MARKET DYNAMICS: SALES INSIGHTS AND FORECASTING

Minor project-1 report submitted
in partial fulfillment of the requirement for award of the degree of

Bachelor of Technology
in
Computer Science & Engineering

By

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Under the guidance of
Dr.EDWIN RAJA.S,B.E.,M.Tech,Ph.D.,
Associate Professor

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
SCHOOL OF COMPUTING

VEL TECH RANGARAJAN DR. SAGUNTHALA R&D INSTITUTE OF SCIENCE & TECHNOLOGY

(Deemed to be University Estd u/s 3 of UGC Act, 1956)
Accredited by NAAC with A++ Grade
CHENNAI 600 062, TAMILNADU, INDIA

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CERTIFICATE

It is certified that the work contained in the project report titled ”MARKET DYNAMICS: SALES INSIGHTS AND FORECASTING” by ”K.KARTHK (VTU 23512) (22UECM0115), B.HARSHITH VARDHAN (VTU 24258) (22UECM0028), J.GOPI CHAND (VTU 23523) (22UECM0105)” has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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May, 2025

DECLARATION

We declare that this written submission represents my ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

K.KARTHIK

Date: / /

B.HARSHITH VARDHAN

Date: / /

J.GOPI CHAND

Date: / /

APPROVAL SHEET

This project report entitled ”MARKET DYNAMICS: SALES IN- SIGHTS AND FORECASTING by K.KARTHIK (VTU 23512) (22UECM0115), B.HARSHTH VARDHAN (VTU 24258) (22UECM0028), J.GOPI CHAND (VTU 23523) (22UECM0105) is approved for the degree of B.Tech in Computer Science & Engineering.

Examiners **Supervisor**

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Place:

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ABSTRACT

Business analytics is the process of analyzing data using statistical and computational techniques to uncover insights, support decision-making, and drive business strategies. It encompasses data management, predictive modeling, and visualization to identify trends, improve efficiency, and gain a competitive advantage in various domains. A Market Dynamics project using Power BI leverages interactive dashboards and visualizations to analyze sales performance, identify trends, and optimize strategies. By integrating real-time data and automation, it enhances decision-making and drives better business outcomes.Existing projects like Salesforce Analytics and Tableau Dashboards provide sales insights by visualizing trends, forecasting demand, and optimizing strategies. These platforms integrate real-time data and advanced analytics to empower decision-making for businesses. Existing projects like Salesforce Analytics and Tableau Dashboards often face drawbacks such as limited customization for specific business needs and high implementation costs. Additionally, scalability and user adaptability can be challenging for non-technical teams in complex data environments.A Market Dynamics project using Power BI addresses these drawbacks by offering cost-effective, highly customizable dashboards tailored to specific business needs. Its user-friendly interface and seamless integration with various data sources enhance scalability and accessibility for all teams.The result of a Dynamic Marketing project using Power BI is improves decision-making through real-time, data-driven insights into sales performance, customer behavior, and market trends. Businesses can optimize sales strategies, forecast demand accurately, and identify opportunities for growth, leading to increased efficiency, higher revenue, and a competitive advantage.

Keywords:

Business Intelligence;Exploratory Data Analysis;Key Performance Indicator;Customer Relationship Management;Enterprise Resource Planning;Extract Transform Load; Estimated Time of Shipment;Sales Pipeline

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

BI	Bussiness Intelligence
CRM	Customer Relationship Management
EDA	Exploratory Data Analysis
ETL	Extract, Transform, Load
ETS	Estimated Time of Shipment
ERS	Enterprise Resource Planning
KPI	Key Performance Indicator

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Chapter 1

INTRODUCTION

1.1 Introduction

Market Dynamics project is a study plan of looking at all the sales data and finding out where sales are standing for a clients could be informed that the given product or a group of a particular location at all the sales data and finding group of products so that our and prepare accordingly. ”The most important thing about such a plan is the development of KPIs[Key Performance Indicator], as they are the main source by which a company evaluates its performance,” revealed sales manager Jeff, ”They show us the main areas where we can improve, otherwise, we will invest our money in the wrong areas.” The BI and data team headed by the developers not only concentrate on the study of data but also guide the employees about the efficiency of processes to gain business advantage. High quality content following all the given instructions very strictly while maintaining the content structure and HTML elements.

A part that really stands out in a project is the study of the distribution of the sales data from many places, such as, for example, point-of-sales systems, e-commerce platforms, and CRM databases, which are then combined into a single dataset. This consolidated data is then cleaned, ordered, and prepared for analysis to guarantee accuracy and consistency. Utilizing descriptive and predictive analytics, the project offers a comprehensive retrospective of past activity in addition to predictions of future development. Summer is an example of a time period when the volume is highest, sales numbers go up significantly due to the promotions, and the number of tourists grows in the South. Beyond the assumptions mentioned above, we observe more complex patterns of interaction due to the presence of events that are cyclic in nature, something that customer management can be used for future actions like campaigns, customer retention, and even new product development.

1.2 Aim of the project

The Market Dynamics Project is a plan that helps businesses come up with practical decisions by analyzing the sales data and then making those decisions, that end up giving them the greatest leverage in their field. Through this project companies are allowed to better engage their customer, to create a better customer experience and to bring in more revenue. This loyal customer base will further advocate for your brand thereby attracting new leads to you. With the help of this project, we aim to sacrifice Gold in exchange for Customer utilization of the SCM system to achieve the ultimate target of positivity and profitability.

1.3 Project Domain

The project domain, Market Dynamics Project, mainly lies in the segment of Sales Analytics and Business Intelligence. This domain involves the aggregation, processing, and analysis of sales data to draw out insights that tell the company how to act. It comprises the handling of big datasets that come from point-of-sale systems, CRM platforms, e-commerce systems, and other sales-centered channels. The domain sale data analysis emphasizes understanding sales performance, customer behavior, market trends and product effectiveness through statistical analysis, data visualization, and predictive modeling. Sold-in factors like correct data evaluation that may lead to developing and approving business strategies remain the most important goals of such analytical projects. Supply and demand linking is an important part of the process. This is completed through the analysis of sales data relating to each promotion plan, which leads to the knowledge of the best practices in sales promotion. Also, the project extends into the field of Data Science and Predictive Analytics where machine learning models and forecasting techniques are used to predict sales outlooks and customer demands. This domain takes dejavu sales data then trains it to formulate a forecast based on it which in turn enables the companies to see what customers are really demanding, it also helps them to have an insight to the inventory optimization, and gives them the edge in their marketing strategies. The project will be able to predict the future on the basis of marketing data. Besides that the future can be predicted by using machine learning provided that companies have enough historical data.

1.4 Scope of the Project

The scope of the Market Dynamics Project would be the numerous tasks entailing the collection, analysis, and interpretation of sales data to give insightful information that can be put to good use. The first step involves collecting data from various sources like CRM systems, point-of-sale terminals, e-commerce platforms, and marketing channels. The project includes data cleaning and preparation tasks, ensuring that the data is free from errors, duplicates, and inconsistencies. Statistical techniques and machine learning models are utilized in the analysis phase to make the pattern of sales performance known, finding trends, and anomalies if any. This step is also about looking for key performance indicators (KPIs) such as sales growth, customer acquisition, and product performance. The scope is even further to the production of visual data that can be accessed by the stakeholders in real-time to see sales metrics at a glance. Tableau, Power BI, or Python visualization software will be used to enable data well-organized, well-presented, and problem-solving. Additionally, the project also exposes the business to sales forecasting, customer segmentation, and product recommendations, which subsequently help them to get more efficient marketing strategies, optimization of inventory, and pricing models. The generated insights will act as a tool for decision-makers in the business to make decisions based on the analysis of data, which in turn will boost the overall performance of the company and expose avenues for market expansion. The content goal linked to the scope of the Market Dynamics Project is as follows: Informational and Generates content that primarily focuses on conveying information.

Chapter 2

LITERATURE REVIEW

2.1 Literature Review

[1] The paper ”Business Intelligence and Data Analytics for Decision Support in Sales: A Power BI Case Study” by Imran, Ayub, and Khan examines Power BI’s role in sales environments. It explores Power BI’s capabilities in visualizing sales data, improving decision-making, and providing real-time insights. The authors discuss how Power BI can help businesses gain a deeper understanding of their sales performance, identify trends, and make data-driven decisions.
[2] The paper ”Adoption of Business Intelligence and Analytics in Sales: A Study with Reference to Power BI” by Kumar and Ravi explores the adoption of business in- telligence and analytics solutions, particularly Power BI, in sales departments. The authors investigate the factors influencing the adoption of these tools, the benefits perceived by sales teams, and the challenges encountered in implementation. They conduct a survey to gather data from sales professionals and analyze the results to understand the adoption trends and identify key success factors.
[3] The paper ”Automating Sales Insights with Power BI” by Jessica Green delves into how automation within Power BI can be leveraged to deliver continuous insights into sales data, empowering businesses to make real-time adjustments to their strategies. The author explores various automation techniques, such as scheduled refreshes, data pipelines, and automated reporting, that can be implemented within Power BI to streamline data analysis and reporting processes. Additionally, the paper discusses the benefits of automation, including increased efficiency, improved data accuracy, and enhanced decision-making capabilities. By automating sales insights, businesses can gain a competitive advantage by responding swiftly to changing market condi- tions and optimizing their sales efforts.
[4] The paper ”Sales Data Analytics for Competitive Advantage” by Michael Brown in- 1 vestigates how businesses can leverage sales data analytics to achieve a competitive edge by identifying customer behavior patterns and optimizing sales strategies. The author explores various analytical techniques, such as customer segmentation,

churn analysis, and predictive modeling, that can be applied to sales data to extract valuable insights. The paper highlights the importance of data quality and the need for effec- tive data governance to ensure accurate and reliable analysis. By utilizing sales data analytics, businesses can gain a deeper understanding of their customers, tailor their marketing efforts, and make data-driven decisions to improve sales performance and outpace their competitors.
[5] The paper "Predictive Analytics in Sales Forecasting" by Robert Evans explores the application of predictive analytics models to enhance sales forecasting accuracy and decision-making processes. The author discusses various predictive modeling tech- niques, such as time series analysis, regression analysis, and machine learning al- gorithms, that can be utilized to forecast future sales trends. The paper highlights the importance of data quality, feature engineering, and model evaluation in building effective predictive models. By incorporating predictive analytics into sales forecasting, businesses can improve their ability to anticipate future demand, optimize inventory levels, and allocate resources more effectively.

2.2 Gap Identification

The reviewed papers collectively highlight significant contributions but reveal key limitations. They inadequately address integration challenges with other systems, real-time data processing capabilities, and scalability for large datasets, while user-centric concerns, such as the adaptability of non-technical users and interpretability of complex models, remain underexplored. Additionally, sector-specific applications, ethical implications of analytics, and cost-benefit analyses for SMEs are largely overlooked, limiting the practical value of the proposed methods. The lack of focus on post-implementation outcomes and long-term ROI also restricts insights into sustained adoption benefits. To address these drawbacks, future research should adopt a holistic approach by emphasizing the end-to-end integration of Power BI and analytics tools across sales processes. Real-time capabilities can be enhanced by leveraging streaming data pipelines and cloud-based architectures for scalability. User-centric solutions, such as customized dashboards and low-code/no-code interfaces, can improve adaptability and ease of use. Sector-specific case studies should be included to demonstrate tailored applications, and ethical considerations must be embedded into model development to minimize biases.

Chapter 3

PROJECT DESCRIPTION

3.1 Existing System

The existing systems for sales insights often present significant disadvantages that can hinder a company's ability to make informed decisions. One major drawback is the lack of real-time data processing. Many traditional systems rely on outdated methods of data collection and analysis, resulting in delays that can prevent businesses from responding swiftly to market changes. This latency can lead to missed opportunities, as companies may not be able to identify emerging trends or shifts in consumer behavior in a timely manner. Additionally, these systems often suffer from a fragmented data approach, where information is siloed across different departments. This fragmentation makes it challenging for sales teams to get a holistic view of customer interactions and sales performance, limiting their ability to develop comprehensive strategies.

Furthermore, existing systems can be overly complex and difficult to navigate, leading to user frustration and decreased productivity. Sales teams may struggle with the steep learning curve associated with these tools, which can deter them from fully utilizing the insights available. Moreover, inadequate integration with other business applications can result in inconsistent data, leading to misinformed decisions based on inaccurate insights. This lack of coherence not only complicates the sales process but also undermines the overall effectiveness of marketing and customer relationship management efforts. To remain competitive, businesses must seek more streamlined, user-friendly solutions that provide real-time insights and foster collaboration across teams.

3.2 Problem statement

The proposed system for sales insights offers several advantages that can significantly enhance a company's ability to drive sales performance and improve decision-

making. One of the primary benefits is its capability for real-time data processing. Unlike traditional systems, which often rely on outdated information, the proposed system allows for immediate access to sales data and trends. This enables businesses to react swiftly to market changes and customer demands, ensuring they capitalize on opportunities as they arise. By utilizing advanced analytics and machine learning algorithms, the system can identify patterns in consumer behavior, providing actionable insights that inform targeted marketing strategies and sales approaches.
Additionally, the proposed system emphasizes integration and collaboration across departments. By consolidating data from various sources into a unified platform, sales, marketing, and customer service teams can work together more effectively. This holistic view of customer interactions fosters better communication and ensures that all teams are aligned in their efforts. Moreover, the user-friendly interface simplifies navigation, reducing the learning curve for employees and increasing overall productivity. With automated reporting and dashboard features, teams can easily visualize performance metrics and track progress toward sales goals. Overall, the proposed system not only enhances efficiency but also empowers organizations to make data-driven decisions that propel growth and competitiveness in the marketplace.

3.3 System Specification

3.3.1 Hardware Specification

Processor: Intel Core i7 or AMD Ryzen 7 (latest generation) for high performance and multitasking capabilities.
RAM: 16 GB DDR4 or higher for efficient data processing and smooth operation of analytics applications.
Storage: 512 GB SSD (Solid State Drive) or larger for fast data access and improved system responsiveness.
Optionally, additional 1 TB HDD for storing large datasets.
Graphics Card: NVIDIA GeForce GTX 1660 or AMD Radeon RX 5600 for enhanced graphical processing in data visualization tools.
Network Interface: Gigabit Ethernet port and Wi-Fi 6 support for fast and reliable internet connectivity.
Motherboard: Compatible motherboard with PCIe 4.0 support for future-proofing and high-speed data transfer.

Power Supply: 600W or higher power supply unit for reliable and stable performance.
Cooling System: Efficient cooling solution (air or liquid cooling) to maintain optimal operating temperatures during heavy processing.
Backup Solution: External hard drive or NAS (Network-Attached Storage) for regular backups and data security.
Operating System: Windows 11 Pro or Linux (latest distribution) to ensure compatibility with modern software applications.
These specifications ensure that the sales insights system operates efficiently, supports advanced analytics, and provides a seamless user experience.

3.3.2 Software Specification

Operating System: Windows 11 Pro or the latest version of a Linux distribution (e.g., Ubuntu 22.04) for compatibility and security.
Data Analytics Tools: Microsoft Power BI or Tableau (latest versions) for advanced data visualization and reporting capabilities.
R or Python (latest versions) for statistical analysis and data manipulation.
Customer Relationship Management (CRM) Software: Salesforce or HubSpot (latest versions) for managing customer interactions and sales tracking.
Database Management System: Microsoft SQL Server 2022 or PostgreSQL (latest version) for robust data storage and querying capabilities.
Business Intelligence Tools: Looker or Qlik Sense (latest versions) for comprehensive business intelligence and reporting solutions.
Collaboration Software: Microsoft Teams or Slack (latest versions) for team communication and collaboration.
Data Integration Tools: Apache NiFi or Talend (latest versions) for seamless data integration from various sources.
Cloud Storage Solutions: Google Cloud Storage or Microsoft Azure Blob Storage for scalable and secure data storage.
Security Software: Antivirus software (e.g., Bitdefender or Norton) and firewall solutions to ensure data protection.
Backup and Recovery Tools: Veeam Backup Replication or Acronis Cyber Backup for reliable data backup and recovery solutions.

These software specifications provide a comprehensive framework for implementing a robust sales insights system that maximizes data utility and enhances collaboration.

3.3.3 Standards and Policies

Power BI Desktop

Power BI Desktop is a powerful data visualization and business intelligence tool that allows users to transform raw sales data into interactive reports and dashboards. It supports various data sources and provides advanced data modeling capabilities, enabling users to analyze sales performance, identify trends, and generate actionable insights. The user-friendly interface and extensive visualization options facilitate effective communication of data findings.

Standard Used: ISO/IEC 27001

Power BI Service

Power BI Service is a cloud-based platform that enables collaboration and sharing of Power BI reports and dashboards. It allows teams to access real-time sales insights from anywhere, facilitating informed decision-making. The service also provides features like data refresh, content distribution, and user access controls, ensuring that the right stakeholders have access to relevant sales data.

Standard Used: ISO/IEC 27001

Chapter 4

METHODOLOGY

4.1 Proposed System

The planning of the proposed Sales Insight System through Power BI lies in creating Business Intelligence which will be reached by the data integration from the CRM, POS, and e-commerce platforms will be utilized for the thorough analysis of sales performance. This implementation based on the capabilities of Power BI is competent to descriptive analytics and predictive analytics and KPIs monitoring like total sales, average transaction value, and customer retention, along with repositories of real-time, interactive dashboards for the stakeholders. Participants can go into depth to metrics and access tailored report formats that are adaptable to their needs, so that they see the information clearly. Besides that, the system involves AI, specifically Azure Machine Learning, to make predictions on future sales and prescriptive analytics to offer solutions that can be implemented. With automated reporting, collaboration tools, and mobile access, the system not only enables fast decision-making and flexibility, but also generates profit and idealizes the sales strategies as binding business demands.

4.2 General Architecture

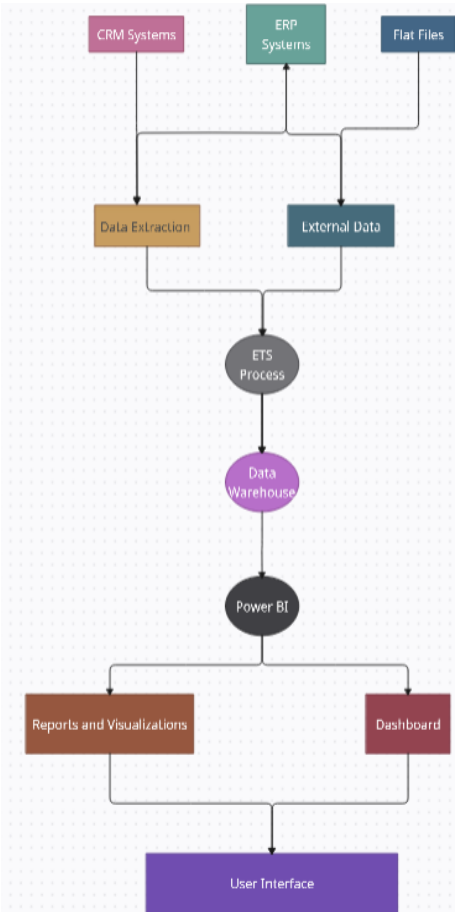

Figure 4.1: **General Architecture**

Description

The process is shown in the diagram that starts with sources of data that include CRM systems, ERP systems, and flat files, which first are extracted and, in some cases, complemented with external data. This data is initially pulled from the above sources, and data ETL (Extract, Transform, Load) process is then executed in order to clean, transform, and load data into a data warehouse, where it will be stored in a centralized manner. These are the data, which, via Power BI, uses for creating reports and dashboards. Such reports and dashboards that are also interactive and have access management are then displayed on the user interface.

4.3 Design Phase

4.3.1 Data Flow Diagram

Figure 4.2: **Data Flow**

Description

The diagram shows the data flow process for business intelligence, in the first place, the data collection needs to start with customer relationship management or enterprise resource planning systems and external sources. The data is then extracted, transformed, and cleaned during the ETL (Extract, Transform, Load) process, before being stored in a data warehouse. From the data warehouse, Power BI is used to create and share reports and dashboards to users, while an administrator also manages user access to keep data security and proper usage in check.

4.3.2 Use Case Diagram

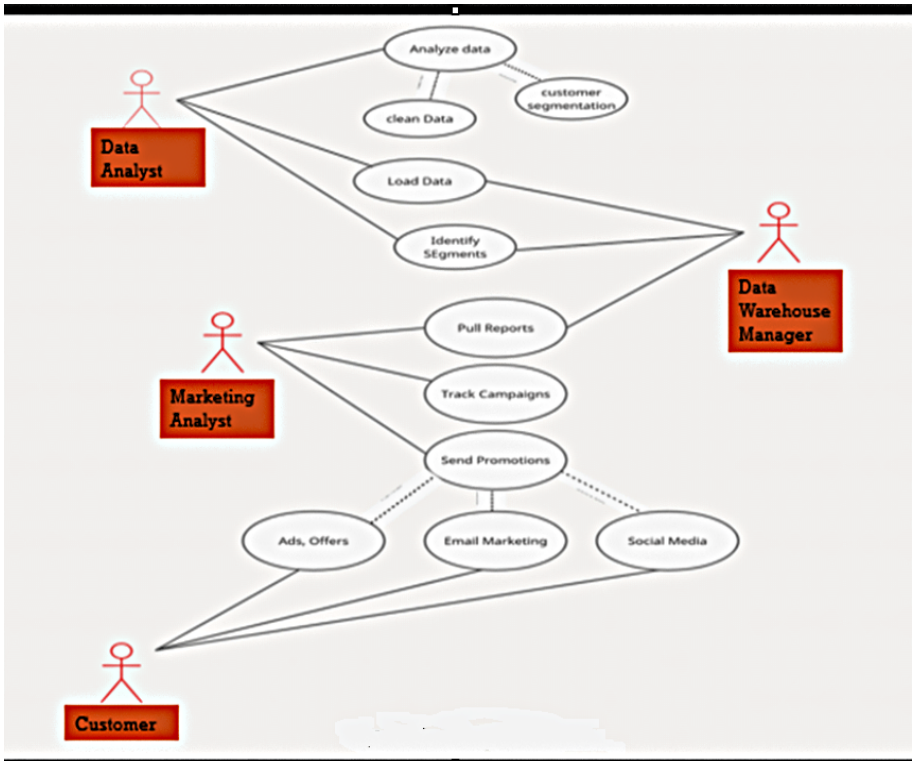

Figure 4.3: **Use Case Diagram**

Description

Create dashboards that will be enhanced through the Sales Insight apply of Power BI; its main task is to analyze sales performance data and provide actionable insights into decision-making to some specific people. Along with the interactivity and data visualization achieved, the project is able to track such primary indicators as the dynamics of revenue, the product performance, the regional sales distribution as well as behavior of the customer. Power BI is allowing the connection of different data sources to it from real-time through the dynamic filter for the sales' specified features. As a result, the stakeholders carry out the attainment of the stated aims, control the KPIs, and devise the sales strategy that best suits the company by way of making them data-driven decisions.

4.3.3 Class Diagram

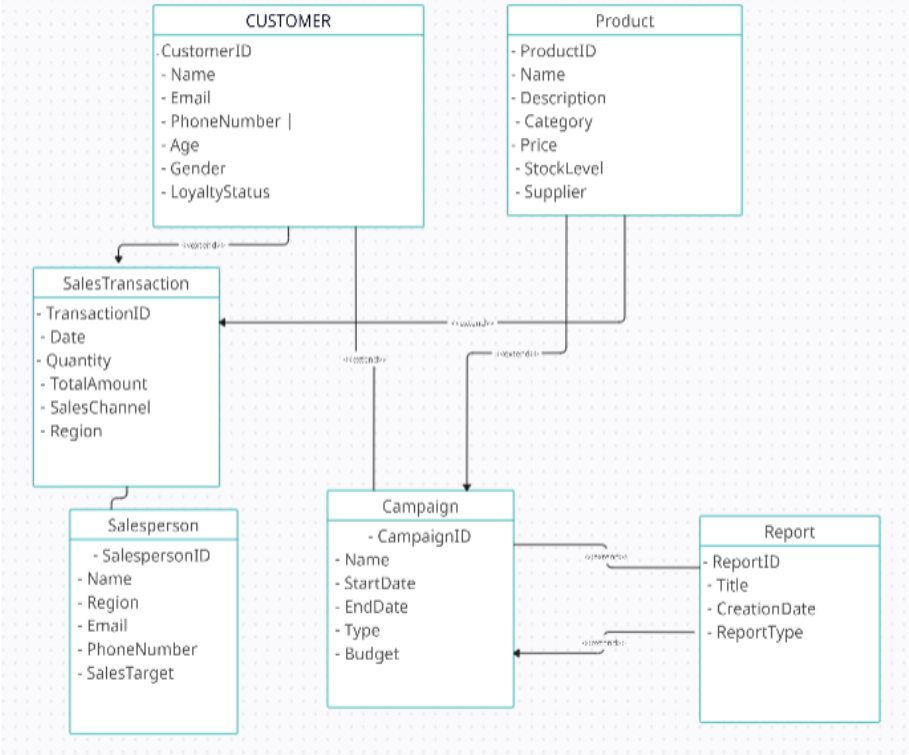

Figure 4.4: **Class Diagram**

Description

The sales insight project class diagram shows the main objects and their relations in the sales data system with regard to customers, products, and sales transactions, salespersons, campaigns, and reports. It showcases how each transaction is linked to a customer and a product, whereas salespersons are associated with the sale of a product to many customers. Campaigns, on the other hand, concentrate on specific items and buyers. The report combines information from different sources for analysis. The general scenario of how sales data files look like and some uses thereof is given. It also allows the BI application to work like a heliographer by hosting more business data in one place.

4.3.4 Sequence Diagram

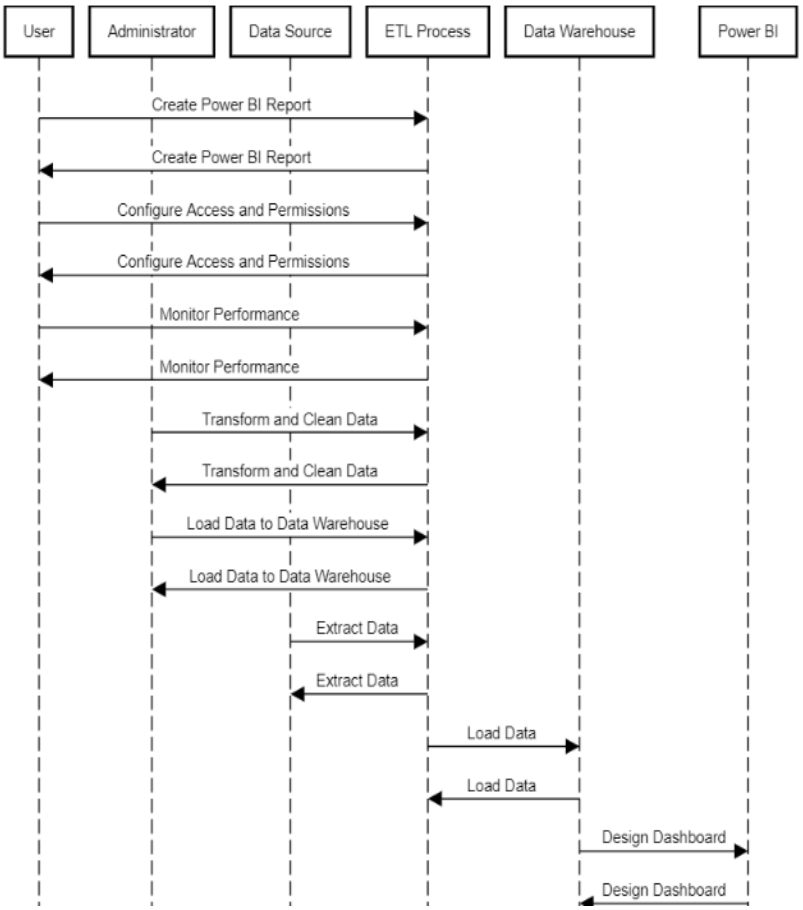

Figure 4.5: **Sequence Diagram**

Description

This sequence diagram depicts the workflow of a data management sequence, coursed through a user and an administrator who are in turn served with a data source. Data comes out of the source, it is then transformed and cleaned up through the ETL process and after that, it is loaded into the data warehouse. When the data is ready, a Power BI dashboard is created in order to visualize it. Users are able to create reports, view dashboards, and manage access permissions. Moreover, performance monitoring is performed for effective system operation that is in turn inclusive of the whole cycle from data extraction to reporting and monitoring.

4.3.5 Collaboration diagram

Figure 4.6: **Collaboration Diagram**

Description

A workflow described herein is a data management system through which data used by a particular system moves across different processes such as ETL (Extract, Transform, Load), the process that prepares and loads the data into a centralized data warehouse. Tools such as Power BI help the user to visualize and analyze the data while allowing them to get actionable insights as well. The administrator supervises the whole concept making sure the ETL processes and data integrity as well as Power BI reports are running smoothly and are, therefore, the users that can make accurate decisions from reliable and well-arranged data. Online data streaming is one way to achieve the seamless functioning of the actual data streaming. On the other hand, offline streaming processes may take data from data stores to a data processing unit and then to a data visualization front end. The workflow processes the data by first structuring the data transaction and then making the necessary changes to the data in the error handling or transformation phase.

4.3.6 Activity Diagram

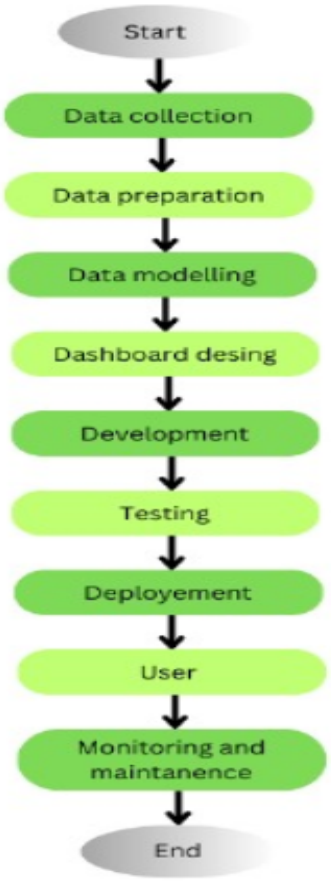

Figure 4.7: **Activity Diagram**

Description

The procedure of developing sales insights in Power BI is the first step of data collection where the pertinent sales data is drawn from various sources like CRM systems and databases. Subsequently, the cheeky data is prepared, which means that the data is cleaned and transformed for its analysis. After that in the data modeling step, relationships between different datasets are created to generate a unified model. The graphic dashboard design element aims at designing visual elements that will best interpret the information. During development, the first step is the creation of reports and dashboards through Power BI. Then they are tested to make sure that they work as they should. After the approval of the reports, they are then deployed which means they are put on the Power BI service. User training comes up next to make the stakeholders very familiar with the tools and monitoring and maintenance come at the end that will ensure ongoing updates and performance. Here the whole cycle is finished.

4.4 Algorithm & Pseudo Code

4.4.1 Algorithm

Define Objectives: Identify the key questions or metrics you want to analyze (e.g., total sales, sales by region, product performance).
Data Collection: Identify data sources (e.g., CRM systems, ERP databases, spreadsheets). Gather sales data, customer information, product details, and any other relevant data.
Data Preparation:
ETL Process: Extract: Import data from identified sources.
Transform: Clean the data (remove duplicates, handle missing values, format dates).
Load: Store the transformed data into a data warehouse or directly in Power BI.

Data Modeling:
Create relationships between different data tables (e.g., linking sales data with customer data). Define measures and calculated columns (e.g., total sales, average order value).
Visual Design:
Use Power BI to create a report/dashboard layout. Select appropriate visualizations (e.g., bar charts, line graphs, pie charts) for each metric. Arrange visuals for clarity and impact.
Data Analysis:
Analyze trends, patterns, and anomalies in the sales data. Use filters and slicers for dynamic data exploration.
Add Interactivity:
Implement drill-through options, tooltips, and bookmarks to enhance user experience. Enable users to explore data at different levels of granularity.
Testing and Validation:
Review the dashboard for accuracy and performance. Validate data against original sources to ensure correctness.
Deployment:
Publish the report to the Power BI service. Share it with stakeholders and set up appropriate access permissions.

Feedback and Iteration:

Gather user feedback on the insights and usability of the dashboard. Make necessary adjustments and improvements based on feedback.

Monitoring and Maintenance:

Regularly update the data and dashboard as new sales data comes in. Monitor performance and user engagement with the insights

4.4.2 Pseudo Code

```
  BEGIN SalesInsightProject

// Step 1: Data Extraction
FUNCTION ExtractData
  // Establish connections to various data sources
  CONNECT to CRMSystem
  CONNECT to ERPSystem
  CONNECT to ExternalSources
  // Retrieve data from each source
  FOR EACH dataSource IN [CRMSystem, ERPSystem, ExternalSources]
    DATA = RETRIEVE data from dataSource
    OUTPUT "Data extracted from", dataSource
  END FOR
END FUNCTION

// Step 2: Data Transformation
FUNCTION TransformData(RawDataStore)
  // Clean and prepare the data
  FOR EACH record IN RawDataStore
    CLEAN duplicates and inconsistencies
    HANDLE missing values
  END FOR
  MERGE data from all sources
  NORMALIZE data fields
  OUTPUT "Data transformation complete"
  RETURN TransformedDataStore
END FUNCTION

// Step 3: Data Loading
FUNCTION LoadData(TransformedDataStore)
  // Load data into a warehouse
  CONNECT to DataWarehouse
  LOAD TransformedDataStore INTO DataWarehouse
  INDEX and PARTITION DataWarehouse
  OUTPUT "Data loaded into warehouse successfully"
END FUNCTION

// Step 4: Data Modeling
FUNCTION ModelData(DataWarehouse)
  // Connect to PowerBI and define relationships and measures
```

Figure 4.8: **Pseudo Code**

4.4.3 Data Set / Generation of Data

Revamped Input Text: Sales Data:

Transaction Records: Deals that are collaborations between sellers and buyers, have, among other things, aspects like transaction ID, date, product ID, total sales

amount, and payment method mentioned above.

Salesperson Data: The performance statistics of the sales representatives, their IDs, and their names are the essential information.

Product Information:

Product Catalog: The detailed database of each and every product, including product ID, name, category, price, and inventory levels.Product Performance

Metrics: Customer opinions, product sales trends, and calculated return rates are the statistics that are gathered.

Customer Data:

Customer Profiles: Demographic information, i.e., customer ID, name, age, location, and contact details are listed in customer profiles.

Purchase History: Records of past purchases by each customer that are the basis for the analysis of buying patterns and preferences.

Geographic Data:

Location Information: Total sales data from various geographic areas for the past month year or store by region, city, or store info. It might also include geographic coordinates that can be used to plot visualizations to the map.

Time Data:

Time Dimensions: A calendar table including the date attributes (year, quarter, month, week, day) for time-based analysis and trend visualization.

External Data :

Market Trends: Additional information such as sectoral benchmarks or economic indicators that supply a big picture view of sales are optional.

4.5 Module Description

4.5.1 Module1

1. Data Visualization

Overview: Data visualization in Power BI involves transforming raw data into graphical representations to make insights easier to understand. Effective visualizations can reveal trends, patterns, and anomalies in sales data.

Key Components:

Charts and Graphs: Common types include bar charts (for comparing sales across

different products or regions), line graphs (for tracking sales trends over time), and pie charts (for showing market share).

Maps: Geographic visualizations can show sales performance by location, helping identify strong and weak markets.

Tables and Matrices: Useful for displaying detailed sales figures, allowing for easy comparisons and drill-downs into specific data points.

Custom Visuals: Power BI allows the integration of custom visuals to meet specific analytical needs, enhancing user experience.

Benefits:

Simplifies complex data sets. Facilitates quick decision-making through clear and engaging presentations. Allows for interactive dashboards, enabling users to explore data dynamically.

2. Data Modeling

Overview: Data modeling in Power BI involves structuring and organizing data from different sources to create a cohesive dataset. This process is crucial for effective analysis and reporting.

Key Components:

Data Sources: Power BI can connect to various data sources, such as Excel files, SQL databases, and cloud services. Properly integrating these sources is essential for accurate analysis.

Relationships: Establishing relationships between different data tables (e.g., linking sales data with customer demographics or product information) helps create a unified view. Understanding cardinality (one-to-many, many-to-many) is vital here.

Star Schema: Many analysts prefer a star schema approach, where a central fact table (e.g., sales transactions) is connected to multiple dimension tables (e.g., products, time, customers). This structure optimizes performance and simplifies queries.

Benefits:

Enhances data accuracy and integrity. Supports complex analyses by enabling comprehensive queries across multiple tables. Streamlines report generation and dashboard creation.

4.5.2 Module3

3. DAX (Data Analysis Expressions)

Overview: DAX is a formula language designed specifically for data analysis in Power BI, Excel, and other Microsoft tools. It allows users to create calculated columns, measures, and custom aggregations.

Key Components:

Calculated Columns: These are additional columns created in tables that compute values based on existing data. For example, creating a ”Total Sales” column that sums individual sales entries.

Measures: These are dynamic calculations that can change based on the context of a report. For instance, a measure might calculate total sales for a selected period or specific product category.

Time Intelligence Functions: DAX includes functions that simplify time-based calculations, such as year-to-date totals, quarter-over-quarter growth, and comparisons across different time periods.

Benefits:

Provides powerful analytical capabilities that enable detailed insights and forecasting. Enhances reporting by allowing users to create tailored metrics based on specific business needs. Supports complex calculations that can adjust dynamically based on user selections in reports.

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Input and Output

5.1.1 Input Design

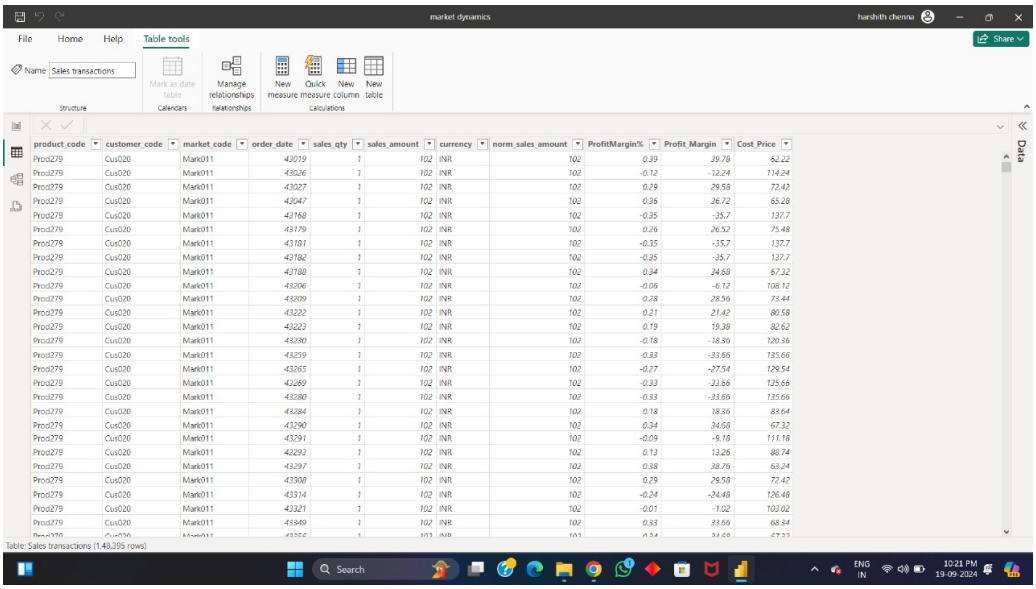

Figure 5.1: **Sample Input**

Description

Among the data sources for a company, the sales insights are one that plays a major role in the decision-making process and the increase in revenue. Along with the customer data, which opens up valuable controls such as demographics, preferences, and buying patterns, the customer segmenting will be the possibility to engage with the customers intermediately are some of the outcomes. Additionally, the product data shows us the sale trends and best sellers, which deals with efficient inventory management and product optimization. Companies will be able to, through the analysis of sales transactions, achieve forecasts, test promotional strategies among others, etc. Which product will be the best seller in a following period is announced by the sales trend data. Thus, the businesses need to manage the inventories such as giving priority to the products that are selling the most. Also, through the trafficking of sales

periods, companies may conduct various other analyses such as testing promotional efficiency and carrying out the forecasting of the sales in a very accurate manner.

5.1.2 Output Design

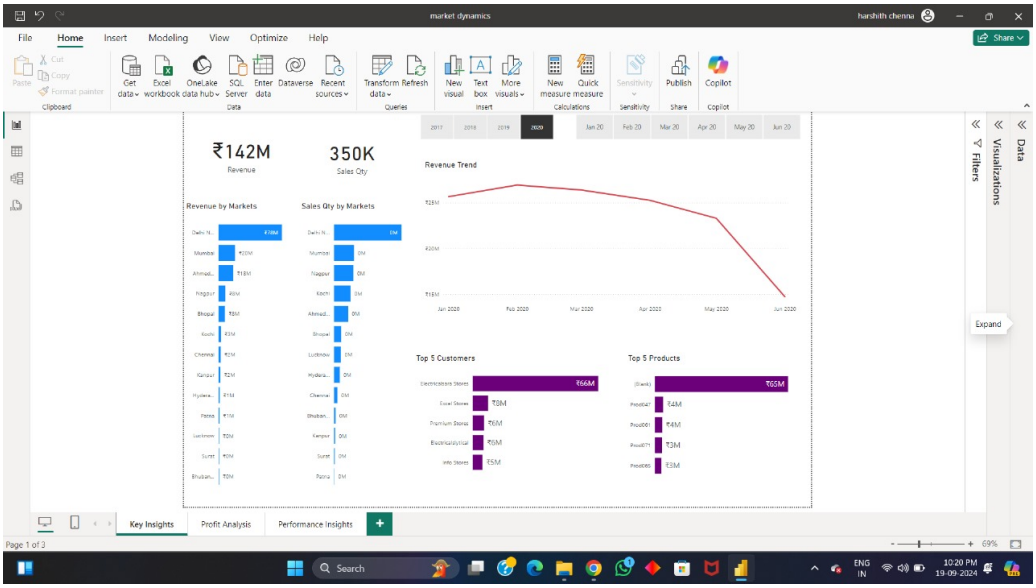

Figure 5.2: **Output**

Description

Power BI visualizations are visual data that provide a visual representation of important metrics. The sales performance can be captured through graphs of line and the bar, showing the KPIs like the revenue and growth. A pie chart and a tree map are new demographic tools that are presented and it is rather an effective way to help the audience determine the target customers. Also, product performance data represented by scatter plots and column charts is shown which indicates the sales of goods and trends in the market. The regional sales strength is shown by a geographical map while a funnel chart shows the beginning of each stage of the sales cycle. Time-series trends and predictive analytics help in forecasting with the detailed tracking of profit margins and expenses of the products and regions by financial tables and matrices.

5.2 Testing

5.3 Types of Testing

5.3.1 Unit testing

Unit tests should be developed on significant features of the login page and home page, such as input validation, authentication, error handling, user experience, secu rity, and accessibility. What these tests can do is ensure that these pages work right, offer a pleasant user experience, and fulfill the needs of the target audience. This can actually further help improve the overall reliability and efficiency of the system.

Input

```
import pandas as pd
from sqlalchemy import create_engine

# Function to load the CSV
def load_data(file_name):
    data = pd.read_csv(file_name)
    return data

# Function to clean the data
def clean_data(data):
    data = data.dropna()
    return data

# Function to save the data to a SQL database
def save_data(data, db_string, table_name):
    engine = create_engine(db_string)
    data.to_sql(table_name, engine, if_exists='replace')

# Run pipeline
data = load_data('data.csv')
data = clean_data(data)
save_data(data, 'sqlite:///database.db', 'my_table')
```

Test result

Result Grid | Filter Rows: | Export: | Wrap Cell Content: | Fetch rows:

product_code	customer_code	market_code	order_date	sales_qty	sales_amount	currency
Prod001	Cus001	Mark001	2017-10-10	100	41241	INR
Prod001	Cus002	Mark002	2018-05-08	3	-1	INR
Prod002	Cus003	Mark003	2018-04-06	1	875	INR
Prod002	Cus003	Mark003	2018-04-11	1	583	INR
Prod002	Cus004	Mark003	2018-06-18	6	7176	INR
Prod003	Cus005	Mark004	2017-11-20	59	500	USD
Prod003	Cus005	Mark004	2017-11-22	36	250	USD
Prod003	Cus005	Mark004	2017-11-23	39	21412	INR
Prod003	Cus005	Mark004	2017-11-27	35	19213	INR
Prod003	Cus005	Mark004	2017-11-28	310	170185	INR
Prod003	Cus005	Mark004	2017-11-29	184	101194	INR
Prod003	Cus005	Mark004	2017-11-30	35	19213	INR
Prod004	Cus005	Mark004	2017-11-29	17	9426	INR
Prod004	Cus005	Mark004	2017-12-19	1	218	INR
Prod005	Cus005	Mark004	2018-08-07	5	3093	INR
Prod003	Cus006	Mark004	2017-12-04	58	30306	INR
Prod005	Cus006	Mark004	2018-06-29	38	52319	INR
Prod005	Cus006	Mark004	2018-07-02	93	126296	INR
Prod005	Cus006	Mark004	2018-07-03	79	107500	INR
Prod005	Cus006	Mark004	2018-07-04	1	273	INR
Prod005	Cus006	Mark004	2018-07-06	3	3574	INR
Prod005	Cus006	Mark004	2018-07-13	1	273	INR

transactions 2 ×

Figure 5.3: **Data Set**

5.3.2 Integration testing

Integration testing of your government school infrastructure and resource manage ment platform will involve verification that different components of the system work well together. It may include data flow checks, testing of component dependencies, validation of user interaction, data consistency, finding integration issues, and so lution to such issues. Therefore, through such all-inclusive integration testing, you ensure your platform performs well as a unit and is user-friendly.

Input

```
import promisePool from '../utils/dbConnection'
import { jwtDecoder } from '../utils/jwtDecoder'
import { formatResponse } from '../utils/responseFormatter'
const addUser = async (event) => {
  const request = JSON.parse(event.body)
  const insertUser = 'INSERT INTO user (name, phone, email) VALUES(?, ?, ?)'
  const dataFromDecoder = jwtDecoder(event)
  if (typeof dataFromDecoder === 'string')  return formatResponse(null, { code: 400, message:
      dataFromDecoder })
  if(!request.email) return formatResponse(null, { code: 400, message: 'email is required' })
  try {
```

```
        await promisePool.query(insertUser, [request.name, request.phone, request.email])
        return formatResponse({ status: 200, message: 'user created successfully' }, null)

    } catch (error) {
      return formatResponse(null, { message: error.message, code: 400 })
    }
}
export default {
  addUser
```

Test result

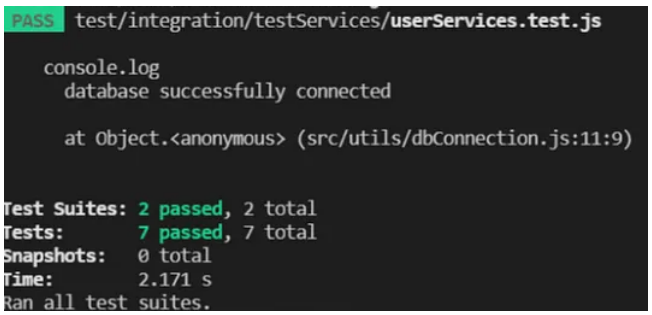

Figure 5.4: **Test Result**

5.3.3 System testing

Input

```
import pandas as pd

# Load the sales data which mimics the Power BI dataset
sales_data = pd.read_csv('sales_data.csv')

# Function to calculate expected values
def calculate_sales_insight(data):
    total_sales = data['Sales'].sum()
    total_cost = data['Cost'].sum()
    total_profit = total_sales - total_cost
    return total_sales, total_cost, total_profit

# Expected values based on sales_data.csv
expected_sales = 1000 + 2000 + 3000 + 1500 + 2500
expected_cost = 600 + 1500 + 1000 + 800 + 1200
expected_profit = expected_sales - expected_cost

```

```
# Actual values from the calculation function
actual_sales, actual_cost, actual_profit = calculate_sales_insight(sales_data)

# Validate outputs
def test_sales_insight():
    assert actual_sales == expected_sales, f"Expected sales: {expected_sales}, but got: {
        actual_sales}"
    assert actual_cost == expected_cost, f"Expected cost: {expected_cost}, but got: {actual_cost}"
    assert actual_profit == expected_profit, f"Expected profit: {expected_profit}, but got: {
        actual_profit}"

# Run tests
if __name__ == "__main__":
    try:
        test_sales_insight()
        print("All tests passed successfully!")
    except AssertionError as e:
        print(f"Test failed: {e}")
```

Test Result

product_code	customer_code	market_code	order_date	sales_qty	sales_amount	currency	norm_sales_amount	ProfitMargin%	Profit_Margin	Cost_Price
Prod279	Cus020	Mark011	43019	1	102	INR	102	0.39	39.78	62.22
Prod279	Cus020	Mark011	43026	1	102	INR	102	-0.12	-12.24	114.24
Prod279	Cus020	Mark011	43027	1	102	INR	102	0.29	29.58	72.42
Prod279	Cus020	Mark011	43047	1	102	INR	102	0.36	36.72	65.28
Prod279	Cus020	Mark011	43168	1	102	INR	102	-0.35	-35.7	137.7
Prod279	Cus020	Mark011	43179	1	102	INR	102	0.26	26.52	75.48
Prod279	Cus020	Mark011	43181	1	102	INR	102	-0.35	-35.7	137.7
Prod279	Cus020	Mark011	43182	1	102	INR	102	-0.35	-35.7	137.7
Prod279	Cus020	Mark011	43188	1	102	INR	102	0.34	34.68	67.32
Prod279	Cus020	Mark011	43206	1	102	INR	102	-0.06	-6.12	108.12
Prod279	Cus020	Mark011	43209	1	102	INR	102	0.28	28.56	73.44
Prod279	Cus020	Mark011	43222	1	102	INR	102	0.21	21.42	80.58
Prod279	Cus020	Mark011	43223	1	102	INR	102	0.19	19.38	82.62
Prod279	Cus020	Mark011	43230	1	102	INR	102	-0.18	-18.36	120.36
Prod279	Cus020	Mark011	43259	1	102	INR	102	-0.33	-33.66	135.66
Prod279	Cus020	Mark011	43265	1	102	INR	102	-0.27	-27.54	129.54
Prod279	Cus020	Mark011	43269	1	102	INR	102	-0.33	-33.66	135.66
Prod279	Cus020	Mark011	43280	1	102	INR	102	-0.33	-33.66	135.66
Prod279	Cus020	Mark011	43284	1	102	INR	102	0.18	18.36	83.64
Prod279	Cus020	Mark011	43290	1	102	INR	102	0.34	34.68	67.32
Prod279	Cus020	Mark011	43291	1	102	INR	102	-0.09	-9.18	111.18
Prod279	Cus020	Mark011	43293	1	102	INR	102	0.13	13.26	88.74
Prod279	Cus020	Mark011	43297	1	102	INR	102	0.38	38.76	63.24
Prod279	Cus020	Mark011	43308	1	102	INR	102	0.29	29.58	72.42

Figure 5.5: **Result**

5.3.4 Test Result

```
  BEGIN SalesInsightProject

// Step 1: Data Extraction
FUNCTION ExtractData
  // Establish connections to various data sources
  CONNECT to CRMSystem
  CONNECT to ERPSystem
  CONNECT to ExternalSources
  // Retrieve data from each source
  FOR EACH dataSource IN [CRMSystem, ERPSystem, ExternalSources]
    DATA = RETRIEVE data from dataSource
    OUTPUT "Data extracted from", dataSource
  END FOR
END FUNCTION

// Step 2: Data Transformation
FUNCTION TransformData(RawDataStore)
  // Clean and prepare the data
  FOR EACH record IN RawDataStore
    CLEAN duplicates and inconsistencies
    HANDLE missing values
  END FOR
  MERGE data from all sources
  NORMALIZE data fields
  OUTPUT "Data transformation complete"
  RETURN TransformedDataStore
END FUNCTION

// Step 3: Data Loading
FUNCTION LoadData(TransformedDataStore)
  // Load data into a warehouse
  CONNECT to DataWarehouse
  LOAD TransformedDataStore INTO DataWarehouse
  INDEX and PARTITION DataWarehouse
  OUTPUT "Data loaded into warehouse successfully"
END FUNCTION

// Step 4: Data Modeling
FUNCTION ModelData(DataWarehouse)
  // Connect to PowerBI and define relationships and measures
```

Figure 5.6: **Test Image**

Description

Pseudocode serves as a simplified, high-level representation of an algorithm or program, designed to convey the logic and flow of the code without getting bogged down in the syntax of a specific programming language. It uses plain language and common programming structures, such as loops, conditionals, and function calls, to outline the steps needed to achieve a particular task or solve a problem. By abstracting away the technical details, pseudocode allows developers, analysts, and stakeholders to focus on the algorithm's functionality and overall structure, making it easier to communicate ideas and collaborate on solutions. It is particularly useful in the planning phase of software development, as it helps identify potential issues and optimizations before actual coding begins.

Chapter 6

RESULTS AND DISCUSSIONS

6.1 Efficiency of the Proposed System

The proposal of the sales insights system using Power BI supports the business by presenting highly sophisticated data visualization and analytics features. Power BI's capability to link undeniably to disparate data is so superior that users can just link the software to the data set and get the results in real time. In a matter of a second, this feature can be used to immediately come up with the trending points and interpretations that would lead to decisions that make a difference, instead of the lengthy operation that manual reporting usually entails. The user-friendly and adaptable interface as well as the drag-and-drop interface is very likeable and permits users of these dashboards to visualize their data in a blink of a second. As a result, decision making becomes not only simple but faster and the response with market alternation also becomes more agile.

At the same time, the work efficiency meted out to the collaboration capabilities of the system is part of the success story. The very fact that Power BI is the medium that allows divisional members to safely exchange reports and dashboards speaks volumes about how the company is using the data-driven method to reach its goals. Moreover, being equipped with productivity tools that are built in for real-time collaboration, the team members can pool their minds together and refine their insights or construct their strategies based on the most recent data. Furthermore, the method of automatic data update enhances the precision of the information. By and large, the Power BI application not only simplifies the sales insight process but also brings in a lot of advantages like improved productivity, reduced operating costs, and high returns on investments in data-linked activities.

6.2 Comparison of Existing and Proposed System

Existing system:(Decision tree)

The existing system uses a decision tree algorithm to make sales predictions, which is mainly concerned with forecasting customer behavior and outcomes. Despite the decision tree model providing an easy-to-understand representation of the variable splits and their significance, the model also has the most significant limitations. One major drawback is that if the decision tree becomes too complex with too many splits, it will tend to overfit the training dataset. Overfitting the model is a problem as it cannot be generalized to the new data and may require a more complex performance on real applications, maybe less for more definition. Also, regarding the efficiency of the decision tree, it does not necessarily ”keep” in the case of lesser complications, unlike the more advanced algorithms, which can be used with more convenience as well in other areas.

Proposed system:(Random forest algorithm)

The system implemented uses the Random Forest algorithm, which is a more advanced technology compared to the decision trees. The Random Forest model is reached through the method of Decision Ensembles. The process, wherein the model is trained on thousands of inputs and the ensemble makes the final decision by combining the feedback from the individual models. The users are allowed to give the input by first giving the tree number division which further communicates more volume of data error reduction in the model. The number of trees added weight to each tree in the model and the model's relative accuracy was the improving variable. With increasing trees, the correctness of the model is heading to the maximum point around 200 without increasing bias and it stabilizes. Not also random selection of features (RF) solve the problem about the rise in variance and hence, makes the result more consistent and reliable. This system indeed gives more precise and applicable business insights, leading enterprises to make the informed decisions with the help of the data and thus, it surpasses the existing decision tree approach.

```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor
from sklearn.metrics import mean_squared_error, r2_score
from sklearn.preprocessing import LabelEncoder

# Load the dataset
def load_data(file_name):
    data = pd.read_csv(file_name)
```

```
    return data

# Preprocess the dataset
def preprocess_data(data):
    # Convert Date to datetime
    data['Date'] = pd.to_datetime(data['Date'])

    # Extract features from Date
    data['Year'] = data['Date'].dt.year
    data['Month'] = data['Date'].dt.month
    data['Day'] = data['Date'].dt.day

    # Label Encoding for categorical variables
    label_encoder = LabelEncoder()
    data['Product'] = label_encoder.fit_transform(data['Product'])
    data['Season'] = label_encoder.fit_transform(data['Season'])

    # Drop the original Date column
    data.drop(columns=['Date'], inplace=True)

    return data

# Train the Random Forest model
def train_model(X, y):
    model = RandomForestRegressor(n_estimators=100, random_state=42)
    model.fit(X, y)
    return model

# Evaluate the model
def evaluate_model(model, X_test, y_test):
    predictions = model.predict(X_test)
    mse = mean_squared_error(y_test, predictions)
    r2 = r2_score(y_test, predictions)
    print(f'Mean Squared Error: {mse}')
    print(f'R^2 Score: {r2}')
    return predictions

# Make predictions for future sales
def make_predictions(model, future_data):
    return model.predict(future_data)

# Main function to run the ETL and model training process
def main():
    # Load the data
    data = load_data('sales_data.csv')

    # Preprocess the data
    data = preprocess_data(data)

    # Define features and target variable
```

```
    X = data.drop(columns=['Sales'])
    y = data['Sales']

    # Split the data into training and testing sets
    X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

    # Train the model
    model = train_model(X_train, y_train)

    # Evaluate the model
    evaluate_model(model, X_test, y_test)

    # Make future predictions (example input)
    future_data = pd.DataFrame({
        'Product': [1], # Encoded value for Widget A
        'Cost': [700],
        'Promotion': [1],
        'Season': [2], # Encoded value for Spring
        'Year': [2024],
        'Month': [4],
        'Day': [15]
    })

    future_sales_prediction = make_predictions(model, future_data)
    print(f'Predicted Sales: {future_sales_prediction[0]}')

if __name__ == "__main__":
    main()
```

Output

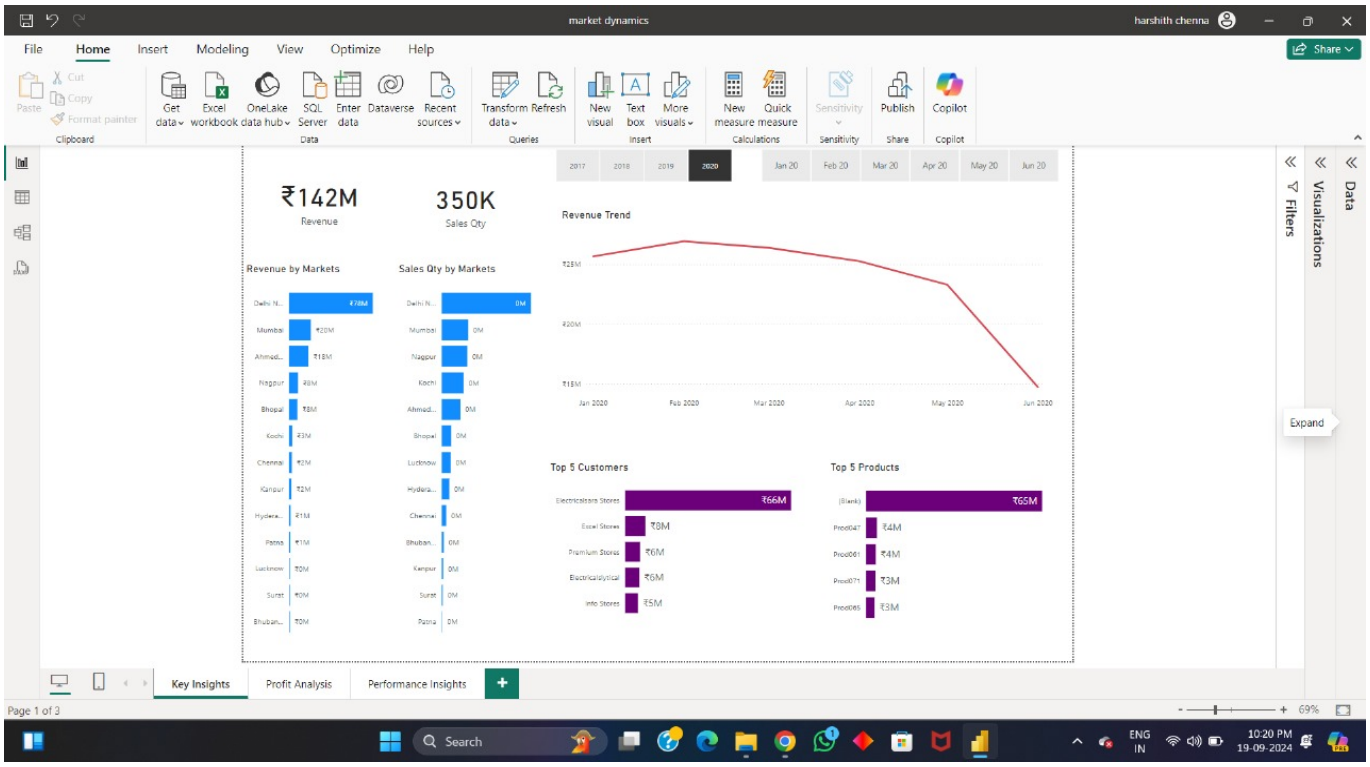

Figure 6.1: **Dash Board 1**

Description

The Power BI dashboard serves as a comprehensive analytical tool that transforms raw sales data into actionable insights, facilitating better decision-making within the organization. With its user-friendly interface, the dashboard presents critical metrics like Total Sales, Total Cost, and Profit Margin prominently, allowing stakeholders to quickly assess business health. Visualizations such as trend lines, bar charts, and pie charts not only enhance the understanding of sales performance across various products and time periods but also reveal underlying patterns and anomalies. The inclusion of interactive filters empowers users to tailor their analysis to specific segments, making it easier to derive insights that align with strategic goals. Additionally, the dashboard's predictive analytics capabilities offer a forward-looking view, equipping management with the tools needed for effective planning and resource allocation. By combining interactivity, visualization, and advanced analytics, the Power BI dashboard ultimately fosters a data-driven culture, ensuring that the organization can adapt and thrive in a competitive marketplace.

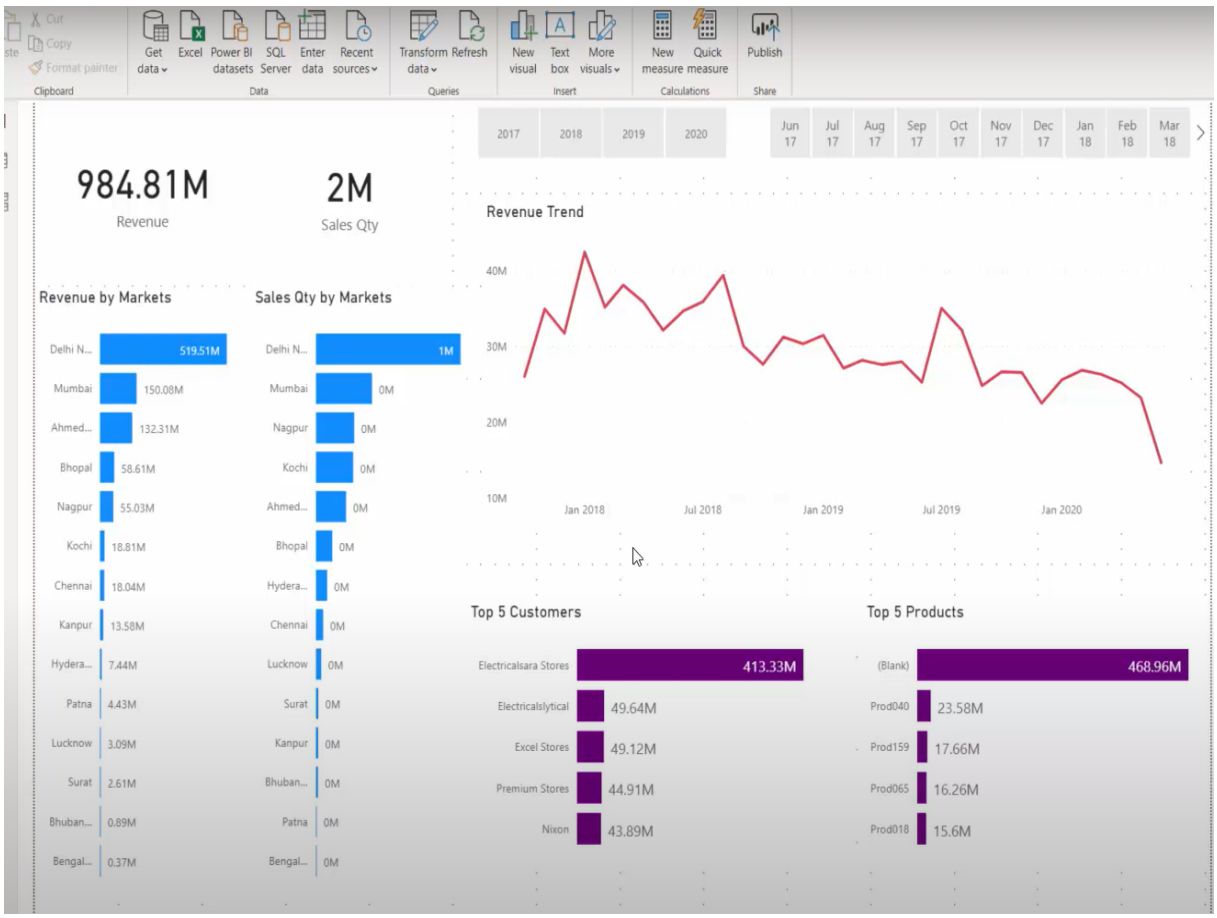

Figure 6.2: **Dash Board 2**

Description

The completed Power BI dashboard offers an interactive and insightful visual representation of sales data, empowering users to make informed, data-driven decisions. At the top, Key Performance Indicators (KPIs) such as Total Sales, Total Cost, and Total Profit provide a quick overview of overall business performance. The dashboard features a line chart to visualize sales trends over time, enabling users to identify patterns and seasonal fluctuations. A bar chart displays product performance, allowing for easy comparison of sales across different product lines, while a pie chart breaks down costs by category, helping to pinpoint cost drivers. Interactive elements like slicers and filters enable users to segment data by various dimensions, enhancing the exploration of insights. Geographical visualizations highlight regional sales performance, and predictive analytics provide forecasts based on historical data. Overall, the dashboard combines visual clarity, interactivity, and predictive capabilities, making it an essential tool for sales teams and management to optimize strategies and drive business growth.

DAX Queries

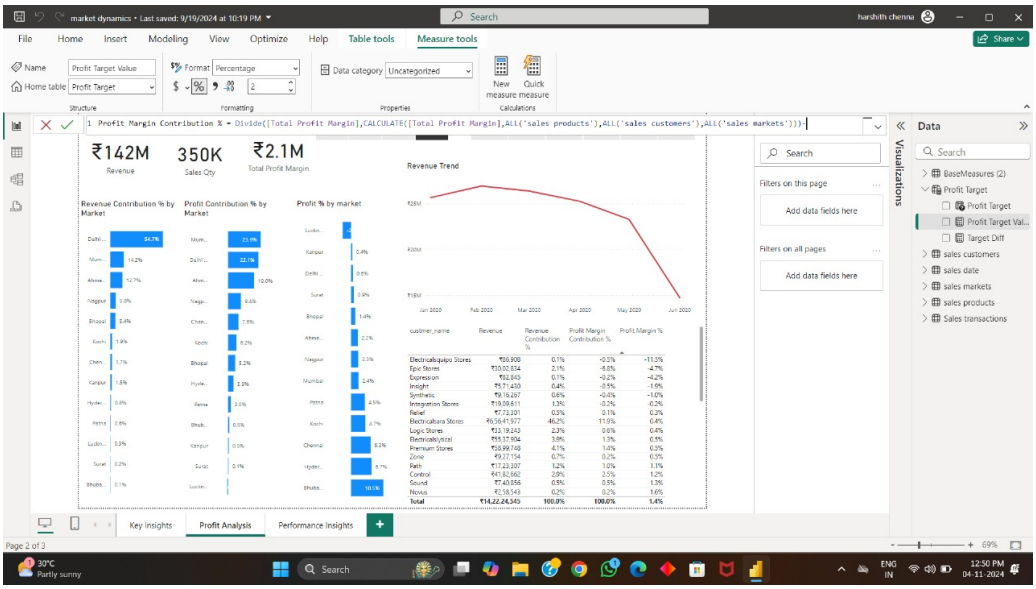

Figure 6.3: **DAX Queries**

Description

DAX (Data Analysis Expressions) queries in Power BI are potent instruments for generating insightful analyses on sales data. By the means of DAX, users can construct measures, as well as, calculated columns that are expedient for the ultimate, sales metrics, the total revenue, profit margin, and sales growth through the passage of time. It is a catalyst for complex consolidations, for instance, calculating the year-over-year growth or cumulative totals, which throw more light on sales trends. Moreover, DAX functions such as ‘FILTER‘, ‘SUMX‘, and ‘CALCULATE‘ enable sophisticated filtering, which is used for comparing sales performance across different regions, products, and time scales, hence, more informed business decisions are made.

Chapter 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 Conclusion

Therefore, deploying Power BI for Sales Insight projects can be a game-changer in any company's capacity to analyze and draw conclusions from the huge amount of data that the sales department processes. Through the adoption of different programs like Sales Performance Dashboards, Customer Insights, and Sales Forecasting, the company will have access to the whole sales process, which is crucial for identifying where the company can improve or grow. These applications provide the users with the current information, which in turn, helps the teams identify the issues, their drivers, and take necessary steps. Power BI's visualization tools enable users to make sense of data in the context of their businesses, as these tools enable out-of-the-box solutions for data analysis and business intelligence. Also, the enlightenments coming from Power BI give both consumers and companies the opportunity to be customer-centric, as a result, lead to more personalized and better customer experience and engagement. Through the use of the application, companies will be able to predict future sales trends, and thus, they will optimize the allocation of resources and the management of inventory, which will eventually bring growth and efficiency. As the situation is now, Power BI will continue to become a prominent player in this new era of data-based decision-making and thus, it will be a major part of businesses and their strategies. It is absolutely fair to say that it is, surprisingly, one of the most vital instruments today that are being applied to the competitive landscape.

7.2 Future Enhancements

Our project's future could be dedicated to some improvements in user commitment and functionality extension. A major area of improvement is the introduction of ar-

tificial intelligence to personalize user experiences. We are allowed to use machine learning algorithms to the user behavior, and preferences analysis so that we can understand exactly what they want. We will also allow the user to select the content or recommendations of his/her taste. This will allow users to feel that they have genuine relationships with the system and they are on the same page with it. What is more, AI chatbots will be helpful in giving the real-time support that anyone requires and will thus serve as an additional point to customer service which is to be bettered. Besides, we can think of the platform's enlargement with the inclusion of social features. The platform can act as an active community where users can socialize, exchange ideas, and cooperate with other people. Forums for instance, user-submitted content, and common projects can not only trigger the user's future interaction with the website, but also make them feel apart of the community. However, among the features to be added, we cannot overlook the point of how we would guarantee the privacy and security of the users. It is essential that we strictly follow the norms of the laws that are in operation or that come into effect with the need to know the users. In the long term, the introduction of these factors will not only bring services of a higher quality to the user, but it will also result in the platform being in the top rank.

Chapter 8

PLAGIARISM REPORT

Figure 8.1: **Plagiarism Report**

Chapter 9

Source Code

```
    import pandas as pd
from sqlalchemy import create_engine

# Function to load the CSV data
def load_data(file_name):
    data = pd.read_csv(file_name)
    return data

# Function to clean the data (if needed)
def clean_data(data):
    data['Date'] = pd.to_datetime(data['Date'])  # Convert Date to datetime
    return data

# Function to perform sales calculations
def calculate_sales_insight(data):
    total_sales = data['Sales'].sum()
    total_cost = data['Cost'].sum()
    total_profit = total_sales - total_cost
    return total_sales, total_cost, total_profit

# Function to save the processed data to a SQL database
def save_data(data, db_string, table_name):
    engine = create_engine(db_string)
    data.to_sql(table_name, engine, if_exists='replace', index=False)

# Main function to run the ETL process
def main():
    # Load the data
    data = load_data('sales_data.csv')

    # Clean the data
    data = clean_data(data)

    # Calculate sales insights
    total_sales, total_cost, total_profit = calculate_sales_insight(data)
    print(f"Total Sales: {total_sales}")
    print(f"Total Cost: {total_cost}")
    print(f"Total Profit: {total_profit}")

    # Save the cleaned data to a database
    save_data(data, 'sqlite:///sales_insight.db', 'sales')
```

```
42
43 if __name__ == "__main__":
44     main()
```

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