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Financial Performance Measurement and Analysis in Quick Service Restaurant

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Abstract: ***This paper presents a comprehensive review of Power BI to analyze the financial and operational performance of a large fast-food chain in India, specifically in the Quick Service Restaurant (QSR) sector. It starts by explaining the company's structure and then focuses on analyzing its financial data, such as financial statements, budgeting, and future projections, tailored tothe needs of the QSR industry. Key to the analysis is organizing and cleaning data, creating unique product IDs, and ensuring accuracy for budget comparisons. The project covers in-depth data manipulation and modeling to ensure reliable insights into key financial metrics, such as revenue and profit. Advanced visualizations, including charts and Pareto analysis, help present a clear picture of the company's performance. This research paper offers a detailed approach for using Power BI in the QSR sector, providing insights for improving business operations and profitability.***
Keywords: Financial Analysis, Quick Service Restaurants, Power BI

I. INTRODUCTION

Financial performance analysis in Quick Service Restaurants(QSRs) involves managing vast data from sales, inventory, and labor costs. With tight profit margins, QSRs must make quick, informed decisions to optimize costs and boost profits. However, integrating data from systems like POS, HR, and inventory software remains a challenge.

Business Intelligence (BI) tools like Power BI revolutionize data analysis by offering real-time visualizations of key metrics like sales, costs, and profitability. Python complements this by preprocessing and cleaning data, ensuring accuracy and reliability before analysis. Techniques like regression and clustering uncover trends, such as sales patterns or unexpected cost changes.

Power BI provides real-time monitoring of financial health, enabling QSRs to identify cost-saving opportunities and make strategic decisions to improve profitability. This paper highlights the integration of Python for data preparation and Power BI for visualization to address these challenges effectively.

The Quick Service Restaurant (QSR) industry operates in a highly competitive and fast-paced environment where optimizing financial performance and operational efficiency is crucial for success. QSRs face challenges in managing vast amounts of financial and operational data from multiple sources, such as sales, inventory, labour, and customer feedback. Traditional methods relying on static reports and fragmented data systems often fail to provide timely insights, limiting the ability to make data-driven decisions.

To address these challenges, this project focuses on developing a system that integrates data collection, processing, and visualization to provide actionable insights for QSRs. Byleveraging tools likePower BI for dashboards and Python for advanced data analysis, the system enables comprehensive financial performance measurement. Key metrics such as revenue growth, profit margins, and cost structures are analysed to assist. Managers in making in formed decisions that improve profitability and operational efficiency.

This study aims to demonstrate how a data-driven approach can revolutionize financial management in QSRs, ensuring scalable and sustainable growth in a competitive market.

II. LITERATURE REVIEW

Several studies have explored tools and frameworks to enhance decision-making and operational efficiency in the Quick Service Restaurant (QSR) and food service industries.

Author(s): Nathaniel Wikamulia and Sani Muhamad Isa Publication Details: Bulletin of Electrical Engineering and Informatics, Vol. 12, No. 5, October 2023

Nathaniel Wikamulia and Sani Muhamad Isa, in their study "Predictive Business Intelligence Dashboard for Food and Beverage Business," address the challenges faced by the food and beverage industry in managing perishable goods. The study introduces a framework employing predictive analytics to enhance decision-making processes. Using the XG Boost algorithm for demand forecasting, the research ensures precise inventory management and minimizes losses due to spoilage.

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Furthermore, MiniBatch KMeans clustering is applied to segment customers based on Recency, Frequency, and Monetary (RFM) metrics, enabling a better understanding of customer behavior. This comprehensive business intelligence tool aims to improve operational efficiency and customer satisfaction in the food and beverage sector.

Author(s): Susan Chacko, R. Sumathi, M. K. Badri Narayanan, and Syam Narayanan Publication Details: International Journal of Scientific Technology Research, Volume 9, Issue 4, April 2020

Susan Chacko, R. Sumathi, M. K. Badri Narayanan, and Syam Narayanan, in their study "Predominant Factor Prediction to Accelerate Growth of Quick-Service Restaurants (QSR)," highlight the use of machine learning to identify key success factors in QSRs. By combining qualitative and quantitative data, the research uncovers trends overlooked by traditional methods and emphasizes the need for adaptive predictive models. The study provides valuable insights for optimizing QSR performance while noting challenges in implementing these tools effectively.

Author: Miss Siddhi PrashantChitnis Publication:*International Journal of Trend in Scientific Research and Development (IJTSRD)*, ISSN: 2456-6470, Special Issue, March 2019

Miss Siddhi Prashant Chitnis, in her study, explores the fast- food industry's growth in India driven by urbanization and rising incomes. It highlights challenges like cultural restrictions, waste management, and health concerns, such as obesity. The paper emphasizes innovative, sustainable solutions for aligning with cultural, environmental, and health- conscious demands.

Authors: Dr. Muhammad Abd Elmonem Ebrahem Abdelsalam, Remon Samir Fouad

Publication: *Journal of Economics, Finance, and Management Studies (JEFMS)*, Volume 3, Issue 01, January 2020

This study emphasizes the role of performance measurement systems (PMS) in the competitive QSR industry. Traditional financial metrics are inadequate; modern frameworks like the Balanced Scorecard (BSC) and Key Performance Indicators (KPIs) offer multidimensional performance evaluation, covering financial results, customer satisfaction, internal processes, and growth opportunities. Challenges such as insufficient training and unclear strategies can limit effectiveness. However, the research advocates for comprehensive PMS frameworks combining financial and non-financial metrics to ensure sustainable success in QSR operations. These research papers collectively emphasize the role of advancedanalyticsandcustomizedperformancesystemsin the QSR industry. Building on these insights, our project combines Python and Power BI to streamline financial performance measurement, offering dynamic dashboards and real-time insights tailored to the unique needs of QSR businesses.

III. MOTIVATION

The Quick Service Restaurant (QSR) industryoperates in a highly dynamic and competitive environment, where thin profit margins and high customer expectations demand timely and informed decision-making. Despite advancements in technology, many QSRs still rely on outdated systems for financial performance measurement, often resulting in fragmented data and delayed insights. This limits their ability to adapt quickly to market changes, optimize costs, and improve profitability.

The increasing availability of tools like Power BI and Python presents an opportunityto address these challenges by integrating real-time data analysis with interactive visualizations. These technologies enable businesses to consolidate financial and operational data from various sources, such as sales, inventory, and labor costs, into a single, coherent platform. This not only streamlines decision-making but also helps identify trends and inefficiencies that would otherwise go unnoticed.

Moreover, the growing demand for data-driven strategies in the QSR industry, coupled with the need for scalability across multiple locations, makes it imperative to develop a robust system that can deliver actionable insights. By leveraging the potential of advanced analytics and visual dashboards, QSRs can enhance their operational efficiency, optimize resource allocation, and boost profitability while staying ahead of competitors.

This project is motivated by the vision of empowering QSR managers with a comprehensive, user-friendly tool for real- time financial and operational analysis, driving better business outcomes and long-term growth.

IV. METHODOLOGY

The financial performance measurement system for QSRs was developed using advanced data analysis tools and visualization platforms. The system integrates Power BI for real-time visualization and Python for data preprocessing, ensuring accurate and actionable insights.

Key functionalities include:

1) Data Integration: Centralizes data from POS, inventory management, and financial systems for unified analysis.
2) Visualization: Interactive Power BI dashboard provide insights into revenue trends, cost efficiency, and operational performance.

3) Scenario Analysis: Enables predictive modeling and decision-making support through simulation of strategies like pricing changes and new product launches.

The system is scalable for multi-location operations and was tested for performance and usability. This ensures QSRs can make informed, data-driven decisions to enhance profitability and efficiency.

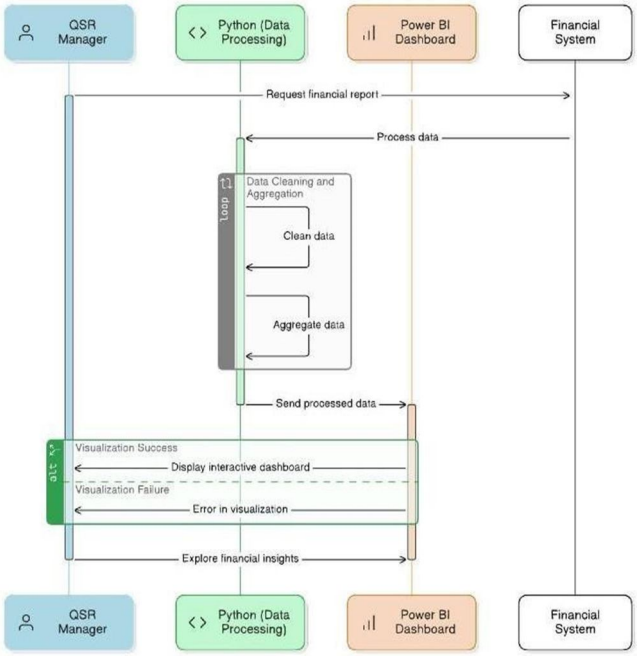

Fig.1 Architecture Diagram

V. SYSTEM DESIGN

The system for analysing financial performance in Quick Service Restaurants (QSRs) is structured to ensure efficient data integration, processing, visualization, and secure user access. Each component of the design addresses the unique requirements of QSR operations and financial analysis. Below is an overview of the system's layered architecture:

A. System Design Overview

1) Data Collection: - Data is gathered from various sources such as POS systems (sales), inventory systems (stock and costs), financial systems (revenue and expenses), HR systems (labour costs), and customer feedback.

2) Data Integration: -Collected data is standardized and stored in a centralized database using ETL tools for seamless analysis and retrieval.

3) Data Processing: - Python scripts handle data cleaning, calculations (e.g., revenue growth, profit margins), and trend analysis for actionable insights.

4) Visualization: - Power BI dashboards display key metrics and trends through interactive visualizations like graphs and charts, with real-time updates.

5) User Access: - Role-based access ensures secure data usage. Predictive analytics and user-friendly dashboards

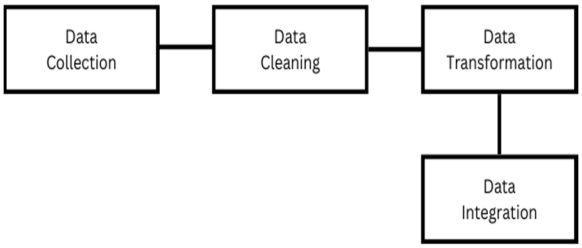

Fig.2 Architecture Overview

B. Objective of the System

1) Optimize Decision- Making Provide action able insights through real-time data analysis and visualization.
2) Enhance Efficiency: Automated at a integration, cleaning, and processing for accurate financial metrics.
3) Improve Profitability: Identify trends, reduce costs, and optimize resources using predictive analytics.
4) Ensure Accessibility: Deliver secure, role-based access to dynamic dashboards and reports.

C. Component Description:

1) Database Requirements:

- Type: Relational database (e.g., SQL Server, Azure SQL). Data Sources: Includes financial data (revenue, expenses), inventory details, and POS sales records.
- Format: Supports .xlsx files for integration with external tools.
- Integration: Seamlessly connects with Python and Power BI for processing and visualization.

2) Software Requirements:

- Power BI: For interactive dashboards and visualizations. Python: For data cleaning and advanced analytics using libraries like Pandas and Matplotlib.
- OS: Requires 64-bit systems (Windows 10 or later).
- Browser: Modern browsers (e.g., Chrome, Edge) for accessing dashboards.
- Hardware: Minimum 8 GB RAM and Intel i5 processor for data-intensive tasks.

D. Data Flow:

The system's data flow ensures a seamless process from data collection to actionable insights for Quick Service Restaurants (QSRs):

1) Data Collection: Data for the system is collected from various sources to ensure comprehensive analysis. POS systems provide transaction-level sales data, while inventory systems track stock levels and associated costs.
2) Data Integration: Collected data is cleaned, standardized, and stored in a central database using ETL (Extract, Transform, and Load) processes.
3) Data Processing: The data processing component leverages Python scripts to perform advanced calculations, identify trends, and recognize patterns within the data. Key metrics such as profit margins, revenue growth, and cost structures are computed to provide actionable insights. This analysis ensuresaccurateand detailed financialevaluation,enabling better decision-making for improved operational and financial performance.
4) Data Visualization: Processed data is visualized through Power BI dashboards, enabling stakeholders to explore interactive charts and graphs in real time. Custom visualizations like Pareto charts and trend analyses support detailed decision-making.

User Interaction: Stakeholders access the dashboards and reports based on role-specific permissions. Predictive analytics tools provide insights for strategic decisions like resource allocation and cost optimization.

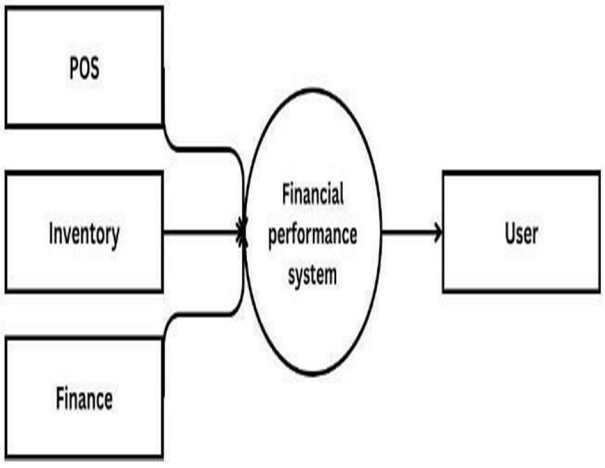

Fig.3 Data Flow of QSR.

E. Advantages:

The system offers several benefits of Quick Service Restaurant (QSR's):

1) Data-Driven Insights: Provides real-time analysis of financial and operational data, enabling more informed decision-making.
2) Advanced Visualizations: Power BI dashboards present key metrics like profitability, sales trends, and cost optimization in an interactive and easy-to-understand format.
3) Efficiency Improvements: Automates data integration and processing, reducing manual effort and minimizing errors.
4) Scalability: The system is capable of handling increased data volumes as the business grows.
5) Cost Optimization: Identifies areas to reduce expenses, improve resource allocation, and maximize profitability.

F. Project Module:

The project is divided into the following modules to streamline the development and implementation process:

1) Data Collection Module: This module gathers data from various sources, including POS systems (sales data), inventory management systems (stock and costs), HR systems (labour costs), financial systems (revenue and expenses), and customer feedback (satisfaction and behaviour).
2) Data Integration Module: Collected data is cleaned, standardized, and stored in a centralized repository using ETL (Extract, Transform, Load) processes. This ensures consistency and prepares the data for analysis.
3) Data Processing Module: Advanced analytics are performed using Python scripts to calculate key metrics like profit margins, revenue growth, and cost structures.The module also identifies patterns and trends to provide actionable insights.
4) Visualization Module: Processed data is visualized through interactive Power BI dashboards, displaying financial and operational metrics such as sales trends, cost breakdowns, and profitability. Custom visualizations like Pareto charts and trend graphs enhance decision-making.
5) User Access and Reporting Module: This module provides secure, role-based access to reports and dashboards. It enables stakeholders, such as managers and financial analysts, to monitor performance, generate insights, and support strategic planning.
6) Predictive Analytics Module: Using historical data, this module forecasts future trends, Such as revenue projections and cost simulations, helping in proactive decision-making and resource optimization.

VI. CONCLUSION

This research paper introduces financial performance measurement and analysis system developed for Quick Service Restaurants (QSRs) provides a comprehensive framework for improving operational efficiency and profitability. By integrating advanced tools like Power BI for visualization and Python for data processing, the system enablesreal-time analysis of critical metrics such as revenue growth, profit margins, and cost structures. This approach not only automates complex calculations but also enhances decision-making by presenting actionable insights through interactive dashboards. The project demonstrates the potential of data-driven strategies in addressing the challenges faced by QSRs, such as managing high data volumes, optimizing costs, and adapting to market demands. This system lays a foundation for scalable and sustainable growth, equipping QSRs with the tools to stay competitive.

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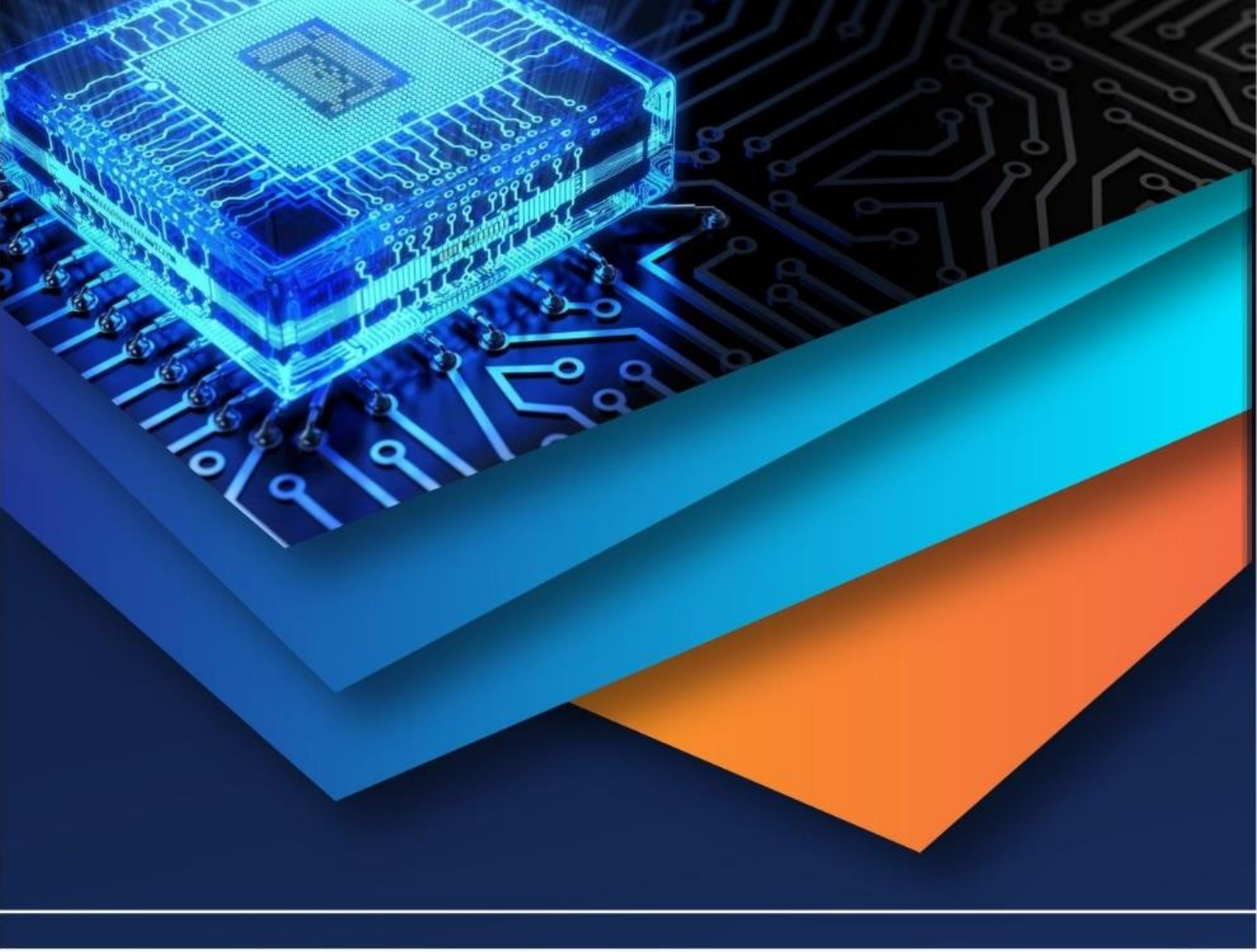

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