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Software Component Design Project

Section D

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Introduction

This project aims to monitor and analyze student performance using a data visualization tool, Power BI, with data collected in Excel. The chosen development approach is the **Incremental Model**, which allows gradual development, testing, and refinement of components.

Objective

- Provide an interactive dashboard for monitoring student grades, attendance, and performance.
- Visualize insights through charts and tables for better decision-making by teachers and administrators.

Chosen Development Model

Incremental Model

The Incremental Model was selected because it supports step-by-step implementation and testing of components. This approach enables the development team to refine each component iteratively based on feedback and results from previous increments.

Project Development Phases:

- **Increment 1:** Data importing.
- **Increment 2:** Build initial Power BI dashboard visuals.
- **Increment 3:** Add slicers and interactivity.
- **Increment 4:** Optimize visuals and finalize the dashboard.

System Architecture

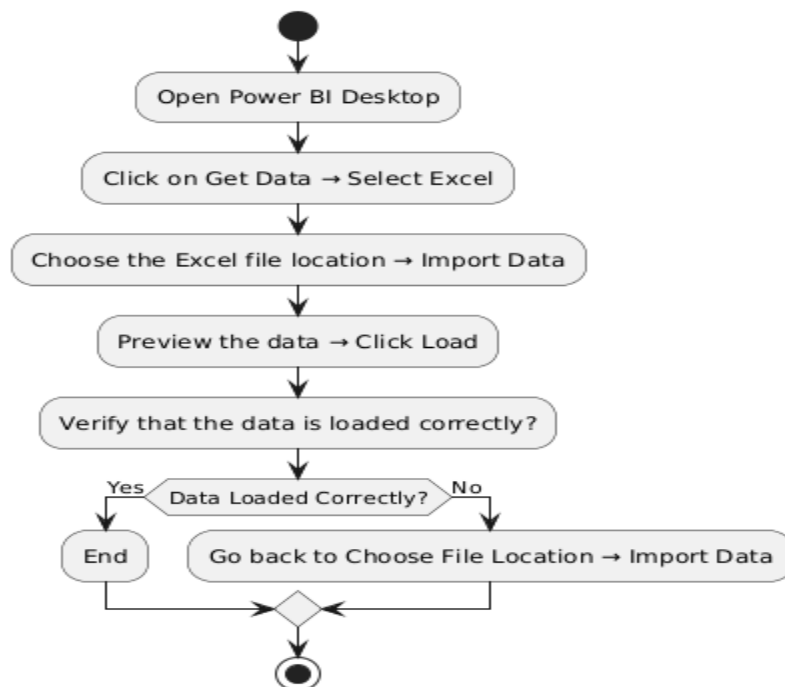
The system is divided into three main components:

Component	Description
Input Component	Excel files containing student data (ID, attendance, grades, and performance).
Processing Component	Power BI processes the data to calculate average marks and categorize performance.
Visualization Layer	Power BI generates interactive visuals, including charts, tables, and slicers for user interaction.

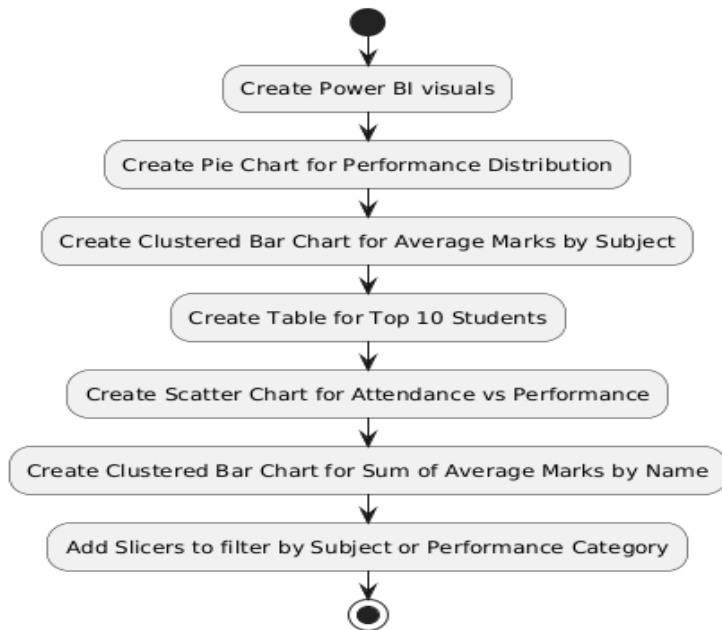
Architecture Diagram

Workflows have been created using PlantUML to illustrate the system's components and their interactions:

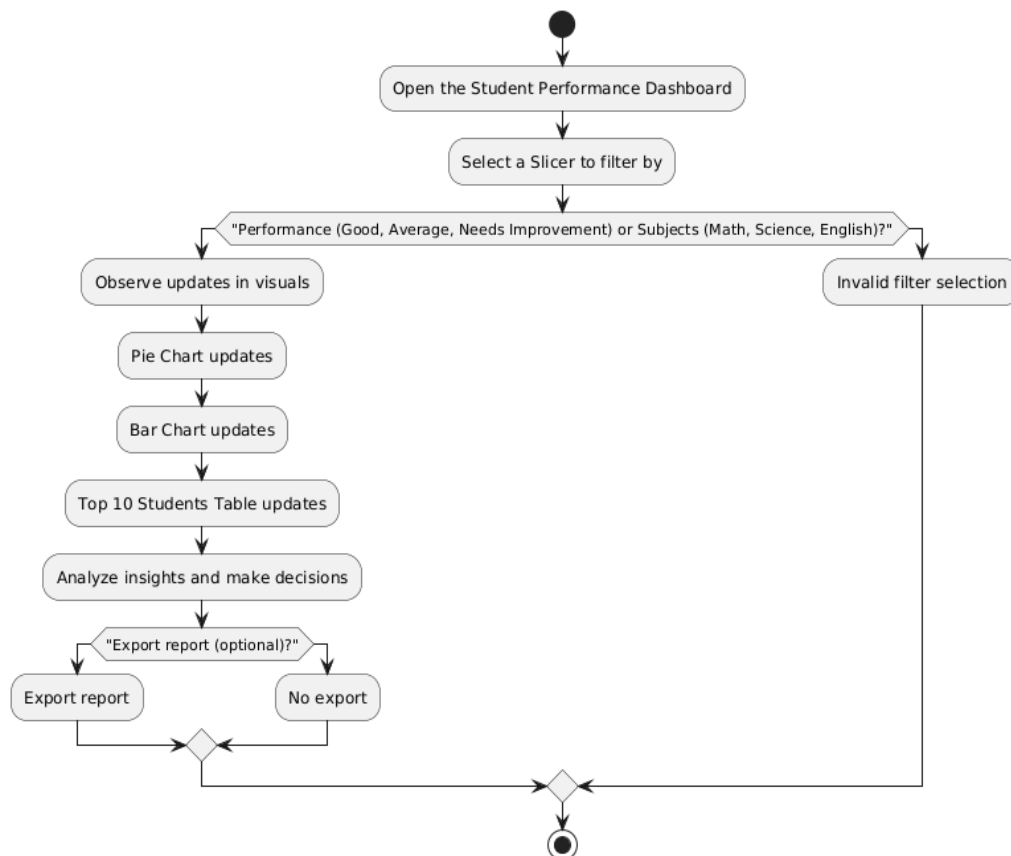
Workflow 1: Data Import Workflow



Workflow 2: Visualization Creation



Workflow 3: User Interaction



Visualizations

The following Power BI visuals were developed to represent student performance:

Visual	Purpose	Description
Pie Chart	Overall Performance Overview	Shows the percentage of students in Good, Average, and Needs Improvement.
Clustered Bar Chart	Average Marks by Subject	Compares average marks across subjects like Math, Science, and English.
Table	Top 10 Students Based on Average Marks	Displays the top 10 students ranked by their average marks.
Scatter Chart	Attendance vs Performance	Analyzes the relationship between student attendance and their academic performance.
Clustered Bar Chart	Sum of Average Marks by Student	Displays the sum of average marks for each student.
Slicers	Filter by Performance and Subjects	Allows users to filter visuals by performance categories or subjects.

Key Features

- **Interactive Dashboard:** Users can filter data using slicers (Performance/Subjects) to dynamically adjust the visuals.
- **Real-Time Analysis:** Visuals update dynamically as filters are applied, providing real-time insights into student performance.
- **User-Friendly Interface:** Easy-to-read charts and tables enable quick decision-making for teachers and administrators.
- **Customizable Design:** Power BI visuals use consistent themes and professional formatting for clarity and consistency.

Benefits of Power BI as a Component

Power BI acts as a reusable visualization component within the system:

- **Modularity:** Power BI is independent of the input data source and can visualize data from Excel, Google Cloud, or databases.
- **Reusability:** The same dashboard can be reused by other academic institutions with minimal changes to the data source.
- **Scalability:** Power BI can handle large datasets, making it scalable as the number of students increases.

Conclusion

The "Student Performance Dashboard" provides a robust and reusable software component for analyzing student data. By implementing the **Incremental Model**, the project ensured gradual improvements and better testing. Power BI's powerful visuals and interactivity make this solution scalable and efficient for academic institutions. The system provides real-time insights that can aid in decision-making, and its modularity allows it to be adapted to different educational environments.