**Departmental Project & Budget Analysis**

**Introduction**

The **Departmental Project & Budget Analysis** project aims to provide insights into how departments manage their budgets and resources to complete projects. By utilizing SQL for data analysis and Power BI for visualization, this project helps to understand critical aspects such as budget utilization, project completion rates, workforce distribution, and goal alignment across departments.

**Problem Statement**

This project addresses the following key questions:

1. How effectively are departments utilizing their budgets in completed projects?
2. Which departments have the highest employee involvement in projects?
3. What is the project completion rate for each department?
4. How are project delays and durations distributed across departments?
5. Are the project goals aligned with the departments’ objectives?
6. How is the workload and employee distribution managed across departments?

**Workflow of the Project**

**1. Data Collection:**

* Collected data related to departments, projects, and employees stored in SQL tables.

**2. Data Cleaning:**

* Renamed irregular column names and performed necessary cleaning for easier access during analysis.

**3. SQL Queries:**

* Developed SQL queries to analyze key metrics such as budget utilization, project completion, and employee involvement.

**4. Data Visualization:**

* Power BI was used to visualize the SQL output through dynamic charts and KPIs for easy interpretation.

**5. Insights & Decision-Making:**

* Based on the analysis, actionable insights were derived to improve resource management and project performance across departments.

**Main Objectives:**

The main objective of the analysis using these problem statements is to **evaluate departmental efficiency, resource allocation, and project management performance**. Specifically, the goals can be broken down as follows:

1. **Assess Budget Utilization and Financial Efficiency**:
   * Evaluate how well departments are managing their project budgets.
   * Identify any budget overruns or underutilization in completed projects.
   * Provide insights on whether department budgets align with actual spending on projects.
2. **Analyze Employee Involvement and Resource Allocation**:
   * Determine how human resources (employees) are distributed across projects and departments.
   * Identify departments that may be understaffed or overloaded with project assignments.
   * Ensure that employee allocation is optimal for both ongoing and completed projects.
3. **Measure Project Performance and Completion Rates**:
   * Calculate project completion rates and assess how efficiently departments are delivering projects.
   * Understand how upcoming projects are distributed across departments and whether they are meeting strategic goals.
   * Provide visibility on project timelines and potential delays.
4. **Monitor Project Budgets Across Departments**:
   * Compare the budgets of completed and upcoming projects to understand spending trends.
   * Highlight departments that receive larger project budgets and examine whether these departments are producing high-value outcomes.
5. **Evaluate Departmental Goal Alignment with Projects**:
   * Ensure that departments are working on projects that align with their stated goals and objectives.
   * Highlight any discrepancies between departmental goals and the types of projects they are completing.
6. **Analyze Leadership and Project Management**:
   * Identify the project leads across departments and analyze whether certain departments have more experienced leadership.
   * Examine how project leads are distributed across different projects and departments.

**Key Outcomes:**

* **Operational Efficiency**: Gain a clear understanding of how efficiently departments are managing resources and budgets.
* **Strategic Alignment**: Ensure projects align with departmental and organizational goals.
* **Performance Optimization**: Identify areas for improvement in terms of budget management, resource allocation, and project timelines.
* **Data-Driven Decision Making**: Provide actionable insights that allow decision-makers to optimize project assignments, resource distribution, and budgeting strategies.

Ultimately, the goal is to enable departments to become more **efficient, strategic, and aligned** with the organization’s overall objectives while optimizing the use of resources (both financial and human) in project execution.

**Steps Involved in the Project**

**Data Integration**

The dataset includes details on departments, employees, and projects. Data was integrated into SQL and Power BI for visualization and further analysis.

**Data Analysis Using SQL Queries**

**1. Data Exploration & Understanding**

* **Tables Overview:**
  + **Departments**: Contains department details such as budget, goals, and the number of employees.
  + **Completed Projects**: Contains projects that have been finished, linking to their respective departments.
  + **Head Shots**: Stores employee ID and their headshots, useful for employee visualization in Power BI.
  + **Project Assignment**: Links employees to projects they worked on.
  + **Project**: Another table for projects, possibly similar to completed projects but with an extra column "MyUnknownColumn".
  + **Upcoming Projects**: Details of future projects with a project lead column.

**2. SQL Queries**

Problem Statements for SQL Analysis and Power BI Dashboard

1. **Departmental Budget Utilization**
   * Problem: How effectively are departments utilizing their budgets in completed projects, and what percentage of the total department budget has been spent on projects?

**SQL Query :-**

**SELECT**

**d.Department\_Name,**

**d.Department\_Budget,**

**COALESCE(SUM(cp.project\_budget), 0) AS Total\_Project\_Spent,**

**ROUND((COALESCE(SUM(cp.project\_budget), 0) / d.Department\_Budget) \* 100, 2) AS Budget\_Utilization\_Percentage**

**FROM**

**departments d**

**LEFT JOIN**

**completed\_projects cp ON d.Department\_ID = cp.department\_id**

**GROUP BY**

**d.Department\_Name, d.Department\_Budget;**

**Output:**

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1. **Employee Involvement in Projects**
   * Problem: Which departments have the highest employee involvement in projects, and how is the workforce distributed across completed and upcoming projects?

**SQL Query :-**

**SELECT**

**d.department\_name AS Departments,**

**COUNT(DISTINCT pa.employee\_id) AS Employees\_Involved\_Completed\_Projects,**

**'Completed' AS Project\_Type**

**FROM**

**departments d**

**JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**JOIN**

**project\_assignments pa ON cp.project\_id = pa.project\_id**

**GROUP BY**

**d.department\_name**

**UNION**

**-- For Employee Involvement in Upcoming Projects**

**SELECT**

**d.department\_name AS Department,**

**COUNT(DISTINCT pa.employee\_id) AS Employees\_Involved\_Upcoming\_Projects,**

**'Upcoming' AS Project\_Type**

**FROM**

**departments d**

**JOIN**

**upcoming\_projects up ON d.department\_id = up.department\_id**

**JOIN**

**project\_assignments pa ON up.project\_id = pa.project\_id**

**GROUP BY**

**d.department\_name;**

**Output :**

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1. **Project Completion Rate by Department**
   * Problem: What is the project completion rate for each department, and are departments meeting their project goals?

**SQL Query :-**

**SELECT**

**d.department\_name AS Department,**

**COUNT(DISTINCT cp.project\_id) AS Completed\_Projects,**

**COUNT(DISTINCT p.project\_id) AS Total\_Projects,**

**ROUND((COUNT(DISTINCT cp.project\_id) / COUNT(DISTINCT p.project\_id)) \* 100, 2) AS Project\_Completion\_Rate\_Percentage**

**FROM**

**departments d**

**LEFT JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**LEFT JOIN**

**projects p ON d.department\_id = p.department\_id**

**GROUP BY**

**d.department\_name;**

**-- Departments Are Meeting Their Project Goals**

**SELECT**

**d.department\_name AS Department,**

**d.department\_goals AS Department\_Goals,**

**COUNT(DISTINCT cp.project\_id) AS Completed\_Projects,**

**CASE**

**WHEN COUNT(DISTINCT cp.project\_id) >= d.department\_goals THEN 'Goals Met'**

**ELSE 'Goals Not Met'**

**END AS Goal\_Achievement\_Status**

**FROM**

**departments d**

**LEFT JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**GROUP BY**

**d.department\_name, d.department\_goals;**

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1. **Project Budget Analysis**
   * Problem: What are the average and total project budgets for completed and upcoming projects across different departments? Are some departments receiving larger project budgets compared to others?

**SQL Query :-**

**SELECT**

**d.department\_name AS Department,**

**SUM(cp.project\_budget) AS Total\_Completed\_Budget,**

**AVG(cp.project\_budget) AS Average\_Completed\_Budget,**

**'Completed' AS Project\_Type**

**FROM**

**departments d**

**JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**GROUP BY**

**d.department\_name**

**UNION ALL**

**-- Average and Total Budgets for Upcoming Projects**

**SELECT**

**d.department\_name AS Department,**

**SUM(up.project\_budget) AS Total\_Upcoming\_Budget,**

**AVG(up.project\_budget) AS Average\_Upcoming\_Budget,**

**'Upcoming' AS Project\_Type**

**FROM**

**departments d**

**JOIN**

**upcoming\_projects up ON d.department\_id = up.department\_id**

**GROUP BY**

**d.department\_name;**

**Output :**

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1. **Project Timelines and Delays**
   * Problem: Are there any significant delays in project completion, and how do the durations of completed projects compare across departments?

**SQL Query :-**

**SELECT**

**d.department\_name AS Department,**

**cp.project\_name AS Project\_Name,**

**cp.project\_start\_date,**

**cp.project\_end\_date,**

**DATEDIFF(cp.project\_end\_date, cp.project\_start\_date) AS Project\_Duration,**

**CASE**

**WHEN DATEDIFF(cp.project\_end\_date, cp.project\_start\_date) > 30 THEN 'Delayed'**

**ELSE 'On Time'**

**END AS Delay\_Status**

**FROM**

**departments d**

**JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**ORDER BY**

**d.department\_name, Project\_Duration;**

**Output :**

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1. **Departmental Goals and Project Alignment**
   * Problem: How aligned are the completed and upcoming projects with the stated departmental goals? Are departments working towards their goals through the projects they are assigned?

**SQL Query :-**

**SELECT**

**d.department\_name AS Department,**

**d.department\_goals AS Department\_Goals,**

**COUNT(DISTINCT cp.project\_id) AS Completed\_Projects,**

**COUNT(DISTINCT up.project\_id) AS Upcoming\_Projects,**

**COUNT(DISTINCT cp.project\_id) + COUNT(DISTINCT up.project\_id) AS Total\_Projects,**

**CASE**

**WHEN (COUNT(DISTINCT cp.project\_id) + COUNT(DISTINCT up.project\_id)) >= d.department\_goals THEN 'On Track'**

**ELSE 'Not On Track'**

**END AS Goal\_Alignment\_Status**

**FROM**

**departments d**

**LEFT JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**LEFT JOIN**

**upcoming\_projects up ON d.department\_id = up.department\_id**

**GROUP BY**

**d.department\_name, d.department\_goals**

**ORDER BY**

**d.department\_name;**

**Output :**

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1. **Project Leadership and Resource Distribution**
   * Problem: Are project leads and resources (employees) being distributed equally across departments, or are some departments overloaded with work?

**SQL Query :-**

**SELECT**

**d.department\_name AS Department,**

**COUNT(DISTINCT cp.project\_id) AS Total\_Completed\_Projects,**

**COUNT(DISTINCT up.project\_id) AS Total\_Upcoming\_Projects,**

**COUNT(DISTINCT pa.employee\_id) AS Total\_Employees\_Assigned,**

**COUNT(DISTINCT up.project\_lead) AS Total\_Project\_Leads,**

**COUNT(DISTINCT pa.assignment\_id) AS Total\_Assignments**

**FROM**

**departments d**

**LEFT JOIN**

**completed\_projects cp ON d.department\_id = cp.department\_id**

**LEFT JOIN**

**upcoming\_projects up ON d.department\_id = up.department\_id**

**LEFT JOIN**

**project\_assignments pa ON pa.project\_id IN (cp.project\_id, up.project\_id)**

**GROUP BY**

**d.department\_name**

**ORDER BY**

**Total\_Employees\_Assigned DESC, Total\_Project\_Leads DESC;**

**Output :**

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**3. Power BI Visualization**

* **KPI Dashboard**: Create Key Performance Indicators (KPIs) for departments:
  + Total project budget.
  + Number of projects completed.
  + Employee headcounts by department.
* **Pie Charts**: Show budget distribution across departments.
* **Bar Charts**: Visualize the number of employees assigned to upcoming and completed projects.
* **Interactive Tables**: Provide a table view of employees with their respective projects (use headshots for a visual element).
* **Trend Analysis**: A timeline showing the start and end dates of projects, categorized by department.

**Results and Insights**

Based on the analysis, the following insights were derived:

1. **Budget Utilization**:
   * The average budget utilization rate across departments is 80%. Some departments have exceeded their assigned budgets, indicating overuse of resources.
2. **Project Completion Rate**:
   * Departments with higher employee involvement have higher project completion rates. The average completion rate across departments is 75%.
3. **Employee Involvement**:
   * Departments that distribute work evenly among employees show better efficiency and timely completion of tasks.

**Dashboard Overview**

Below is a snapshot of the Power BI dashboard that visualizes key metrics such as project completion rates, budget utilization, and workforce distribution.

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**Conclusion and Recommendations**

The **Departmental Project & Budget Analysis** provides valuable insights into how departments can better manage their budgets, projects, and workforce. The Power BI dashboard offers real-time tracking of departmental performance and supports strategic decision-making to improve resource allocation.

* **Recommendations**:
  + Departments should monitor budget usage more closely to prevent resource overuse.
  + Increased focus on balanced employee workload distribution can help achieve better project outcomes.
  + Regular tracking of project progress and completion rates will ensure departments stay aligned with their goals.