Workforce Analytics and Optimization Using Employee Data (Report)

A. Data Cleaning and Preprocessing

Ans: From the result, none of the column is empty. This implies that we won't be performing missing values on the dataset.

- Data Formats

Ans: from the result the data is in the right datatypes which implies that the data format is perfect

ii. Use SQL to structure and extract clean subsets of the data for analysis.

Ans: From the result, we have full-time and part-time column as decimal and numeric values, I rounded up the decimal values to the nearest whole number for perfect conversion. After data standardization is been carried out to convert (0 to No and 1 to Yes), this means that any field with 0 represents that don't work as a part-time and full-time worker and 1 which represent Yes means that they work as full-time and part-time worker.

I added a new column fulltime, duplicated the values from previous full_time column into it. At default it converted the numeric values into nearest whole number. Second option is to use the Ceiling function to convert the values into the nearest whole number.

Changing the datatype from integer to text for easier conversion.

- There's inconsistency in the year joined, update it by re calculating years in the company.

B. Demographic Analysis

Gender by Department Demographics

a. Analyze gender, age, ethnicity and education level distribution across departments.

Ans: From the result,

Customer Support

Gender representation is well-balanced, with female (216 count) and male (210 count) employees nearly equal.

Non-binary (186 count) and transgender (209 count) representation are also significant, indicating a highly inclusive department**.**

Engineering

Engineering has one of the most diverse gender spreads**:**

Non-binary employees lead at 26.90%**,** followed closely by female (24.81%)**,** transgender (25.14%)**,** and male (23.15%)**.**

This department demonstrates a progressive hiring pattern, possibly supported by equity-focused initiatives.

Finance

Slightly higher representation of females (27.47%) than other genders.

Transgender and non-binary employees both account for 24%, while male representation is 24.66%.

This indicates broad gender inclusivity with no dominant gender category.

HR

HR has the highest male representation (28.50%), slightly more than female (26.60%).

Non-binary (22.33%) and transgender (22.57%) representation is relatively lower compared to other departments.

Suggests HR may benefit from targeted efforts to boost non-binary and transgender.

Marketing

Gender spread is almost equal, with:

- Female: 24.60%
- Male: 25.94%
- Non-binary: 22.78%
- Transgender: 26.67%

Reflects a department that embodies gender balance and neutrality.

Sales

Slight female lead (26.08%) over transgender (25.19%), non-binary (24.30%), and male (24.43%).

Again, this department demonstrates a balanced, inclusive workforce composition.

Age by Department Demographics

1. Customer Support

- 85.75% of employees fall between 30–45 years old, with only 14.25% aged 46–50.
- Indicates a young and active workforce, possibly reflecting early-career or mid-level roles with potential for internal growth.

2. Engineering

- 84.23% are within 30–45, while 15.77% are aged 46–50.
- Engineering retains a healthy mix of experienced professionals and younger innovators, which is ideal for a department focused on technical skills and innovation.

3. Finance

- A similar pattern: 84.37% in the 30–45 group and 15.63% in the older age group.
- Shows that the department likely recruits individuals with mid-level experience while retaining a core of senior financial professionals.

4. Human Resources (HR)

- 82.66% between 30–45, and 17.34% aged 46–50 the highest percentage of older professionals among all departments.
- Suggests that HR benefits from a **slightly more experienced workforce**, which is advantageous in managing personnel, policies, and leadership development.

5. Marketing

- Like Customer Support, 85.75% of employees are aged 30–45 and 14.45% ranges from 46-50.
- Indicates that the department leans toward mid-career creativity and strategic execution, rather than early-entry or late-career staffing.

6. Sales

- 85.44% fall within the 30–45 range, and 14.56% in the 46–50 category.
- Sales typically benefits from energy and agility, and this distribution aligns with expectations for an active, performance-driven team.

Ethnicity by Department demographics

The company has a **well-balanced mix of ethnic groups** across all departments. No group is too high or too low, with most ranging between **13% and 19%**.

This shows the company is doing well in diversity and inclusion. Every department has a good mix of people from different backgrounds, including those who chose not to share their ethnicity.

It's a sign of fair hiring and a welcoming workplace for everyone.

Ethnicity by Department Demographics

Here's a short and simple explanation of your education level analysis:

Across all departments, the education levels are well balanced. Most teams have a mix of employees with high school, associate, bachelor's, master's, and PhD degrees, each making up about 15% to 22% of their department.

This shows the company hires people from different educational backgrounds, creating a diverse and flexible workforce. No single education level dominates, which supports both experience-based and academically strong employees in all departments.

ii. **Measure workforce diversity and identify areas of imbalance or opportunity**.

Using Gender by Department Demographic to measure workforce diversity and also to identity imbalance areas.

Ans: Overall, the organization demonstrates strong workforce diversity with no critical imbalances. However, there are small gaps in specific departments that can be viewed as opportunities to fine-tune recruitment or support efforts, especially to:

- Maintain balance as teams grow.
- Ensure all gender groups feel equally supported and represented.

C. Salary & Compensation Analysis

Assess salary distribution by department, gender, and position.

Ans:

Average salaries generally increase with position level: Entry → Mid → Senior → Executive, as expected.

All gender groups (Female, Male, Non-Binary, Transgender) earn comparable average salaries within the same role and department, indicating no obvious gender-based pay gap.

Standard deviations show some variation, but nothing extreme—this suggests salary ranges are consistent, though a few departments (like Marketing and Sales) show slightly wider pay spread, possibly due to performance-based or commission-heavy roles.

No department shows any severe imbalance in salary by gender or position.

Identify salary disparities using statistical comparisons (mean, median, standard deviation).

Ans: For the salary disparities we will make use of gender and department. Across all departments, the average salaries are fairly close across gender groups, showing no major pay disparities. Each group (Female, Male, Non-Binary, and Transgender) earns similar average salaries within the same department.

- In most departments, the differences in average pay are within a few dollars.
- Standard deviation values (how spread out salaries are) are also similar, indicating consistent salary ranges for all genders.

D. Departmental & Performance Insights

Rank departments based on employee count, performance, and average salary.

Ans:

- Engineering ranks 1st in employee count (907), showing it has the largest team, but it ranks 4th in salary, suggesting it might be resource-heavy but not the most efficient or best-paid.
- Marketing performs strongly, ranking 1st in average salary and 3rd in performance, despite having a smaller team (821 employees). This shows it's a well-compensated, high-performing department.
- Customer Support is average across the board 3rd in performance and salary, tied in employee count (821). It's steady but not leading in any metric.
- Sales has the smallest team (790) but ranks 2nd in salary likely due to incentives or commissions though it ranks last in performance**.**
- HR shows balanced results, ranking 2nd in performance but 5th in salary, which could indicate a high-performing but underpaid team.
- Finance ranks low across the board last in salary and near-last in performance which might indicate a department in need of support or review.

I**dentify high-performing departments vs. those needing training or resource support.**

Ans: Using the range of 15000 – 13000, all departments are classified as High Performing based on their average bonuses (18,000+) and tenure (4.5+ years)**.** This suggests that:

- Employees are well-rewarded across departments.
- Teams are experienced and stable, with average tenure above 4.5 years.
- There’s no immediate need for training or performance support in any department.

E. Tenure & Retention Analysis

Use Python to calculate employee tenure.

Ans: A new column was created as calculated tenure, this gives the exact years the employee has spent in the company.

Perform statistical analysis on average tenure by department, age group, or gender.

Ans: The report shows that employees stay in the company for about 4.5 to 4.9 years on average, depending on the department. Customer Support has the highest average tenure, while HR has the lowest. Employees aged 30–35 stay the longest, while those aged 41–45 stay the shortest. Across genders, tenure is very similar, with transgender employees staying slightly longer than others. Overall, tenure is quite balanced, but there are some negative values that may be data errors and should be checked.

F. Predictive Insights (Optional Advanced Objective)

Apply correlation analysis to understand relationships among age, performance, and salary.

Ans: The correlation analysis shows that age, salary, and performance don't have strong relationships with each other. Age has almost no effect on salary or performance. Likewise, employees with higher salaries don't necessarily perform better. Overall, these three factors appear to be unrelated in this dataset.

Correlation Matrix:

	age	salary	performance_score
age	1.000000	0.039504	-0.000561
salary	0.039504	1.000000	-0.021182
performance_score	-0.000561	-0.021182	1.000000

POWER BI DASHBOARD INTERPRETATION

The employee dashboard provides a comprehensive view of workforce metrics across various departments and companies. It highlights key insights into salary, experience, diversity, and education, helping stakeholders make informed decisions.

1. Compensation Overview

- **Average Salary:** 87.17K
- **Average Annual Bonus:** 18.60K
- The Marketing and Sales departments report the highest average salaries, indicating potentially higher performance or strategic importance.

2. Work Experience & Tenure

- Finance and Engineering departments have employees with the highest prior experience.
- Customer Support shows the longest average tenure, suggesting strong employee retention.

3. Gender Distribution

- All departments have a relatively balanced distribution across Female, Male, Non-Binary, and Transgender employees, reflecting efforts toward gender diversity.

4. Educational Background

- Employees possess a wide range of educational qualifications.

5. Salary by Position

- Salary range are almost the same for all position.

6. Ethnic Diversity

- The workforce is ethnically diverse, with no single group dominating.
- Representation includes Hispanic**,** Black or African American**,** White**,** Asian**,** and Others, supporting an inclusive organizational culture.

7. Dashboard Interactivity

- The dashboard includes filters for Ethnicity**,** Gender**,** Department, Company, and Position, allowing dynamic exploration of specific employee segments.

Conclusion:

The analysis of the employee dataset reveals that the organization maintains a well-balanced and inclusive workforce across gender, ethnicity, education, and departments. Salaries are fairly distributed across gender and positions, with no major disparities. Most departments show consistent performance and healthy tenure levels, suggesting strong retention strategies and employee satisfaction.

Recommendations

Training Opportunities: Although no department currently shows poor performance, regular upskilling and support programs can sustain high performance across the board.

Predictive Insights: Expand data tracking (e.g., engagement scores, project completion rates) to enable more meaningful predictive modeling in the future.

Dashboard Use: Continue leveraging Power BI for real-time monitoring, and expand its use across managerial teams for data-driven decisions.