

## 1. Synopsis

Sales performance analysis is critical for businesses to understand their revenue trends, customer behavior, and market opportunities. Traditional sales reporting methods involve extensive spreadsheets and manual calculations, making it challenging to derive actionable insights quickly. Power BI, a robust business intelligence tool by Microsoft, enables businesses to visualize their sales data interactively, providing real-time insights for better decision-making.

This project aims to develop an interactive sales performance dashboard using Power BI. The dashboard will facilitate tracking of key sales metrics, trend analysis, and performance evaluation across different sales channels and regions. By leveraging Power BI's advanced data visualization capabilities, users can explore historical and real-time sales data in an intuitive manner.

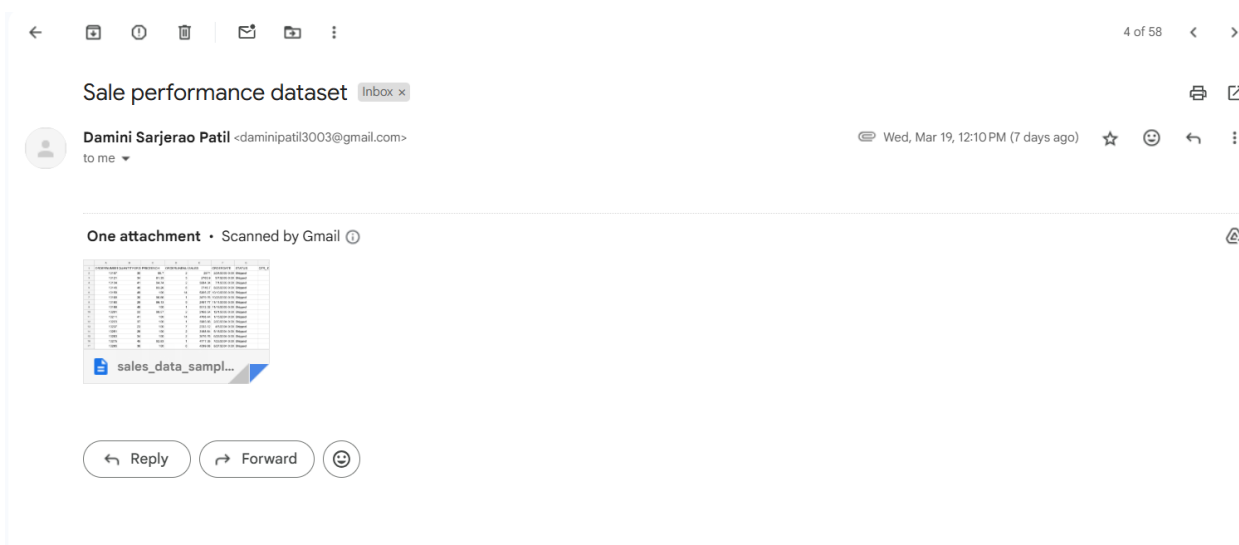
## Literature Survey

To explore the role of data analytics and visualization in business intelligence (BI) tools, especially Power BI. The article discusses how AI and ML algorithms are integrated into BI platforms to enhance sales forecasting, trend analysis, and decision-making. A paper is used to analyze the integration of machine learning models and data visualization in relation to best practices and real-world applications involving sales data and predictive analytics. [1]

This literature review explores the combination of business intelligence and predictive analytics, discussing various BI tools and tools like Power BI in the sales and customer data context. It focuses on predictive models and their visualization, including the use of AI/ML algorithms to predict sales trends. The methodologies and techniques related to data visualization and the importance of presenting predictive insights clearly to non-technical users within an organization are discussed [2].

### Dataset Source :

Dataset collected from LinkedIn



## Problem Statement

Design and develop an interactive sales performance dashboard using Power BI that enables businesses to track key sales metrics, analyze trends, and make informed decisions based on real-time data.

Sales data is one of the most valuable assets for businesses. However, most organizations fail to utilize it effectively due to challenges such as:

1. **Data Overload and Complexity:** Companies generate vast amounts of sales data from different sources without proper data visualization tools, deriving meaningful insights becomes overwhelming.
2. **Lack of Real-Time Analysis:** Traditional sales reports are static and often outdated by the time they are reviewed. This delay in analysis leads to missed opportunities and reactive decision-making instead of proactive strategy planning.
3. **Challenges in Identifying Key Performance Indicators (KPIs):** Without a structured approach, businesses struggle to track crucial KPIs such as revenue trends, customer acquisition costs, conversion rates, and regional sales performance.

- **Expected Outcomes**

- Improved sales performance tracking through interactive dashboards.
- Enhanced decision-making by visualizing sales trends and patterns.
- Identification of key performance indicators (KPIs) impacting revenue generation.

## Objectives

- To collect and analyze sales data from various sources.
- To create interactive visualizations using Power BI.
- To provide insights into sales trends, customer behavior, and regional performance.
- To develop predictive models for future sales forecasting.
- To enhance business decision-making through data-driven insights.

### For Ex.

Imagine you own a chain of ice cream shops in different cities. Imagine you own a chain of ice cream shops in different cities.

**Sales Trends** – Ice cream sales are highest in summer and drop in winter.

**Customer Behavior** – Kids love chocolate flavor, while adults prefer vanilla.

**Regional Performance** – More sales happen near beaches than in colder areas.

If Power BI shows that mango flavor is popular in one city but not in another, you can send more mango ice cream to that city.

## Software Requirement

### ○ Functional Requirements

- **Data Integration**

Connecting Power BI to data sources such as Excel.

- **Data Transformation**

Cleaning and structuring raw sales data for accurate analysis.

- **Dashboard Creation**

Developing visual dashboards to represent sales performance metrics.

- **Real-Time Analysis**

Implementing real-time data updates for up-to-date reporting.

### ○ Non-Functional Requirements

- **Performance**

Dashboards should load within 2-3 seconds for smooth user experience.

- **Scalability**

The system should handle increasing data volumes effectively.

- **Security**

Implementing data encryption and role-based access control.

- User Interface Requirement

- **Interactive Design**

- User-friendly interface with dynamic filtering.

- **Responsive Layout**

- Adaptable across desktop.

- Hardware And Software Requirement

- Hardware Requirements

- **Server**

- Multi-core processor.

- **RAM**

- Minimum of 8GB

- **Storage**

- 512 GB

- Software Requirements

- **Operating System**

Windows for server hosting.

- **Database**

We can collect data from LinkedIn in the form of **Excel Sheet**

- Performance Requirement

- Dashboards must load within 3 seconds.
- Queries should return results within 5 seconds.

## Methodology

This section outlines the methodology and planning for developing the Sales performance Visualization using Power BI. The proposed approach follows a structured phased development model, ensuring systematic data collection, processing, visualization, and user interaction.

### **Phase 1- Figure Out What We Need :**

- We will decide what questions we want to answer about sales.
- We will find all the sales data.
- We will plan how to set up Power BI.

### **Phase 2- Clean and Organize the Sales Data :**

- We will gather all the sales numbers.
- We will fix any mistakes or missing information.
- We will get the data ready for Power BI.

### **Phase 3- Connect the Data in Power BI :**

- We will link different sales data together in Power BI.
- We will make sure Power BI understands how the data relates .

### **Phase 4- Make Easy-to-See Pictures :**

- We will create charts and graphs in Power BI to show sales trends.
- We will make it interactive, so users can filter and drill down into the data.



**Phase 5- Check if It Works Right :**

- We will test the Power BI reports to make sure they're accurate.
- We will make sure they load quickly and work well.
- We will have some people try it out, and give us feedback.

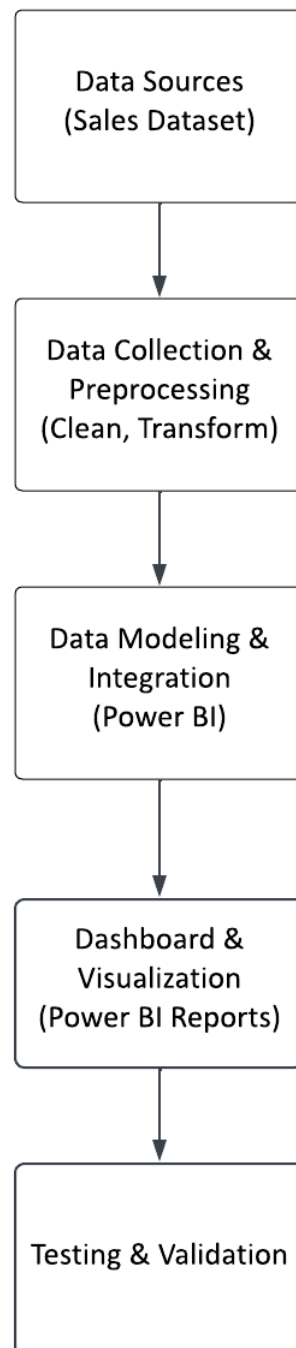
**Phase 6- Share It with Everyone :**

- We will put the Power BI reports online so everyone can see them.
- We will teach people how to use them.
- We will set up automatic alerts for important sales changes.

**Phase 7- Keep Making It Better :**

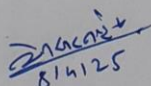
- We will add new features, like predicting future sales.
- We will keep the reports up-to-date and working well.

## Block Diagram



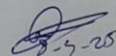
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1. Breiman, L. (2001). Random forests. Machine Learning, 45(1), 5-32. International Journal of Computer Science and Network Security, Vol. 15, Issue 9, Sep. 2015, pp. 222-234.
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3. <https://youtu.be/fZn83JRt4Nk?si=1W3C4Inp9oAu4ZfX> , accessed on 17/03/2025



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Project Coordinator:

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## 2. Introduction

Sales performance analysis is critical for businesses to understand their revenue trends, customer behavior, and market opportunities. Traditional sales reporting methods involve extensive spreadsheets and manual calculations, making it challenging to derive actionable insights quickly. Power BI, a robust business intelligence tool by Microsoft, enables businesses to visualize their sales data interactively, providing real-time insights for better decision-making.

This project aims to develop an interactive sales performance dashboard using Power BI. The dashboard will facilitate tracking of key sales metrics, trend analysis, and performance evaluation across different sales channels and regions. By leveraging Power BI's advanced data visualization capabilities, users can explore historical and real-time sales data in an intuitive manner.

### 2.1 Overview of Project

In a competitive digital business environment, sales performance is a key driver of growth. This project, **"Unlocking Sales Performance Through Data Visualization,"** focuses on using modern visualization tools to transform raw sales data into actionable business insights. By using platforms like Power BI, this project enables better decision-making and improved sales outcomes.

## 2.2 Problem Statement

Design and develop an interactive sales performance dashboard using Power BI that enables businesses to track key sales metrics, analyze trends, and make informed decisions based on real-time data.

Despite the abundance of sales data, many companies struggle to derive strategic insights due to ineffective reporting methods. Traditional text-heavy reports are hard to analyze, delaying critical business decisions. There is a need for an interactive system that can visualize sales data in real-time and help identify performance gaps, trends, and opportunities.

Sales data is one of the most valuable assets for businesses. However, most organizations fail to utilize it effectively due to challenges such as:

4. **Data Overload and Complexity:** Companies generate vast amounts of sales data from different sources without proper data visualization tools, deriving meaningful insights becomes overwhelming.
5. **Lack of Real-Time Analysis:** Traditional sales reports are static and often outdated by the time they are reviewed. This delay in analysis leads to missed opportunities and reactive decision-making instead of proactive strategy planning.
6. **Challenges in Identifying Key Performance Indicators (KPIs):** Without a structured approach, businesses struggle to track crucial KPIs such as revenue trends, customer acquisition costs, conversion rates, and regional sales performance.

## 2.3 Objective

- Convert raw sales data into dynamic, interactive visual formats.
- Track sales revenue, growth, and customer acquisition.
- Identify trends, outliers, and areas of improvement.
- Provide real-time dashboards to support fast decision-making.
- Improve performance monitoring at both individual and team levels.

### 3. Literature Review

To explore the role of data analytics and visualization in business intelligence (BI) tools, especially Power BI. The article discusses how AI and ML algorithms are integrated into BI platforms to enhance sales forecasting, trend analysis, and decision-making. A paper is used to analyze the integration of machine learning models and data visualization in relation to best practices and real-world applications involving sales data and predictive analytics. [1]

This literature review explores the combination of business intelligence and predictive analytics, discussing various BI tools and tools like Power BI in the sales and customer data context. It focuses on predictive models and their visualization, including the use of AI/ML algorithms to predict sales trends. The methodologies and techniques related to data visualization and the importance of presenting predictive insights clearly to non-technical users within an organization are discussed [2].

The last ten years, in particular, have brought about new technologies and an increase in the amount of data available. The scale and variety of data has posed new analytic challenges on data visualization [3]

This has made it easier to create complex visualizations. More so because of these advancements, data visualizations deserve specific attention outside the realm of simply being part of document design. With the proliferation of information graphics and online tools that create data visualizations and research that shows the effectiveness of including visuals in health and medical communication [4]

There is an increased urgency to determine effective practices for their creation and use. However, scholarship in TPC (and in other fields) has not kept pace with these advancements, which means we have little empirical evidence on which to base current practice. Currently, data visualization research is dispersed across a range of fields and disciplines, which makes it difficult to build a coherent body of research. For example, psychologists study the comprehension of bar graphs [5]



## 4. Basic System Architecture

### 4.1 Outline of Proposed System

#### 1. Data Sources

- Sales data is collected from various platforms like:
  - Excel files (e.g., exported sales logs)

#### 2. Data Processing (ETL Layer)

- **Extract:** Gather raw data from different sources.
- **Transform:** Clean and standardize the data (remove nulls, correct formats).
- **Load:** Load the structured data into Power BI-compatible formats.

#### 3. Data Integration

- Merge datasets based on relationships like:
  - Date
  - Product
  - Salesperson

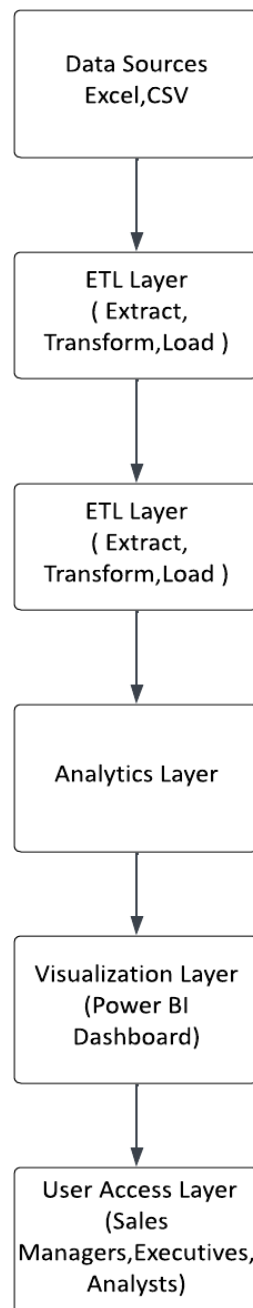
**4. Visualization Layer (Power BI)**

- Create:
  - Dashboards
  - Charts
  - Graphs
- Include filtering, slicing, drill-down options.

**5. User Interaction Layer**

- End-users (sales managers, executives) interact with the Power BI reports to:
  - Apply filters
  - Export reports
  - Analyze performance trends
  - Forecast future sales

## 4.2 Proposed System Block Diagram



**Fig.4.2.1**

### 1. Data Sources (Excel, CSV)

- This is where your sales data comes from.
- It could be Excel sheets, CSV files, or any other files containing sales information (like product, region, revenue, etc.).

### 2. ETL Layer (Extract, Transform, Load)

- This step appears **twice** in your diagram, which may be a duplication—usually, it's needed just once.
- Here's what ETL means:
  - **Extract:** Pull data from your files.
  - **Transform:** Clean it—fix errors, remove duplicates, change formats.
  - **Load:** Put the cleaned data into Power BI or a database.

### 3. Analytics Layer

- This is where you calculate trends, or performance metrics.
- Examples include total sales, best-selling product, or performance by region.

### 4. Visualization Layer (Power BI Dashboard)

- This is where charts, graphs, and dashboards are built in **Power BI**.
- It visually shows the sales insights in an easy-to-understand way.

### 5. User Access Layer (Sales Managers, Executives, Analysts)

- These are the people who will use the dashboard.
- They can interact with the reports, filter the data, and make decisions based on what they see.

## 5. Design

### 5.1 Data Flow Diagram

DFD level 0

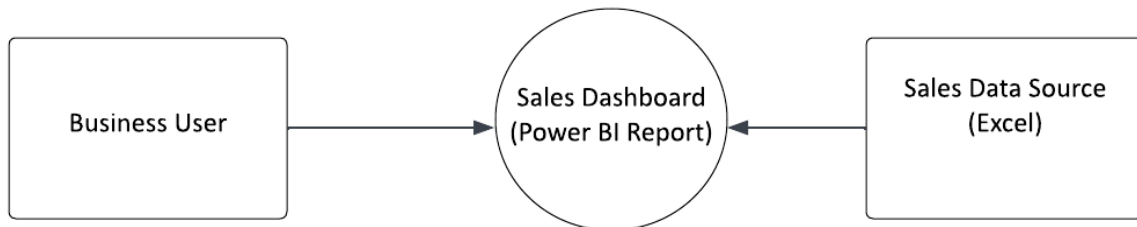


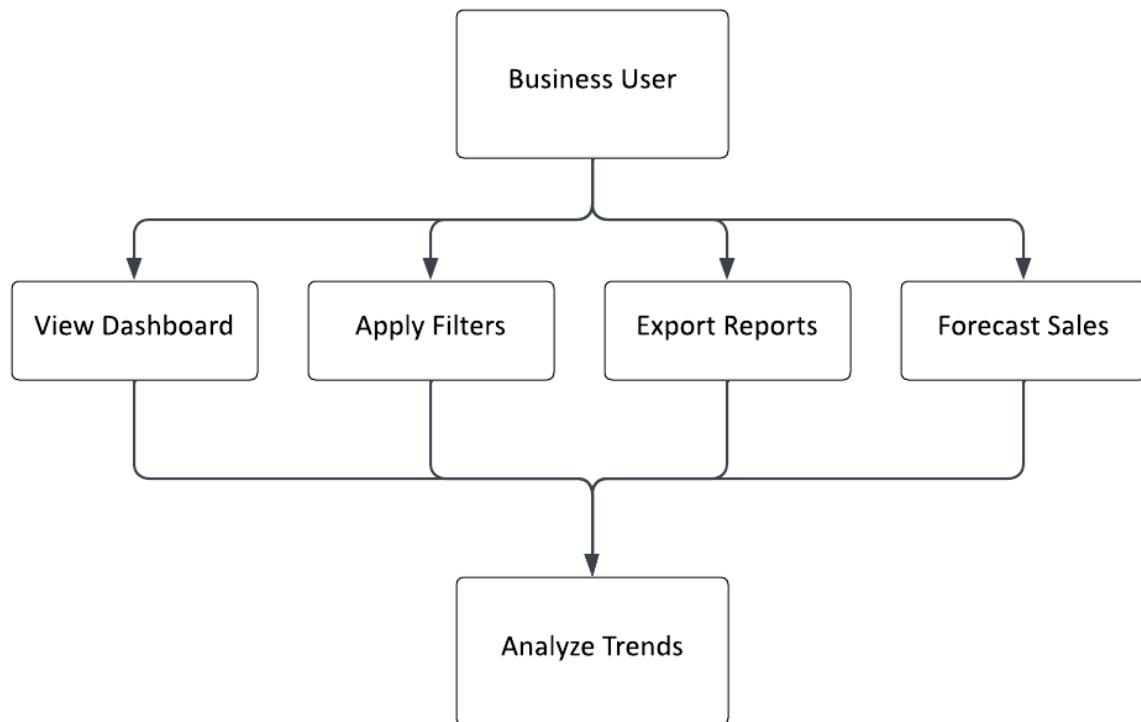
Fig.5.1.1

DFD level 1



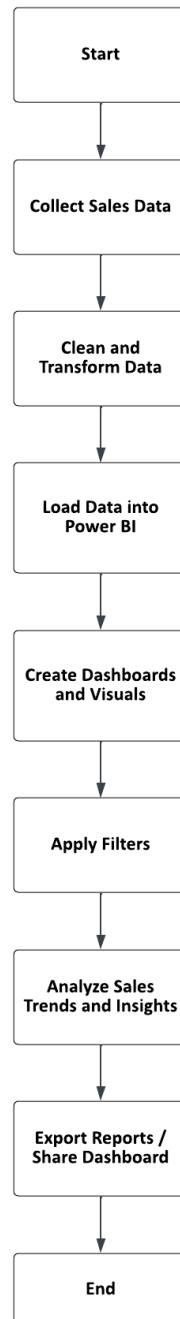
Fig.5.1.2

## 5.2 Use Case Diagram



**Fig.5.2.1**

### 5.3 Activity Diagram



**Fig.5.4.1**

## 6. Implementation

### 6.1 Algorithms – Power BI Sales Dashboard

#### 1. Initialize the Data Pipeline

**Step 1.1:** Load the sales dataset (Excel/CSV) into Power BI Desktop.

**Step 1.2:** Connect Power BI to the data source and define data model relationships (e.g., between date, region, product, and customer tables).

#### 2. Receive User Requirements

**Step 2.1:** Identify business questions (e.g., “What are the top-selling products by region?” or “Which customer segment generates the most revenue?”).

**Step 2.2:** Define key performance indicators (KPIs) such as:

- Total Sales
- Total Orders
- Average Order Value
- Monthly Sales Trends
- Top 10 Customers by Sales

#### 3. Prepare and Transform the Data

**Step 3.1:** Use Power Query Editor to:

- Remove duplicates.
- Handle missing/null values.
- Standardize date formats and numeric fields.



**Step 3.2:** Create calculated columns and measures using DAX (Data Analysis Expressions) for:

- Revenue per region
- Order quantity per customer
- Average order value, etc.

#### **4. Create Data Model and Define Relationships**

**Step 4.1:** Link related tables using primary and foreign keys:

- Link Orders table to Customers, Products, Regions, and Date tables.

**Step 4.2:** Ensure one-to-many relationships are established correctly to support filtering across visuals.

#### **5. Build and Design the Dashboard**

**Step 5.1:** Add visualizations for:

- **KPIs** (Cards for total sales, orders)
- **Map chart** (Sales by Country)
- **Pie chart** (Order Status Distribution)
- **Line chart** (Monthly Sales Trend)
- **Bar chart** (Sales by Product Line)
- **Table** (Top 10 Customers)

**Step 5.2:** Add slicers and filters for:

- Date range
- Product type
- Region
- Order status

## **6. Implement Interactivity**

**Step 6.1:** Enable cross-filtering and drill-down in charts.

**Step 6.2:** Add tooltips and interactive highlighting to improve data exploration.

**Step 6.3:** Apply conditional formatting to highlight KPIs (e.g., low-performing regions in red).

## **7. Publish and Share the Dashboard**

**Step 7.1:** Publish the report to Power BI Service.

**Step 7.2:** Configure sharing settings for executives and sales teams.

**Step 7.3:** Enable export to PDF or Excel for offline reporting.

## 7. Testing

### 7.1 Test Report

#### Test Case 1

Test Case ID	PBI_01	Test Case Description	Power BI Dashboard – Testing Visualization and Interactivity of Sales Data		
Created By	Parth Shinge	Reviewed By	Mr. Naren V. Sarnaik	Version	1.1

**QA Tester's Log**

Initial testing of Power BI dashboard functionalities – filters and data accuracy.

Tester's Name		Date Tested	13-05-2025	Test Case (Pass/Fail/Not Executed)	Pass
S #	Prerequisites:		S #	Test Data	
1	Power BI Desktop or Service active.		1	Sales by Country: USA, Spain, France, etc.	
2	Sales dataset (Excel/CSV) loaded with order details.		2	Product Lines: Classic Cars, Trains, Planes, etc.	
3	Dashboard created and visuals published.		3	KPIs: Total Sales = 10.03M, Orders = 29M, Avg Order Value = 3.55K	

**Test**

Verify that the Power BI dashboard accurately visualizes sales data, responds to filters and exports reports properly.

**Scenario**

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Load Power BI dashboard	Dashboard loads within 3 seconds	As Expected	Pass
2	Check "Total Sales", Total Orders", "Avg Order Value" cards	10.03M, 29M, 3.55K respectively	Displayed correctly	Pass
3	Hover over "Sales by Country" map	All visuals update to reflect Classic Cars only	Displayed correctly	Pass

**Test Case 2**

<b>Test Case ID</b>	PBI_02	<b>Test Case Description</b>	Testing dashboard responsiveness, cross-visual interaction, and filter synchronization in Power BI.		
<b>Created By</b>	Omkar Patil	<b>Reviewed By</b>	Mr. Naren V. Sarnaik	<b>Version</b>	1.1

**QA Tester's Log**

Second-phase testing focused on dynamic filter response and cross-visual behavior validation.

<b>Tester's Name</b>	Omkar Patil	<b>Date Tested</b>	13-05-2025	<b>Test Case (Pass/Fail/Not Executed)</b>	Pass
<b>S #</b>	<b>Prerequisites:</b>	<b>S #</b>	<b>Test Data</b>		
1	Dashboard visuals connected via shared model relationships	1	Filter: Product = "Planes"; Region = "Europe"		
2	Proper data mapping of customer and product fields	2	Time Period = Jan 2004 – Dec 2004		
3	Tooltips and drill-down options enabled for visuals	3	Customer Segment = "Top 5 Customers"		

**Test****Scenario**

Verify that the Power BI dashboard accurately visualizes sales data, responds to filters and exports reports properly.

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Filter by Product = "Planes" And Region = "Europe"	All charts and KPIs update to reflect filtered product and region	As Expected	Pass
2	Set Time Period to Jan– Dec 2004	Line graph and KPIs update to show only 2004 data	As Expected	Pass
3	Click on "France" in Map (Sales by Country) visual	All visuals and data cards update to show France-specific insights	As Expected	Pass
4	Hover over "Order Status" pie chart	Tooltip displays accurate percentage and count of each order status	As Expected	Pass

**Test Case 3**

<b>Test Case ID</b>	PBI_03	<b>Test Case Description</b>	Testing dashboard behavior and data consistency during multi-step user interactions (filters, selections, and cross-filtering over session usage).		
<b>Created By</b>	Omkar Koli	<b>Reviewed By</b>	Mr. Naren V. Sarnaik	<b>Version</b>	1.1

**QA Tester's Log**

Testing the dashboard's ability to maintain accurate visual synchronization and update logic over consecutive user interactions.

<b>Tester's Name</b>	Omkar Koli	<b>Date Tested</b>	13-05-2025	<b>Test Case (Pass/Fail/Not Executed)</b>	Pass
<b>S #</b>	<b>Prerequisites:</b>	<b>S #</b>	<b>Test Data</b>		
1	Dashboard is published and fully connected to model	1	Turn 1: Select Region = "North America"		
2	All visuals support cross-filtering and cross-highlighting	2	Turn 2: Apply Product filter ="Vintage Cars"		
3	Visuals contain KPIs, maps, and charts for interaction	3	Turn 4: Change time range to Year = 2005		

**Test****Scenario**

Verify that the Power BI dashboard accurately visualizes sales data, responds to filters and exports reports properly.

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	User selects Region = "North America"	All visuals update to show data related to North America only	As Expected	Pass
2	User applies additional Product filter = "Vintage Cars"	Dashboard shows only sales of Vintage Cars in North America	As Expected	Pass
3	User clears product filter (Vintage Cars), region filter remains	Dashboard reverts to full product data, still filtered by North America	As Expected	Pass
4	User changes Date filter to Year = 2005	Dashboard updates all visuals to show only 2005 data for North America	As Expected	Pass

## Test Case 4

<b>Test Case ID</b>	PBI_04	<b>Test Case Description</b>	Testing dashboard export functionality, performance speed, and mobile responsiveness of Power BI visuals.		
<b>Created By</b>	Prajyot Hupare	<b>Reviewed By</b>	Mr. Naren V. Sarnaik	<b>Version</b>	1.1

**QA Tester's Log**

Tested user experience and technical performance across multiple platforms (desktop, mobile, export) and verified consistent report rendering.

<b>Tester's Name</b>	Prajyot Hupare	<b>Date Tested</b>	13-05-2025	<b>Test Case (Pass/Fail/Not Executed)</b>	Pass
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S #	Prerequisites:	S #	Test Data
1	Dashboard is published to Power BI Service	1	Desktop: Chrome browser, 8 Mbps connection
2	Internet connection with mobile and desktop device access	2	Filters: Apply Region = "Europe" and Year = 2004
3	Dashboard filters and visuals load under 3 seconds	3	Export: PDF export using File → Export as PDF

**Test**

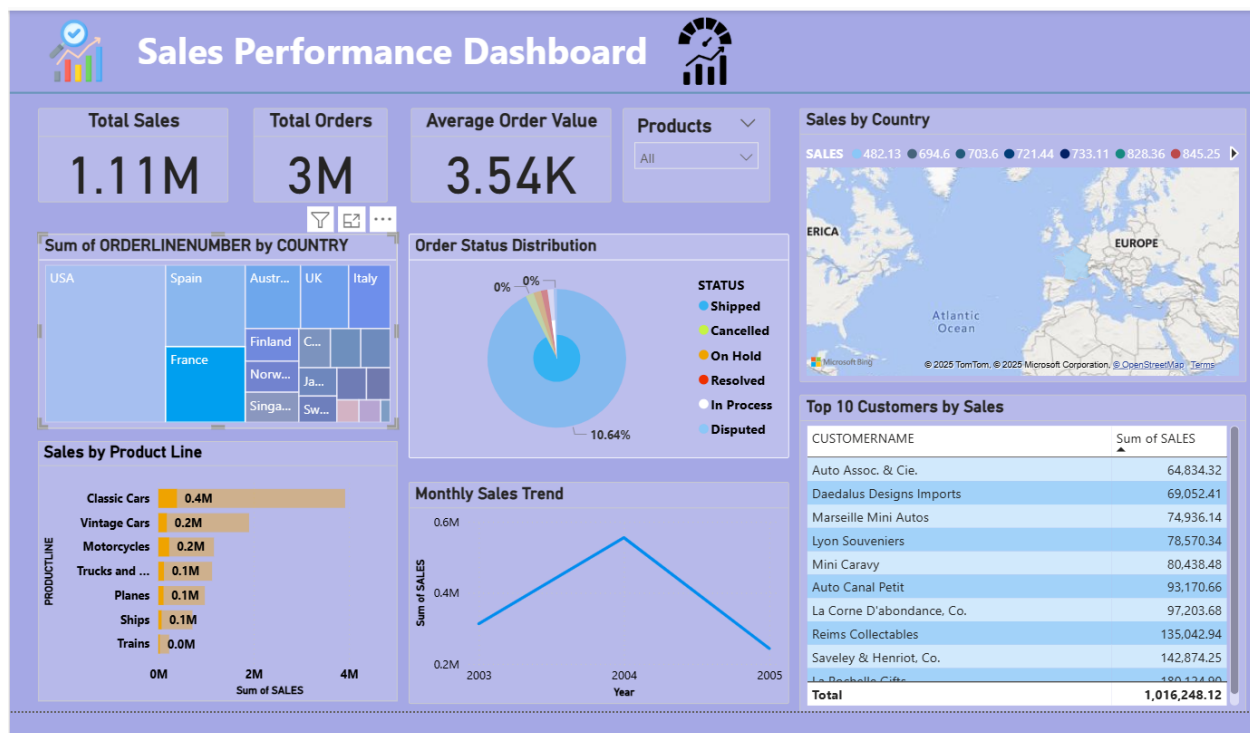
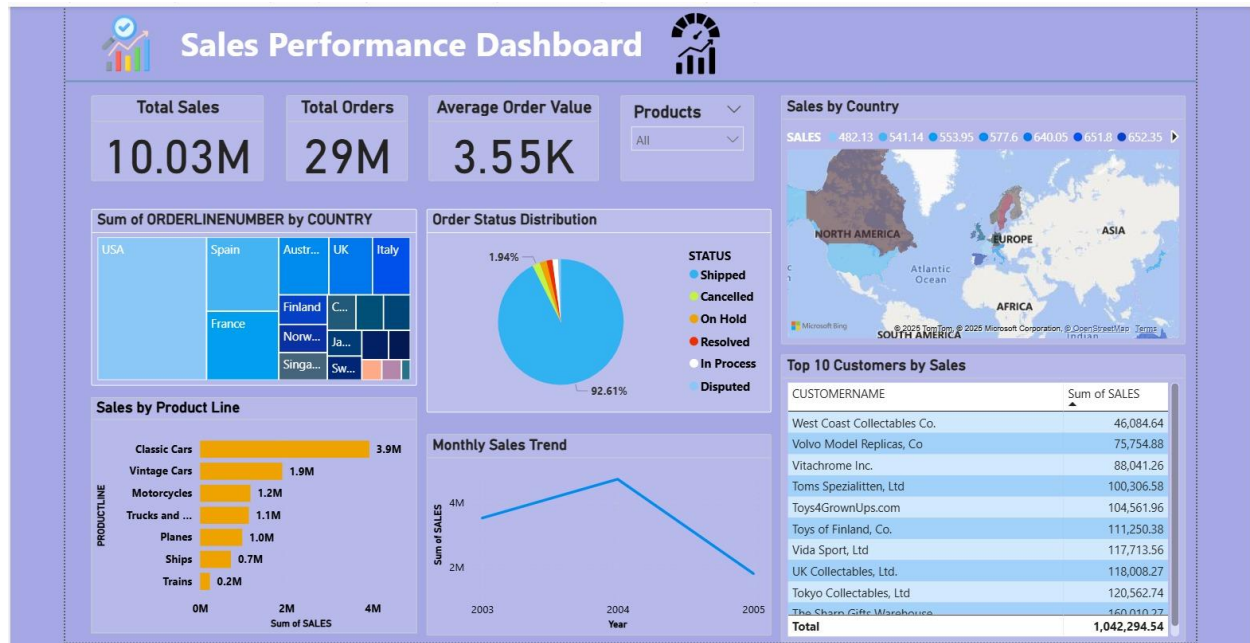
Validate the Power BI dashboard's performance, mobile layout compatibility, and export

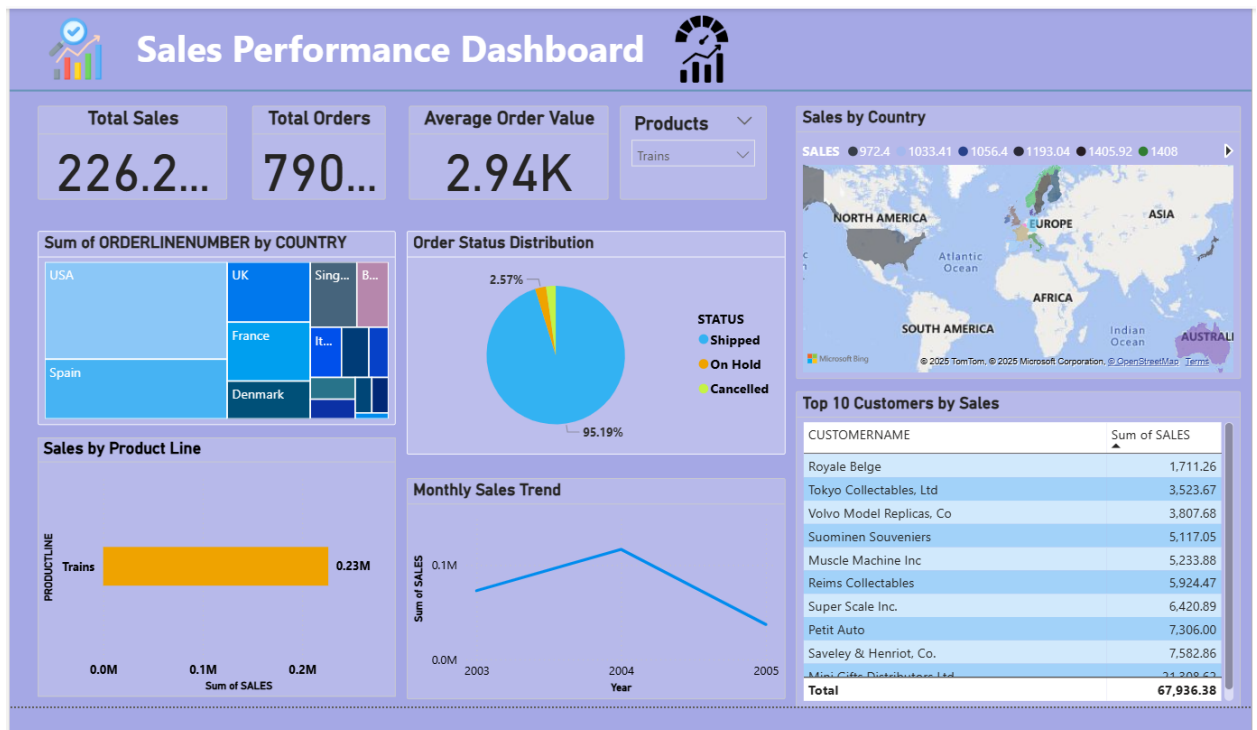
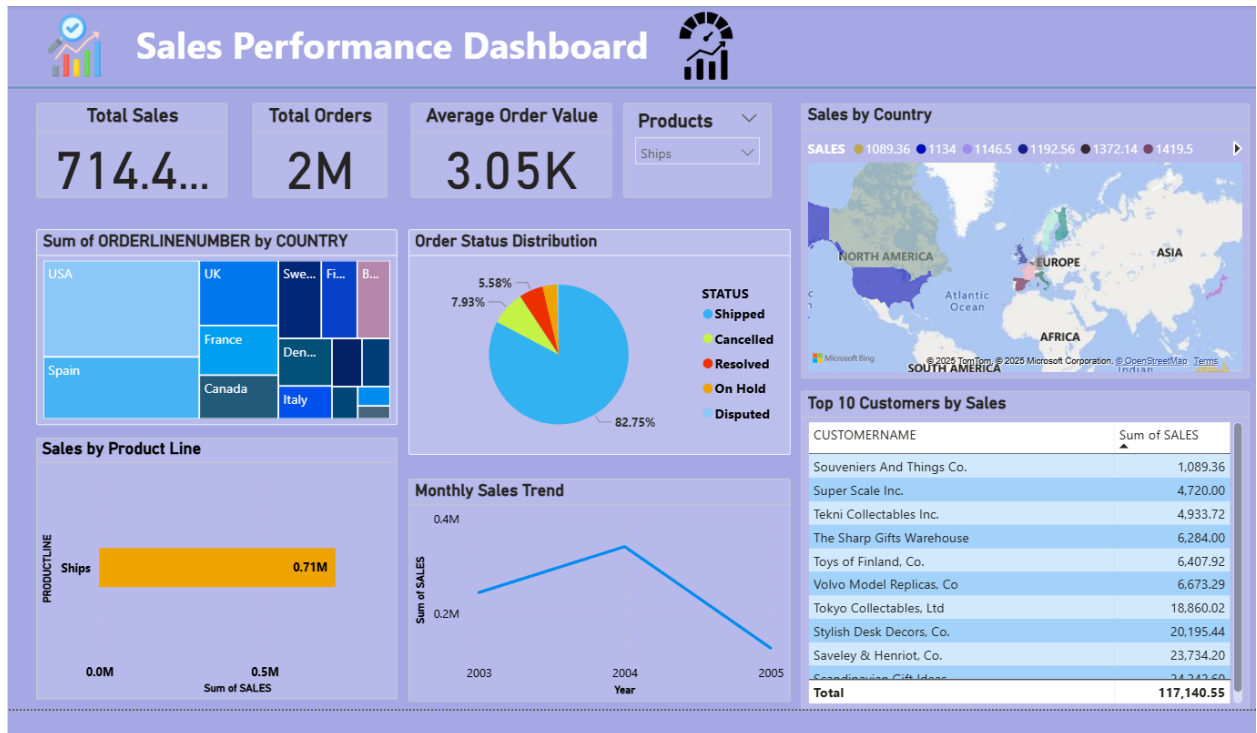
**Scenario**

functionality under normal usage conditions.

Step #	Step Details	Expected Results	Actual Results	Pass / Fail / Not executed / Suspended
1	Apply Region filter = "Europe" and Year = 2004	All visuals update accordingly within 2 seconds	As Expected	Pass
2	Load dashboard in Power BI	Loads under 3 seconds without visual distortion	As Expected	Pass
3	Export dashboard to PDF using File → Export as PDF	PDF includes all visuals and filters; layout matches screen view	As Expected	Pass

## 8. Project Screenshots







## 9. Conclusion and Future Work

### 9.1 Conclusion

The project demonstrates that data visualization tools can transform raw sales data into meaningful business intelligence. Interactive dashboards improve the speed and accuracy of decisions, enhance transparency, and enable tracking of sales performance across multiple dimensions.

### 9.2 Future work

- Add predictive analytics using Python/ML models.
- Real-time API integration for live dashboards.
- Role-specific dashboards (sales reps, managers).
- Natural Language Query integration (e.g., Ask Data).
- SMS/Email alert system for KPI thresholds.

## 10. References

1. Breiman, L. (2001). Random forests. Machine Learning, 45(1), 5-32. International Journal of Computer Science and Network Security, Vol. 15, Issue 9, Sep. 2015, pp. 222-234.
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7. Data Collected From LinkedIn ( Damini S Patil <https://www.linkedin.com/in/damini-s-patil-4b2545253> )