SUPPLY CHAIN ANALYTICS

Kahwaji Group 1
Azam Jah Al Ahmed
Shravya Agala Padmegowda
Tanya Singh

Affiliation

COLLEGE OF BUSINESS
COLORADO STATE UNIVERSITY

Dr. Hamed Qahri-Saremi

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INTRODUCTION

What is Supply Chain?

A supply chain is a network of companies and the individuals who are involved in manufacturing a product and delivering it to the consumer. The supply chain links starts with the producers of the raw materials and ends when the final goods or the product is delivered to the customer or the end users.

Supply chain management is the entire interconnected entity network which is involved in the distribution and the manufacturing of goods and services, from raw material suppliers to the customers or the end users. It deals with several activities which includes manufacturing, transportation, warehousing, procurement, distribution, and retailing. The supply chain management primary goal is to ensure the flow of information of the material and resources across the network of supply chain with costs minimization and value maximization for all stakeholders involved.

Fig 1: Supply Chain

The supply chain is characterized by its several factors which include globalization, complexity, and rapid pace of change. With globalization, supply chains have become extensively interconnected and extended

across multiple time zones and geographic regions. This has led to many different opportunities for saving costs, expansion of the market, and having access to different sources of supply. However, it has also led to the introduction of new challenges such as increased risk in the supply chain, volatility, and uncertainty in the supply chain.

Supply chain management is a very important function for any business which is operating in today's competitive and challenging marketplace. Efficient supply chain management can provide competitive advantage by helping the companies to deliver goods to end users faster, at a cost which is much lower and having a high level of service. In contrast, poor supply chain management can lead to delays in product delivery, can lead to stockouts, excess inventory, and higher costs of operations, which could negatively impact profitability and lead to bad customer satisfaction.

A supply chain includes every step that is involved in getting a finished product or service to the customer. The steps may include sourcing raw materials, moving them to production, then transporting the finished products to a distribution center or retail store where they may be delivered to the consumer.

This project delves into supply chain analytics, mainly focusing on optimizing the flow of goods and services from the origin point to the final consumer. Supply chain analytics deals with data analysis and modeling techniques which helps in enhancing efficiency, reducing the costs, and improving the overall performance within supply chains.

The dataset utilized for our Supply Chain Analytics project was sourced through extensive exploration across various online repositories and data providers. Given the specificity of our project objectives and the tailored nature of our analytical questions, we sought a dataset that closely aligned with our analytical needs.

After thorough consideration and evaluation of multiple datasets, we identified one that exhibited a strong alignment with our project's parameters. Crucially, this dataset contained essential date columns, which were integral for crafting the measures and conducting the analyses required to address our questions effectively.

While the exact source of the dataset may vary due to the nature of online data repositories and providers, it was selected based on its relevance, accuracy, and alignment with our project objectives. Notably, the dataset provided the foundational information necessary to provide insightful conclusions and facilitate strategic decision-making within supply chain management.

The selection of an appropriate dataset in supply chain management is crucial for optimizing operations, enhancing efficiency, and making informed decisions. Among various datasets available, the inclusion of tables such as warehouses, products, customers, regions, and sales is fundamental for gaining comprehensive insights into the supply chain dynamics. This report delves into the significance of selecting such a dataset and highlights its importance in driving strategic initiatives within the supply chain domain.

DATASET

The dataset in Supply Chain Analytics in Excel format shows five sheets such as Sales Order, Warehouse, Customers, CN Regions, and Products as mentioned below;

Sales Orders: This sheet records transactional data, including order numbers, channels, dates (procured, order, ship, and delivered), warehouse and customer indices, region and product indices, order quantities, unit prices, and unit costs. This data can be analyzed to answer questions about sales trends, geographical distribution of sales, product performance, and the efficiency of shipping and delivery processes.

Warehouse: This sheet details warehouses, including indices, codes, city, province, country, full name, latitude, and longitude. It can help analyze the geographical spread and logistical capacities of warehouses.

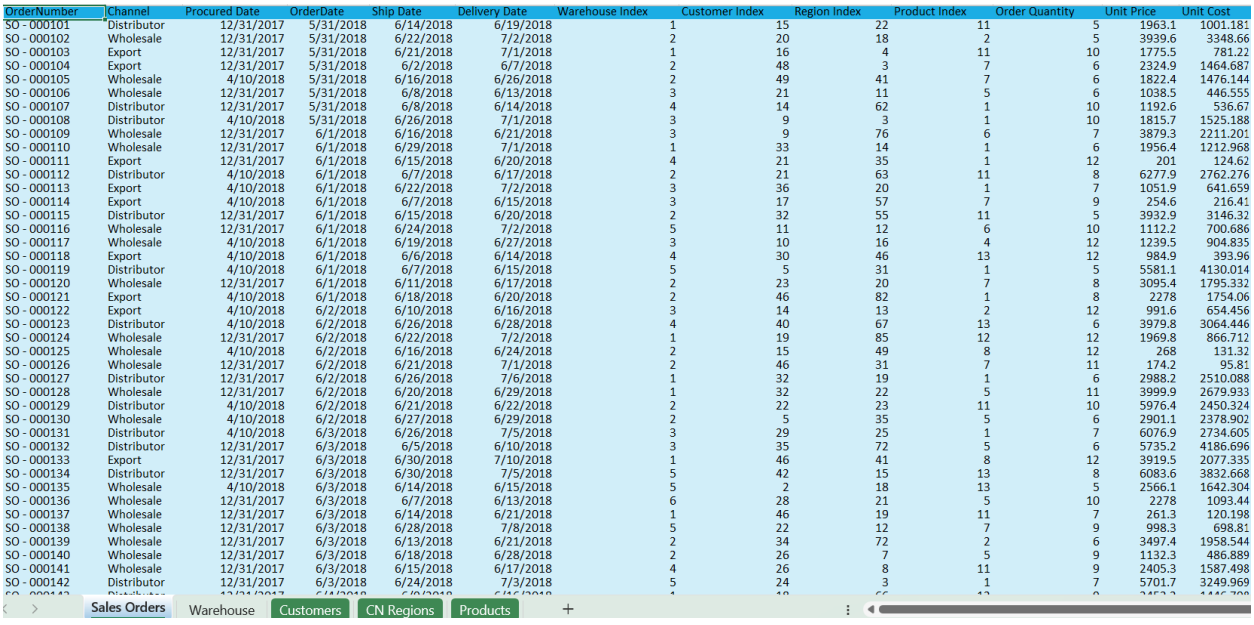
Customers: Lists customer indices and names, which are crucial for customer segmentation and analyzing sales performance by customer group.

CN Regions: This database contains data about different regions, including city, province, country, full name, latitude, and longitude. This data can help analyze sales trends and demand across different geographical regions.

Products: This sheet lists product indices and names, which are essential for analyzing product-specific sales performance, inventory needs, and profitability.

The questions presented for the project are answered by following dataset analysis:

Geographical Sales Analysis: By combining sales data with regional and warehouse information, we can identify which regions and warehouses handle the most sales, helping to optimize inventory distribution and marketing strategies.



OrderNumber	Channel	Procured Date	OrderDate	Ship Date	Delivery Date	Warehouse Index	Customer Index	Region Index	Product Index	Order Quantity	Unit Price	Unit Cost
SO - 000101	Distributor	12/31/2017	5/31/2018	6/14/2018	6/19/2018	1	15	22	11	5	1963.1	1001.181
SO - 000102	Wholesale	12/31/2017	5/31/2018	6/22/2018	7/2/2018	2	20	18	2	5	3939.6	3348.66
SO - 000103	Export	12/31/2017	5/31/2018	6/21/2018	7/1/2018	1	16	4	11	10	1775.5	781.22
SO - 000104	Export	12/31/2017	5/31/2018	6/2/2018	6/7/2018	2	48	3	7	6	2324.9	1464.687
SO - 000105	Wholesale	4/10/2018	5/31/2018	6/16/2018	6/26/2018	2	49	41	7	6	1822.4	1476.144
SO - 000106	Wholesale	12/31/2017	5/31/2018	6/8/2018	6/13/2018	3	21	11	5	6	1038.5	446.555
SO - 000107	Distributor	12/31/2017	5/31/2018	6/8/2018	6/14/2018	4	14	62	1	10	1192.6	536.67
SO - 000108	Distributor	4/10/2018	5/31/2018	6/26/2018	7/1/2018	3	9	3	1	10	1815.7	1525.188
SO - 000109	Wholesale	12/31/2017	6/1/2018	6/16/2018	6/21/2018	3	9	76	6	7	3879.3	2211.201
SO - 000110	Wholesale	12/31/2017	6/1/2018	6/29/2018	7/1/2018	1	33	14	1	6	1956.4	1212.968
SO - 000111	Export	12/31/2017	6/1/2018	6/15/2018	6/20/2018	4	21	35	1	12	201	124.62
SO - 000112	Distributor	4/10/2018	6/1/2018	6/7/2018	6/17/2018	2	21	63	11	8	6277.9	2762.276
SO - 000113	Export	4/10/2018	6/1/2018	6/22/2018	7/2/2018	3	36	20	1	7	1051.9	641.659
SO - 000114	Export	4/10/2018	6/1/2018	6/7/2018	6/15/2018	3	17	57	7	9	254.6	216.41
SO - 000115	Distributor	12/31/2017	6/1/2018	6/15/2018	6/20/2018	2	32	55	11	5	3932.9	3146.32
SO - 000116	Wholesale	12/31/2017	6/1/2018	6/24/2018	7/2/2018	5	11	12	6	10	1112.2	700.686
SO - 000117	Wholesale	4/10/2018	6/1/2018	6/19/2018	6/27/2018	3	10	16	4	12	1239.5	904.835
SO - 000118	Export	4/10/2018	6/1/2018	6/6/2018	6/14/2018	4	30	46	13	12	984.9	393.96
SO - 000119	Distributor	4/10/2018	6/1/2018	6/7/2018	6/15/2018	5	5	31	1	5	5581.1	4130.014
SO - 000120	Wholesale	12/31/2017	6/1/2018	6/11/2018	6/17/2018	2	23	20	7	8	3095.4	1795.332
SO - 000121	Export	4/10/2018	6/1/2018	6/18/2018	6/20/2018	2	46	82	1	8	2278	1754.06
SO - 000122	Export	4/10/2018	6/2/2018	6/10/2018	6/16/2018	3	14	13	2	12	991.6	654.456
SO - 000123	Distributor	4/10/2018	6/2/2018	6/26/2018	6/28/2018	4	40	67	13	6	3979.8	3064.446
SO - 000124	Wholesale	12/31/2017	6/2/2018	6/22/2018	7/2/2018	1	19	85	12	12	1969.8	866.712
SO - 000125	Wholesale	4/10/2018	6/2/2018	6/16/2018	6/24/2018	2	15	49	8	12	268	131.32
SO - 000126	Wholesale	12/31/2017	6/2/2018	6/21/2018	7/1/2018	2	46	31	7	11	174.2	95.81
SO - 000127	Distributor	12/31/2017	6/2/2018	6/26/2018	7/6/2018	1	32	19	1	6	2988.2	2510.088
SO - 000128	Wholesale	12/31/2017	6/2/2018	6/20/2018	6/29/2018	1	32	22	5	11	3999.9	2679.933
SO - 000129	Distributor	4/10/2018	6/2/2018	6/21/2018	6/22/2018	2	22	23	11	10	5976.4	2450.324
SO - 000130	Wholesale	4/10/2018	6/2/2018	6/27/2018	6/29/2018	2	5	35	5	6	2901.1	2378.902
SO - 000131	Distributor	4/10/2018	6/3/2018	6/26/2018	7/5/2018	3	29	25	1	7	6076.9	2734.605
SO - 000132	Distributor	12/31/2017	6/3/2018	6/5/2018	6/10/2018	3	35	72	5	6	5735.2	4186.696
SO - 000133	Export	12/31/2017	6/3/2018	6/30/2018	7/10/2018	1	46	41	8	12	3919.5	2077.335
SO - 000134	Distributor	12/31/2017	6/3/2018	6/30/2018	7/5/2018	5	42	15	13	8	6083.6	3832.668
SO - 000135	Wholesale	4/10/2018	6/3/2018	6/14/2018	6/15/2018	5	2	18	13	5	2566.1	1642.304
SO - 000136	Wholesale	12/31/2017	6/3/2018	6/7/2018	6/13/2018	6	28	21	5	10	2278	1093.44
SO - 000137	Wholesale	12/31/2017	6/3/2018	6/14/2018	6/21/2018	1	46	19	11	7	261.3	120.198
SO - 000138	Wholesale	12/31/2017	6/3/2018	6/28/2018	7/8/2018	5	22	12	7	9	998.3	698.81
SO - 000139	Wholesale	12/31/2017	6/3/2018	6/13/2018	6/21/2018	2	34	72	2	6	3497.4	1958.544
SO - 000140	Wholesale	12/31/2017	6/3/2018	6/18/2018	6/28/2018	2	26	7	5	9	1132.3	486.889
SO - 000141	Wholesale	12/31/2017	6/3/2018	6/15/2018	6/17/2018	4	26	8	11	9	2405.3	1587.498
SO - 000142	Distributor	12/31/2017	6/3/2018	6/24/2018	7/3/2018	5	24	3	1	7	5701.7	3249.969

Sales Orders | Warehouse | Customers | CN Regions | Products

Fig 2: Sales Orders Sheet

Warehouse Index	Warehouse Code	City	Province	Country	Full Name	Latitude	Longitude
1	WARE-UHY1004	Martensville	Saskatchewan	Canada	Martensville, SK, Canada	52.289722	-106.666664
2	WARE-NMK1003	Sainte-Marguerite-du-Lac-Masson	Quebec	Canada	Sainte-Marguerite-du-Lac-Masson, QC, Canada	46.029999	-74.050003
3	WARE-PUJ1005	Saint-Pamphile	Quebec	Canada	Saint-Pamphile, QC, Canada	46.966667	-69.783333
4	WARE-XYS1001	Terrebonne	Quebec	Canada	Terrebonne, QC, Canada	45.700001	-73.633331
5	WARE-MKL1006	Estevan	Saskatchewan	Canada	Estevan, SK, Canada	49.13673	-102.990959
6	WARE-NBV1002	Stanstead	Quebec	Canada	Stanstead, QC, Canada	45.016666	-72.099998

Fig 3: Warehouse Sheet

Customer Index	Customer Names
1	Avon Corp
2	WakeFern
3	Elorac, Corp
4	ETUDE Ltd
5	Procter Corp
6	PEDIFIX, Corp
7	New Ltd
8	Medsep Group
9	Ei
10	21st Ltd
11	Apollo Ltd
12	Medline
13	Ole Group
14	Linde
15	Rochester Ltd
16	3LAB, Ltd
17	Pure Group
18	Eminence Corp
19	Qualitest
20	Pacific Ltd
21	Ohio

Fig 4: Customers Sheet

Index	Product Name
1	Product A
2	Product B
3	Product C
4	Product D
5	Product E
6	Product F
7	Product G
8	Product H
9	Product I
10	Product J
11	Product K
12	Product L
13	Product M
14	Product N

Fig 5: CN Regions Sheet

Index	City	Province	Country	Full Name	Latitude	Longitude
1	Yorkton	Saskatchewan	Canada	Yorkton, SK, Canada	51.21389	-102.462776
2	Warman	Saskatchewan	Canada	Warman, SK, Canada	52.321945	-106.584167
3	Swift Current	Saskatchewan	Canada	Swift Current, SK, Canada	50.288055	-107.793892
4	North Battleford	Saskatchewan	Canada	North Battleford, SK, Canada	52.7575	-108.28611
5	Moose Jaw	Saskatchewan	Canada	Moose Jaw, SK, Canada	50.393333	-105.551941
6	Melville	Saskatchewan	Canada	Melville, SK, Canada	50.930557	-102.807777
7	Melfort	Saskatchewan	Canada	Melfort, SK, Canada	52.856388	-104.610001
8	Martensville	Saskatchewan	Canada	Martensville, SK, Canada	52.289722	-106.666664
9	Humboldt	Saskatchewan	Canada	Humboldt, SK, Canada	52.201942	-105.123055
10	Lloydminster	Saskatchewan	Canada	Lloydminster, SK, Canada	53.278046	-110.00547
11	Estevan	Saskatchewan	Canada	Estevan, SK, Canada	49.13673	-102.990959
12	Westmount	Quebec	Canada	Westmount, QC, Canada	45.484531	-73.597023
13	Waterville	Quebec	Canada	Waterville, QC, Canada	45.266666	-71.900002
14	Waterloo	Quebec	Canada	Waterloo, QC, Canada	45.349998	-72.51667
15	Ville-Marie	Quebec	Canada	Ville-Marie, QC, Canada	47.333332	-79.433334
16	Victoriaville	Quebec	Canada	Victoriaville, QC, Canada	46.049999	-71.966667
17	Vaudreuil-Dorion	Quebec	Canada	Vaudreuil-Dorion, QC, Canada	45.400002	-74.033333
18	Varennes	Quebec	Canada	Varennes, QC, Canada	45.683334	-73.433334
19	Val-d'Or	Quebec	Canada	Val-d'Or, QC, Canada	48.099998	-77.783333
20	Valcourt	Quebec	Canada	Valcourt, QC, Canada	45.5	-72.316666
21	Trois-Rivières	Quebec	Canada	Trois-Rivières, QC, Canada	46.349998	-72.550003
22	Trois-Pistoles	Quebec	Canada	Trois-Pistoles, QC, Canada	48.119999	-69.18
23	Thurso	Quebec	Canada	Thurso, QC, Canada	45.599998	-75.25
24	Thetford Mines	Quebec	Canada	Thetford Mines, QC, Canada	46.099998	-71.300003
25	Terrebonne	Quebec	Canada	Terrebonne, QC, Canada	45.700001	-73.633331
26	Témiscouata-sur-le-Lac	Quebec	Canada	Témiscouata-sur-le-Lac, QC, Canada	47.68	-68.879997
27	Témiscaming	Quebec	Canada	Témiscaming, QC, Canada	46.716667	-79.099998
28	Stanstead	Quebec	Canada	Stanstead, QC, Canada	45.016666	-72.099998
29	Sorel-Tracy	Quebec	Canada	Sorel-Tracy, QC, Canada	46.033333	-73.116669
30	Shawinigan	Quebec	Canada	Shawinigan, QC, Canada	46.566666	-72.75
31	Sept-Iles	Quebec	Canada	Sept-Iles, QC, Canada	50.216667	-66.383331
32	Senneterre	Quebec	Canada	Senneterre, QC, Canada	48.383331	-77.23333
33	Scotstown	Quebec	Canada	Scotstown, QC, Canada	45.529999	-71.279999
34	Salaberry-de-Valleyfield	Quebec	Canada	Salaberry-de-Valleyfield, QC, Canada	45.25	-74.129997
35	Saint-Sauveur	Quebec	Canada	Saint-Sauveur, QC, Canada	45.900002	-74.169998
36	Saint-Rémi	Quebec	Canada	Saint-Rémi, QC, Canada	45.266666	-73.616669
37	Saint-Raymond	Quebec	Canada	Saint-Raymond, QC, Canada	46.900002	-71.833336
38	Saint-Pie	Quebec	Canada	Saint-Pie, QC, Canada	45.5	-72.900002
39	Saint-Pascal	Quebec	Canada	Saint-Pascal, QC, Canada	47.533333	-69.800003
40	Saint-Pamphile	Quebec	Canada	Saint-Pamphile, QC, Canada	46.966667	-69.783333
41	Saint-Ours	Quebec	Canada	Saint-Ours, QC, Canada	45.883331	-73.150002
42	Saint-Lin–Laurentides	Quebec	Canada	Saint-Lin–Laurentides, QC, Canada	45.849998	-73.76667

Fig 6: Products Sheet

GOAL OF THE PROJECT

This project aims to optimize operational efficiency, enhance customer satisfaction, and maximize profitability through detailed supply chain analytics for the business. Each analysis within the project serves specific strategic purposes.

By identifying high-demand regions, the business can better allocate inventory and tailor marketing efforts, ensuring that products are available where they are most needed and potentially increase sales. Analyzing top-selling products allows for more efficient inventory management, focusing resources on items that generate the most profit and ensuring optimal stock levels to meet demand without overinvesting in less popular items.

Evaluating the profitability of different sales channels helps the business invest more wisely, channeling funds and efforts into the most lucrative channels while identifying and addressing the inefficiencies in less profitable ones. This strategic allocation of resources can enhance the return on investment across channels.

Improving shipping and fulfillment processes by pinpointing delays and inefficiencies reduces operational costs and speeds up delivery times, directly impacting customer satisfaction and loyalty. Client satisfaction increases the likelihood of recurring business and recommends the company to others.

Finally, effectively managing inventory according to demand trends prevents stockouts during high-demand periods and reduces excess inventory during slower sales. This leads to more consistent sales, better cash flow management, and reduced storage costs, contributing to overall financial health and operational agility.

DATA MODEL

In this data model, we have one fact table and five dimension tables. Each of the dimension tables is connected to the fact table using the indices, except the Date table.

We created the date table using DAX to have the time series analysis as it is crucial to understand the trends.

```
DateTable =
ADDCOLUMNS(
    CALENDAR(DATE(2017, 1, 1), DATE(2021, 12, 31)),
    "Year", YEAR([Date]),
    "MonthOfYear", MONTH([Date]),
    "DayOfYear", DAY([Date]),
    "DayOfWeek", WEEKDAY([Date]))
```

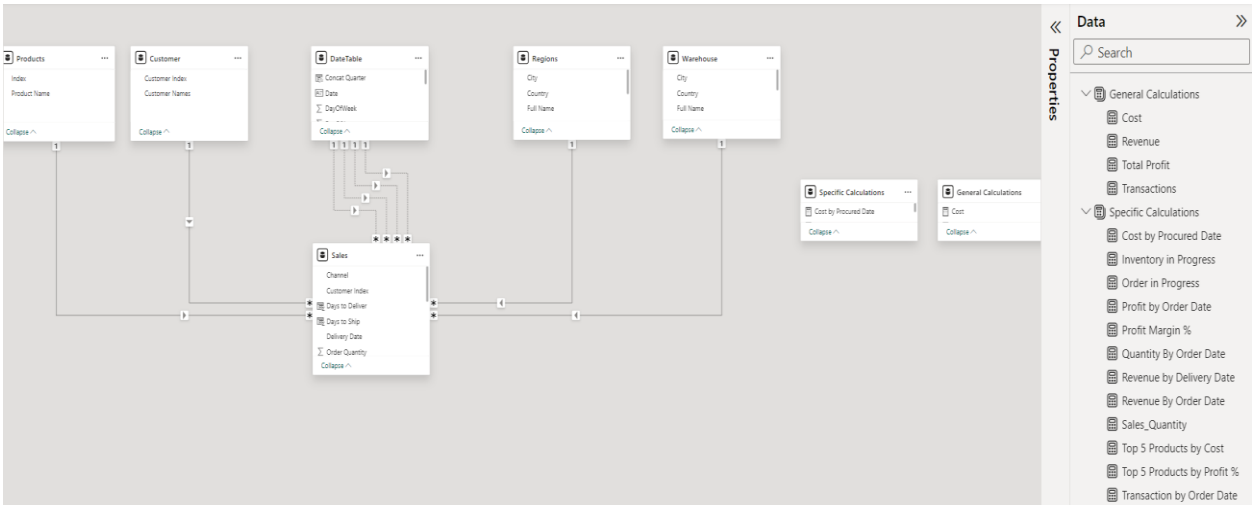


Fig 7: Data Model

All the dimension tables are related to the fact table in one-to-many cardinality. The date table has multiple relationships with the Sales(fact) table, as we have most of our analysis based on various dates to understand the trend.

In the data model presented, the measures tables labeled "General Calculations" and "Specific Calculations" are kept separate from the other tables and are not directly connected to them. This separation serves a practical purpose in organizing and managing data within the model. By grouping measures into distinct tables, the model remains uncluttered and more manageable, especially as the complexity of calculations increases.

Having these calculations isolated in their tables allows easier access and modification of these measures. It simplifies the process for users who need to quickly locate and utilize specific metrics without navigating a complex web of table relationships. This approach also enhances performance by centralizing all measure calculations in one place, making it more efficient for the reporting software, such as Power BI, to process and retrieve these calculations during analysis. This setup ensures that the dashboard remains efficient and responsive, even as datasets evolve.

QUESTIONS FOR DATA ANALYSIS

These questions are very important for the businesses engaged in supply chain management as they address key aspects of inventory management, demand forecasting, revenue optimization, and order fulfillment efficiency. Here's why each of these questions is important:

1)What is the overall profit, profit margin, cost, transaction count and overall revenue generated by the business, across all the sales data?

To achieve this, we used card visualization, where we show the numbers of the above metrics.

Fig 8: Card Visualization

Measures created for the card visualizations

1) Revenue = SUMX(Sales,Sales[Order Quantity] * Sales[Unit Price])

For any company, revenue is something that they look into. Revenue generation is the key metrics for any organization. Revenue can be generated once there is an order placed. So for each row in the Sales table, the expression Sales[Order Quantity] * Sales[Unit Price] calculates the revenue generated by that particular sale (order quantity multiplied by unit price). Then, SUMX adds up all these revenues, giving us the total revenue across all sales.

2) Cost = SUMX(Sales,Sales[Order Quantity] * Sales[Unit Cost])

Cost is created as a measure to analyze the total sales by any company based on the per unit cost. So, for each row in the Sales table, the expression Sales[Order Quantity] * Sales[Unit Cost] calculates the cost of that particular sale (order quantity multiplied by unit cost). Then, SUMX adds up all these costs, giving us the total cost across all sales.

3) Total Profit = [Revenue] - [Cost]

At the end of the day, we want to see that the company is making profits or losses and based on that various decisions are taken.

The formula [Revenue] - [Cost] simply subtracts the total cost from the total revenue, giving us the overall profit.

4) Profit by Order Date = CALCULATE([Total Profit],USERELATIONSHIP(DateTable[Date],Sales[OrderDate]))

By using USERELATIONSHIP, it evaluates the total profit based on the relationship established between the Date table and the Sales table using the Order Date. This was useful because we have multiple date columns in our data model, and we wanted to calculate profit specifically based on the Order Date.

5) Transactions Count = COUNTROWS(Sales)

Each of the orders in the sales table have a unique order number. So the number of entries in the table can give us the total number of transactions that have happened.

Simply counting the number of rows gives us the result.

6) Profit Margin % = DIVIDE([Profit by Order Date], [Revenue By Order Date], 0)

The result is the profit margin percentage, which represents the portion of revenue that is retained as profit after accounting for costs. Generally it is a common financial metric used to assess the profitability of a business or specific transactions.

7) Sales_Quantity = SUM(Sales[Order Quantity])

This expression simply sums up the values in the "Order Quantity" column of the Sales table to give us the total quantity sold or ordered across all transactions or orders.

2)Which geographical region has maximum sales?

It helps find the answer to how businesses can utilize geographical data visualization to gain insights into regional demand variations, optimize inventory allocation, and enhance logistics planning for effective order fulfillment.

Fig 9: Data Map

For this visualization, we have used the Latitude and Longitude from the Regions Table, and the Profit Margin% measure for the bubble size. We have also added measures “Revenue by Order Date” and “Cost by Procured Date” in the tooltip to show additional information.

1) Revenue By Order Date =

   CALCULATE([Revenue],USERELATIONSHIP(DateTable[Date],Sales[OrderDate]))

   The total revenue based on the relationship established between the Date table and the Sales table using the Order Date is calculated.

2) Cost by Procured Date =

   CALCULATE([Cost],USERELATIONSHIP(DateTable[Date],Sales[Procured Date]))

   Cost by procured date gives us information about the investment made in all the products across the sales table.

3)What are the top 5 products by Profit Margin, Quantity and Cost?

Identifying the top 5 products by quantity and cost in Power BI for supply chain analytics helps businesses understand high-demand items, assess profitability, optimize supplier relationships, improve inventory management, and make strategic decisions based on key product performance data.

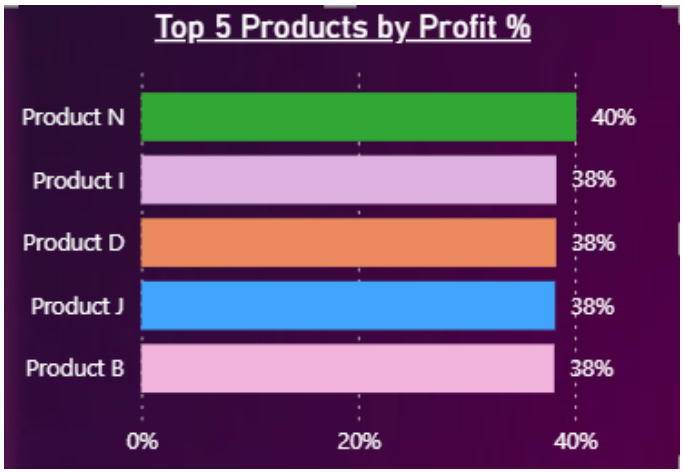


Fig 10: Bar Chart

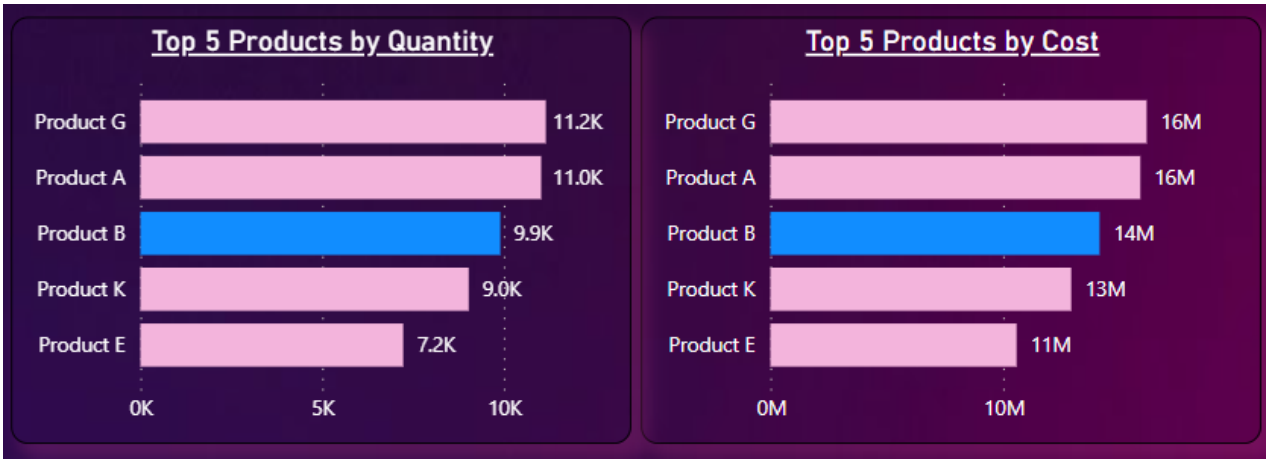


Fig 11: Bar Chart

To achieve this, the measures used are:

1) Top 5 Products by Profit % = CALCULATE([Profit Margin %],

   TOPN(5, ALL(Products[Product Name]),[Profit Margin %]), VALUES(Products[Product Name]))

This expression calculates the profit margin percentage for all products and then selects the top 5 products based on their profit margin percentage.

2) Quantity By Order Date =

```
CALCULATE([Sales_Quantity],USERELATIONSHIP(DateTable[Date],Sales[OrderDate]))
```

Here we evaluated the total sales quantity based on the relationship established between the Date table and the Sales table using the Order Date.

3) Top 5 Products by Cost = CALCULATE(

```
[Cost by Procured Date],
TOPN( 5, ALL(Products[Product Name]),[Cost by Procured Date]), VALUES(Products[Product Name]))
```

This calculation yields a result of the top 5 products on which the most amount of money is invested. That is why we have used Procured Date.

4)What are the revenue contributions of the products across different sales channels (e.g., Export, Distributor, wholesale), and how can we optimize channel-specific strategies to maximize overall revenue and profitability?

This helps in understanding the revenue contributions across different sales channels which can help the businesses to identify profitable segments and allocate resources effectively and efficiently. By optimizing channel-specific strategies based on revenue and profitability metrics, businesses can maximize overall revenue while minimizing costs associated with each channel.

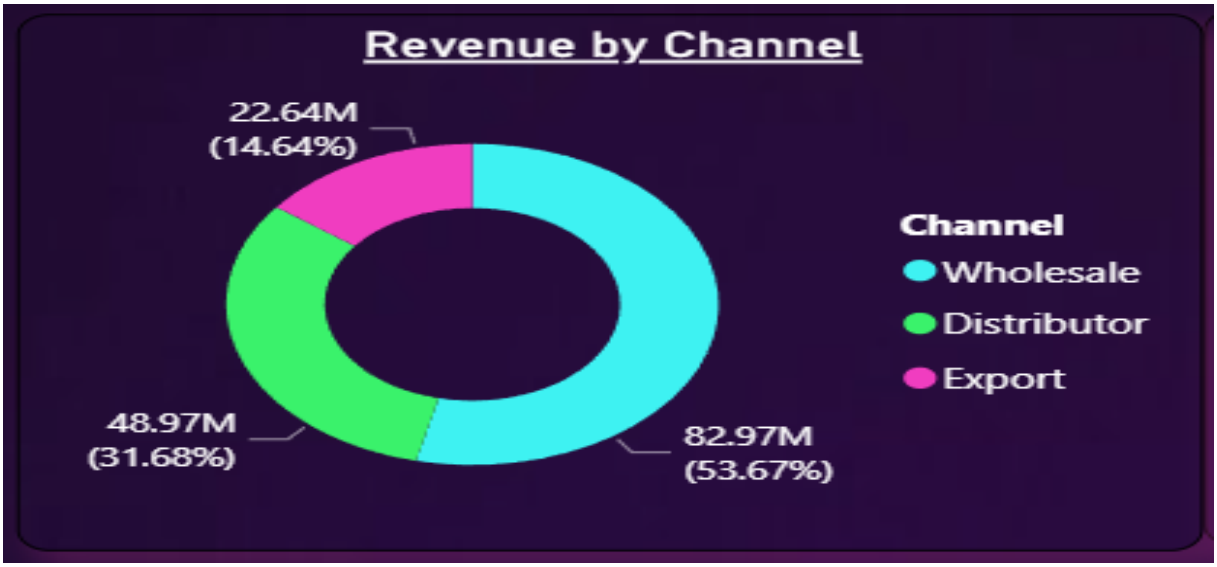


Fig 12: Donut Chart

Measure used:

1) Revenue by Order Date (explained above)

5)What is the historical inventory order data for the products considering revenue trends by date, inventory in progress, and revenue fluctuations, to optimize inventory replenishment processes and reduce carrying costs?

Analyzing the historical inventory order data helps the businesses to identify trends, patterns, and optimal order quantities. By considering revenue trends, inventory in progress, fluctuations and revenue by delivery date, businesses can utilize this data to optimize replenishment processes, reduce carrying costs, and improve overall operational efficiency.

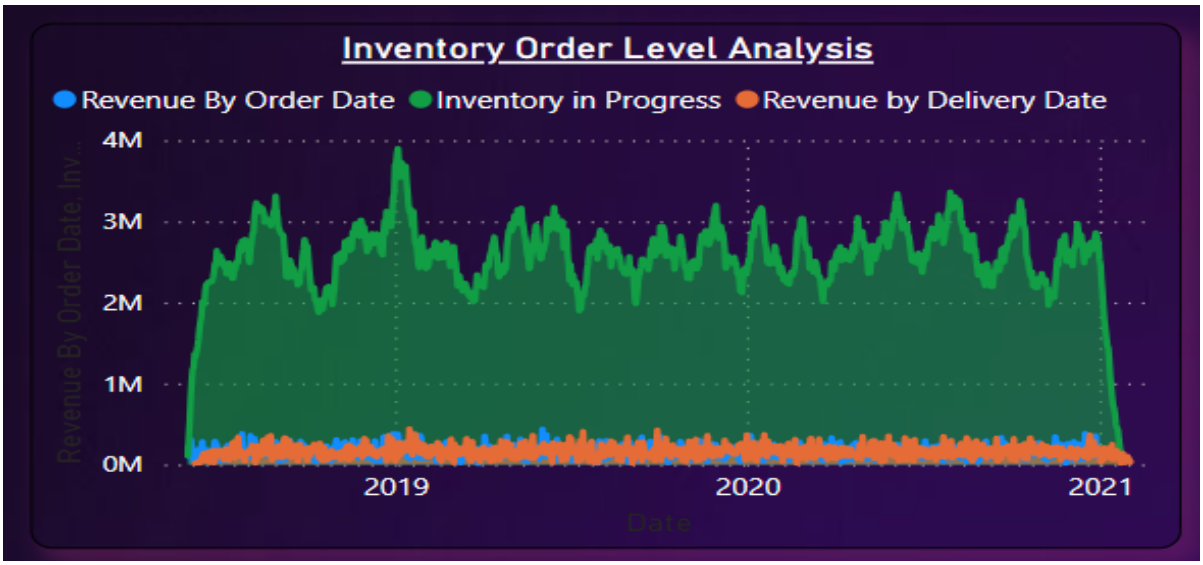


Fig 13: Area Chart

To get this visualization, the measures used are:

1) Revenue By Order Date

2) Inventory in Progress =

CALCULATE([Revenue],

FILTER(VALUES(Sales[OrderDate]) , Sales[OrderDate] <= MAX(DateTable[Date])),

FILTER(VALUES(Sales[Ship Date]) , Sales[Ship Date] >= MIN(DateTable[Date])))

This expression calculates the revenue for orders where the Order Date is *on or before* the current date and the Ship Date is *on or after* the earliest date in the Date table. This essentially represents the revenue generated from orders that are in progress or have not yet been shipped as of the current date.

3) Revenue by Delivery Date =

CALCULATE([Revenue],USERELATIONSHIP(DateTable[Date],Sales[Delivery Date]))

Using this DAX we evaluated the total revenue based on the relationship established between the Date table and the Sales table using the Delivery Date.

6) What are the orders in progress for the products across different warehouses to ensure timely fulfillment and minimize order lead times?

Tracking the orders in progress across different warehouses and analyzing this data is very important for ensuring timely fulfillment of the order and minimizing order lead times. By optimizing the operations of the warehouses and distribution processes, businesses can enhance delivery reliability, maintain competitive advantage and customer satisfaction.

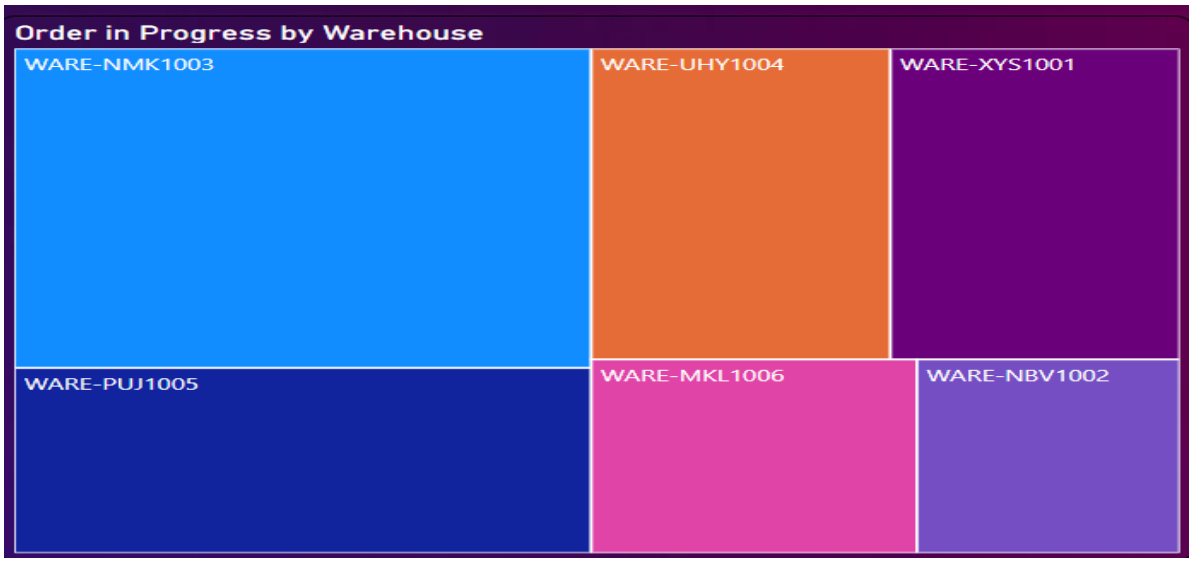


Fig 14: Tree Map

Measures used:

1) Profit Margin%
2) Order in Progress =

```
CALCULATE([Transactions],
FILTER(VALUES(Sales[OrderDate]), Sales[OrderDate] <= MAX(DateTable[Date])),
```

FILTER(VALUES(Sales[Delivery Date]) , Sales[Delivery Date] >= MIN(DateTable[Date])))

This expression calculates the number of transactions (orders) where the Order Date is on or before the current date and the Delivery Date is on or after the earliest date in the Date table. This represents the orders that are in progress or have not yet been delivered as of the current date.

7)How many days did it take for the product from different channels and warehouses to be shipped and delivered to the customers?

Analyzing the average days to ship the product and days for the delivery to the customer helps the businesses to identify bottlenecks in the fulfillment of the order process and helps the business to improve overall customer satisfaction. By streamlining the processes of shipping and delivery, businesses can reduce lead times, enhance order accuracy, and provide a superior customer experience.

OrderDate	OrderNumber	Warehouse Code	Channel	Days to Ship	Days to Deliv
09-13-2018	SO - 0001000	WARE-NMK1003	Wholesale	20	26
09-13-2018	SO - 0001001	WARE-NMK1003	Export	9	19
09-13-2018	SO - 0001002	WARE-MKL1006	Distributor	11	17
09-13-2018	SO - 0001003	WARE-UHY1004	Distributor	19	25
09-13-2018	SO - 0001004	WARE-NMK1003	Wholesale	6	12
09-13-2018	SO - 0001005	WARE-XYS1001	Wholesale	28	32
09-13-2018	SO - 0001006	WARE-MKL1006	Distributor	4	7
09-13-2018	SO - 0001007	WARE-XYS1001	Distributor	28	30
09-13-2018	SO - 0001008	WARE-PUJ1005	Distributor	27	36
09-14-2018	SO - 0001009	WARE-PUJ1005	Wholesale	6	14
05-31-2018	SO - 000101	WARE-UHY1004	Distributor	14	19
09-14-2018	SO - 0001010	WARE-NMK1003	Wholesale	10	19
09-14-2018	SO - 0001011	WARE-MKL1006	Distributor	19	21
09-14-2018	SO - 0001012	WARE-NMK1003	Distributor	26	34
09-14-2018	SO - 0001013	WARE-PUJ1005	Wholesale	22	29
09-14-2018	SO - 0001014	WARE-NMK1003	Wholesale	25	35
09-14-2018	SO - 0001015	WARE-NBV1002	Wholesale	3	7
09-14-2018	SO - 0001016	WARE-UHY1004	Distributor	13	15
09-14-2018	SO - 0001017	WARE-NMK1003	Wholesale	20	22

Fig 15: Table Visualization

We have used two calculated columns:

1) Days to Deliver = INT(Sales[Delivery Date]-Sales[OrderDate])

This DAX calculates the number of days it took to deliver each order by subtracting the order date from the delivery date and then converting the result into an integer.

2) Days to Ship = INT(Sales[Ship Date]-Sales[OrderDate])

This DAX gives us the number of days to ship by calculating the number of days it took to ship each order by subtracting the order date from the ship date and then converting the result into an integer.

In summary, addressing these questions in supply chain analytics enables businesses to optimize inventory management, enhance demand forecasting accuracy, maximize revenue, improve operational efficiency, and ultimately deliver value to customers. By leveraging data-driven insights and analytics techniques, businesses can gain a competitive edge in today's dynamic marketplace.

On all of the above visualizations, we have included five slicers, to understand the trend yearly and quarterly. We have also included slicers for Warehouse Code, Product Name and Channels.

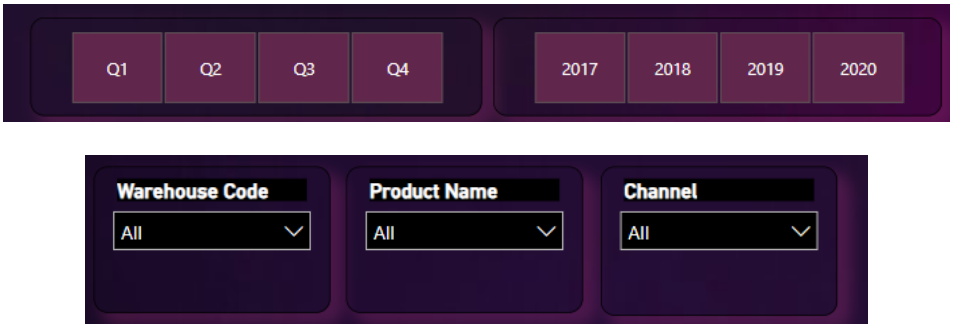


Fig 16: Slicers

Calculated Columns used:

1) Concat Quarter = CONCATENATE("Q",DateTable[QuaterOfYear])

We have used the “CONCATENATE” function to add the letter “Q” at the beginning of the quartered number, which we wanted to show in our visualization.

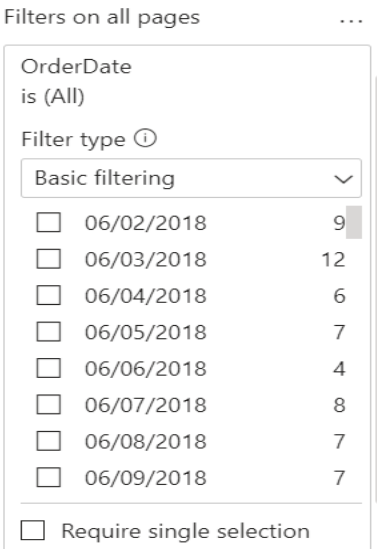


Fig 17: Fiter on all pages

The decision to not include the date filter in the slicer of the dashboard but rather keep it as a filter option is a strategic choice, especially in analyzing supply chain data over broader time spans like quarters or years. This approach helps focus on trends and patterns crucial for strategic decision-making.

Additionally, by keeping the date as a general filter, users can drill down to more granular daily data when necessary, without cluttering the main views of the dashboard. This setup enhances the performance by managing large datasets more efficiently and ensures consistency across all visualizations by applying the selected date range uniformly. It also improves the user experience by simplifying the interface, making it more intuitive and focused on macro trends while allowing for detailed analysis when required.

DASHBOARD VISUALIZATION

Creating an integrated dashboard was a strategic decision to maximize efficiency in data analysis processes. Incorporating all critical visualizations into a single dashboard enables the application of filters such as quarter, year, product code, warehouse name, and channel, with the changes instantly reflected across all data points.

This means that when any of these filters are adjusted, the entire dashboard updates to provide a comprehensive and interconnected view of how different supply chain elements are performing relative to each other. This approach makes the data more manageable and significantly accelerates the ability to make informed decisions based on real-time, synchronized insights across various metrics. This setup is designed to streamline the analytical process and enhance strategic decision-making capabilities.

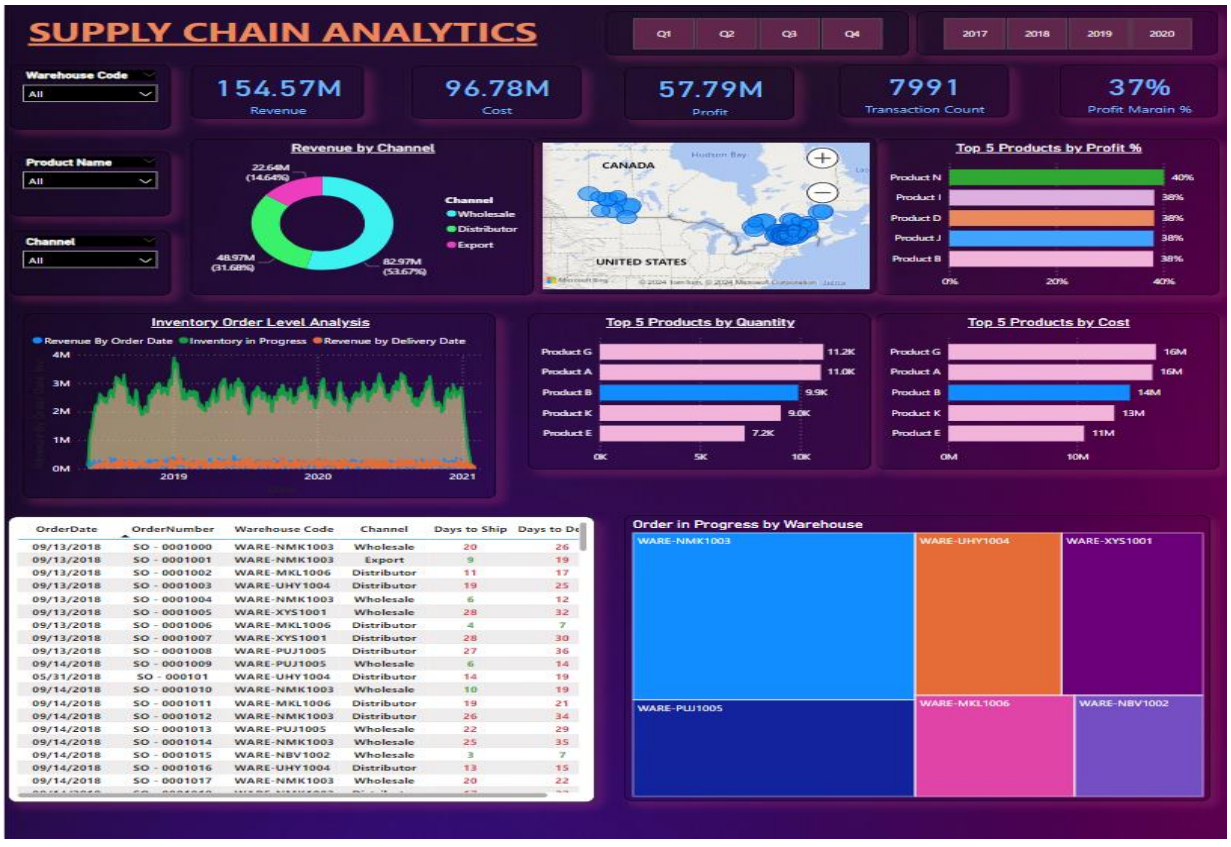


Fig 18: Supply Chain Analytics Dashboard

CONCLUSION

The findings derived from our Supply Chain Analytics project present compelling insights that are poised to significantly impact the organization's operational strategies and competitive positioning. Through rigorous data analysis, we have illuminated critical facets of our supply chain dynamics, elucidating opportunities for optimization and growth.

A paramount revelation from our analysis is the imperative understanding of regional variations and consumer preferences. By discerning the geographical regions driving the highest sales, we can strategically allocate resources, tailor marketing initiatives, and optimize inventory management practices to meet localized demand dynamics, enhancing market penetration and customer engagement.

Furthermore, the identification of top-performing products by both quantity and cost affords us a strategic advantage in inventory prioritization and supplier negotiations. This insight enables us to channel resources judiciously, maximizing profitability while ensuring optimal inventory levels to meet evolving customer needs.

The nuanced examination of revenue contributions across diverse sales channels provides invaluable intelligence for channel-specific strategy optimization. By aligning resource allocation with revenue and profitability metrics, we can capitalize on lucrative market segments, bolster overall revenue streams, and fortify our competitive position.

Moreover, our historical inventory and revenue trends analysis equip us with the foresight to proactively manage replenishment processes, mitigate carrying costs, and ensure agile responsiveness to fluctuating market demands. This operational agility is essential for maintaining competitive relevance in dynamic market environments.

In parallel, our concerted efforts to streamline shipping and delivery processes underscore our commitment to customer-centricity. By identifying operational bottlenecks and optimizing fulfillment

operations, we endeavor to ensure prompt order fulfillment, elevating customer satisfaction and fostering enduring brand loyalty.

In summation, the insights derived from our Supply Chain Analytics endeavor represent a pivotal resource for informed decision-making and strategic planning within our organization. Through the judicious application of data-driven analytics, we are poised to enhance operational efficiency, maximize profitability, and deliver unparalleled value to our stakeholders in the competitive landscape of contemporary business.