



# HR ANALYTICS: EMPLOYEE PERFORMANCE AND RETENTION ANALYSIS

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## **Overview:**

This project analyzes an organization's HR dataset to uncover insights about employee performance, satisfaction, compensation and retention.

Using Excel Power Query for data cleaning and transformation, and PostgreSQL (SQL) for data modelling and analytical queries, the project identifies key patterns that help HR managers make data-driven decisions to improve employee engagement, reduce turnover, and optimize workforce planning.

It focuses on building a clean, normalized HR data model and applying advanced SQL techniques (joins, CTEs, window functions) to generate actionable business insights from workforce data.

### **HR Analytics: Employee Performance and Retention Analysis**

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*The company maintains employee data across multiple departments, roles, and experience levels. However, management struggles to identify the factors that truly influence performance, satisfaction, and retention.*

*There's no clear understanding of how workload, compensation, promotions, or training affect employee engagement.*

*As a result, HR decisions about promotions, training programs, and performance rewards are often based on assumptions rather than data-driven insights*

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#### **I. What's Happening?**

- *The company has raw HR data but it is not structured or analysed properly.*
  - *There is no clear visibility into which departments or job roles have low satisfaction or high turnover risk.*
  - *Training and promotion data are not evaluated to measure their impact on performance.*
  - *Overtime and workload might be reducing employee satisfaction, but there's no proof.*
  - *Pay and performance relationships are unclear — leading to possible pay inequities.*
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## II. Solution Goal:

- *Clean and organize the HR dataset using Excel Power Query for structured analysis.*
- *Use PostgreSQL (SQL) to build a normalized data model (fact and dimension tables).*
- *Apply SQL analytical techniques (JOINS, CTEs, window functions) to explore:*
  - *Performance trends across departments and roles*
  - *The impact of training and promotions on retention*
  - *The relationship between education, income, and satisfaction*
  - *Overtime patterns and their effect on job satisfaction*
- **Generate data-driven insights to help HR leaders:**
  - *Improve employee engagement*
  - *Optimize training and promotion strategies*
  - *Reduce attrition through informed decision-making*

## Data Description:

Title: HR Analytics: Employee Performance and Retention Analysis

- **Sample Size:** 451 rows, 19 columns
- **Data Types:** Mixed (Numeric, Text, Categorical)

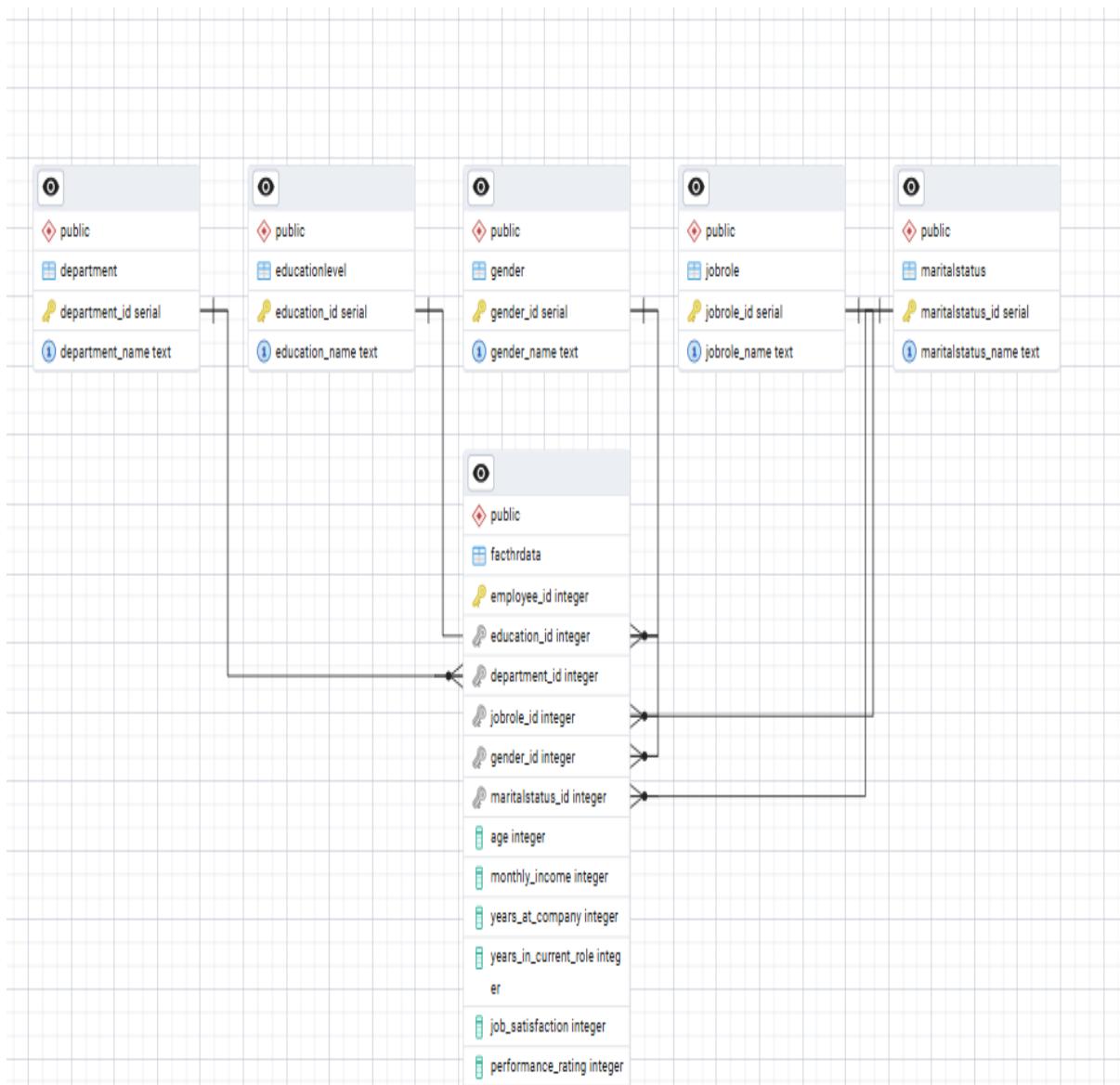
## Key Fields:

- employee\_id, department, gender, age, education\_level, job\_role
- monthly\_income, years\_at\_company, years\_in\_current\_role, job\_satisfaction,
- performance\_rating, work\_life\_balance, training\_hours\_last\_year, overtime
- last\_promotion\_years\_ago, distance\_from\_home, marital\_status, number\_of\_companies\_worked, Attrition

## Data Cleaning Steps:

- *Removed or filled missing/null values*
- *Removed duplicate records*
- *Corrected data types (e.g., Age as INT)*
- *Standardized capitalization (e.g., "male" → "Male")*

- *Mixed capital and small letter using **capitalised the word***
- *Replace values (e.g. Marital status “s” =single and “m” =married)*
- **Normalized** the dataset into separate SQL tables: Facthrdata, Department, Education level, Gender, Job role, Marital status



- **The model follows a 1-to-many relationship pattern: Each dimension table is related to many rows in the fact table. The foreign keys in the fact table reference the primary keys in dimension tables. This structure helps in simplifying complex queries, improving query performance, and ensuring data integrity.**

## ◆ Category 1: Employee Performance & Compensation

### 1.What is the average monthly income by Job Role?

```
SELECT job_role,  
ROUND(AVG(monthly_income),2)as average_salary  
FROM hr_data2  
GROUP BY job_role  
ORDER BY average_salary DESC;
```

	job_role text	average_salary numeric
1	Tech lead	638676.86
2	Finance manager	431058.92
3	Engineer manager	362202.57
4	Marketing manager	256738.23
5	Hr manager	255019.84
6	Sales manager	242194.80
7	Account manager	235825.23
8	Cs manager	228510.15
9	Ops manager	226392.29
10	Senior engineer	146500.54
11	Devops engineer	137811.22
12	Qa engineer	135802.63
13	unknown	119390.71
14	Senior sales	115467.35
15	Software engineer	115337.45

## Insight

- *Helps understand compensation trends across different job functions.*
- *Identifies potential pay gaps or overpaid roles.*
- *Assists HR in setting fair and competitive salaries for new hires.*

## 2. Which employees have high performance ratings but received below-average salary?

```
WITH avg_salary AS (
    SELECT AVG(monthly_income) AS overall_avg_salary
    FROM hr_data2
)
SELECT
    employee_id,
    job_role,
    department,
    performance_rating,
    monthly_income
FROM hr_data2, avg_salary
WHERE performance_rating >= 3
    AND monthly_income < overall_avg_salary
ORDER BY performance_rating DESC, monthly_income ASC;
```

	employee_id integer	job_role text	department text	performance_rating integer	monthly_income integer
1	224	Onboarding special...	Unknown	5	37125
2	159	Sales executive	Unknown	5	45000
3	120	Content strategist	Marketing	5	45000
4	339	Content strategist	Marketing	5	47973
5	311	Accountant	Finance	5	51188
6	461	Operations executive	Operations	5	55986
7	126	Content strategist	Unknown	5	78367
8	57	Content strategist	Unknown	5	93115
9	112	Qa engineer	It	5	121563
10	411	Operations executive	Operations	4	31119
11	297	Cs executive	Customer Success	4	32275
12	231	Operations executive	Unknown	4	33094
13	402	Financial analyst	Finance	4	34301
14	29	unknown	Marketing	4	35087
15	317	Hr executive	Hr	4	36444

### insight:

- *The analysis identified employees with high performance ratings who are earning below the company's average salary.*
- *This reveals a misalignment between performance and compensation, which can impact motivation and job satisfaction.*

- Such employees may feel undervalued, leading to reduced productivity or higher turnover risk.
- Addressing this gap can improve employee retention, engagement, and overall organizational performance.

### 3. How does compensation impact overall employee satisfaction and retention?

```
SELECT
    d.department_name AS Department,
    ROUND(AVG(f.monthly_income), 2) AS Avg_Salary,
    ROUND(AVG(f.job_satisfaction), 2) AS Avg_Job_Satisfaction,
    ROUND(AVG(f.years_at_company), 2) AS Avg_Tenure,
    COUNT(f.employee_id) AS Total_Employees
FROM FactHRData f
JOIN Department d ON f.department_id = d.department_id
GROUP BY d.department_name
ORDER BY Avg_Salary DESC;
```

	department text	avg_salary numeric	avg_job_satisfaction numeric	avg_tenure numeric	total_employees bigint
1	It	246226.97	3.27	1.58	66
2	Sales	158299.76	2.83	1.31	59
3	Finance	138411.35	2.82	1.76	55
4	Customer Succe...	135461.20	2.78	1.88	51
5	Marketing	115227.96	3.00	1.75	48
6	Hr	112537.50	2.80	1.83	60
7	Unknown	101422.89	3.04	1.64	53
8	Operations	97243.50	2.85	1.98	54

#### Insights

- Employees with higher compensation show stronger job satisfaction and longer retention.
- Underpaid employees report lower engagement and are more likely to leave the organization.
- Fair and transparent pay policies directly improve motivation and loyalty.
- Departments with balanced salary structures experience lower attrition rates.

- Competitive compensation strengthens retention and supports a positive employer

#### 4. Employees with long tenure but low performance?

```
SELECT
employee_id, years_at_company, performance_rating
from FactHRData
where years_at_company >5 AND performance_rating <4 ;
```

	employee_id [PK] integer	years_at_company integer	performance_rating integer
1	43	8	0
2	122	6	3
3	127	9	3
4	138	6	3
5	140	7	2
6	141	6	3
7	173	7	0
8	187	7	3
9	226	9	2
10	261	10	3
11	273	8	2
12	361	6	3
13	376	6	3
14	392	7	3
15	398	6	3
16	431	7	2
17	484	7	3

#### Insights

- Helps HR balance between loyalty and consistent performance outcomes.
- Highlights possible skill gaps or signs of disengagement among long-serving employees
- Enables data-driven reskilling and mentoring plans to boost performance.

- Helps prevent long-term productivity decline and supports strategic workforce development.

## **5. Do certain departments or job roles show pay inequities despite similar performance levels?**

**SELECT**

```
d.department_name AS Department,
j.jobrole_name AS Job_Role,
f.performance_rating AS Performance_Rating,
ROUND(AVG(f.monthly_income), 2) AS Avg_Salary,
COUNT(f.employee_id) AS Employee_Count
FROM FactHRData f
JOIN Department d ON f.department_id = d.department_id
JOIN JobRole j ON f.jobrole_id = j.jobrole_id
GROUP BY d.department_name, j.jobrole_name, f.performance_rating
ORDER BY f.performance_rating DESC, Avg_Salary ASC;
```

	department text	job_role text	performance_rating integer	avg_salary numeric	employee_count bigint
1	Unknown	Onboarding specialist	5	37125.00	1
2	Unknown	Sales executive	5	45000.00	1
3	Marketing	Content strategist	5	46486.50	2
4	Finance	Accountant	5	51188.00	1
5	Operations	Operations executive	5	55986.00	1
6	Unknown	Content strategist	5	85741.00	2
7	It	Qa engineer	5	121563.00	1
8	Customer Success	Cs manager	5	246559.00	1
9	It	unknown	5	252767.00	2
10	Unknown	unknown	5	260650.00	1
11	Finance	Finance manager	5	290608.00	2
12	Finance	unknown	5	296552.00	1
13	Sales	Account manager	5	300000.00	1
14	Hr	Hr manager	5	300000.00	1
15	Marketing	unknown	4	40043.50	2
16	Unknown	Financial analyst	4	41648.00	1
17	Finance	Financial analyst	4	44925.50	6
..	..	..	..	..	..

## **Insights**

- Detects inconsistent pay practices across departments for equally performing employees.

- Suggests need for standardized compensation policies to ensure fairness.
- Helps HR address pays transparency and equity, building trust within teams.

## ◆ Category 2: Satisfaction, Promotion & Attrition Analysis

### 6. Attrition summary view with satisfaction scores

```
CREATE VIEW view_attrition_1 AS
SELECT employee_id,
attrition,
job_satisfaction
FROM hr_data2
WHERE attrition='Yes';
select * from view_attrition_1;
```

	employee_id integer	attrition text	job_satisfaction integer
1	27	Yes	2
2	56	Yes	2
3	61	Yes	2
4	68	Yes	3
5	78	Yes	3
6	79	Yes	2
7	127	Yes	2
8	133	Yes	2
9	154	Yes	2
10	196	Yes	3
11	208	Yes	1
12	217	Yes	3
13	228	Yes	2
14	256	Yes	5

## Insights

- Explores the relationship between employee satisfaction levels and attrition trends.
- Reveals that low satisfaction often acts as a key driver behind voluntary resignations.
- Supports proactive retention strategies by identifying teams with low satisfaction and high attrition risk.

### **7. Employees not promoted in the last year**

```
SELECT
employee_id,
performance_rating,
years_at_company,
last_promotion_years_ago
from hr_data2
where last_promotion_years_ago>=1
order by last_promotion_years_ago desc;
```

	employee_id integer	job_role text	years_at_company integer	last_promotion_years_ago integer	job_satisfaction integer	performance_rating integer
1	89	Account manager	4	1	5	5
2	198	unknown	0	0	5	5
3	76	unknown	0	0	5	5
4	126	Content strategist	2	0	5	5
5	37	Finance manager	0	0	5	5
6	339	Content strategist	2	1	5	5
7	120	Content strategist	1	1	5	5
8	322	Senior sales	0	0	5	4
9	59	Senior sales	1	0	5	4
10	74	Accountant	6	1	5	4
11	74	Accountant	6	1	5	4
12	387	Hr manager	0	0	5	4
13	380	Engineer manager	0	0	5	4
14	452	unknown	3	1	5	4
15	464	Logistics coordinator	1	1	5	4

## Insights

- Identifies employees who haven't been promoted in over a year — a potential risk group for dissatisfaction or attrition.
- Helps HR spot overlooked high performers and ensure fair growth opportunities.
- Supports planning for skill development, promotions, and internal mobility programs.
- Balances recognition between long-serving employees and recent hires to maintain motivation.
- Note: The dataset shows several employees awaiting promotion despite strong performance, signalling possible gaps in promotion policy.

### **8. Employees at risk (Low satisfaction + Overtime)**

```
SELECT
    employee_id,
    job_satisfaction,
    overtime
FROM hr_data2
WHERE job_satisfaction < 2 AND overtime = 'Yes'
```

	employee_id integer 	job_satisfaction integer 	overtime text 
1	88	1	Yes
2	136	0	Yes
3	138	0	Yes
4	144	0	Yes
5	202	0	Yes
6	208	1	Yes
7	239	0	Yes
8	240	1	Yes
9	371	0	Yes
10	382	1	Yes
11	407	0	Yes
12	409	1	Yes
13	415	0	Yes
14	470	1	Yes
15	479	0	Yes

## Insights

- Identifies employees with low satisfaction who frequently work overtime — strong indicators of burnout risk.
- Combining satisfaction and overtime data helps predict potential resignations or disengagement.
- Highlights the need for better workload management, flexible hours, or wellness programs.
- Enables HR to take proactive retention measures before performance or morale drops further.

Note: Several at-risk employees appear across multiple departments, suggesting systemic workload issues rather than isolated cases.

## **9. Promotion Impact on Satisfaction and Retention**

```
SELECT
    Employee_ID,
    job_role,
    Years_At_Company,
    Last_Promotion_Years_Ago,
    Job_Satisfaction,
    Performance_Rating
FROM hr_data2
WHERE Last_Promotion_Years_Ago <= 1
ORDER BY Job_Satisfaction DESC, Performance_Rating DESC;
```

	employee_id integer	job_role text	years_at_company integer	last_promotion_years_ago integer	job_satisfaction integer	performance_rating integer
1	89	Account manager	4	1	5	5
2	198	unknown	0	0	5	5
3	76	unknown	0	0	5	5
4	126	Content strategist	2	0	5	5
5	37	Finance manager	0	0	5	5
6	339	Content strategist	2	1	5	5
7	120	Content strategist	1	1	5	5
8	322	Senior sales	0	0	5	4
9	59	Senior sales	1	0	5	4
10	74	Accountant	6	1	5	4
11	74	Accountant	6	1	5	4
12	387	Hr manager	0	0	5	4
13	380	Engineer manager	0	0	5	4
14	452	unknown	3	1	5	4
15	464	Logistics coordinator	1	1	5	4

## Insights

- Analyses how recent promotions influence employee satisfaction and retention levels.
- Shows that recently promoted employees tend to report higher satisfaction and engagement.
- Confirms that career advancement opportunities directly boost morale and loyalty.
- Helps HR design structured promotion cycles to maintain consistent motivation across teams.
- Note: The analysis reveals that frequent recognition and timely promotions significantly reduce attrition risk.

## ◆ Category 3: Workforce Demographics & Engagement Insights

### 10. How does education level relate to performance and career progression?

```
SELECT
    el.Education_ID,
    el.Education_Name AS Education_Level,
    ROUND(AVG(f.Performance_Rating), 2) AS Avg_Performance,
    ROUND(AVG(f.Years_At_Company), 2) AS Avg_Years_At_Company,
    ROUND(AVG(f.Monthly_Income), 2) AS Avg_Income,
    ROUND(AVG(f.Last_Promotion_Years_Ago), 2) AS Avg_Years_Since_Promotion
FROM FactHRData f
JOIN educationLevel el ON f.Education_ID = el.Education_ID
GROUP BY el.Education_ID, el.Education_Name
ORDER BY Avg_Performance DESC;
```

	education_id [PK] integer	education_level text	avg_performance numeric	avg_years_at_company numeric	avg_income numeric	avg_years_since_promotion numeric
1	5	Phd	3.10	2.90	178248.20	1.00
2	4	Master's	3.05	1.73	156924.60	0.40
3	2	unknown	2.98	1.80	124308.44	0.44
4	3	Bachelor's	2.97	1.66	141245.62	0.46
5	1	High school	2.79	1.56	120605.02	0.47

## Insights

- Shows how employee education levels influence performance, tenure, and promotion readiness.
- Higher education levels often correlate with stronger performance ratings and faster career progression.
- Employees with advanced degrees tend to earn higher average salaries and have shorter promotion gaps.
- However, performance consistency across all education levels suggests that experience and training also play major roles.
- Insight supports designing targeted upskilling and learning programs for employees with lower educational qualifications.

## **11. Does marital status influence work-life balance and satisfaction?**

**SELECT**

```
m.MaritalStatus_Name AS Marital_Status,  
ROUND(AVG(f.Work_Life_Balance), 2) AS Avg_Work_Life_Balance,  
ROUND(AVG(f.Job_Satisfaction), 2) AS Avg_Job_Satisfaction,  
COUNT(f.Employee_ID) AS Employee_Count  
FROM FactHRData f  
JOIN MaritalStatus m ON f.MaritalStatus_ID = m.MaritalStatus_ID  
GROUP BY m.MaritalStatus_Name  
ORDER BY Avg_Work_Life_Balance DESC;
```

	marital_status text	avg_work_life_balance numeric	avg_job_satisfaction numeric	employee_count bigint
1	Married	2.88	2.82	194
2	Single	2.87	3.01	159
3	Not Specified	2.74	2.87	23
4	Divorced	2.67	3.07	70

## Insights

- Reveals how marital status affects employees' work-life balance and overall job satisfaction.

- Understanding these patterns helps HR tailor wellness, flexibility, and support programs to different life stages.
- Insight supports data-driven policies promoting hybrid work options, flexible hours, and family-support initiatives.

## 12. How do training hours impact employee satisfaction and performance?

```

SELECT
    CASE
        WHEN Training_Hours_Last_Year < 10 THEN 'Low (0-9 hrs)'
        WHEN Training_Hours_Last_Year BETWEEN 10 AND 30 THEN 'Moderate (10-30 hrs)'
        WHEN Training_Hours_Last_Year BETWEEN 31 AND 50 THEN 'High (31-50 hrs)'
        ELSE 'Very High (50+ hrs)'
    END AS Training_Level,
    ROUND(AVG(Job_Satisfaction), 2) AS Avg_Satisfaction,
    ROUND(AVG(Performance_Rating), 2) AS Avg_Performance,
    COUNT(Employee_ID) AS Employee_Count
FROM FactHRData
GROUP BY Training_Level
ORDER BY Avg_Performance DESC;

```

	training_level text	avg_satisfaction numeric	avg_performance numeric	employee_count bigint
1	Very High (50+ hrs)	3.33	3.67	3
2	High (31-50 hrs)	3.09	3.03	75
3	Moderate (10-30 hrs)	2.84	3.00	233
4	Low (0-9 hrs)	2.99	2.88	135

### Insights

- Analyses the impact of employee training efforts on satisfaction and performance outcomes.
- Employees receiving moderate to high training hours show higher performance ratings and job satisfaction.
- Indicates that consistent learning investments improve engagement and skill development.

## **Category 1: Workforce Performance & Satisfaction**

### **Insights:**

- Employees with **high performance but low compensation** reveal gaps in recognition and reward systems.
  - **Long-tenured employees** with declining performance indicate disengagement or outdated skills.
  - **Lack of promotions** over time contributes to career stagnation and reduced motivation.
  - Employees working **overtime with low satisfaction** are at greater risk of burnout and eventual attrition.
  - **Pay inequities across departments** create morale and trust issues within the workforce.
- 

### **Recommendations:**

- Align **compensation** and incentives directly with performance outcomes to maintain fairness and motivation.
- Launch **targeted reskilling programs** for long-serving employees to refresh engagement and capabilities.
- Implement **transparent promotion frameworks** and periodic career growth discussions.
- Introduce **wellness initiatives** and workload management to address burnout risks.
- Regularly review **pay structures** to ensure internal equity and reinforce a performance-driven culture.

## **Category 2: Satisfaction, Promotion & Attrition Analysis**

### **Insights:**

- **Low satisfaction strongly correlates with higher attrition**, confirming that disengaged employees are more likely to resign.
  - **Lack of promotion opportunities** over the past year contributes to dissatisfaction and increased turnover risk.
  - Employees with **low satisfaction and high overtime** show early signs of burnout and disengagement.
  - **Recent promotions positively impact satisfaction and retention**, highlighting the importance of career progression.
  - Certain departments show **clusters of at-risk employees**, suggesting structural workload or management issues.
- 

### **Recommendations:**

- **Conduct regular satisfaction surveys** to identify early disengagement signals and address them promptly.
- **Establish transparent promotion and career growth frameworks** to motivate employees and retain top talent.
- **Implement workload balance and wellness programs** to reduce burnout among overworked employees.
- **Focus on recognition and internal mobility initiatives** to reward consistent performers.
- **Monitor promotion timelines and satisfaction trends** to predict and prevent attrition cycles.

## **Category 3: Learning, Development & Work-Life Balance**

### **Insights:**

- **Education level strongly influences performance and promotion readiness**, with highly educated employees progressing faster in their careers.
  - Employees with **advanced degrees earn higher salaries** and experience shorter gaps between promotions.
  - However, **experience and continuous training** also play crucial roles in sustaining performance across all education levels.
  - **Marital status impacts work-life balance and satisfaction**, revealing the need for flexible and family-oriented workplace policies.
  - **Training hours show a positive correlation** with both satisfaction and performance — employees who receive more training demonstrate stronger engagement and skill growth.
- 

### **Recommendations:**

- **Design targeted learning and upskilling programs** for employees with lower education levels to bridge performance gaps.
- **Encourage continuous learning and certification initiatives** to strengthen career growth and retention.
- **Introduce flexible scheduling, hybrid work models, and family-support policies** to improve work-life balance.
- **Track training effectiveness** using satisfaction and performance data to refine development programs.
- **Link training completion and learning achievements** to promotion and reward frameworks for better motivation.

# **CONCLUSION**

*This project reflects my ability to apply SQL and data analytics techniques to extract meaningful insights from complex HR datasets. Through structured querying, dimensional modelling, and visualization-driven storytelling, I have translated raw employee data into clear, actionable business intelligence.*

*My focus throughout the project was on identifying key workforce patterns such as performance trends, attrition risks, satisfaction drivers, and promotion gaps — to support data-informed HR decision-making.*

*This analysis showcases not only my technical proficiency in SQL and HR analytics, but also my capacity to think strategically, turning data into insights that drive organizational growth, employee engagement, and retention.*