

# IBM Employee Attrition Analysis: Project Report

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## **Team members:**

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**Problem statement:** IBM wants to know the reasons behind employees leaving their organization so they can retain them. The 3 key questions are:

- ✓ Which section/category of employees are more likely to attrite?
- ✓ What could be the potential causes of attrition?
- ✓ What actions can be taken to prevent attrition?

**Dataset description:** IBM has provided us with a dataset containing comprehensive information about 1,470 of their employees including (i) Personal details about individual employees (Age, gender, Marital status, Education etc., ) (ii) Employees' association with the company (Department, Role, Years at the company etc.,) (iii) Performance at work (Percent salary hike, performance rating, etc.,), and (iv) Employee satisfaction levels (Job satisfaction, Environment satisfaction etc.,).

The dataset allows us to slice and dice the employee information and observe attrition through different angles. This exercise will help us identify profiles of the types of employees who leave the company, and also dig deep into the reasons for their attrition.

**Importance of the problem:** Employees are the assets of any organization. An organization's success is directly dependent on the well-being and satisfaction of its employees. Hence, the impact of attrition can be detrimental to both the bottom-line and morale of the company.

From costs incurred in recruiting new employees, loss of productivity during the ramping up phase and the domino effect leading to an exit wave, attrition can affect a company in multiple levels. Just in terms of expenses incurred for replacing a salaried employee, Society for Human Resource Management (SHRM) says that it costs 6 to 9 months' salary of the employee, on an average.

Given the high risks involved, it is critical for organizations to be aware of employee attrition rate. They should refrain from assuming that their employees are happy and create a strong feedback system within environment to understand the status-quo. With the recent trends caused by the 'job-hopping millennials' and the booming job markets, employees leave

their companies for a multitude of reasons. Thus, companies should be aware of 'why' their employees leave and develop appropriate strategies to prevent them from leaving.

Employee attrition is a universal problem for all companies, whether the company is currently facing it. Though one size doesn't fit all, and our analysis is specific to IBM, some of our recommendations may be applied to a broader subset of organizations.

**Exploratory data analysis:** Before delving into the dataset, we wanted to understand IBM's workforce better. We performed basic summaries on the data to arrive at the following facts:

- ✓ Millennials and Gen Z form ~50% of the company's overall workforce. This is typical as these groups, form most of the workforce in the technology industry.
- ✓ Thanks to the relentless diversity and inclusion efforts made by IBM, our workforce is comprised by 40% being female, compared to the overall technology industry average of 20%
- ✓ 95% of IBM's workforce is across the Research and Development (65%) and Sales (30%) departments. This means that the titles "Research Scientist", "Sales Executive", and "Sales Representative" dominate our data.
- ✓ The turnover rate at IBM based on the data given is 16.1%, which is higher than the 13.2% average turnover rate in the tech industry

Once we had a holistic picture of the company, we brainstormed and did our research to hypothesize on the main reasons for employee attrition. The reasons fell under three broad categories:

- Better job opportunities
- Better work environment

We performed univariate analysis to identify groups/categories of employees who attrite more when compared to the rest, followed by bivariate plots to dive into the high-attrition groups and look for patterns behind their behavior.

**Better job opportunities:** Out of employees who leave the company, around 68% are classified as either Gen Z or Millennial, or, under 35 years of age. For most of them, about 75% leave in less than 5 years of joining IBM! This can be attributed their thirst for career development and desire for a better pay-scale. A quick breakdown of the stats:

- ~ 20% of the overall attrition is due to young employees aged between 18 and 25, who only form 8% of the workforce. Their turnover rate is 36% (16.1% being the company's average). 93% of those who leave do so in less than 5 years of joining!

- Older millennials (Aged between 26 and 35) constitute around ~50% of the overall attrition. They have the second highest turnover rate of 19% after 18-25-year-old group, but they also form 41% of the workforce. 68% of those who leave, do so in less than 5 years of joining.
- Gen X'ers (Above the age of 35) have a relatively lower turnover rate ranging between 9% and 12% and are significantly less likely to leave the company for better job opportunities.

**Better work environment:** Sales and R&D departments show the highest turnover rates – 21% and 19% respectively. They also constitute majority of the workforce - 39% and 56% respectively. A quick breakdown of the stats:

- Sales representatives constitute 20% of the sales department (Sales executives being the rest). However, 40% of Sales Representatives end up leaving the company. This contributes to 14% of the overall attrition by all roles.
- 52% of the sales representatives who attrite have explicitly stated lower job satisfaction levels as a reason for leaving.
- Human resources and Laboratory technician employees who attrite have also stated lower job satisfaction levels.
- However, the job and environment satisfaction of other employees seem distributed evenly across the spectrum.

**Better work life balance:** Unsurprisingly, work life balance seems to be one of the most significant drivers for attrition. There is a clear distinction amongst employees across different levels of work life balance:

- 28% of the workforce have stated low work satisfaction levels, and those with low work satisfaction contributed to 35% of the company's overall attrition. Their turnover rate is close to 20%.
- ~20% of the workforce travel frequently for work and they contribute to 30% of the company's attrition. The turnover rate for these employees is 25%.
- 15 out of the 23 sales representatives who were required to travel frequently for work ended up leaving IBM. A Sales representative with low work life balance is more likely to leave the company when compared to employees with low work life balance in other roles.
- 28% of IBM's employees work overtime and they constitute 54% of the overall attrition in the company. Their turnover rate is a whopping 31%!

**Solution and insights:** Our goal of the analysis is to classify employees who are 'most likely to attrite', using the factors which differentiate them from other employees. As identifying the reasons were critical for our goal, we used the logistic regression classification technique.

We ran three iterations of the logistic regression model with the following variations:

1. *Baseline iteration*: All the available information was fed as predictors to the model. The iteration provided a recall score of 40% for attrition.
2. *Resampling of the minority class*: The number of employees in the 'Attrite' class was much lower than the 'Non attrite': 237 out of 1470, because the turnover rate was only 16.1%. We then used the SMOTE oversampling method to introduce new attrition instances between the existing ones. This increased the recall rate to 71%.
3. *Refinement using EDA results*: Our EDA provided information on the possible features in the dataset. We leveraged the findings to prune our list of predictors, which resulted in improving the recall rate from 71% to 74%.

## References:

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