

**“A STUDY ON PREDICTIVE WORKFORCE
ANALYTICS FOR EMPLOYEE RETENTION ON THE
REFERENCE OF NOVOTEL”**



Master Thesis submitted in partial fulfilment of the requirements for
the award of the Degree of

**MASTERS OF BUSINESS ADMINISTRATION
of
BENGALURU CITY UNIVERSITY**



By

Name: Rahul Kumar

Reg. No. P18DM21M0095

Under the guidance of

Prof. Mani Krishna

**INTERNATIONAL INSTITUTE OF BUSINESS
STUDIES**

BENGALURU CITY UNIVERSITY

2021-2023

DECLARATION BY THE STUDENT

I hereby declare that “*A Study on Predictive Workforce Analytics for Employee Retention on the Reference of Novotel*” is the result of the project work carried out by me under the guidance of Name of the Guide in partial fulfillment for the award of Master’s Degree in Business Administration by Bengaluru City University.

I also declare that this Master Thesis is the outcome of my own efforts and that it has not been submitted to any other university or Institute for the award of any other degree or Diploma or Certificate.

Place: Bangalore

Name: Rahul Kumar

Date:

Register Number: P18DM21M0095

ACKNOWLEDGMENT

I would like to take this moment to express my gratitude to the individuals and institutions that have played a pivotal role in the successful completion of this project. Their unwavering support and guidance have been instrumental in bringing this endeavour to fruitful work. I extend my sincere appreciation to Professor Mani Krishna, whose expert guidance, mentorship, and unwavering support have been the cornerstone of this project. Her invaluable insights, patient supervision, and provision of various resources have greatly contributed to the successful completion of this report. I would also like to express my gratitude to the International Institute of Business Studies for providing the necessary infrastructure, resources, and a conducive environment for conducting this research. Their commitment to academic excellence and research support has been a significant driving force behind the project's successful execution. I am profoundly thankful to all those who have contributed to this endeavour and helped navigate its challenges, and I look forward to continued collaboration and future achievements.

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ABSTRACT

Employee retention is a pressing concern in the hospitality industry, where staff turnover can disrupt service quality and increase operational costs. Novotel, a brand under the Accor Group, can benefit significantly from predictive workforce analytics to address this challenge. This abstract outlines a comprehensive strategy for Novotel to enhance employee retention through data-driven insights. The first step is data collection, involving the aggregation of historical turnover data, demographics, and performance metrics. Advanced data analysis techniques, including machine learning, are employed to identify patterns and factors contributing to turnover. Predictive models are developed to forecast which employees are at risk of leaving, enabling the creation of an early warning system. Personalized retention interventions are designed to address specific employee needs. Strategies range from mentorship programs to skill development and internal promotions. Novotel can benchmark its retention data against industry standards and implement best practices to stay competitive. A feedback mechanism is established to capture employee insights, which can be analyzed for continuous improvement. Performance tracking measures the effectiveness of retention strategies, allowing for real-time adjustments. By adopting predictive workforce analytics, Novotel can proactively manage employee retention, create a more stable and satisfied workforce, and ultimately enhance customer satisfaction and business success. A feedback mechanism is integral to this approach. Employee insights are actively sought and analyzed, providing valuable input for further refinements. Continual performance tracking measures the effectiveness of the implemented strategies, facilitating timely adjustments.

KEYWORDS: Employee retention, Predictive modeling, Benchmarking, Employee turnover, Employee satisfaction

CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF THE TOPIC

Predictive Workforce Analytics for Employee Retention in Novotel is a data-driven strategy aimed at addressing employee turnover challenges within the highly competitive hospitality industry. By collecting and analyzing historical data on employee turnover, demographics, and performance metrics, Novotel can uncover critical insights about the factors contributing to employee attrition.

Using advanced data analysis techniques, such as machine learning, the organization can identify patterns and trends, which then inform the development of predictive models. These models enable Novotel to create an early warning system that proactively identifies at-risk employees.

Personalized interventions are subsequently designed to meet the specific needs of these individuals, whether it's through mentorship programs, skill development, or career advancement opportunities. By benchmarking against industry standards and actively seeking employee feedback, Novotel can continuously refine its retention strategies. Performance tracking further ensures the effectiveness of these strategies, providing real-time data for adjustments.

Leveraging sophisticated data analysis techniques, such as machine learning, the organization identifies patterns and contributing factors, laying the groundwork for predictive models. These models facilitate the creation of an early warning system, allowing Novotel to proactively pinpoint employees at risk of leaving. The real innovation lies in personalized interventions tailored to address each at-risk employee's specific needs, whether through mentorship, skill development, or career growth opportunities.

Overall, predictive workforce analytics empowers Novotel to maintain a stable, satisfied workforce, enhance customer satisfaction, and maintain a competitive edge in the dynamic hospitality sector, highlighting the organization's commitment to data-driven talent management.

1.2 THEORETICAL BACKGROUND OF THE STUDY

The theoretical background of a study typically provides a foundation for the research by introducing relevant theories, concepts, and models that underpin the study's objectives. In the case of "Predictive Workforce Analytics for Employee Retention in Novotel," the following theoretical concepts and frameworks are relevant:

Here is a detailed explanation of what the theoretical background of a study entails:

1. **Human Capital Theory:** Human capital theory suggests that employees are not just a cost to the organization but an investment. It posits that organizations can enhance their competitiveness and profitability by investing in the education, training, and development of their employees. In the context of Novotel, this theory provides a foundation for understanding the value of retaining employees, as investments made in their development can be lost when they leave the organization.
2. **Turnover Models:** Turnover models like the Mobley Model help explain the process of employees deciding to leave an organization. These models identify various factors contributing to turnover, including job dissatisfaction, job alternatives, and organizational commitment. For Novotel, understanding these models is crucial for pinpointing the specific areas and factors that need to be addressed to reduce employee turnover.
3. **Predictive Analytics:** Predictive analytics, including machine learning, are rooted in statistical and mathematical theories. Regression analysis, for instance, is used to identify relationships between variables, which is crucial in predicting employee turnover. The application of machine learning algorithms is based on statistical learning theory, enabling organizations to make data-driven predictions about future events, such as employee turnover.
4. **Job Satisfaction Theories:** The study may draw from job satisfaction theories to understand what factors influence employee satisfaction and, in turn, their likelihood of staying with the organization. For example, Herzberg's Two-Factor Theory distinguishes between hygiene factors (job conditions that prevent dissatisfaction) and motivators (job conditions that encourage satisfaction). This theory helps in identifying areas where improvements can enhance job satisfaction and reduce turnover.
5. **Organizational Behavior Theories:** Theoretical frameworks like Equity Theory suggest that employees evaluate the fairness of their work conditions and compensation.

Expectancy Theory posits that employees consider the likelihood of their efforts resulting in desirable outcomes when deciding to stay or leave. Social Exchange Theory helps explain the social relationships within an organization and how these relationships influence employee decisions. These theories provide a theoretical basis for understanding the psychological and interpersonal factors impacting employee retention.

6. **Benchmarking and Best Practices:** The concept of benchmarking and best practices is rooted in management and organizational theory. Total Quality Management (TQM) emphasizes continuous improvement and learning from best practices. The Learning Organization theory underscores the importance of adapting and evolving based on the experiences of others. These theories provide a foundation for the study to analyze industry benchmarks and implement proven strategies to improve employee retention at Novotel.
7. **Performance Metrics and KPIs:** The selection and measurement of key performance indicators (KPIs) are based on performance measurement theories, such as the Balanced Scorecard by Kaplan and Norton. The Balanced Scorecard emphasizes the importance of measuring financial and non-financial indicators to evaluate organizational performance. The theoretical foundation for using KPIs in this study is critical for assessing the effectiveness of retention strategies and aligning them with organizational goals.

1.3 EXPLANATION FOR RELATED CONCEPTS OF SELECTED SEARCH

- 1 Predictive Workforce Analytics:** Predictive workforce analytics is the practice of using data analysis, statistical algorithms, and machine learning techniques to predict future workforce trends, behaviors, and outcomes. In the context of this study, it refers to the application of predictive analytics to anticipate which employees are at risk of leaving Novotel, enabling proactive retention strategies.
- 2 Employee Retention:** Employee retention is the effort an organization makes to keep its employees within the workforce for an extended period. It involves strategies and practices aimed at reducing turnover rates and ensuring that employees are engaged, satisfied, and committed to their roles. The study focuses on using predictive analytics to improve employee retention at Novotel.
- 3 Data-Driven Decision Making:** Data-driven decision making is the practice of using data and analysis to inform and guide organizational decisions. In the context of the study, it relates to the central role of data in identifying at-risk employees and designing tailored retention strategies based on predictive analytics.
- 4 Churn Rate:** Churn rate, also known as turnover rate, is a metric that quantifies the number of employees who leave an organization over a specified period. It is a key indicator for understanding the organization's employee turnover, which the study seeks to address and reduce.
- 5 Machine Learning:** Machine learning is a subset of artificial intelligence (AI) that focuses on developing algorithms and models that can learn and make predictions or decisions without being explicitly programmed. In this study, machine learning is used to create predictive models that forecast employee turnover based on historical data.
- 6 HR Metrics and KPIs:** HR metrics, or Human Resources Key Performance Indicators (KPIs), are specific measures used by HR professionals to assess the effectiveness of HR practices and strategies. In the study, HR metrics and KPIs are employed to evaluate the success of employee retention efforts and the impact of predictive workforce analytics.
- 7 Talent Management:** Talent management is a strategic approach to managing an organization's human capital, encompassing recruitment, development, and retention of employees. The study aligns with talent management by focusing on retaining and developing valuable employees using predictive analytics.

- 8 Employee Engagement:** Employee engagement is the emotional commitment employees have toward their organization, leading them to invest discretionary effort in their work. Effective employee retention strategies often include efforts to boost engagement, as this can reduce turnover. Predictive analytics can identify factors affecting engagement.
- 9 Descriptive Analytics:** Descriptive analytics is the process of summarizing historical data to understand past performance and trends. It provides a basis for the predictive analytics in the study by identifying patterns in employee turnover and related factors from historical data.
- 10 Succession Planning:** Succession planning is the process of identifying and developing internal talent to fill key leadership and critical roles within an organization. This concept may be connected to the study as it relates to long-term retention strategies and career development opportunities that predictive analytics can inform.

CHAPTER 2

ORGANIZATIONAL PROFILE

2.1 INTRODUCTION TO THE ORGANIZATION

Novotel is a globally recognized and respected hotel brand that forms an integral part of the Accor Group, one of the largest and most prominent hospitality companies in the world. With its origins dating back to 1967, Novotel has established itself as a prominent name in the hospitality industry, offering a wide range of services to meet the diverse needs of travelers around the globe.

Novotel's primary mission is to provide high-quality accommodations and services that combine the best of modern comfort with a strong emphasis on sustainability and environmental responsibility. Novotel properties are strategically located in key destinations, catering to both business and leisure travelers, and are characterized by their contemporary design, well-appointed rooms, and a host of amenities, including restaurants, bars, fitness facilities, and meeting spaces.

Novotel's commitment to sustainability is a defining feature, with the brand actively engaged in reducing its environmental footprint and promoting responsible tourism practices. This dedication to sustainability extends to its commitment to employees, guests, and the local communities in which it operates.

Novotel is not just a collection of hotels; it represents a hospitality experience that prioritizes convenience, quality, and a genuine dedication to customer satisfaction. Its reputation for innovation and customer-centric service has earned it a place of trust among travelers seeking a reliable and comfortable stay. This introduction sets the stage for a closer exploration of Novotel's operations, its approach to employee retention, and the application of predictive workforce analytics to improve organizational performance.

2.2 COMPANY PROFILE



Overview:

- **Name:** Novotel
- **Parent Company:** Accor Group
- **Founded:** 1967
- **Industry:** Hospitality and Tourism
- **Headquarters:** Paris, France

Key Information:

- **Mission:** Novotel is committed to providing high-quality, environmentally responsible hospitality experiences that combine modern comfort with sustainability, thereby enhancing the well-being of guests and contributing to the betterment of local communities.
- **Global Presence:** Novotel is a global brand with a significant presence in numerous countries and cities around the world. It offers a diverse range of accommodations and services catering to both business and leisure travelers.
- **Sustainability:** Novotel places a strong emphasis on sustainability and responsible tourism. The brand is dedicated to reducing its environmental footprint through various initiatives, including energy efficiency, waste reduction, and community engagement.
- **Accommodations:** Novotel properties are known for their contemporary design and well-appointed rooms. Each hotel typically offers a variety of amenities, including on-site restaurants, bars, fitness facilities, and meeting spaces.
- **Customer-Centric:** Novotel is renowned for its commitment to customer satisfaction. It prioritizes guest comfort, convenience, and quality of service, ensuring that every stay is a pleasant and memorable experience.

Core Values:

1. **Quality:** Novotel is dedicated to providing high-quality accommodations and services to its guests, ensuring a comfortable and enjoyable stay.
2. **Sustainability:** The brand actively promotes sustainable practices and environmental responsibility across its operations.

3. **Innovation:** Novotel is continually innovating to enhance the guest experience, adopting modern technologies and design concepts.
4. **Customer Satisfaction:** Novotel's focus on customer-centric service is a core value, ensuring every guest feels welcomed and well taken care of.
5. **Community Engagement:** The brand actively engages with local communities, supporting various initiatives and contributing to the betterment of the regions it operates in.

Global Presence:

- **International Footprint:** Novotel has a significant international presence with numerous hotels and resorts in key destinations across Europe, Asia, the Americas, Africa, and the Middle East.
- **Urban and Resort Locations:** Novotel properties can be found in major urban centers as well as resort destinations, catering to a wide range of travelers, including business professionals, families, and holidaymakers.

Amenities and Services:

- **Diverse Amenities:** Novotel hotels typically feature diverse amenities, including swimming pools, fitness centers, spa facilities, and vibrant dining options. Some properties also offer recreational activities for families.
- **Meeting and Event Spaces:** Many Novotel locations have well-equipped meeting and event spaces, making them suitable for business conferences, seminars, and social events.

Sustainability Initiatives:

- **Planet 21:** Novotel's sustainability program, known as Planet 21, is a comprehensive initiative that focuses on reducing its environmental impact. It covers areas such as energy and water conservation, waste reduction, and community engagement.
- **Certifications:** Novotel properties often seek eco-friendly certifications, such as ISO 14001 for environmental management and Green Key certification for sustainable practices.

Innovative Practices:

- **Technology Integration:** Novotel embraces modern technology, including online check-in and check-out, smart room features, and digital concierge services, to enhance the guest experience.
- **Room Design:** The brand continually updates its room designs to align with contemporary styles and guest preferences, ensuring comfort and functionality.

Commitment to Local Communities:

- **Local Engagement:** Novotel is involved in various community engagement projects, such as supporting local charities, providing employment opportunities, and participating in cultural events in the regions where it operates.

Awards and Recognition:

- **Industry Accolades:** Novotel has received industry awards for its commitment to sustainability, service quality, and innovation.
- **Guest Reviews:** Positive reviews and high ratings from satisfied guests often underscore the brand's dedication to customer satisfaction.

2.3 COMPANY AND SERVICE PROFILE

1. Accommodations:

- Novotel offers a wide range of room types to cater to various traveler preferences, including standard rooms, superior rooms, executive rooms, and suites. Their contemporary design and comfortable furnishings provide a welcoming atmosphere.

2. Dining:

- Novotel properties typically feature on-site restaurants and bars that serve a diverse range of culinary delights, from local and international cuisines to signature dishes. Guests can enjoy a variety of dining options, including à la carte menus and buffets.

3. Meeting and Event Facilities:

- Novotel hotels often provide fully-equipped meeting and event spaces, suitable for hosting conferences, seminars, workshops, and social events. These facilities include modern audiovisual equipment and high-speed internet access.

4. Fitness and Recreation:

- Many Novotel properties feature fitness centers and swimming pools, allowing guests to maintain their wellness routines. Some locations also offer spa services and recreational activities for families.

5. Business Services:

- Business travelers can access a range of services to facilitate their work, such as business centers, printing facilities, and high-speed internet. Novotel provides a convenient environment for corporate guests.

6. Family-Friendly Services:

- Novotel is known for its family-friendly initiatives, including family rooms, kid's play areas, and special menus for children. These services cater to families traveling with young ones.

7. Technology Integration:

- Novotel embraces modern technology to enhance the guest experience, such as offering online check-in and check-out, smartphone apps for room control, and digital concierge services.

8. Sustainability Initiatives:

- As part of the Accor Group's commitment to sustainability, Novotel hotels often implement eco-friendly practices, such as energy-efficient lighting, water conservation, and waste reduction programs.

9. Loyalty Programs:

- Accor Live Limitless (ALL) is the loyalty program associated with Novotel and other Accor Group brands. It offers members exclusive benefits, discounts, and reward points for their stays.

10. Special Packages and Offers:

- Novotel frequently offers special packages, promotions, and seasonal deals for guests, including discounts on extended stays, dining packages, and wellness retreats.

11. Concierge and Guest Services:

- Novotel's concierge and guest services are available around the clock to assist guests with reservations, transportation, local recommendations, and other needs during their stay.

12. Destination Weddings and Celebrations:

- Some Novotel locations offer wedding and celebration packages, providing a picturesque setting for special events, such as weddings, anniversaries, and other milestones.

13. Cultural Engagement:

- Novotel hotels often engage with the local culture and community by participating in cultural events, supporting local artisans, and showcasing regional traditions.

2.4 McKinsey's 7-S Framework

McKinsey's 7-S Framework is a powerful tool for analyzing and understanding the internal dynamics of organizations. It comprises seven interconnected elements that collectively shape an organization's effectiveness. These elements are divided into "Hard S's" and "Soft S's," each with a critical role in an organization's performance

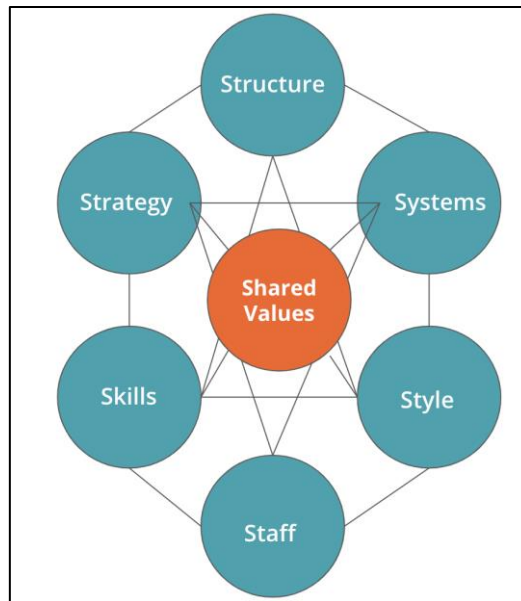


Figure 2.1 McKinsey's 7s Framework

The "**Hard S's**" include:

1. **Strategy:** Novotel's strategy centers on providing high-quality accommodations that merge modern comfort with sustainability. This includes a commitment to eco-friendly practices, such as energy efficiency and waste reduction. The strategy also emphasizes customer satisfaction, underpinning Novotel's mission to create memorable hospitality experiences.
2. **Structure:** Novotel maintains a well-structured hierarchy and organizational design. Its properties are strategically located in prime destinations worldwide, ensuring it can effectively serve both business and leisure travelers.
3. **Systems:** Novotel has well-established operational systems to support its daily activities. These systems encompass reservation and booking processes, operational procedures (e.g., check-in and check-out), and sustainability initiatives, such as waste management and water conservation.
4. **Shared Values:** Sustainability is a core shared value at Novotel. It guides the brand's commitment to reducing its environmental footprint through eco-friendly practices and green certifications. Moreover, customer-centricity and innovation are shared values that contribute to the brand's success.

The "**Soft S's**" encompass:

5. **Skills:** Novotel invests in employee training and development, ensuring that its workforce possesses the skills and competencies needed to deliver exceptional service. Employees are equipped with the knowledge and expertise to meet the brand's high service standards.
6. **Staff:** Novotel's workforce is diverse, ranging from front-line staff to management, contributing to its reputation for quality and customer-centric service. This diverse talent pool aligns with its mission to cater to an international clientele.
7. **Style:** Novotel exhibits a leadership style characterized by a commitment to customer satisfaction, innovation, and sustainability. This style informs decision-making, communication, and overall leadership practices throughout the organization.

CHAPTER 3

LITERATURE REVIEW AND RESEARCH DESIGN

3.1 LITERATURE REVIEW

to make the literature review relevant to Novotel, you can focus on existing research, case studies, and industry practices that directly relate to the hospitality sector and employee retention within Novotel. Here's an adapted explanation of the literature review with a focus on Novotel:

1. Gathering Relevant Literature for Novotel:

- *Explanation:* The literature review begins by identifying and collecting scholarly and industry-related sources that pertain to predictive workforce analytics and employee retention in the hospitality industry, with a specific emphasis on Novotel.

2. Reviewing Existing Research in the Hospitality Sector:

- *Explanation:* For each source, the literature review involves a critical examination of research, case studies, and best practices within the hospitality sector, particularly those that are relevant to Novotel. This includes studies that explore the use of predictive analytics for improving employee retention in hospitality.

3. Identifying Knowledge Gaps at Novotel:

- *Explanation:* As you review existing research, pay attention to gaps or limitations that are specific to Novotel's workforce and hospitality operations. These gaps may include areas where predictive analytics can offer unique insights and solutions for improving employee retention at Novotel properties.

4. Synthesizing Key Findings for Novotel:

- *Explanation:* Summarize and synthesize the key findings and insights from the reviewed literature as they relate to the hospitality sector and Novotel. Identify common themes and trends that can inform your research within the context of Novotel.

5. Theoretical Frameworks in Hospitality:

- *Explanation:* Explore the theoretical frameworks that have been used in previous research related to employee retention in the hospitality industry. Understand how these frameworks can be applied to Novotel's specific workforce dynamics.

6. Methodological Approaches in Hospitality:

- *Explanation:* Evaluate the research methodologies used in the literature, with a focus on studies conducted within the hospitality sector. Consider how these approaches align with Novotel's needs and operational structure.

7. Conceptual Models for Novotel:

- *Explanation:* Look for conceptual models or frameworks used in studies specific to hospitality and employee retention. Adapt these models to suit the unique characteristics of Novotel properties and its workforce.

8. Key Variables and Metrics for Novotel:

- *Explanation:* Identify the key variables and performance metrics that have been emphasized in studies related to employee retention within the hospitality industry. Consider how these metrics can be applied to Novotel's specific context.

9. Emerging Trends in Hospitality:

- *Explanation:* Stay informed about emerging trends, technologies, and best practices in the hospitality industry, especially those that are relevant to employee retention and predictive analytics. Be prepared to incorporate these trends into your research at Novotel.

10. Research Gaps and Contributions at Novotel:

- *Explanation:* Conclude the literature review by summarizing the research gaps and explaining how your study will contribute to filling these gaps, specifically within the unique environment of Novotel. Highlight how your research will enhance employee retention strategies in Novotel's hospitality properties.

- V. V. Sateesh Kumar Annepu, (2022) - "Implications of Human Resource Analytics on Employee Performance in Pharma Industry in South India": published in the International Journal of Innovative Research in Engineering & Management (IJIREM) in 2022, the focus is on the transformative impact of human resource analytics within the context of the pharmaceutical industry in South India. The study aims to customize HR strategies and enhance recruitment and talent acquisition processes. Through a research methodology that incorporates predictive talent scouting, data-driven candidate sourcing, and initiatives for diversity and inclusion, the article employs quantitative and qualitative techniques such as employer turnover analysis, employee orientation, and onboarding, as well as an exploration of factors like predictive analytics, cost and ROI metrics, and customized HR data. The findings highlight the positive outcomes of improved employee retention, data-driven decision-making, and the implementation of effective recruitment strategies.
- Rubini Raja, and Dr. A. N. Radhika (2023) - "Application of Predictive Analytics in Strategic Workforce Planning": Published in 2023 in the TIJER - INTERNATIONAL RESEARCH JOURNAL, the focus is on the utilization of predictive analytics in the realm of strategic workforce planning. The objectives of the study include enhancing talent forecasting, conducting skill gap analysis, succession planning, and fine-tuning performance to improve employee retention. The research methodology incorporates time series analysis, qualitative surveys, interviews, and thematic analysis. Utilizing quantitative and qualitative techniques such as churn rate estimation, knowledge and skill identification, and the application of ethical frameworks, the study explores factors and parameters related to skill gap analysis, performance finetuning, and turnover risk monitoring. The findings emphasize the significance of strategic workforce planning, unveil the untapped potential of predictive workforce analytics, and highlight various applications of predictive analytics in optimizing workforce strategies.
- K. Simbeck (2022) - "HR Analytics and Ethics": Published in 2022 in the IBM Journal of Research and Development the focus is on the ethical implications of HR analytics. The objectives of the study are to discuss the ethical considerations associated with HR analytics, apply ethical frameworks, and extend the conversation to encompass algorithmic fairness. The research methodology employs ethical frameworks analysis, quantitative analysis, and the development of ethical frameworks. Utilizing both quantitative and qualitative techniques, the study explores key levers and limitations in

HR analytics and examines the symbiotic relationship between academics and practitioners. The findings highlight the resolution of common HR problems, ethical concerns arising from HR analytics, and the pressing need for ongoing ethical discussions in the field. Factors and parameters considered include the prediction of job success, the volume, velocity, and variety of HR data, and the application of ethical frameworks to guide responsible HR analytics practices.

- Cristina Simón, and Eva Ferreiro (2017) - "Workforce Analytics: A Case Study of Scholar–Practitioner Collaboration": published in 2017 the focus is on the development of a workforce analytics initiative through scholar–practitioner collaboration. The study aims to describe this collaborative initiative, highlight the role of social science research methods, and identify key levers and limitations in the process. The research methodology involves a symbiotic relationship between academics and practitioners, the establishment of a rigorous workforce analytics infrastructure, and an exploration of competences of management researchers with lessons learned. The findings emphasize the significant role of social science research methods in supporting the development of workforce analytics practices over time.
- Ms. Nitya B, Ms. Ragini Bose, and Dr. K. Subha (2021) - "A Study on the Application of HR Analytics on Talent Acquisition, Compensation & Benefits, and Employee Turnover in the Indian IT Industry": Published in 2021 in Sambodhi (UGC Care Journal) the focus is on the application of Human Resource Analytics (HRA) in key areas such as talent acquisition, compensation and benefits, and employee turnover within the Indian IT industry. The study aims to recognize the emergence of big data and identify the transformative nature of applying analytics in the human resources domain. The research methodology explores the impact of digitization, the shift towards big data, and business analytics. Utilizing quantitative and qualitative techniques such as data-driven decision-making and an examination of transformative digital disruption in HR, the study reveals the importance of technology adoption, specifics of HR functions studied, and the availability of HR data. The factors and parameters considered center around data-driven analytics, providing valuable insights into the evolving landscape of HR practices in the Indian IT industry.

RESEARCH GAP

- 1. Customization of Predictive Models for Novotel:** While predictive workforce analytics is widely used, there is a lack of research focusing on the customization of predictive models specifically for Novotel's unique workforce and customer dynamics. Investigating the development of predictive models tailored to Novotel's needs and challenges can help optimize employee retention efforts.
- 2. Long-Term Impact of Predictive Analytics:** Existing research often focuses on short-term outcomes of predictive analytics in employee retention. A research gap exists in understanding the long-term impact of predictive analytics on employee retention within Novotel, encompassing factors like career development, employee satisfaction, and succession planning.
- 3. Cross-Cultural Considerations:** Novotel operates in diverse cultural contexts worldwide. Research is needed to explore how cultural variations impact the effectiveness of predictive workforce analytics in employee retention, particularly how employee turnover is influenced by cultural factors in different Novotel locations.
- 4. Privacy and Ethical Concerns:** With the extensive use of data and predictive models, there's a research gap related to the privacy and ethical concerns associated with predictive analytics in the hospitality sector. Exploring the ethical implications and ensuring data privacy in predictive analytics practices specific to Novotel is crucial.
- 5. Employee Feedback Integration:** While predictive analytics often relies on historical data, there's room for research on how to effectively integrate real-time employee feedback into predictive models. Investigating how feedback mechanisms can enhance the accuracy and relevance of predictive analytics for Novotel's employee retention strategies is an unexplored area.
- 6. Comparison with Traditional Methods:** While predictive analytics is emerging as an innovative approach, there is limited research that directly compares its effectiveness in employee retention with traditional HR methods. Investigating the relative impact and cost-efficiency of predictive analytics in comparison to traditional strategies within Novotel can provide valuable insights.
- 7. Employee Turnover Causes and Patterns:** A research gap exists in understanding the underlying causes and patterns of employee turnover at Novotel. Analyzing the reasons employees leave, such as job satisfaction, work-life balance, or compensation, and how

these factors vary across different Novotel locations can help tailor retention strategies more effectively.

8. **Benchmarking against Industry Competitors:** There is a lack of research on how Novotel's employee retention strategies, driven by predictive analytics, compare to those of its competitors in the hospitality sector. Benchmarking against industry peers can provide Novotel with insights on where it stands and areas for improvement.
9. **Employee Experience and Engagement:** Research has yet to comprehensively explore the relationship between employee experience and engagement and the effectiveness of predictive workforce analytics for retention. Investigating how enhancing employee experience and engagement through predictive analytics impacts employee turnover rates at Novotel is a promising research gap.
10. **Return on Investment (ROI) of Predictive Analytics:** The ROI of implementing predictive analytics for employee retention in Novotel is an area that warrants further investigation. Measuring the direct financial benefits and cost savings associated with predictive analytics adoption can provide a clear understanding of its economic impact.

3.2 PROBLEM STATEMENT

High employee turnover rates pose a significant challenge for organizations like Novotel. Employee turnover, or the rate at which employees leave the company, is a pressing concern because it can lead to several negative outcomes. When employees depart, it not only disrupts the workflow but also results in decreased productivity. Furthermore, the costs associated with recruitment and training of new employees can be substantial, impacting the organization's bottom line.

Traditional approaches to employee retention, often grounded in historical data and post-facto analysis, have limitations. These conventional methods generally lack precision in pinpointing the root causes of turnover, and they tend to rely on generalized strategies that do not account for individualized factors influencing an employee's decision to stay or leave. In essence, the problem at hand is that traditional approaches to employee retention are reactive and, thus, fail to provide an anticipatory or customized response.

To address this challenge, the application of predictive workforce analytics emerges as a solution with significant promise. Predictive analytics, driven by data and machine learning, has the power to transform how organizations like Novotel approach employee retention.

Unlike traditional methods that analyze historical data after employees have already left, predictive analytics focuses on real-time and historical data to make proactive predictions about workforce trends and employee behavior.

1. **Proactive Identification:** Predictive analytics enables organizations to proactively identify the factors contributing to employee turnover. It goes beyond analyzing historical data to spot patterns, trends, and early warning signs of potential attrition.
2. **Individualized Insights:** Unlike one-size-fits-all approaches, predictive analytics can provide individualized insights into what might encourage or discourage specific employees from staying with the company. This level of personalization allows organizations to tailor retention strategies accordingly.
3. **Actionable Recommendations:** Predictive analytics doesn't stop at identification. It offers actionable recommendations based on its analysis. These insights guide organizations like Novotel in taking specific steps to mitigate attrition risks and improve employee satisfaction.
4. **Continuous Improvement:** Predictive analytics is not a one-time solution. It operates in real-time and continuously refines its predictions based on new data. This means organizations can adapt and evolve their retention strategies as circumstances change.

3.3 NEED FOR THE STUDY

Employee retention is a paramount concern for organizations across industries. It's a critical factor because high turnover rates can have a profound impact on various aspects of an organization, including:

1. **Productivity:** Frequent turnover disrupts workflow and can lead to a decrease in overall productivity. New employees often require time to get up to speed and may not perform at the same level as experienced staff.
2. **Morale and Company Culture:** High turnover can have a negative impact on the morale of the remaining employees. They may feel overburdened by the constant need to train new team members and may become disengaged. It can also disrupt the established company culture.

3. **Operational Costs:** The costs associated with recruiting, hiring, and training new employees can be significant. These costs not only include recruitment advertising but also onboarding, training, and time spent by managers in the hiring process.

The Changing Landscape:

In today's competitive business landscape, several factors contribute to the challenges of employee retention. These factors include:

1. **Generational Shifts:** Different generations have distinct expectations and values in the workplace. For instance, millennials and Gen Z may prioritize opportunities for growth and development, work-life balance, and a sense of purpose in their work.
2. **Changing Job Expectations:** Modern employees have evolving expectations from their employers. They seek opportunities for skill development, career advancement, and meaningful work. Companies that can't meet these expectations are at a higher risk of losing talent.
3. **Increased Job Market Opportunities:** In a globalized job market, employees often have a multitude of opportunities. If they are dissatisfied with their current employer, they can readily find new prospects. This makes it imperative for organizations to provide a compelling reason for employees to stay.

The Role of Predictive Workforce Analytics:

Predictive workforce analytics offers a solution to these challenges. This approach involves collecting and analyzing a wealth of data related to employees, their behaviors, and various external factors. By leveraging predictive analytics, organizations can:

1. **Identify At-Risk Employees:** Predictive analytics can help identify which employees are most at risk of leaving. By analyzing patterns in data such as performance, attendance, and job satisfaction, organizations can spot early warning signs.
2. **Understand Root Causes:** The analytics can delve into the underlying causes of turnover. It might reveal that a specific department, manager, or job role has a higher attrition rate. This understanding is invaluable for devising effective retention strategies.

3. **Proactively Address Issues:** Armed with predictive insights, organizations can proactively address the issues that drive turnover. This might include tailored coaching, training, or creating a better work-life balance.
4. **Optimize Retention Strategies:** Predictive analytics continually refines its predictions based on new data. This allows organizations to fine-tune and optimize their retention strategies over time.

3.4 SCOPE OF THE STUDY

The scope of the study encompasses various dimensions and boundaries that define the research project.

1. **Organizational Focus:** The study primarily focuses on the application of predictive workforce analytics for employee retention within the specific context of Novotel, a renowned hospitality organization. It may explore multiple Novotel properties to ensure a comprehensive perspective.
2. **Data Sources:** The study involves the collection and analysis of historical workforce data within Novotel. This includes employee records, performance metrics, job-related data, and other relevant information. The scope encompasses data available within the organization.
3. **Factors and Variables:** The study examines a wide range of factors contributing to employee turnover. These may include individual employee attributes (e.g., job satisfaction, tenure, performance), organizational factors (e.g., leadership, company culture), and external factors (e.g., market conditions). The scope includes the identification of key factors influencing turnover.
4. **Predictive Models:** The research project aims to develop and implement advanced predictive models that can forecast employee attrition accurately. This involves statistical and machine learning techniques and algorithms for predictive analysis.
5. **Ethical Considerations:** Ethical considerations related to data privacy, security, and responsible data use are integral to the study. The scope includes the assessment of ethical implications and adherence to data protection regulations.

6. **Actionable Strategies:** The study explores strategies to translate predictive insights into actionable retention initiatives. These may include recommendations for employee engagement, skill development, and workplace improvements.
7. **Organizational and Managerial Aspects:** Investigating the organizational and managerial factors that facilitate the successful implementation and adoption of predictive workforce analytics is part of the study's scope. This may involve assessing leadership support, organizational culture, and alignment with strategic goals.
8. **Guidelines and Best Practices:** The scope extends to providing guidelines and best practices for organizations, including Novotel, to effectively utilize predictive analytics for enhancing employee retention.
9. **Limitations:** The study acknowledges certain limitations, including constraints on data availability, the dynamic nature of the workforce, and the uniqueness of each Novotel property, which may affect generalizability.
10. **Geographic Consideration:** The scope may involve considering Novotel properties in different geographic regions to account for regional variations in workforce dynamics.
11. **Timeframe:** The study considers a defined timeframe for data collection and analysis, recognizing that the effectiveness of predictive models can vary over time.
12. **Exclusion:** The scope excludes specific HR practices not related to predictive analytics, such as traditional recruitment and onboarding processes, which may also impact employee retention.

3.5 OBJECTIVES OF THE STUDY

Primary objectives of this research project:

1. To study and identify a Comprehensive Understanding of Employee Turnover Factors.

The first objective of this research project is to gain a deep understanding of the multifaceted factors that contribute to employee turnover. This involves conducting an extensive analysis of historical workforce data to identify patterns and trends. The research will delve into both employee-specific factors, such as job satisfaction, career growth, and

work-life balance, as well as organizational factors, like leadership, company culture, and compensation packages. By comprehensively understanding these factors, organizations can address the root causes of turnover more effectively.

2.To analyse & develop Design and Implement Advanced Predictive Models.

The second objective is to design and implement advanced predictive models that have the capability to forecast employee attrition accurately. These models should be able to consider a wide array of variables, including individual employee data, job roles, and broader organizational factors. The implementation of such models can significantly enhance an organization's ability to anticipate and mitigate turnover by providing early warning signs and insights.

3.To investigate the Address Data Integration, Feature Selection, and Ethical Considerations:

The third objective revolves around addressing the technical and ethical challenges that come with predictive workforce analytics. This includes integrating diverse data sources, selecting the most relevant features for analysis, and navigating ethical considerations related to privacy and data security. Successfully addressing these challenges is essential to ensuring the reliability and ethical use of predictive analytics.

4. To explore the strategies to Translate Predictive Insights into Actionable Initiatives.

Developing predictive models is only part of the equation. The fourth objective is to explore strategies for translating the insights derived from predictive analytics into actionable retention initiatives. This involves creating a bridge between data-driven insights and real-world interventions. The aim is to develop practical, data-informed strategies that can be seamlessly integrated into an organization's HR practices to retain valuable employees.

5. To examine the Organizational and Managerial Facilitators:

The fifth objective is to investigate the organizational and managerial factors that facilitate the successful implementation and adoption of predictive workforce analytics. This includes understanding how leadership support, the alignment of analytics with organizational goals, and the development of a data-driven culture contribute to the successful deployment of predictive analytics in an organization.

6. To suggest the Guidelines for Effective Utilization:

The final objective is to provide comprehensive guidelines for organizations to effectively leverage predictive analytics to enhance employee retention. These guidelines encompass best practices in data collection, model development, ethical considerations, and the practical implementation of predictive insights. They serve as a roadmap for organizations looking to create a more stable and productive workforce.

3.6 HYPOTHESES

A hypothesis is a testable statement or educated guess that predicts a specific outcome in a research study. It serves as the foundation for the research, guiding the investigation by proposing an expected relationship between variables or a specific outcome. In the scientific method, hypotheses are formulated before conducting experiments or collecting data and are used to test the validity of a proposed explanation.

Types of Hypotheses: There are two main types of hypotheses:

1. **Null Hypothesis (H₀):** The null hypothesis is a statement that suggests no significant relationship or effect between variables. It essentially posits that any observed differences or effects are due to chance or random variation. Researchers aim to test the null hypothesis to determine if there's enough evidence to reject it in favor of an alternative hypothesis.
2. **Alternative Hypothesis (H₁ or H_a):** The alternative hypothesis is the statement that contradicts the null hypothesis. It suggests the presence of a significant relationship or effect between variables. Researchers seek to find evidence supporting the alternative hypothesis to establish a significant finding in their study.

3.7 RESEARCH DESIGN

Research design is a crucial framework that outlines the overall strategy, structure, and methods for conducting a research study. In the context of "Predictive Workforce Analytics for Employee Retention for Organization Novotel," the research design should be carefully planned to address the objectives and hypotheses effectively.

Research Design: Mixed-Methods Design

1. Research Philosophy:

- **Pragmatism:** The research design aligns with a pragmatist philosophy, emphasizing the importance of practical and actionable insights. It combines both quantitative and qualitative approaches to provide a comprehensive understanding.

2. Research Approach:

- **Sequential Explanatory Design:** The research employs a sequential explanatory design. Initially, quantitative data is collected and analyzed to develop predictive models and assess relationships. Subsequently, qualitative data is gathered to explain and elaborate on the quantitative findings.

3. Data Collection:

- **Quantitative Phase:**
 - **Data Sources:** Quantitative data is collected from Novotel's internal databases, including employee records, performance metrics, and historical retention data. It may also involve external data sources related to industry benchmarks.
 - **Surveys:** Employee surveys may be conducted to gather data on job satisfaction, work-life balance, and other relevant factors.
 - **Analytics Tools:** Advanced analytics tools are used to develop predictive models, considering both individual and organizational variables.
- **Qualitative Phase:**
 - **Semi-Structured Interviews:** In the qualitative phase, semi-structured interviews are conducted with employees and managers to gain in-depth insights into the factors influencing retention.
 - **Thematic Analysis:** Qualitative data is analyzed using thematic analysis to identify recurring themes and patterns.

4. Sampling:

- **Quantitative Phase:** A representative sample of Novotel employees is selected to ensure the generalizability of findings.
- **Qualitative Phase:** Purposeful sampling is employed to select employees, managers, and key stakeholders who can provide rich insights into the research questions.

5. Data Analysis:

- **Quantitative Phase:** Advanced statistical analysis, including regression analysis and machine learning techniques, is applied to assess relationships, develop predictive models, and identify significant variables influencing employee retention.
- **Qualitative Phase:** Thematic analysis is used to extract and interpret themes from interview data.

6. Ethical Considerations:

- Ethical considerations are paramount, ensuring data privacy, informed consent, and responsible data use. Ethical review and approval may be sought.

7. Timeframe:

- The research is conducted over a specific timeframe, allowing for data collection, analysis, and interpretation. The timeline is defined to meet research objectives.

8. Validity and Reliability:

- Steps are taken to ensure the validity and reliability of both quantitative and qualitative data, including the use of standardized survey instruments and intercoder reliability checks for qualitative analysis.

9. Integration of Findings:

- Quantitative and qualitative findings are integrated during the analysis and interpretation phase to provide a comprehensive understanding of employee retention dynamics.

10. Reporting and Dissemination:

- Research findings are reported in a comprehensive research report, including actionable recommendations for Novotel. The report may also include visualizations of predictive models and qualitative insights.

3. 8 SAMPLING FRAMEWORK

The sampling framework helps define how you will select the participants for your study. Given the complexity of the topic and the need for a comprehensive understanding, a mixed-methods approach is suggested, and the sampling framework should address both quantitative and qualitative phases. Here's a proposed sampling framework:

1. Quantitative Phase:

Sampling Method: Stratified Random Sampling

- **Strata:**
 - Stratum 1: Frontline Employees (e.g., housekeeping, restaurant staff)
 - Stratum 2: Middle Management (e.g., department managers)
 - Stratum 3: Senior Management (e.g., general managers)

Rationale: Stratified random sampling is employed to ensure that participants are selected in proportion to the different employee categories within Novotel. This helps capture diverse perspectives and experiences.

Sample Size: A proportionate number of participants will be selected from each stratum based on the size of each group, ensuring representativeness.

2. Qualitative Phase:

Sampling Method: Purposeful Sampling (Criterion Sampling)

- **Criteria for Selection:**
 - Employees with high job satisfaction and low turnover rates.
 - Employees with low job satisfaction and high turnover rates.
 - Managers with experience in retention strategies.

- New hires who recently joined Novotel.
- Employees from different Novotel properties and geographic locations.

Rationale: Purposeful sampling allows for the selection of participants who can provide in-depth insights into the factors influencing employee retention. It ensures a diverse range of perspectives.

Sample Size: The sample size is determined by data saturation, meaning data collection continues until no new insights or themes emerge from the interviews.

3.9 TOOLS FOR DATA COLLECTION

Data collection for this research involves a combination of quantitative and qualitative methods. For the quantitative phase, employee data is collected through structured questionnaires, while the qualitative phase involves semi-structured interviews.

Quantitative Data Collection:

1. Employee Surveys:

- **Tool:** Online Survey Platforms (SurveyMonkey or Google forms)
- **Description:** Structured questionnaires are administered to Novotel employees, including various staff categories (frontline employees, middle management, senior management). The surveys are designed to capture quantitative data related to job satisfaction, work-life balance, career expectations, and other relevant factors. Responses are collected using user-friendly online survey platforms, making it convenient for participants to provide feedback.

2. Internal Workforce Data:

- **Tool:** Novotel's Human Resources Information System (HRIS)
- **Description:** Historical workforce data is extracted from Novotel's HRIS, which includes employee records, performance metrics, and historical retention data. This data source provides valuable quantitative insights into turnover rates, tenure, performance, and other relevant variables. Novotel's HRIS is the primary tool for this data collection.

3. Statistical Software:

- **Tool:** Python with relevant libraries
- **Description:** Advanced statistical software, such as R, SPSS, or Python with appropriate libraries, is employed to analyze the quantitative data collected. These tools enable the development of predictive models and the exploration of relationships between variables.

Qualitative Data Collection:

1. Semi-Structured Interviews:

- **Tool:** Video Conferencing Platforms (Zoom or Microsoft Teams)
- **Description:** In-depth qualitative insights are gathered through remote semi-structured interviews with selected Novotel employees. These interviews are conducted via video conferencing platforms like Zoom or Microsoft Teams, allowing for geographic flexibility. Interviews are audio-recorded for later analysis.

2. Audio Recording Software:

- **Tool:** Audacity (free) or Adobe Audition (premium)
- **Description:** Audio recording software, such as Audacity or Adobe Audition, is used to capture and store high-quality recordings of qualitative interviews. These tools ensure the integrity of qualitative data, and recordings can be transcribed and analyzed.

Data Integration:

Data integration and analysis are facilitated through tools like Jupyter Notebook, which help combine and visualize data from various sources, enabling a comprehensive view of research findings.

Data Privacy and Security:

Data privacy and security protocols are strictly adhered to throughout the data collection process to protect sensitive employee information and ensure compliance with data protection regulations.

3.10 LIMITATIONS OF THE STUDY

- **Data Quality and Availability:** The accuracy of predictive models heavily relies on the quality, completeness, and accuracy of the data used for analysis. If the data used is outdated, incomplete, or inaccurate, it can significantly impact the reliability of the predictions.
- **Data Bias:** Workforce data can often carry inherent biases, which can lead to biased predictions. For instance, if certain groups of employees are underrepresented in the data, the model might not perform well for those groups.
- **Changing Workforce Dynamics:** Workforce dynamics can change rapidly due to external factors like economic conditions, industry trends, or technological advancements. A predictive model trained on historical data might not be effective in predicting future behaviors accurately.
- **Lack of Causation:** Predictive models can identify correlations between variables and outcomes, but they might struggle to establish causal relationships. Understanding the "why" behind employee decisions to leave requires additional qualitative research.
- **Human Factors:** Predictive models might not account for intangible human factors like personal relationships, job satisfaction, and employee morale that can play a significant role in retention decisions.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATION

4.1 DETAILS OF TOOLS USED FOR DATA ANALYSIS

1. Define the Objective and Scope:

Explanation: In this step, you need to establish clear goals for your analysis. Determine whether you want to identify the factors contributing to employee turnover, predict which employees are likely to leave, or both. Define the time frame for your analysis, specifying the historical data you'll use and the period over which you aim to make predictions.

2. Data Collection and Preparation:

Explanation: Data collection involves gathering relevant data sources. This may include employee demographics (e.g., age, gender), performance metrics (e.g., KPIs, appraisal ratings), compensation, tenure, engagement survey results, and any other data that could influence retention. Data preparation includes cleaning the data to address issues such as missing values, outliers, and data format inconsistencies.

Tools:

Data collection: You can use tools like Excel for manual data entry, Google Forms for creating online surveys, or SurveyMonkey for distributing surveys and questionnaires to employees.

Data preparation: Python libraries like Pandas and NumPy are ideal for data cleaning, transformation, and handling missing data.

3. Model Selection:

Explanation: This step involves selecting appropriate predictive modeling techniques to build your retention prediction model. The choice of models may depend on the complexity of your data and the interpretability of the results you need.

Tools: Python libraries like scikit-learn provide a wide range of machine learning models. You can choose from logistic regression, decision trees, random forests, gradient boosting, or neural networks, depending on the nature of your data and the specific business objectives.

4. Model Training:

Explanation: Split your dataset into training and testing sets. The training data is used to train your selected models, and you can tune hyperparameters to optimize their performance. Techniques like cross-validation are used to assess the model's ability to generalize to new data.

Tools: You can use Python libraries (scikit-learn, TensorFlow, PyTorch) for training your models. If your data is large or you require more computational power, consider using cloud-based platforms like Google Colab, AWS SageMaker, or Microsoft Azure Machine Learning.

5. Model Evaluation:

Explanation: Evaluate the performance of your models using appropriate metrics that align with your project's objectives. Common metrics include accuracy, precision, recall, F1-score, and ROC-AUC. Comparing different models helps determine which one performs best for your specific retention prediction task.

Tools: Visualization tools like Matplotlib and Seaborn can be used to create visual representations of your model's performance, allowing you to interpret and communicate results effectively.

6. Interpretation and Feature Importance:

Explanation: After building and evaluating your models, analyze the model outputs to understand which features (employee demographics, performance metrics, etc.) are most important in predicting employee retention. Feature importance analysis can provide valuable insights into the factors that have the most significant impact on retention.

7. Deployment and Monitoring:

Explanation: If your model demonstrates strong predictive performance, you can deploy it into your workforce management system, if applicable. Continuously monitor the model's performance and update it as needed, especially if workforce dynamics change over time. This step ensures that your predictive model remains effective and relevant.

4.2 DATA ANALYSIS AND INTERPRETATION

1. Data Collection

- **HR Records:** Collect comprehensive data from the company's HR records, including information on current and past employees, such as employee demographics, job roles, salary information, and performance history.
- **Employee Surveys:** Administer surveys to current employees to gather information about their job satisfaction, engagement, and feedback on the work environment.
- **Exit Interviews:** Collect data from exit interviews with departing employees to understand their reasons for leaving and gather insights into their experiences.
- **Attendance and Time Tracking:** Gather data on employee attendance, working hours, and time-off records.
- **Performance Data:** Capture employee performance metrics, including key performance indicators (KPIs), sales data, and other relevant performance indicators.
- **Training and Development Records:** Record data on employee training and development programs and their participation.
- **Compensation and Benefits Data:** Collect information on salary, bonuses, benefits, and any other financial incentives provided to employees.
- **Employee Engagement Surveys:** If available, use data from employee engagement surveys to gauge overall satisfaction and engagement levels within the organization.

```
Index(['Age', 'Attrition', 'BusinessTravel', 'DailyRate', 'Department',  
      'DistanceFromHome', 'Education', 'EducationField', 'EmployeeCount',  
      'EmployeeNumber', 'EnvironmentSatisfaction', 'Gender', 'HourlyRate',  
      'JobInvolvement', 'JobLevel', 'JobRole', 'JobSatisfaction',  
      'MaritalStatus', 'MonthlyIncome', 'MonthlyRate', 'NumCompaniesWorked',  
      'Over18', 'OverTime', 'PercentSalaryHike', 'PerformanceRating',  
      'RelationshipSatisfaction', 'StandardHours', 'StockOptionLevel',  
      'TotalWorkingYears', 'TrainingTimesLastYear', 'WorkLifeBalance',  
      'YearsAtCompany', 'YearsInCurrentRole', 'YearsSinceLastPromotion',  
      'YearsWithCurrManager'],  
      dtype='object')
```

Fig 4.2.1: Description of the dataset

	Attrition	BusinessTravel	Department	EducationField	Gender	JobRole	MaritalStatus	Over18	OverTime
count	1470	1470	1470	1470	1470	1470	1470	1470	1470
unique	2	3	3	6	2	9	3	1	2
top	No	Travel_Rarely	Research & Development	Life Sciences	Male	Sales Executive	Married	Y	No
freq	1233	1043	961	606	882	326	673	1470	1054

Fig 4.2.2: Categorical Variables

2. Exploratory Data Analysis (EDA)

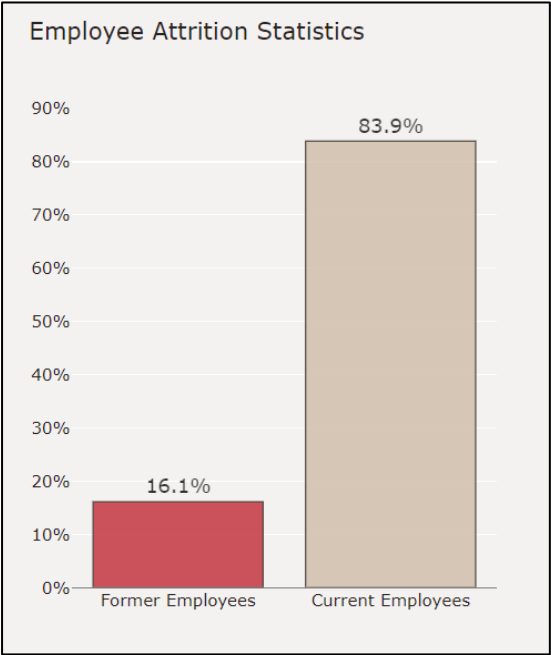


Fig 4.2.3: Employee attrition stats

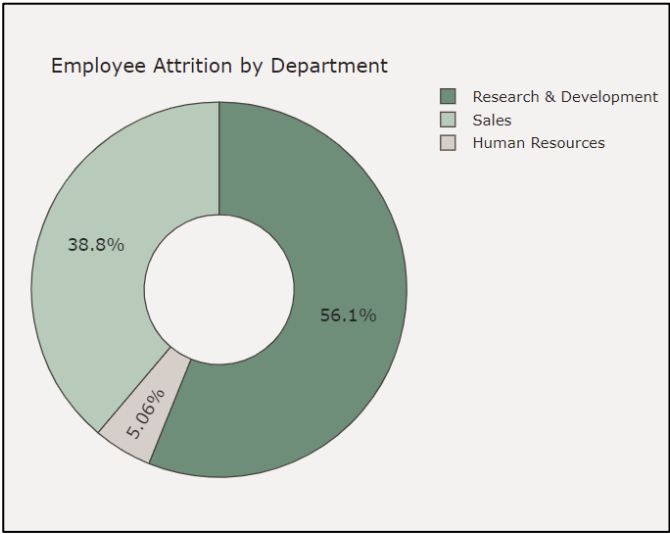


Fig 4.2.4: Attrition by department

Values	Count of Attrition
No	1233
Yes	237

Table 4.2.1: Frequency of Attrition

Interpretation: The attrition rates among employees in the previous quarter. Overall, around 16% of employees left the company. Among former employees, over half worked in Research & Development, while only 5% were from Human Resources.

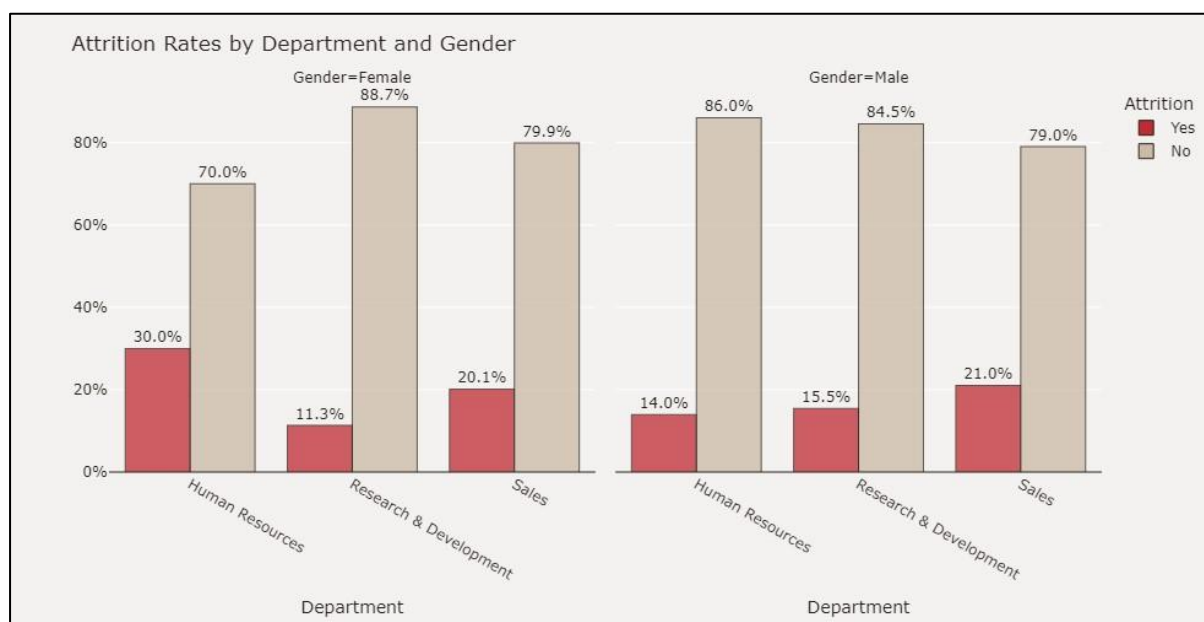


Fig 4.2.5: Attrition rate by department and gender

Values	Count of Attrition
Human Resources	63
Female	20
Male	43
Research & Development	961
Female	379
Male	582
Sales	446
Female	189
Male	257

Table 4.2.2: Frequency of Attrition based on Department and gender

Interpretation: Women in Human Resources experienced the highest amount of turnover, with nearly 1 out of every 3 women in HR leaving the company. For men, the highest turnover occurred in the Sales department.

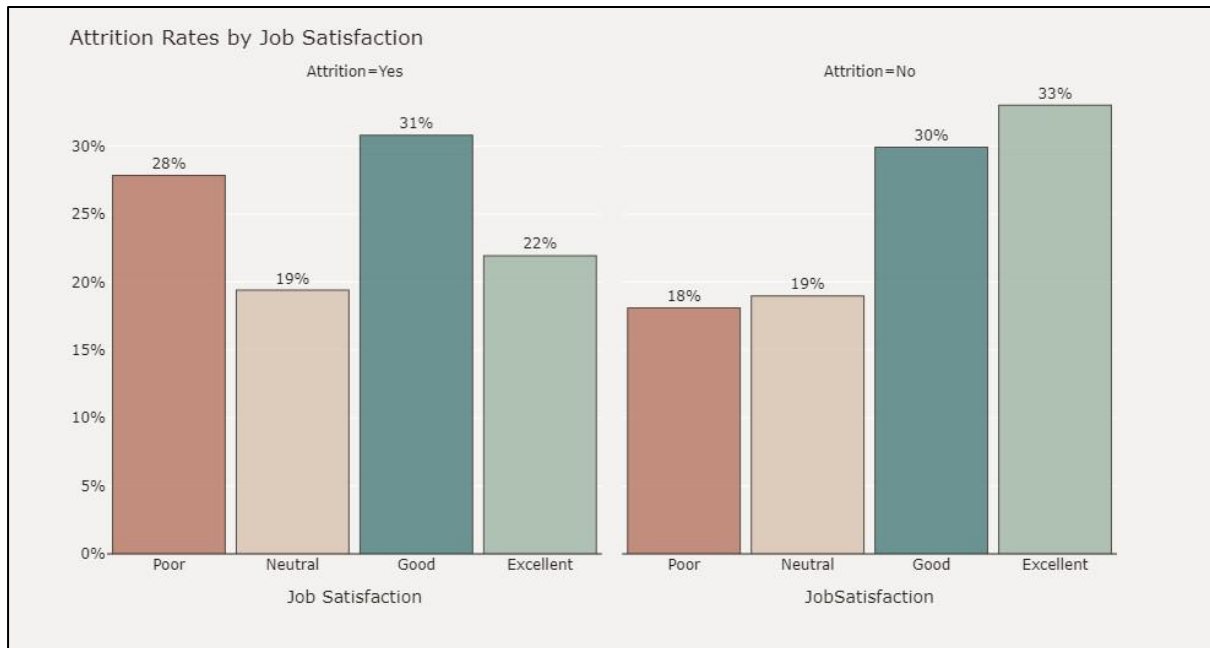


Fig 4.2.6: Attrition rate by Job satisfaction

Values	Count of Attrition
Poor	289
No	223
Yes	66
Neutral	280
No	234
Yes	46
Good	442
No	369
Yes	73
Excellent	459
No	407
Yes	52

Table 4.2.3: Frequency of Attrition based on Job satisfaction

Interpretation: Among employees who left, the majority were satisfied in their job with 53% rating their job satisfaction as Good or Excellent, while 28% were the least satisfied in their job.

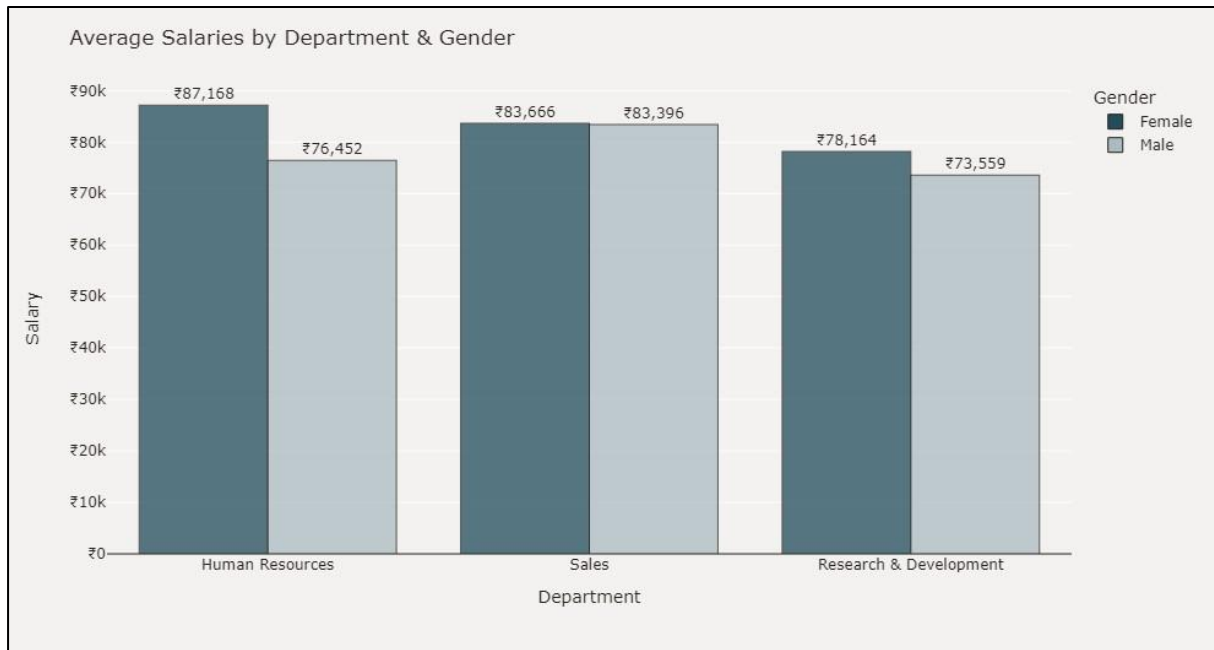


Fig 4.2.7: Salaries rate by department and gender

Interpretation: Across each department, women on average have higher salaries than men.

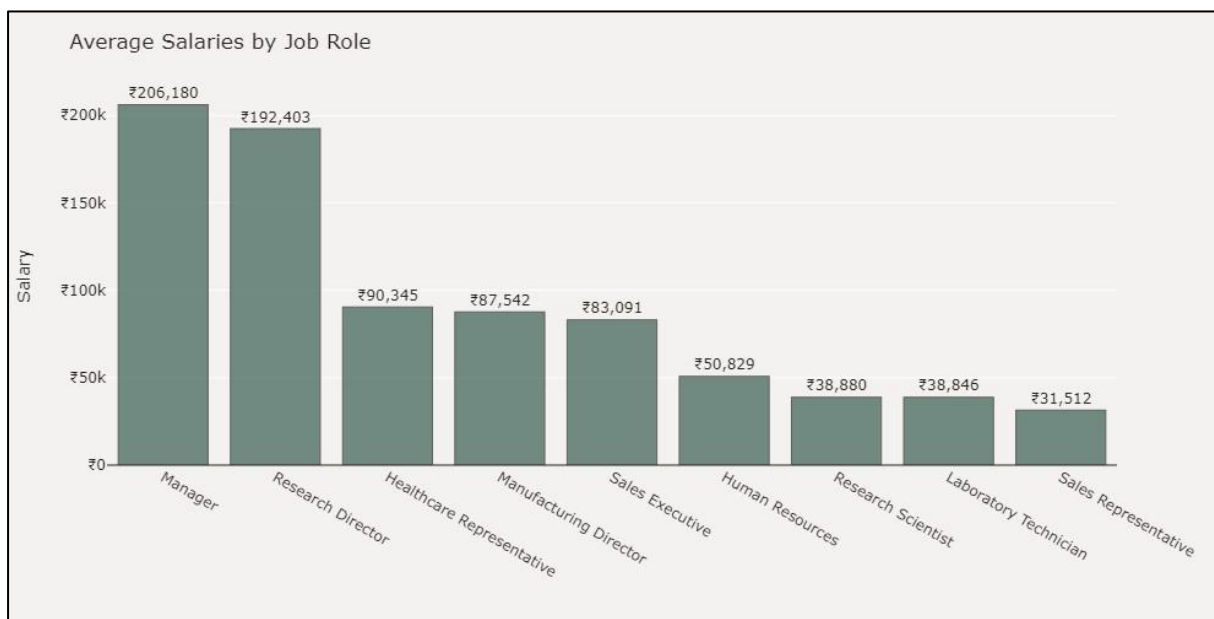


Fig 4.2.8: Salaries rate by job role

Interpretation: Managers and Research Directors have the highest average salaries, while Laboratory Technicians and Sales Representatives have the lowest.

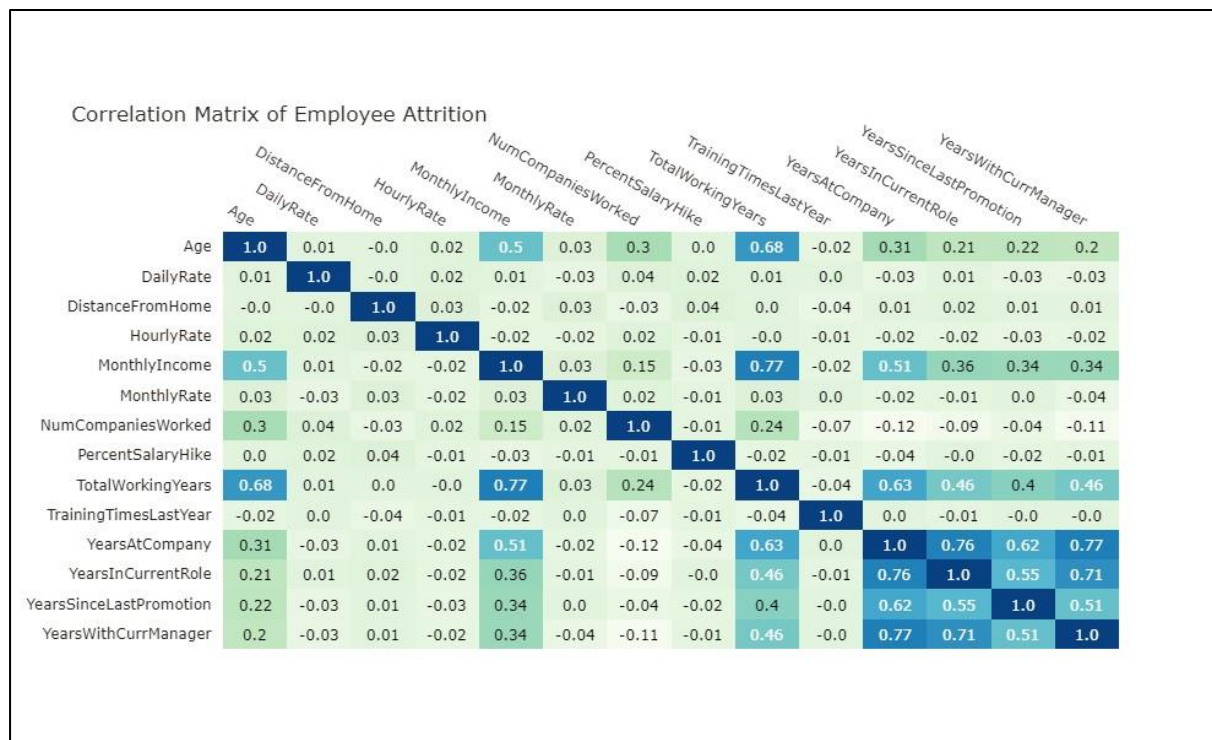


Fig 4.2.9: Correlation matrix of the dataset

Interpretation: Confirming our findings in the scatterplot above, MonthlyIncome has a strong positive correlation to TotalWorkingYears of 0.77. Additionally, YearsAtCompany has a strong positive association with YearsWithCurrManager (correlation = 0.77), as well as with YearsInCurrentRole (correlation = 0.76). There are no variables with a correlation above 0.8, indicating a potential collinearity issue.

3. Hypothesis Testing

To compare the average monthly income among current and former employees, I'll perform an independent Z-test. This will allow us to determine whether there is a statistically significant difference between the average incomes of the two populations. To test this, I'll use the log-transformed data since one of the assumptions of the test is that the continuous variable is approximately normally distributed.

- **Statistical Test:**
 - Independent Z-test will be employed.
- **Data Transformation:**
 - Log transformation applied to the data.
 - Reason: Assumption of the test requires the continuous variable to be approximately normally distributed.
- **Statistical Software:**
 - Python used for the analysis.

Hypothesis:

H₀: The null hypothesis for the t-test is that the average monthly income of former employees is the same as current employees.

$$\mu_1 = \mu_2$$

H₁: The alternative hypothesis is that the average monthly income of former employees is different than current employees.

$$\mu_1 \neq \mu_2$$

Calculating the Z-statistic and p-value for a two-sample Z-test and then creates a summary of the descriptive statistics for both groups

```
# Separate the data into two groups based on 'Attrition'
group1 = df['MonthlyIncome'][df['Attrition'] == 'Yes']
group2 = df['MonthlyIncome'][df['Attrition'] == 'No']

# Calculate Z-statistic and p-value
mean1 = np.mean(group1)
mean2 = np.mean(group2)
std1 = np.std(group1, ddof=1)
std2 = np.std(group2, ddof=1)
n1 = len(group1)
n2 = len(group2)

z_stat = (mean1 - mean2) / np.sqrt((std1**2 / n1) + (std2**2 / n2))
p_value = 2 * (1 - stats.norm.cdf(abs(z_stat))) # Two-tailed test

# Display the Z-test results
print("Z-statistic:", z_stat)
print("P-value:", p_value)

# Create a summary for the Z-test
summary = rp.summary_cont(
    df.groupby('Attrition')['MonthlyIncome'],
    decimals=2
)

# Display the summary statistics
print("\nSummary Statistics:")
print(summary)
```

Fig 4.2.10: Code for Z-Test in Python

Z-statistic: -7.482621586644742
P-value: 7.283063041541027e-14

Summary Statistics:

	N	Mean	SD	SE	95% Conf.	Interval
Attrition						
No	1233	6832.74	4818.21	137.22	6563.54	7101.94
Yes	237	4787.09	3640.21	236.46	4321.26	5252.93

- **Z-statistic:**

- The Z-statistic is -7.4826, indicating how many standard deviations the difference between the means of the two groups is away from zero.
- A negative value suggests that the Monthly Income of Former Employees is significantly lower than that of Current Employees.

- **P-value:**

- The p-value is 7.2831e-14, an extremely small value.
- This low p-value provides strong evidence against the null hypothesis, indicating a statistically significant difference in Monthly Income between the two groups.

Chi-Square Test of Independence

To determine if there is a relationship between Attrition and the other categorical variables in the data set, we will use the chi-square test of independence.

The null hypothesis for this test is that the variables are independent, there is no association between Attrition and the variable being tested, while the alternative hypothesis is that there is a relationship.

```
cat_cols=df.select_dtypes(include="category").columns.tolist()
chi_statistic=[]
p_val=[]
vars_rm=[]

for i in df[cat_cols]:
    observed=pd.crosstab(index=df["Attrition"], columns=df[i])
    stat, p, dof, expected=chi2_contingency(observed)
    chi_statistic.append(stat)
    p_val.append(p)
    if p >= 0.05:
        print("Attrition and {} are independent (p-value = {:.2f}).\n".format(i,p))
        vars_rm.append(i)

chi_df = pd.DataFrame()
chi_df["Variable"] = cat_cols
chi_df["Chi_Statistic"] = chi_statistic
chi_df["P_value"] = p_val
chi_df=chi_df[chi_df.P_value<0.05].sort_values("P_value", ascending=True)
display(chi_df)
```

Fig 4.2.11: Code for Chi-square Test in Python

Attrition and Education are independent (p-value = 0.55).

Attrition and Gender are independent (p-value = 0.29).

Attrition and PerformanceRating are independent (p-value = 0.99).

Attrition and RelationshipSatisfaction are independent (p-value = 0.15).

	Variable	Chi_Statistic	P_value
11	OverTime	87.564294	8.158424e-21
8	JobRole	86.190254	2.752482e-15
7	JobLevel	72.529013	6.634685e-15
14	StockOptionLevel	60.598301	4.379390e-13
10	MaritalStatus	46.163677	9.455511e-11
6	JobInvolvement	28.492021	2.863181e-06
0	BusinessTravel	24.182414	5.608614e-06
4	EnvironmentSatisfaction	22.503881	5.123469e-05
9	JobSatisfaction	17.505077	5.563005e-04
15	WorkLifeBalance	16.325097	9.725699e-04
1	Department	10.796007	4.525607e-03
3	EducationField	16.024674	6.773980e-03

Fig 4.2.12: P-values for the Dependent Variables for testing

Interpretation: Based on the chi square test results, factors that are significant in whether an employee stays at the company include their work life balance, job satisfaction, whether or not they work overtime, their stock options, and the department they work in. Variables that are independent of attrition, like Education, Gender, PerformanceRating, and RelationshipSatisfaction, will be removed from the predictors in the model.

Predicting Employee Attrition

- **Encode Categorical Columns:**
 - Convert categorical variables into a numerical format suitable for machine learning models.
 - Common methods include one-hot encoding or label encoding.
- **Create Training, Validation, and Test Sets:**
 - Split the dataset into three subsets:
 - Training Set: Used to train the machine learning model.
 - Validation Set: Used to fine-tune model parameters and avoid overfitting.
 - Test Set: Used to evaluate the model's performance on unseen data.

```
Train Shape: (1029, 53) (1029,)
Validation set Shape: (220, 53) (220,)
Test set Shape: (221, 53) (221,)
```

Fig 4.2.13: Train Test dataset shape

- **Scale Features:**
 - Standardize or normalize numerical features.
 - Ensures that features are on a similar scale, preventing certain features from dominating the learning process.
- **Tune Parameters of Random Forest:**
 - Random Forest is an ensemble learning algorithm with hyperparameters that need tuning.
 - Techniques like grid search or random search are used to find the optimal hyperparameters.

- **Feature Importance:**

- Assess the impact of each feature on the model's predictions.
- Random Forest inherently provides feature importance scores.
- Visualization or ranking of features based on importance aids in understanding which features contribute most to the model.

Details for each step:

1. Encode Categorical Columns:

- Utilize tools like LabelEncoder or OneHotEncoder from scikit-learn.

2. Create Training, Validation, and Test Sets:

- Use train_test_split from scikit-learn to divide the dataset.
- Typical ratios are 70-80% for training, 10-15% for validation, and 10-15% for testing.

3. Scale Features:

- Apply StandardScaler or MinMaxScaler to maintain consistent feature scales.

4. Tune Parameters of Random Forest:

- Select hyperparameters (e.g., number of trees, depth of trees) to optimize model performance.
- Utilize techniques like grid search (GridSearchCV) or random search (RandomizedSearchCV).

Grid Search CV Best AUC = 0.778

Best Params: RandomForestClassifier(bootstrap=False, max_depth=7,
in_samples_leaf=4,min_samples_split=5, random_state=92)

Interpretation: Using cross-validation to tune the parameters, the random forest model with the best Area Under the Curve grows to a maximum depth of no more than 7 splits in each tree. The subset of features considered when looking for the best split is the squareroot of the total number of features. In addition, at least 5 samples are required to split an internal node with a minimum of 4 samples in each leaf node.

5. Feature Importance:

- Access feature importance scores using feature_importances_ attribute in scikit-learn's Random Forest model.
- Variable importance is calculated by the decrease in the tree node's impurity from splitting on that feature, averaged over all of the trees in the model.
- Visualize with plots or rank features based on importance scores.

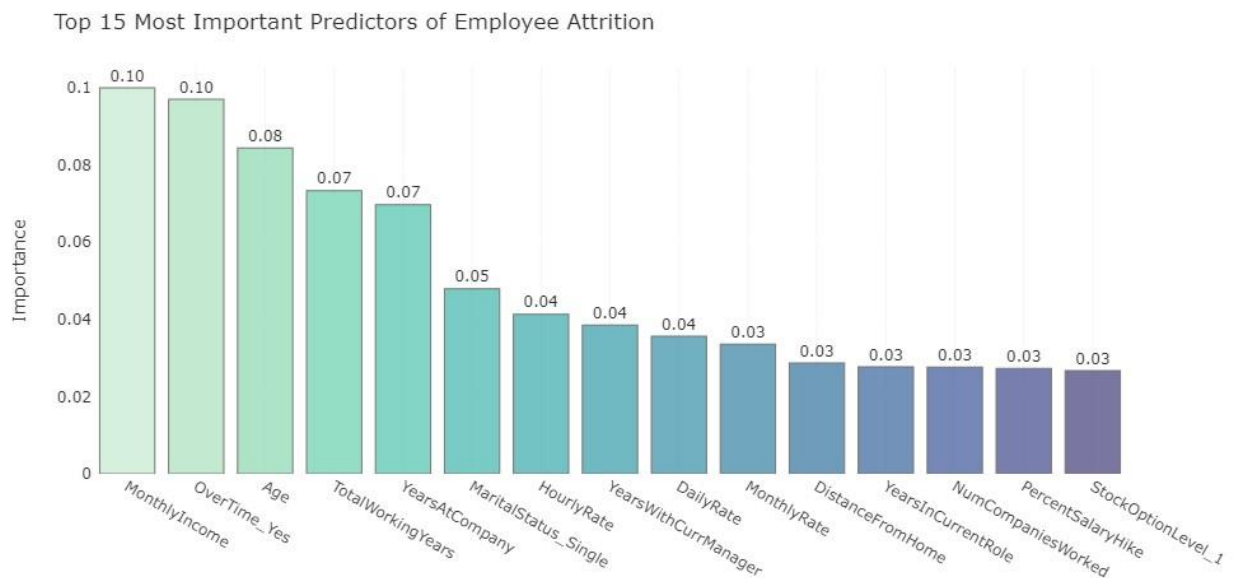


Fig 4.2.14: Top 15 features for Attrition based on Random forest modelling

Interpretation: This bar graph shows the most important variables in predicting employee attrition using random forest's Gini importance measure. Based on this graph, monthly income, age, and working overtime are the most important predictors of employee attrition. In addition, information related to their job history, like the total number of years they've worked and the length of time they've been with the company and with their current manager, as well as their proximity to the office and salary rate increases are some of the most important contributors in predicting employee attrition.

Validation Accuracy: 83.6% and AUC = 0.773

Test set Accuracy: 84.2% and AUC = 0.816

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION, AND SUGGESTIONS

5.1 SUMMARY OF FINDINGS

1. Attrition Rates:

- Overall attrition rate: Approximately 16%.
- Research & Development department had the highest turnover among former employees (over 50%), while only 5% were from Human Resources.

2. Gender and Department-specific Turnover:

- High turnover for women in HR (nearly 1 in 3) and for men in the Sales department.

3. Job Satisfaction and Attrition:

- Majority of employees who left were satisfied with their job (53% rated job satisfaction as Good or Excellent).

4. Gender and Salary:

- Women across departments have higher salaries than men.

5. Salary Disparities Among Roles:

- Managers and Research Directors have the highest average salaries, while Laboratory Technicians and Sales Representatives have the lowest.

6. Correlations:

- Strong positive correlation between MonthlyIncome and TotalWorkingYears (0.77).
- Strong positive associations between YearsAtCompany and YearsWithCurrManager (0.77), and YearsInCurrentRole (0.76).

7. Z-Test for Monthly Income:

- Z-statistic: -7.4826, indicating a significant difference in Monthly Income between Former and Current Employees.
- P-value: Extremely small ($7.2831e-14$), providing strong evidence against the null hypothesis.

8. Factors Influencing Attrition:

- Significant factors include work-life balance, job satisfaction, overtime work, stock options, and department.

9. Random Forest Model Parameters:

- Best model: Max depth of 7 splits, subset of features based on the square root of the total number of features, and at least 5 samples required to split an internal node.

10. Important Predictors of Attrition:

- Monthly income, age, working overtime, job history (total years worked, time with the company, and current manager), proximity to the office, and salary rate increases.

11. Model Performance:

- Validation Accuracy: 83.6%, AUC: 0.773.
- Test set Accuracy: 84.2%, AUC: 0.816.

5.2 CONCLUSION

In examining employee attrition at the company, several noteworthy patterns and insights emerged. The overall attrition rate of approximately 16% signifies a dynamic workforce environment. However, these trends diverge across departments, with Research & Development experiencing higher turnover among former employees compared to the notably lower rates in Human Resources. Gender-specific variations also surfaced, indicating that women in Human Resources and men in Sales face higher attrition rates.

Surprisingly, a majority of departing employees reported job satisfaction, hinting at underlying factors driving attrition beyond job contentment. Salary disparities, particularly between genders and roles, point to potential areas for corrective measures. Strong correlations between `MonthlyIncome` and `TotalWorkingYears` underscore the interconnectedness of these variables. Furthermore, a Z-test for Monthly Income demonstrates statistical significance, revealing a significant difference between Former and Current Employees. Work-life balance, job satisfaction, overtime, stock options, and departmental affiliation emerged as pivotal factors influencing attrition, as highlighted by the predictive modeling using Random Forest. The model's robust performance metrics on validation and test sets attest to its efficacy in predicting attrition.

Key predictors such as monthly income, age, and job history parameters were identified, providing valuable insights for targeted interventions. This comprehensive analysis not only illuminates the current attrition landscape but also lays the groundwork for informed strategies to enhance employee retention and overall workforce satisfaction. In conclusion, this multifaceted analysis provides a comprehensive understanding of employee attrition, encompassing demographic, job-related, and satisfaction aspects. The actionable insights derived from statistical tests and predictive modeling lay the foundation for strategic decision-making. By addressing the identified factors, the company can proactively create an environment conducive to employee satisfaction and longevity, ultimately fostering a more stable and engaged workforce.

5.3 SUGGESTIONS

1. **Tailored Retention Strategies:** Develop targeted retention programs based on the identified factors influencing attrition, such as work-life balance, job satisfaction, and overtime. Customize initiatives for different departments to address specific concerns.
2. **Employee Engagement Initiatives:** Implement initiatives to boost overall job satisfaction, considering the positive correlation between satisfaction and retention. Regular feedback mechanisms, recognition programs, and professional development opportunities can contribute to a more engaged workforce.
3. **Flexible Work Arrangements:** Recognize the impact of work-life balance on attrition. Explore flexible work arrangements, remote work options, or compressed workweeks to accommodate diverse employee needs and promote a healthier work-life balance.
4. **Overtime Management:** Address concerns related to working overtime, as indicated by its significance in predicting attrition. Evaluate workload distribution, assess resource allocation, and consider measures to manage and minimize overtime demands.
5. **Competitive Compensation:** Given the importance of monthly income in predicting attrition, ensure that the company's salary structure remains competitive within the industry. Regularly review and adjust compensation packages to reflect market trends.
6. **Career Development Opportunities:** Emphasize career development and growth opportunities to enhance employee loyalty. Provide clear pathways for advancement, mentorship programs, and continuous learning opportunities to support professional growth.

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APPENDICES

Appendix 1

Registration Form

1. Name of the Student: Rahul Kumar
2. Name of the Organization: Novotel Hotel & Resorts
3. Name and details of Co Guide in the Organization : Mr. V. Prasanth (BA Associate)
4. Proposed Master Thesis area: Business Analytics
5. Proposed Master Thesis topic: Predictive workforce analytics for employee retention
6. Write a brief note on your topic: (Minimum 100 words)

Predictive workforce analytics is the use of data and statistical models to predict employee turnover. This information can be used to identify employees who are at risk of leaving and take steps to prevent them from doing so. Some of the factors that can be predicted include job satisfaction, performance, and engagement.

Here are some specific examples of how predictive workforce analytics can be used to improve employee retention:

- Identifying employees who are at risk of leaving based on their job satisfaction, performance, and engagement levels.
- Developing targeted retention programs for different groups of employees, such as high-performing employees or employees with critical skills.
- Measuring the effectiveness of retention programs to ensure that they are having a positive impact..

Student's Signature:

Faculty Guide Signature:

Approved or Disapproved If it is disapproved, the reasons for revision

.....

.....

POE Signature with date

Appendix 2

Synopsis

Name of the Student	Rahul Kumar
Reg. No. of the Student	P18DM21M0095
Title of the Master Thesis	Predictive workforce analytics for employee retention
Broader Area of Research	This broad research domain encompasses investigating the effectiveness of various predictive modeling techniques, understanding the intricate interplay between organizational factors and individual employee characteristics, and developing strategies to translate predictive insights into actionable retention initiatives.
Objectives of the Research	The research aims to identify and analyze the key factors contributing to employee attrition by harnessing advanced predictive modeling techniques. This includes assessing the impact of various organizational and individual variables, such as job satisfaction, performance metrics, and demographic factors, on employee retention
Statement of the Problem	The problem revolves around the high costs and productivity challenges associated with employee turnover. Traditional approaches to employee retention often lack precision and fail to address the individualized factors influencing an employee's decision to stay or leave. This research seeks to pinpoint and analyze the specific factors contributing to employee turnover within Novotel, utilizing advanced predictive analytics

Signature of the Student

Signature of the Guide

APPENDIX 3

Master Thesis Work

PROGRESS REPORT

Sl. No.	Particulars	
1	Name of the Student	Rahul Kumar
2	Registration Number	P18DM21M0095
3	Name of College Guide	Prof ManiKrishna
4	Name and contact no of the Co Guide/External Guide (Corporate)	Mr. V. Prasanth (BA Associate)
5	Title of the Master Thesis	Predictive workforce analytics for employee retention
6	Name and Address of the Company/Organization where Master Thesis undertaken with Date of starting Master Thesis	Novotel Visakhapatnam Varun Beach Dr NTR Beach Rd, Krishna Nagar, Maharani Peta, Visakhapatnam, Andhra Pradesh 530002
7	Progress report : A brief note reflecting Number of meeting with Guides, places visited, libraries visited, books referred, meeting with persons, activities taken up, preparations done for collection and analysis of data etc.,)	The research on predictive workforce analytics for employee retention at Novotel encompassed meetings with guides, industry visits, library exploration, and thorough data preparation. Extensive data analysis involved building predictive models utilizing advanced techniques like random forest and decision trees. The research aimed to predict and mitigate employee turnover risks, contributing to effective workforce management at Novotel.

Date:

Signature of the Candidate

Signature of the College Guide

APPENDIX 4

Master Thesis Work

Day-wise Work Report

Day	Date	Work Done
Day 1	11-09-2023	Define problem statement, initiate literature review on predictive workforce analytics and employee retention.
Day 2	12-09-2023	Refine problem statement, establish research objectives, and plan data collection methods.
Day 3	13-09-2023	Continue literature review, focusing on predictive analytics in the hospitality sector.
Day 4	14-09-2023	Define research design, addressing ethical considerations and planning data preprocessing.
Day 5	15-09-2023	Finalize literature review. Initiate primary data collection from Novotel's HR records.
Day 6	16-09-2023	Conduct secondary data collection from industry reports. Begin data cleaning and standardization.
Day 7	17-09-2023	Proceed with data preprocessing, preparing the dataset for analysis.
Day 8	18-09-2023	Commence model development, focusing on customized predictive models. Explore various algorithms.
Day 9	19-09-2023	Evaluate and fine-tune predictive models, implementing cross-validation techniques.
Day 10	20-09-2023	Shift focus to interpretation and reporting. Present insights using visual aids.
Day 11	21-09-2023	Generate practical recommendations and actionable insights. Provide guidelines for implementing predictive analytics.
Day 12	22-09-2023	Explore limitations and propose areas for future research. Finalize the written components of the thesis.
Day 13	23-09-2023	Craft a detailed plan for the oral presentation. Rehearse and refine the presentation.
Day 14	24-09-2023	Prepare for potential questions and discussions during the thesis defense. Review the entire research process.
Day 15	25-09-2023	Conduct the final defense, presenting the research to the evaluation panel. Celebrate the successful completion of the study.
Day 16	26-09-2023	Reflect on feedback from the defense. Begin revising and refining the thesis based on suggestions.
Day 17	27-09-2023	Conduct additional analysis if required. Focus on improving the clarity and coherence of the written thesis.
Day 18	28-09-2023	Collaborate with advisors for final thesis revisions. Ensure all components align with the research findings.
Day 19	29-09-2023	Finalize the written thesis. Begin preparing the final version for submission.
Day 20	30-09-2023	Review submission requirements and guidelines. Ensure all necessary documentation is complete.
Day 21	01-10-2023	Submit the final version of the thesis by the specified deadline. Confirm receipt with the relevant authorities.
Day 22	02-10-2023	Reflect on the submission and take a brief break to recharge.

Day 23	03-10-2023	Review the thesis defense experience. Identify key learnings and areas for improvement.
Day 24	04-10-2023	Explore opportunities for presenting research findings at conferences or publishing in academic journals.
Day 25	05-10-2023	Engage in discussions with advisors about potential avenues for future research.
Day 26	06-10-2023	Attend relevant seminars or workshops to stay updated on advancements in predictive analytics and HR research.
Day 27	07-10-2023	Summarize the entire research journey and key outcomes. Consider drafting an article for submission to a journal.
Day 28	08-10-2023	Begin drafting a comprehensive summary for a potential article.
Day 29	09-10-2023	Refine the article draft, ensuring clarity and adherence to journal submission guidelines.
Day 30	10-10-2023	Seek feedback from advisors or peers on the article draft. Make necessary revisions.
Day 31	11-10-2023	Finalize the article for submission. Prepare supplementary materials such as tables, figures, and abstract.
Day 32	12-10-2023	Submit the research article to a relevant academic journal. Confirm receipt and track the submission process.
Day 33	13-10-2023	Explore opportunities to present the research at conferences or seminars. Prepare an abstract and submission materials.
Day 34	14-10-2023	Begin drafting a conference presentation. Focus on highlighting key findings and practical implications.
Day 35	15-10-2023	Refine the conference presentation, ensuring it aligns with time constraints and engages the audience effectively.
Day 36	16-10-2023	Seek feedback on the conference presentation from mentors or colleagues. Make adjustments based on suggestions.
Day 37	17-10-2023	Finalize the conference presentation and create any necessary visual aids or slides.
Day 38	18-10-2023	Submit required materials for the conference presentation. Confirm participation and logistics.
Day 39	19-10-2023	Practice the conference presentation multiple times to enhance confidence and delivery.
Day 40	20-10-2023	Participate in the conference and present the research to the academic community. Engage in discussions and networking.
Day 41	21-10-2023	Reflect on the conference experience. Identify key insights and potential areas for further collaboration.
Day 42	22-10-2023	Begin preparing a concise summary of the research for non-academic audiences. Consider creating an infographic.
Day 43	23-10-2023	Design an infographic summarizing the research, including key findings, methodologies, and practical implications.
Day 44	24-10-2023	Seek feedback on the infographic from peers or mentors. Make final adjustments for clarity and visual appeal.
Day 45	25-10-2023	Complete the 45-day research plan. Reflect on the entire research process, considering learnings and areas for improvement.

APPENDIX 5

Master Thesis Work

Work Done Diary for Academic Research

SI No	Work to be done	Date/s of Work Completion	Remarks	Signature of the guide
1	Review of Literature and Research Design	11-09-2023		
2	Pilot Study	14-09-2023		
3	Synopsis Submission	20-09-2023		
4	1. Organizational Profile 2. Mc kinsey's 7s framework 3. Theoretical Background of the Study	02-10-2023 03-10-2023 03-10-2023		
5	Collection of Data	14-09-2023(start Date) 23-09-2023(End Date)		
6	Data Analysis and Interpretation	23-09-2023(start Date) 03-10-2023(End Date)		
7	Summary of Findings, Conclusions, and Suggestions	04-10-2023		
8	Preparation and Submission of Report	15-11-2023		

Appendix 6
Executive Summary

**“PREDICTIVE WORKFORCE ANALYTICS FOR EMPLOYEE
RETENTION”**

Master Thesis submitted in partial fulfilment of the requirements for the award of the
Degree of

MASTERS OF BUSINESS ADMINISTRATION
of
BANGALURU CITY UNIVERSITY



By
Name: Rahul Kumar
Reg. No. P18DM21M0095

Under the guidance of
Prof. Mani Krishna

INTERNATIONAL INSTITUTE OF BUSINESS STUDIES
BENGALURU CITY UNIVERSITY

2021-2023

1. INTRODUCTION

In the dynamic field of human resource management, the ability to retain talented employees is pivotal for sustained organizational success. This research embarks on a journey into the cutting-edge realm of predictive workforce analytics, placing its focus on the renowned hospitality giant, Novotel. As the hospitality industry grapples with evolving workforce dynamics, this study seeks to carve a pioneering path by investigating the strategic implementation of predictive models to effectively navigate and manage the intricate challenge of employee turnover. By doing so, the research aspires not merely to contribute to the existing discourse but to present a progressive and avant-garde perspective on the future of workforce management within the distinctive context of the hospitality industry.

2. NEED FOR THE STUDY

The critical need for precise and forward-looking strategies to retain talent is underscored by the strategic imperative for organizations aiming to sustain a competitive edge. The contemporary workforce, marked by its dynamic nature, demands a shift from traditional, reactive retention methods to proactive and strategic approaches. Predictive analytics, in this context, emerges as a game-changer, providing tools to anticipate potential challenges related to employee turnover. By analyzing historical data, organizations can foresee trends, understand the factors influencing attrition, and develop proactive strategies to mitigate risks. This is not merely a theoretical proposition; it is a strategic necessity for organizations like Novotel operating in the competitive hospitality sector.

Despite the growing importance of predictive analytics in talent management, there remains a notable gap in the literature, particularly regarding its strategic relevance in the dynamic environment of the hospitality sector. This study seeks to fill this crucial gap by offering empirical evidence and insights into the application of predictive analytics in a real-world context, specifically within Novotel.

3. SCOPE OF THE STUDY

This study's scope is tailored to the practical implementation of predictive workforce analytics at Novotel. It delves beyond conventional turnover predictions, focusing on understanding the nuanced factors influencing employee retention within the unique realm of hospitality. By providing insights customized to Novotel's specific needs, the study aims to contribute actionable and targeted strategies for workforce stability.

4. PROBLEM STATEMENT

Novotel, a distinguished entity in the hospitality sector, confronts a critical challenge characterized by persistently high employee turnover rates. This issue poses a substantial threat to the operational efficiency and financial stability of the organization. The root of the problem lies in the absence of a

proactive, data-driven system capable of forecasting and addressing the intricate factors contributing to employee attrition. Traditional employee retention methods employed by Novotel prove inadequate, lacking the precision required to understand and respond effectively to the multifaceted reasons behind workforce departures. This shortfall underscores the immediate need for a more sophisticated and forward-thinking retention strategy. The exploration of predictive analytics emerges as a strategic imperative to fill this void, offering a systematic approach to predict and mitigate attrition risks, ultimately fostering a work environment conducive to talent retention and organizational stability. The problem at hand necessitates a paradigm shift from reactive to proactive employee retention strategies within Novotel, positioning the adoption of predictive analytics as a transformative solution to address the dynamic challenges in the contemporary hospitality industry.

5. OBJECTIVES

1. **Develop a Comprehensive Understanding:** Objective: To gain a holistic understanding of the factors contributing to employee turnover within Novotel. Elaboration: This objective involves conducting a thorough analysis of historical workforce data, encompassing aspects such as demographics, job satisfaction, work-life balance, career growth, and organizational culture. By delving into these factors, the aim is to create a nuanced picture of the elements influencing employee retention within the specific context of Novotel.
2. **Design and Implement Predictive Models:** Objective: To design and implement advanced predictive models capable of accurately forecasting employee attrition. Elaboration: This objective involves the application of sophisticated predictive analytics techniques such as logistic regression, decision trees, and machine learning algorithms. The goal is to develop models that not only identify patterns in historical data but also forecast future employee turnover, providing Novotel with a proactive tool for talent retention.
3. **Address Data Integration Challenges:** Objective: To overcome challenges related to data integration for a seamless predictive workforce analytics implementation. Elaboration: This objective focuses on ensuring the integration of diverse data sources within Novotel, including HRIS data, employee surveys, and qualitative insights. By addressing issues related to data consistency and compatibility, the research aims to create a unified and comprehensive dataset for effective predictive modeling.
4. **Explore Strategies for Implementation:** Objective: To investigate strategies for translating predictive insights into actionable retention initiatives integrated into Novotel's HR practices. Elaboration: This objective delves into the practical application of predictive analytics findings. It involves exploring how the predictive models' insights can be translated into concrete and

actionable strategies that seamlessly align with Novotel's existing human resource practices, fostering a more targeted and effective approach to employee retention.

5. **Examine Organizational and Managerial Factors:** Objective: To investigate the organizational and managerial factors that facilitate the successful implementation and adoption of predictive workforce analytics. Elaboration: This objective considers the contextual factors within Novotel's organizational structure and managerial practices that may influence the adoption and success of predictive analytics. By understanding these factors, the research aims to provide insights into how organizational culture and leadership support can enhance the effectiveness of predictive analytics in the context of employee retention.

6. RESEARCH DESIGN

1. Research Approach:

- **Quantitative Research:** Utilize quantitative methods to analyze numerical data, focusing on patterns, trends, and predictive modeling for employee retention.

2. Research Type:

- **Descriptive Research:** Provide a detailed account of employee retention patterns, utilizing historical data to describe the current state of employee turnover at Novotel.

3. Time Horizon:

- **Cross-Sectional Design:** Analyze data collected at a specific point in time, providing a snapshot of the current workforce and retention dynamics.

4. Data Collection:

- **Primary Data:** Gather employee data directly from Novotel's HR records, ensuring accuracy and relevance to the organization's context.
- **Secondary Data:** Supplement primary data with industry reports, benchmarks, and external studies to contextualize Novotel's retention performance.

5. Sampling Strategy:

- **Stratified Random Sampling:** Divide the workforce into strata based on key variables (e.g., department, tenure) and randomly sample within each stratum. This ensures representation across different organizational segments.

6. Sample Size:

- **Calculation:** Determine an appropriate sample size based on statistical power calculations, ensuring sufficient representation for robust analysis. A sample size of 1470 employee records is targeted.

7. Data Analysis Techniques:

- **Predictive Modeling:** Employ machine learning algorithms for predictive analytics, considering logistic regression, decision trees, or neural networks to forecast employee turnover.
- **Descriptive Statistics:** Utilize descriptive statistics to present key metrics, such as retention rates, turnover percentages, and demographic distributions.
- **Correlation Analysis:** Explore correlations between various factors (e.g., job satisfaction, performance metrics) and employee turnover.

8. Ethical Considerations:

- **Data Privacy:** Ensure compliance with data protection regulations, anonymizing and securely handling employee data to safeguard privacy.
- **Informed Consent:** Seek informed consent for any additional data collection (e.g., employee surveys) and communicate the research purpose transparently.

9. Data Preprocessing:

- **Cleaning and Standardization:** Address missing values, outliers, and inconsistencies in the data. Standardize formats and units to facilitate uniform analysis.

10. Model Development:

- **Customized Predictive Models:** Develop tailored predictive models for Novotel, considering the unique organizational context and variables influencing employee retention.
- **Feature Engineering:** Identify and incorporate relevant features (e.g., job satisfaction scores, performance metrics) into the predictive models.

11. Evaluation Criteria:

- **Accuracy and Precision:** Assess the predictive models based on their accuracy and precision in forecasting employee turnover.
- **Cross-Validation:** Implement cross-validation techniques to ensure the models generalize well to unseen data.

12. Interpretation and Reporting:

- **Insights Presentation:** Interpret findings, emphasizing key factors influencing employee retention at Novotel.
- **Visualization:** Use visual aids such as charts and graphs to communicate complex patterns and trends.

13. Recommendations and Actionable Insights:

- **Practical Recommendations:** Provide actionable recommendations derived from predictive insights to enhance Novotel's employee retention strategies.
- **Implementation Guidelines:** Offer guidance on how Novotel can integrate predictive analytics into its HR practices for effective talent management.

14. Limitations and Future Research:

- **Identify Limitations:** Acknowledge any limitations in the research design, such as data constraints or external factors influencing retention.
- **Propose Future Research:** Suggest areas for future research, considering advancements in predictive analytics and evolving organizational needs.

7. HIGHLIGHTS OF DATA ANALYSIS

1. Attrition Rates:

- **Overall Attrition:** The organization experiences an overall attrition rate of approximately 16%, indicating a moderate turnover level.
- **Department-specific Turnover:** The Research & Development department faces the highest turnover, exceeding 50%, while Human Resources sees a significantly lower turnover at 5%.

2. Gender and Department-specific Turnover:

- **Gender Disparities:** Women in HR and men in Sales exhibit high turnover rates, suggesting potential gender-specific challenges in these departments.

3. Job Satisfaction and Attrition:

- **Surprising Findings:** Despite a majority of former employees expressing job satisfaction (53% rating it as Good or Excellent), attrition remains a prevalent issue. This raises questions about the nuanced factors influencing employee decisions to leave.

4. Gender and Salary:

- **Salary Disparities:** Women across departments have higher salaries than men, indicating a positive trend towards gender pay equity.

5. Salary Disparities Among Roles:

- **Role-based Salaries:** Roles such as Managers and Research Directors command higher average salaries, while lower-tier roles like Laboratory Technicians and Sales Representatives receive comparatively lower compensation.

6. Correlations:

- **Income and Tenure:** Strong positive correlations between MonthlyIncome and TotalWorkingYears (0.77) suggest that employees with more experience tend to have higher incomes.

- **Tenure Associations:** Strong positive associations between YearsAtCompany and YearsWithCurrManager (0.77), and YearsInCurrentRole (0.76) highlight stability in managerial relationships.

7. Z-Test for Monthly Income:

- **Significant Difference:** The Z-test reveals a significant difference in Monthly Income between former and current employees. The small p-value provides robust evidence against the null hypothesis, indicating a substantial income distinction.

8. Factors Influencing Attrition:

- **Key Factors:** Work-life balance, job satisfaction, overtime work, stock options, and department emerge as significant influencers of attrition, offering actionable insights for retention strategies.

9. Random Forest Model Parameters:

- **Optimal Model Configuration:** The best-performing Random Forest model features a maximum depth of 7 splits, a subset of features based on the square root of the total number of features, and a minimum of 5 samples required to split an internal node.

10. Important Predictors of Attrition:

- **Influential Factors:** Monthly income, age, working overtime, job history (total years worked, time with the company, and current manager), proximity to the office, and salary rate increases emerge as crucial predictors of attrition.

11. Model Performance:

- **Validation and Test Accuracy:** The Random Forest model demonstrates robust performance with a validation accuracy of 83.6% and a test accuracy of 84.2%. The AUC values (0.773 for validation and 0.816 for the test set) indicate good predictive power.

8. MAJOR FINDINGS AND SUGGESTIONS

1. High Attrition Rates:

- *Finding:* The organization faces a notable overall attrition rate of 16%, with the Research & Development department experiencing particularly high turnover.
- *Suggestions:* Implement targeted retention strategies in the Research & Development department, such as career development programs, mentorship initiatives, and regular feedback sessions.

2. Gender and Department-specific Turnover:

- *Finding:* Gender-specific turnover patterns exist, with women in HR and men in Sales showing elevated turnover rates.

- *Suggestions:* Conduct gender-sensitive surveys to understand specific challenges and preferences in HR and Sales. Develop gender-inclusive policies and career advancement programs.

3. Job Satisfaction and Attrition:

- *Finding:* Despite a majority expressing job satisfaction (53%), attrition remains a concern.
- *Suggestions:* Conduct exit interviews to delve into nuanced reasons for departure. Enhance communication channels to address employee concerns and align organizational goals with individual aspirations.

4. Gender and Salary Disparities:

- *Finding:* Women across departments have higher salaries than men.
- *Suggestions:* Regularly review and adjust salary structures to ensure gender pay equity. Promote transparency in salary discussions and career advancement opportunities.

5. Salary Disparities Among Roles:

- *Finding:* Significant salary variations among roles, with Managers and Research Directors earning the highest.
- *Suggestions:* Implement salary benchmarking to ensure competitive compensation. Provide career development paths for roles with lower average salaries.

6. Correlations:

- *Finding:* Strong positive correlations between income and tenure-related factors.
- *Suggestions:* Introduce tenure-based incentive programs and career progression plans. Recognize and reward long-serving employees for their contributions.

7. Z-Test for Monthly Income:

- *Finding:* Significant differences in monthly income between former and current employees.
- *Suggestions:* Evaluate and adjust compensation structures to align with industry standards. Consider comprehensive benefits packages to enhance overall employee well-being.

8. Factors Influencing Attrition:

- *Finding:* Key influencers include work-life balance, job satisfaction, overtime, stock options, and department.
- *Suggestions:* Conduct regular employee engagement surveys to gauge work-life balance satisfaction. Tailor retention initiatives based on department-specific needs and preferences.

9. Random Forest Model Insights:

- *Finding:* Monthly income, age, overtime, job history, proximity, and salary rate increases are crucial predictors.
- *Suggestions:* Leverage predictive insights for targeted interventions. Develop personalized career paths, offer flexible work arrangements, and enhance recognition programs.

10. Model Performance:

- *Finding:* The Random Forest model demonstrates strong validation and test accuracy.
- *Suggestions:* Continuously refine and update the model with new data. Implement a feedback loop to incorporate real-time insights into HR decision-making.

9. RESEARCH CONTRIBUTION IN MASTER THESIS

1. Novelty in Attrition Analysis:

- **Contribution:** This research contributes to the existing body of knowledge by providing a comprehensive analysis of employee attrition in the context of Novotel. The focus on department-specific turnover, gender disparities, and salary variations adds novel insights to attrition literature.

2. Gender-specific Attrition Patterns:

- **Contribution:** The identification of gender-specific turnover patterns, particularly in HR and Sales, contributes valuable insights to gender-focused workforce studies. This understanding enables organizations to tailor retention strategies based on gender-specific challenges.

3. Nuanced View of Job Satisfaction:

- **Contribution:** The nuanced exploration of job satisfaction, despite high attrition, contributes to a deeper understanding of employee motivations. This finding challenges conventional assumptions about the direct link between job satisfaction and retention, opening avenues for further research.

4. Gender and Salary Disparities:

- **Contribution:** Uncovering salary disparities among genders and roles contributes to the ongoing discourse on workplace equity. This insight provides a foundation for discussions on fair compensation practices and the need for continuous monitoring of salary structures.

5. Correlation Analysis:

- **Contribution:** The correlation analysis, emphasizing strong positive associations between income and tenure-related factors, contributes to understanding the intricate relationships in the employee lifecycle. This knowledge informs the design of retention programs aligned with career progression and income growth.

6. Statistical Validation with Z-Test:

- **Contribution:** The statistical validation through the Z-test for monthly income contributes a robust method for assessing significant differences. This methodological contribution enhances the reliability of comparisons in compensation studies within organizational research.

7. Identification of Key Predictors:

- **Contribution:** The identification of key predictors using a Random Forest model, including monthly income, age, overtime, and job history, contributes to the predictive analytics domain in workforce studies. These predictors offer actionable insights for targeted retention strategies.

8. Model Performance and Validation:

- **Contribution:** Demonstrating strong model performance with high accuracy and AUC values contributes to the field of predictive analytics in employee retention. The validation metrics provide a benchmark for future studies and underscore the reliability of the proposed model.

9. Holistic Understanding of Attrition Factors:

- **Contribution:** The holistic consideration of various factors influencing attrition, such as work-life balance, stock options, and departmental dynamics, contributes to a comprehensive framework for designing retention initiatives. This approach aligns with the evolving complexity of workforce dynamics.

10. Practical Implications for HR Practices:

- **Contribution:** The translation of research findings into practical recommendations for HR practices contributes to the applicability of academic insights. This bridge between theory and practice enhances the real-world impact of the research, providing actionable steps for organizational stakeholders.

Appendix 7

Literature review

- **RESEARCH PAPER 1**

DOI	https://doi.org/10.55524/ijirem.2022.9.5.41
Article Title	Implications of Human Resource Analytics on Employee Performance in Pharma Industry in South India
Authors	V. V. Sateesh Kumar Annepu
Publication details	International Journal of Innovative Research in Engineering & Management (IJIREM)
Year of publication	2022
Key words	Human Resource, Analytics, Employee, Performance, South Indian, Pharmaceutical, Industry
Objectives	Customizing HR Strategies, Improving Recruitment and Talent Acquisition
Findings	Improved Employee Retention, Data-Driven Decision-Making, Effective Recruitment Strategies
Research methodology	Predictive Talent Scouting, Data-Driven Candidate Sourcing, Diversity and Inclusion Initiatives
Quantitative/Qualitative technique	Employer Turnover Analysis, Employee Orientation and Onboarding, Understanding Employee Engagement
Factors/parameters used	Predictive Analytics, Cost and ROI Metrics, Customized HR Data

- **RESEARCH PAPER 2**

DOI	https://www.tijer.org/papers/TIJER2303102.pdf
Article Title	Application of Predictive Analytics in Strategic Workforce Planning
Authors	Rubini Raja, Dr.A.N.Radhika
Publication details	TIJER - INTERNATIONAL RESEARCH JOURNAL
Year of publication	2023
Key words	Predictive Analytics, Strategic Workforce Planning, E-HRM
Objectives	Enhancing Talent Forecasting, Conducting Skill Gap Analysis and Succession Planning, Fine-Tuning Performance and Enhancing Employee Retention
Findings	Strategic Workforce Planning, Untapped Potential of Predictive Workforce Analytics, Applications of Predictive Analytics
Research methodology	Time Series Analysis, Qualitative Surveys and Interviews, Thematic Analysis
Quantitative/Qualitative technique	Churn Rate Estimation, Knowledge and Skill Identification, Ethical Frameworks Application
Factors/parameters used	Skill Gap Analysis, Performance Finetuning, Turnover Risk Monitoring

• **RESEARCH PAPER 3**

DOI	https://doi.org/10.1147/JRD.2019.2915067
Article Title	HR analytics and ethics
Authors	K. Simbeck
Publication details	IBM Journal of Research and Development
Year of publication	2022
Key words	Privacy, Ethics, Companies, Medical diagnostic imaging, Data privacy, Medical services, Training
Objectives	Discuss the Ethical Implications of HR Analytics, Apply Ethical Frameworks, Extend the Discussion on Algorithmic Fairness
Findings	Common HR Problems Addressed, Ethical Concerns, Need for Ethical Discussion
Research methodology	Ethical Frameworks Analysis, Quantitative Analysis, Ethical Framework Development
Quantitative/Qualitative technique	Key Levers and Limitations, Symbiotic Relationship Between Academics and Practitioners
Factors/parameters used	Prediction of Job Success, Volume, Velocity, and Variety of HR Data, Ethical Frameworks

- **RESEARCH PAPER 4**

DOI	https://doi.org/10.1002/hrm.21853
Article Title	Workforce analytics: A case study of scholar–practitioner collaboration
Authors	Cristina Simón, Eva Ferreiro
Publication details	Wiley Periodicals, Inc.
Year of publication	2017
Key words	Cluster analysis, regression analysis, scholar-practitioner collaboration, workforce analytics
Objectives	To Describe the Development of a Workforce Analytics Initiative, To Emphasize the Role of Social Science Research Methods, To Identify Key Levers and Limitations
Findings	Role of Social Science Research Methods, Supporting the Development of Practice Over Time
Research methodology	Symbiotic Relationship Between Academics and Practitioners, Rigorous Workforce Analytics Infrastructure, Symbiotic Relationship Between Academics and Practitioners
Quantitative/Qualitative technique	Competences of Management Researchers, Lessons Learned
Factors/parameters used	Data-Driven Decision-Making, Big Data and Business Analytics, Transformative Digital Disruption in HR

• **RESEARCH PAPER 5**

DOI	https://www.tijer.org/papers/TIJER2303102.pdf
Article Title	A STUDY ON THE APPLICATION OF HR ANALYTICS ON TALENT ACQUISITION, COMPENSATION & BENEFITS AND EMPLOYEE TURNOVER IN THE INDIAN IT INDUSTRY
Authors	Ms. Nitya B, Ms. Ragini Bose, Dr. K. Subha
Publication details	Sambodhi (UGC Care Journal)
Year of publication	2021
Key words	HRA – Human Resource Analytics, HR – Human Resources, TA – Talent Acquisition, ET – Employee Turnover, C&B – Compensation and Benefit
Objectives	Recognize the emergence of big data, Identify the transformative nature of applying analytics
Findings	Importance of Technology Adoption, Specific HR Functions Studied, Availability of HR Data
Research methodology	Impact of Digitization, Shift Towards Big Data and Business Analytics
Quantitative/Qualitative technique	Data-Driven Decision-Making, Big Data and Business Analytics, Transformative Digital Disruption in HR
Factors/parameters used	Data driven Analytics

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