

PRESENTED BY NARENDRA PATIL

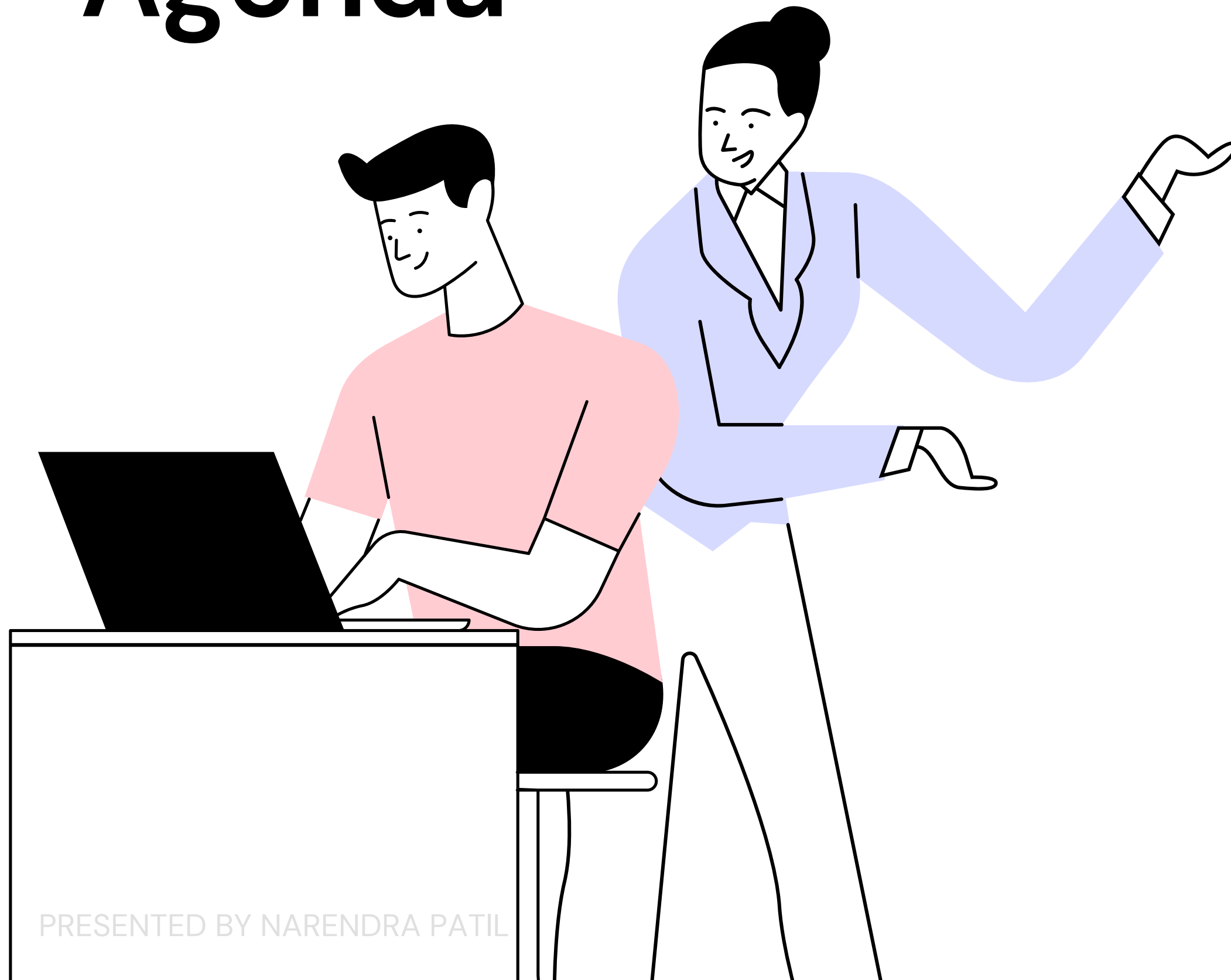
JUNE, 2024

Employee Attrition Analysis

HR Data Analysis



Agenda



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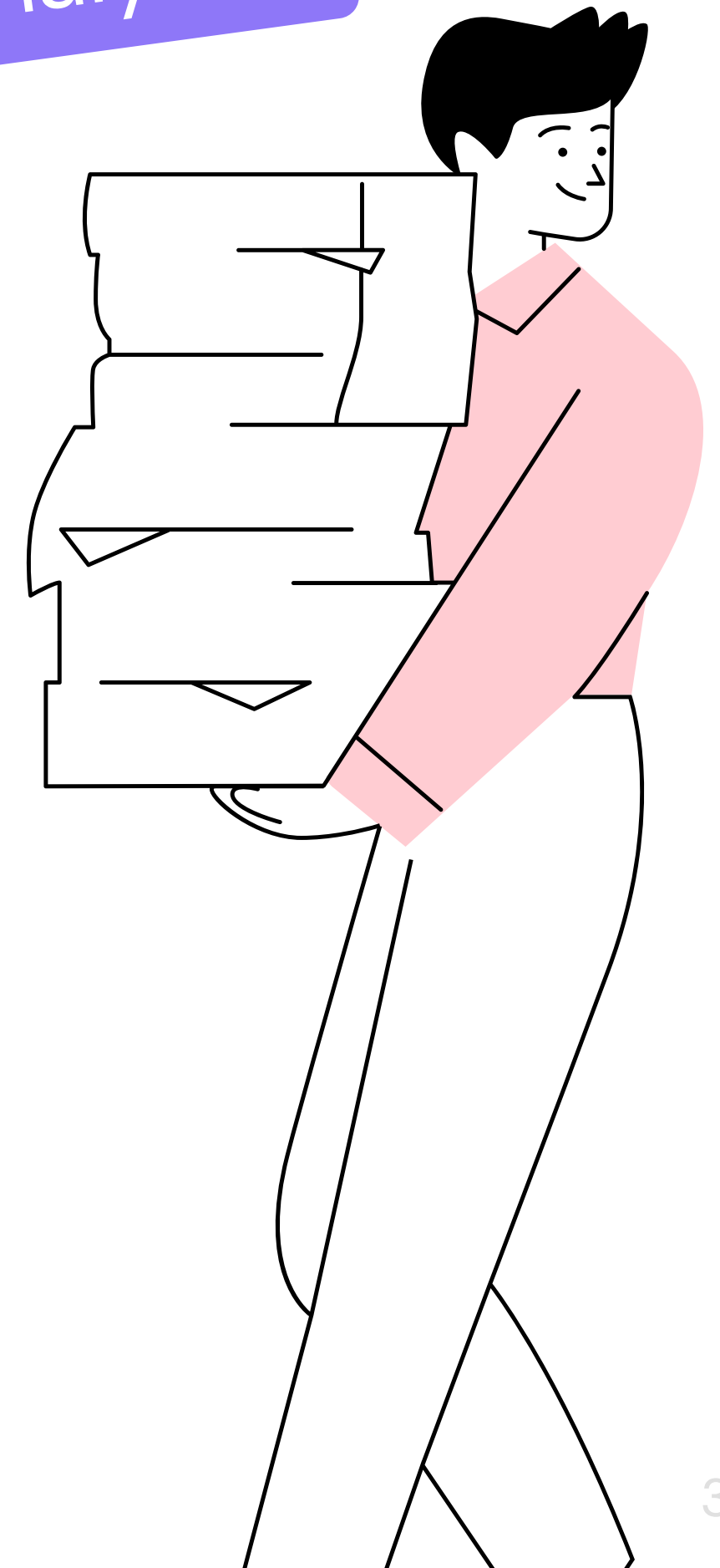
Introduction

Attrition

HR Analytics

Employee attrition is a critical challenge for organizations, impacting productivity, team morale, and operational costs. Our project focuses on analyzing employee data to understand the underlying reasons behind a company's high attrition rate.

Through comprehensive HR analytics, we aim to uncover key factors contributing to employee attrition. Our data-driven approach will enable the company to make informed decisions to reduce the attrition rate, thereby enhancing productivity and reducing financial losses.



Business Problem Statement



A Company, established a few years ago, is grappling with a **persistent 15% annual employee attrition rate**. This high turnover is significantly impacting productivity, team morale, and operational costs. Analysis shows that replacing an employee cost approximately 1.5 to 2 times their annual salary and much more in lost productivity, translating to substantial financial losses for the company.

To address this issue, we propose conducting a HR analytics study. This data-driven approach will enable the company to make informed decisions, potentially **reducing the attrition rate to below 10% within the next fiscal year** and saving financial losses for the company.

Data Source

The dataset used for this analysis comprises information from XYZ Company, focusing on factors influencing employee attrition rates. It includes a **total of 4,410 records with 26 attributes per employee**.

Key features such as age, monthly income, job role, and job satisfaction levels are included, providing a **comprehensive view of the workforce dynamics**.

The dataset has been preprocessed to handle missing values and encoded for analysis, aiming to identify significant predictors of attrition and propose data-driven strategies to mitigate it.



Project Statement

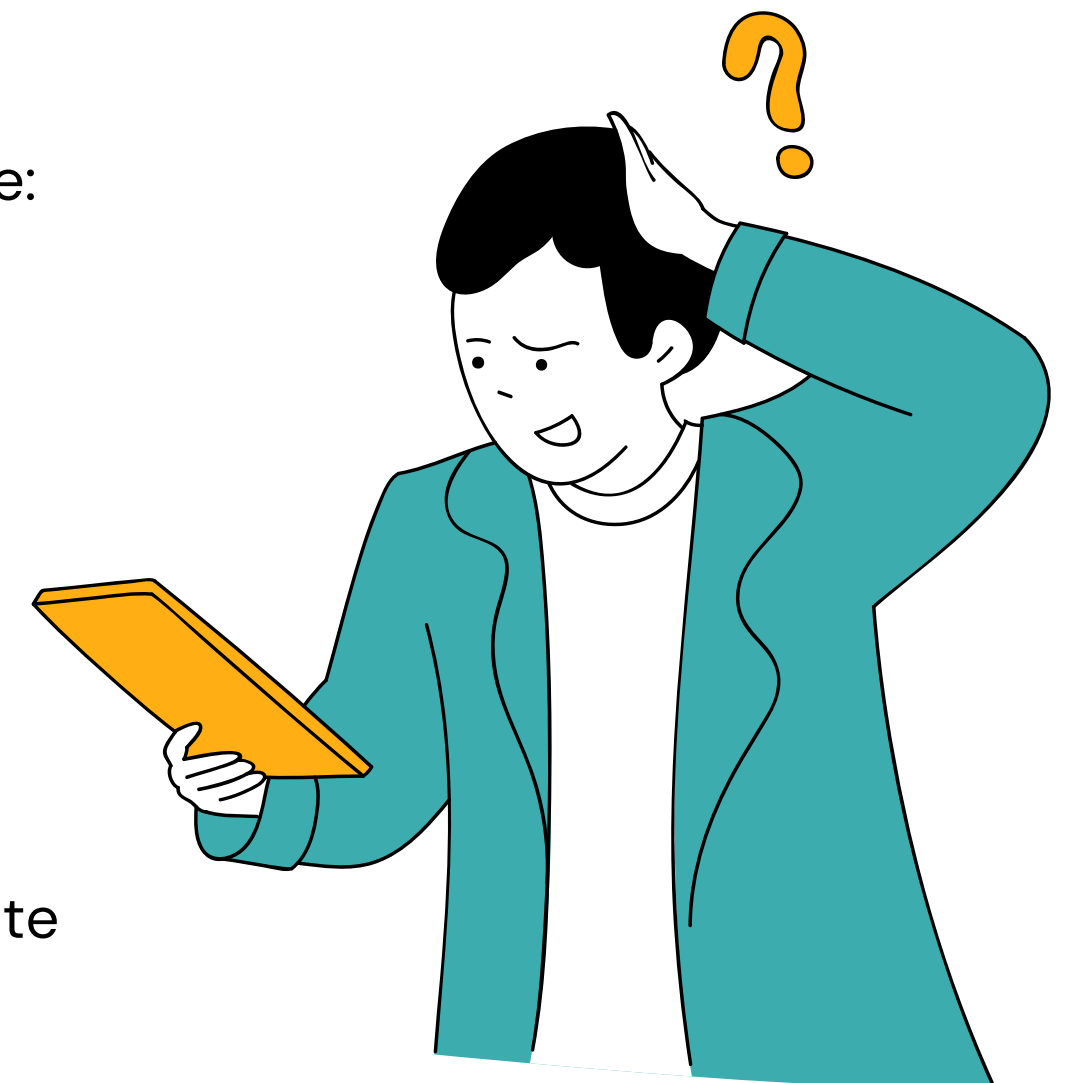
To effectively address the high attrition rate, **we need to translate the business problem into a data science problem** statement. This will guide us in generating relevant insights and following appropriate analytical steps.

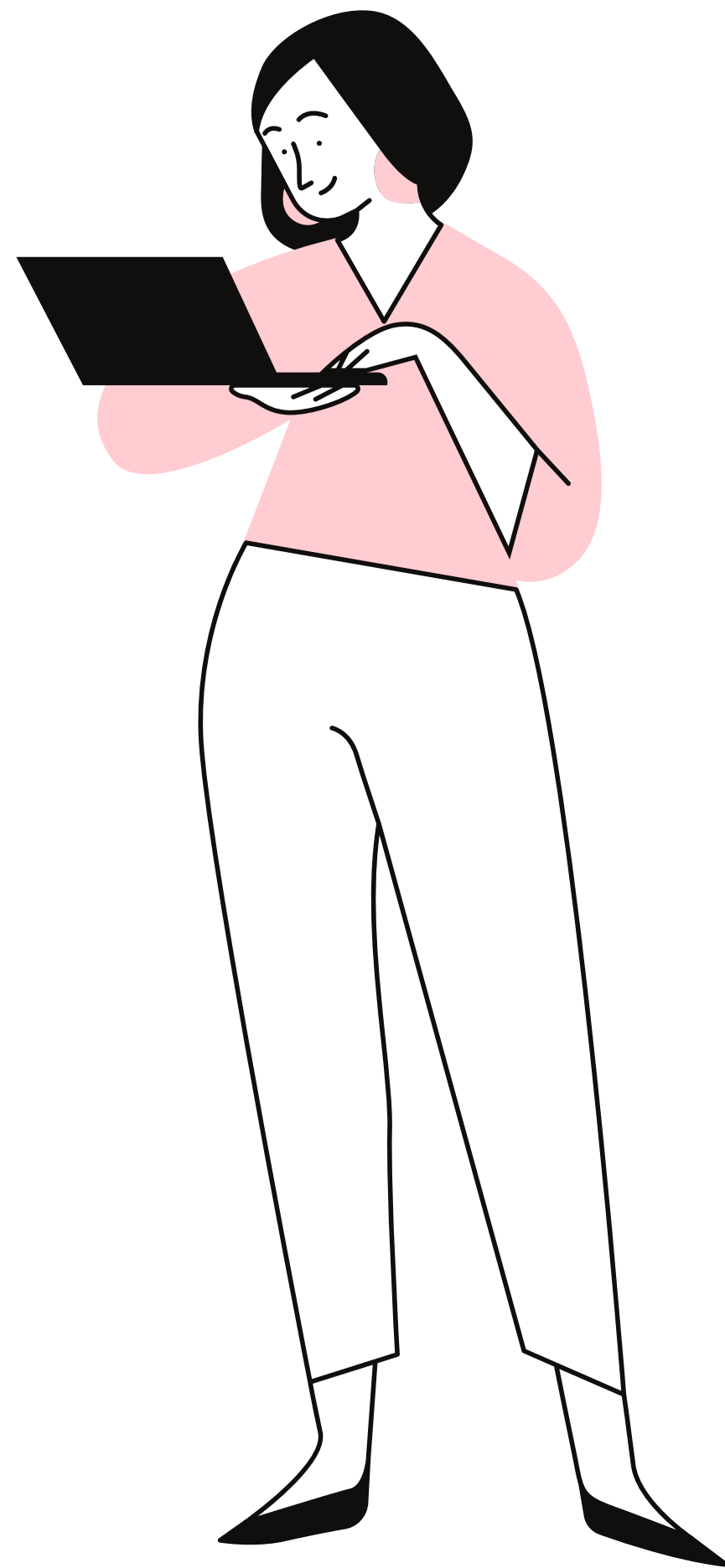
Attrition Rate: The attrition rate quantifies employee turnover as a percentage. A **healthy organization typically has an attrition rate of 10% or less**. High attrition negatively impacts the company's costs, productivity, and morale.

Given our company's attrition rate above 15%, **it is crucial to identify the underlying reasons to develop targeted retention strategies**. Key questions for analysis include:

- How are the KPIs performing?
- How do employee demographics affect attrition?
- Are salary and financial incentives adequate?
- Do certain departments and job roles have higher attrition rates?
- Is the company's work culture satisfactory?
- Which factors have the largest impact on attrition?

By answering these questions through data analysis, we aim to reduce the attrition rate to below 10% and mitigate financial losses.





Tools Used

Python

For Data cleaning & Exploratory Data Analysis (EDA)

Pandas

For Data manipulation and analysis

Matplotlib & Seaborn

For Data Visualization

Scikit-Learn

For Feature Analysis and Predictive Analysis

Power BI

For Data Visualization Using Dashboards

GitHub

For Documentation

Data Cleaning

Data Cleaning process involves fixing or removing incorrect, corrupted, incorrectly formatted, duplicate, or incomplete data within a dataset, to prepare data for analysis.

- **Dropping Unnecessary Columns:** We have identified 3 columns with constant values across all entries, making them irrelevant for analysis. These columns will be dropped.
- **Handling Missing Values:** Four columns contain missing entries. We will use mean imputation, which replaces missing values with the average of the existing values in those columns.
- **Handling Duplicated Entries:** No duplicated entries were found in the data.



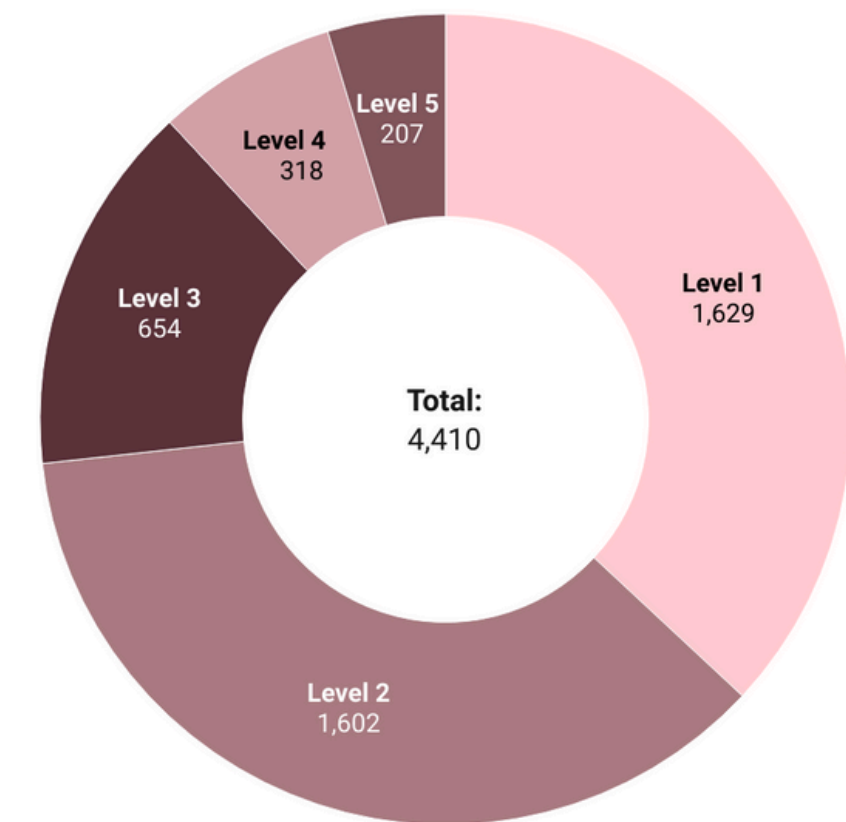
Descriptive Statistics

Our analysis of the employee dataset reveals that out of 4410 employees, 711 have left the company, indicating a significant attrition rate. The workforce is composed of 1764 females and 2646 males.

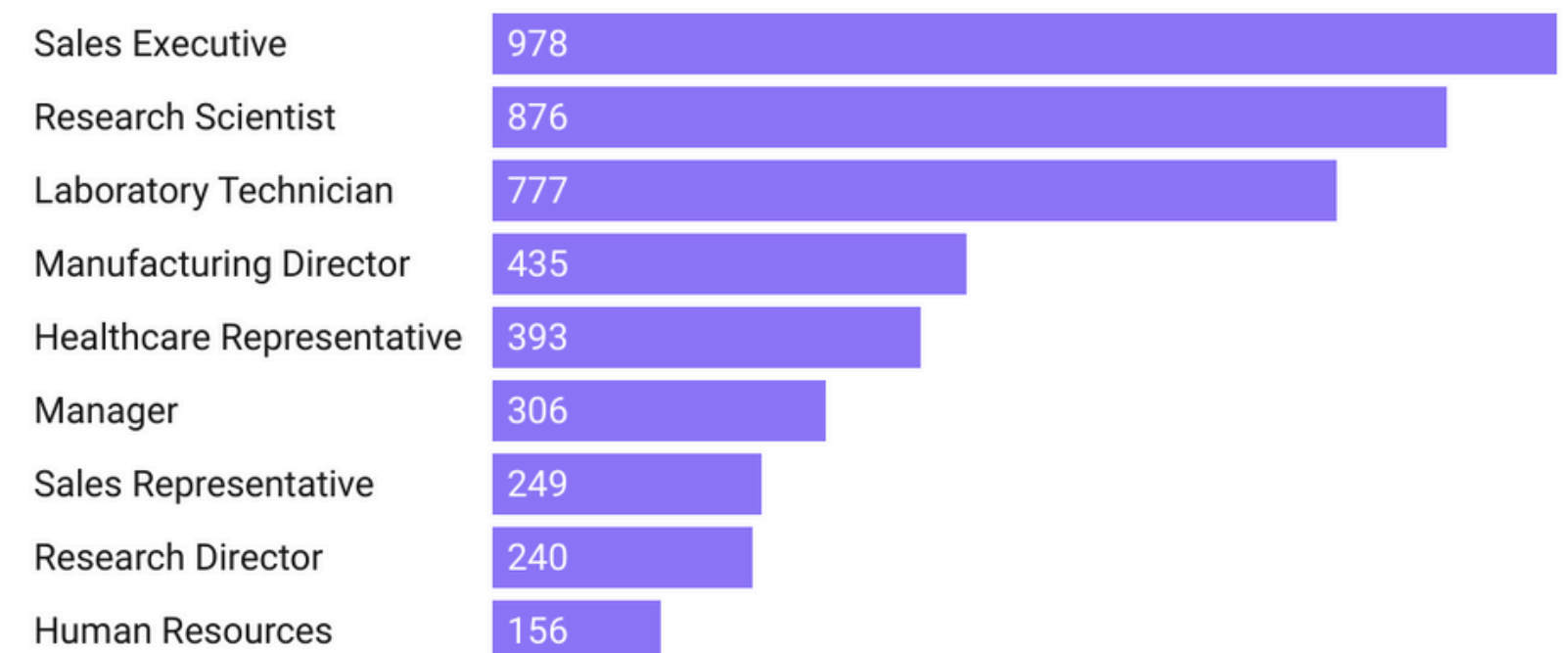
The distribution across departments shows a concentration in Research & Development with 2883 employees, followed by Sales with 1338 employees, and Human Resources with 189 employees.

These insights provide a clear picture of the current workforce demographics and departmental distribution, helping us to better understand the areas most impacted by attrition.

Employees Per Job Level



Employees Per Job Roles



Key Performance Indices(KPIs)

Attrition Rate: **16.12%**

Retention Rate: **83.88%**

Average Salary: **₹65,029.31**

Average Salary Hike: **15.21%**

Average Performance Rating: **3.15**

Key Performance Indicators (KPIs) are critical metrics that [help in evaluating the effectiveness and overall health of the organization](#). They provide insights into various aspects of the workforce, such as attrition, retention, salary, performance, and employee satisfaction.

- Department-wise, Research & Development has the highest attrition rate at 63.71%, followed by Sales at 28.27%, and Human Resources at 8.02%.
- The average distance from home to the office is 9.19 miles.
- The average employee experience is 11.28 years.
- Work environment, job satisfaction, and work-life balance have average ratings of 2.73, 2.73, and 2.76 respectively.

These KPIs provide valuable insights into the factors influencing employee satisfaction and retention. [High attrition rates in certain departments](#) highlight areas needing attention, while [average ratings on job satisfaction and work-life balance](#) can guide improvements in workplace policies and practices.

Analysis and Insights

To facilitate a comprehensive understanding of the various factors contributing to employee attrition, we have grouped them into several key categories.

These groupings are essential because no single factor can solely account for attrition. By categorizing similar factors, we can gain comprehensive insights into the reasons for attrition and identify areas that require attention.



Demographics

Includes age, gender, and marital status.

Salary and Financial Incentives

Includes salary, salary hike, and stock option level.

Job Related Factors

Includes department, job role, and years with current manager.

Work Culture

Includes environment satisfaction, job satisfaction, work-life balance, and job involvement.

Career Progression

Includes job level, years since last promotion, and training times last year.

Commute & Traveling

Includes business travel and distance from home.

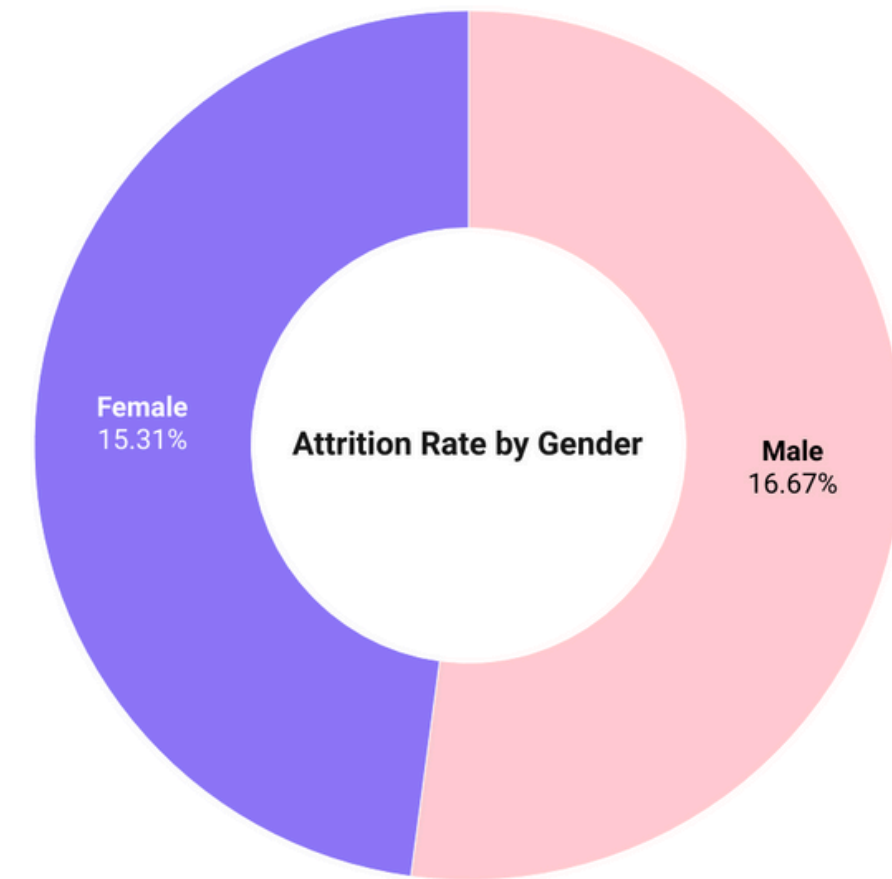
Employee Portfolio

Includes performance rating, total experience, years at the company, and number of companies worked.

1. Demographics

1.1 Gender

The attrition rate among **male employees is 16.67%**, while among **female employees it is 15.31%**. Gender appears to have a moderate influence on attrition rates, with slightly higher rates observed among male employees. Possible reasons could include varying job roles, career aspirations, or workplace dynamics influenced by gender-specific factors.

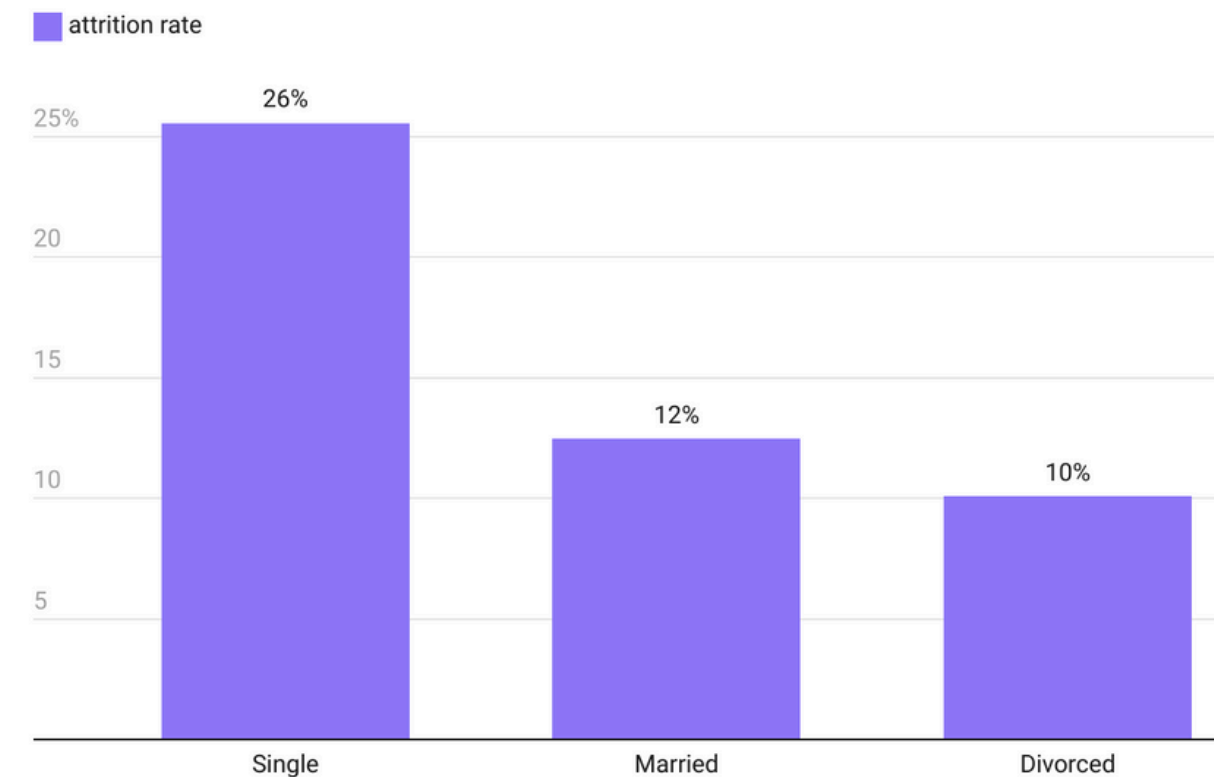


1.2 Marriage Status

Employees who are **single have a significantly higher attrition rate of 25.53%**, compared to **married employees at 12.48%** and **divorced employees at 10.09%**.

Marital status plays a crucial role in attrition, with single employees showing the highest propensity to leave. This could be due to career mobility, personal life changes, or job dissatisfaction influenced by marital status-related factors.

Attrition Rate Based on Marriage Status



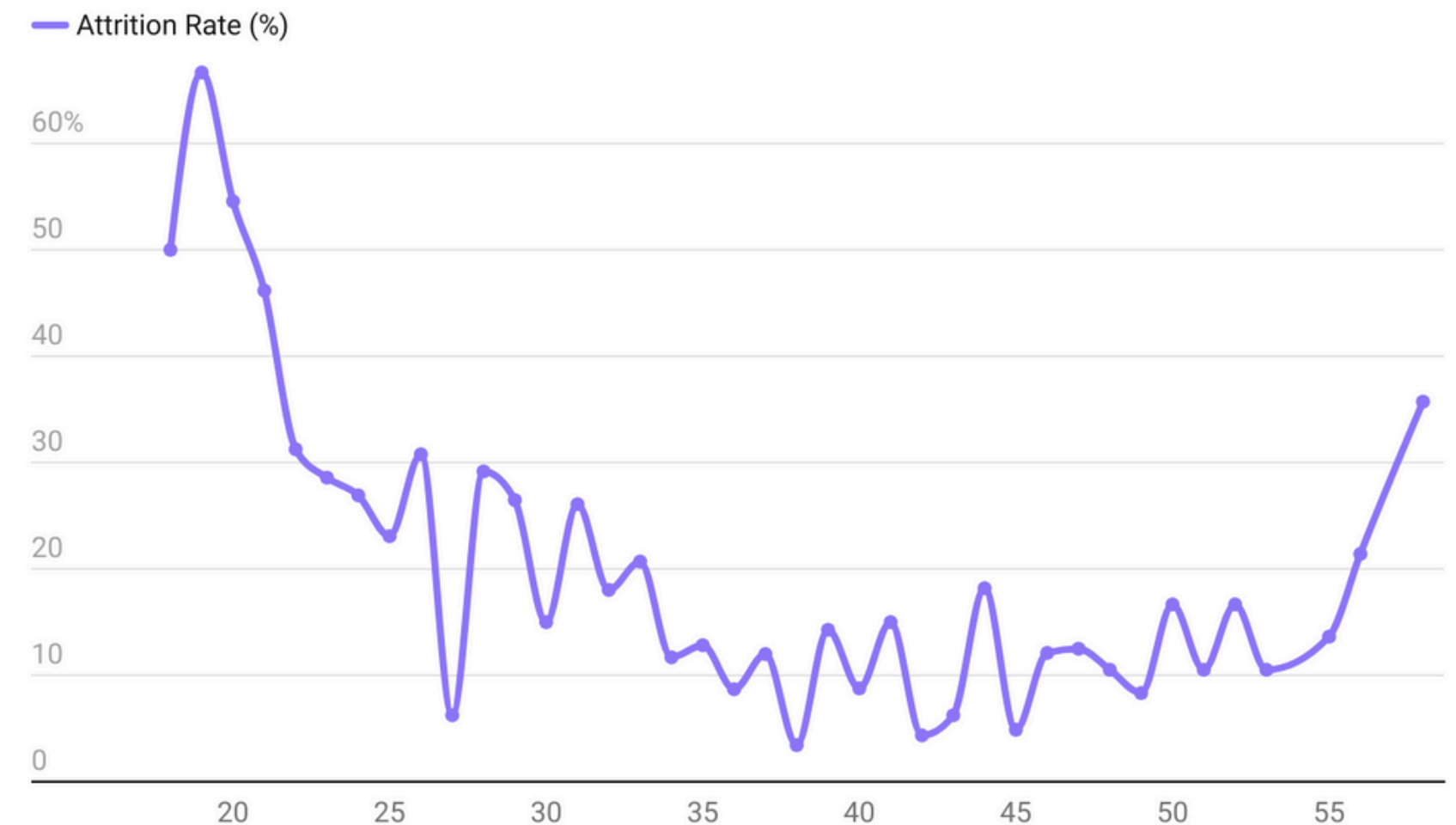
1. Demographics

1.3 Age

Attrition rates vary across different age groups, with **notable spikes observed among younger employees (e.g., 18 to 22 years) and fluctuations throughout mid-career stages.**

Age-related attrition patterns reflect stages of professional development, career aspirations, and workplace experiences. Younger employees may seek rapid career progression or explore diverse opportunities, leading to higher turnover.

Attrition Rate Based on Age

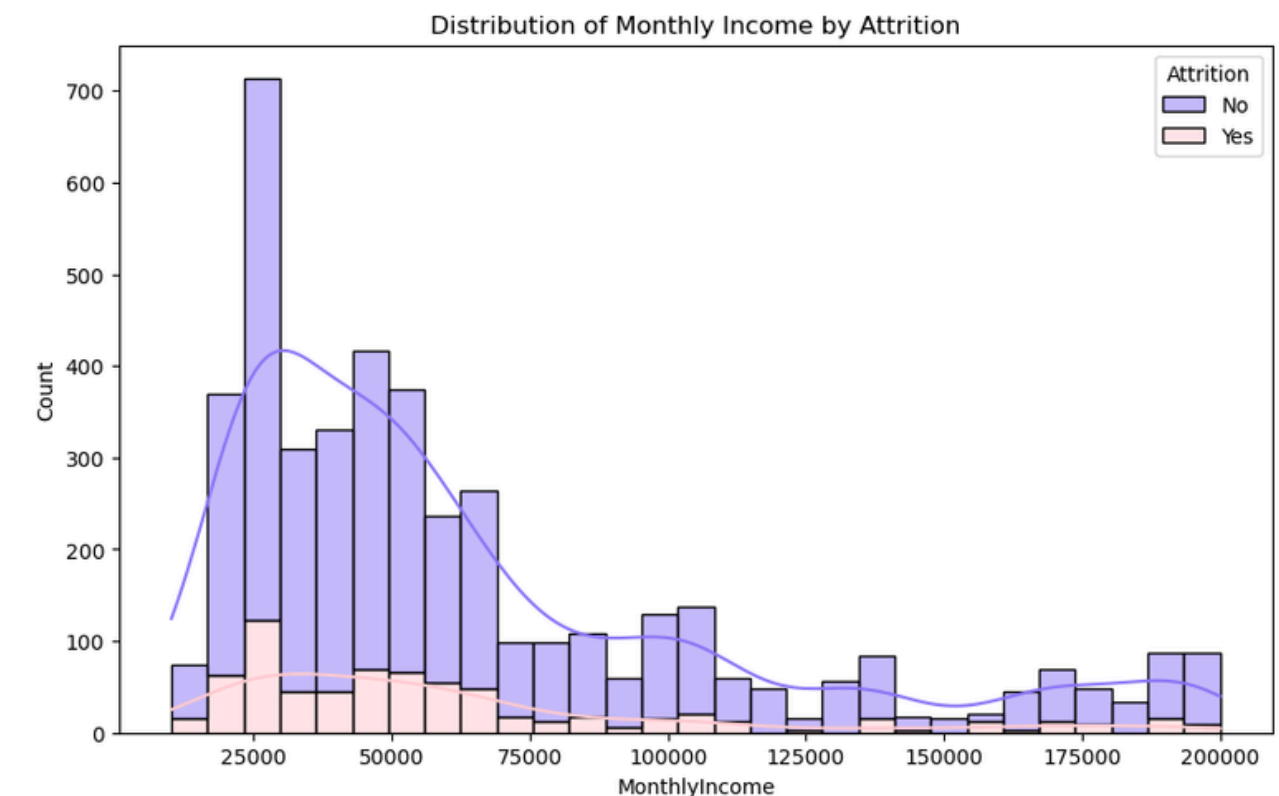


2. Salary and Financial Incentives

2.1 Salary

The data indicates that **employees with lower monthly incomes are more likely to leave the company**. As the monthly income increases, the attrition rate decreases.

This trend highlights that, compensation for lower-level employees is inadequate compared to industry standards. It also reiterates the importance of competitive salaries in retaining employees.

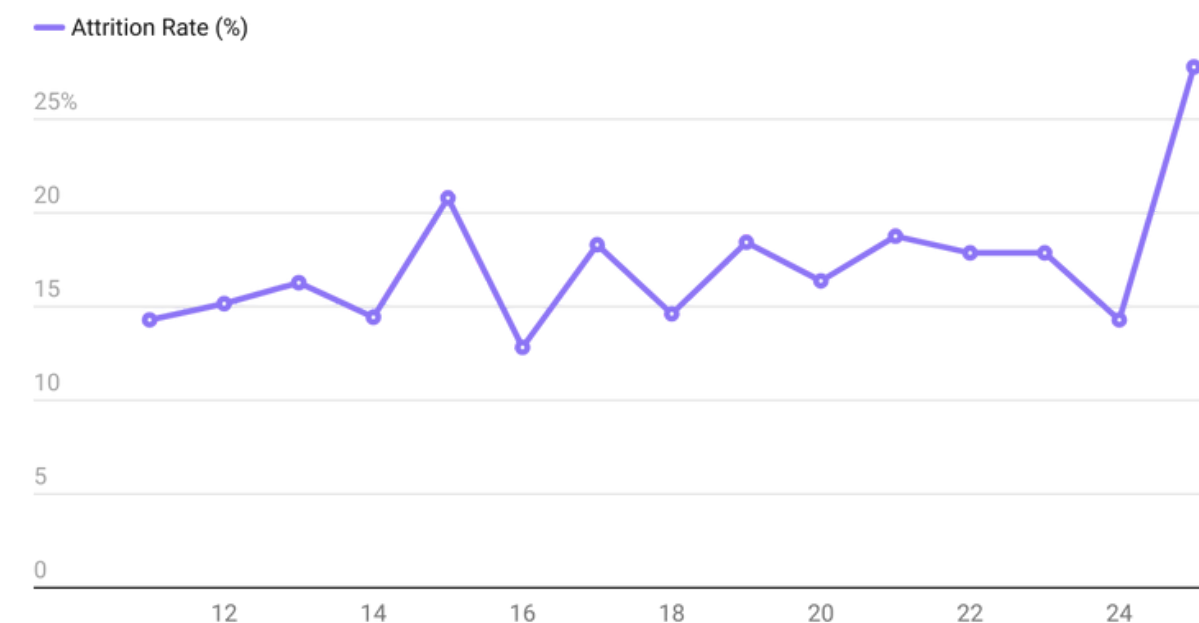


2.2 Percentage Salary Hike

Higher attrition rates are observed at salary hike levels of 15%, 17%, 19%, 21%, 22%, 23%, and especially 25%. This suggests that **incremental salary hikes do not necessarily correlate with reduced attrition**.

In some cases, employees might feel that the salary hike is insufficient compared to their expectations or industry standards.

Attrition Rate based on % Salary Hike



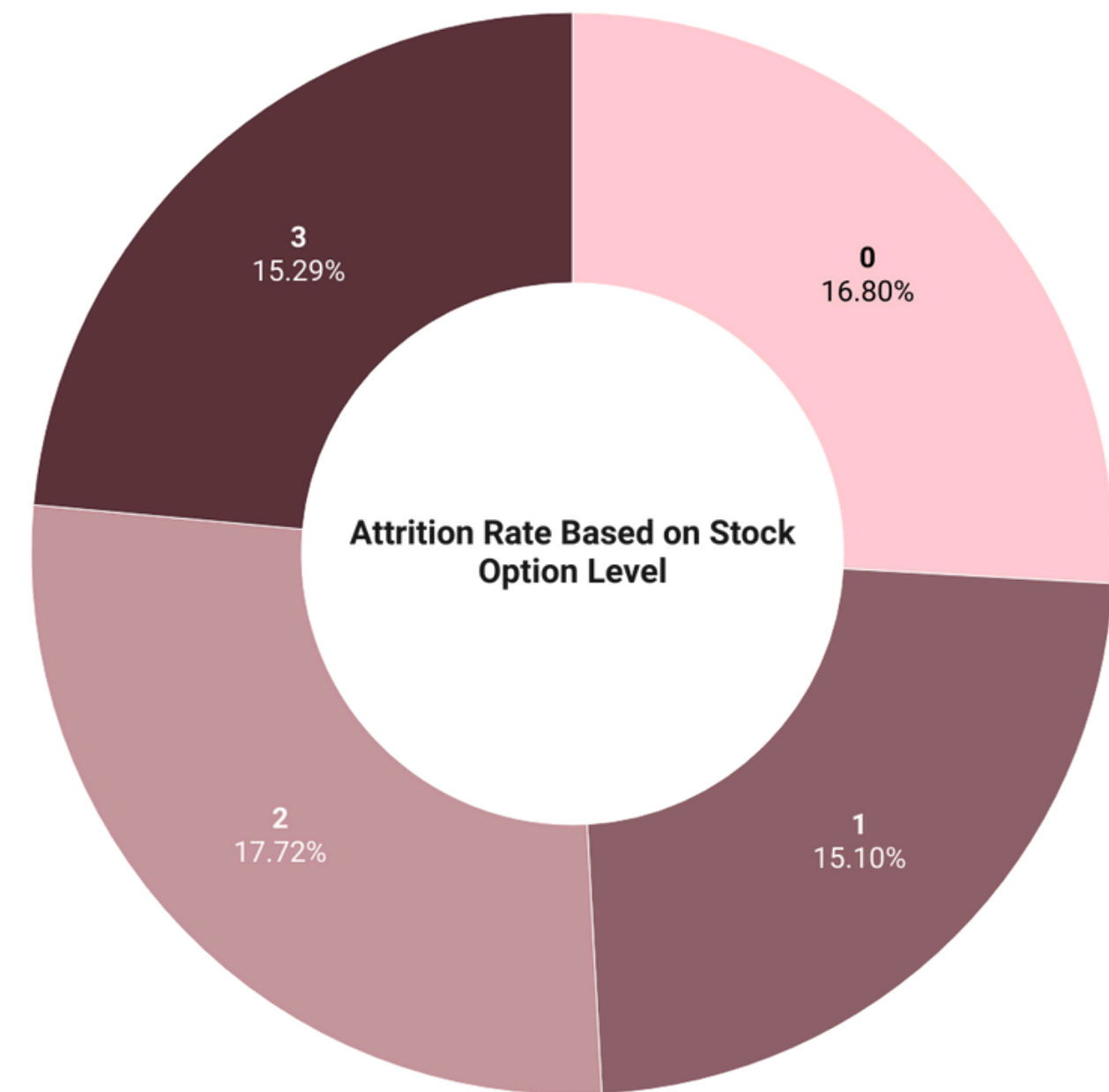
2. Salary and Financial Incentives

2.3 Stock Option Level

Employees with stock options at **level 2 show a slightly higher attrition rate compared to other levels.**

This suggests that while stock options are an incentive, they may not be a strong enough factor alone to significantly reduce attrition. Employees might value more immediate or tangible rewards.

Companies should consider a mix of financial incentives. While stock options are beneficial, combining them with other forms of compensation may be more effective in retaining employees.



3. Job Related Factors

3.1 Department

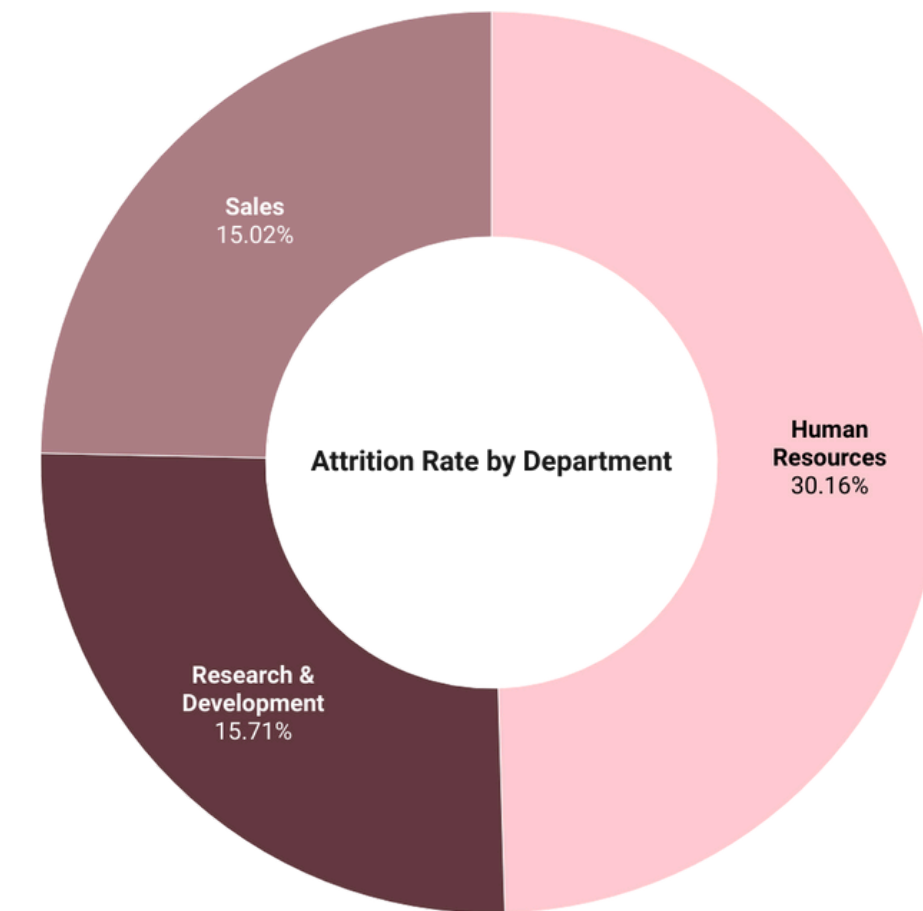
The **high attrition rate in Human Resources** suggests possible dissatisfaction within this department, perhaps due to job stress, lack of growth opportunities, or insufficient support.

Research & Development and Sales have relatively lower attrition rates but are still significant.

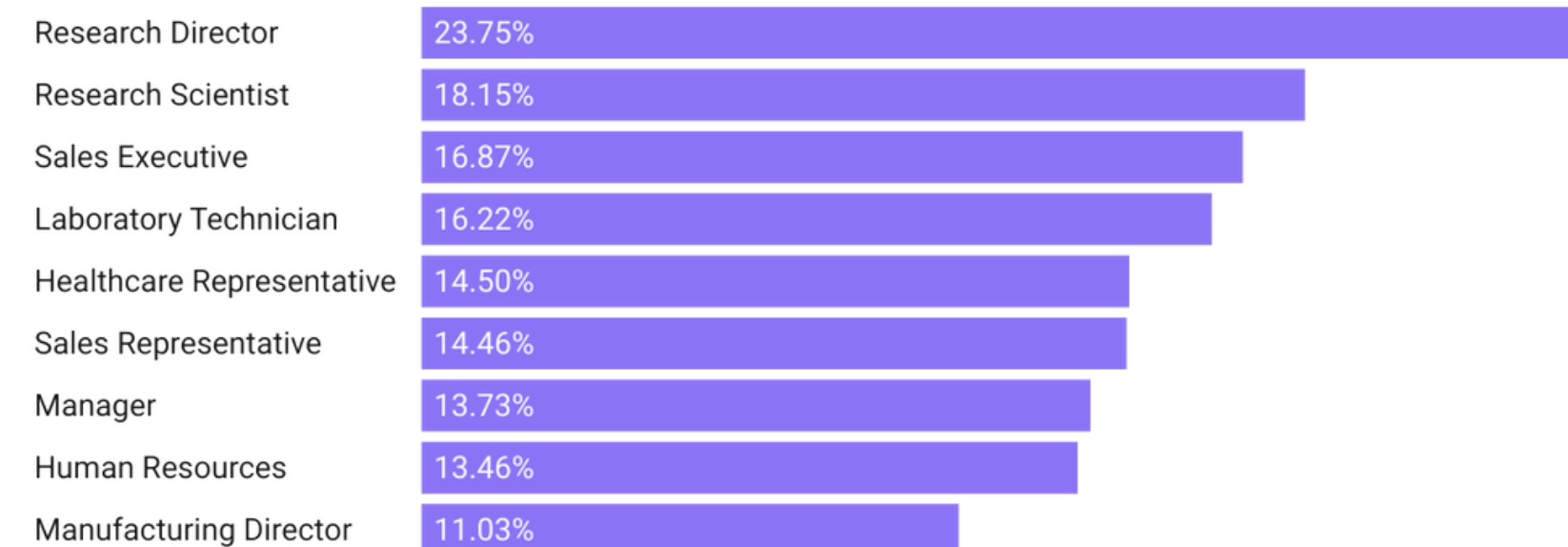
3.2 Job Role

The **highest attrition rates are among Research Directors and Research Scientists**, indicating potential issues with job satisfaction or career progression in these roles.

Lower attrition rates among Managers and Manufacturing Directors suggest better job stability and satisfaction.



Attrition Rate Based on Job Role



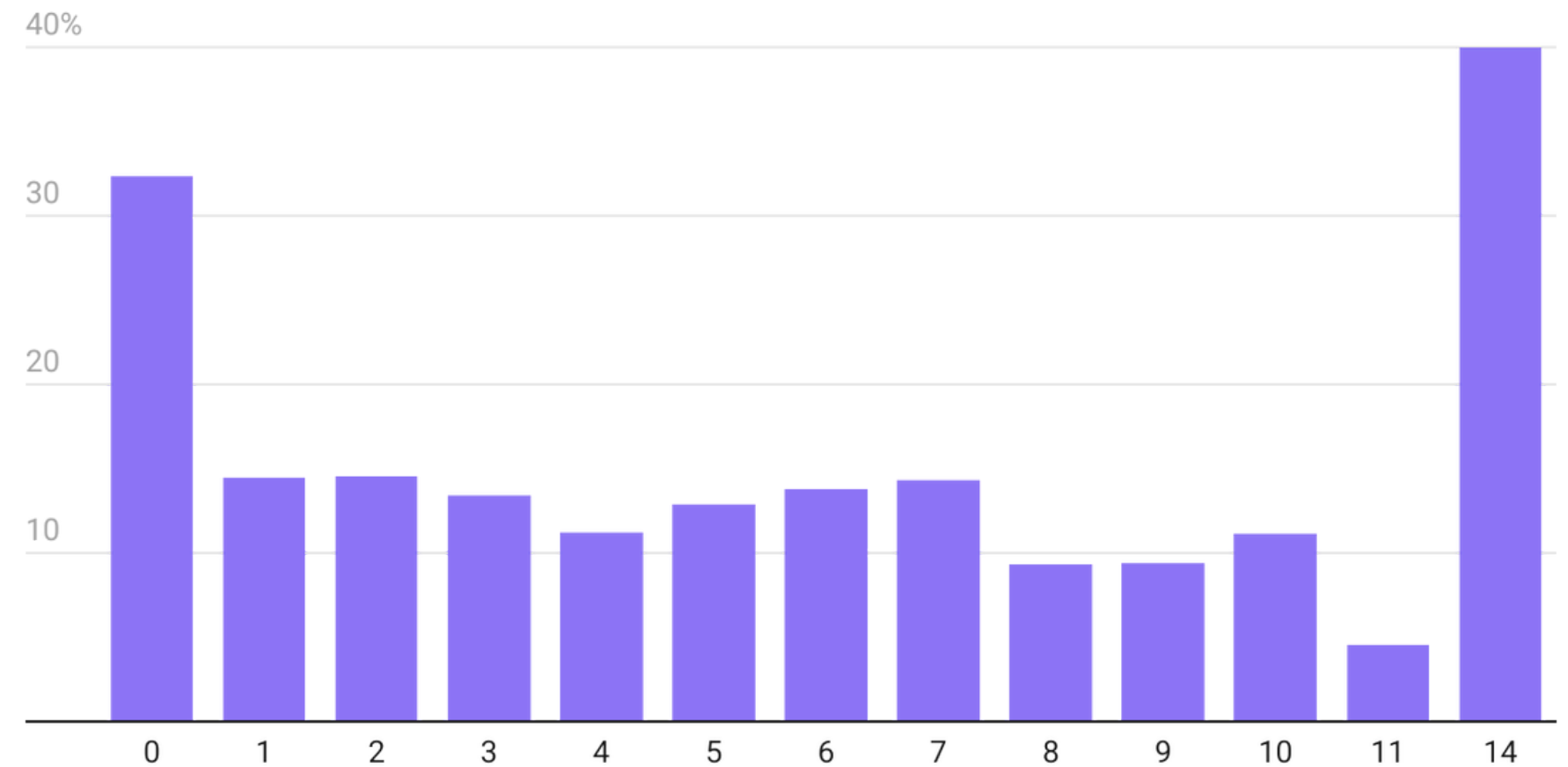
3. Job Related Factors

3.3 Years with Current Manager

The **highest attrition rate occurs among employees who have been with their current manager for less than a year**, suggesting a critical period of adjustment. The spike at 14 years indicates a potential outlier or unique situation.

Generally, **longer tenure with a manager correlates with lower attrition rates**, highlighting the importance of stable and positive manager-employee relationships.

Attrition Rate based on Years with Current Manager



4. Work Culture

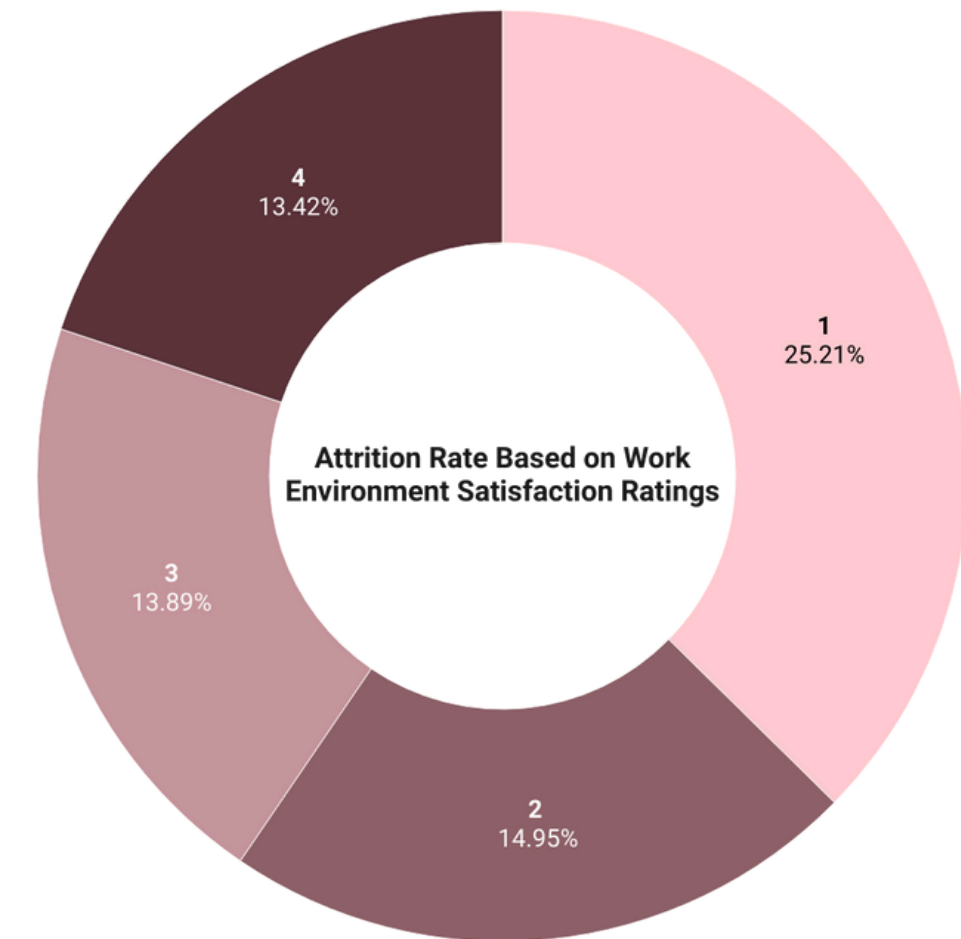
4.1 Environment Satisfaction

Employees with the lowest satisfaction with their work environment (rating 1) have the highest attrition rate. **As satisfaction increases, attrition decreases significantly**, indicating that a positive work environment plays a crucial role in retaining employees.

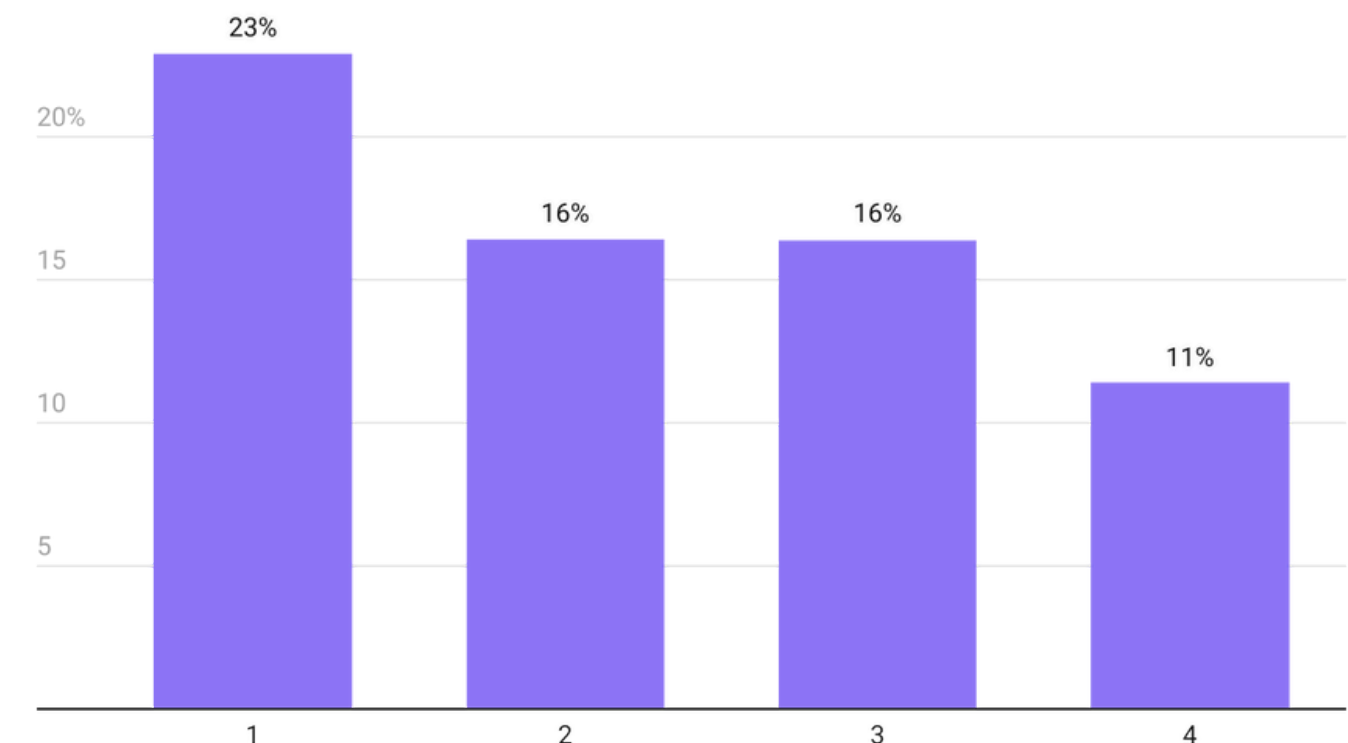
Poor work environment satisfaction can lead to high turnover, reducing team cohesion and productivity.

4.2 Job Satisfaction

Similar to work environment satisfaction, employees with the lowest job satisfaction (rating 1) exhibit the highest attrition rate. **Higher job satisfaction is associated with lower attrition**, highlighting the importance of ensuring employees find their roles fulfilling and rewarding.



Attrition Rate Based on Job Satisfaction Ratings



4. Work Culture

4.3 Work-Life Balance

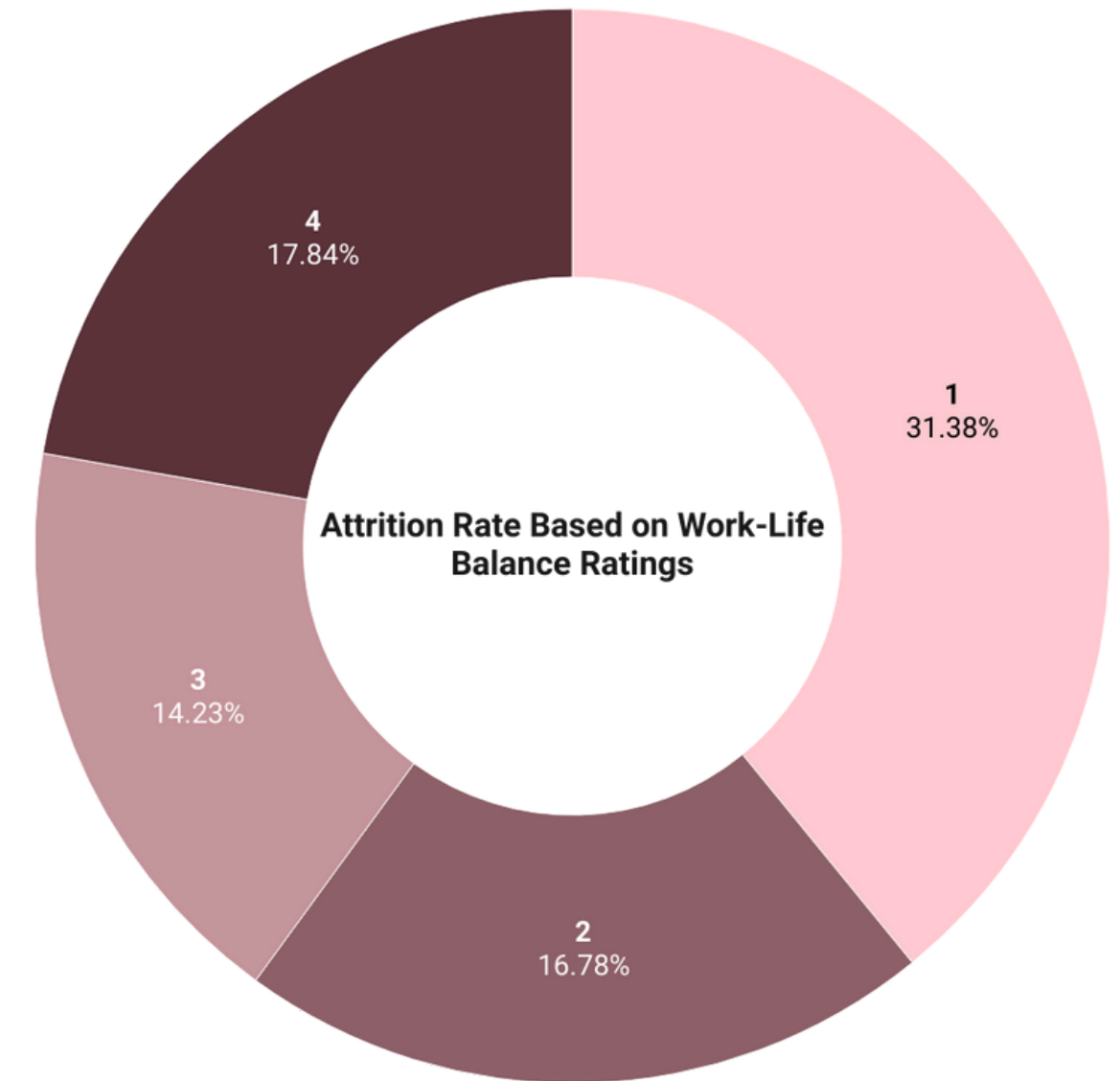
Employees with the **poorest work-life balance (rating 1)** have the **highest attrition rate**, which significantly drops as work-life balance improves.

Interestingly, the attrition rate slightly increases for the highest rating (4), suggesting possible outliers or differing expectations. Poor work-life balance is a major driver of attrition, leading to burnout and dissatisfaction.

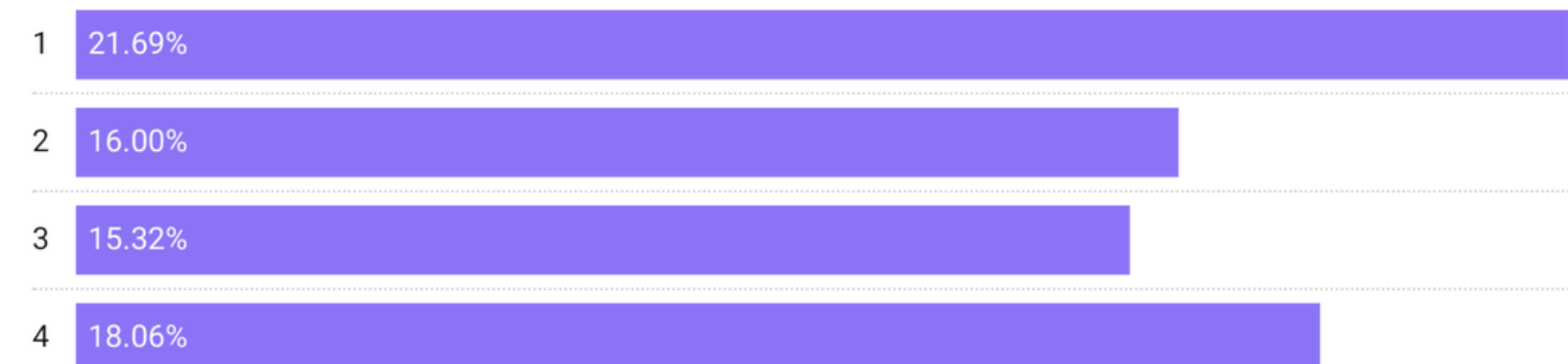
4.4 Job Involvement

Employees with the **lowest job involvement (rating 1)** exhibit **higher attrition rates**, indicating disengagement and lack of connection to their work.

However, the **highest job involvement rating (4)** also shows a **higher attrition rate**, possibly due to burnout or over-commitment. Both low and excessively high job involvement can lead to attrition.



Attrition Rate Based on Job Involvement Ratings



5. Career Progression

5.1 Job Level

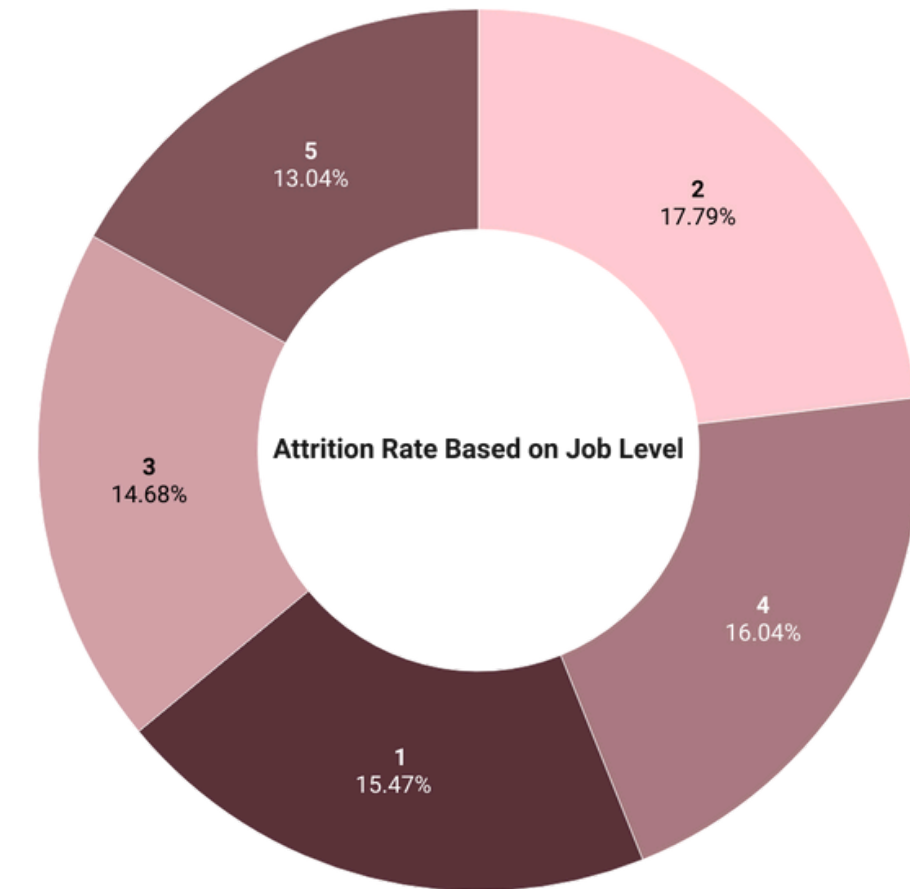
Employees at **mid-level positions (Job Level 2)** exhibit the **highest attrition rates**. Attrition decreases as job levels increase, with **senior-level employees (Job Level 5)** having the **lowest attrition rates**.

This suggests that employees in lower and mid-level positions may feel less secure or less satisfied with their career progression.

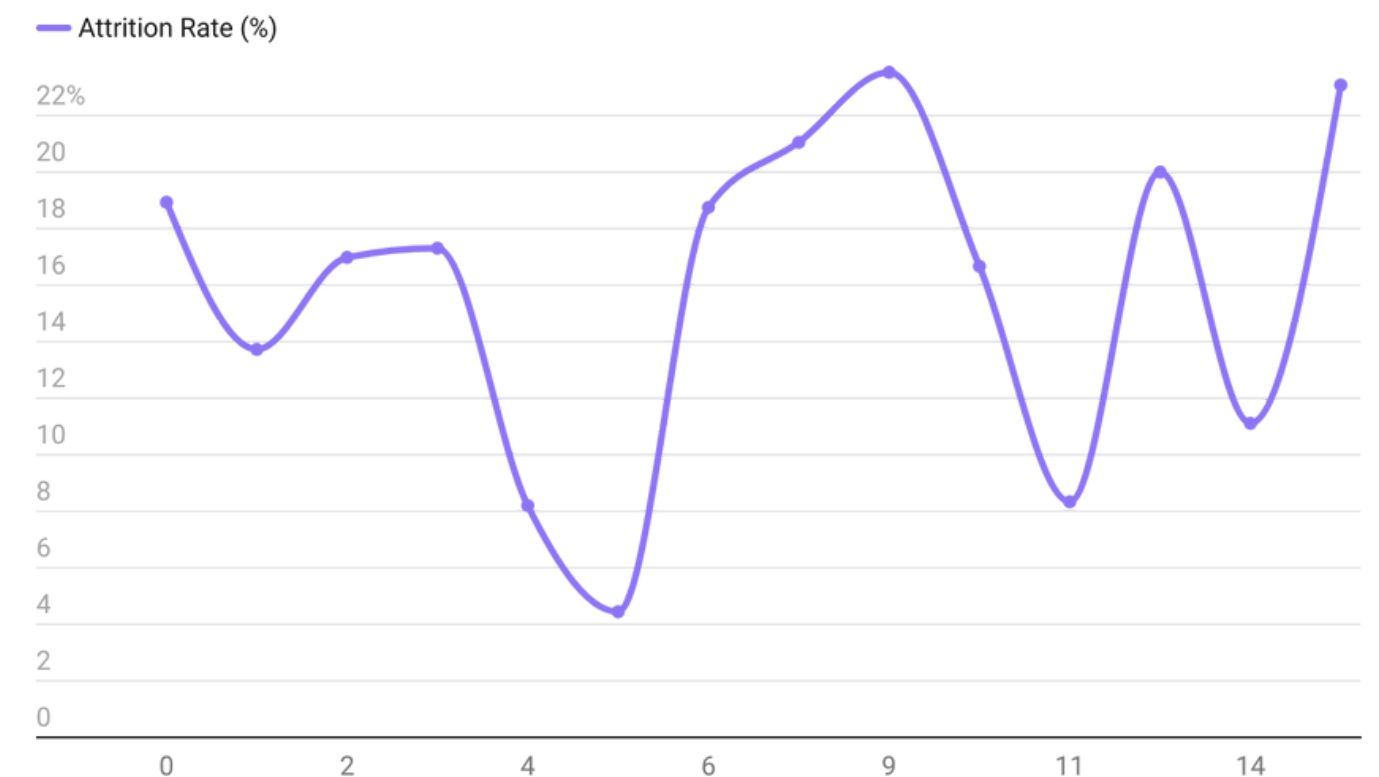
5.1 Years Since Last Promotion

Employees who have not received a promotion recently (0 years) have a high attrition rate, but surprisingly, **attrition decreases significantly at the 4–5 year mark**. However, **employees who haven't been promoted for 6 years or more show a spike in attrition**, indicating frustration or stagnation.

Lack of promotion opportunities can lead to dissatisfaction and higher attrition, especially among employees who feel overlooked.



Attrition Rate Based on Years Since Last Promotion



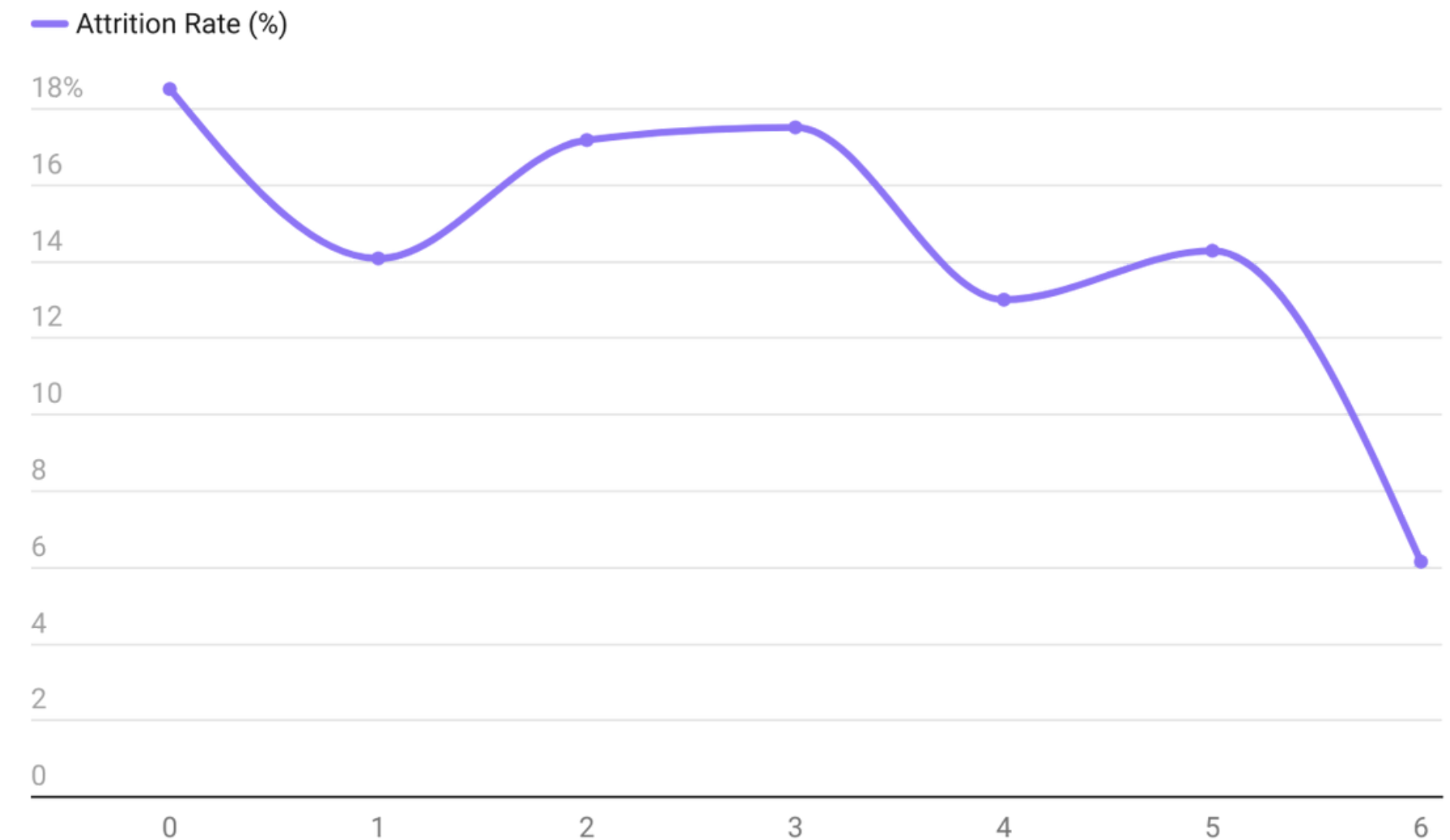
5. Career Progression

5.3 Training Times Last Year

Employees who received no training last year have the highest attrition rate. Training participation correlates with lower attrition rates, particularly notable for employees receiving training 4–6 times a year.

Lack of training opportunities can result in higher attrition due to perceived stagnation and lack of skill development.

Attrition Rate Based on Training Times Last Year



6. Commute & Travelling

6.1 Commute Distance

Employees who commute longer distances (e.g., 12 km, 15 km, 19 km) show significantly higher attrition rates, with the peak at 15 km (42.31%). Conversely, employees with very short or moderate commutes (e.g., 3 km, 13–14 km, 26 km) exhibit lower attrition rates.

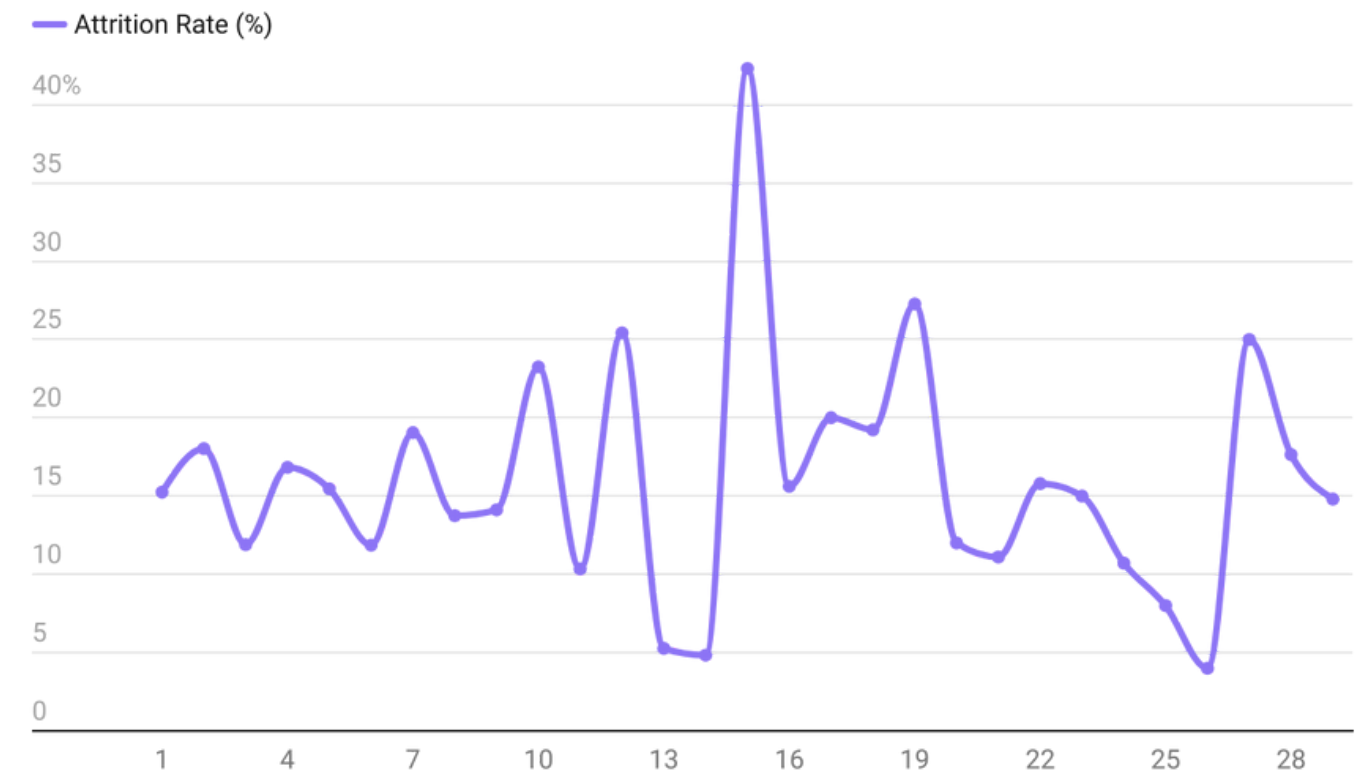
Employees with lengthy commutes may struggle with work-life balance, leading to increased turnover.

6.2 Business Travel

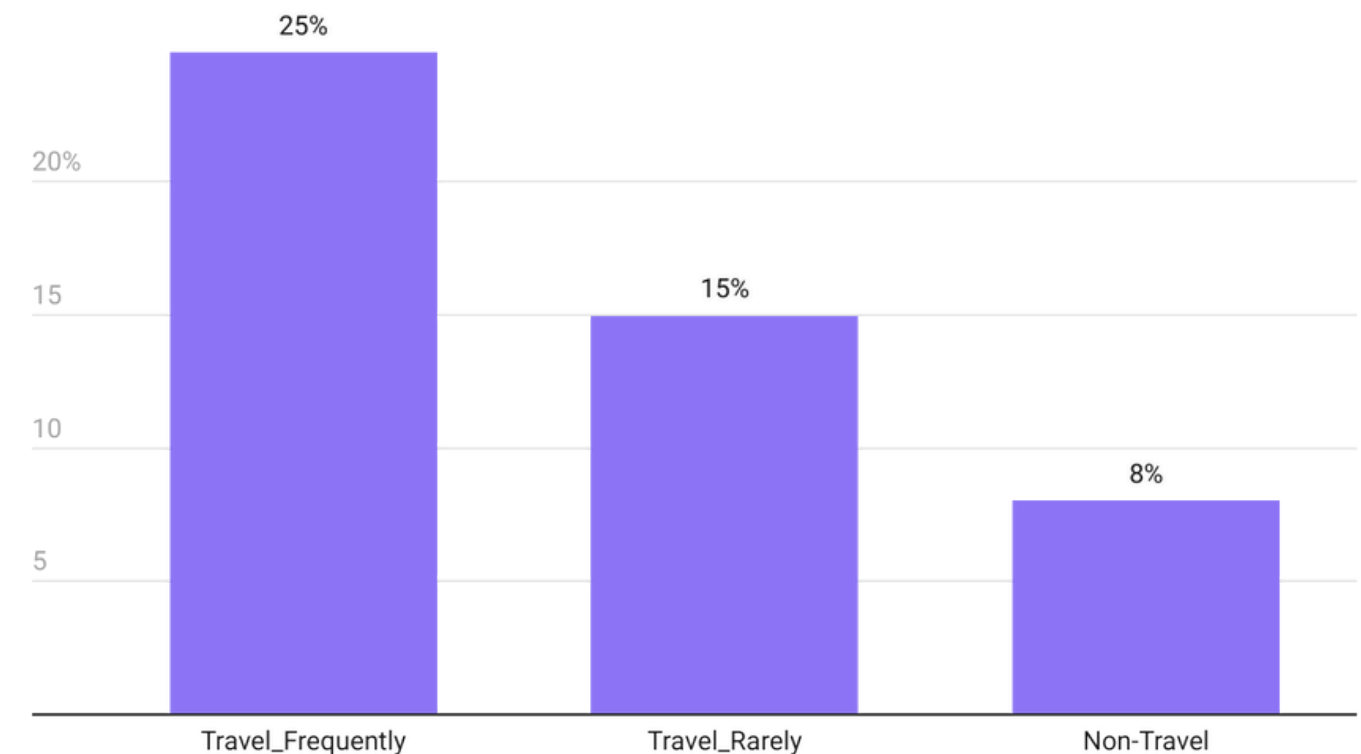
Employees who travel frequently for business exhibit the highest attrition rates, followed by those who travel rarely. Non-traveling employees have the lowest attrition rate.

Frequent travel can be taxing, leading to burnout and reduced job satisfaction.

Attrition Rate Based on Commute Distance



Attrition Rate Based on Business Travel



7. Employee Portfolio

7.1 Performance Rating

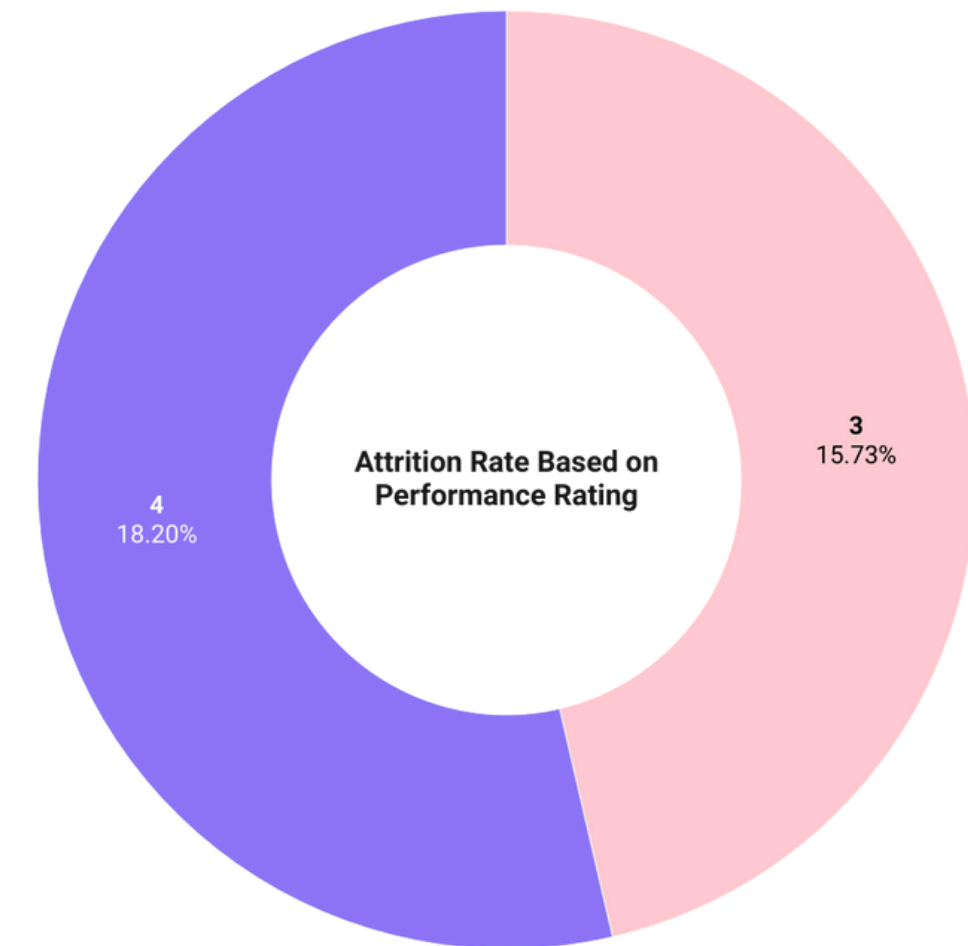
Employees with higher performance ratings (4) have a higher attrition rate compared to those with a lower rating (3). High performers may feel underappreciated or seek better opportunities elsewhere.

These employees often drive innovation and efficiency within the company, and their departure can result in decreased performance and morale.

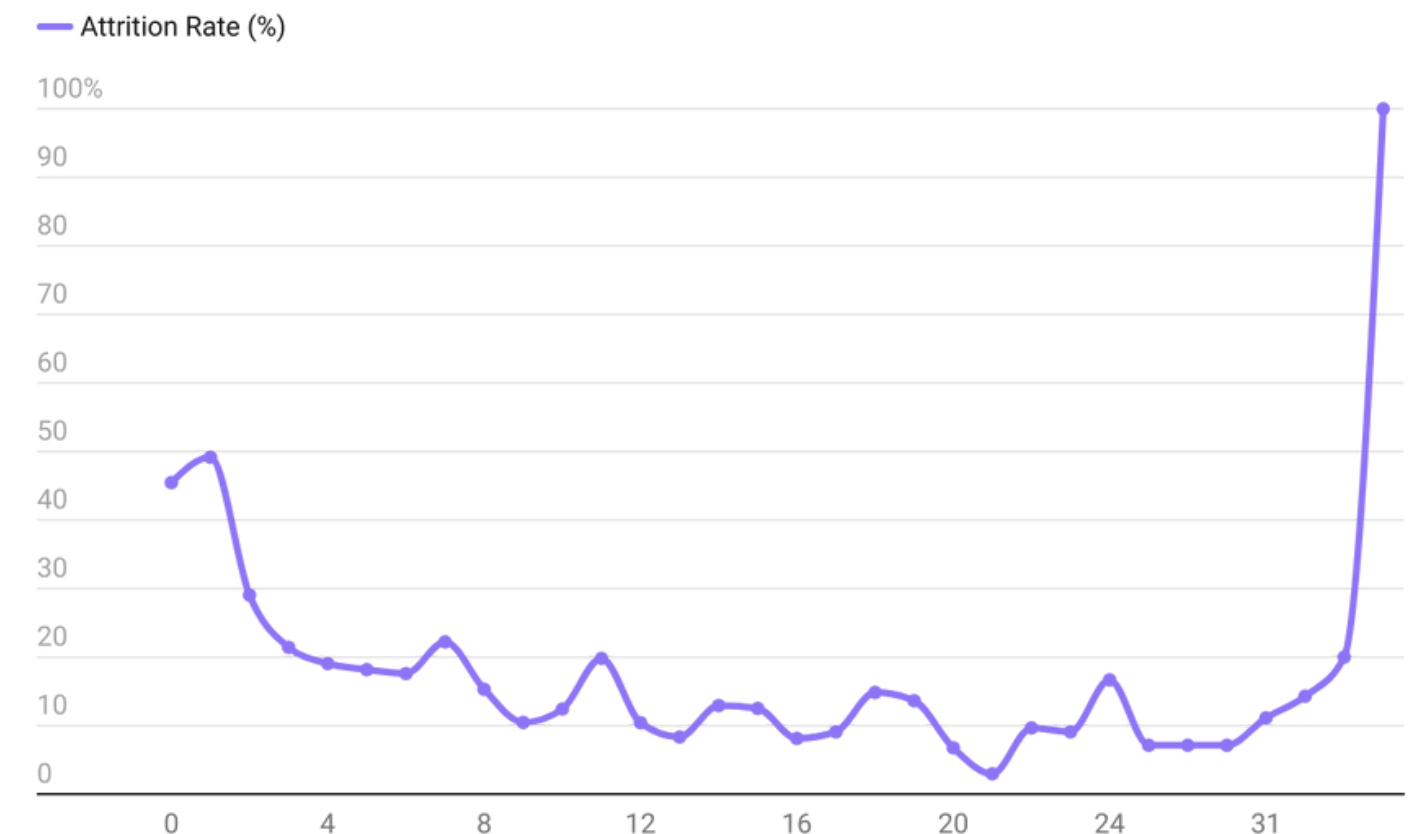
7.2 Total Experience

Attrition rates decrease as work experience increases. High attrition rates at 0 and 1 year indicate that new hires are more likely to leave, possibly due to poor onboarding, unmet job expectations, or a mismatch with company culture.

The spike at 40 years suggests retirement or end-of-career departures.



Attrition Rate Based on Total Work Experience



7. Employee Portfolio

7.3 Years at Company

Attrition rates are highest at 0 years (36.36%), 1 year (34.50%), and again at higher tenure milestones like 23 years (50%) and 40 years (100%).

High early attrition suggests issues with integration or satisfaction during the initial employment period. Attrition at longer tenures may be due to retirement or seeking new challenges.

7.4 Total Companies Employee Worked For

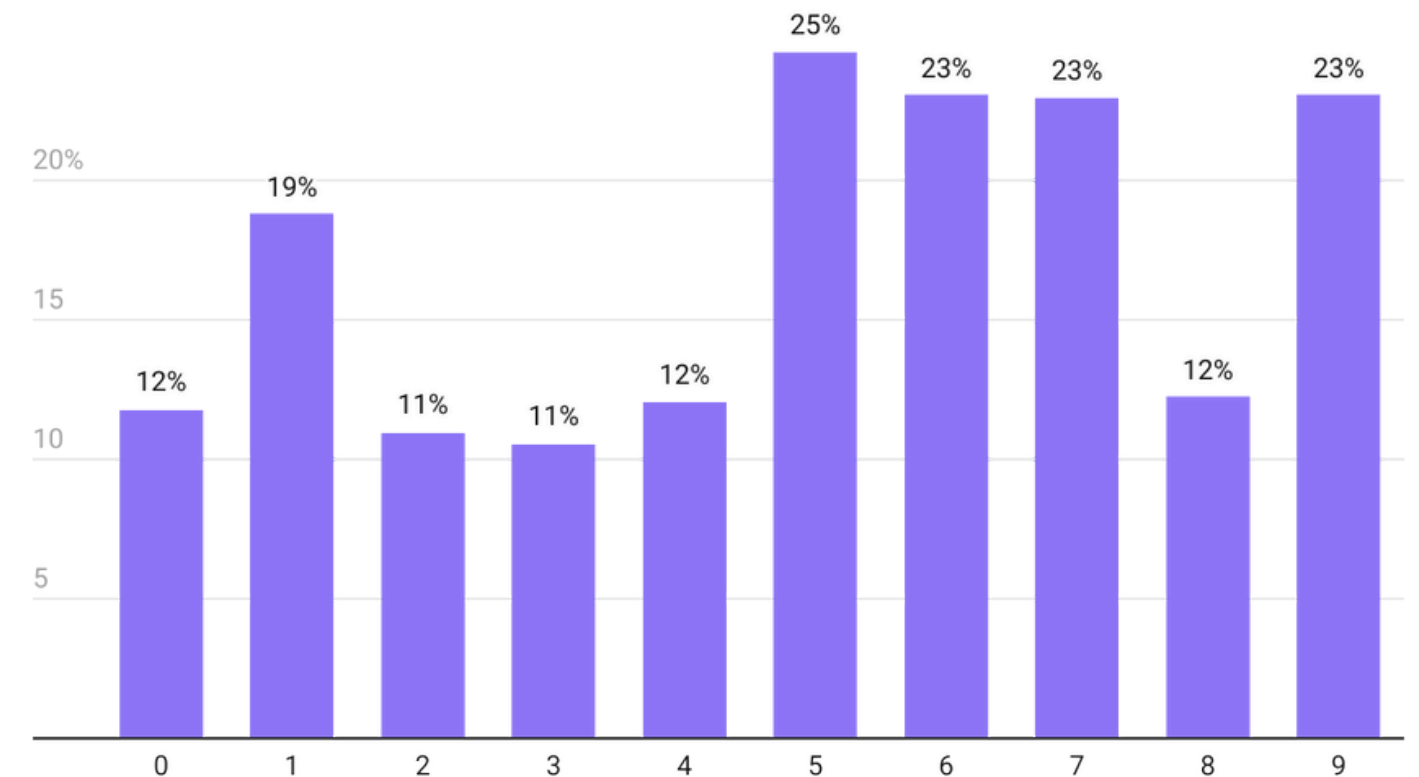
Employees who have worked for more companies(5 and more) have higher attrition rates.

Employees with varied work histories might be more adaptable and marketable, leading to higher attrition as they seek better opportunities. Conversely, those with fewer past employers tend to stay longer.

Attrition Rate Based on Total Years at Company



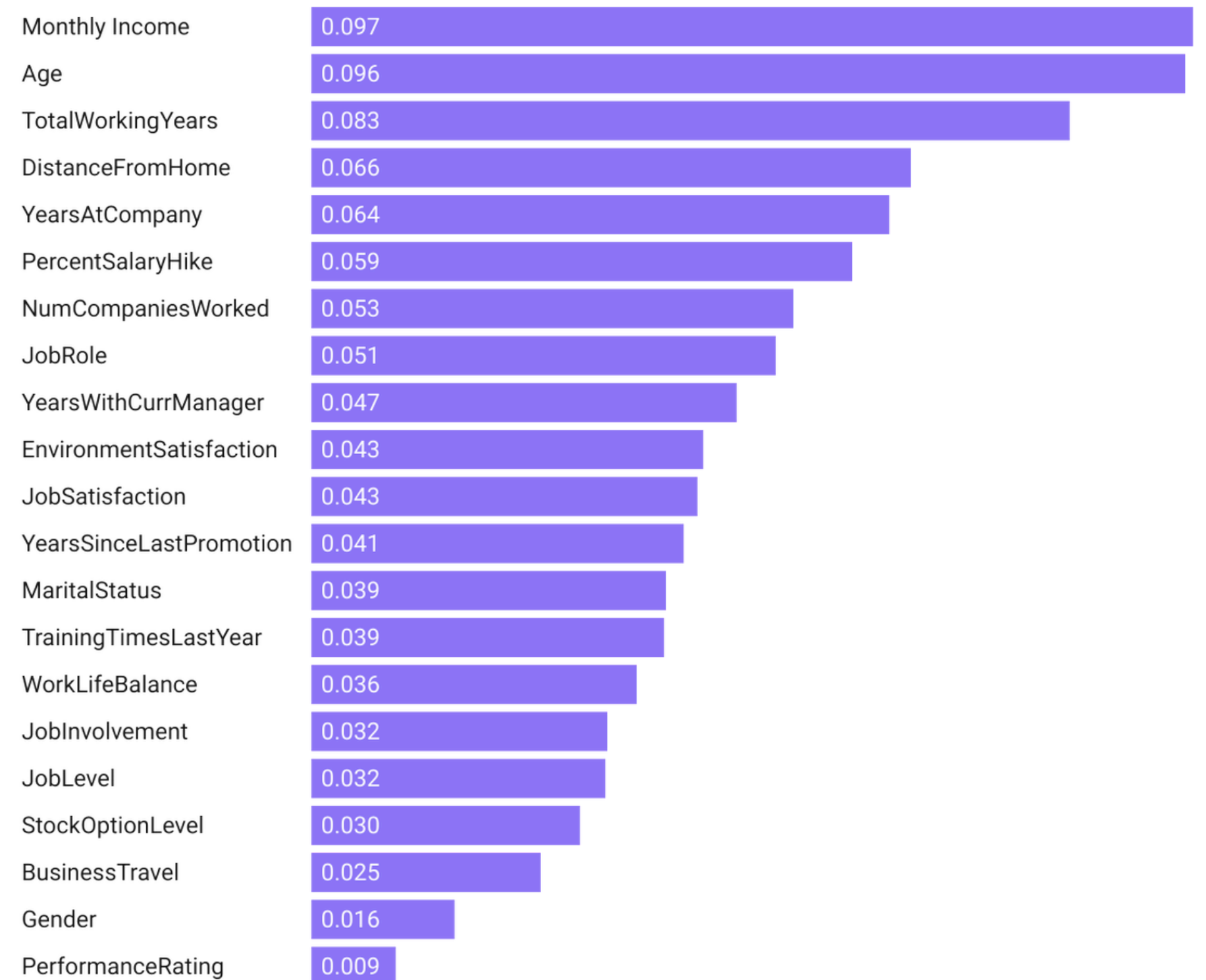
Attrition Rate Based on Companies Employee Worked for



Feature Analysis

Feature analysis aims to identify which features in our dataset contribute most to employee attrition. By using a **Random Forest Classifier**, we can rank the importance of various features, such as age, salary, job role, and job satisfaction, to determine their influence on attrition. This analysis provides a clear understanding of the key drivers behind employee turnover.

- **Top Contributing Factors:** The analysis reveals that **Monthly Income (0.097)** and **Age (0.096)** are the most significant factors influencing employee attrition. These insights suggest that financial compensation and the age demographics of employees play crucial roles in their decision to stay or leave the company.
- **Career and Experience:** Total Working Years (0.083) and Distance from Home (0.066) also significantly impact attrition. This indicates that employees' overall experience and their commute times are important considerations for retention strategies.



Predictive Analysis

Predictive analysis involves **simulating different policy changes to estimate their potential effects on the attrition rate**. Using the simulation method, we apply changes to factors like monthly income, salary hikes, and stock option levels, and predict how these changes would influence employee attrition. This method allows us to examine the effectiveness of proposed policies in reducing the attrition rate.

To predict the impact of targeted policy changes on employee attrition, we **simulated adjustments in salary and financial incentives**. The following policy changes were applied:

1. Increase Monthly Income by 15%
2. Increase Percent Salary Hike by 10%
3. Increase Stock Option Level by 1

Results:

- Baseline Attrition Rate: 16.12%
- New Attrition Rate: 15.08%
- **Predicted Percentage Decrease in Attrition Rate: 6.47%**

These simulated changes indicate a potential reduction in attrition by 6.47%, suggesting that enhancing financial incentives can effectively improve employee retention. This **predictive analysis demonstrates the value of targeted policy changes in reducing turnover** and highlights the importance of competitive compensation packages.



Summary

Demographics: Higher attrition among younger employees, single individuals, and males. Younger employees (18–22) and single employees have significantly higher attrition rates.

Salary and Financial Incentives: Moderate correlation between stock options, salary hikes, and attrition. Higher attrition in employees with lower stock options and those receiving minimal salary hikes.

Job-Related Factors: Higher attrition in Human Resources and certain roles like Research Directors. Employees with 0 years under current manager have the highest attrition.

Work Culture: Poor work environment satisfaction, low job satisfaction, and poor work-life balance are linked to higher attrition rates.

Career Progression: Higher attrition among employees at lower job levels and those with fewer years since last promotion. Frequent job changes and lack of recent promotions contribute to turnover.

Commute and Travel: Greater attrition among employees with long commutes and frequent business travel. Employees with longer commutes (15+ units) and frequent travelers have higher attrition rates.

Employee Portfolio: Higher attrition rates among employees with varied job histories and extensive work experience. New hires and those with many previous employers are more likely to leave.



Recommendations



Enhance Employee Engagement: Implement programs to improve job satisfaction and work-life balance, especially targeting younger and single employees.

Review Financial Incentives: Offer competitive salary hikes and stock options to retain talent, focusing on those receiving minimal increments.

Support Career Development: Create clear career progression paths and provide regular promotions and training opportunities to boost employee morale.

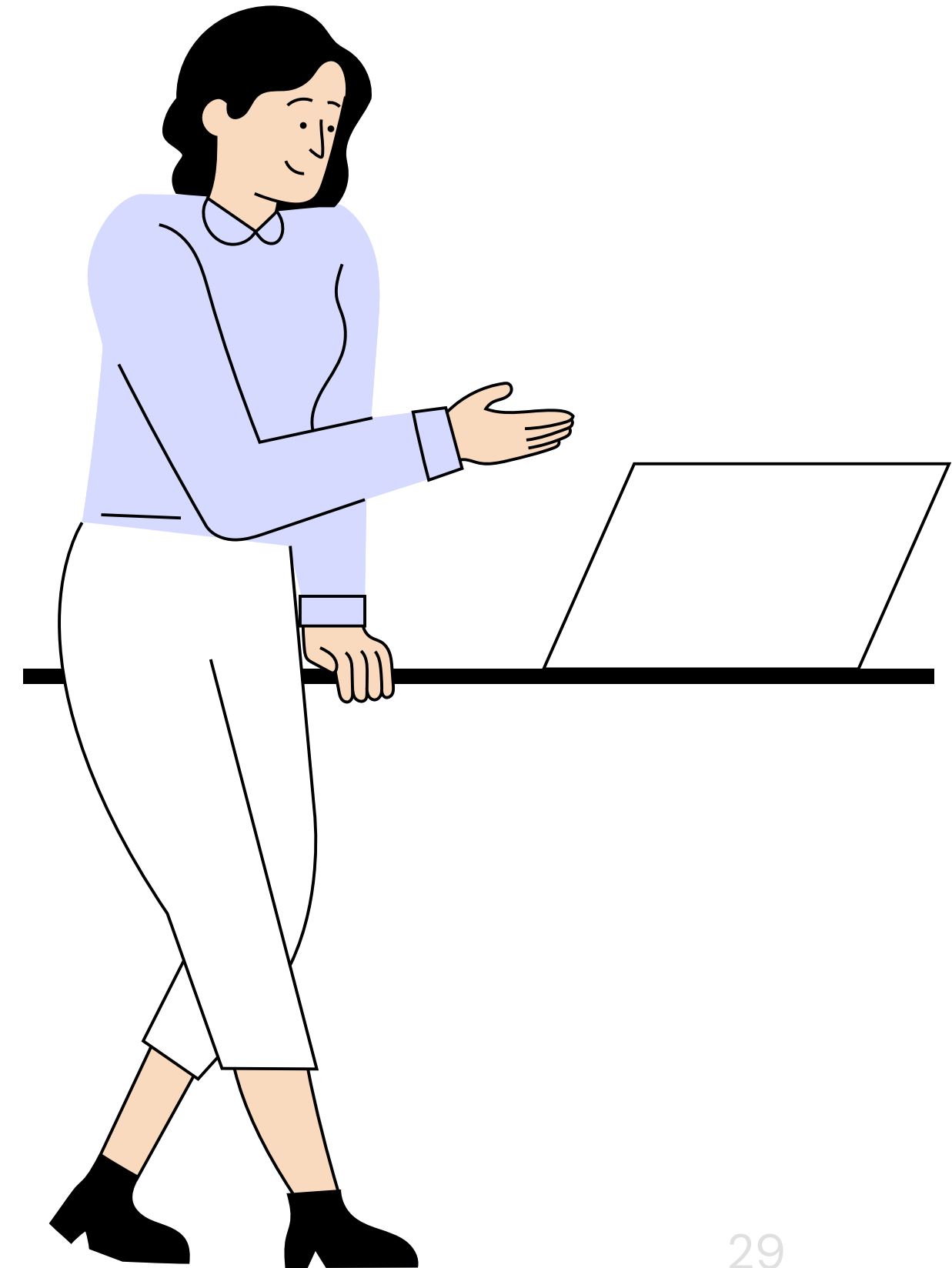
Improve Work Environment: Foster a positive work culture with a focus on environment satisfaction and job involvement to reduce turnover.

Optimize Commute and Travel Policies: Introduce flexible working arrangements and reduce the need for frequent business travel to lower attrition rates.

Monitor and Support New Hires: Pay special attention to new hires and those with diverse job histories, providing mentorship and integration support to increase retention.

Limitations

- Data Quality: Issues with missing values, inaccuracies, or outdated information in the dataset could affect the reliability of the analysis.
- Limited Scope: The analysis focuses primarily on internal company data and may not account for external factors such as industry trends, economic conditions, or regional job markets.
- Lack of Real-Time Data: The analysis is based on historical data and may not reflect real-time changes or trends that could influence employee behavior and attrition.
- Model Assumptions: The Random Forest Classifier assumes that relationships between features and attrition are stable over time, which may not hold true in a rapidly changing work environment.
- Generalizability: Insights and predictions are specific to the company under study and may not be directly applicable to other organizations with different contexts or employee demographics.
- Policy Simulation Limitations: The predictive analysis assumes linear relationships between policy changes and attrition rates, which may oversimplify the real-world impact of these changes.



Appendix

- GitHub Repository
- Dataset Used
- Data Analysis Python File
- Power BI Analysis Dashboard
- Project Documentation and Detailed Report



Thank You ! For Your Time

Presented By

Narendra Patil

