Cover Page

Title:

College Management System Using Power BI

Project Type: Academic / Certification Project

Tool Used: Microsoft Power BI

Database Type: Star Schema (Dimensional Model)

Prepared By:
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Course / Program: Data Analytics / Power BI Certification

Institution / Organization: _____Entri_____

Submission Date: _____20 Jan 2026_____

This project focuses on analyzing student enrollment, academic performance, attendance, fees, and departmental insights using Power BI dashboards and DAX-based analytics.

Declaration

I hereby declare that the project titled **“College Management System”** is an original work carried out by me under the guidance of my mentors. This project has not been submitted to any other university, institution, or certification body for the award of any degree or diploma.

All the data used in this project is either simulated for academic purposes or used strictly for learning and demonstration. Any references to external concepts, tools, or techniques have been duly acknowledged.

I further declare that this work reflects my own understanding, analysis, and implementation of Power BI concepts including data modeling, DAX, visualization design, and business storytelling.

Place: __Hyderabad_____

Date: _____20 Jan 2026_____

Signature: _Lavanya Pillari _____

Name: Lavanya Pillari

Acknowledgement

I would like to express my sincere gratitude to my instructors and mentors for their continuous guidance and encouragement throughout the course of this project. Their valuable insights into data analytics, Power BI modeling, and visualization best practices played a crucial role in the successful completion of this work.

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Special thanks to my peers and family members for their motivation and support during the development of this project.

Finally, I would like to acknowledge Microsoft Power BI for providing a powerful and intuitive platform that enables meaningful data-driven decision-making.

Lavanya Pillari

Abstract

This project presents a comprehensive **College Management System** developed using **Microsoft Power BI**, aimed at analyzing academic performance, attendance, enrollment trends, and financial data of a college. The primary objective of this project is to design an efficient data model using a **Star Schema** and create insightful, interactive dashboards that support data-driven decision-making for academic administrators and stakeholders.

The dataset used in this project simulates real-world college data, including student demographics, course structures, subject details, enrollment records, attendance percentages, examination eligibility, and fee payment status. The data is modeled into dimension tables such as **Students**, **Courses**, **Subjects**, and **Time**, along with a central **Fact_Enrollments** table that captures measurable metrics. This modeling approach ensures reduced data redundancy, improved performance, and accurate aggregation.

Using Power BI features such as **Power Query** for data transformation, **DAX** for calculated measures, and advanced visualizations, the project delivers multiple dashboards covering executive summaries, department-wise analysis, student performance insights, financial analysis, and subject-level comparisons. Interactive elements like slicers, drill-throughs, and tooltips enhance user experience and analytical depth.

The outcome of this project demonstrates how Power BI can be effectively used in the education domain to monitor institutional performance, identify trends, evaluate eligibility and pass rates, track fee collections, and support strategic planning. The project serves as a practical implementation of business intelligence concepts and highlights the importance of data visualization in educational analytics.

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Introduction

In today's data-driven world, educational institutions generate vast amounts of data related to students, courses, academic performance, attendance, and financial operations. However, raw data alone does not provide meaningful insights unless it is properly processed, analyzed, and visualized. This is where **Business Intelligence (BI)** tools play a critical role in transforming data into actionable information that supports effective decision-making.

This project, titled **"College Management System"** focuses on leveraging Microsoft Power BI to analyze and visualize college-level data in a structured and insightful manner. The project demonstrates how academic and administrative data can be modeled using a **Star Schema**, transformed using **Power Query**, and analyzed using **DAX (Data Analysis Expressions)** to generate dynamic dashboards.

The system is designed to provide insights into multiple dimensions of college operations, including: - Student enrollment trends - Department-wise strength and performance - Attendance and examination eligibility - Student academic rankings and toppers - Subject-wise performance analysis - Fee collection, pending fees, and overdue analysis

By integrating these aspects into a single analytical solution, the project enables stakeholders such as principals, department heads, and administrators to monitor institutional performance effectively. The dashboards created in Power BI allow users to interact with data through slicers, filters, drill-throughs, and visual-level interactions, making the analysis both intuitive and user-friendly.

The project also emphasizes best practices in data modeling by separating descriptive data into dimension tables and measurable data into fact tables. This approach not only improves performance but also ensures data accuracy and scalability. Overall, this project serves as a practical implementation of business intelligence concepts in the education domain and highlights the power of data visualization in improving academic and operational outcomes.

Problem Statement

Educational institutions often maintain large volumes of data related to students, academics, attendance, and finances. In many cases, this data exists in isolated spreadsheets or transactional systems, making it difficult to analyze holistically. Traditional reporting methods are time-consuming, static, and lack the flexibility required for real-time decision-making.

The key problems identified are: - Lack of a centralized system to analyze academic and financial data - Difficulty in tracking student performance across departments and years - Inability to clearly identify examination eligibility based on attendance - Limited visibility into fee collection, pending amounts, and overdue fees - Challenges in comparing department-wise performance and student outcomes

Without an effective analytical solution, college administrators struggle to identify trends, assess risks such as dropouts, and take timely corrective actions. Therefore, there is a need for an interactive and scalable business intelligence solution that can convert raw college data into meaningful insights.

Objectives of the Project

The primary objective of this project is to design and develop an interactive **College Analytics Dashboard** using Microsoft Power BI that enables efficient analysis of academic and financial data. The specific objectives of the project are as follows:

1. To design an optimized data model using the **Star Schema** approach.
2. To analyze student enrollment and department-wise strength.
3. To evaluate student academic performance and identify toppers.
4. To assess attendance levels and determine examination eligibility.
5. To analyze subject-wise performance across courses and years.
6. To monitor fee collection, pending fees, and overdue amounts.
7. To provide interactive dashboards for effective decision-making.
8. To implement DAX measures for accurate calculations and rankings.
9. To improve data visibility for academic administrators.

Scope of the Project

The scope of this project is limited to the analysis and visualization of college-level academic and financial data using Microsoft Power BI. The project focuses on simulated data representing students enrolled in various departments such as Arts, Science, Commerce, and Computers.

The scope includes: - Student demographic analysis - Department-wise enrollment and performance comparison - Attendance and eligibility analysis - Subject-wise performance evaluation - Financial analysis related to fee collection and pending amounts

The project does not include real-time database connectivity, predictive analytics, or external system integration. However, the designed model is scalable and can be extended in the future to include advanced analytics, real-time data sources, and automation features.

Literature Review

Business Intelligence (BI) has become an essential component in modern organizations, including educational institutions, to support informed decision-making. Several studies highlight the importance of data analytics and visualization tools in improving academic performance monitoring and administrative efficiency.

According to existing literature, traditional reporting systems in educational institutions often fail to provide timely and actionable insights due to static reports and fragmented data sources. BI tools such as Microsoft Power BI, Tableau, and Qlik Sense enable institutions to consolidate data from multiple sources, perform advanced analytics, and present insights through interactive dashboards.

Research also emphasizes the effectiveness of dimensional data modeling techniques such as the **Star Schema**, which simplifies complex data relationships and improves query performance. Studies suggest that using fact and dimension tables enhances scalability and accuracy in analytical systems.

In the education domain, BI applications have been successfully used to analyze student performance, attendance patterns, dropout rates, and financial operations. These systems help institutions identify underperforming areas, optimize resource allocation, and improve overall institutional outcomes. This project builds upon these concepts by applying BI techniques specifically to college-level academic and financial data using Power BI.

System Requirements

The successful implementation of this project requires both hardware and software resources. The system requirements are outlined below.

Hardware Requirements

- Processor: Intel Core i5 or higher
- RAM: Minimum 8 GB (16 GB recommended)
- Hard Disk: At least 10 GB free space
- Display: Minimum resolution of 1366 x 768

Software Requirements

- Operating System: Windows 10 or later
- Microsoft Power BI Desktop (Latest Version)
- Microsoft Excel (for data preparation)
- Web Browser (for Power BI Service access)
- GitHub (for project version control and documentation)

Tools & Technologies Used

The following tools and technologies were used in the development of this project:

1. **Microsoft Power BI Desktop** – Used for data modeling, DAX calculations, and dashboard creation.
2. **Power Query** – Utilized for data cleaning, transformation, and preparation.
3. **DAX (Data Analysis Expressions)** – Used to create calculated measures such as rankings, eligibility, and financial metrics.
4. **Microsoft Excel** – Served as the primary data source for storing dimension and fact tables.
5. **GitHub** – Used for maintaining project documentation and version control.
6. **Windows Operating System** – Platform used for development and execution.

These tools collectively enabled efficient data processing, analysis, and visualization, resulting in a robust and scalable BI solution.

Data Description

The dataset used for this project represents a simulated college environment and is designed to closely resemble real-world academic and administrative data. The data is stored in Microsoft Excel and consists of multiple tables that are later modeled into a star schema within Power BI.

The major data entities included in the dataset are:

- **Students Data**: Contains demographic and enrollment information such as Student ID, Student Name, Age, Gender, Enrollment Date, and Graduation Status.
- **Courses Data**: Includes details of academic programs such as Course ID, Course Name, and Duration of the course.
- **Subjects Data**: Represents individual subjects offered under each course along with the year of study.
- **Enrollment and Performance Data**: Captures transactional records such as attendance percentage, yearly grades, examination eligibility, fee amount, and fee status.

The dataset consists of approximately **500 student enrollment records**, ensuring sufficient volume for meaningful analysis and visualization. The data is structured to support multi-dimensional analysis across departments, years, subjects, and financial metrics.

Data Modeling (Star Schema)

Data modeling is a crucial step in building an efficient and scalable business intelligence solution. In this project, a **Star Schema** data model is implemented to organize the data in a structured manner.

The star schema consists of:

Dimension Tables

- **Dim_Students**: Stores student demographic details with StudentID as the primary key.
- **Dim_Courses**: Contains course-related information with CourseID as the primary key.
- **Dim_Subjects**: Holds subject details linked to courses and year of study.
- **Dim_Time** (Optional): Used for time-based analysis such as year and semester.

Fact Table

- **Fact_Enrollments**: Acts as the central table containing measurable data such as attendance percentage, overall grade, eligibility status, annual fee, and fee status.

All dimension tables are connected to the fact table using **one-to-many relationships**, ensuring accurate aggregation and eliminating data redundancy. This model improves query performance and simplifies report development in Power BI.

Data Transformation (Power Query)

Power Query is used extensively in this project to clean, transform, and prepare data before loading it into the Power BI data model. Data transformation ensures data consistency and accuracy for analysis.

Key transformations performed include: - Removing duplicate records from dimension tables - Standardizing column names and data types - Creating calculated columns for eligibility and categorization - Filtering invalid or null records - Separating dimension and fact data from raw datasets

Power Query operations are performed using a combination of graphical interface steps and M language in the background. By performing transformations at the data preparation stage, the model remains clean, optimized, and easy to maintain.

DAX Measures and Calculations

Data Analysis Expressions (DAX) plays a vital role in deriving meaningful insights from the data model. In this project, DAX measures are used to perform calculations related to student performance, attendance eligibility, rankings, and financial analysis.

Some of the key DAX measures created include:

- **Total Students**: Calculates the distinct count of students enrolled.
- **Average Overall Grade**: Computes the average yearly performance of students.
- **Eligible Students**: Identifies students eligible for examination based on attendance criteria.
- **Pass and Fail Counts**: Segregates students based on eligibility rules.
- **Department Ranking**: Ranks departments based on average performance.
- **Total Fees Collected**: Calculates fees collected where fee status is marked as paid.
- **Pending and Overdue Fees**: Identifies outstanding fee amounts.

All measures are stored in a separate **Measures Table** to improve model organization and maintainability. Filter context and row context are carefully managed using functions such as CALCULATE, FILTER, and RANKX to ensure accurate results across visuals.

Dashboard Design and Visualizations

Dashboard design focuses on clarity, usability, and storytelling. The dashboards are structured across multiple pages to provide a logical flow from high-level summaries to detailed analysis.

The following design principles are applied: - Use of consistent color themes and fonts - Minimal clutter with appropriate spacing - Clear titles and labels for each visual - Logical grouping of related visuals

Key dashboards developed include: - **Executive Summary Dashboard**: Displays overall KPIs such as total students, average grade, attendance rate, and fees collected. - **Department Analysis Dashboard**: Compares departments based on strength, performance, and eligibility. - **Student Performance Dashboard**: Highlights toppers, rankings, and attendance vs performance. - **Financial Dashboard**: Analyzes fee collection, pending amounts, and overdue fees.

Interactive elements such as slicers, drill-throughs, and cross-filtering enhance user engagement and analytical depth.

Department-wise Analysis

Department-wise analysis provides insights into the performance and strength of individual academic departments such as Arts, Science, Commerce, and Computers.

The analysis includes: - Total number of students per department - Average overall grade by department - Attendance eligibility percentage - Pass and fail comparison - Department ranking based on performance

Visualizations such as clustered bar charts, ribbon charts, and tables are used to enable effective comparison across departments. This analysis helps stakeholders identify top-performing departments, areas requiring improvement, and trends over academic years.

Student Performance Analysis

Student performance analysis is a critical component of this project, as it helps evaluate individual academic outcomes and identify top-performing students. This section focuses on analyzing student grades, attendance, and examination eligibility.

The key aspects of student performance analysis include: - Overall year-wise academic performance of students - Identification of top performers (toppers) - Attendance versus performance comparison - Examination eligibility based on attendance criteria

Visuals such as tables, bar charts, and ranking-based filters are used to present student performance data clearly. Conditional formatting is applied to highlight high-performing students and those who require academic support. This analysis enables academic staff to monitor student progress effectively and take corrective actions where necessary.

Financial and Fee Analysis

Financial analysis focuses on understanding fee-related metrics, including total fees to be collected, fees collected, pending fees, and overdue amounts. This section provides insights into the financial health of the institution.

The financial analysis includes: - Total annual fees based on student enrollments - Fees collected from students with paid status - Pending and overdue fee amounts - Fee distribution across departments

Visuals such as cards, funnel charts, and bar charts are used to represent financial metrics. The funnel chart effectively illustrates the breakdown of total fees into collected, pending, and overdue categories. This analysis helps administrators track revenue, identify payment gaps, and plan financial strategies.

Subject-wise Analysis

Subject-wise analysis evaluates academic performance at the subject level across different courses and years of study. This analysis helps identify strong and weak subjects within the curriculum.

The subject-wise analysis includes: - Average marks scored in each subject - Comparison of subject performance across departments - Identification of top-performing subjects - Subject ranking based on average grades

Visuals such as tree maps and bar charts are used to present subject performance effectively. Tree maps highlight subjects with higher average scores, enabling quick identification of academic strengths. This analysis supports curriculum evaluation and continuous academic improvement.

Navigation and User Interaction

Navigation and user interaction are important aspects of an effective Power BI dashboard. In this project, multiple techniques are used to ensure smooth navigation and an intuitive user experience.

The following features are implemented: - Page navigation buttons to move between dashboards such as Executive Summary, Department Analysis, Student Performance, and Financial Analysis - Slicers for filtering data by department, course, year of study, and gender - Cross-filtering between visuals to allow dynamic data exploration - Clear and consistent layout across all report pages

These features allow users to interact with the dashboards easily and focus on specific insights without being overwhelmed by data.

Results and Insights

The dashboards developed in this project provide valuable insights into the academic and financial performance of the college. Some of the key findings include:

- Certain departments consistently outperform others in terms of average academic scores
- Higher attendance percentages strongly correlate with better academic performance
- Examination eligibility plays a significant role in pass and fail outcomes
- Fee collection varies across departments, with some having higher pending and overdue amounts
- Subject-wise analysis highlights core subjects with strong performance trends

These insights enable administrators to take informed decisions related to academic planning, student support, and financial management.

Challenges Faced

During the development of this project, several challenges were encountered:

- Handling duplicate records and maintaining data consistency
- Designing accurate DAX measures for ranking and eligibility calculations
- Managing filter context issues in complex visuals
- Ensuring proper relationships between dimension and fact tables
- Balancing visual clarity with analytical depth

These challenges were addressed through iterative testing, data validation, and careful model design, resulting in a stable and reliable analytical solution.

Limitations of the System

Despite delivering valuable insights, the system has certain limitations. The dataset used in this project is simulated and may not fully represent real-world institutional complexities. Real-time data integration is not implemented, and the analysis is limited to historical data available at the time of reporting.

Advanced analytics such as predictive modeling, forecasting, and machine learning are outside the scope of this project. Additionally, user-level security (Row-Level Security) is not implemented, which would otherwise restrict data access based on user roles.

Future Enhancements

The project can be further enhanced by incorporating additional features and advanced analytics. Possible future improvements include:

- Integration with real-time databases such as SQL Server
- Implementation of Row-Level Security (RLS)
- Predictive analysis for student performance and dropout trends
- Automation of data refresh schedules
- Integration with Power BI Service for online sharing and collaboration

These enhancements would make the system more robust, scalable, and suitable for enterprise-level deployment.

Conclusion

This project successfully demonstrates the application of Microsoft Power BI in analyzing college-level academic and financial data. By using a structured star schema model, effective data transformations, and DAX-based calculations, meaningful insights were derived from raw data.

The dashboards developed provide a comprehensive view of student performance, departmental comparison, attendance eligibility, subject-wise trends, and fee analysis. The project highlights the importance of business intelligence tools in educational institutions for improving decision-making and operational efficiency.

Overall, this project serves as a practical implementation of business intelligence concepts and validates the effectiveness of Power BI as a powerful analytical tool.

References

1. Microsoft Power BI Documentation – Microsoft Learn
2. Kimball, R. – The Data Warehouse Toolkit
3. Power BI Community Blogs and Forums
4. Academic articles on Business Intelligence in Education

Appendix

Appendix A: Sample DAX Measures

- Total Students
- Eligible Students
- Department Ranking
- Total Fees Collected

Appendix B: Dashboard Screenshots

Screenshots of all Power BI dashboards including Executive Summary, Department Analysis, Student Performance, and Financial Analysis are included in this section.