E-Commerce Sales Analysis Dashboard using Business Intelligence Tool - Microsoft Power BI

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Abstract:

This paper utilizes Microsoft Power BI, a leading business intelligence tool, to conduct a comprehensive analysis of e-commerce sales data. I analyze E-Commerce sales data to gain insights into its performance and identify opportunities for growth. The company has a vast amount of sales data, including information on Category, Sub-Category, Region, Segment, products, customers, Order quantity, Sales, Profit, Discount and Shipping mode. The main objective is to extract meaningful insights from this data to analyse the overall sales. By leveraging Microsoft Power BI advanced data visualization capabilities, we transform raw sales data into interactive dashboards and reports.

Keywords: Power-Bi, Data Visualisation, Dashboards, Business Intelligence, Sales Analysis.

Introduction

Sales analysis is essential for understanding business performance, identifying trends, and making informed decisions. This analysis evaluates key metrics such as revenue, customer acquisition cost, average order value, and product performance. By using tools like Power BI, businesses can transform raw sales data into insightful visualizations and interactive dashboards. These insights help identify top-performing products, analyze customer behavior, and assess marketing campaign effectiveness. Ultimately, sales analysis provides actionable recommendations to optimize sales strategies, enhance customer engagement, and drive growth, showcasing the importance of data-driven decision-making in achieving business success.

Data visualization is the graphical representation of information and data using visual elements like charts, graphs, and maps. This technique helps to simplify complex data sets, making it easier to understand patterns, trends, and outliers. Effective data visualization enables businesses to quickly grasp insights, communicate findings clearly, and make informed decisions. Tools like Power BI, Tableau, and Excel are commonly used to create interactive and dynamic visualizations. By transforming raw data into visual formats, organizations can enhance their analytical capabilities, identify opportunities, and drive strategic actions, ensuring data-driven decision-making across all levels.

Power BI is a powerful business intelligence tool developed by Microsoft, designed to transform raw data into insightful visualizations and interactive dashboards. It enables users to connect to various data sources, perform data preparation, and create detailed reports with ease. Power BI supports real-time data updates and provides advanced analytics features, allowing businesses to monitor key performance indicators, identify trends, and make data-driven decisions. Its user-friendly interface and robust capabilities make it ideal for organizations seeking to enhance their data analysis processes, optimize operations, and drive growth through actionable insights.

Literature Survey

This study focuses on the interactive visualization of educational institution databases utilizing the Microsoft Power BI Tool and its many modules. It focuses on the Microsoft Power BI process model, operations, and data sources available in the tool, and the many forms of visual insights or context. Visualisation is becoming increasingly important in corporate intelligence and analytics across all fields. There are several approaches for visualising datasets, which might be dynamic or interactive [1].

This study focus on AWS Redshift is the primary contributor to this cloud-based data warehouse. After the compilation of data in the Data-Warehouse, the following step is to extract some analytical data from it. This will help to develop business skills, resulting in increased income and efficiency [2].

This study focuses on three key areas of business intelligence, data warehousing, business intelligence, and data integration. The study also focuses on business intelligence methodologies and technology, which are useful for getting exact data in a much more accessible method [3].

This study focuses on sales forecasting; the time series model begins early, but it purely considers sales volume and ignores other relevant factors throughout the same period. Methods for sales forecasting include the time series model, machine learning model, and artificial neural network model [4].

This study focuses on a comprehensive comparison of two popular data visualization technologies, Power BI and Tableau. A business's specific goals and conditions should be considered while choosing among these tools. While Power BI has good interaction with the Microsoft environment and a range of price options, Tableau excels in terms of usability and broad data exploration capabilities [5].

This study provides an integrated Power BI dashboard with projections and future forecasting on sales, finance, marketing, and supply chain. The dashboard enables firms to make data-driven decisions, optimize resource allocation, and identify future growth prospects by leveraging data analytics and visualization. The dashboard's sales forecasting tool forecasts future sales performance based on previous sales data, market trends, and customer behavior patterns. It also provides real-time visibility into revenue estimations, conversion rates, and sales. Furthermore, the dashboard provides precise revenue, expense, and profitability estimates using a variety of cutting-edge algorithms [6].

Sales data analysis is critical for understanding consumer behavior since it reveals what products people buy and why they make specific purchasing decisions. By examining this data, organizations can find trends and patterns in client behaviour, allowing them to modify their marketing and sales tactics to better suit customer needs [7].

Objectives

1. The goal of this project is to create an e-commerce sales dashboard for a sales department using Power BI to track sales success and provide user statistics.
2. The project aims to increase sales by analysing data and creating performance dashboards to improve decision making.

Methodology
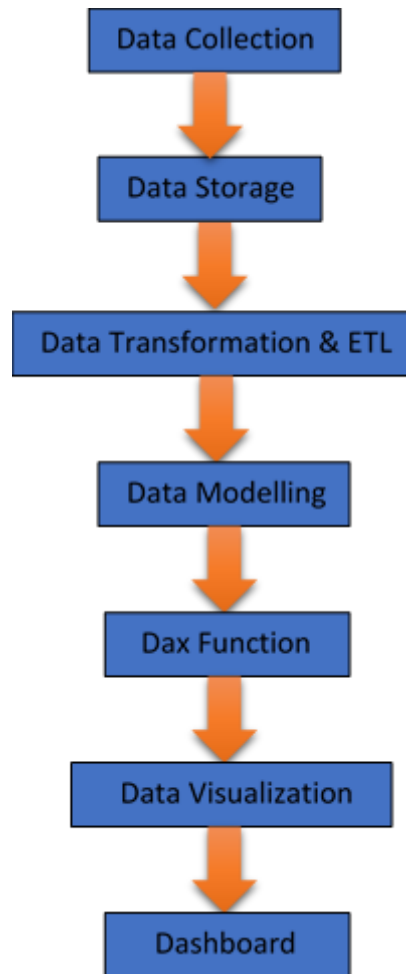
Data Collection (From Kaggle)

Data collection is the process of gathering and measuring information on certain variables inside an established system, allowing one to answer relevant inquiries and evaluate outcomes. Data is downloaded from Kaggle.

Data Storage (Stored in Excel or CSV Format)

Power BI uses two primary repositories for storing and managing data. In this project, I used Excel format dataset.

Data Cleaning (Power Query Editor-ETL)

Once the data is stored into power BI it is important to clean and transform data before you build any visualizations or reporting .This is essential step in building quality visualization. Cleaning and transforming data enables to build visualizations from sound and clean data.

Data Modelling (Relationship between)

Data modelling in Power BI involves structuring and organizing data for efficient analysis and visualization. It starts with importing and transforming data using Power Query, followed by defining relationships between tables.

DAX Function (Calculation)

DAX (Data Analysis Expressions) is a powerful formula language used in Microsoft Power BI, Power Pivot, and Analysis Services to enable advanced data manipulation and calculations. It allows users to create custom calculations, aggregations, and complex business logic in tabular models, facilitating detailed data analysis and reporting.
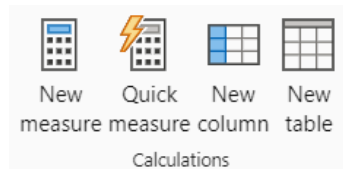
Dax Calculation

Data Visualization (Charts)

In this process we convert manually data into visualization is to visually display collected data by using various charts, graphs or other visualization types. We can create various kinds of charts like Bar charts, Stacked Bar charts, Line Charts, Area Charts, Funnel Charts, Scatter Plots, Cards, Multi-cards, Matrix Charts and Table Charts.
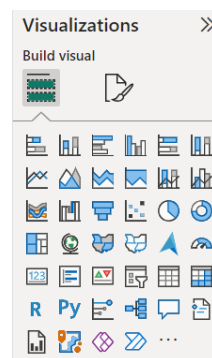

Dashboard (Report)

A dashboard in Power BI is a single-page interface that consolidates key metrics and visualizations for quick insights. Dashboards are crucial for real-time decision-making, providing a clear and intuitive representation of critical data, enhancing business intelligence and communication.

Problem solving:

1. Find out which Sub-Category are most Sales?
2. Find out Top 10 Product vs Sales?
3. Find out Top 10 City Vs Sales?
4. Find out Top 10 County Vs Sales?
5. Find out which is the Preferred Ship Mode?
6. Find out year wise sales?
7. Find out report for Category, Sub-Category vs Sales and Profit?
8. Find out report for Difference between current years to previous year's sales and also ratio?
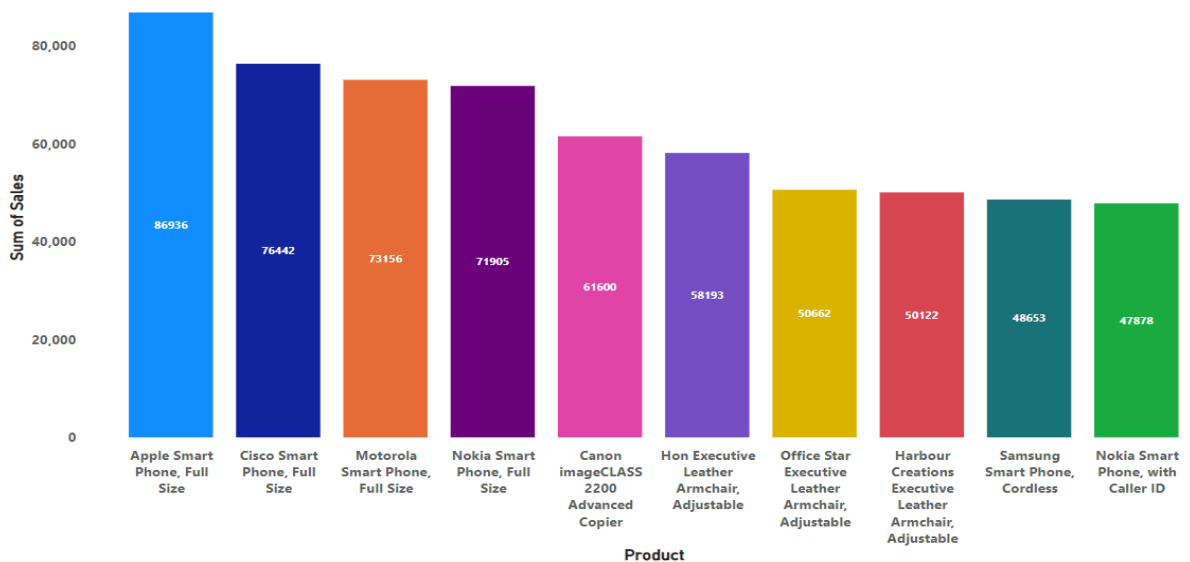
Data Visualization

### 1. Find out which Sub-Category is most Sales?
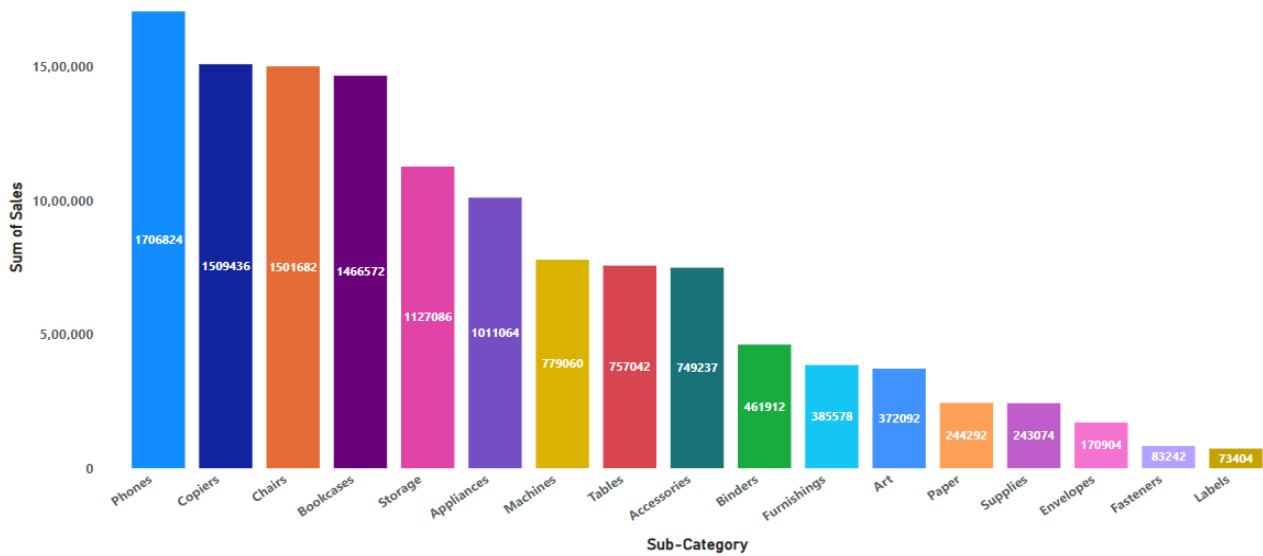
1. At 17,06,824.14, Phones had the highest Sum of Sales and was 2,225.25% higher than Labels, which had the lowest Sum of Sales at 73,404.03.
2. Phones accounted for 13.50% of Sum of Sales.
3. Across all 17 Sub-Category, Sum of Sales ranged from 73,404.03 to 17,06,824.14.

### 2. Find out Top 10 Product vs Sales?

1. At 86,935.78, Apple Smart Phone, Full Size had the highest Sum of Sales and was 81.58% higher than Nokia Smart Phone, with Caller ID, which had the lowest Sum of Sales at 47,877.79.
2. Apple Smart Phone, Full Size accounted for 13.90% of Sum of Sales.
3. Across all 10 Product Name, Sum of Sales ranged from 47,877.79 to 86,935.78.

**3. Find out Top 10 City Vs Sales?**
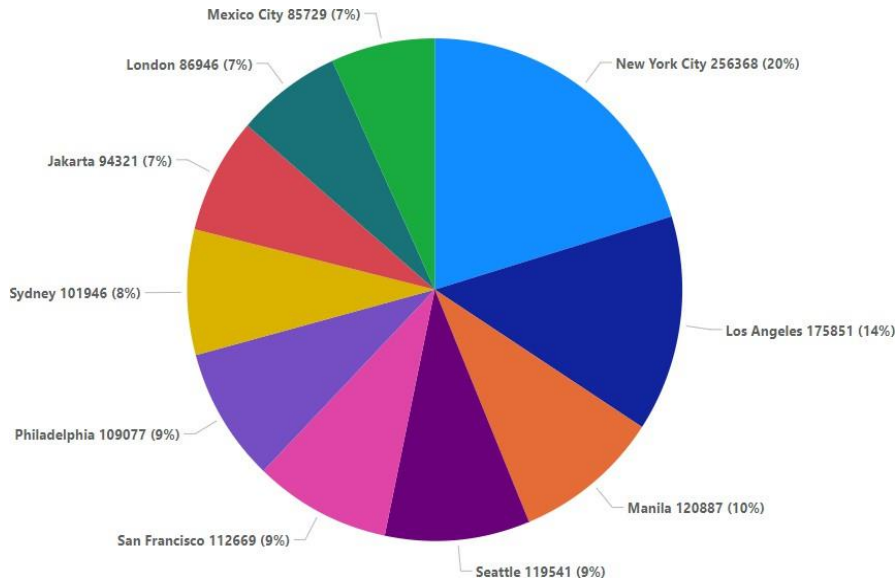
1. At 2,56,368.16, New York City had the highest Sum of Sales and was 199.05% higher than Mexico City, which had the lowest Sum of Sales at 85,728.55.
2. New York City accounted for 20.29% of Sum of Sales. Across all 10 City, Sum of Sales ranged from 85,728.55 to 2,56,368.16.

**4. Find out Top 10 County Vs Sales?**
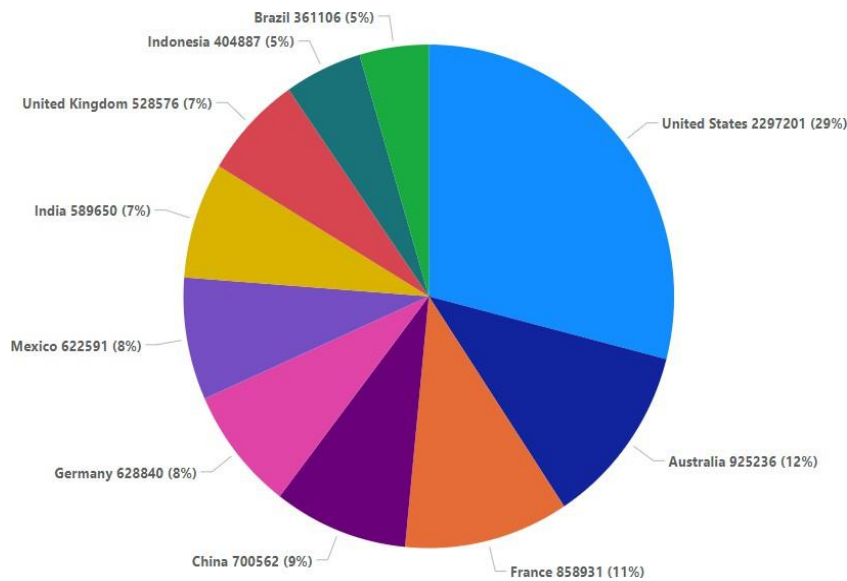
1. At 22,97,200.86, United States had the highest Sum of Sales and was 536.16% higher than Brazil, which had the lowest Sum of Sales at 3,61,106.42.
2. United States accounted for 29.01% of Sum of Sales.
3. Across all 10 Country, Sum of Sales ranged from 3,61,106.42 to 22,97,200.86.

5. Which is the Preferred Ship Mode?
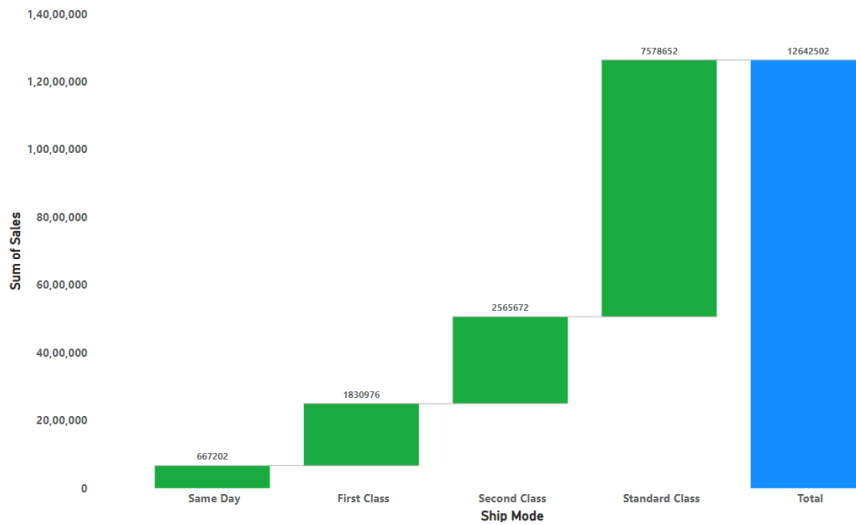
1. At 75,78,652.11, Standard Class had the highest Sum of Sales and was 1,035.89% higher than Same Day, which had the lowest Sum of Sales at 6,67,201.98.
2. Standard Class had the highest Sum of Sales at 75,78,652.11, followed by Second Class, First Class, and Same Day.
3. Standard Class accounted for 59.95% of Sum of Sales.
4. Across all 4 Ship Mode, Sum of Sales ranged from 6,67,201.98 to 75,78,652.11.

6. Find out year wise sales?
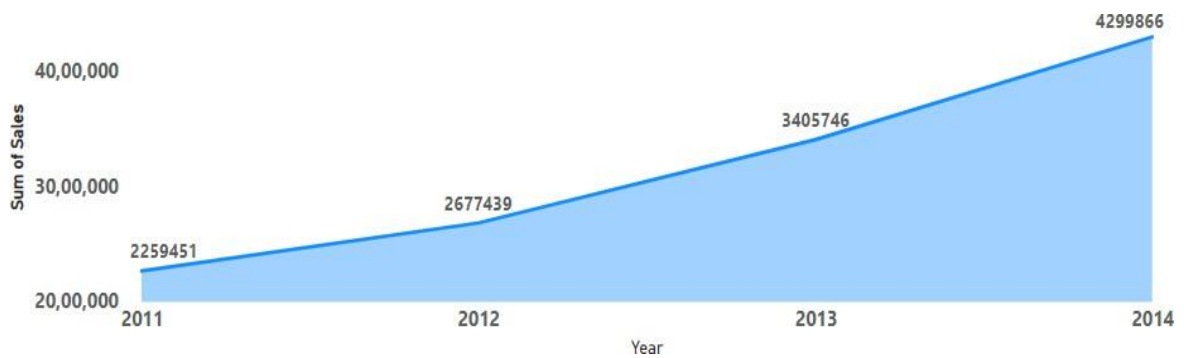
1. Sum of Sales trended up, resulting in a 90.31% increase between 2011 and 2014.
2. Sum of Sales started trending up on 2011, rising by 90.31% (20,40,414.98) in 3 years.
3. Sum of Sales jumped from 22,59,450.90 to 42,99,865.87 during its steepest incline between 2011 and 2014.

**7. Find out report for Category, Sub-Category vs Sales and Profit**

Category	Sum of Sales	Sum of Profit
⊟ **Furniture**	**41,10,874.19**	**2,85,204.72**
Bookcases	14,66,572.24	1,61,924.42
Chairs	15,01,681.76	1,40,396.27
Furnishings	3,85,578.26	46,967.43
Tables	7,57,041.92	-64,083.39
⊟ **Office Supplies**	**37,87,070.23**	**5,18,473.83**
Appliances	10,11,064.30	1,41,680.59
Art	3,72,091.97	57,953.91
Binders	4,61,911.51	72,449.85
Envelopes	1,70,904.30	29,601.12
Fasteners	83,242.32	11,525.42
Labels	73,404.03	15,010.51
Paper	2,44,291.72	59,207.68
Storage	11,27,085.86	1,08,461.49
Supplies	2,43,074.22	22,583.26
⊟ **Technology**	**47,44,557.50**	**6,63,778.73**
Accessories	7,49,237.02	1,29,626.31
Copiers	15,09,436.27	2,58,567.55
Machines	7,79,060.07	58,867.87
Phones	17,06,824.14	2,16,717.01
Total	**1,26,42,501.91**	**14,67,457.29**

1. Sum of Sales and total Sum of Profit are positively correlated with each other.
2. Technology in Sub-Category Phones made up 13.50% of Sum of Sales.

8. Find out report for Difference between current years to previous year's sales and also ratio?

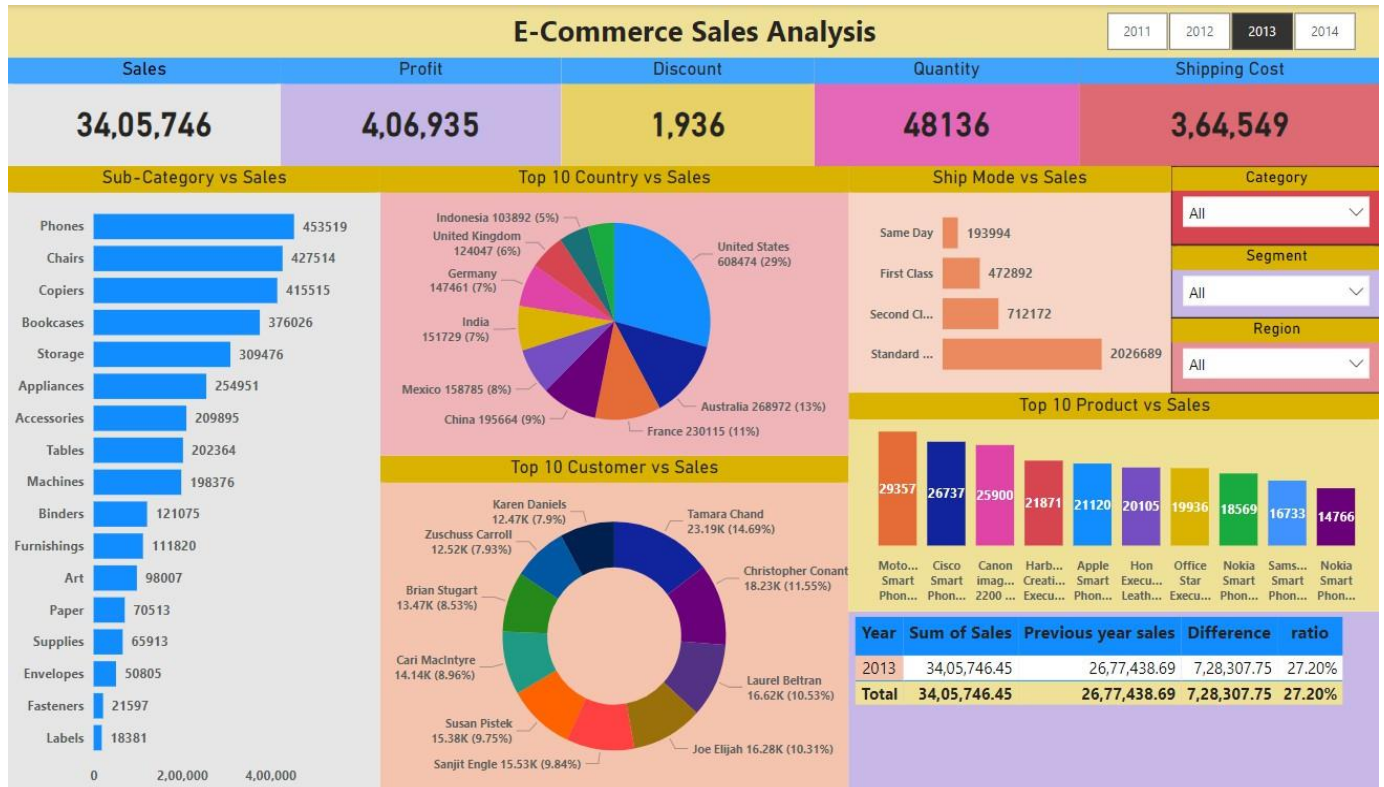| Year	Sum of Sales	Previous year sales	Difference	ratio
2011	22,59,450.90		22,59,450.90	Infinity
2012	26,77,438.69	22,59,450.90	4,17,987.80	18.50%
2013	34,05,746.45	26,77,438.69	7,28,307.75	27.20%
2014	42,99,865.87	34,05,746.45	8,94,119.42	26.25%
Total	**1,26,42,501.91**		**1,26,42,501.91**	**Infinity**

Dashboard Design
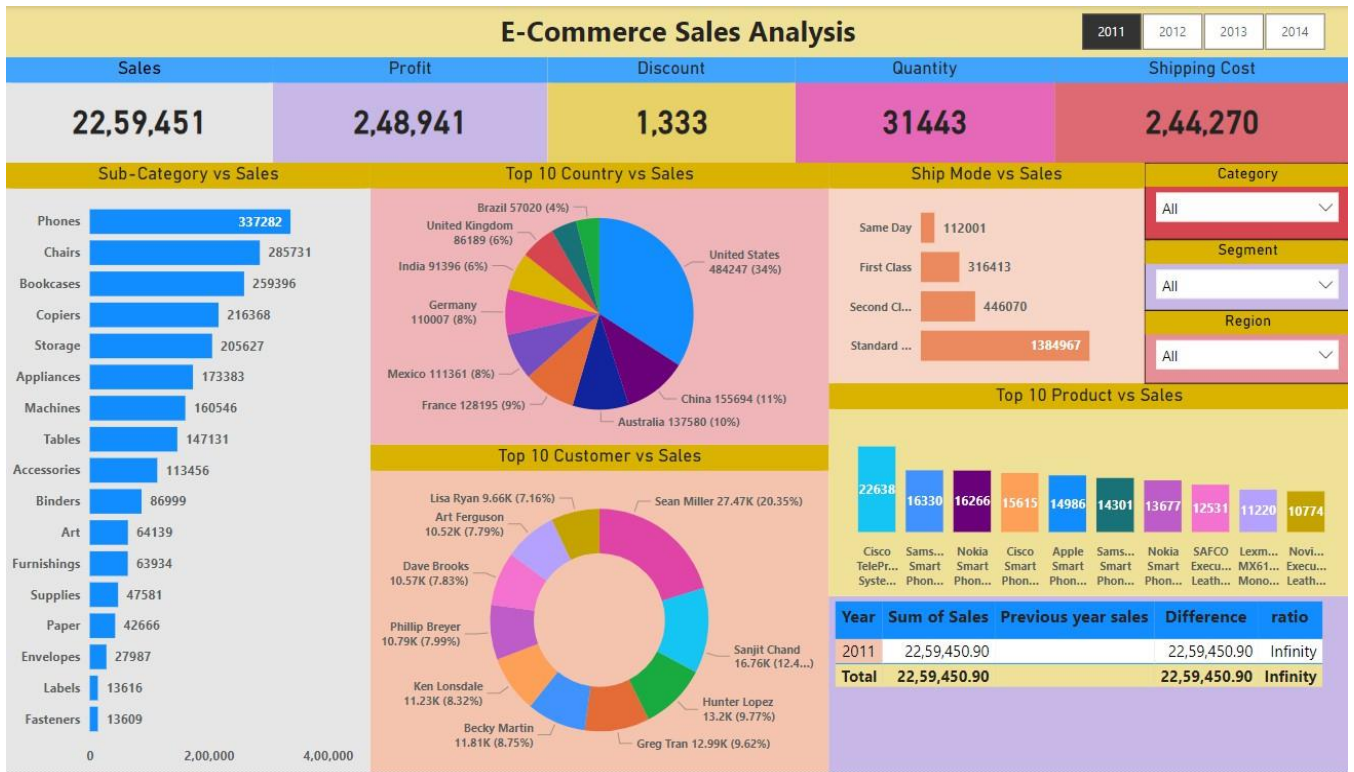
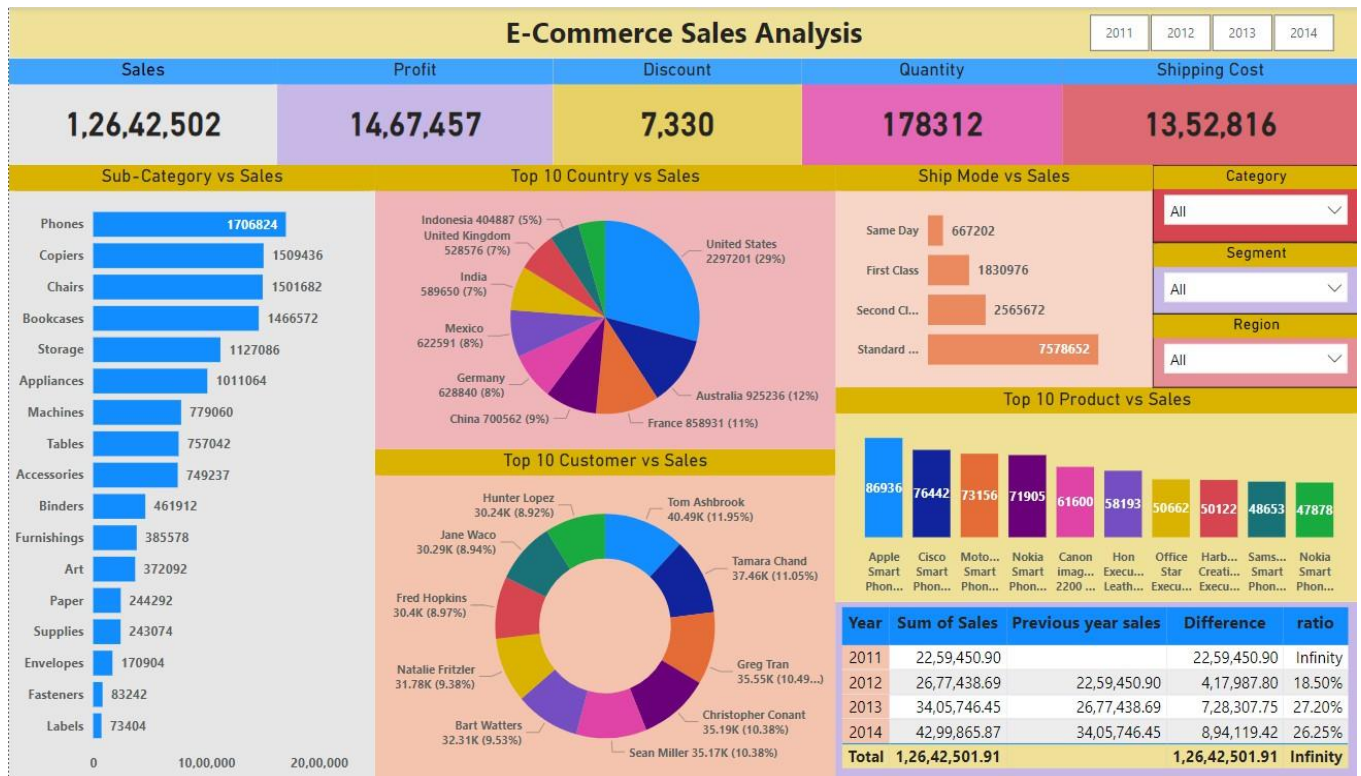**E-commerce Sales Analysis Dashboard - 2011**
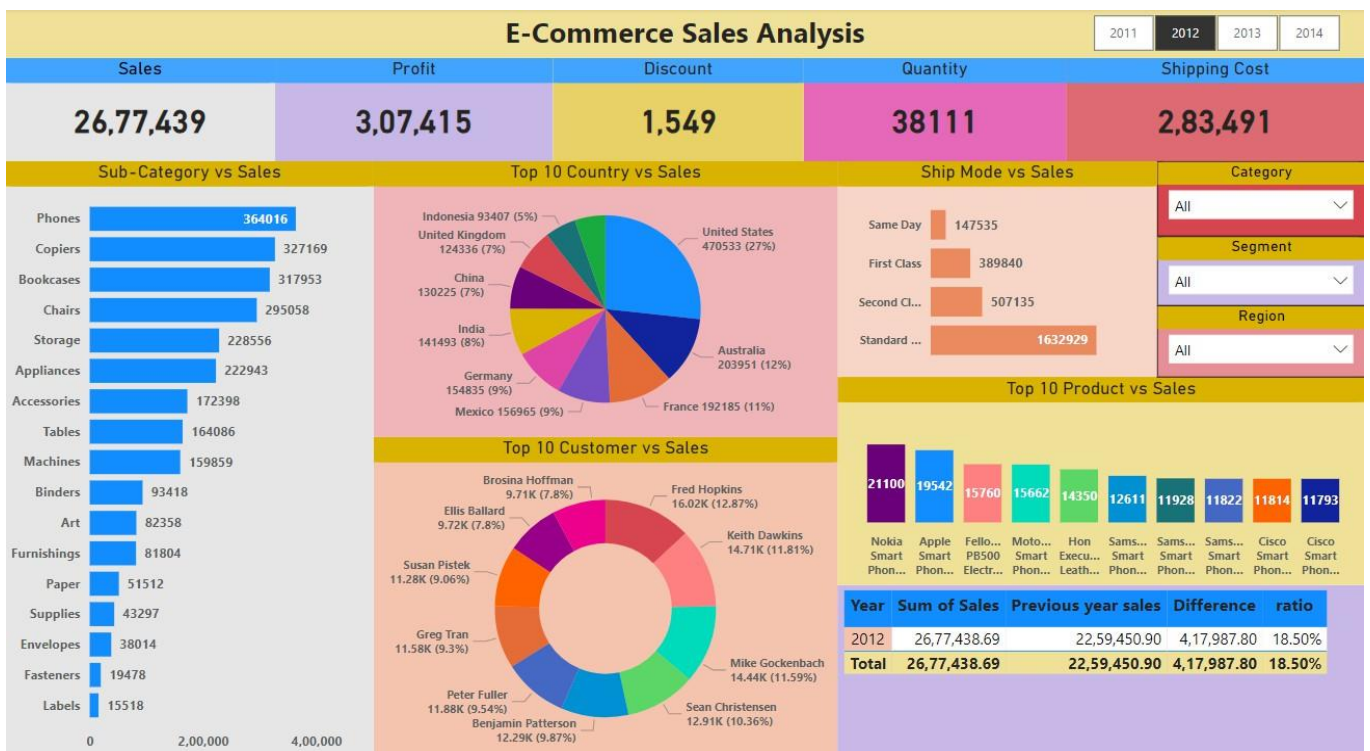
E-commerce Sales Analysis Dashboard - 2012

E-commerce Sales Analysis Dashboard - 2013
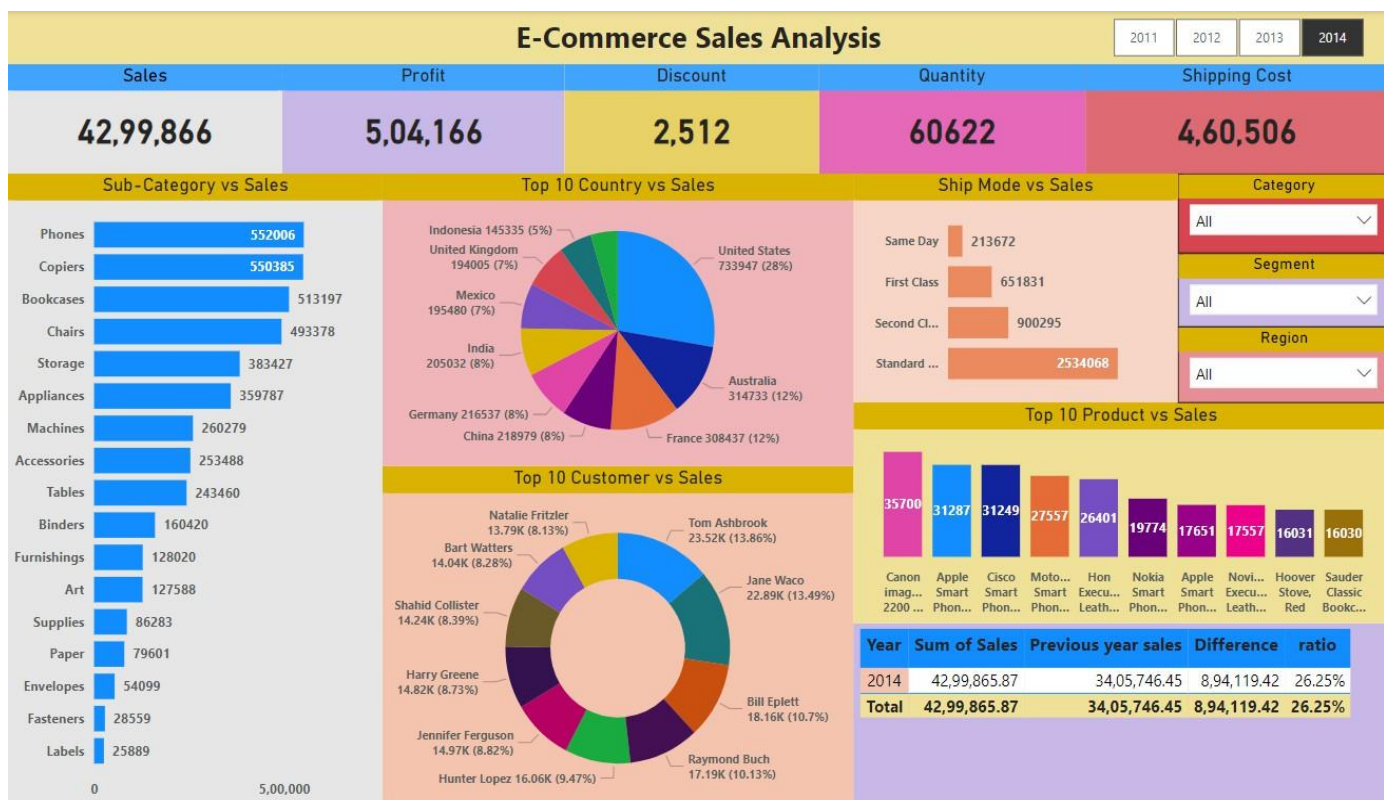
E-commerce Sales Analysis Dashboard - 2014

E-commerce Sales Analysis Dashboard overall (2011, 2012, 2013, 2014)

Results and Conclusion

A dashboard is used for presenting a real-time status of business, monitoring business performance in organizations. An effective dashboard is able to facilitate decision-making process and to quickly trigger actions by delivering information to end users. In this project, a sales department, facing a large amount of data every day, requires a visual communication. To achieve better data visualization, Microsoft power BI is integrated to visualize and display sales data through dashboard and reports.

1. Category wise "Technology" has more sales 37.53% and got profit 45.23%, when compare to Office supplies and Furniture.
2. Sub-Category wise "Phone" is the highest sales Rs.17,06,824 (13.50%) and it will be increased in the year of 2015.
3. Segment wise "consumer" has more sales 51.48% and got profit 51.06% when compare to corporate and Home Office.
4. Region wise "Central" is the highest sales and profit when compare to other regions.
5. Customer wise "Tom Ashbrook" is the highest sales person, his sales RS.40488.
6. Product wise "Apple Smart Phone" is the most selling product and sales are Rs.86936.
7. City wise "New York City" is the most sales around 20.29% compare to other cities.
8. Country wise "United States of America" is the most sales around 29.01% compare to other country.
9. Preferred ship mode is "Standard class" for transport those products by customer.
10. Sales will be increased by more than 20 to 25 % in the "year of 2015".

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