively, and had at their disposal a conversational chatbot to navigate through insights.

5.3.2.2 Functionality of working chatbot - Predefined Query



Insights

The chatbot proved effective as it managed to respond to both predefined and self-created questions, giving HR managers flexibility when seeking insights.

Predefined Query:

The interface of the chatbot had an available drop-down for frequently asked questions. For instance, the pre-defined question "Who was the email sent to?" immediately gave the response "Emails were sent to: kanchanaskrp@gmail.com". This eradicated the requirement of tracking by hand and ensured the transparency of communication to the point where HR managers could always check the recipients of retention risk alert messages.

Custom Query:

The feature of the custom query allowed users to enter personalized questions like "average salary by department." The chatbot gave back a formatted table with yearly salary figures for various departments:

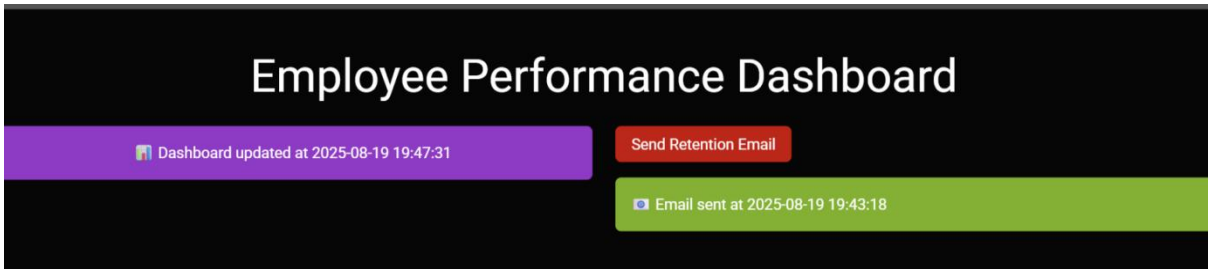
Department	Annual Salary
Customer Support	76846.58
Engineering	77006.96
Finance	76782.91
HR	76804.27
IT	76975.19
Legal	76695.3
Marketing	76534.29
Operations	76947.68
Sales	76957.85

This reinforces the chatbot's potential to not just process natural language input queries but also return data-intensive outputs in tabular format, further amplifying its function as an interactive HR analytics assistant.

Summary:

With pre-defined and ad-hoc queries, the chatbot was both effective and responsive, allowing HR users to gain instant access to routine information while facilitating advanced analysis through ad-hoc exploration.

5.3.2.3 Notifications and Email Status



Insights

Dashboard Status Panel and Alerts:

The dashboard had a live alerting capability to provide transparency of communication.

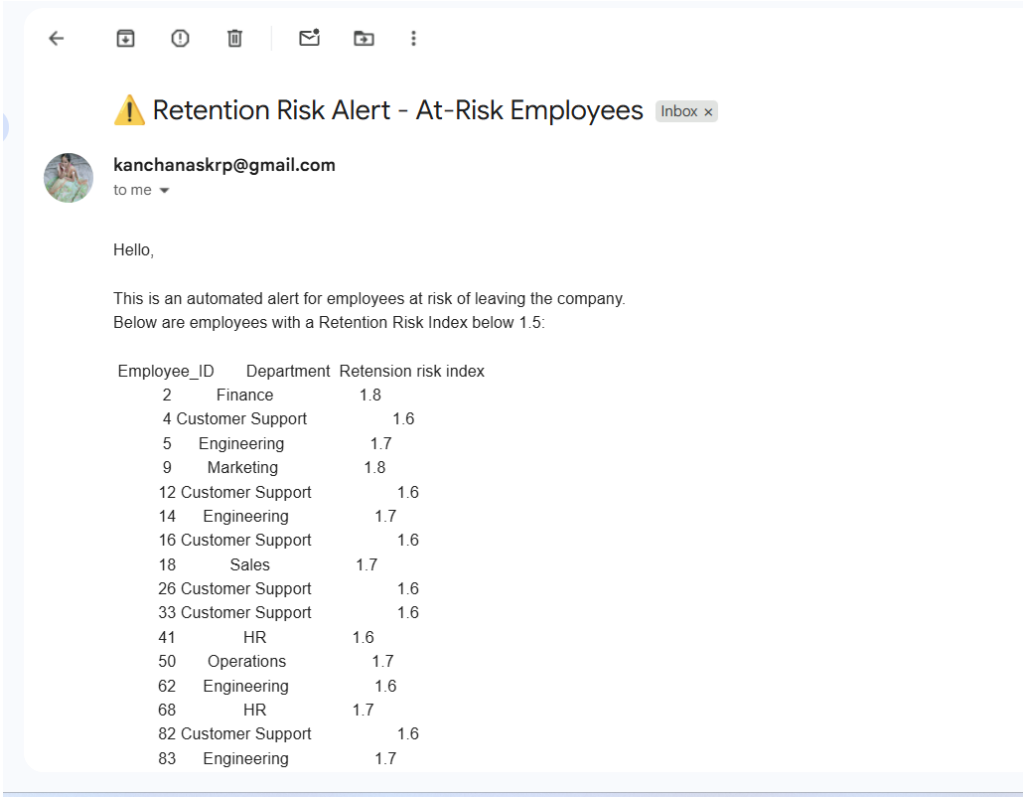
A purple banner indicated the time of last dashboard update to remind users when the data was last updated.

A green confirmation panel showed notifications like "Email sent successfully to HR admin", assuring that the retention risk alerts were triggered without fail.

This instant visual feedback also comforted users that the system of email alerts was operating properly, enhancing trust in the automation process.

Email Received Confirmation:

In addition to the status panel, the system automatically created and dispatched an email to the registered HR admin.



⚠️ Retention Risk Alert - At-Risk Employees Inbox ×

kanchanaskrp@gmail.com
to me

Hello,

This is an automated alert for employees at risk of leaving the company.
Below are employees with a Retention Risk Index below 1.5:

Employee_ID	Department	Retension risk index
2	Finance	1.8
4	Customer Support	1.6
5	Engineering	1.7
9	Marketing	1.8
12	Customer Support	1.6
14	Engineering	1.7
16	Customer Support	1.6
18	Sales	1.7
26	Customer Support	1.6
33	Customer Support	1.6
41	HR	1.6
50	Operations	1.7
62	Engineering	1.6
68	HR	1.7
82	Customer Support	1.6
83	Engineering	1.7

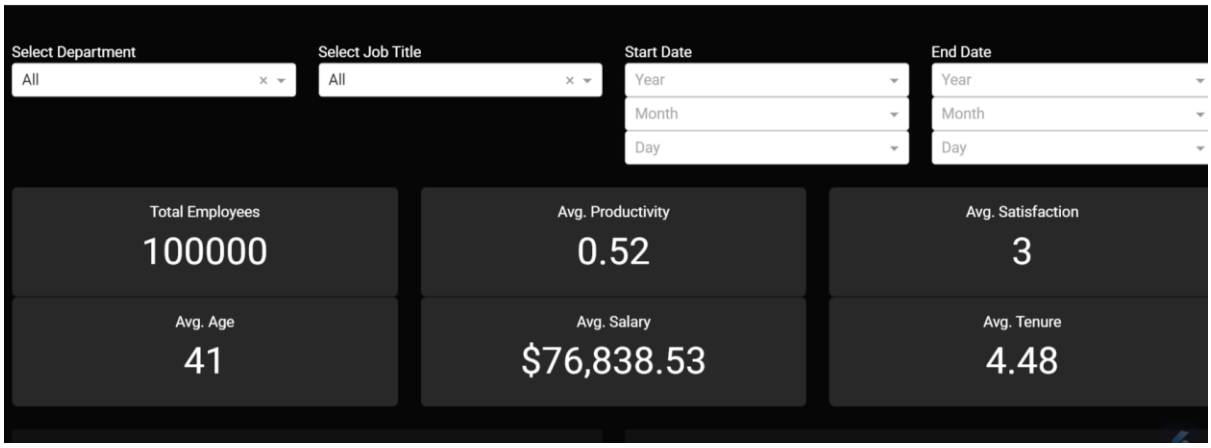
The email acted as an immediate escalation tool, providing HR stakeholders with actionable information in their email box without having to manually check the dashboard all the time.

Summary:

The double-sided mechanism of dashboard notifications and email confirmations guaranteed that administrators were instantly notified both within the platform and outside through

email. This enhanced accountability, reduced delays for HR interventions, and established a strong communication loop for managing employee retention risks.

5.3.2.4 KPIs and Filters



Insights

The dashboard offered several filters (Department, Job Title, Start Date, End Date) that allowed the HR managers to cut and slice employee data for more targeted insights. The KPIs at the top offered an overview of the workforce status:

- **Total Employees:** 100,000 – shows a big and diverse workforce.
- **Average Productivity Score:** 0.52 – presents average levels of productivity throughout the company.
- **Average Satisfaction:** 3.0 (out of 5) – indicates that employee satisfaction is at a steady but improvable level.
- **Average Salary:** $76,838.53 – provides a baseline for compensation analysis.
- **Average Age:** 41 years – indicates a mid-career prevalent workforce.
- **Average Tenure:** 4.48 years – indicates that employees tend to stay with the company for a moderate number of years before leaving.

Summary

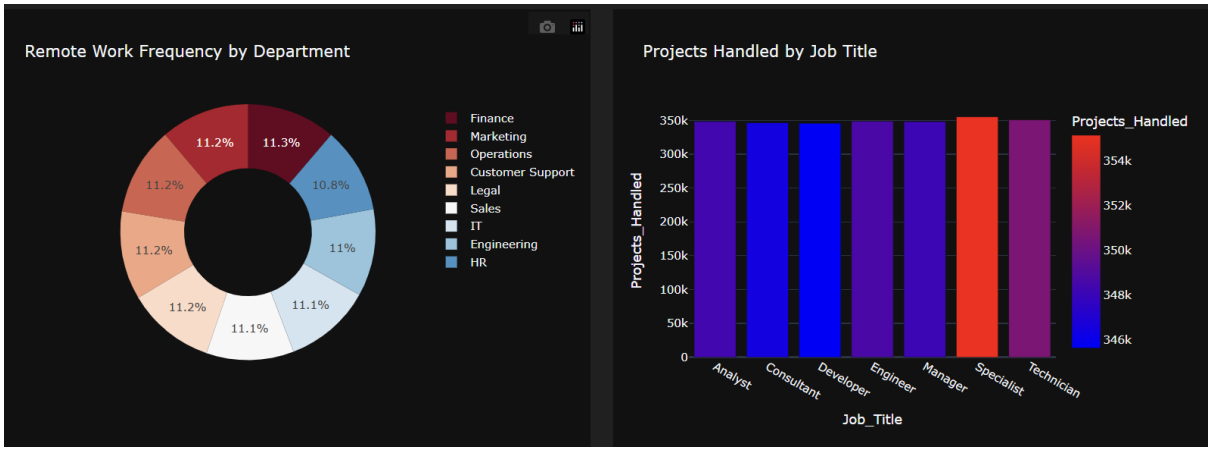
These KPIs acted as key performance metrics for HR, providing instant evaluation of organization well-being. The addition of filters facilitated the ability to perform agile, departmental, or time-enabled analysis, which made the dashboard extremely interactive and actionable.

5.3.2.5 Takeaways from Visuals

The visuals on the dashboard further enhanced HR insights with richer views:

1. Remote Work Frequency by Department:

Every department demonstrated nearly equal (approximately 11.1%) frequency of remote work distribution, which implies that remote work opportunities were evenly spread all over the organization with no serious bias.



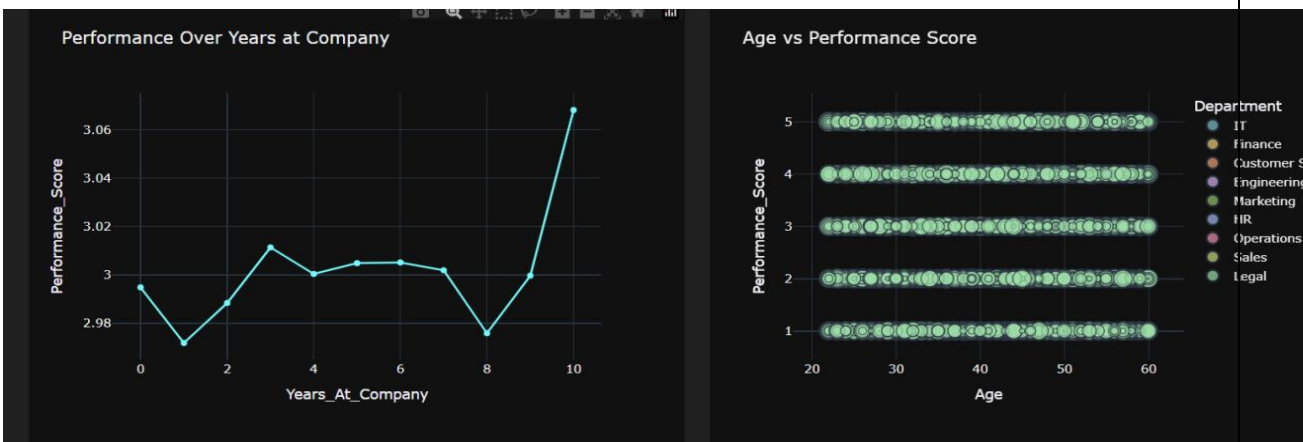
2. Projects Handled by Job Title:

The bar chart indicated almost uniform distribution of project allocation among job titles, providing equality in workload distribution. This equilibrium helps in averting employee burnout and providing equal opportunities for growth.

3.Performance Over Years at Company:

A trend chart illustrated how performance changed with years of tenure. The chart identified that early years revealed progressive improvement in performance, but the trend dipped after several years, reflecting the importance of ongoing learning initiatives to ensure long-term performance.

4



4.Age vs Performance Score (by Department):

This scatter plot showed the insights into performance variations across departments for different age groups. For instance, some departments had consistent performance irrespective of age, while others showed variation. This suggested that training or mentoring based on age could further improve performance.

5.Satisfaction by Department

The graph illustrated that the satisfaction of employee's department wise was generally around a moderate value of 3. Some of the departments such as Finance and IT exhibited greater variability, and others like HR and Marketing were more consistent. This indicated that some departments required specific attention and effort to be made to mitigate dissatisfaction.

6.Performance vs Satisfaction Heatmap

The heatmap also revealed that overall satisfaction and overall performance tended to be aligned. The majority of employees occupied mid-to-high ranges for both measurements, indicating that higher satisfaction usually accompanied better performance.

Summary of the Last Six Visuals

On all six graphs, the dashboard emphasized equity in telecommuting and project assignment, stable but mid-range employee satisfaction, and performance trends that enhanced in initial years but eventually flattened. Departmental differences in satisfaction and performance indicated areas of intervention, whereas the heatmap affirmed a positive relationship between satisfaction and productivity.

5.4 Power BI vs. Python Dashboard comparison

The research entailed creating dashboards on two platforms—Power BI and Python (Dash/Plotly)—to assess which platform was more appropriate for HR analytics. Both platforms effectively presented HR data but differed in their strengths and limitations based on usability, flexibility, and advanced functionality.

Power BI provided a user-friendly, very visual interface that facilitated fast dashboard development with minimal coding. Its drag-and-drop functionalities made it particularly useful for speedy visualization and top-level reporting. Nevertheless, Power BI was limited when it came to automation, customization, and integration into sophisticated machine learning workflows, which limited its flexibility for changing HR demands.

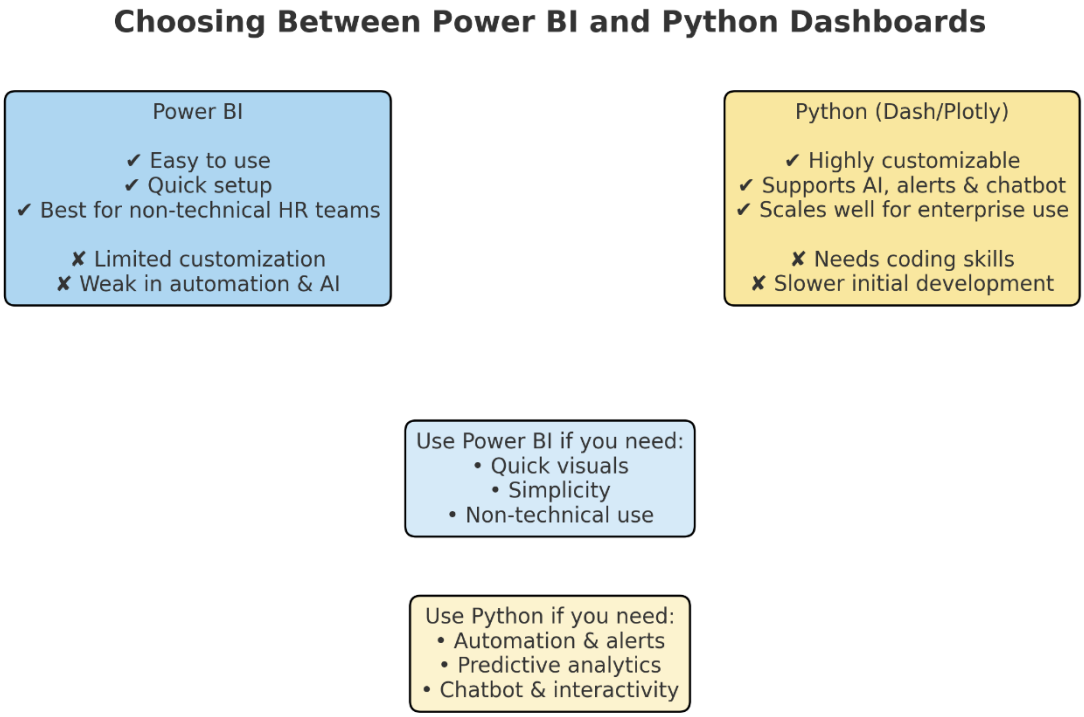
Conversely, the dashboard based on Python did call for coding skills but offered much more flexibility. It supported smooth embedding of alerts, chatbot, real-time updates, and sophisticated logic that Power BI could not efficiently process. The Python dashboards were also simpler to scale and incorporate predictive analytics but took much longer to develop and demanded much more technical expertise than Power BI.

5.4.1 Tabular Comparison between Power BI and Python Dashboards

Feature	Power BI Dashboard	Python Dashboard (Dash/Plotly)
Ease of Use	User-friendly, drag-and-drop, minimal technical skill needed.	Requires coding knowledge, less intuitive for beginners.
Development Speed	Fast for standard visuals and KPIs.	Slower to build due to coding and debugging requirements.
Customization	Limited customization options beyond built-in visuals.	Highly customizable, supports complex logic and unique visualizations.
Automation & Alerts	No direct real-time alerting; requires external setup.	Supports automated alerts, email triggers, and status updates.
Integration with AI/ML	Minimal support for predictive models.	Seamless integration with machine learning and NLP chatbots.
Scalability	Best for reporting at team/department level.	Scales better for enterprise-level analytics and advanced workflows.
Cost	Requires license/subscription.	Open-source and free (except hosting/maintenance costs).

Feature	Power BI Dashboard	Python Dashboard (Dash/Plotly)
Best Use Case	Quick visualization and reporting for HR managers.	Advanced analytics, real-time monitoring, and AI-driven HR insights.

In Summary, for the purpose of this internship project, although Power BI was a good initial candidate for rapidly developing the original dashboard and visualizing HR KPIs, the Python dashboard proved to be the better solution. Its features allowing real-time alerts, retention risk auto-notifications, and chatbot-based query handling made it much more suited for the goals of the project.



Thus, Power BI is suitable for fast, technical-free reporting, while for advanced HR analytics incorporating predictive and interactive capabilities, Python dashboards are the more prudent long-term option.

5.5 Challenges Encountered During the Internship

Working on both the Power BI dashboard and the HR Analytics dashboard based on Python was an immensely valuable experience, but it came with some setbacks. Because this was my initial attempt at designing such solutions from scratch, I faced numerous setbacks from technical to conceptual understanding. These setbacks served to enhance my learning process immensely.

5.5.1 Problems in Building the Power BI Dashboard

As I started working with Power BI, I found the platform easy to use at first due to its drag-and-drop nature, but as I went further, there were various challenges:

1. **Data Cleaning and Preparation**

   For the first time, I understood how important it is to pre-process raw HR data prior to importing in Power BI. Missing values, in-consistent formats (like dates and salary fields), and duplicate records caused confusion. At first, I assumed that Power BI would work directly with the raw data, but I soon came to realize that I had to spend considerable time in Excel and Power Query Editor to ready the data.

2. **Selecting the Appropriate KPIs**

   Since I was a new by, it didn't become apparent in the beginning what metrics would be the most effective for HR analytics. Initially, I included too many KPIs, so the dashboard became messy. With experience, I realized that employee satisfaction, risk of retention, tenure, and salary averages were much more effective than regular statistics.

3. **Layout and Design**

   Designing a professional and insightful layout was harder than expected. I initially placed visuals without much thought, but it quickly looked unorganized. Learning about dashboard design principles — such as simplicity, consistency, and logical flow — required trial and error.

4. **Limitations of Interactivity**

   I anticipated that Power BI would take care of interactive alerts automatically, but I quickly discovered that its capability was limited for real-time notifications. This caused me to reconsider the scope and culminated in the eventual shift towards the use of Python dashboards.

5.5.2 Challenge in Creating the Python Dashboard

Shifting to Python was even more difficult, as it required coding skills, patience, and debugging. As this was my first experience creating a dashboard with automation, I encountered several obstacles:

1. **Learning Curve in Python Dash and Plotly**

   First, I struggled to grasp the organization of a Dash application — how layouts, callbacks, and interactivity came together. It was overwhelming versus the graphical interface of Power BI. There were times when I had to take things back to basics, relearning Python fundamentals in order to make progress.

2. Integrating Alerts and Email Notifications

Creating the alert logic was an entirely new experience. I was initially unclear how to implement real-time update checks and email triggers. Sending an automated email based on high retention risk sounded easy in theory, but implementing it and having it work effectively required multiple attempts. Getting the email status and confirmation message displayed correctly on the dashboard required several tests.

3. Chatbot Integration

Integrating the chatbot was the most thrilling but challenging task. As I had no experience with Natural Language Processing (NLP) or pre-defined/custom queries, I first felt confused. My initial efforts resulted in the chatbot misreading queries or displaying blank outputs. Over time, I learned to create helper functions, manage synonyms, and display outputs in table formats to enhance the meaning of the response.

4. Debugging and Errors

In contrast to Power BI, debugging was a persistent requirement for Python. Tiny syntax mistakes or a small misalignment of data columns would bring down the whole program. Being a beginner, I first felt irritated, but eventually, I mastered the art of debugging step by step — reading the error messages, locating issues, and testing sequentially.

5. Balancing Functionality and Simplicity

My initial tendency was to include as many features as could be squeezed in, but I subsequently understood that there were too many elements which made the dashboard slow and confusing. I needed to find a balance between including advanced features (such as alerts and chatbot) and maintaining an interface that was easy to use.

5.5.3 Reflection on the Challenges

Aspect	Power BI Dashboard Challenges	Python Dashboard Challenges
Data Handling	Struggled with missing values, inconsistent formats, and duplicates during data preparation.	Needed to preprocess data manually and handle errors in dataframes for compatibility with dashboard logic.

Aspect	Power BI Dashboard Challenges	Python Dashboard Challenges
Learning Curve	Easy to start but difficult to understand advanced features like Power Query and DAX.	Steep learning curve in Dash/Plotly callbacks and layout structuring; required solid Python knowledge.
Design & Layout	Initially cluttered visuals; required trial-and-error to apply design principles.	Balancing too many features with usability was difficult; needed iterations to achieve simplicity.
Interactivity	Limited real-time alerts or automation; mostly static visuals.	Building real-time alerts and email triggers was complex, required repeated testing.
Advanced Features	Could not support chatbot or AI-based interactions.	Integrating chatbot with NLP was challenging; first attempts led to incorrect or empty responses.
Debugging	Few errors but hard to customize beyond standard visuals.	Frequent syntax and logic errors; debugging was time-consuming but improved problem-solving skills.
Overall Experience	Good for quick visualization but restricted for advanced analytics.	Powerful for automation and AI integration but required patience and coding expertise.

Reflecting on it, each obstacle was a chance to learn. In Power BI, I learned to appreciate the cleanliness of data, effective KPIs, and design concepts, while Python taught me coding logic, debugging, and incorporating advanced features. At first, I did these tasks with the attitude of "it should just work", but the exercise educated me that creating dashboards is all about iterative improvement, problem-solving, and restraint.

The setbacks not only enhanced my technical skills but also influenced my problem-solving attitude. Now, I can approach similar projects in the future with more confidence, knowing that the initial try might not be ideal, but determination and systematic learning will result in accomplishment.

CHAPTER 6: SUGGESTIONS AND CONCLUSIONS

6.1 Results of the Study

The internship project led to the successful creation of an HR Analytics Dashboard integrated with Alerts and Chatbot, which noticeably improved the ability of HR teams to monitor and manage workforce information. The key outcomes included:

1. **Interactive Dashboard:**

   A Power BI (prototype) dashboard was created and subsequently ported to Python (Dash / Plotly) for enhancing features. The dashboard mapped KPIs like employee headcount, satisfaction, productivity, salary, tenure, and retention risk distribution.

2. **Real-Time Alerts:**

   Manual email triggers and real-time status monitoring were built into the system so that HR managers could get timely updates on high attrition risks while having the ability to control communication.

3. **Chatbot Integration:**

   There was an NLP-powered chatbot integrated in the dashboard. It was able to take both standard and custom questions, enabling HR experts to fetch insights like average salary, high performers, and department-wise allocation without going through technical personnel.

4. **Enhanced Accessibility of Data:**

   There were several filters (department, gender, hire date, job title) available for detailed analysis, thereby enabling HR decision-makers to concentrate on specific employee segments.

6.1.1 Actionable Insights Derived:

The dashboard emphasized:

- High turnover risks (avg. ~98%) in units such as Finance and Customer Support.
- Plateauing of performance after first few years of service, indicating necessity of ongoing learning initiatives.
- Average employee satisfaction scores (avg. 3/5) with variation by department.
- Evenly distributed employees but salary-performance mismatches in some sections.

Overall, the project provided a scalable, engaging, and easy-to-use solution consistent with actual-world HR requirements.

6.2 Conclusions

Based on the development and deployment of this project, the following conclusions may be reached:

1. **Power BI and Python Dashboards:**

   Whereas Power BI sufficed for rapid prototyping and visualization, Python was more flexible for automation, chatbot interface, and real-time alerting. Python dashboards are hence more appropriate for high-level HR analytics.

2. **Strategic Role of HR Analytics:**

   Alert-based interactive dashboards transform HR from reactive to proactive as they allow for timely actions on employee retention and workforce planning.

3. **Value of Chatbots:**

   Addition of conversational AI fills the gap between technical tools and non-technical HR personnel, making analytics more inclusive and easier to access.

4. **Learning Curve and Practical Exposure:**

   The internship gave practical exposure to both BI tools and Python-based analytics, wherein data cleaning, visualization principles, automation, and debugging were emphasized.

6.3 Suggestions

Based on the experience and observation, the following suggestions are made:

1. **For the Organization (Innodatatics):**
   - Integrate the dashboard with live HRMS data sources for real-time employee monitoring.
   - Expand chatbot capabilities to support voice-based queries for enhanced accessibility.
   - Introduce predictive modeling (e.g., machine learning-based attrition prediction) to further improve retention strategies.
   - Provide role-based access within the dashboard so managers view only their department data, maintaining data privacy.

2. **For Academic/Internship Learning:**
    - Students should start with BI tools such as Power BI for visualization basics before venturing into coding-intensive dashboards.
    - Future projects can be incorporated cross-functional analytics (aths, marketing, operations) to get end-to-end business insights.

6.4 Limitations and Drawbacks

In spite of its success, the project had some limitations:

1. **Data Source:**

   The dashboard was developed with a simulated datataset. Integration with live HR data systems was beyond the scope of this internship.

2. **Chatbot Scope:**

   The chatbot only supports limited predefined/custom queries and is unable to process sophisticated conversational flows.

3. **Alert Mechanism:**

   Notifications were restricted to email-based alerts. SMS, WhatsApp, or in-app push were not utilized.

4. **No Predictive Models:**

   Though retention risk indicators were added, sophisticated predictive analytics based on machine learning were not incorporated given the time limitation.

6.5 Future Scope

The project is solid but can be further developed in the following directions:

1. **Integration with HRMS/ERP Systems:**

   Direct integration of the dashboard with HR databases would allow real-time automatic updates without manual intervention.

2. **Predictive Analytics:**

   Utilizing machine learning algorithms like logistic regression, random forests, or neural networks can predict the probability of attrition more precisely.

3. **Improved Chatbot Features:**
    - Expand NLP models to enable multi-turn conversations.
    - Integrate with voice assistants (Google Assistant, Alexa) to facilitate more natural interaction.
    - Offer multilingual support for global workforce adoption.
4. **Cross-Platform Usability:**

    Making the dashboard mobile-friendly or integrating it within current HR portals would enhance usability for HR professionals on the move.

5. **Scalability and Cloud Deployment:**

    Hosting the Python dashboard on cloud platforms (AWS, Azure, GCP) would guarantee scalability, shared access, and enterprise adoption.

6. **Broader HR Use-Cases:**

    Expanded use cases of analytics for training effectiveness, recruitment funnel optimization, diversity and inclusion measurements, and employee engagement surveys.

6.6 Learnings and Personal Experiences

Innodatatics' internship experience gave me a life-changing learning experience that connected theoretical knowledge with practical implementation. Though the project was mainly about developing an HR Analytics Dashboard with Alerts and Bot, the journey had much more to do with technical skills. It reoriented my problem-solving strategy, increased my confidence, and provided some interesting insights into industry practices.

6.6.1 Technical Learnings

1. **Data Handling and Preprocessing**
    - I came to understand the significance of clean and organized data in analytics projects.
    - At first, I believed that raw data would directly be managed by applications like Power BI, but I quickly realized the importance of data cleaning, formatting, and transformation prior to visualization.
2. **Visualization and Dashboard Creation**
    - Power BI educated me on the fundamentals of data storytelling, KPI choice, and dashboard design principles.
    - Transitioning to Python (Dash/Plotly) opened up my technical scope, as I discovered how to create interactive dashboards, callback functions, and dynamic layouts using coding.

3. **Automation and Alerts**
    - Implementing real-time update checks and email triggers was difficult but worth it.
    - I gained knowledge on how automation minimizes manual dependency and accelerates decision-making.
4. **Chatbot Integration**
    - Creating a chatbot was my introduction to Natural Language Processing (NLP).
    - I gained skills in mapping queries, dealing with synonyms, and framing outputs into readable responses.
5. **Debugging and Problem-Solving**
    - Python dashboards unlike drag-and-drop tools had to be debugged very often.
    - This instilled in me patience, step-by-step troubleshooting, and grit in debugging hard problems.

6.6.2 Professional Learnings

1. **Bridging Theory and Practice**

    Theoretical concepts studied in courses like HR Analytics, Business Intelligence, and Data Visualization were brought to life in a real-world industry context, making me understand them better.

2. .Collaboration and Feedback

    Collaboration with team members and mentors instilled in me the importance of agile iterations, constructive feedback, and teamwork in project development.

3. **Time Management**

    Managing several stages of the project—dashboard design, data preparation, chatbot integration, and testing—refined my planning and prioritization skills.

4. **Communication Skills**

    Presenting results, documenting the project, and describing functionalities of the dashboard enhanced my capability to convey technical work to non-technical stakeholders.

6.6.3 Personal Growth

1. **Confidence and Independence**

    At first, I was overwhelmed by coding-intensive projects, but towards the end, I gained the confidence to tackle challenging projects on my own.

2. Problem-Solving Mindset

I transitioned from having a mind-set of "it should just work" to a systematic method of trial and error and improvement.

3. Career Direction

This internship reaffirmed my passion for Business Analytics and HR Tech, encouraging me to take further studies in predictive analytics, AI-based HR systems, and cloud-based dashboards.

6.6.4 Overall Reflection

The internship was not simply about producing a dashboard but also about developing into a better learner, problem solver, and professional. Each challenge, from working with inconsistencies in data in Power BI to debugging chatbot logic in Python, made me grow. I am now more confident in my capacity to design analytical solutions, work in real-life teams, and deliver value to data-driven HR decision-making.

CHAPTER 7 ANNEXURES

7.1 Code Samples

Importing the Necessary Libraries and Loading the Dataset

```
Importing the necessary libraries
```

```python
from dash import Dash, dcc, html, Input, Output, State, ctx
import dash_bootstrap_components as dbc
import pandas as pd
import plotly.express as px
import plotly.io as pio
from datetime import datetime
import smtplib
from email.message import EmailMessage
import os

# ---------- Load Data ----------
DATA_FOLDER = os.path.expanduser("~/Desktop/Python/Machine Learning")
DATA_FILE = os.path.join(DATA_FOLDER, "employee_performance.csv")

def load_data():
    try:
        df = pd.read_csv(DATA_FILE, low_memory=False)
        df = df.drop(columns=[col for col in df.columns if "Unnamed" in col or df[col].isnull().all()])
        df['Hire_Date'] = pd.to_datetime(df['Hire_Date'], dayfirst=True)
        return df.dropna(subset=['Hire_Date'])
    except Exception as e:
        print("Data loading error:", e)
        return pd.DataFrame()
```

Email Alerts

```python
# ---------- Email ----------
email_status = "📭 No email sent yet"
dashboard_status = "📊 Dashboard not updated yet"

def send_email():
    global email_status
    try:
        df = load_data()
        threshold = 1.5
        if 'Retension risk index' not in df.columns:
            email_status = "❌ Error: 'Retension risk index' column not found in data."
            return

        risky_employees = df[df['Retension risk index'] > threshold]
        if risky_employees.empty:
            email_status = f"✅ No risky employees found with risk < {threshold}"
            return

        selected_cols = ['Employee_ID', 'Department', 'Retension risk index']
        risky_employees = risky_employees[selected_cols]
        table_str = risky_employees.to_string(index=False)

        msg = EmailMessage()
        msg['Subject'] = '⚠️ Retention Risk Alert - At-Risk Employees'
        msg['From'] = 'kanchanaskrp@gmail.com'
        msg['To'] = 'kanchanaskrp@gmail.com'
        msg.set_content(f'''
Hello,
```

```
This is an automated alert for employees at risk of leaving the company.
Below are employees with a Retention Risk Index below {threshold}:

{table_str}

Regards,
Employee Dashboard Bot
''')

        with smtplib.SMTP_SSL('smtp.gmail.com', 465) as smtp:
            smtp.login('kanchanaskrp@gmail.com', 'ugscscvebllvhvii')
            smtp.send_message(msg)

        email_status = f"📧 Email sent at {datetime.now().strftime('%Y-%m-%d %H:%M:%S')}"
    except Exception as e:
        email_status = f"❌ Email failed: {e}"
```

Filter Panel

```
# ---------- App ----------
pio.templates.default = "plotly_dark"
df = load_data()

departments = [{'label': dept, 'value': dept} for dept in sorted(df['Department'].dropna().unique())]
job_titles = [{'label': job, 'value': job} for job in sorted(df['Job_Title'].dropna().unique())]
years = sorted(df['Hire_Date'].dt.year.unique())
months = list(range(1, 13))
days = list(range(1, 32))

app = Dash(__name__, external_stylesheets=[dbc.themes.CYBORG])
```

Dashboard Layout

```
# ---------- Layout ----------
app.layout = dbc.Container([
    html.H4("🤖 Employee Dashboard Chatbot", className="text-center mt-4 mb-3"),
    dbc.Row([
        dbc.Col([
            html.Label("Choose a predefined question:", style={"color": "white"}),
            dcc.Dropdown(
                id='faq-dropdown',  # ✅ ID added here
                placeholder="Select a question...",
                options=[{'label': q, 'value': q} for q in predefined_qa.keys()],
                className="mb-3"
            ),

            html.Label("Or ask your own question:", style={"color": "white"}),
            dbc.InputGroup([
                dbc.Input(id='chat-input', placeholder="Type or speak your question...", type='text'),
                dbc.Button("🎤 Speak", id='voice-btn', color='info', n_clicks=0)
            ], className="mb-2"),
            dbc.Row([
                dbc.Col(dbc.Button("Submit", id='chat-submit-btn', color='primary', className='me-2'), width="auto"),
                dbc.Col(dbc.Button("Clear", id='chat-clear-btn', color='secondary'), width="auto")
            ], className="mb-2"),
            dbc.Alert(id='chat-response', children="Welcome! Ask me anything about the dashboard.", color="secondary")
        ], md=12)
    ]),

    html.H2("Employee Performance Dashboard", className="text-center my-4"),
```

7.2 Dataset and Relevant Documents

- Dataset: https://drive.google.com/file/d/1-k9WZXOBFfmkkVO9mVOnPWJIGb5wCGz-/view?usp=sharing
- Power BI Dashboard: https://drive.google.com/file/d/1iaIuzUkjFF-P2pgu6s3htlWToF6ar3zF/view?usp=sharing
- Python Dashboard (Complete Code): https://drive.google.com/file/d/1sTjVlUM3FU-2K7SV-6-Jsq-NRHlKPZMt/view?usp=sharing
- Requirements: https://docs.google.com/document/d/1cCIOkpHTG7cF7Kbr4QLwvtAlKLeOTNh-/edit?usp=sharing&ouid=113941500337888641268&rtpof=true&sd=true
- Technical Document: https://docs.google.com/document/d/1ZxnJA2AWv4uC7-eHnt6ziYNr30ITt4bw/edit?usp=sharing&ouid=113941500337888641268&rtpof=true&sd=true
- BRD: https://docs.google.com/document/d/1AAjfktPH6usMiiW23XGfVQq_oE4i8Qan/edit?usp=sharing&ouid=113941500337888641268&rtpof=true&sd=true

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REFERENCES

- https://youtube.com/playlist?list=PLeo1K3hjS3uuvuAXhYjV2lMEShq2UYSwX&si=EBd-QI3wJGZI3CdE
- https://youtube.com/playlist?list=PLWuFHho1zKhWN-Qp5hrR0e9RZIo7QO7z6&si=GDIbaetjVd8gxPMq
- https://youtu.be/3Qlqd-1DcRM?si=uwUc35ZcN2_ekkcL
- https://youtu.be/DFBkTIhptOQ?si=FXTzRB3ZIUJGQ-I2
- https://youtu.be/t2_Q2BRzeEE?si=4YSNYU0VM_H-a-L4
- https://youtu.be/j4xlVLgsmNQ?si=03prqF3NdN2BVQOJ
- https://youtu.be/lk8PJmTthCQ?si=GszavAVloOHK2V3J
- https://youtu.be/fJvfUbO5ox0?si=--ESTpWCcr7urKMO
- https://innodatatics.ai/
- https://www.planeks.net/python-vs-power-bi-for-dashboards/
- https://asana.com/resources/business-requirements-document-template