A
Project Report
On
"Store Sales Analytics"

(IT447 - Software Project Major)

Prepared by
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Under the Supervision of
Prof. Chintal Raval

Submitted to

Charotar University of Science & Technology (CHARUSAT)
for the Partial Fulfillment of the Requirements for the
Degree of Bachelor of Technology (B.Tech.)
in Information Technology (IT)
for 8th semester B. Tech

Submitted at

Accredited with Grade A+ by NAAC

DEPARTMENT OF INFORMATION TECHNOLOGY
Devang Patel Institute of Advance Technology and Research (DEPSTAR)
Faculty of Technology & Engineering (FTE), CHARUSAT
At: Changa, Dist: Anand, Pin: 388421.
MAY, 2024

DECLARATION BY THE CANDIDATE

I hereby declare that the project report entitled "**Store Sales Analytics**" submitted by me to Devang Patel Institute of Advance Technology and Research, Changa in partial fulfilment of the requirement for the award of the degree of **B.Tech** in Information Technology, from Department of Information Technology, DEPSTAR-FTE, CHARUSAT, is a record of bonafide IT447 Software Project Major (project work) carried out by me under the guidance of Prof. Chintal Raval. I further declare that the work carried out and documented in this project report has not been submitted anywhere else either in part or in full and it is the original work, for the award of any other degree or diploma in this institute or any other institute or university.

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COMPANY CERTIFICATE

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Accredited with Grade A+ by NAAC
Accredited with Grade A by KCG

CERTIFICATE

This is to certify that the report entitled "**Store Sales Analytics**" is a bonafide work carried out by **Malav Patel (20DIT059)** under the guidance and supervision of **Prof. Chintal Raval** & **Mr. Karandeep Singh Grover** for the subject **Software Project Major (IT447)** of 8th Semester of Bachelor of Technology in **Information Technology** at Devang Patel Institute of Advance Technology and Research (DEPSTAR), Faculty of Technology & Engineering (FTE) – CHARUSAT, Gujarat.

To the best of my knowledge and belief, this work embodies the work of candidate himself, has duly been completed, and fulfills the requirement of the ordinance relating to the B.Tech. Degree of the University and is up to the standard in respect of content, presentation, and language for being referred by the examiner(s).

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ABSTRACT

The "Store Sales Analytics" project aims to provide comprehensive insights into the performance and behaviour of retail stores across different cities in the US, focusing on sales transactions and other pertinent master data. Leveraging tools such as SQL for data processing and Power BI for visualization, the project endeavours to empower sales managers with actionable insights to optimize store operations and enhance customer satisfaction. The project encompasses various phases, starting from requirements gathering and data modelling to dashboard design, implementation, and verification. Through iterative development and meticulous testing, the dashboard is tailored to meet the needs of new clients, ensuring simplicity, usability, and effectiveness in driving data-driven decision-making. Key features of the dashboard include interactive visualizations, such as charts, graphs, and tables, enabling users to explore sales performance, customer behaviour, product insights, and employee metrics. The dashboard's intuitive interface and user-friendly design facilitate seamless navigation and personalized data exploration, catering to users' diverse needs and preferences. Validation processes, including SQL query verification and screenshot comparisons, are employed to ensure the accuracy, reliability, and consistency of the dashboard data. By adhering to rigorous testing methodologies, stakeholders can have confidence in the integrity of the insights derived from the dashboard, empowering them to make informed decisions and drive business success. In conclusion, the "Store Sales Analytics" project serves as a valuable tool for sales managers, providing them with actionable insights to optimize store performance, enhance customer satisfaction, and achieve business objectives. Through continuous refinement and improvement, the dashboard remains a dynamic and indispensable asset for driving organizational growth and competitiveness in the retail industry.

ACKNOWLEDGEMENT

It is truly a pleasure to express my thanks and gratitude to everyone who has helped me throughout the process of making this project. This project gave me a great opportunity to think, implement and interact with different aspects of the software development lifecycle. I would like to thank everyone who has helped me at one time or another by providing the support, encouragement, and foundation needed to carry out the project throughout the internship.

I express my deep gratitude to our External Guide, **Mr. Karandeep Singh Grover** and Internal Project Guide, **Prof. Chintal Raval** for their innovative ideas and efforts. Their seriousness to make my project successful. It was their sincerity that inspired me throughout the project to work hard using technologies adopted by the industry.

I am sincerely grateful to Professor **Dr. Amit Nayak** (HOD-IT) for his unconditional and objective support throughout the research and development process. All of which provide me with a supportive environment. Without them, I would not have achieved my goal. I thank the manager of **AtliQ Technologies** for giving us the opportunity to work at.

The combination of gratitude, joy and great satisfaction is what I feel like passing my debt on to all those who have contributed directly or indirectly to the implementation of the project.

With Sincere Regards

Malav Patel

(20DIT059)

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CHAPTER 1: INTRODUCTION

1.1 Project Summary:

This project is all about understanding how well stores are doing by looking at their sales data. We will use special tools like SQL and PowerBi to help us with this task. The main idea is to give useful information to the people who manage the stores, so they can make good decisions. We want to help them make the stores better and keep customers happy. By analyzing sales data, we can find patterns and trends that might not be obvious at first glance. This can help store managers see what is working well and what needs improvement.

1.2 Purpose:

The purpose of this project is to give store managers more insights into their sales. We want to help them understand things like which products are popular, when customers tend to buy more, and how much money the stores are making. With this information, managers can make better decisions to improve the stores' performance. For example, if they see that certain products sell well at specific times, they can make sure those products are always in stock during those times.

1.3 Objectives:

Our main goal is to dig deep into the sales data to find valuable information. We want to answer questions like: How much are the stores selling each month? Which products are the most profitable? Are there any patterns in customer behaviour that we can identify? By answering these questions, we can help managers make data-driven decisions to optimize their stores. This means they can focus on what is working and make changes where needed to boost sales and customer satisfaction.

1.4 Scope:

This project covers a wide range of tasks related to analysing sales data. We will look at things like sales trends over time, customer preferences, and employee performance. We will also examine different aspects of the sales process, such as how promotions affect sales and which stores perform best. Our analysis will be comprehensive, covering various angles to provide a complete picture of store performance. By presenting the findings in easy-to-understand charts and graphs using PowerBi, we aim to make it simple for managers to interpret the data and take action to improve their stores.

CHAPTER 2: SYSTEM

2.1 System Requirement Specification

2.1.1 Functional Requirements

Functional requirements define the specific features and capabilities that the " Store Sales Analytics" dashboard must possess to fulfil its purpose effectively. These requirements outline the actions that users can perform and the system's responses.

Here are detailed explanations of some key functional requirements:

1. **Data Integration and Processing:**
   - The system shall integrate data from various sources including sales transactions, customer information, product inventory, and employee data.
   - It shall process the integrated data to perform tasks such as data cleaning, transformation, and aggregation

2. **Dashboard Development:**
   - The system shall develop interactive dashboards to visualize sales performance, customer behaviour, product insights, and employee metrics.
   - Dashboards shall include visualizations such as bar charts, line charts, pie charts, and tables to represent key metrics and trends.

3. **User Authentication and Authorization:**
   - The system shall provide user authentication to ensure secure access to the dashboards.
   - It shall implement role-based access control to restrict dashboard access based on user roles and permissions.

4. **Data Exploration and Analysis:**
   - The system shall enable users to explore data through interactive features such as filters, slicers, and drill-down functionality

- Users shall be able to perform ad-hoc analysis to derive insights and make data-driven decisions.

2.1.2 Non-Functional Requirements

Non-functional requirements define the qualities that the dashboard must possess to ensure its effectiveness, security, and performance. They outline how the system should behave and its attributes.

Here are detailed explanations of some key non-functional requirements:

1. **Performance:**
   - The system shall provide responsive performance, with dashboards loading within acceptable timeframes even when handling large datasets.
   - It shall support concurrent user access without significant degradation in performance.

2. **Scalability:**
   - The system shall be scalable to accommodate future growth in data volume and user base.
   - It shall support scalability through efficient data storage, processing, and visualization techniques.

3. **Usability:**
   - The system shall be intuitive and user-friendly, with a clean and organized interface.
   - It shall provide clear instructions and guidance to users for effective navigation and interaction with the dashboards.

4. **Security:**
   - The system shall ensure data security and confidentiality, with mechanisms in place to prevent unauthorized access and data breaches.
   - It shall comply with relevant data protection regulations and industry best practices for security.

CHAPTER 3: SYSTEM DESIGN AND PLANNING

3.1 Hardware and software requirement

Hardware Specification:

- 16 GB RAM
- 100 GB Storage

Software Specification:

- Database: MySQL Workbench 8.0 CE
- Dashboard: PowerBi
- Report: Microsoft Word

3.2 System Flow Chart

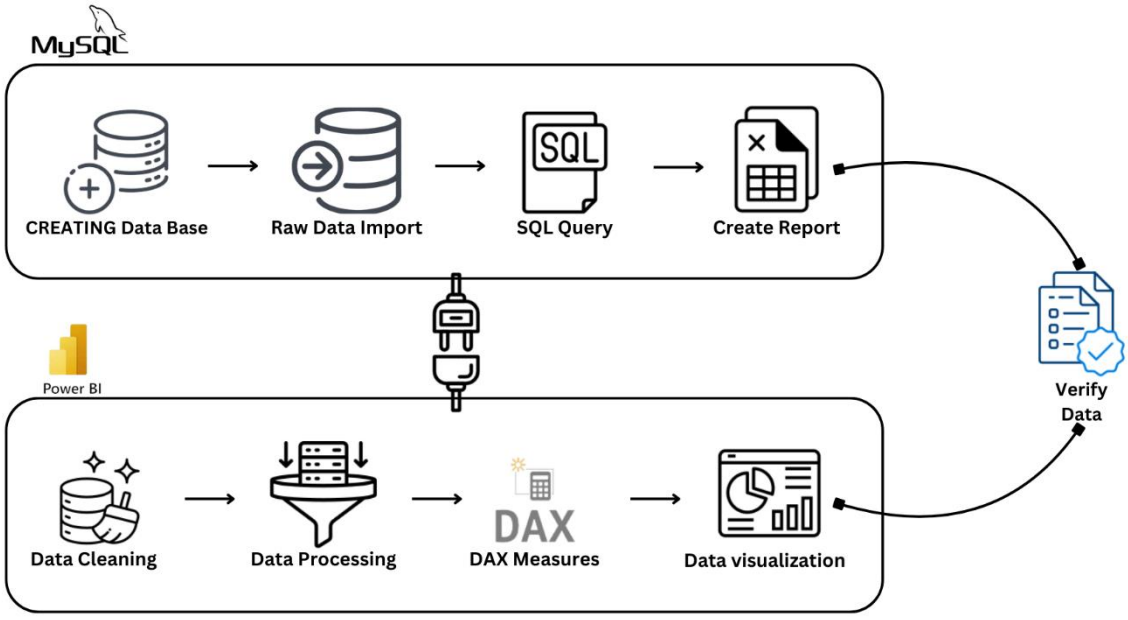


Fig 3.1: System Flow Chart

CHAPTER 4: FOUNDATIONS OF DASHBOARD DEVELOPMENT FOR NEW CLIENTS

4.1 Understanding Client's Needs:

As the client is new to dashboard usage, it is crucial to have detailed discussions to understand their requirements and expectations. This involves gathering information about their business goals, key performance indicators (KPIs), and specific metrics they want to track. By actively listening to their needs, we ensure that the dashboard meets their objectives effectively.

4.2 Identifying Key Metrics:

Once we grasp the client's objectives, we identify the essential metrics and insights they need to monitor their stores effectively. This may include metrics such as total sales, profit margins, inventory levels, customer demographics, and sales performance by product category or location. By focusing on these key metrics, we ensure that the dashboard provides actionable insights relevant to the client's business operations.

4.3 Designing User-Friendly Interface:

Since the client is new to dashboard usage, it is essential to design a user-friendly interface that is intuitive and easy to navigate. This involves organizing the dashboard layout logically, with clear labels and intuitive navigation elements. By prioritizing simplicity and ease of use, we ensure that the client can quickly access the information they need without any confusion.

4.4 Implementing Basic Visualizations:

For new clients, we prioritize the inclusion of basic visualizations that provide clear and straightforward insights into their store performance. This may include simple charts such as bar charts, line charts, and pie charts, which effectively communicate key metrics and trends briefly. By

keeping the visualizations simple and easy to interpret, we ensure that the client can understand the information presented without any prior dashboard experience.

4.5 Incorporating Interactive Elements:

Although the client may be new to dashboards, we still incorporate basic interactive elements to enhance their user experience. This may include filters, slicers, and drill-down functionality that allow the client to explore the data and customize the dashboard to their specific needs. By providing basic interactivity, we empower the client to engage with the data and derive actionable insights tailored to their requirements

CHAPTER 5: IMPLEMENTATION

5.1 Initial Assessment and Skill Evaluation:

I started by taking a big test to see how well I know SQL and Python. This test was like a big quiz with lots of questions. It helped me understand where I am good and where I need to improve. In the test, I had to do things like writing programs in Python and asking for information from a database using SQL. By doing this test, I could see how much I know about these languages and what I need to learn more about. It is like taking a big step back to see the whole picture of what I know and what I need to work on. This helped me plan my learning better and focus on the things I need to improve. It is like checking my skills before starting something big, so I know where I stand and what I need to do next. This way, I can make sure I am ready for the project and have all the skills I need to do a good job.

5.2 SQL Revision and Practice:

After the test, I went back to the basics of SQL. This means I revisited the starting points, the simple stuff, to make sure I understood everything well. I focused on four main things: creating new data (like making new entries in a database), reading data (like getting information from a database), updating data (like changing existing information in a database), and deleting data (like removing information from a database). These are the essential actions we do with data in a database, and it is important to know how to do each of them properly.

Additionally, I spent time learning about joins. Joins are like puzzle pieces; they help us put different parts of information together. For example, if we have data about customers in one table and data about their orders in another table, we can use joins to connect them and see which customers made which orders. This helps us understand our data better and find connections between different pieces of information.

Lastly, I practiced writing stored procedures. Stored procedures are like ready-made commands that we can use whenever we need to do a specific task in a database. Instead of writing out the same commands every time, we can save them as stored procedures and just use them whenever we need

to. This makes things quicker and more efficient, especially for tasks we do often. So, by revisiting these basics and practicing these key concepts, I strengthened my foundation in SQL and prepared myself for more advanced tasks in the project.

5.3 Python Revision and Practice:

Next, I focused on refreshing my understanding of Python, starting from the very beginning. I revisited all the fundamental concepts, like understanding different types of data and how to work with them. For example, I reviewed how to work with numbers, text, and lists of items. I also practiced using variables to store and manipulate data, which are like containers that hold information.

Moreover, I spent time going over loops, which are like repetitive tasks that the computer can do for us. I learned about different types of loops, like "for" loops and "while" loops, and how to use them to repeat actions multiple times. This is handy when we want the computer to do something repeatedly without us having to write out every step each time.

Additionally, I revisited conditionals, which are like decision-making tools for the computer. I learned how to use "if" statements to tell the computer what to do based on certain conditions. This is useful for making programs that can adapt and respond to different situations.

Furthermore, I practiced error handling, which is how we deal with mistakes that might happen in our programs. I learned about different types of errors and how to write code that can handle them gracefully, without crashing the whole program. This ensures that our programs can run smoothly even if something unexpected happens.

By revisiting these fundamental concepts and practicing them in Python, I strengthened my understanding of the language and prepared myself for more advanced topics and challenges in the project ahead.

5.4 Learning Flask Technology:

After refreshing my knowledge of Python, I embarked on learning Flask technology from the ground up. Flask is a web framework written in Python, used for building web applications. To start, I delved into understanding the basics of web development and how Flask fits into this ecosystem. I learned about the client-server architecture, where the client (like a web browser) interacts with the server (where our Flask application runs) to exchange information.

Additionally, I explored Flask's routing mechanisms, which are like road signs that help direct web traffic to different parts of our application. I understood how to map URLs to specific functions in our Flask application, allowing users to access different pages or features.

Furthermore, I delved into Flask's templating system, which enables us to create dynamic HTML pages by inserting data into pre-defined templates. I learned how to use Jinja2, Flask's default templating engine, to generate HTML content dynamically based on data from our Python code.

Moreover, I studied how Flask handles user requests and responses. I grasped the concept of HTTP methods like GET and POST, which are used for sending and receiving data between the client and server. I also learned about request and response objects in Flask, which allow us to access and manipulate incoming requests and outgoing responses.

Throughout this learning process, I practiced building simple web applications using Flask, gradually increasing the complexity of my projects. By the end, I felt confident in my ability to develop Flask-based solutions for assigned tasks and projects, equipped with the knowledge and skills needed to tackle web development challenges effectively.

5.5 Introduction to Power BI Concepts:

I dedicated time to grasp basic concepts of Power BI, a powerful tool for creating interactive reports and dashboards. I delved into understanding fundamental functionalities such as slicers, bookmarks, and drill-through. Slicers act like filters, allowing users to interactively slice and dice data to focus on specific subsets. Bookmarks enable saving different views or states of a report for easy navigation, while drill-through functionality allows users to explore detailed data from summarized views.
Moreover, I explored Power BI's capabilities in data visualization, learning about various chart types like bar charts, line charts, and pie charts. Each chart type serves a specific purpose in visualizing data, whether it is showing trends over time, comparing categories, or illustrating proportions.

Additionally, I practiced using Power BI Desktop, the application for building and editing reports and dashboards. I familiarized myself with its user interface, tools, and functionalities, gaining hands-on experience in creating and customizing visualizations.

Furthermore, I delved into Power BI's data modeling capabilities, understanding concepts such as relationships between tables, calculated columns, and measures. Data modeling is crucial for organizing and structuring data in a way that enables efficient analysis and visualization.

Throughout this learning journey, I worked on practical exercises and projects to reinforce my understanding of Power BI concepts. By the end, I felt confident in my ability to apply these concepts to create informative and visually appealing reports and dashboards that provide valuable insights to stakeholders.

5.6 Understanding Business Concepts:

In addition to technical skills, I dedicated time to understanding essential business concepts critical for effective data analysis. These concepts included Inventory turnover, Sales, and Revenue. Inventory turnover refers to how quickly a company sells its goods within a specific period, indicating the efficiency of managing inventory levels. Understanding sales metrics, such as total

sales revenue and sales growth rate, provided insights into a company's financial performance and market trends. Revenue, the income generated from selling goods or services, is a key indicator of a company's financial health and profitability.

By learning these business concepts, I gained a deeper understanding of the context in which data analysis takes place. This understanding allowed me to interpret data more accurately and derive meaningful insights to support decision-making processes. For instance, analyzing inventory turnover rates could help identify slow-moving products and optimize inventory management strategies. Similarly, analyzing sales and revenue data could uncover patterns and trends that drive business growth and identify areas for improvement.

Moreover, understanding these concepts enabled me to communicate effectively with stakeholders, including business leaders and decision-makers. By speaking the language of business and understanding their priorities and challenges, I could tailor data analysis and insights to address their specific needs and objectives. Overall, integrating business knowledge with technical skills enhanced the value of my data analysis efforts and contributed to more informed decision-making within the organization.

5.7 Project Familiarization and Research:

Before delving into the project, I embarked on a comprehensive research journey to ensure a thorough understanding of the project's details and requirements. This involved immersing myself in related literature, case studies, and industry best practices. By studying similar projects and real-world examples, I gained insights into successful approaches and potential challenges.

Additionally, I conducted in-depth research into relevant tools, technologies, and methodologies. This included exploring the latest advancements in data analysis, visualization techniques, and project management methodologies. By staying updated on the latest trends and innovations, I aimed to leverage cutting-edge tools and techniques to enhance the project's outcomes.

Moreover, I sought to understand the project's objectives, scope, and stakeholders' expectations. This involved engaging in discussions with project managers, team members, and stakeholders to

clarify requirements and gather insights. Through active communication and collaboration, I ensured alignment with project goals and established a clear roadmap for execution.

Furthermore, I examined the available data sources and conducted preliminary data exploration to assess data quality and feasibility. This step helped identify potential challenges and opportunities related to data acquisition, preparation, and analysis.

By conducting thorough research, I equipped myself with the knowledge and insights needed to approach the project effectively. This foundational understanding laid the groundwork for successful project execution and informed decision-making throughout the project lifecycle.

5.8 Single-Page Dashboard Creation:

As part of my preparation for the project, I engaged in practical exercises by creating a single-page dashboard. This hands-on activity allowed me to apply the knowledge and skills acquired during my learning journey in a real-world scenario.

I focused on designing a dashboard that effectively presented key insights and metrics relevant to the project's objectives. This included selecting appropriate visualizations, such as charts, graphs, and tables, to showcase data in a clear and concise manner. I paid attention to the layout and organization of the dashboard to ensure ease of navigation and readability for end-users.

Moreover, I practiced incorporating interactive elements into the dashboard to enhance user engagement and interactivity. This included adding filters, slicers, and drill-down capabilities to allow users to explore the data and gain deeper insights.

Additionally, I paid attention to the aesthetic aspect of the dashboard, ensuring that it was visually appealing and aligned with best practices in data visualization. I experimented with color schemes, fonts, and styling to create a professional-looking dashboard that captured the attention of stakeholders.

Throughout the process, I iteratively refined the dashboard based on feedback and insights gained from testing and evaluation. This iterative approach allowed me to continuously improve the dashboard's effectiveness and relevance to the project's objectives.

By completing this exercise, I gained practical experience in dashboard design and development, preparing me for more complex tasks and projects in the future.

5.9 Developing DAX Formulas:

To enhance my proficiency in Power BI, I delved into the development of Data Analysis Expressions (DAX) formulas tailored to specific tasks required for the project. DAX is a powerful formula language used in Power BI for creating calculated columns, measures, and tables to perform complex calculations and analysis on data.

I focused on understanding the syntax and functionality of DAX functions, which enable me to perform various calculations and manipulations on the data. For example, I learned how to use functions like SUM, AVERAGE, and CALCULATE to aggregate and summarize data, as well as functions like RELATED and FILTER to establish relationships and apply filters to data tables.

Additionally, I practiced creating calculated columns and measures using DAX to derive new insights and metrics from the raw data. This involved defining calculations for key performance indicators (KPIs) such as sales growth rate, profitability ratios, and inventory turnover.

Furthermore, I explored advanced DAX concepts such as time intelligence functions, which enable me to perform calculations based on time-related data such as year-over-year comparisons and moving averages. This allowed me to analyze trends and patterns in the data over different time periods.

By developing proficiency in DAX formulas, I enhanced my ability to perform sophisticated analysis and derive meaningful insights from the data, contributing to the effectiveness of the Power BI solutions developed for the project.

5.10 SQL Queries for DAX Measure Verification:

After implementing DAX formulas in Power BI, I undertook the crucial task of validating the results obtained from these formulas by comparing them with the data retrieved directly from SQL

queries. This validation process was essential to ensure the accuracy and reliability of the insights presented in the Power BI reports and dashboards.

I carefully crafted SQL queries tailored to match the logic and calculations performed by the DAX measures. This involved replicating the same aggregations, filters, and transformations applied in Power BI to the underlying database tables.

5.11 Power BI Design Practice:

I dedicated time to practicing Power BI report and dashboard design to refine my visualization skills and create compelling data presentations. This involved experimenting with various design elements, layouts, and interactive features to develop visually appealing and informative reports.

I focused on selecting appropriate chart types, such as bar charts, line charts, and pie charts, to effectively communicate different types of data insights. Each chart type was chosen based on the nature of the data and the message it aimed to convey.

Moreover, I paid close attention to the layout and organization of the reports and dashboards to ensure clarity and ease of understanding for end-users. This included arranging visualizations in a logical sequence, providing clear labels and annotations, and minimizing clutter to maintain focus on key insights.

Additionally, I incorporated interactive elements such as slicers, filters, and drill-through functionality to empower users to explore the data and uncover deeper insights. These interactive features enhanced user engagement and facilitated a more immersive data exploration experience.

Furthermore, I leveraged best practices in data visualization, such as using consistent color schemes, employing appropriate fonts and text styles, and optimizing chart sizes and proportions. By adhering to these principles, I ensured that the reports and dashboards were not only visually appealing but also effectively communicated the intended message.

5.12 Data Loading into Power BI:

With a solid understanding of the project requirements and data sources, I proceeded to load the relevant data into Power BI for analysis and visualization. This involved connecting to various data sources such as databases, spreadsheets, and cloud services, and importing the necessary data tables into Power BI Desktop.
I carefully mapped the relationships between different data tables to establish connections and ensure the integrity of the data model. This step was crucial for creating meaningful relationships between related data tables and enabling efficient analysis across multiple datasets.

Moreover, I implemented data transformation and cleaning processes using Power Query to ensure that the imported data was accurate, consistent, and formatted correctly for analysis. This involved tasks such as removing duplicates, handling missing values, and restructuring data to align with the desired data model.

Additionally, I optimized the data model for performance by creating calculated columns, measures, and hierarchies to facilitate efficient data analysis and visualization. This involved defining custom calculations and aggregations to derive key performance indicators (KPIs) and metrics relevant to the project objectives.

5.13 Data Cleaning and Transformation:

Following the data loading phase, I engaged in data cleaning and transformation activities using Power Query within Power BI. This phase involved refining the imported data to ensure its accuracy, consistency, and suitability for analysis and visualization.

I began by assessing the quality of the imported data, identifying any inconsistencies, errors, or missing values that needed to be addressed. This involved performing exploratory data analysis to gain insights into the structure and characteristics of the data.

Next, I implemented data cleaning procedures to address any identified issues, such as removing duplicates, correcting errors, and standardizing formats. This ensured that the data was consistent and reliable for analysis.

Additionally, I conducted data transformation tasks to reshape and restructure the data as needed to align with the desired data model and reporting requirements. This involved tasks such as splitting columns, merging tables, and creating calculated columns to derive new insights from the data.

By completing the data cleaning and transformation phase, I prepared the data for analysis and visualization, laying the groundwork for developing insightful Power BI reports and dashboards that would provide actionable insights to stakeholders.

5.14 Power BI Implementation:

With the data validated and insights confirmed, I proceeded with the implementation phase of the Power BI project. This involved leveraging the insights gained from the data analysis and visualization to develop comprehensive reports and dashboards that would effectively communicate key findings to stakeholders.

I utilized the Power BI Desktop application to design and build the reports and dashboards, leveraging its intuitive interface and robust features. This involved selecting appropriate visualizations, arranging them in a logical manner, and configuring interactive elements to enhance user engagement.

Furthermore, I focused on creating visually appealing and informative data visualizations that would effectively convey insights and trends hidden within the data. This included choosing the right chart types, colors, and formatting options to ensure clarity and readability.

Additionally, I paid close attention to the layout and organization of the reports and dashboards to ensure ease of navigation and comprehension for end-users. This involved structuring the content in a logical sequence, providing clear labels and annotations, and incorporating intuitive navigation elements such as buttons and links.

Moreover, I implemented advanced features such as drill-down capabilities, cross-filtering, and interactive slicers to empower users to explore the data and uncover deeper insights. These interactive elements enhanced the user experience and facilitated more meaningful data exploration and analysis.

By completing the implementation phase, I delivered comprehensive Power BI reports and dashboards that provided stakeholders with actionable insights and facilitated informed decision-making. These reports and dashboards served as valuable tools for monitoring performance, identifying opportunities, and driving business growth.

5.15 Data Verification:

Following the implementation of Power BI reports and dashboards, I conducted thorough data verification and validation processes to ensure the accuracy and reliability of the insights presented in the visualizations.

I compared the data displayed in Power BI with the original data stored in SQL databases, executing SQL queries to retrieve the same information used in the Power BI visualizations. This comparison allowed me to confirm that the data presented in Power BI accurately reflected the underlying data in the source systems.

Additionally, I verified the calculations, aggregations, and transformations applied in Power BI by cross-referencing them with the corresponding DAX formulas and SQL queries. This validation process ensured that the data manipulation performed in Power BI aligned with the defined logic and calculations.

CHAPTER 6: DASHBOARD PAGE OVERVIEW AND FUNCTIONALITY

6.1 Nav Bar:

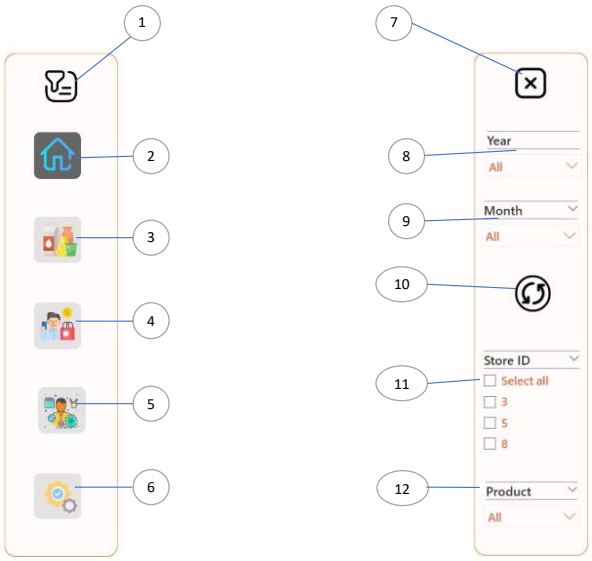


Fig 6.1: Nav Bar

6.1.1 Filter Button:

Description: The filter button serves to open the filter navigation bar, providing users with access to customizable filtering options.

6.1.2 Home Button:

Description: The Home page serves as the central hub for accessing key performance metrics and overall store performance summaries briefly.

6.1.3 Product Button:

Description: The Product page focuses on analyzing product-related metrics to optimize inventory management and product performance.

6.1.4 Customer Button:

Description: The Customer page provides insights into customer behavior and retention to enhance customer relationship management.

6.1.5 Employee Button:

Description: The Employee page focuses on analyzing employee performance metrics to optimize workforce management and productivity.

6.1.6 Operation Button:

Description: The Operation page provides insights into store operational performance to streamline operations and enhance efficiency.

6.1.7 Close Button:

Description: The Close button closes the filter navigation bar and reverts to the default navigation bar settings.

6.1.8 Year Filter:

Description: The year filter allows users to select a specific year to filter the data accordingly.

6.1.9 Month Filter:

Description: The month filter enables users to select specific months or a range of months to filter the data, allowing for detailed analysis and comparison within the chosen time frame.

6.1.10 Reset Button:

Description: The Reset button clears all applied filters, reverting the data display to its default state, ensuring a clean slate for new analyses.

6.1.11 Store Filter:

Description: The Store Filter allows users to select specific store locations or a range of stores to filter the data, enabling focused analysis and comparison across different store locations.

6.1.12 Product Filter:

Description: The Product Filter empowers users to select specific products or a range of products to filter the data, facilitating targeted analysis and comparison of product performance within the dataset.

6.2 Home Page:

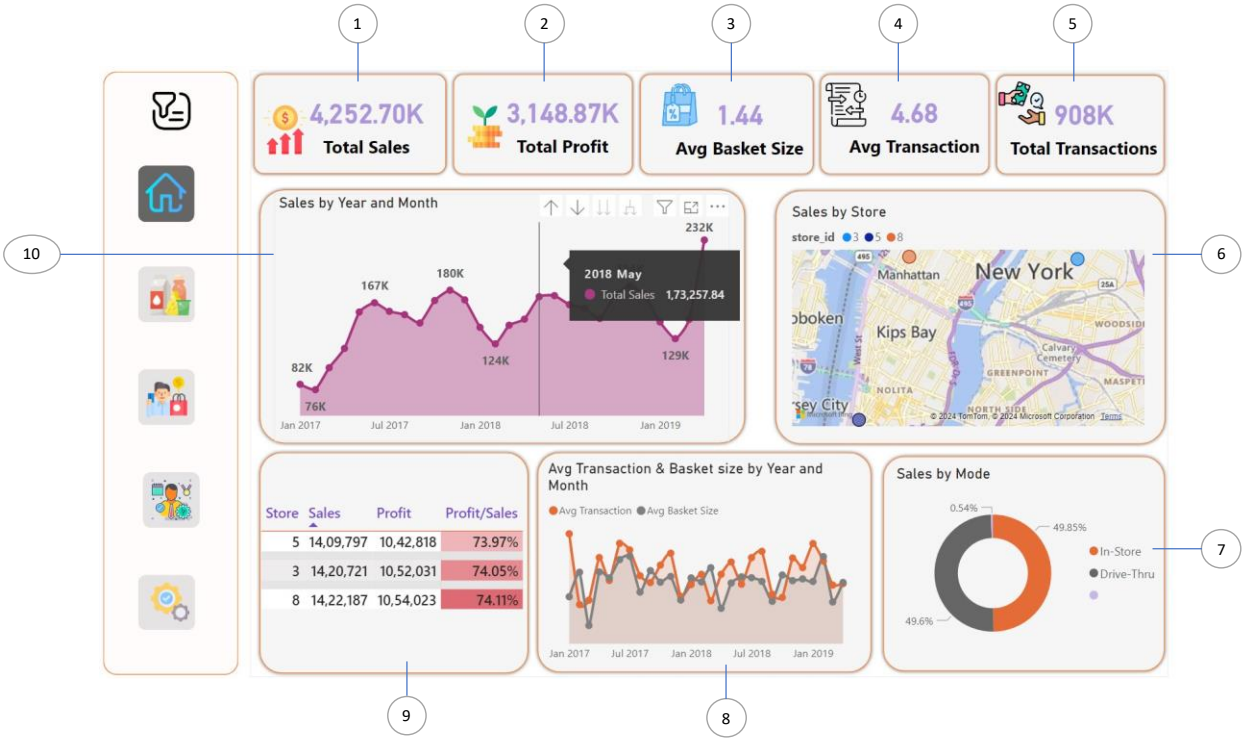


Fig 6.2: Home Page

6.2.1 Total Sales:

Description: Displays the total sales revenue generated across all stores.

6.2.2 Total Profit:

Description: Shows the total profit generated from sales transactions after accounting for costs.

6.2.3 Average Basket Size:

Description: Indicates the average number of items purchased per transaction, providing insights into customer buying behavior.

6.2.4 Average Transaction Value:

Description: Represents the average value of each sales transaction, indicating the typical purchase size.

6.2.5 Total Transactions:

Description: Displays the total number of sales transactions processed during the specified period.

6.2.6 Sales by Store:

Data Representation: Each store location represented on the map

Visualization Type: Map

Color Gradient: Shades of color representing sales performance (e.g., darker shades for higher sales, lighter shades for lower sales)

Description: This map visualization provides a geographical representation of sales performance across different store locations. Each store is marked on the map, and the color gradient indicates the level of sales achieved by each store. It offers a quick and intuitive understanding of sales distribution and highlights high-performing and low-performing stores for further analysis and strategic decision-making.

6.2.7 Sales by Mode (In-store vs. Drive-Thru):

Data Representation: Distribution of sales between in-store and drive-thru modes

Visualization Type: Pie Chart

Description: This pie chart illustrates the proportion of sales attributed to in-store transactions compared to drive-thru transactions. It provides a visual breakdown of sales distribution between the two modes, allowing for quick and easy comparison. By analyzing the percentage of sales

generated through each mode, stakeholders can gain insights into customer preferences and optimize operational strategies to meet demand effectively.

6.2.8 Average Transaction Value and Basket Size by Year and Month:

X-axis: Month and Year (from the calendar table)

Y-axis: Average Transaction Value and Average Basket Size (dual Y-axis)

Visualization Type: Line Chart

Description: This line chart visualizes the trends of average transaction value and average basket size over time, broken down by month and year. It allows for the identification of patterns and fluctuations in customer spending behavior, providing insights into changes in purchasing patterns and overall sales performance. By analyzing both metrics simultaneously, stakeholders can gain a comprehensive understanding of transaction dynamics and make informed decisions to optimize sales strategies.

6.2.9 Store Sales, Profit, and Profit Margin:

Columns:

Store: ID of each store
Sales: Total sales revenue generated by each store
Profit: Total profit generated by each store
Profit Margin (%): Percentage of profit relative to sales for each store

Visualization Type: Table

Description: This table provides a comprehensive overview of sales and profitability metrics for each store in the chain. It displays the total sales revenue, total profit, and profit margin percentage for each store, allowing stakeholders to compare performance across different locations. By analyzing these metrics, stakeholders can identify high-performing stores, assess profitability, and make strategic decisions to optimize sales and profitability across the entire chain.

6.2.10 Sales by Year and Month:

X-axis: Month and Year (from the calendar table)

Y-axis: Total Sales Amount

Visualization Type: Line Chart

Description: This line chart visualizes the trend of sales over time, broken down by month and year. It allows for the identification of seasonal patterns, trends, and fluctuations in sales performance, providing valuable insights for sales forecasting and strategic decision-making.

6.3 Product Page:

Fig 6.3: Product Page

6.3.1 Total Quantity Sold by Product Category:

Data Representation: Total quantity sold by product category

Visualization Type: Ribbon Chart

Description: This ribbon chart visualizes the total quantity of products sold within each product category. Each ribbon represents a product category, and the width of the ribbon corresponds to the total quantity sold. This visualization provides a clear comparison of sales performance across different product categories, allowing stakeholders to identify top-selling categories and analyze sales distribution effectively.

6.3.2 Bottom 5 Products by Sales:

Data Displayed: Product Name, Sales Amount

Visualization Type: Multi-Row Card

Description: This multi-row card displays the bottom 5 products ranked by sales amount. It provides a concise overview of the least performing products in terms of sales, allowing stakeholders to quickly identify underperforming items and take appropriate actions such as adjusting pricing, promotions, or marketing strategies.

6.3.3 Top 5 Products by Sales:

Data Displayed: Product Name, Sales Amount

Visualization Type: Multi-Row Card

Description: This multi-row card presents the top 5 products ranked by sales amount. It offers a concise summary of the best performing products in terms of sales, enabling stakeholders to quickly identify high-performing items and leverage their success to drive further sales or optimize inventory management strategies.

6.3.4 Product Category Sales, Profit, and Profit Margin:

Columns:

Product Category: Category names of each product category
Sales: Total sales revenue generated within each product category
Profit: Total profit generated within each product category
Profit Margin (%): Percentage of profit relative to sales for each product category

Visualization Type: Table

Description: This table provides an overview of sales and profitability metrics for each product category. It displays the total sales revenue, total profit, and profit margin percentage for each category, allowing stakeholders to assess the performance of different product categories. By

analyzing these metrics, stakeholders can identify high-profit categories, assess profitability, and make strategic decisions to optimize product assortment and marketing strategies.

6.3.5 Total Quantity Sold by Product:

Data Representation: Total quantity sold for each product

Visualization Type: Donut Chart

Description: This donut chart visualizes the distribution of total quantity sold across different products. Each segment of the donut represents a product, and the size of the segment corresponds to the total quantity sold. This visualization provides a clear comparison of sales performance across different products, allowing stakeholders to identify top-selling products and analyze sales distribution effectively.

6.4 Customer Page:

Fig 6.4: Customer Page

6.4.1 Month-wise Customer Retention Rate by Transaction Date:

X-axis: Transaction Date (from the calendar table)

Y-axis: Customer Retention Rate

Visualization Type: Line Chart

Description: This line chart visualizes the month-wise customer retention rate over time, based on transaction dates. It allows for the tracking of customer retention trends, indicating the percentage of customers retained from previous months. By analyzing customer retention rates over time, stakeholders can evaluate the effectiveness of customer retention strategies and identify opportunities to improve customer loyalty.

6.4.2 Customer Sales and Basket Size:

Columns:

Customer: Customer names or IDs

Total Sales: Total sales revenue generated by each customer

Basket Size: Average number of items purchased per transaction by each customer

Visualization Type: Table

Description: This table provides insights into customer sales behavior and transaction characteristics. It displays the total sales revenue generated by each customer along with their average basket size, indicating the typical size of their purchases. By analyzing these metrics, stakeholders can identify high-value customers, assess purchasing patterns, and tailor marketing strategies to enhance customer engagement and loyalty.

6.4.3 Sales by Gender:

Data Representation: Sales funnel segmented by gender

Visualization Type: Funnel Chart

Description: This funnel chart visualizes the sales process and conversion rates segmented by gender. It represents the progression of sales from the initial stage (e.g., total leads or customers) through various stages of the sales pipeline (e.g., inquiries, conversions) for each gender group. By analyzing the funnel, stakeholders can assess sales performance by gender, identify potential bottlenecks or areas for improvement, and optimize sales strategies to maximize conversion rates and revenue generation.

6.4.4 Average Basket Size by Gender:

Data Representation: Funnel segmented by gender

Visualization Type: Funnel Chart

Description: This funnel chart visualizes the average basket size for each gender group. It represents the progression of average basket size from the initial stage (e.g., total transactions) through various stages of the customer journey (e.g., product selection, checkout) for each gender. By analyzing the funnel, stakeholders can assess the purchasing behavior of different gender groups, identify potential differences or trends, and tailor marketing or product strategies accordingly to enhance customer engagement and satisfaction.

6.4.5 New Customers by Month and Year:

X-axis: Month and Year (from the calendar table)

Y-axis: Number of New Customers

Visualization Type: Line Chart

Description: This line chart visualizes the trend of new customers acquired over time, segmented by month and year. It allows for the tracking of customer growth and acquisition patterns, indicating the number of new customers added each month and year. By analyzing this chart, stakeholders can assess the effectiveness of marketing campaigns, identify seasonal trends in customer acquisition, and make informed decisions to drive customer growth and retention strategies.

6.5 Employee Page:

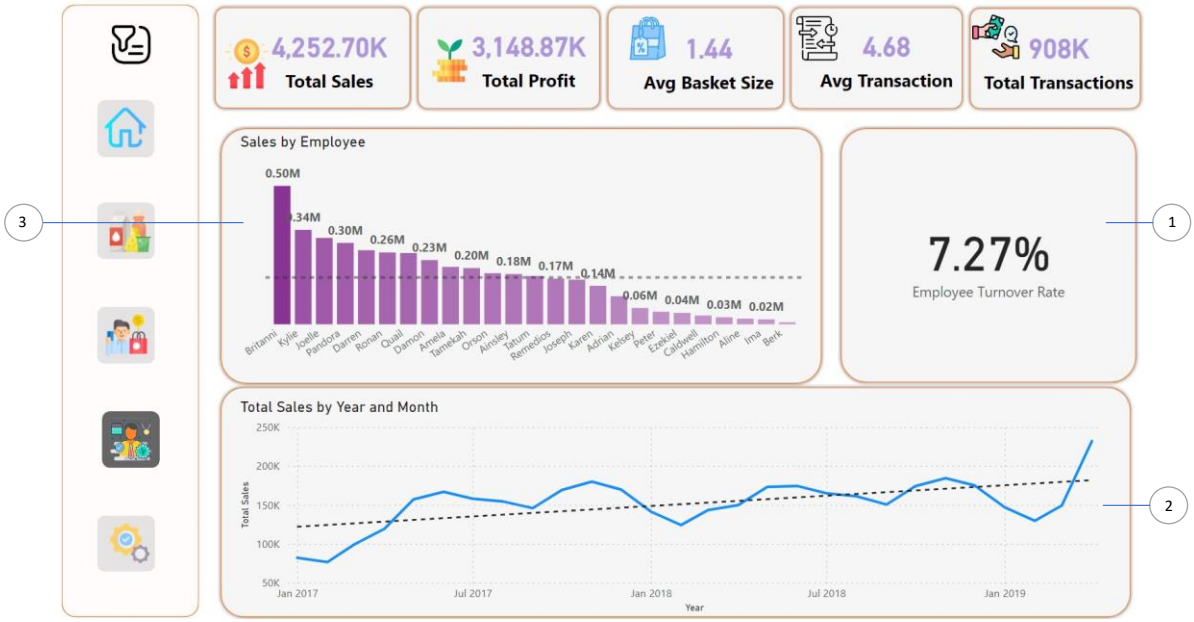


Fig 6.5: Employee Page

6.5.1 Employee Turnover Ratio:

Data Displayed: Employee Turnover Ratio

Visualization Type: Card

Description: This card visualization displays the employee turnover ratio, representing the percentage of employees who have left the organization within a specific time period. It provides a snapshot of employee attrition rates, allowing stakeholders to assess workforce stability and identify potential issues impacting employee retention. By monitoring the turnover ratio, stakeholders can implement strategies to improve employee satisfaction, reduce turnover, and enhance organizational performance.

6.5.2 Total Sales by Year and Month:

X-axis: Month and Year (from the calendar table)

Y-axis: Total Sales Amount

Visualization Type: Line Chart

Description: This line chart visualizes the trend of total sales over time, segmented by year and month. It allows employees to reference historical sales data to understand overall sales performance trends and patterns. By analyzing this chart, employees can identify peak sales periods, seasonal trends, and historical sales fluctuations, providing valuable context for performance evaluation and decision-making.

6.5.3 Sales by Employee:

X-axis: Employee Names or IDs

Y-axis: Total Sales Amount

Visualization Type: Column Chart

Description: This column chart visualizes the total sales generated by each employee. It provides a comparison of sales performance across different employees, allowing stakeholders to identify top-performing salespeople and recognize their contributions. By analyzing this chart, stakeholders can assess individual sales performance, identify areas for improvement, and implement targeted training or incentive programs to enhance overall sales productivity.

6.6 Operation Page:

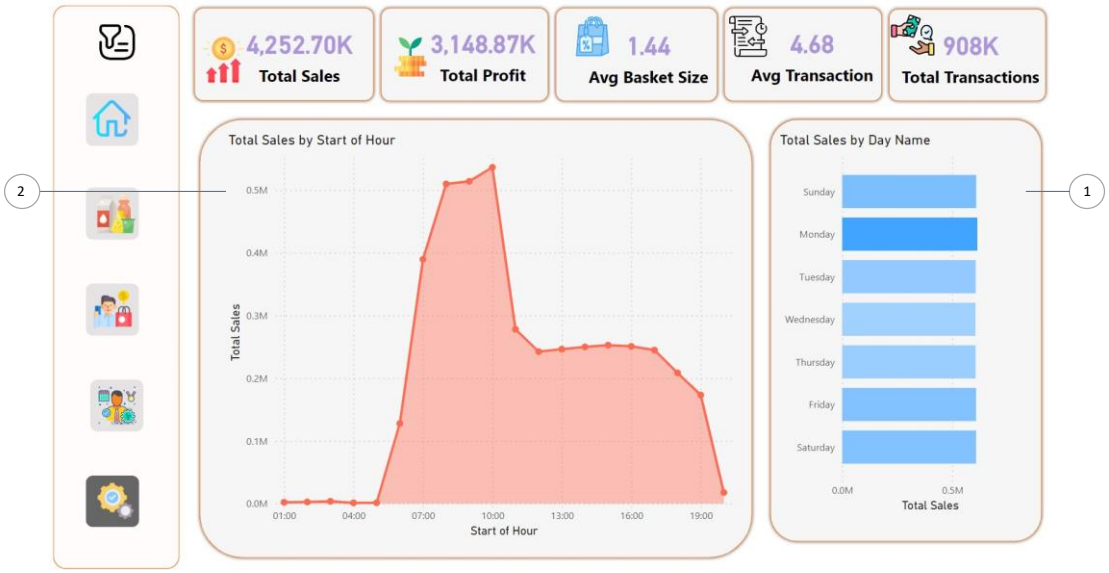


Fig 6.6: Operation Page

6.6.1 Total Sales by Weekday:

X-axis: Weekday (Monday, Tuesday, Wednesday, etc.)

Y-axis: Total Sales Amount

Visualization Type: Bar Chart

Description: This bar chart visualizes the total sales generated on each weekday. It provides a comparison of sales performance across different days of the week, allowing stakeholders to identify patterns and trends in sales activity. By analyzing this chart, stakeholders can determine which weekdays typically experience higher or lower sales volumes, helping to optimize staffing levels, promotions, and operational strategies accordingly.

6.6.2 Total Sales by Hours:

X-axis: Hours of the day (e.g., 00:00 to 23:00)

Y-axis: Total Sales Amount

Visualization Type: Area Chart

Description: This area chart visualizes the total sales generated during each hour of the day. It provides a comprehensive view of sales activity throughout the day, highlighting peak and off-peak sales hours. By analyzing this chart, stakeholders can identify patterns in sales activity, optimize staffing levels during peak hours, and implement targeted marketing or promotional activities to drive sales during slower periods

CHAPTER 7: TESTING AND VERIFICATION

7.1 SQL Queries Verification:

7.1.1 Execution of SQL Queries:

We execute SQL queries provided in the reference document to retrieve the same data used in the dashboard visualizations.

7.1.2 Comparison with Dashboard Data:

We compare the output of SQL queries with the corresponding data displayed on the dashboard, ensuring consistency in data representation and accuracy in calculations.

7.1.3 Validation of Aggregations and Transformations:

We validate the aggregations, calculations, and transformations applied in the dashboard using SQL queries, ensuring they align with the defined logic and produce accurate results.

7.2 Screenshot Comparison:

7.2.1 Capture of SQL Query Outputs:

We capture screenshots of the SQL query outputs, including relevant data tables and result sets, for comparison with the dashboard data.

7.2.2 Visual Comparison with Dashboard:

We visually compare the screenshots of SQL query outputs with the corresponding sections of the dashboard, focusing on data consistency, formatting, and visualization accuracy.

7.2.3 Identification of Discrepancies:

Any discrepancies or inconsistencies between the SQL query outputs and dashboard data are identified and documented for further investigation and resolution.

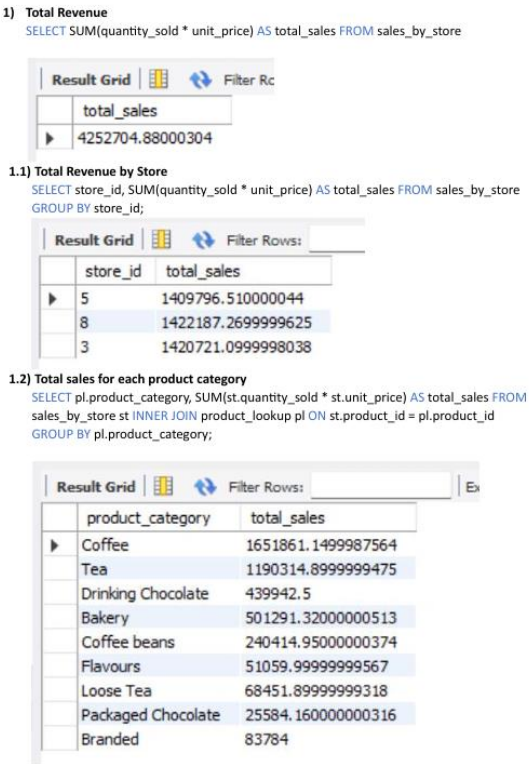
7.3 Functional Testing:

7.3.1 Dashboard Navigation Testing:

We test the dashboard navigation elements such as menus, buttons, and links to ensure they function as expected and facilitate seamless navigation.

7.3.2 Interactive Features Testing:

We validate the functionality of interactive elements such as filters, slicers, and drill-down options to ensure they enable users to explore the data effectively.



1) **Total Revenue**

```
SELECT SUM(quantity_sold * unit_price) AS total_sales FROM sales_by_store
```

Result Grid | Filter Rc

total_sales
4252704.88000304

1.1) **Total Revenue by Store**

```
SELECT store_id, SUM(quantity_sold * unit_price) AS total_sales FROM sales_by_store
GROUP BY store_id;
```

Result Grid | Filter Rows:

store_id	total_sales
5	1409796.510000044
8	1422187.2699999625
3	1420721.0999998038

1.2) **Total sales for each product category**

```
SELECT pl.product_category, SUM(st.quantity_sold * st.unit_price) AS total_sales FROM
sales_by_store st INNER JOIN product_lookup pl ON st.product_id = pl.product_id
GROUP BY pl.product_category;
```

Result Grid | Filter Rows: | Ex

product_category	total_sales
Coffee	1651861.1499987564
Tea	1190314.8999999475
Drinking Chocolate	439942.5
Bakery	501291.32000000513
Coffee beans	240414.95000000374
Flavours	51059.99999999567
Loose Tea	68451.89999999318
Packaged Chocolate	25584.160000000316
Branded	83784

Fig 7.1: Some Snapshot of SQL Query Documentation (Pg 1)

1.3) Total sales for each month

```
SELECT c.Month_Name, c.Year_ID, SUM(st.quantity_sold * st.unit_price) AS total_sales
FROM sales_by_store st INNER JOIN calendar c ON st.transaction_date = c.Transaction_Date
GROUP BY c.Month_Name, c.Year_ID ORDER BY c.Year_ID, c.Month_Name;
```

Result Grid | Filter Rows:

Month_Name	Year_ID	total_sales
April	2017	119309.01000000109
August	2017	154485.32000000397
December	2017	169884.92000000575
February	2017	76273.98999999958
January	2017	81845.08999999925
July	2017	157968.55000000485
June	2017	166899.7800000055
March	2017	99154.43
May	2017	157208.99000000456
November	2017	179999.30000000683
October	2017	169223.54000000574
September	2017	145821.1900000033
April	2018	149780.0800000037
August	2018	161108.6000000051

1.4) Total sales by month wise

```
SELECT c.Month_ID, SUM(st.quantity_sold * st.unit_price) AS total_sales FROM
sales_by_store st INNER JOIN calendar c ON st.transaction_date = c.Transaction_Date
GROUP BY c.Month_ID ORDER BY c.Month_ID;
```

Result Grid | Filter Rows:

Month_ID	total_sales
1	369993.32999999705
2	329778.480000001
3	392031.55999999767
4	501435.88999999315
5	330466.8300000057
6	341249.12000000355
7	322953.89000000845
8	315593.92000000866
9	296305.1300000104
10	343516.56000000343
11	364400.61000000045
12	344979.56000000477

Fig 7.2: Some Snapshot of SQL Query Documentation (Pg 2)

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