

Group Project: Northwind Traders

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OMIS 661: Business Intelligence Applications and Tools

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Table of Contents

Content	Page Number
Executive Summary	3
Data Modelling	4
Data Cleaning and Shaping	7
Data Visualization	13
Dashboard Design	16
Data Analysis and Data Patterns	18
Recommendations	23

Executive Summary

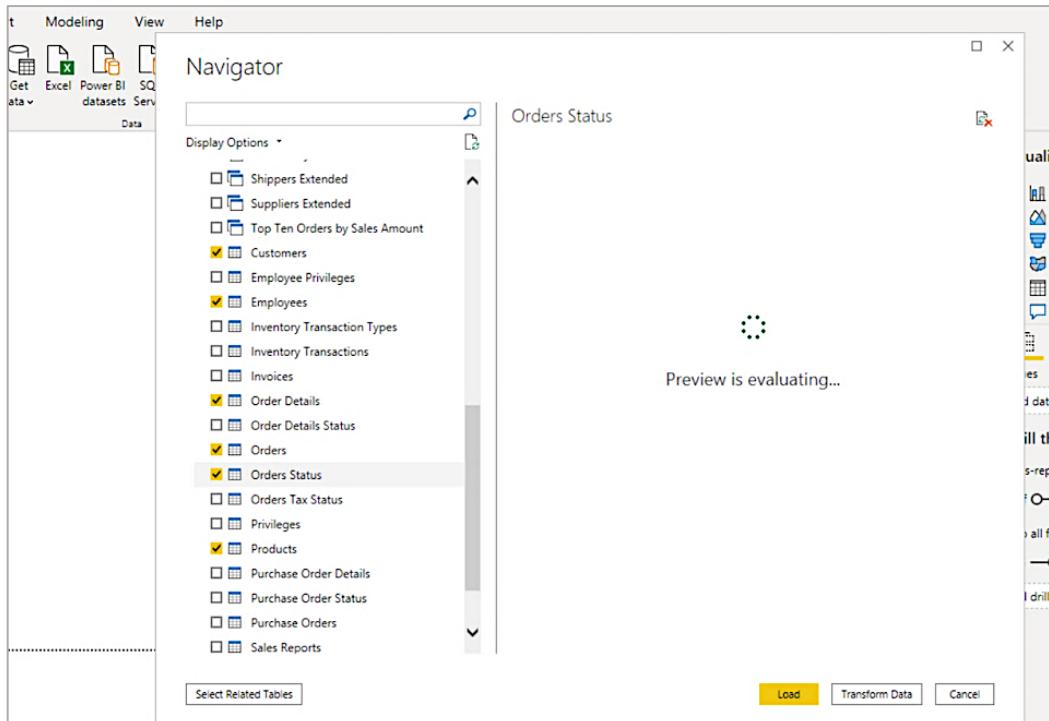
The report emphasizes analysis of the Northwind database. Northwind Traders database provides product, sales, employees, orders, and inventory information about the company in the USA from January to June of 2006. The database provides the product orders and sales information between the Northwind traders company and its customers. It includes detailed information of the products of Northwind, employees who work for Northwind Traders, details of customers, shippers, and suppliers of the Northwind. It also includes the details of inventory transactions and invoices. Northwind database is analyzed using the Power BI to provide a detailed report covering the data modeling, data cleaning and shaping, data visualization, dashboard design, data analysis, and patterns and recommendations to the company.

The reports provides steps for detailed data modelling to create a star schema with Customers, Employees, Orders, Product, Shipper, and Suppliers tables. Data cleaning is performed for each of the tables in the star schema using the very effective Edit Query/Transform Data function of Power BI. Data Visualization for the Northwind Traders is divided into three sections: Overview, Order Analysis, and Product Analysis using the different pages in Power BI Report and these pages are linked using the page navigation feature available in the visualization actions of the report panel. Two dashabords one for key metrics and the other to view the performance of the the entities involved with NorthWind Traders are designed to give the management a view a glance experience.

A detailed analysis is performed from the visualization developed and interesting data patterns are documented. Based on the analysis performed, four recommendations are provided to the management at Northwind Traders.

Data Modeling

Data modeling is important for data analysis. It is performed using the Star schema data model. To design the star schema, Customers, Employees, Orders, Product, Shipper, and Suppliers tables are selected from the Northwind dataset. Employees, Customers, Products, Shippers, and Suppliers tables are used as dimension tables, and the Orders table is used as a Fact table.



FactOrders table contains the measures like Product Unit Price and Product Quantity. Using these measures, the new columns and new measures are added to the FactOrders table as follow:

New Columns:

Gross Revenue = FactOrders [Unit Price] * FactOrders [Quantity] + FactOrders [Shipping Fee]

Net Revenue = FactOrders [Gross Revenue] - FactOrders [Discount] - FactOrders [Shipping Fee]

1 Gross Revenue = FactOrders[Unit Price] * FactOrders[Quantity] + FactOrders[Shipping Fee]												
Shipped Date	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Products Standard Cost	Gross Revenue	Net Revenue		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	30	\$3.5	\$0	\$3	\$305	\$105		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$30	\$0	\$22.5	\$305	\$300		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$30	\$0	\$22.5	\$305	\$300		

1 Net Revenue = FactOrders[Gross Revenue] - FactOrders[Discount] - FactOrders[Shipping Fee]												
Shipped Date	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Products Standard Cost	Gross Revenue	Net Revenue		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400		
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	30	\$3.5	\$0	\$3	\$305	\$105		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$30	\$0	\$22.5	\$305	\$300		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$53	\$0	\$39.75	\$535	\$530		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$53	\$0	\$39.75	\$535	\$530		
Sunday, January 22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$3.5	\$0	\$3	\$40	\$35		
Sunday, January 22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	15	\$18	\$0	\$13.5	\$275	\$270		

Days To Ship = IF (ISBLANK (FactOrders [Shipped Date]), BLANK (), (FactOrders [Shipped Date] - FactOrders[Order Date]))

1 Days To Ship = IF (ISBLANK(FactOrders[Shipped Date]) 2 , BLANK() 3 , (FactOrders[Shipped Date] - FactOrders[Order Date]))												
Shipped Date	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Products Standard Cost	Gross Revenue	Net Revenue	Status ID	Days To Ship
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400	3	7
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400	3	7
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400	3	7
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,400	3	7
Sunday, January 22, 2006	2	\$200	Check	Sunday, January 15, 2006	30	\$3.5	\$0	\$3	\$305	\$105	3	7

New Measures:

Total Sales = SUM (FactOrders[Gross Revenue])

Total Orders = DISTINCTCOUNT (FactOrders [Order ID])

Total Quantity = SUM (FactOrders [Quantity])

1 Total Sales = SUM [FactOrders[Gross Revenue]]														
Product ID	Order ID	Supplier ID	Employee ID	Customer ID	Order Date	Shipped Date	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Gross F
34	30	1	9	27	01/15/2006	01/22/2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	
34	30	1	9	27	01/15/2006	01/22/2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	
34	30	1	9	27	01/15/2006	01/22/2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	
34	30	1	9	27	01/15/2006	01/22/2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	

1 Total Quantity = SUM[FactOrders[Quantity]]												
Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Products Standard Cost	Gross Revenue	Net Rev	Fields	Search	FactOrders
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600			
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600			
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600			

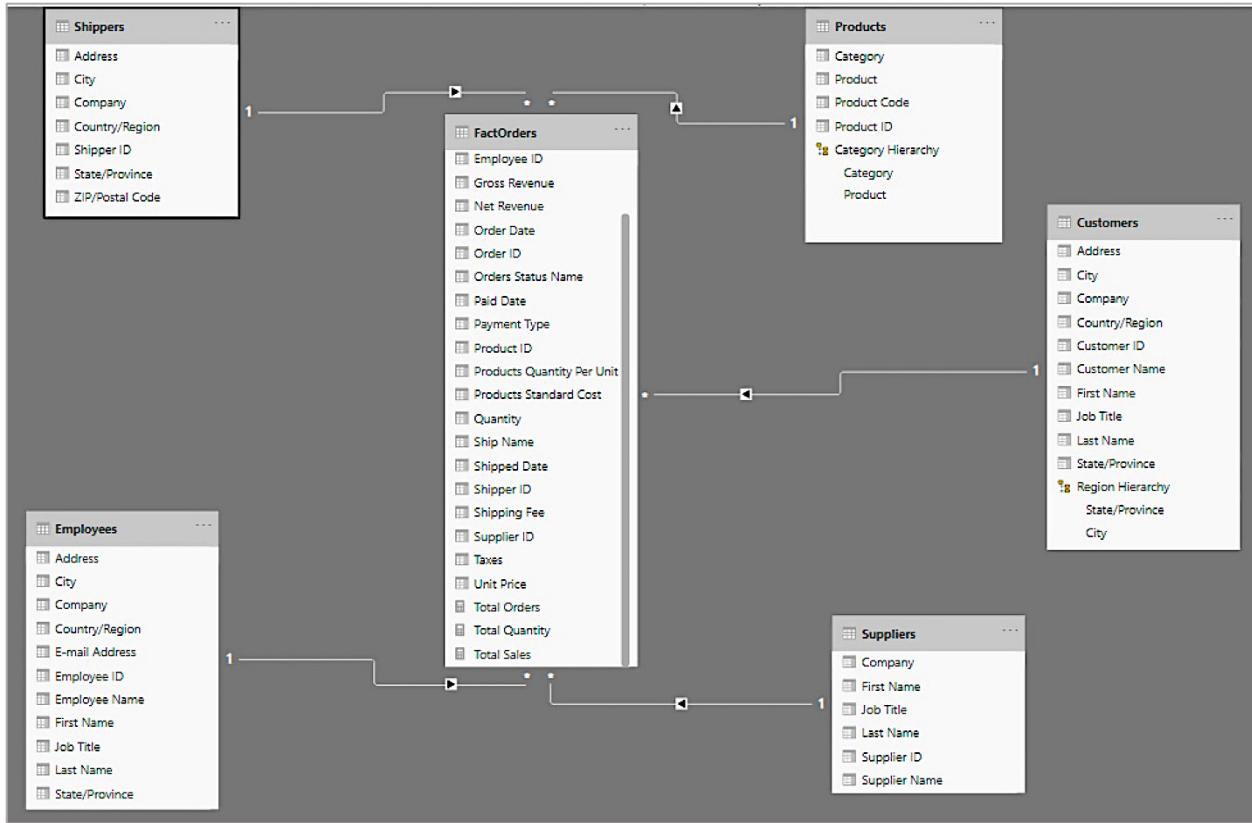
1 Total Orders = DISTINCTCOUNT(FactOrders[Order ID])

	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price	Discount	Products Standard Cost	Gross Revenue	Net Rev
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,600
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,600
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,600
22, 2006	2	\$200	Check	Sunday, January 15, 2006	100	\$14	\$0	\$10.5	\$1,600	\$1,600
22, 2006	2	\$200	Check	Sunday, January 15, 2006	30	\$3.5	\$0	\$3	\$105	\$105
22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$30	\$0	\$22.5	\$305	\$305
22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$53	\$0	\$39.75	\$535	\$535
22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$53	\$0	\$39.75	\$535	\$535
22, 2006	1	\$5	Credit Card	Friday, January 20, 2006	10	\$3.5	\$0	\$3	\$40	\$40
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	15	\$18	\$0	\$13.5	\$275	\$275
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	15	\$18	\$0	\$13.5	\$275	\$275
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	15	\$18	\$0	\$13.5	\$275	\$275
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	20	\$46	\$0	\$34.5	\$925	\$925
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	20	\$46	\$0	\$34.5	\$925	\$925
22, 2006	2	\$5	Credit Card	Sunday, January 22, 2006	20	\$46	\$0	\$34.5	\$925	\$925
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
31, 2006	3	\$50	Credit Card	Monday, January 30, 2006	30	\$9.2	\$0	\$6.9	\$326	\$326
y 7, 2006	3	\$4	Check	Monday, February 6, 2006	20	\$9.2	\$0	\$6.9	\$188	\$188
y 7, 2006	3	\$4	Check	Monday, February 6, 2006	20	\$9.2	\$0	\$6.9	\$188	\$188
y 7, 2006	3	\$4	Check	Monday, February 6, 2006	20	\$9.2	\$0	\$6.9	\$188	\$188
y 7, 2006	3	\$4	Check	Monday, February 6, 2006	20	\$9.2	\$0	\$6.9	\$188	\$188
y 7, 2006	3	\$4	Check	Monday, February 6, 2006	20	\$9.2	\$0	\$6.9	\$188	\$188

Manage relationships

Active	From: Table (Column)	To: Table (Column)
<input checked="" type="checkbox"/>	FactOrders (Customer ID)	Customers (Customer ID)
<input checked="" type="checkbox"/>	FactOrders (Employee ID)	Employees (Employee ID)
<input checked="" type="checkbox"/>	FactOrders (Product ID)	Products (Product ID)
<input checked="" type="checkbox"/>	FactOrders (Shipper ID)	Shippers (Shipper ID)
<input checked="" type="checkbox"/>	FactOrders (Supplier ID)	Suppliers (Supplier ID)

FactOrders table contains the Order ID as a primary key and Shipper ID, Employee ID, Customer ID, Product ID, and Supplier ID as foreign keys. To establish the relationship between the dimension table and Fact table, the Shipper ID from the Shippers table is connected to the Shipper ID of the FactOrders table. It creates a one-to-many relationship between the tables. Similarly, the Employees table's Employee ID is connected to the Employee ID of the FactOrders table. Customer ID from the Customers table is connected to Customer ID of the FactOrders table, Product ID from Products table is connected to Product ID of the FactOrders table, Supplier ID from Supplier table is connected to the Supplier ID of the FactOrders table. And the star schema design is completed, and the final star schema data model is as below:



Data Cleaning and Shaping

Data cleaning is performed after selecting the required tables from the Northwind database. Power BI has a very effective Edit Query/Transform Data function for the data cleaning purpose. As previously mentioned, Customers, Employees, Orders, Product, Shipper, and Suppliers tables are selected from the Northwind database. Using the Transform Data function, data cleaning is performed. Columns those having Null or False values are removed from the tables.

Customers Table

In the Customers table, the ID column is renamed as a Customer ID. And unwanted columns are deleted such as Email address, Web page, Home Phone, Fax, Zip columns as they contain the null values. And the first name column and last name column are concatenated as a Customer Name column. The final Customers table looks as follows-

Customer ID	Company	City	State/Prov	Country/Regi	Job Title	Address	Customer Name	Last Name	First Name
1	Company A	Seattle	WA	USA	Owner	123 1st Street	Anna Bedecs	Bedecs	Anna
2	Company B	Boston	MA	USA	Owner	123 2nd Street	Antonio Gratacos Solsona	Gratacos Solsona	Antonio
3	Company C	Los Angelas	CA	USA	Purchasing Representative	123 3rd Street	Thomas Axen	Axen	Thomas
4	Company D	New York	NY	USA	Purchasing Manager	123 4th Street	Christina Lee	Lee	Christina
5	Company E	Minneapolis	MN	USA	Owner	123 5th Street	Martin O'Donnell	O'Donnell	Martin
6	Company F	Milwaukee	WI	USA	Purchasing Manager	123 6th Street	Francisco Pérez-Olaeta	Pérez-Olaeta	Francisco
7	Company G	Boise	ID	USA	Owner	123 7th Street	Ming-Yang Xie	Xie	Ming-Yang
8	Company H	Portland	OR	USA	Purchasing Representative	123 8th Street	Elizabeth Andersen	Andersen	Elizabeth
9	Company I	Salt Lake City	UT	USA	Purchasing Manager	123 9th Street	Sven Mortensen	Mortensen	Sven
10	Company J	Chicago	IL	USA	Purchasing Manager	123 10th Street	Roland Wacker	Wacker	Roland
11	Company K	Miami	FL	USA	Purchasing Manager	123 11th Street	Peter Krschne	Krschne	Peter
12	Company L	Las Vegas	NV	USA	Purchasing Manager	123 12th Street	John Edwards	Edwards	John

Employees Table

In the Employees table, the ID column is renamed as an Employee ID. Home phone, Fax, Zip, Web page columns are deleted as they contain the null values. Also, the first name and last name columns are concatenated as an Employee Name column. The final Employees table looks as follows-

Employee ID	Company	Last Name	First Name	E-mail Address	Job Title	City	State/Prov	Country/Regi	Address	Employee Name
1	Northwind Traders	Freehafer	Nancy	nancy@northwindtraders.com	Sales Representative	Seattle	WA	USA	123 1st Avenue	Nancy Freehafer
2	Northwind Traders	Cencini	Andrew	andrew@northwindtraders.com	Vice President, Sales	Bellevue	WA	USA	123 2nd Avenue	Andrew Cencini
3	Northwind Traders	Kotas	Jan	jan@northwindtraders.com	Sales Representative	Redmond	WA	USA	123 3rd Avenue	Jan Kotas
4	Northwind Traders	Sergienko	Mariya	mariya@northwindtraders.com	Sales Representative	Kirkland	WA	USA	123 4th Avenue	Mariya Sergienko
5	Northwind Traders	Thorpe	Steven	steven@northwindtraders.com	Sales Manager	Seattle	WA	USA	123 5th Avenue	Steven Thorpe
6	Northwind Traders	Neipper	Michael	michael@northwindtraders.com	Sales Representative	Redmond	WA	USA	123 6th Avenue	Michael Neipper
7	Northwind Traders	Zare	Robert	robert@northwindtraders.com	Sales Representative	Seattle	WA	USA	123 7th Avenue	Robert Zare
8	Northwind Traders	Giussani	Laura	laura@northwindtraders.com	Sales Coordinator	Redmond	WA	USA	123 8th Avenue	Laura Giussani
9	Northwind Traders	Hellung-Larsen	Anne	anne@northwindtraders.com	Sales Representative	Seattle	WA	USA	123 9th Avenue	Anne Hellung-Larsen

FactOrders Table

Firstly, the Orders table is renamed as a FactOrders table. In the FactOrders table , Ship Name, Ship Address, Ship City, State, Zip, Country, Notes, Tax Rate, Tax Status, Status ID, Taxes columns are deleted as they have no values. Unit Price, Quantity, Discount, Products columns are extracted from the Order Details table. Status Name column is extracted from the Order Status table and Supplier ID is selected from the Inventory Transactions table. Lastly, removed the duplicate rows.

Expand Order Details

Select the columns to expand.

Order ID	Employee ID
1	30
2	30
3	31
4	31
5	31
6	32
7	32
8	33
9	34
10	35
11	36
12	37

(Select All Columns)
 ID
 Order ID
 Product ID
 Quantity
 Unit Price
 Discount
 Status ID
 Date Allocated
 Purchase Order ID
 Inventory ID
 Order Details Status
 Orders
 Products

Search Columns to Expand

Order ID	Status ID	Status Name	Order Details
1	14.00	Closed	
2	3.50	Closed	
3	30.00	Closed	
4	53.00	Closed	
5	3.50	Closed	
6	18.00	Closed	
7	46.00	Closed	
8	9.20	Closed	
9	9.20	Closed	
10	12.75	Closed	
11	9.65	Closed	
12	40.00	Closed	
13	46.00	Closed	
14	12.75	Closed	
15	2.99	Closed	
16	46.00	New	

Use original column name as prefix

Search Columns to Expand

Order ID	Purchase Order ID	Supplier ID	Created By	Submitted Date	Creation Date	Status ID	Expected Date
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

(Select All Columns)
 Purchase Order ID
 Supplier ID
 Created By
 Submitted Date
 Creation Date
 Status ID
 Expected Date

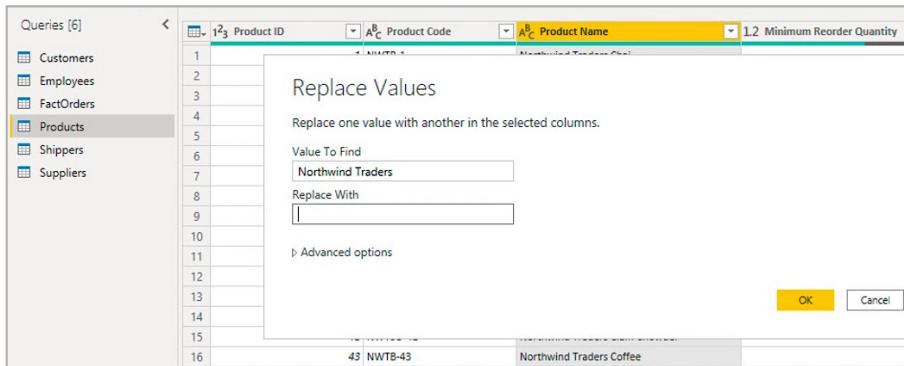
Product Details

Product ID	Order ID	Supplier ID	Employee ID	Customer ID	Order Date	Shipped Date	Shipper ID	Shipping Fee	Payment Type	Paid Date	Quantity	Unit Price
34	30	1	9	27	01/15/2006	01/22/2006	2	\$200	Check	01/15/2006	100	\$14
80	30	4	9	27	01/15/2006	01/22/2006	2	\$200	Check	01/15/2006	30	\$3.5
7	31	2	3	4	01/20/2006	01/22/2006	1	\$5	Credit Card	01/20/2006	10	\$30
51	31	2	3	4	01/20/2006	01/22/2006	1	\$5	Credit Card	01/20/2006	10	\$53
80	31	4	3	4	01/20/2006	01/22/2006	1	\$5	Credit Card	01/20/2006	10	\$3.5
1	32	1	4	12	01/22/2006	01/22/2006	2	\$5	Credit Card	01/22/2006	15	\$18
1	32	8	4	12	01/22/2006	01/22/2006	2	\$5	Credit Card	01/22/2006	15	\$18
43	32	1	4	12	01/22/2006	01/22/2006	2	\$5	Credit Card	01/22/2006	20	\$46
19	33	2	6	8	01/30/2006	01/31/2006	3	\$50	Credit Card	01/30/2006	30	\$9.2
19	34	2	9	4	02/06/2006	02/07/2006	3	\$4	Check	02/06/2006	20	\$9.2
48	35	2	3	29	02/10/2006	02/12/2006	2	\$7	Check	02/10/2006	10	\$12.75
41	36	2	4	3	02/23/2006	02/25/2006	2	\$7	Cash	02/23/2006	200	\$9.65
8	37	2	8	6	03/06/2006	03/09/2006	2	\$12	Credit Card	03/06/2006	17	\$40
43	38	1	9	28	03/10/2006	03/11/2006	3	\$10	Check	03/10/2006	300	\$46
48	39	2	3	8	03/22/2006	03/24/2006	3	\$5	Check	03/22/2006	100	\$12.75
81	40	1	4	10	03/24/2006	03/24/2006	2	\$9	Credit Card	03/24/2006	200	\$2.99

Products Table

In the Products table, the ID column is renamed Product ID. Description, Standard Cost, List Price, Recorder Level, Target Level, Quantity Per Order, Discontinued, Minimum Reorder Quantity columns are deleted as they are not required. Also, the Product Name is renamed as Product and Northwind Traders words are removed from the Product Name.

Product ID	Product Code	Product Name
1	NWTB-1	Northwind Traders Chai
2	NWTCO-3	Northwind Traders Syrup
3	NWTCO-4	Northwind Traders Cajun Seasoning
4	NWTO-5	Northwind Traders Olive Oil
5	NWTJP-6	Northwind Traders Boysenberry Spread
6	NWTDFN-7	Northwind Traders Dried Pears
7	NWTS-8	Northwind Traders Curry Sauce
8	NWTDFN-14	Northwind Traders Walnuts
9	NWTCFV-17	Northwind Traders Fruit Cocktail
10	NWTBGM-19	Northwind Traders Chocolate Biscuits Mix
11	NWTJP-6	Northwind Traders Marmalade



Product ID	Product Code	Product
1	NWTB-1	Chai
2	NWTCO-3	Syrup
3	NWTCO-4	Cajun Seasoning
4	NWTO-5	Olive Oil
5	NWTJP-6	Boysenberry Spread
6	NWTDFN-7	Dried Pears
7	NWTS-8	Curry Sauce
8	NWTDFN-14	Walnuts
9	NWTCFV-17	Fruit Cocktail
10	NWTBGM-19	Chocolate Biscuits Mix
11	NWTJP-6	Marmalade
12	NWTBGM-21	Scones
13	NWTB-34	Beer
14	NWTCM-40	Crab Meat
15	NWTSO-41	Clam Chowder

The final Products table looks like as follows-

Product ID	Product Code	Product	Category
1	NWTB-1	Chai	Beverages
3	NWTCO-3	Syrup	Condiments
4	NWTCO-4	Cajun Seasoning	Condiments
5	NWTO-5	Olive Oil	Oil
6	NWTJP-6	Boysenberry Spread	Jams, Preserves
7	NWTDFN-7	Dried Pears	Dried Fruit & Nuts
8	NWTS-8	Curry Sauce	Sauces
14	NWTDFN-14	Walnuts	Dried Fruit & Nuts
17	NWTCFV-17	Fruit Cocktail	Canned Fruit & Vegetables
19	NWTBGM-19	Chocolate Biscuits Mix	Baked Goods & Mixes
20	NWTJP-6	Marmalade	Jams, Preserves
21	NWTBGM-21	Scones	Baked Goods & Mixes
34	NWTB-34	Beer	Beverages
40	NWTCM-40	Crab Meat	Canned Meat

Shippers Table

ID column is renamed as Shipper ID in the Shippers table. Address, Job Title, Business Phone, Home Phone, Mobile Phone, Fax Number, Web Page, and Notes are null, so deleted from the table.

Shipper ID	Company	Address	City	State/Province	ZIP/Postal Code	Country/Region
1	Shipping Company A	123 Any Street	Memphis	TN	99999	USA
2	Shipping Company B	123 Any Street	Memphis	TN	99999	USA
3	Shipping Company C	123 Any Street	Memphis	TN	99999	USA

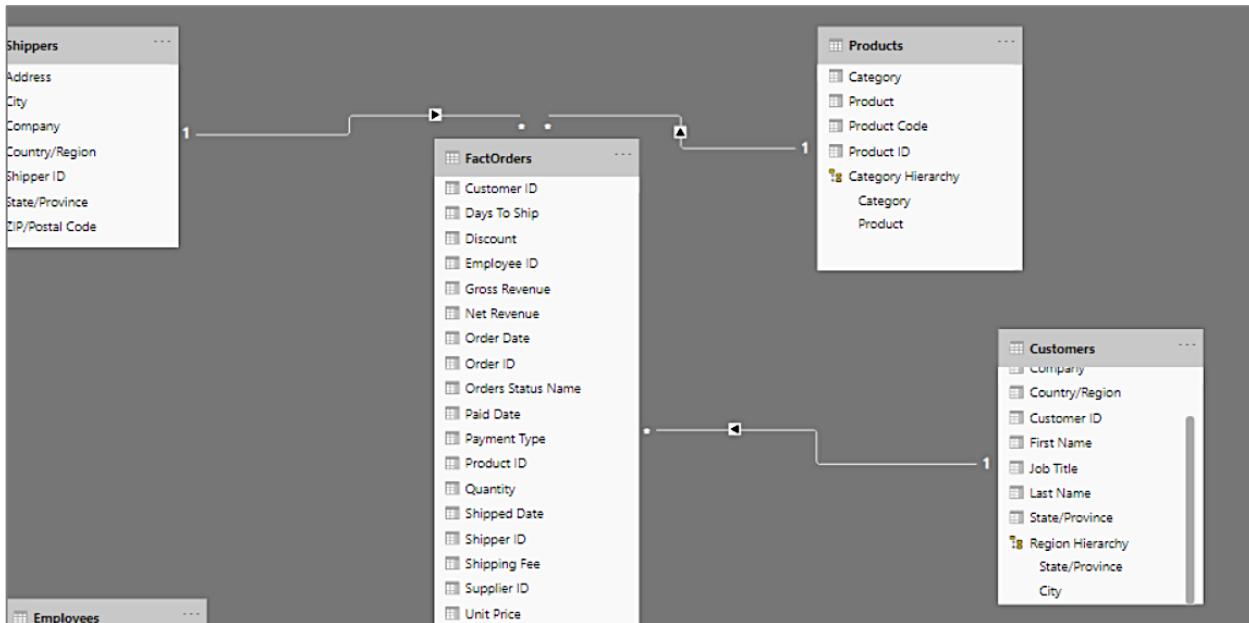
Supplier Table

In the Supplier table, ID column is renamed as Supplier ID. Kept only Company, Last Name, First Name, Job Title columns and deleted rest of columns Email Address, Business Phone, Home Phone, Mobile Phone, Address, Fax Number, City, State, Country/Region, Zip, Web Page, and Notes as they are null. And then, first name and last name columns are concatenated as a Supplier Name column.

Supplier ID	Company	Last Name	First Name	Job Title	Supplier Name
1	Supplier A	Andersen	Elizabeth A.	Sales Manager	Elizabeth A. Andersen
2	Supplier B	Weiler	Cornelia	Sales Manager	Cornelia Weiler
3	Supplier C	Kelley	Madeleine	Sales Representative	Madeleine Kelley
4	Supplier D	Sato	Naoki	Marketing Manager	Naoki Sato
5	Supplier E	Hernandez-Echevarria	Amaya	Sales Manager	Amaya Hernandez-Echevarria
6	Supplier F	Hayakawa	Satomi	Marketing Assistant	Satomi Hayakawa
7	Supplier G	Glasson	Stuart	Marketing Manager	Stuart Glasson
8	Supplier H	Dunton	Brynn Paul	Sales Representative	Brynn Paul Dunton
9	Supplier I	Sandberg	Mikael	Sales Manager	Mikael Sandberg
10	Supplier J	Sousa	Luis	Sales Manager	Luis Sousa

Creation of Hierarchy

Product and Regional hierarchies are created to analyze the products based on their categories and check the granularity at state and city levels.



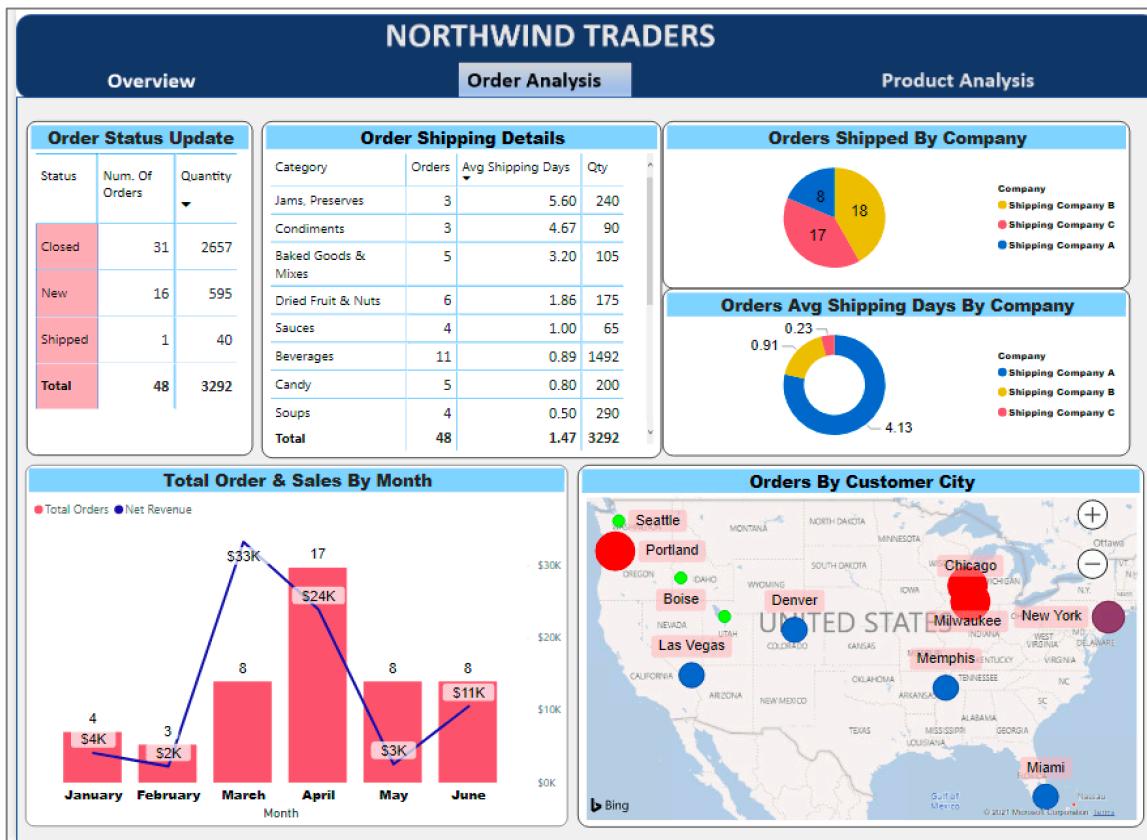
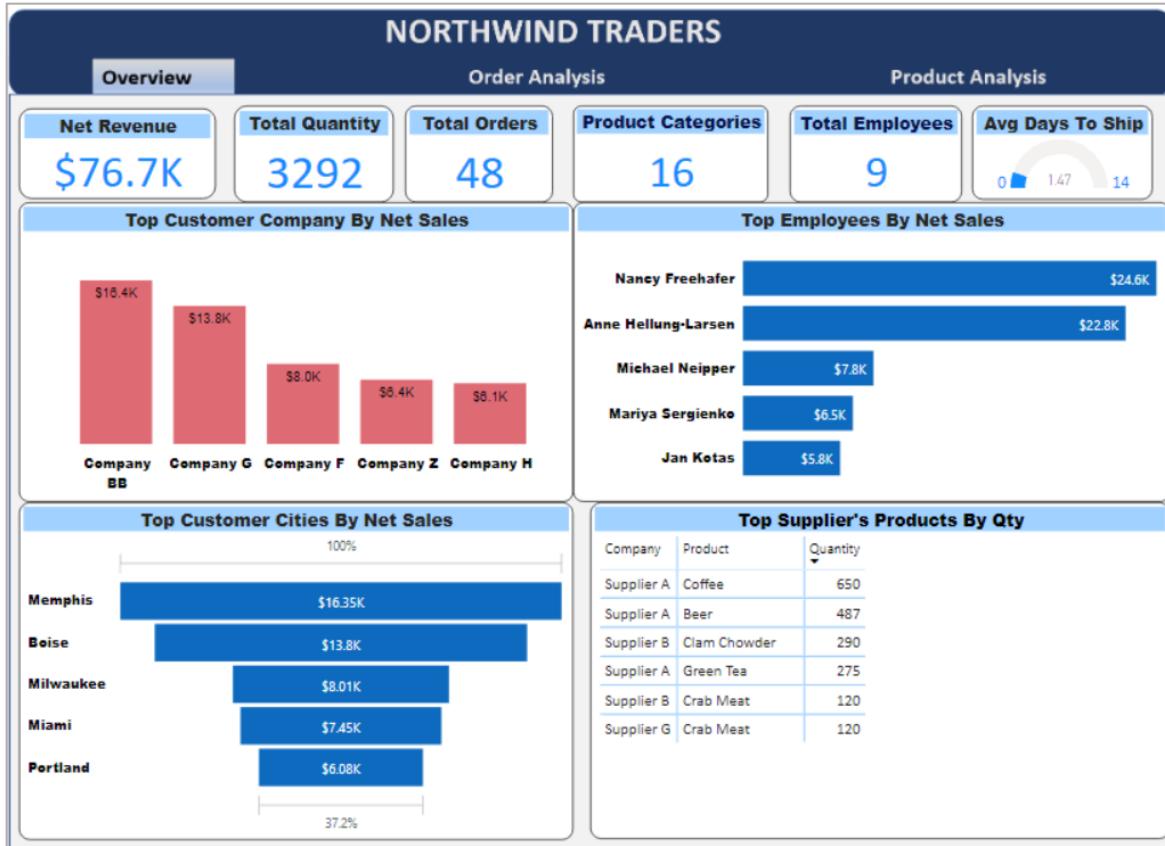
Data Visualization

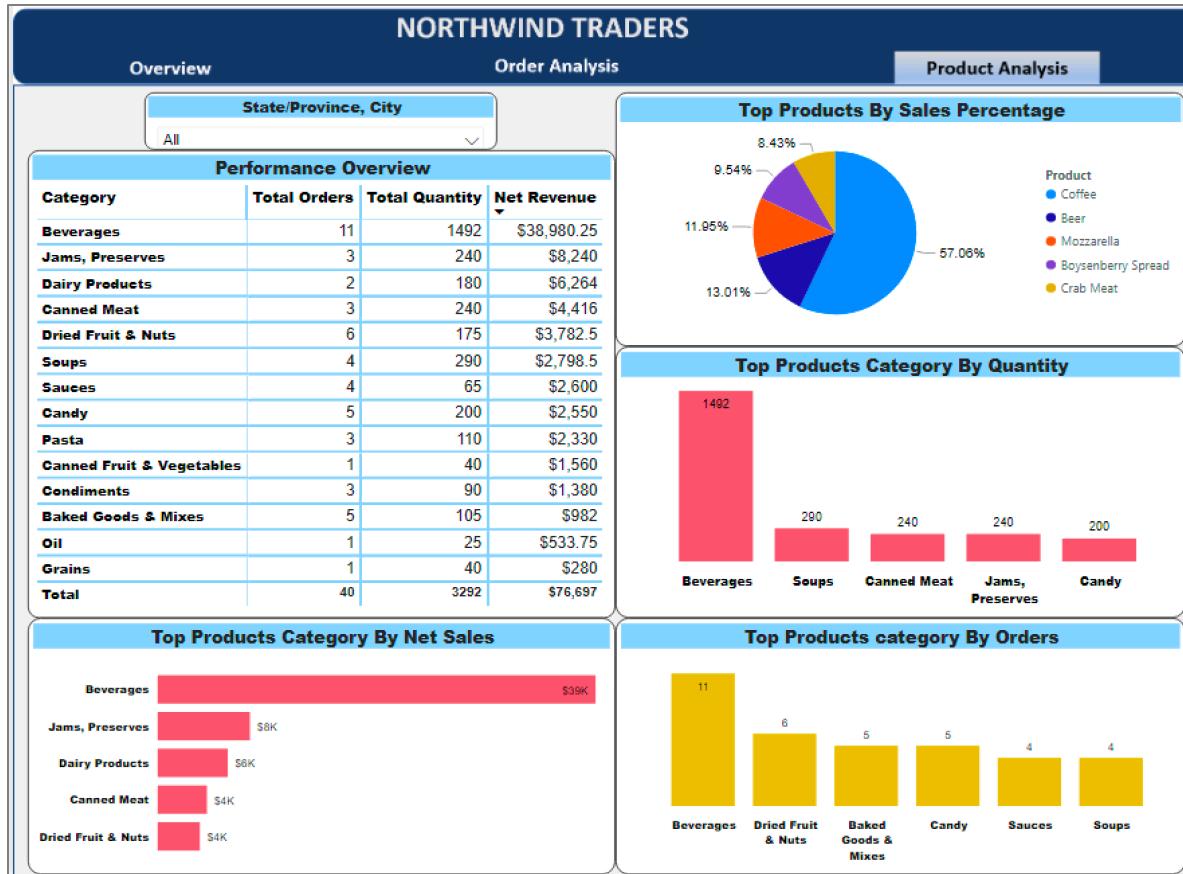
Visualization for the Northwind Traders is divided into three sections: Overview, Order Analysis, and Product Analysis. The overview page contains the overall analysis of the database like total orders, total product quantity, number of product categories, total employees, total net revenue, average days required to ship the orders. It also contains the analysis of customers and employees by net sales, orders. First graph provides the top customer's companies based on the net sales. Second graph is a clustered bar chart and it helps find out top employees by net sales. Next graph shows top customer's cities which contributed more to the net sales of the Northwind. Lastly, the top supplier's product table is added to analyze the top products supply by the supplier's company based on the product quantity.

The order analysis page has information related to product orders. It includes the order status, which shows the number of new, closed, and shipped orders. Order shipping details table helps figure out the number of days required to ship the total orders and total quantity for each category. The order analysis page also provides the analysis of shipping company like the total number of orders shipped by each company and average days required to ship the orders by each company. Total orders by sales and month graph is the analysis of net sales versus total orders for the each month from January to June of 2016.

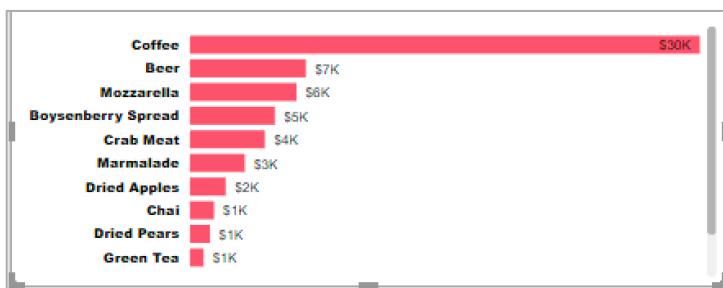
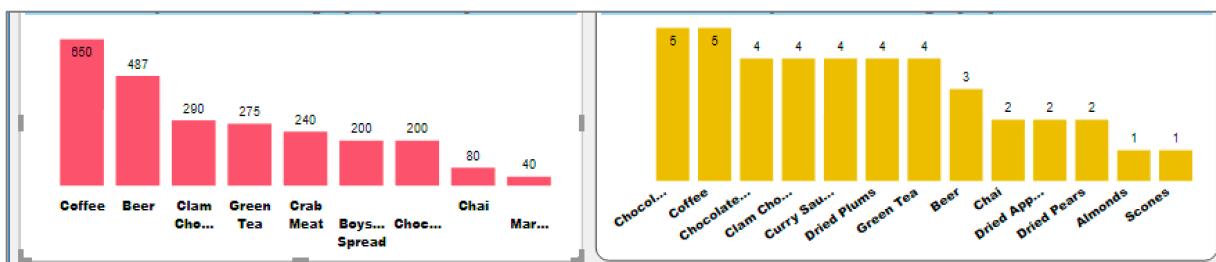
The product analysis page checks the product's overall performance. A slicer for states and cities is added to filter the data by city and state. The performance overview table displays the total number of orders, total quantity, and net revenue for each product category. A donut chart is used to display the top products by sales percentage. It helps to find out the products having the highest percentage of net sales. Top product category by quantity, top product category by orders, and top product category by net sales graphs are also added to analyze the products based on the product orders , quantities and net sales.

This report is then published to Power Bi apps and can be accessed at
<https://app.powerbi.com/groups/me/reports/b1e7aa5b-e32f-4101-bf8a-0dde37bac1a8?ctid=ea873390-8c1c-4231-a799-6b5a0235b2e6>





Top products category by quantity, orders and net sale further expanded to the next level product hierarchy which shows the top products by quantity, orders and net sales as shown below:



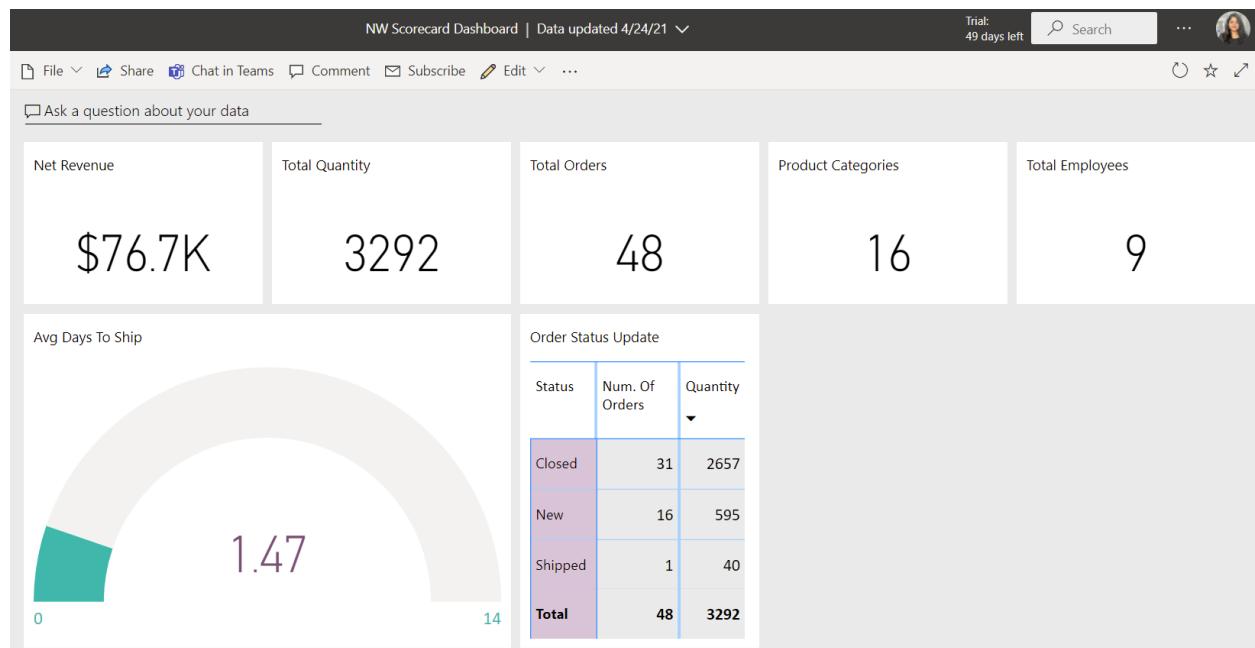
Dashboard Design

Dashboards are a powerful feature of Power BI that provide at a glance access to the important information. We have designed two dashboards to help Northwind traders for better visualization and analysis.

NW Scorecard Dashboard: <https://app.powerbi.com/groups/me/dashboards/77bc1dfc-deca-47ca-a1c5-40e9c8a51aa4?ctid=ea873390-8c1c-4231-a799-6b5a0235b2e6>

NW Performance Dashboard: <https://app.powerbi.com/groups/me/dashboards/af7a3b2d-cd1e-4859-b48d-48a7d3131b79?ctid=ea873390-8c1c-4231-a799-6b5a0235b2e6>

NW Scorecard Dashboard is designed so that management at Northwind traders can get answers to the key metrics in their organization such as Revenue, Total orders Product Categories, Employees and Average days to ship.

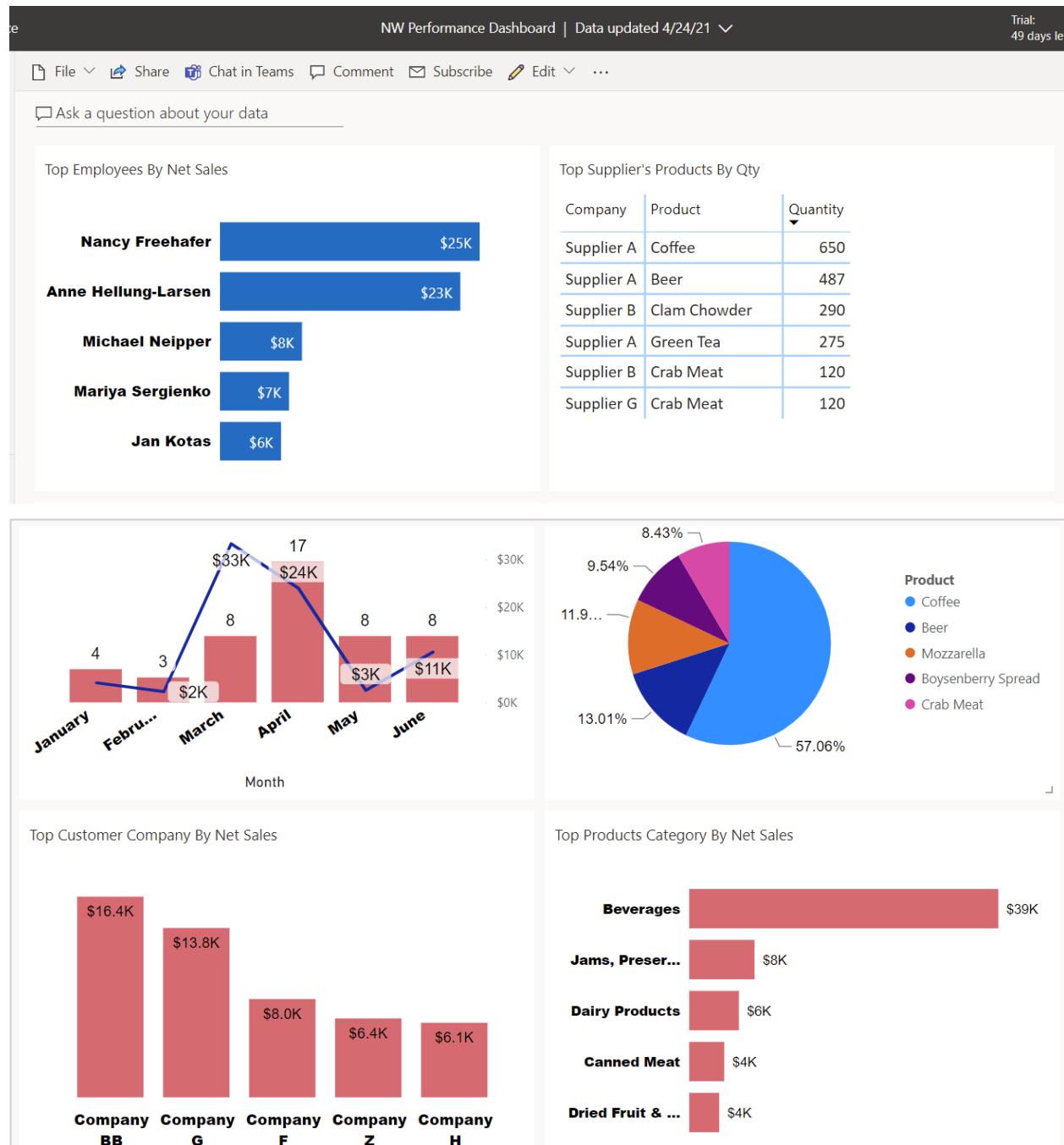


The key insights from this dashboard are

1. Net revenue is \$76.7K
2. Total quantity of the products ordered is 3292
3. The total orders are 48, in which 31 are closed, 16 are new orders and 1 is in shipped status.
4. There are 16 product categories
5. The total count of employees is 9

6. The average days to ship is 1.47 where most of products are shipped on the same day and the longest was 14 days.

NW Performance Dashboard is designed to give access to view all performance details of employees, suppliers, customers, products and monthly sales.



Data Analysis and Patterns

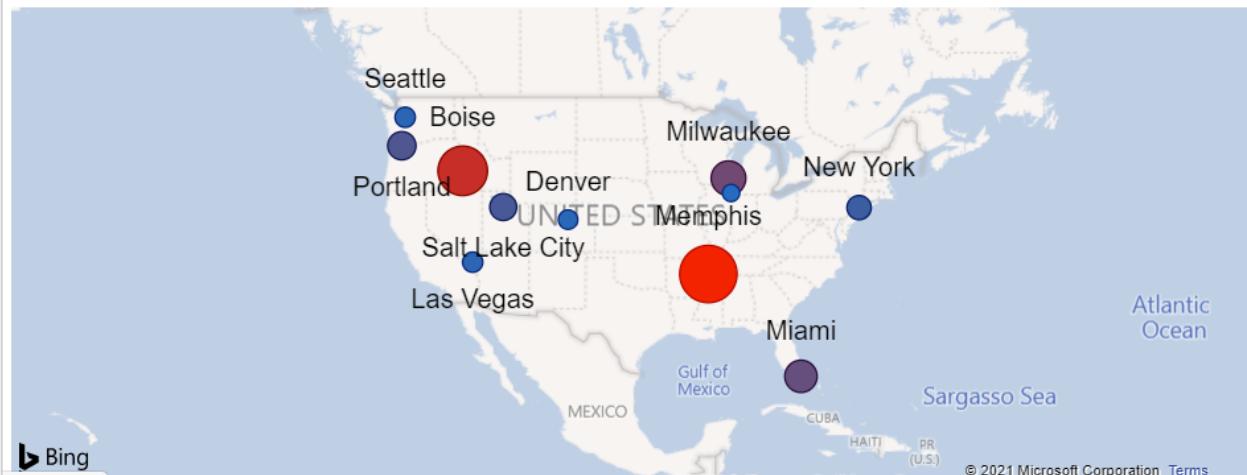
Data Analysis is performed from the dashboards created and using a pivot table. The following are the major takeaways from data analysis.

Customer/ Geographical location Analysis

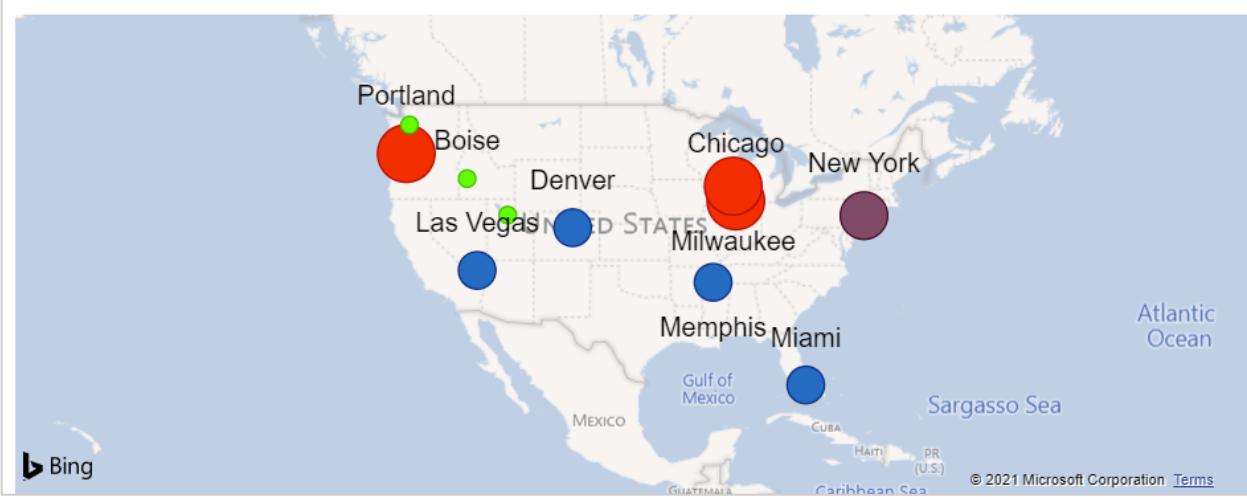
The customer company with the highest sales is Company BB generating \$16.4K revenue. These customer companies are analyzed based on the geographic location of different states and cities of the USA. The highest sales are from the state of Tennessee(Memphis) followed by Idaho(Boise), and the lowest in Illinois (Chicago). A key observation is that, though the number of orders is only 2 for 'Company G' Idaho, the sales are \$13,800, as it depends on the quantity and the products ordered.

City	Company	Total Sales	Total Quantity	Total Orders
Memphis	Company BB	\$16,532.50	455	4
Boise	Company G	\$13,800.00	300	2
Milwaukee	Company F	\$8,631.50	427	6
Miami	Company Z	\$6,787.25	295	2
Portland	Company H	\$6,385.00	300	6
Salt Lake City	Company I	\$5,926.50	210	2
New York	Company D	\$4,982.00	140	5
Seattle	Company A	\$3,596.75	180	2
Denver	Company CC	\$3,319.50	137	4
Los Angelas	Company C	\$2,571.00	253	3
Las Vegas	Company AA	\$2,105.00	130	2
Chicago	Company J	\$1,680.50	275	4
Las Vegas	Company L	\$1,480.00	50	2
Miami	Company K	\$1,019.50	90	2
Chicago	Company Y	\$870.00	50	2
Total		\$79,687.00	3292	48

Sales By Customer City



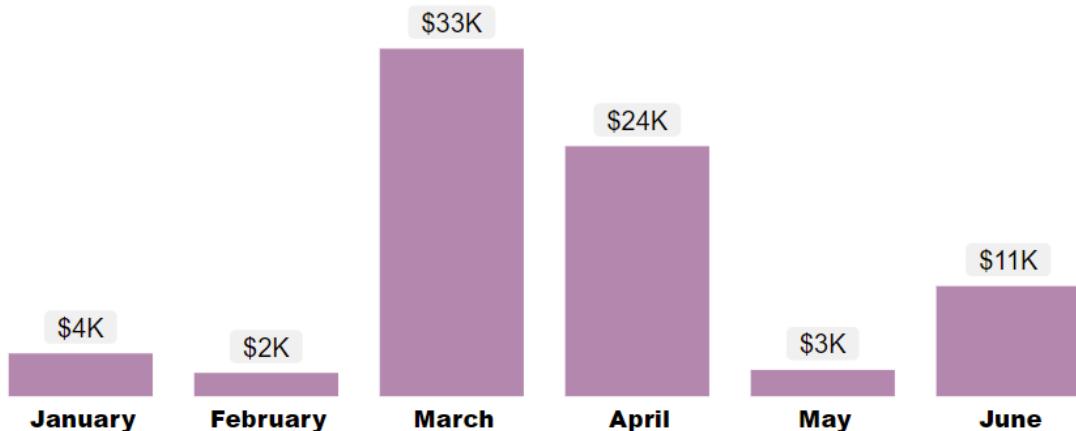
Orders By Customer City



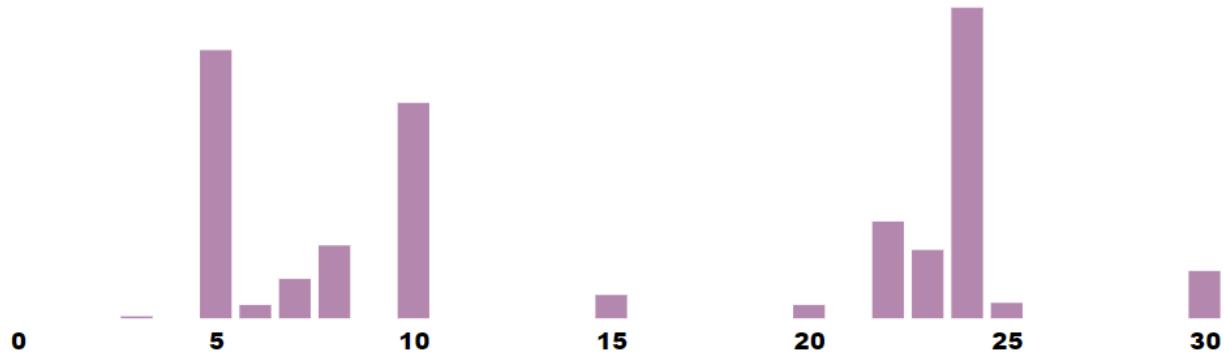
Sales Analysis by Order Date

The data is available for 6 months, and it is analyzed by month and day of the month. It is observed that the sales are highest in the month of March followed by April and the lowest sales in the month of February. The most sold product in March is Coffee and its Beer in April. It is noted that the most sales are made on the 24th, 5th, and 10th days of the month on an average considering the 6 months data.

Sales By Month



Sales By Day



Order Analysis

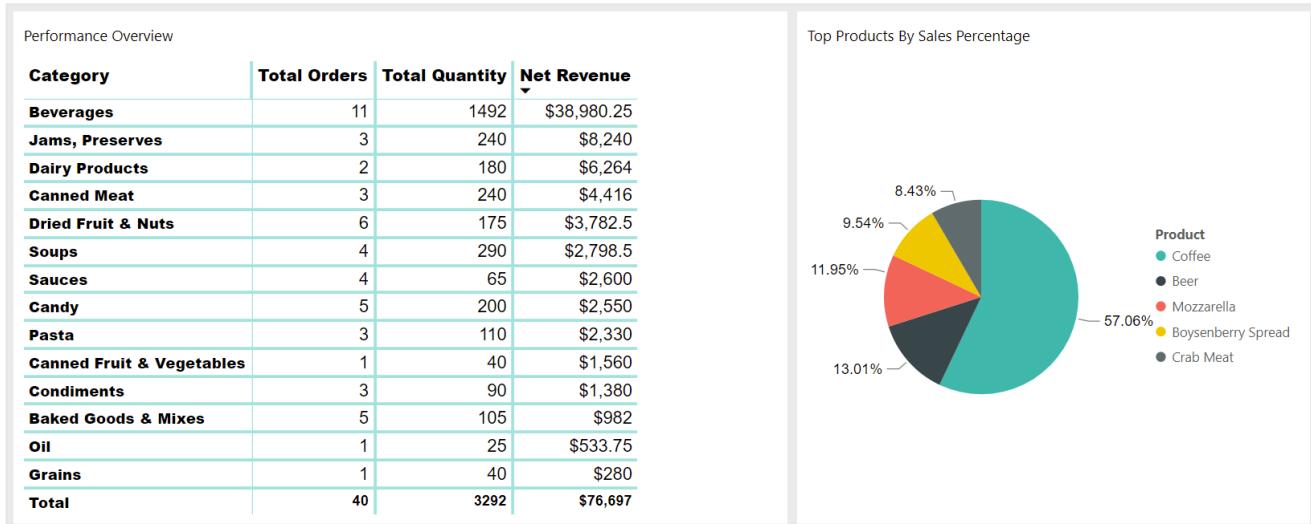
The total orders in the Northwind database are 48, of which 31 are closed, 16 of the new, and once shipped. Days to ship is a measure calculated based on the order date and shipped date, and it is observed that 'Jams, Preserves' is the product category that take longer to ship with an average of 5.6 days, followed by Condiments, Baked Goods and Mixes, Dried fruits and nuts. The rest of the product categories are readily shipped within a day or the same day. It is also observed that 'Shipping Company A' takes longer with an average shipping day as 4.13 compared to the other two companies, which only take less than day (0.91 and 0.23 days) to ship.



Category	Orders	Avg Shipping Days	Qty
Jams, Preserves	3	5.60	240
Condiments	3	4.67	90
Baked Goods & Mixes	5	3.20	105
Dried Fruit & Nuts	6	1.86	175
Sauces	4	1.00	65
Beverages	11	0.89	1492
Candy	5	0.80	200
Soups	4	0.50	290
Canned Fruit & Vegetables	1	0.00	40
Canned Meat	3	0.00	240
Dairy Products	2	0.00	180
Grains	1	0.00	40
Oil	1	0.00	25
Pasta	3	0.00	110
Total	40	1.66	3292

Product Analysis

The product category with the highest sales is 'Beverages' with \$38,980.25 and the lowest is 'Grains' with just \$280. Coffee is the most sold product taking up 57.06% of sales, and Almonds and Scones contribute just 0.33% of total sales.



Recommendations

1. Based on the analysis of orders and average shipping days, 'Shipping company A' takes longer to ship though there is no significant difference in the products. Northwind Traders can provide a better customer experience by faster shipping, and it is advised to choose a shipping partner that delivers faster.
2. Time analysis of sales identifies that sales are doubled in the month of March. We recommend Northwind Traders can employ part-time sales representatives to make sure there are enough resources to handle the sales.
3. As Coffee and Beer are the best-sold products in March and April, it should be made sure the inventory and supply of these products are maintained to meet the demand.
4. The revenue across the states for Northwind Traders is highly varied, and it is noticed that the sales contribution from major metropolitan cities like Chicago, New York, Seattle, and Las Vegas are negligible when compared to the other states. A better marketing strategy and customer relations with the concerned companies can help generate revenues from these major cities.