Shop.Com Report on Retail Management Analysis.

Shop.Com Retail Management Analysis

Power BI Visualiazation

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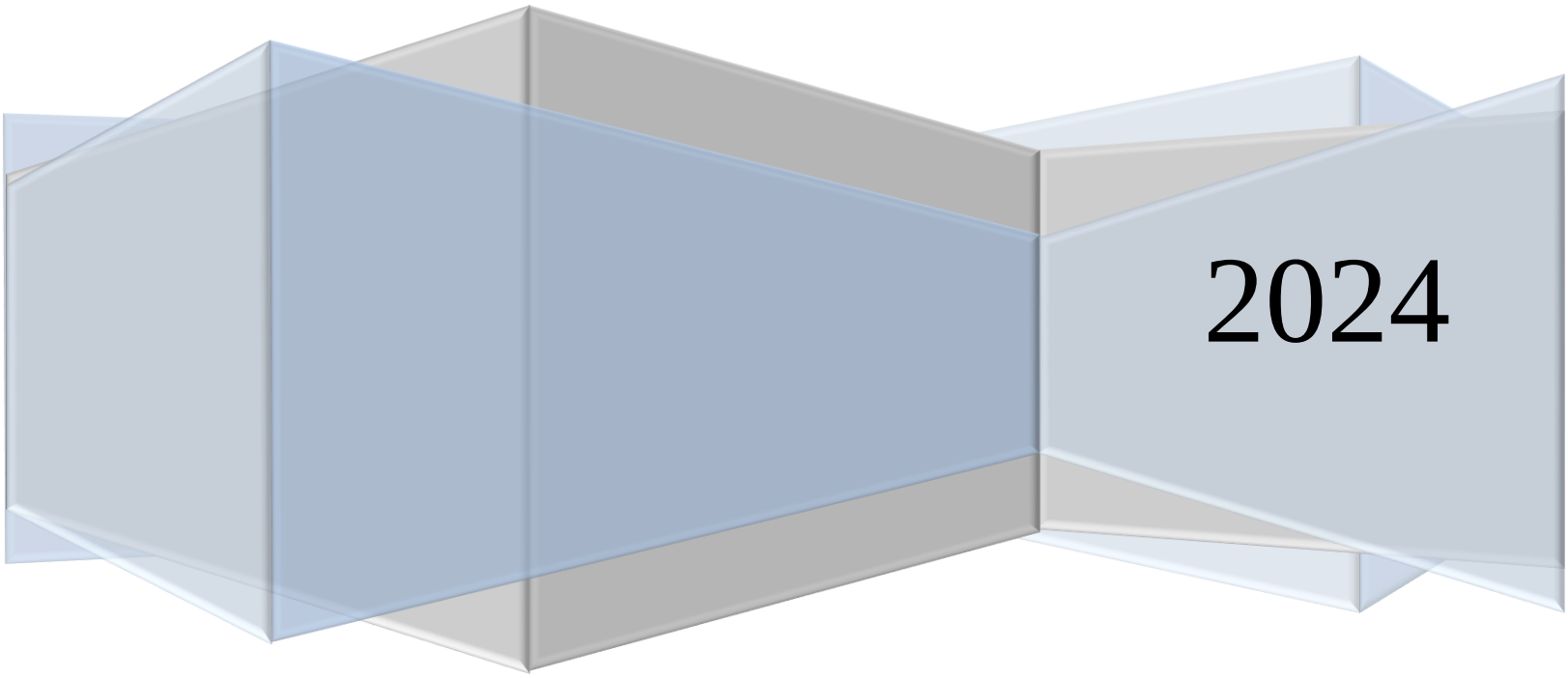

Abstract

The retail industry has seen a significant increase in competition, and all of its participants are vying for the ability to maximize marketing serving procedures while meeting client expectations. Hence, it is imperative for every business or organization to effectively handle and direct data in order to satisfy customers and make healthy profits. Data mining, or more accurately big data analytics, is now present at every step of the retail market/business process for major retail players in the USA and other countries. For example, tracking customer order placements and forecasting the sales of a specific product, optimizing product sales and offers based on customer preferences, monitoring emerging products in the market, forecasting and predicting the sales utilizing the predictive simulation techniques to forecast sales and future demand. Simultaneously, identifying the expectations and interest of customers in particular product categories based on their past purchasing behavior, as well as determining the most effective way to reach them through focused marketing campaigns and, ultimately, what to offer them next, constitute the fundamental components of data analytics.

The project's goal is to demonstrate how to use the DAX query language in Power BI to work with business-oriented retail analytics data and how well the dashboard performs for end users. As a result, for this project, I have developed an analytical dashboard that provides information on historical trends, business performance, top regions, most popular goods, and manager/market performance. In addition, I have produced a what-if analysis based on historical trends for future planning; stakeholders can access this dashboard to learn about functional areas, company growth trends, and visualizations. With the help of this project, you can easily view the performances of all the commodities by visualizing a vast dataset.

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1. Introduction

1.1. Power BI

Power BI is a business analytics service provided by Microsoft. It aims to provide interactive visualizations and business intelligence capabilities to create their own reports and dashboards for the end users. Our data may be in an Excel spreadsheet, or a collection of a cloud based .Pbix file which is designed for to use with Power BI desktop. Power BI was initially released in 2014, operating system: Microsoft windows. Power BI provides cloud-based services, along with desktop interface, called Power BI Desktop. The key components of the Power BI are (I have mentioned only 3 which I have used in this project):

- Power BI desktop: designing and publishing reports and dashboards to the service.
- Power BI service: software as a service.
- Power BI mobile apps: iOS, android, and windows phones.

The objective of my project is to analyze the retail sales data of the items sold across multiple countries and stores. I have used visualization and fields tools to create the data sale analysis charts shown in this report and project.

Benefits of Retail analysis: with the help of Power BI, a retailer can even analyze, if there are any issues in its products, transportation, services. Transactions, supply chain, buying behaviors, multi-channel sales, trends and global coverage can also be tracked with this tool to maximize profit. The sales data stored yearly could be used to improvise the business. To store the yearly sales data, products data, and services data, the retailers usually use the excel sheet or SAP tools.

Instead of presenting each and every data in different layouts, I have used Power BI tools and presented all the charts information in five layouts with the complete information for the year 2014 and all the years.

By looking at this retail analysis layout, the audience who are seeing the layout will come to an understanding what profit they have made in multiple countries. For all the charts in the top corner there are 3 symbols i.e., FILTER, HIGHLIGHT, and NONE. We can choose what option we need to demonstrate the charts regarding our requirements. Filter is like filtering the icons to what to present in all the charts and what not to show. Highlight is just like highlighting the requirements mentioned. None is like not to show which is not needed. For visual interaction there is an option called edit interact, using this option we can directly visualize and edit the data. I have created the Power BI tool for the visualization of data for the years 2011-2014.

1.2. Retail analytics

As we are all aware, the retail business sales output is the fulcrum of company's performance. To achieve the best output sales, there are many parameters, to be mastered.

1) Detailed analysis of the particular product in the area, where it must be marketed. The product demand analysis, which must be done practically by interacting with different segment people of that area.
2) Analysis of competitive brands. Evaluation of positives and negatives of our brand product to be marketed. Plan to make improvisation of product and give more emphasis for acceptability of the product by all segment people of society.

3) Quality of product, which is very important parameter of the product sales. To achieve quality, one should look for quality raw materials at most reasonable rate, which will help to sell product at best marketing competitive price.
4) Marketing of finished product. Selection of marketing team is very challenging. The key is to recruit the marketing team. The team efforts, right from sales manager to field salesman gets the best of product sales.
5) Production of product in relative, with demand in market is more important. If demand is more and production is less, because of shortage of raw material or production staff, will give room for competitive brands to dilute the sales curve.
6) After establishing the best sales of product in the market with outstanding co-ordination of above parameters. The company management must give more emphasis for the consistency product sales by research and sales development. The company which has better research and development will perform best in market.

1.3. Why should retailers care about retail analytics

There are a million tasks retailers must stick on top of the digital age, and it is not an easy job to conduct all the analysis in a single day. Today's retailers are facing a cluster of new challenges, like declining sales, aggressive competition from online stores, and changing consumer preferences. Despite these challenges, some long established retailers are managing to grow year-over-year, shredding past sales records. The winners are doing something contrasting, something which is not only helps them to survive but also succeed/flourish in this rapidly unfolding retail closure – advanced retail analytics.

According to McKinsey Company, the reason some retailers are

winning while others struggle is advanced analytics (Gonzalo et al., 2020). New research says that retailers using advanced analytics outperform the competition by 68% in earnings — and the disparity is growing exponentially. But what exactly is "advanced analytics," and how does it differ from regular old Excel analysis? To explain what makes advanced analytics in the retail industry so special.

1.4. What is retail data analytics

Retail data analytics is the process of collection and studying of different datasets in retail data (like sales, inventory, pricing, etc.) to invent trends, future predict results, and make finer business decisions. Data analytics permits retailers to get more understanding into the performance of their customers, stores, products, and dealers and use that insight to grow profits.

Virtually all retailers are doing different form of data analytics even if they are only reviewing sales numbers on Excel. But there is a very big difference between an analyst firing up Excel to shift through spreadsheets and using purpose-built AI to analyze billions of data points at once. One of the reasons to use data analytics to show decision-making is to secure your decisions are based on actual truth (cold, hard numbers), not just others perception of reality.
Analytics help us understand what's going on with your business with greater detail than you could do otherwise.

A retailer can use data analytics to:

- Understand the value and number of products sold in an average order
- Recognize which products sell the most, the least, and everything in-between
- Identify your most valuable customers
- Discover what your true demand was as well as past lost sales
- Determine optimal suggested order quantities and recommend purchase quantities and allocations.
- Establish the optimal price point for a specific product at any specific location.

It is not a surprise, that there exists an enormous, things in industry for retail analytics solutions. Below, we will discuss some of related applications, how they will work, and what benefits we could see from using them. To productively manage and assemble their data, many businesses choose to turn to Business Intelligence tools. As, BI tools help you to structure and visualize your data.

Many retailers conduct basic BI using native features in their ERP (Enterprise Resource Planning) system, or by importing data directly into Microsoft Excel.
Slightly more advanced retailers are using dedicated BI software like:

- Power BI
- Tableau
- SAP

- QlikView
- Apache Spark

These applications support multiple data sources, appealing visualizations, and some degree of data manipulation. Importantly, all the above mentioned requires a lot of human input and are quite time-consuming to manage. This is especially true for medium to large retailers running hundreds or thousands of stores and products in different segments. Therefore, many retailers have dedicated teams of analysts in most departments to generate reports to get the details of the huge data in a clear form.

1.5. System Requirements

Hardware and Software Requirement: Hardware Requirement:

Processor : Intel(R) Core (TM) i7-8650U CPU @ Intel(R) Core(TM) i7- 8650U CPU @ 1.90GHz 2.11 GHz .

RAM : Minimum16 GB or Greater.

Hard disk : HDD, SDD20 GB (Free Space).

Software Requirement:

Software : Power Bi

Operation System : 64-bit operating system, Windows 10 or higher.

Project Overview:

Front End : Power Bi Desktop

Back End : Excel, Azure and DAX query language.

2. Background

The purpose of the project is to create a helpful piece of software that will help Retail Analytics with the management of user data, the creation of invoices, their validation and inspection, and the promotion of user communication via native messaging. Retail analytics solutions are used by the retail industries to manage sales and consumables. This retail analytics solution is easy to use. Achieving outstanding outcomes with less effort.

2.1. Scalability and performance

The scalability of Power BI High quality/elite capacity, and the scalability of backend is Direct Query or Live Connect data sources. The tool is meant to be used in capacity planning and scale evaluation scenarios when admins of Power BI capacities and backend data sources wish to test the ability of their architecture to serve a certain scale. “It has a 1 GB limit per dataset that is imported into Power BI. If you have chosen to keep the Excel experience, instead of importing the data, the limit is 250 MB for the dataset”.

2.1. DAX queries description:

Syntax Formula:
' ' single quotes indicates to the related table [ ] related to the table name.

Measures for raw data

Column’s calculations are identified by summation symbol in the fields’ Box with cross lines and calculator symbol is calculated columns.

Measure is identified through calculator symbol from the fields.

All queries are in DAX language with calculated column and measures using formulas and syntax and measure as syntax consumes less space it is visualize, whereas measures contain lot of space and it is not visualize in raw data.

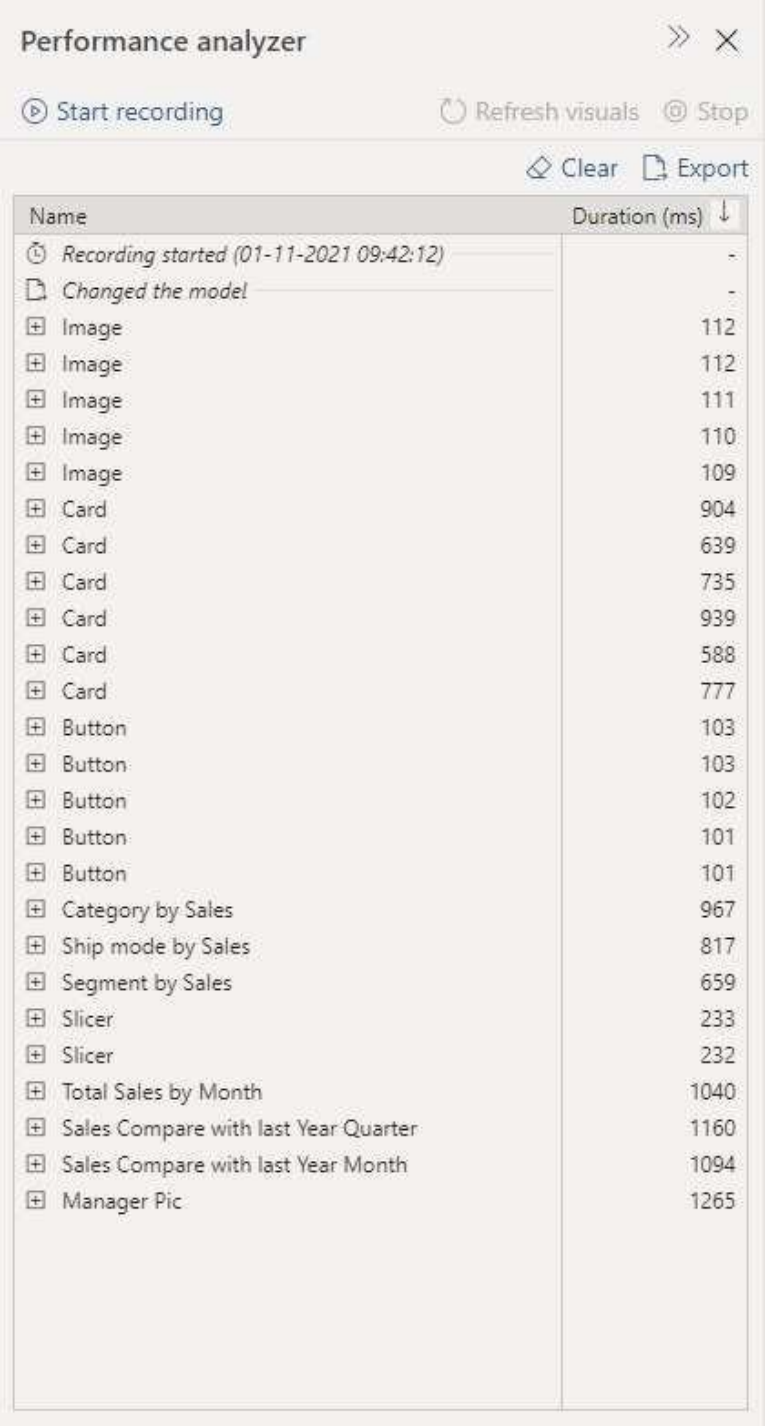


Figure 1. Performance analyzer

- Referring performance analyzer if I set 10 Lacs records

- Duration calculated in microseconds it will take hardly 1 min data and all visualization refreshes.

2.2. Accessibility

When Power BI Dashboard is built on a specific topic with accessible dashboards and reports, the accessibility can be given to many persons in the world. For accessibility, you must share your report on the Power BI web service so everyone could see it.

Table 1. Accessibility checklist.

Standard	**Y/N**	**Comments**
High Contrast	Y	Available on web service
Focus Mode	Y	Available in each visualization
Titles & Labels	Y	Available in each visualization
Legends	Y	Available in each visualization
Filter / Slicer	Y	Adds filters for more drill down
Cards	Y	Few cards created for KPI
Tabs/Pages	Y	Created different pages/tabs for more clarity of visualizati
Data Flow	Y	Data visualize in proper way: 1st page – overview of b product wise 3rd page: market wise; 4th page – geographic wise data
Font size & color	Y	We can change font size and color
Icons for visualization	Y	Uploaded category wise or graph wise icons to understand
Wallpaper	Y	Uploaded background with the help of PPT
Page Navigation	Y	Created page navigation with the help of button and applie
Theme	Y	Created universal them for all page but layout is different
Show Data	Y	we can check raw data
Model	Y	we can check and create connection between multiple ta key
Sort Option	Y	Sort option is available in each visualization
View and Hide	Y	we can hide any visual anytime
Measures	Y	Multiple measures created for calculations, we can che measures
Transform	Y	we can Transform data and modify as per required

Format painter	Y	want to apply same format for other visual them by using t
Drill down	Y	we can drill down with down arrow in all visualization
Disabilities	**Y**	**The above options are accessible to disable people thr**
Color contrast	**Y**	**With the options published on web, using low, high, ye**

2.2.1. Accessibility in Power BI:

While working with Power BI, I considered the different types of users who may interact with these reports. I created reports that are easily navigated and understood by keywords and button / tabs / filters.

2.2.2. Universal Design:

I created Universal design for all pages with background design and colors to make it simple and attractive and user friendly. Created few tabs to separate all pages and applied navigate function to go to directly on that page.

2.2.3. To access this reports / dashboard:

To make it accessible I must publish this report from desktop to web service and mentioned users email id so they can access these reports. We can also set the limitations.

2.2.4. How to use or access dashboard:

In all pages I have created multiple tabs. If you click on any tabs, you will go directly to that page. Retail analytics dashboard is created to quickly see the performance of all the products that a company sell. This layout relationship calculations are done with DAX query language and then visualizations are created through fields and filters. This dashboard contains 5 layouts that is overview, product wise, market wise, geographic wise and what if analysis. The overview of my dashboard/report includes how the sales are done regarding different products in multiple countries and regions and how many customers are buying the products how it is transported how many managers the best profits and comparisons between quartered and month regarding sales. What if analysis to improve the future business in retail analytics. Our cerebrum attracts more to the colors and visualizations rather than written documents.

Accessibility and unit testing performance is done with my dashboard. For accessibility When spotlight option is selected the other are not seen and there are many options like drill up, drill down, colors, transparency, focus mode, show as a table etc.

Figure: Figure showing overall accessibility of the project KPI.

You can click on highlighted button to for focus mode or you can click on below highlighted area and get data table or you can download data into csv.

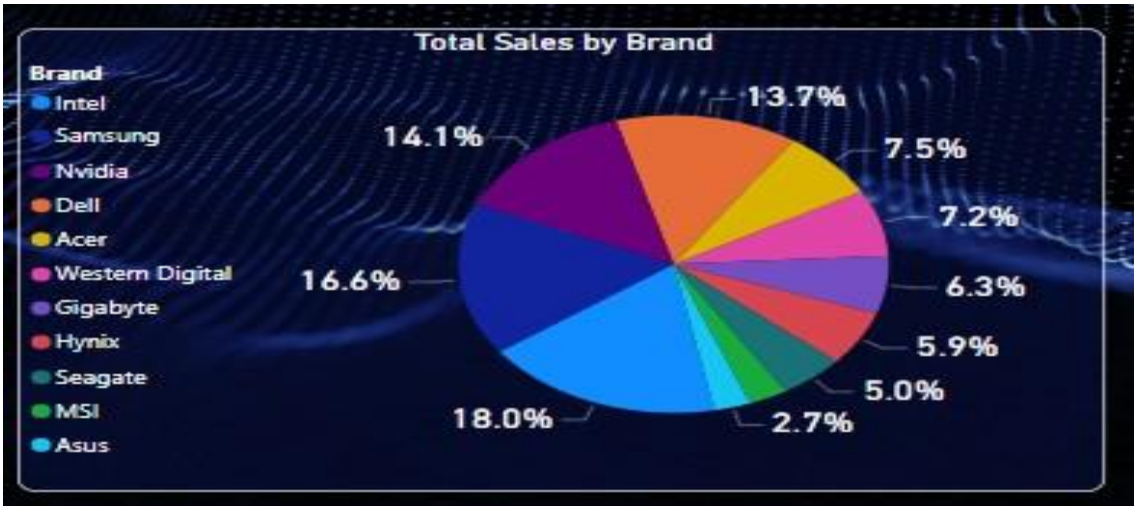


Figure: Figure showing the accessibility of the particular category data.

2.3. GUI

The GUI I have worked on the DAX query Language that is backend program of the application. Power BI interface includes, data source, theme, query language, visualizations, we can manipulate as per our requirement.

Power BI have 2 types of applications:

- Desktop - in Desktop version you can create / modify reports

Web - you can publish your reports from Desktop to web so everyone can access your report or dashboard

3. Methodology

The main objective in making this dashboard is that, the reader can directly analyze what we had in last financial year. Which areas are not making sales, or which is our best product etc. I have created what if analysis also to analyze if we increase any parameter like if we increase or decrease quantity by 5% then what will be the total sales and profit. Reader can take decision for business growth, and it is easy to understand business performance.

3.2. Data Source

Retail raw data taken from google.com there are 3 sheets:

Sales

Below are the Columns with description:

Row ID: Row ID is unique id for each transaction's.

Order ID: Order ID is repeated like if I Purchase product from multiple categories on same time then Order id will be same for both.

Ship Mode: we have 4 types of ship mode (First, Second, Standard, Same Day)

Customer ID: which is unique for all customers

Customer Name

Segment: we have 3 types of segments.
Market: we have 7 Markets
Region

Product ID: which is unique for each product

Category

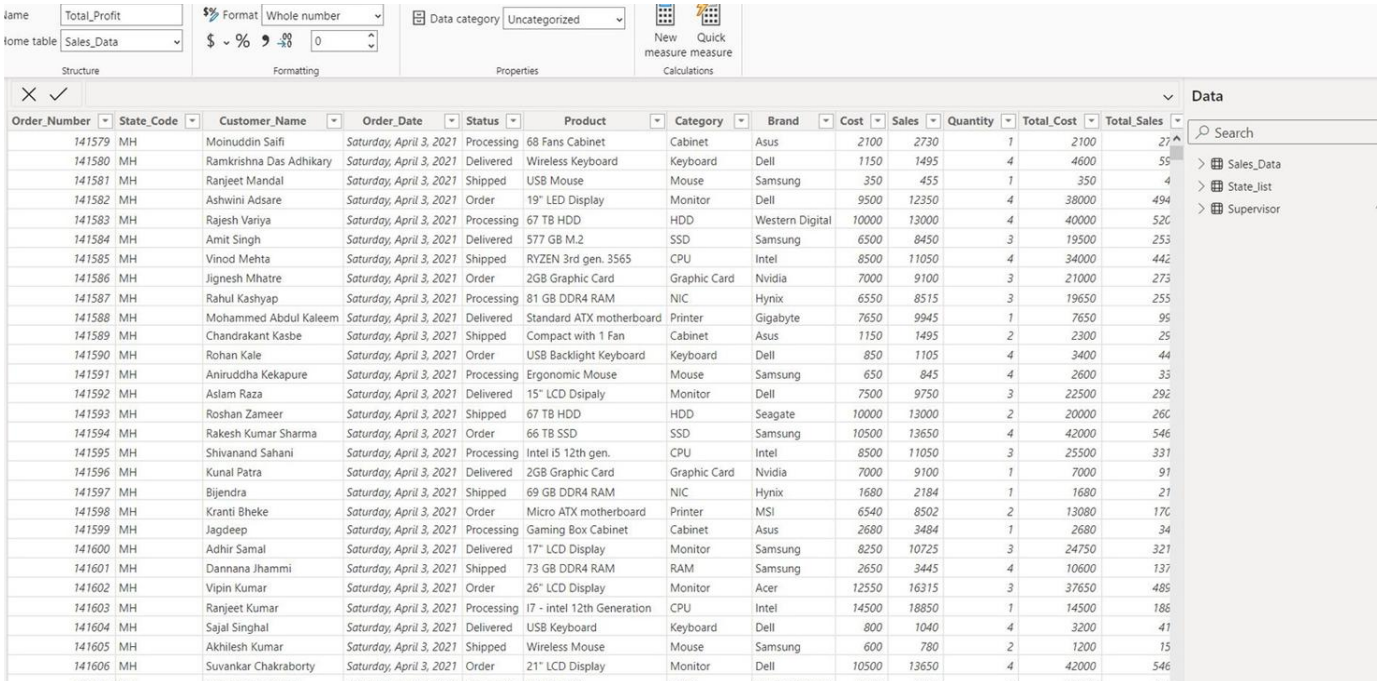
Sub-category
Product
name
Unite
Price
Product **Profit**
Margin Quantity
Discount
Shipping
Cost
Order
Priority

Return

Below are the columns with description
Row ID: which is unique id from sales
Return Status: we have yes comment from row id

Market Supervisor

Below are the columns with description **Market:** Unique Market Name
Market Manager
Manager Pic



Order_Number	State_Code	Customer_Name	Order_Date	Status	Product	Category	Brand	Cost	Sales	Quantity	Total_Cost	Total_Sales
141579	MH	Moinuddin Saifi	Saturday, April 3, 2021	Processing	68 Fans Cabinet	Cabinet	Asus	2100	2730	1	2100	27
141580	MH	Ramkrishna Das Adhikary	Saturday, April 3, 2021	Delivered	Wireless Keyboard	Keyboard	Dell	1150	1495	4	4600	59
141581	MH	Ranjeet Mandal	Saturday, April 3, 2021	Shipped	USB Mouse	Mouse	Samsung	350	455	1	350	4
141582	MH	Ashwini Adsare	Saturday, April 3, 2021	Order	19" LED Display	Monitor	Dell	9500	12350	4	38000	494
141583	MH	Rajesh Variya	Saturday, April 3, 2021	Processing	67 TB HDD	HDD	Western Digital	10000	13000	4	40000	520
141584	MH	Amit Singh	Saturday, April 3, 2021	Delivered	577 GB M.2	SSD	Samsung	6500	8450	3	19500	253
141585	MH	Vinod Mehta	Saturday, April 3, 2021	Shipped	RYZEN 3rd gen. 3565	CPU	Intel	8500	11050	4	34000	442
141586	MH	Jignesh Mhatre	Saturday, April 3, 2021	Order	2GB Graphic Card	Graphic Card	Nvidia	7000	9100	3	21000	273
141587	MH	Rahul Kashyap	Saturday, April 3, 2021	Processing	81 GB DDR4 RAM	NIC	Hynix	6550	8515	3	19650	255
141588	MH	Mohammed Abdul Kaleem	Saturday, April 3, 2021	Delivered	Standard ATX motherboard	Printer	Gigabyte	7650	9945	1	7650	99
141589	MH	Chandrakant Kasbe	Saturday, April 3, 2021	Shipped	Compact with 1 Fan	Cabinet	Asus	1150	1495	2	2300	29
141590	MH	Rohan Kale	Saturday, April 3, 2021	Order	USB Backlight Keyboard	Keyboard	Dell	850	1105	4	3400	44
141591	MH	Aniruddha Kekapure	Saturday, April 3, 2021	Processing	Ergonomic Mouse	Mouse	Samsung	650	845	4	2600	33
141592	MH	Aslam Raza	Saturday, April 3, 2021	Delivered	15" LCD Dsipaly	Monitor	Dell	7500	9750	3	22500	292
141593	MH	Roshan Zameer	Saturday, April 3, 2021	Shipped	67 TB HDD	HDD	Seagate	10000	13000	2	20000	260
141594	MH	Rakesh Kumar Sharma	Saturday, April 3, 2021	Order	66 TB SSD	SSD	Samsung	10500	13650	4	42000	546
141595	MH	Shivanand Sahani	Saturday, April 3, 2021	Processing	Intel i5 12th gen.	CPU	Intel	8500	11050	3	25500	331
141596	MH	Kunal Patra	Saturday, April 3, 2021	Delivered	2GB Graphic Card	Graphic Card	Nvidia	7000	9100	1	7000	91
141597	MH	Bijendra	Saturday, April 3, 2021	Shipped	69 GB DDR4 RAM	NIC	Hynix	1680	2184	1	1680	21
141598	MH	Kranti Bheke	Saturday, April 3, 2021	Order	Micro ATX motherboard	Printer	MSI	6540	8502	2	13080	170
141599	MH	Jagdeep	Saturday, April 3, 2021	Processing	Gaming Box Cabinet	Cabinet	Asus	2680	3484	1	2680	34
141600	MH	Adhir Samal	Saturday, April 3, 2021	Delivered	17" LCD Display	Monitor	Samsung	8250	10725	3	24750	321
141601	MH	Dannana Jhammi	Saturday, April 3, 2021	Shipped	73 GB DDR4 RAM	RAM	Samsung	2650	3445	4	10600	137
141602	MH	Vipin Kumar	Saturday, April 3, 2021	Order	26" LCD Display	Monitor	Acer	12550	16315	3	37650	489
141603	MH	Ranjeet Kumar	Saturday, April 3, 2021	Processing	I7 - intel 12th Generation	CPU	Intel	14500	18850	1	14500	188
141604	MH	Sajal Singhal	Saturday, April 3, 2021	Delivered	USB Keyboard	Keyboard	Dell	800	1040	4	3200	41
141605	MH	Akhilesh Kumar	Saturday, April 3, 2021	Shipped	Wireless Mouse	Mouse	Samsung	600	780	2	1200	15
141606	MH	Suvankar Chakraborty	Saturday, April 3, 2021	Order	21" LCD Display	Monitor	Dell	10500	13650	4	42000	546

Figure : Excel raw data

Source: Skillcourse

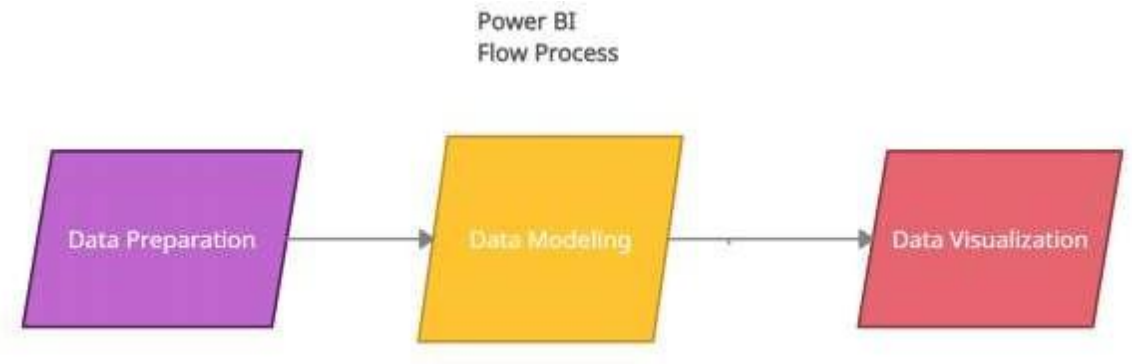


Figure: Data flow process

1. Data preparation – organizing the data in a flat table.

2. Data modeling – It is used to connect multiple data sources in BI tool using a relationship.
3. Data Visualization – It is the process of transforming huge data sets into graphs charts and other visualizations**.**

3.3. How to upload raw data into Power BI

To Create Power BI, visualize dashboard, you need to download Power bi desktop and install. Once you have installed, then we need to follow below process (Microsoft Power BI documentation, 2021):

Click on Get Data => Excel workbook = > browse your raw file = > select required sheets and then click on transform => Power Query editor window will be open => then from each table you have to check all data types, then you have to click on close & apply.
Now your base data is

ready!

Date Table:

I have created date table for measures and apply into charts.

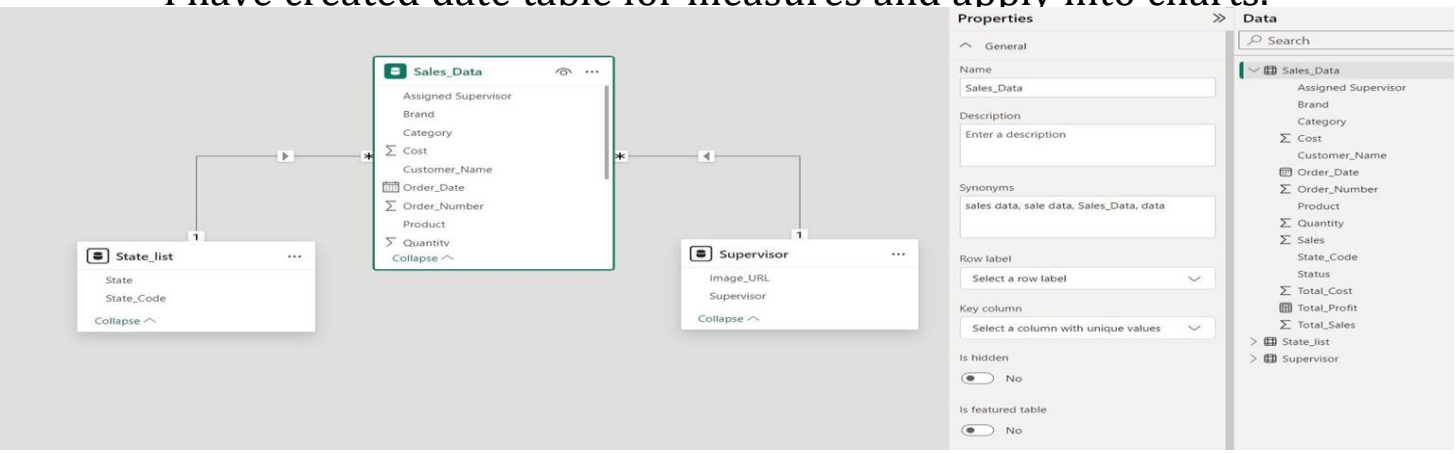


Figure 7. Connection between multiple tables for calculations

3.4. Data Analysis Expressions (DAX)

Data Analysis Expressions (DAX) is a query programming language that is used throughout Microsoft Power BI for creating calculated columns, measures, and custom tables. It is a collection of functions, operators, and constants that can be used in a formula, or expression, to calculate and return one or more values.

3.5. DAX Queries

I have created multiple measures with DAX query:

4. Results

4.1. Power BI Pages

Figure. Overview of the Power BI dashboard

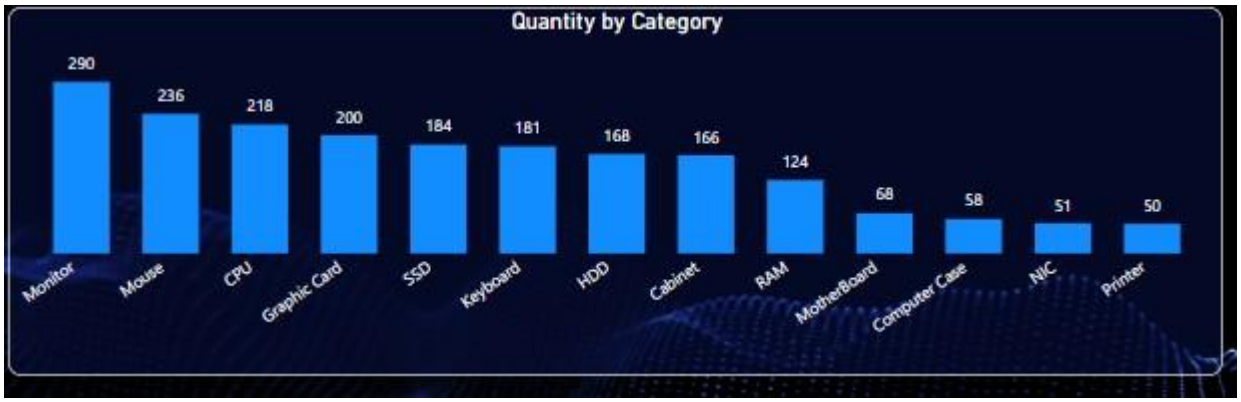


Figure. Multiple cards to represent key performance like: Total Sales | Total Orders | Unique Customers | Return Products with percentage | Total

We can go to that page with the help of direct click on mentioned

tab. I have given year filer and market manager filter to check year wise visualization and manager wise.

Figure. Tabs for multiple pages- As in the above picture we are seeing multiple tabs, Overview, product wise, market wise, geographic wise, what if analysis with the year 2014 and market manager with seven market managers pictures. When we click on these tabs and pictures it directly navigates to the wanted pages to find the information within seconds.

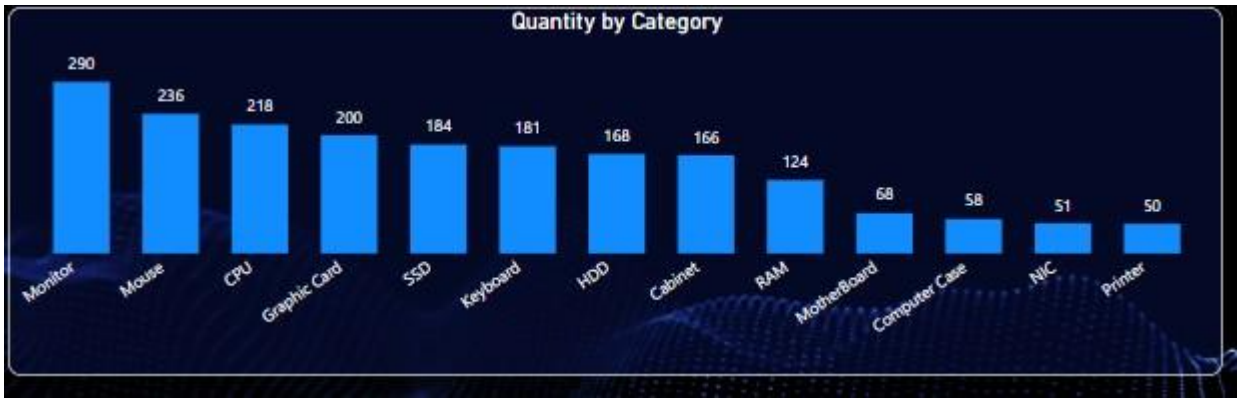


Figure. Visualization showing the category wise sales, Ship mode wise sale, Segment mode.

Results:

The results of a Power BI dashboard are the insights and information gained from analyzing the data presented in the visualizations. Users can interact with the dashboard to explore the data, identify trends, and make informed decisions based on the results.

Conclusion

The dashboard includes a "Quantity by Category" visualization, users can interpret the results by identifying the product categories with the highest and lowest sales quantities. They can also analyze changes in sales quantities over time, identify seasonal trends, and compare sales quantities across different regions or sales channels.

The dashboard includes a "Total Sales by Brand" visualization, users can interpret the results by understanding which brands contribute the most to the company's revenue. They can also analyze changes in sales for each brand over time and identify opportunities for growth or improvement.

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