



Inspiring success

BUSINESS INTELLIGENCE ANALYSIS FOR SALES DATA
SCHOOL OF COMPUTING, ENGINEERING AND DIGITAL
TECHNOLOGIES
APPLIED DATA SCIENCE

Chukwuemeka Kenneth Akuneziri

B1236648

Section 1 Report

January 19, 2022

Table of Contents

Section 1: Business Intelligence Design	3
1a: BI Data Source Description and BI Requirements.....	3
Dataset.....	3
BI Requirements.....	3
1b: BI Data Pre-Processing or Data Cleansing.....	3
1c: BI Data Modelling via Star Schema - Facts and Dimensions	5
Creating Location Table	5
Creating Customer table	7
Creating the Product Table	13
Creating Order Table as the Fact table	14
Creating the Calendar Table (Date Table).....	15
Business Intelligence Modelling.....	17
DAX.....	18
ICA Section 2 – Business Intelligence Solution.....	24
Executive Summary.....	24
Recommendations	25
Introduction	25
Finding based on analysis and evaluation	26
Power BI visuals with the description.....	27
Power BI dashboards	41
Key Findings	42
Conclusion and Recommendation	42

Section 1: Business Intelligence Design

1a: BI Data Source Description and BI Requirements

Dataset

“SalesData” is a dataset that was extracted from the Adventure Works on Kaggle (<https://www.kaggle.com/ukveteran/adventure-works>). The SalesData dataset is for the year 2017 and also without the return columns in the Adventure Work dataset. The SalesData dataset has 30 columns and 29,482 rows with information such as the Customer’s information (Age, Sex, Marital status, Annual income, etc), Order Information, Product information and information about Location.

BI Requirements

A company's strategic and operational decisions are aided by the actionable insights provided by business intelligence (BI). Analytical findings are presented in reports, summaries; dashboards; charts; and sometimes maps to endow users with comprehensive intelligence concerning the current state of the business.

For effective business intelligence, you need to know what aspects of your company you want to examine and have all the relevant data at hand before defining your KPIs. This leads us to some of the business questions we might want to answer for this analysis.

1b: BI Data Pre-Processing or Data Cleansing

The data must first be imported into the system before any data cleansing or data pre-processing can take place. A variety of data-importing methods are available in Power BI, including Excel and SQL. It could be as simple as clicking on the import Excel/CSV button, or it could be as complex as using an API or a database to accomplish it. However, because the data for this project is contained in a CSV file, the import CSV option will be used to import the information.

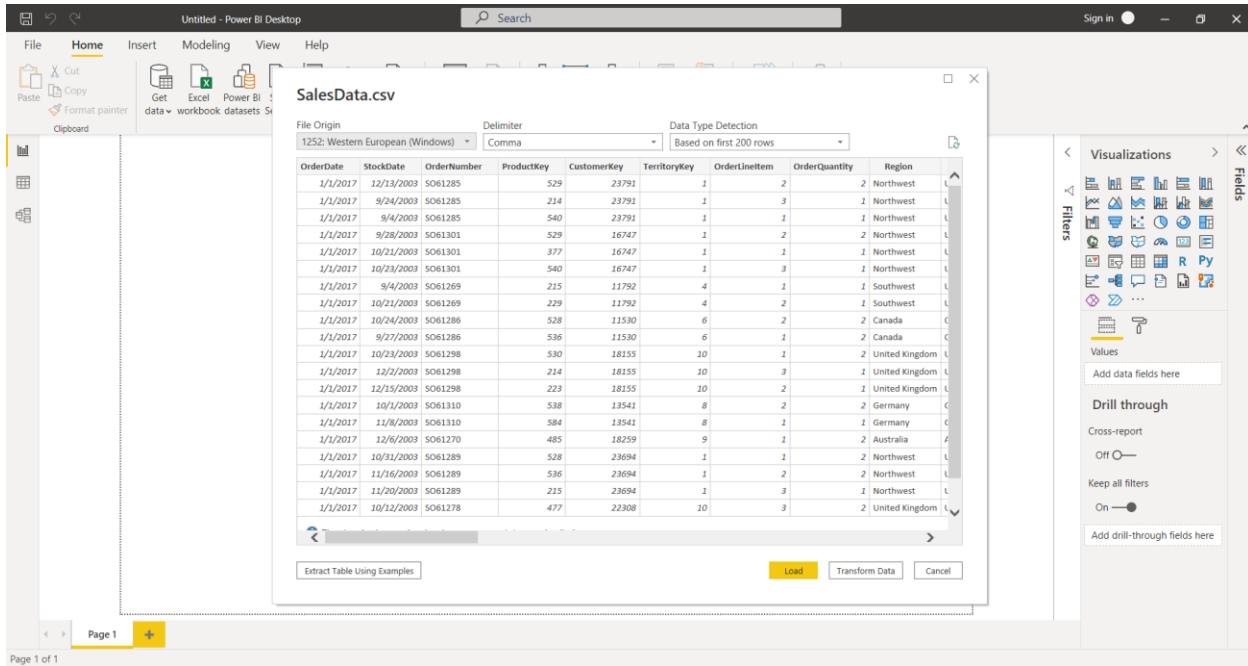


Figure 1: Import and load data

The process of importing an Excel or CSV file is quite an easy one. That can be done by either clicking the “Get data” or “Excel workbook” in the Home tab of Power BI Desktop application and then navigating to the location of the file.

OrderDate	StockDate	OrderNumber	ProductKey	CustomerKey	TerritoryKey	OrderLineItem	OrderQuantity	Region	Country	Continent	Prefix	FirstName	LastName
Sunday, January 1, 2017	Friday, October 31, 2003	S061289	528	23694	1	1	2	Northwest	United States	North America	MR.	BRIAN	BROOK
Saturday, January 7, 2017	Tuesday, December 9, 2003	S061620	528	14743	1	1	2	Northwest	United States	North America	MR.	NATHAN	TURNER
Monday, January 9, 2017	Thursday, November 6, 2003	S061754	528	14917	1	1	2	Northwest	United States	North America	MR.	ADRIAN	MORGAN
Monday, January 16, 2017	Sunday, November 9, 2003	S062189	528	23191	1	1	2	Northwest	United States	North America	MR.	GILBERT	RAJI
Wednesday, January 18, 2017	Tuesday, November 18, 2003	S062719	528	14563	1	1	2	Northwest	United States	North America	MR.	FERNANDO	CARTE
Thursday, February 9, 2017	Thursday, January 15, 2004	S063848	528	14635	1	1	2	Northwest	United States	North America	MR.	LUKE	CARTE
Tuesday, February 14, 2017	Sunday, December 14, 2003	S064152	528	11770	1	1	2	Northwest	United States	North America	MR.	PETER	NARA
Saturday, February 18, 2017	Monday, January 12, 2004	S064405	528	12413	1	1	2	Northwest	United States	North America	MR.	JAMES	GONZALEZ
Monday, February 20, 2017	Friday, November 28, 2003	S064557	528	14763	1	1	2	Northwest	United States	North America	MR.	GARRETT	MORRISON
Tuesday, February 21, 2017	Thursday, January 1, 2004	S064632	528	22283	1	1	2	Northwest	United States	North America	MR.	GEORGE	ARUN
Wednesday, February 22, 2017	Thursday, February 5, 2004	S064699	528	26104	1	1	2	Northwest	United States	North America	MR.	EDUARDO	DAVIS
Thursday, February 23, 2017	Friday, January 23, 2004	S064747	528	23090	1	1	2	Northwest	United States	North America	MR.	TIMOTHY	EDWAI
Thursday, February 23, 2017	Thursday, November 27, 2003	S064753	528	15510	1	1	2	Northwest	United States	North America	MR.	CHRISTOPHER	LEE
Saturday, February 25, 2017	Thursday, November 13, 2003	S064876	528	17487	1	1	2	Northwest	United States	North America	MR.	ERNEST	SHE
Monday, February 27, 2017	Saturday, January 20, 2004	S064984	528	14476	1	1	2	Northwest	United States	North America	MR.	NATHAN	GREEN
Wednesday, March 1, 2017	Wednesday, February 4, 2004	S065127	528	12238	1	1	2	Northwest	United States	North America	MR.	BRYCE	REED
Monday, March 6, 2017	Friday, December 5, 2003	S065655	528	15271	1	1	2	Northwest	United States	North America	MR.	COLIN	JAI
Tuesday, March 7, 2017	Tuesday, January 20, 2004	S065703	528	17341	1	1	2	Northwest	United States	North America	MR.	SAMUEL	YANG
Wednesday, March 8, 2017	Friday, February 20, 2004	S065765	528	15390	1	1	2	Northwest	United States	North America	MR.	ANDY	ALONS
Wednesday, March 15, 2017	Friday, February 20, 2004	S066231	528	15359	1	1	2	Northwest	United States	North America	MR.	JONATHAN	TURNER
Sunday, March 19, 2017	Monday, February 23, 2004	S066455	528	23298	1	1	2	Northwest	United States	North America	MR.	LOGAN	YANG
Thursday, March 23, 2017	Tuesday, December 9, 2003	S066725	528	14588	1	1	2	Northwest	United States	North America	MR.	ROBERT	MARTI
Monday, March 27, 2017	Friday, December 5, 2003	S066988	528	11196	1	1	2	Northwest	United States	North America	MR.	ALEXANDER	TAYLO
Monday, March 27, 2017	Monday, December 22, 2003	S066966	528	22793	1	1	2	Northwest	United States	North America	MR.	ALFREDO	ROME
Tuesday, March 28, 2017	Sunday, December 14, 2003	S067042	528	16236	1	1	2	Northwest	United States	North America	MR.	ANTONIO	JENKIN
Wednesday, March 29, 2017	Monday, February 19, 2004	S067097	528	73671	1	1	2	Northwest	United States	North America	MR.	NICHOLAS	MARTI

Figure 2: Data View in Power BI

This window explains how the data is viewed in Power BI. By scrolling we can see all the columns and rows which gives us a quick overview of what the dataset is about.

1c: BI Data Modelling via Star Schema - Facts and Dimensions

Splitting data into facts and Dimension Table is the major prerequisite to creating a model. To accomplish this, we must first transform Data by clicking on the Transform Data button.

To avoid losing the original file, the first step in splitting tables is to duplicate the flat table. Following that, you can select the columns you require and delete the others. When this is completed, it may be necessary to remove row duplicates in order to have unique rows, and then rename the table accordingly.

Creating Location Table

Click Transform data and duplicate the “SalesData” table

The screenshot shows the Power Query Editor interface with the 'SalesData' query selected in the Queries list. A context menu is open over the query, with the 'Duplicate' option highlighted. The 'APPLIED STEPS' pane on the right shows a single step named 'Promoted Headers'. The main table view displays the first 28 rows of the SalesData table, which contains columns: OrderDate, StockDate, OrderNumber, ProductKey, CustomerKey, TerritoryKey, and OrderLineItem. The 'Properties' pane on the right shows the query name as 'SalesData'.

OrderDate	StockDate	OrderNumber	ProductKey	CustomerKey	TerritoryKey	OrderLineItem	
1/1/2017	12/13/2009	S061285	529	23791	1		
1/1/2017	9/24/2001	S061285	214	23791	1		
1/1/2017	9/4/2003	S061285	540	23791	1		
1/1/2017	9/28/2001	S061301	529	16747	1		
1/1/2017	10/21/2001	S061301	377	16747	1		
1/1/2017	10/23/2001	S061301	540	16747	1		
1/1/2017	9/4/2003	S061269	215	11792	4		
1/1/2017	10/21/2001	S061269	229	11792	4		
1/1/2017	10/24/2001	S061286	528	11530	6		
1/1/2017	9/27/2003	S061286	536	11530	6		
1/1/2017	10/23/2001	S061298	530	18155	10		
1/1/2017	12/2/2001	S061298	214	18155	10		
1/1/2017	12/15/2001	S061298	223	18155	10		
1/1/2017	10/1/2001	S061310	538	13541	8		
1/1/2017	11/8/2003	S061310	584	13541	8		
1/1/2017	12/6/2003	S061270	485	18259	9		
17	1/1/2017	10/31/2001	S061288	528	23694	1	
18	1/1/2017	11/16/2001	S061288	536	23694	1	
19	1/1/2017	11/20/2001	S061289	215	23694	1	
20	1/1/2017	10/12/2003	S061278	477	22308	10	
21	1/1/2017	9/28/2001	S061278	479	22308	10	
22	1/1/2017	12/10/2001	S061278	488	22308	10	
23	1/1/2017	9/25/2001	S061278	580	22308	10	
24	1/1/2017	10/1/2001	S061305	583	20236	9	
25	1/1/2017	9/13/2003	S061283	529	26273	1	
26	1/1/2017	9/27/2001	S061283	538	26273	1	
27	1/1/2017	9/3/2003	S061283	220	26273	1	
28							

Figure 3: Duplicate flat Table

"TerritoryKey", "Region", "Country", "Continent" were selected while the other columns were removed

The screenshot shows the Power Query Editor interface with the 'Promoted Headers' step applied to the 'SalesData' query. The 'TerritoryKey' column is selected in the table, and the context menu is open, showing options like 'Remove Columns' and 'Remove Other Columns'. The 'APPLIED STEPS' pane on the right shows the steps taken: 'Source' (SalesData), 'Promoted Headers', and 'Changed Type'. The table contains data with columns: OrderQuantity, Region, Country, and Continent.

	OrderQuantity	Region	Country	Continent
1	23791	2 Northwest	United States	North America
2	23791	1 Northwest	United States	North America
3	23791	1 Northwest	United States	North America
4	16747	2 Northwest	United States	North America
5	16747	1 Northwest	United States	North America
6	16747	1 Northwest	United States	North America
7	11792	1 Northwest	United States	North America
8	11792	1 Southwest	United States	North America
9	11530	2 Canada	Canada	North America
10	11530	2 United Kingdom	United Kingdom	Europe
11	18155	1 United Kingdom	United Kingdom	Europe
12	18155	1 United Kingdom	United Kingdom	Europe
13	18155	2 Germany	Germany	Europe
14	13541	1 Germany	Germany	Europe
15	13541	2 Australia	Australia	Pacific
16	18259	1	United States	North America
17	23694	2 Northwest	United States	North America
18	23694	1	United States	North America
19	23694	1	United States	North America
20	22308	10	United Kingdom	Europe
21	22308	10	United Kingdom	Europe
22	22308	10	United Kingdom	Europe
23	22308	10	United Kingdom	Europe
24	20236	9	Australia	Pacific
25	26273	1	United States	North America
26	26273	1	2 Northwest	North America
27	26273	1	1 Northwest	North America
28				

Figure 4: Retain valid columns

Remove duplicates and rename table to Location

The screenshot shows the Power Query Editor interface with the 'Changed Type' step applied to the 'SalesData' query. The 'TerritoryKey' column is selected in the table, and the context menu is open, showing options like 'Remove', 'Remove Other Columns', and 'Duplicate Column'. The 'APPLIED STEPS' pane on the right shows the steps taken: 'Source' (SalesData), 'Promoted Headers', 'Changed Type', and 'Removed Other Columns'. The table contains data with columns: TerritoryKey, Region, Country, and Continent.

	TerritoryKey	Region	Country	Continent
1	United States	North America		
2	United States	North America		
3	United States	North America		
4	United States	North America		
5	United States	North America		
6	United States	North America		
7	United States	North America		
8	United States	North America		
9	United States	North America		
10	United States	North America		
11	United States	North America		
12	United States	North America		
13	United Kingdom	Europe		
14	United Kingdom	Europe		
15	United Kingdom	Europe		
16	Australia	Pacific		
17	United States	North America		
18	United States	North America		
19	United Kingdom	Europe		
20	United Kingdom	Europe		
21	United Kingdom	Europe		
22	United Kingdom	Europe		
23	United Kingdom	Europe		
24	Australia	Pacific		
25	United States	North America		
26	United States	North America		
27	United States	North America		
28	Canada	North America		

Figure 5: Remove Duplicates

Rename TerritoryKey to TerritoryID

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Home**: Transform
- Queries [3]**: SalesData, Location, SalesData (2)
- Transform ribbon**: Data Type: Whole Number, Merge Queries, Text Analytics, etc.
- Table**: Territory (4 columns, 10 rows)

	Region	Country	Continent
1	Northwest	United States	North America
2	Southwest	United States	North America
3	Canada	Canada	North America
4	United Kingdom	United Kingdom	Europe
5	Germany	Germany	Europe
6	Australia	Australia	Pacific
7	France	France	Europe
8	Southeast	United States	North America
9	Central	United States	North America
10	Northeast	United States	North America
- Query Settings** pane: Properties (Name: Location), Applied Steps (Renamed Columns).
- Message bar**: 4 COLUMNS, 10 ROWS - Column profiling based on top 1000 rows, PREVIEW DOWNLOADED AT 9:24 AM

Figure 6: Rename Column

Creating Customer table

Duplicate SalesData table, select "CustomerKey", "Prefix", "FirstName", "LastName", "BirthDate", "MaritalStatus", "Gender" and remove other columns.

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Home**: Transform
- Queries [3]**: SalesData, Location, SalesData (2)
- Transform ribbon**: Data Type: Any, Merge Queries, Text Analytics, etc.
- Table**: Prefix (30 columns, 999+ rows)

	CustomerKey	Prefix	FirstName	LastName	BirthDate	MaritalStatus	Gender	EmailAddress
1	MRL	AARON	COPY		20376 S	M	aaron20@adve	
2	MRL	AARON			20376 S	M	aaron20@adve	
3	MRL	AARON			20376 S	M	aaron20@adve	
4	MRL	ALEXANDER			27559 S	M	alexander7@ad	
5	MRL	ALEXANDE			27559 S	M	alexander7@ad	
6	MRL	ALEXANDE			27559 S	M	alexander7@ad	
7	MRS.	ALEXIA			25350 M	F	alexia7@adve	
8	MRS.	ALEXIA			25350 M	F	alexia7@adve	
9	MRL	ANDREW			21027 M	M	andrew24@adv	
10	MRL	ANDREW			21027 M	M	andrew24@adv	
11	MRS.	ARIANNA			19975 M	F	arianna35@adv	
12	MRS.	ARIANNA			19975 M	F	arianna35@adv	
13	MRS.	ARIANNA			19975 M	F	arianna35@adv	
14	MRS.	ASHLEE			22140 M	F	ashlee12@adve	
15	MRS.	ASHLEE			22140 M	F	ashlee12@adve	
16	MS.	BAILEY			23942 S	F	baily10@adve	
17	MRL	BRIAN			16488 M	M	brian13@adven	
18	MRL	BRIAN			16488 M	M	brian13@adven	
19	MRL	BRIAN			16488 M	M	brian13@adven	
20	MRS.	CASSANDRA			26898 M	F	cassandra18@a	
21	MRS.	CASSANDRA			26898 M	F	cassandra18@a	
22	MRS.	CASSANDRA			26898 M	F	cassandra18@a	
23	MRS.	CASSANDRA			26898 M	F	cassandra18@a	
24	MRL	CESAR			23084 S	M	cesar2@advent	
25	MRS.	CHELSEA			20898 M	F	chelsea0@adve	
26	MRS.	CHELSEA			20898 M	F	chelsea0@adve	
27	MRS.	CHELSEA			20898 M	F	chelsea0@adve	
- Query Settings** pane: Properties (Name: SalesData (2)), Applied Steps (Filtered Rows).
- Message bar**: 30 COLUMNS, 999+ ROWS - Column profiling based on top 1000 rows, PREVIEW DOWNLOADED AT 9:25 AM

Figure 7: Retain and Rename Valid columns

Change “Birthdate” type from whole number to date.

The screenshot shows the Power Query Editor interface. In the main area, there is a table with columns: CustomerKey, Prefix, FirstName, LastName, BirthDate, MaritalStatus, Gender, and EmailAddress. The 'BirthDate' column is currently set to 'Whole Number'. A context menu is open over this column, with the 'Change Type' option selected. Under 'Change Type', the 'Date' option is highlighted. The 'APPLIED STEPS' pane on the right shows the step 'Removed Other Columns' has been applied. The 'PROPERTIES' pane shows the query is named 'SalesData (2)'.

Figure 8: Change column Data type

Remove “Prefix” and we already have Marital Status

The screenshot shows the Power Query Editor interface. In the main area, there is a table with columns: CustomerKey, Prefix, LastName, BirthDate, MaritalStatus, Gender, and EmailAddress. The 'Prefix' column is currently set to 'Text'. A context menu is open over this column, with the 'Remove' option selected. The 'APPLIED STEPS' pane on the right shows the step 'Changed Type' has been applied. The 'PROPERTIES' pane shows the query is named 'SalesData (2)'.

Figure 9: Delete Prefix column

Replace “S” with Single in the Marital Status Column.

The screenshot shows the Power Query Editor interface with the 'Replace Values' dialog open over a table of data. The table has columns: BirthDate, MaritalStatus, Gender, EmailAddress, AnnualIncome, and EducationLevel. The 'MaritalStatus' column contains values like 'S', 'M', and 'F'. The 'Replace Values' dialog has 'Value To Find' set to 'S' and 'Replace With' set to 'Single'. The 'APPLIED STEPS' pane on the right shows the step 'Removed Columns'.

Figure 10: Replace Values

Replace “M” with Married in the Marital Status Column .

The screenshot shows the Power Query Editor interface with the 'Replace Values' dialog open over a table of data. The table has columns: BirthDate, MaritalStatus, Gender, EmailAddress, AnnualIncome, and EducationLevel. The 'MaritalStatus' column contains values like 'S', 'M', and 'F'. The 'Replace Values' dialog has 'Value To Find' set to 'M' and 'Replace With' set to 'Married'. The 'APPLIED STEPS' pane on the right shows the step 'Replaced Value'.

Figure 11: Replace value M for Married

Replace “M” with Male in the Gender Column.

The screenshot shows the Power Query Editor interface with the 'Replace Values' dialog open. The 'Value To Find' field contains 'M' and the 'Replace With' field contains 'Male'. The 'Applied Steps' pane on the right shows the step 'Replaced Value1'.

BirthDate	MaritalStatus	Gender	EmailAddress	AnnualIncome	EducationLevel
10/14/1955	Single	M	aaron20@adventure-works.com	20000	Partial High School
10/14/1955	Single	M	aaron20@adventure-works.com	20000	Partial High School
10/14/1955	Single	M	aaron20@adventure-works.com	20000	Partial High School
6/14/11					
6/14/11					
6/14/11					
5/27/11					
5/27/11					
7/26/11					
7/26/11					
9/8/11					
9/8/11					
9/8/11					
8/12/11					
8/12/11					
7/19/11					
7/19/11					
2/20/11					
2/20/1945	Married	M	brian13@adventure-works.com	20000	Partial High School
2/20/1945	Married	M	brian13@adventure-works.com	20000	Partial High School
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
3/14/1963	Single	M	cesar@adventure-works.com	60000	Bachelors
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School

Figure 12: Replace value M for Male

Replace “F” with Female in the Gender Column.

The screenshot shows the Power Query Editor interface with the 'Replace Values' dialog open. The 'Value To Find' field contains 'F' and the 'Replace With' field contains 'Female'. The 'Applied Steps' pane on the right shows the step 'Replaced Value2'.

BirthDate	MaritalStatus	Gender	EmailAddress	AnnualIncome	EducationLevel
10/14/1955	Single	Male	aaron20@adventure-works.com	20000	Partial High School
10/14/1955	Single	Male	aaron20@adventure-works.com	20000	Partial High School
10/14/1955	Single	Male	aaron20@adventure-works.com	20000	Partial High School
6/14/11					
6/14/11					
6/14/11					
5/27/11					
5/27/11					
7/26/11					
7/26/11					
9/8/11					
9/8/11					
9/8/11					
8/12/11					
8/12/11					
7/19/11					
7/19/11					
2/20/11					
2/20/1945	Married	Male	brian13@adventure-works.com	20000	Partial High School
2/20/1945	Married	Male	brian13@adventure-works.com	20000	Partial High School
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
8/22/1973	Married	F	cassandra18@adventure-works.com	40000	Bachelors
3/14/1963	Single	Male	cesar@adventure-works.com	60000	Bachelors
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School
3/19/1957	Married	F	chelsea0@adventure-works.com	20000	Partial High School

Figure 13: Replace Value F for Female

Replace “NA” with Undisclosed in the Gender Column.

The screenshot shows the Power Query Editor interface with the 'Replace Values' dialog open. The dialog has two input fields: 'Value To Find' containing 'NA' and 'Replace With' containing 'Undisclosed'. The main table area shows several rows of data, with the 'Gender' column being modified from 'NA' to 'Undisclosed'. The 'Applied Steps' pane on the right shows the step 'Replaced Value4'.

Figure 14: Replace Value NA with Undisclosed

Merge FirstName and LastName and rename to Customer's name

The screenshot shows the Power Query Editor interface with the 'Merge Columns' dialog open. The dialog has two input fields: 'Separator' containing 'Space' and 'New column name (optional)' containing 'Customer's Name'. The main table area shows several rows of data, with the 'FirstName' and 'LastName' columns being merged into a single 'Customer's Name' column. The 'Applied Steps' pane on the right shows the step 'Replaced Value4'.

Figure 15: Merge and Rename Columns

Transform and Capitalize each word for Customer's name

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Queries [3]**: SalesData, Location, SalesData (2)
- Current Step**: Table.CombineColumns("Replaced Value4", "FirstName", "LastName", Combiner.CombineTextByDelimiter(" ", QuoteStyle.None), "Customer's Name")
- Transform ribbon**: Home, Transform, Add Column, View, Tools, Help
- Transform pane** (highlighted):
 - Choose Columns
 - Remove Columns
 - Keep Rows
 - Remove Rows
 - Sort
 - Split Column
 - Group By
 - Replace Values
 - Transform
- Applied Steps** (right sidebar):
 - Merged Columns
- Properties** (right sidebar):
 - Name: SalesData (2)

The data table shows rows from 1 to 28, with the 'Customer's Name' column being transformed. The 'Applied Steps' pane shows the 'Merged Columns' step.

Figure 16: Capitalize words

Rename CustomerKey to CustomerID , rename table to Customer and remove duplicates.

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Queries [3]**: SalesData, Location, Customer
- Current Step**: Table.RenameColumns("Capitalized Each Word", {"CustomerKey", "CustomerID"})
- Transform ribbon**: Home, Transform, Add Column, View, Tools, Help
- Transform pane** (highlighted):
 - Choose Columns
 - Remove Columns
 - Keep Rows
 - Remove Rows
 - Sort
 - Split Column
 - Group By
 - Replace Values
 - Transform
- Applied Steps** (right sidebar):
 - Renamed Columns
- Properties** (right sidebar):
 - Name: Customer

The data table shows rows from 1 to 28, with the 'Customer' table being renamed. The 'Applied Steps' pane shows the 'Renamed Columns' step.

Figure 17: Rename Table and Column

Creating the Product Table

Duplicate SalesData and Select "ProductKey", "ProductSubcategoryKey", "ProductName", "ModelName", "ProductDescription", "ProductColor", "ProductCost", "ProductPrice", "SubcategoryName", "ProductCategoryKey", "CategoryName" then remove other columns.

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Home**: Transform
- Data Sources**: SalesData (2)
- Properties**: Name: SalesData (2)
- Applied Steps**: Source, Promoted Headers, Changed Type, Filtered Rows
- Query Settings**: Preview downloaded at 9:57 AM
- Queries [4]**: SalesData, Location, Customer, SalesData (2)
- Table Structure** (Visible Columns):
 - Column 1: #REF! productColor
 - Column 2: #REF! ProductSubcategoryKey
 - Column 3: #REF! SubcategoryName
 - Column 4: #REF! ProductCategoryKey
 - Column 5: #REF! CategoryName
- Transform Tools** (Visible):
 - Remove Columns
 - Remove Other Columns
 - Add Column From Examples...
 - Remove Duplicates
 - Remove Errors
 - Replace Values...
 - Change Type
 - Merge Columns
 - Group By...
 - Unpivot Columns
 - Unpivot Other Columns
 - Unpivot Only Selected Columns
 - Move
- Preview**: 30 COLUMNS, 999+ ROWS. Column profiling based on top 1000 rows.

Figure 18: Retain valid columns

Replace NA with Others in the Product Colour Column.

The screenshot shows the Power Query Editor interface with the following details:

- File**: Untitled - Power Query Editor
- Home**: Transform
- Data Sources**: SalesData (2)
- Properties**: Name: SalesData (2)
- Applied Steps**: Source, Promoted Headers, Changed Type, Filtered Rows, Removed Other Columns
- Query Settings**: Preview downloaded at 9:59 AM
- Queries [4]**: SalesData, Location, Customer, SalesData (2)
- Table Structure** (Visible Columns):
 - Column 1: #REF! ProductDescription
 - Column 2: #REF! ProductColor
 - Column 3: #REF! ProductCost
 - Column 4: #REF! ProductPrice
 - Column 5: #REF! SubcategoryName
- Transform Tools** (Visible):
 - Replace Values
- Replace Values Dialog**:
 - Value To Find: NA
 - Replace With: Others
 - Advanced options: OK, Cancel
- Preview**: 11 COLUMNS, 999+ ROWS. Column profiling based on top 1000 rows.

Figure 19: Replace values

Rename the ProductKey column to ProductID, Rename Table to Product and remove duplicates.

The screenshot shows the Power Query Editor interface with the 'Product' table selected. In the 'Transform' ribbon, the 'Remove Duplicates' option is highlighted. The 'Applied Steps' pane on the right shows the step 'Renamed Columns'.

ProductID	ProductName	ModelName	ProductDescription
1	Road Tire Tube	Road Tire Tube	Conventional all-purpose tube.
2	Sport-100 Helmet, Red	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.
3	HL Road Tire	HL Road Tire	Lightweight carbon reinforce for an unrivaled ride at an un-compro...
4	Road Tire Tube	Road Tire Tube	Conventional all-purpose tube.
5	Road-250 Black, 52	Road-250	Alluminum-alloy frame provides a light, stiff ride, whether you are rac...
6	HL Road Tire	HL Road Tire	Lightweight carbon reinforce for an unrivaled ride at an un-compro...
7	Sport-100 Helmet, Black	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.
8	Long-Sleeve Logo Jersey, M	Long-Sleeve Logo Jersey	Unisex long-sleeve AWC logo microfiber cycling jersey
9	Mountain Tire Tube	Mountain Tire Tube	Self-sealing tube.
10	ML Mountain Tire	ML Mountain Tire	Great traction, high-density rubber.
11	Touring Tire Tube	Touring Tire Tube	General purpose tube.
12	Sport-100 Helmet, Red	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.
13	AWC Logo Cap	Cycling Cap	Traditional style with a flip-up brim; one-size fits all.
14	LL Road Tire	LL Road Tire	Same great treads as more expensive tire with a less expensive wire b...
15	Road-750 Black, 58	Road-750	Entry level adult bike; offers a comfortable ride cross-country or down...
16	Fender Set - Mountain	Fender Set - Mountain	Clip-on fenders fit most mountain bikes.
17	Mountain Tire Tube	Mountain Tire Tube	Self-sealing tube.
18	ML Mountain Tire	ML Mountain Tire	Great traction, high-density rubber.
19	Sport-100 Helmet, Black	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.
20	Water Bottle - 30 oz.	Water Bottle	AWC logo water bottle - holds 30 oz; leak-proof.
21	Road Bottle Cage	Road Bottle Cage	Aluminum cage is lighter than our mountain version; perfect for long c...
22	Short-Sleeve Classic Jersey, S	Short-Sleeve Classic Jersey	Short sleeve classic breathable jersey with superior moisture control!
23	2 Road-350-W Yellow, 40	Road-350-W	Cross-train, race, or just socialize on a sleek, aerodynamic bike design
24	2 Road-350-W Yellow, 48	Road-350-W	Cross-train, race, or just socialize on a sleek, aerodynamic bike design
25	37 Road Tire Tube	Road Tire Tube	Conventional all-purpose tube.
26	37 LL Road Tire	LL Road Tire	Same great treads as more expensive tire with a less expensive wire b...
27	31 Sport-100 Helmet, Blue	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.
28			

Figure 20: Rename columns and Table

Creating Order Table as the Fact table

Using the SalesData table select "OrderDate", "StockDate", "OrderNumber", "ProductKey", "CustomerKey", "TerritoryKey", "OrderLineItem" and remove other columns

The screenshot shows the Power Query Editor interface with the 'SalesData' table selected. In the 'Transform' ribbon, the 'Remove Columns' option is highlighted. The 'Applied Steps' pane on the right shows the step 'Selected Headers'.

OrderDate	StockDate	OrderNumber	ProductKey	CustomerKey	TerritoryKey
1/1/2017	12/13/2008	S061285	529	23791	
1/1/2017	9/24/2008	S061285	214	23791	
1/1/2017	9/4/2008	S061285	540	23791	
1/1/2017	9/28/2008	S061301	529	16747	
1/1/2017	10/21/2008	S061301	377	16747	
1/1/2017	10/21/2008	S061301	540	16747	
1/1/2017	9/4/2008	S061269	215	11792	
1/1/2017	10/21/2008	S061269	229	11792	
1/1/2017	10/24/2008	S061286	528	11580	
1/1/2017	9/27/2008	S061286	536	11530	
1/1/2017	10/28/2008	S061298	530	18155	
1/1/2017	12/2/2008	S061298	214	18155	
1/1/2017	12/15/2008	S061298	223	18155	
1/1/2017	10/1/2008	S061310	538	13541	
1/1/2017	11/8/2008	S061310	584	13541	
1/1/2017	12/6/2008	S061270	485	18239	
1/1/2017	10/31/2008	S061289	528	23694	1
1/1/2017	11/16/2008	S061289	536	23694	1
1/1/2017	11/20/2008	S061289	215	23694	1
1/1/2017	10/12/2008	S061278	477	22308	10
1/1/2017	9/28/2008	S061278	479	22308	10
1/1/2017	12/10/2008	S061278	488	22308	10
1/1/2017	9/25/2008	S061278	580	22308	10
1/1/2017	10/1/2008	S061305	583	20236	9
1/1/2017	9/13/2008	S061283	529	26273	1
1/1/2017	9/27/2008	S061283	538	26273	1
1/1/2017	9/3/2008	S061283	220	26273	1
28					

Figure 21: Retain Valid columns

Rename ProductKey, CustomerKey and TerritoryKey to ProductID, CustomerID and TerritoryID ,Change Table name to Orderand remove Duplicate.

The screenshot shows the Power Query Editor interface. The 'Applied Steps' pane on the right lists a single step named 'Renamed Columns'. This step has a dropdown menu open, showing the original column names ('ProductKey', 'CustomerKey', 'TerritoryKey') and their new names ('ProductID', 'CustomerID', 'TerritoryID'). The main table preview area shows the transformed data with these renamed columns. The 'Properties' pane on the right shows the table is named 'SalesData'.

Figure 22: Rename columns and Table

Creating the Calendar Table (Date Table)

Calendar = CALENDARAUTO() will generate a date column using New Table

The screenshot shows the Power BI Desktop interface with the 'Table tools' ribbon selected. A new table named 'Calendar' is being created using the formula 'CALENDARAUTO()'. The table structure is displayed on the left, showing a single column 'Date' with rows from 1/1/1901 to 1/27/1910. The 'Fields' pane on the right shows the newly created 'Calendar' table and its 'Date' column.

Figure 23: Create Calendar Table

The rest of the Columns were also created using the below expression.

```
day = 'Calendar'[Date].[Day]
Month = 'Calendar'[Date].[Month]
MonthNo = 'Calendar'[Date].[MonthNo]
Quater = 'Calendar'[Date].[Quarter]
Year = 'Calendar'[Date].[Year]
```

The screenshot shows the Power BI Desktop interface with the 'Column tools' ribbon selected. The 'Name' field is set to 'Year'. The 'Data type' is 'Whole number'. The 'Format' dropdown shows '\$ %' with a value of 0. The 'Summarization' dropdown is set to 'Sum'. The 'Sort by column' dropdown is set to 'Uncategorized'. The 'Properties' section includes 'Data category', 'Groups', 'Relationships', and 'New column'. The 'Fields' pane on the right shows the hierarchy: Calendar > Date > day, Month, MonthNo, Quater, Year. The table below shows 39,447 rows of data from 1/1/1910 to 1/27/1910, with columns for Date, day, Month, MonthNo, Quater, and Year.

Date	day	Month	MonthNo	Quater	Year
1/1/1910 12:00:00 AM	1	January	1	Qtr 1	1910
1/2/1910 12:00:00 AM	2	January	1	Qtr 1	1910
1/3/1910 12:00:00 AM	3	January	1	Qtr 1	1910
1/4/1910 12:00:00 AM	4	January	1	Qtr 1	1910
1/5/1910 12:00:00 AM	5	January	1	Qtr 1	1910
1/6/1910 12:00:00 AM	6	January	1	Qtr 1	1910
1/7/1910 12:00:00 AM	7	January	1	Qtr 1	1910
1/8/1910 12:00:00 AM	8	January	1	Qtr 1	1910
1/9/1910 12:00:00 AM	9	January	1	Qtr 1	1910
1/10/1910 12:00:00 AM	10	January	1	Qtr 1	1910
1/11/1910 12:00:00 AM	11	January	1	Qtr 1	1910
1/12/1910 12:00:00 AM	12	January	1	Qtr 1	1910
1/13/1910 12:00:00 AM	13	January	1	Qtr 1	1910
1/14/1910 12:00:00 AM	14	January	1	Qtr 1	1910
1/15/1910 12:00:00 AM	15	January	1	Qtr 1	1910
1/16/1910 12:00:00 AM	16	January	1	Qtr 1	1910
1/17/1910 12:00:00 AM	17	January	1	Qtr 1	1910
1/18/1910 12:00:00 AM	18	January	1	Qtr 1	1910
1/19/1910 12:00:00 AM	19	January	1	Qtr 1	1910
1/20/1910 12:00:00 AM	20	January	1	Qtr 1	1910
1/21/1910 12:00:00 AM	21	January	1	Qtr 1	1910
1/22/1910 12:00:00 AM	22	January	1	Qtr 1	1910
1/23/1910 12:00:00 AM	23	January	1	Qtr 1	1910
1/24/1910 12:00:00 AM	24	January	1	Qtr 1	1910
1/25/1910 12:00:00 AM	25	January	1	Qtr 1	1910
1/26/1910 12:00:00 AM	26	January	1	Qtr 1	1910
1/27/1910 12:00:00 AM	27	January	1	Qtr 1	1910

Figure 24: Create Date columns

Business Intelligence Modelling

For the most benefit from the dataset, it is necessary to connect and link the dimension tables and fact table by creating a relationship between the two tables. The 'Data Modeling' feature of Power BI is ideal for accomplishing this. In most cases, Power BI automatically creates relationships between tables; however, it is recommended that you review these relationships because a best approach for the relationships may be available.

Default Modelling.

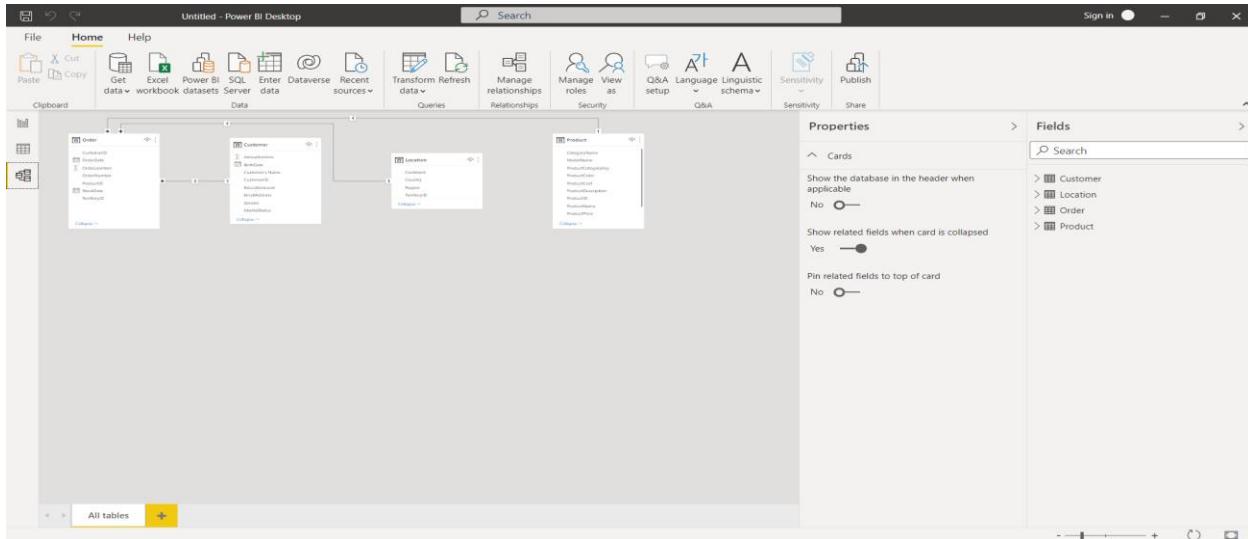


Figure 25: Power BI default Model

Modelling with established relationships

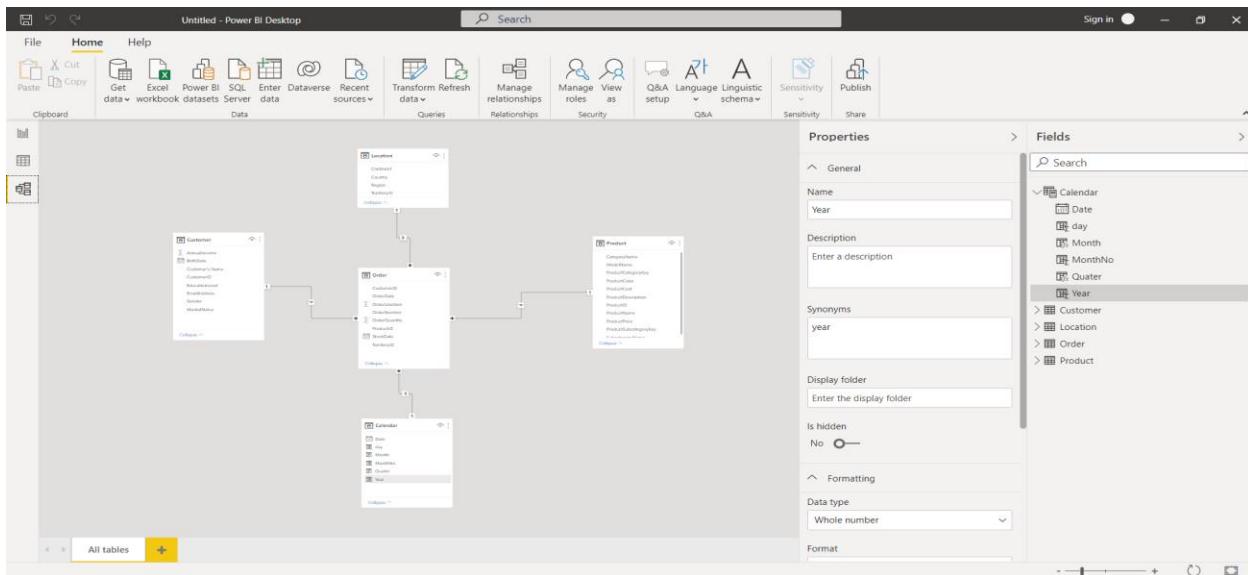


Figure 26: Modelled

DAX

When it comes to data analysis , Data Analysis Expressions (DAX) is a collection of functions and operators that can be combined to create formulas and expressions in Power BI. Some expressions were carried out below.

Creating the Age Column with $\text{Age} = \text{DATEDIFF}(\text{Customer}[\text{BirthDate}], \text{TODAY}(), \text{YEAR})$ in the Customer Table

The screenshot shows the Power BI Desktop interface with the 'Customer' table selected. In the 'Column tools' ribbon, the 'New column' button is highlighted. The formula bar at the top shows the expression: `1 Age = DATEDIFF(Customer[BirthDate], TODAY(), YEAR)`. The Fields pane on the right lists various columns and measures, with 'Age' being the newly created column.

CustomerID	Customer's Name	BirthDate	MaritalStatus	Gender	EmailAddress	AnnualIncome	EducationLevel	Age
27148	Edwin Zhu	Tuesday, December 21, 1965	Single	Male	edwin15@adventure-works.com	70000	Bachelors	57
29188	Colin Kumar	Thursday, September 19, 1968	Single	Male	colin31@adventure-works.com	70000	Bachelors	54
27343	Dale Nath	Thursday, April 10, 1975	Single	Male	dale18@adventure-works.com	70000	Bachelors	47
13618	Jay Raman	Sunday, November 14, 1976	Single	Male	jay19@adventure-works.com	70000	Bachelors	46
25979	Miguel Edwards	Saturday, February 2, 1963	Single	Male	miguel44@adventure-works.com	70000	Bachelors	59
14400	Brandon Brown	Friday, October 22, 1948	Single	Male	brandon42@adventure-works.com	70000	Bachelors	74
23432	Jordan Roberts	Thursday, October 10, 1968	Single	Male	jordan50@adventure-works.com	70000	Bachelors	54
13201	Nicholas Davis	Wednesday, August 23, 1944	Single	Male	nicholas7@adventure-works.com	70000	Bachelors	78
23538	Carlos Evans	Wednesday, July 17, 1963	Single	Male	carlos2@adventure-works.com	70000	Bachelors	59
20256	Javier Serrano	Monday, May 4, 1964	Single	Male	javier11@adventure-works.com	70000	Bachelors	58
20800	Dennis Hu	Tuesday, January 26, 1975	Single	Male	dennis22@adventure-works.com	70000	Bachelors	47
18298	Geoffrey Malhotra	Wednesday, October 10, 1962	Single	Male	geoffrey5@adventure-works.com	70000	Bachelors	60
17235	Joshua Jackson	Sunday, October 13, 1974	Single	Male	joshua13@adventure-works.com	70000	Bachelors	48
20702	Oscar Ross	Sunday, September 8, 1963	Single	Male	oscar11@adventure-works.com	70000	Bachelors	59
25226	Robert Kumar	Tuesday, November 9, 1965	Single	Male	robert40@adventure-works.com	70000	Bachelors	57
25214	Roger Chander	Monday, February 4, 1963	Single	Male	roger43@adventure-works.com	70000	Bachelors	59
25976	Hunter Coleman	Wednesday, April 17, 1968	Single	Male	hunter2@adventure-works.com	70000	Bachelors	54
22298	Marcus Williams	Saturday, October 20, 1968	Single	Male	marcus2@adventure-works.com	70000	Bachelors	54
12067	Aaron Bryant	Tuesday, November 14, 1944	Single	Male	aaron17@adventure-works.com	70000	Bachelors	78
13620	Damien Ye	Sunday, February 1, 1976	Single	Male	damiens7@adventure-works.com	70000	Bachelors	46
15122	Sergio Lopez	Friday, September 26, 1975	Single	Male	sergio17@adventure-works.com	70000	Bachelors	47
11761	Edgar Mehta	Wednesday, April 19, 1967	Single	Male	edgar15@adventure-works.com	70000	Bachelors	55
25228	Brad Ashe	Wednesday, October 14, 1964	Single	Male	brad10@adventure-works.com	70000	Bachelors	58
13870	Pedro Rana	Wednesday, April 17, 1968	Single	Male	pedro11@adventure-works.com	70000	Bachelors	54
18292	Louis Tang	Sunday, August 9, 1964	Single	Male	louis21@adventure-works.com	70000	Bachelors	58
12339	Clayton Jai	Thursday, July 8, 1976	Single	Male	clayton29@adventure-works.com	70000	Bachelors	46
23539	Darren Munoz	Friday, January 4, 1963	Single	Male	darren29@adventure-works.com	70000	Bachelors	59

Figure 27: Create Age Group

Create the Sales column using $\text{Sales} = [\text{Order}][\text{OrderQuantity}] * [\text{Order}][\text{ProductPrice}]$

The screenshot shows the Power BI Desktop interface with the 'Order' table selected. In the 'Table tools' ribbon, the 'New column' button is highlighted. The formula bar at the top shows the expression: `1 Sales = [Order][OrderQuantity] * [Order][ProductPrice]`. The Fields pane on the right lists various columns and measures, with 'Sales' being the newly created column.

OrderID	StockID	OrderDate	CustomerID	TerritoryID	OrderLineItem	OrderQuantity	ProductPrice	Sales
Monday, January 2, 2017	Monday, September 15, 2003	S051371	606	27515	9	1	\$39.99	\$359.99
Tuesday, January 3, 2017	Friday, November 14, 2003	S051427	606	27512	9	1	\$39.99	\$359.99
Tuesday, January 3, 2017	Sunday, October 2, 2003	S051426	606	27500	9	1	\$39.99	\$359.99
Friday, January 6, 2017	Monday, December 17, 2003	S051737	606	27513	9	1	\$39.99	\$359.99
Sunday, January 8, 2017	Wednesday, November 19, 2003	S051731	605	23324	9	1	\$39.99	\$359.99
Monday, January 9, 2017	Tuesday, September 18, 2003	S051782	605	28352	9	1	\$39.99	\$359.99
Wednesday, January 11, 2017	Wednesday, December 24, 2003	S051909	599	12248	9	1	\$39.99	\$359.99
Wednesday, January 11, 2017	Saturday, October 11, 2003	S051921	605	23320	9	1	\$39.99	\$359.99
Thursday, January 12, 2017	Monday, September 15, 2003	S051971	584	27501	9	1	\$39.99	\$359.99
Friday, January 13, 2017	Friday, December 5, 2003	S052021	604	23100	9	1	\$39.99	\$359.99
Saturday, January 14, 2017	Friday, December 5, 2003	S052084	604	22582	9	1	\$39.99	\$359.99
Saturday, January 14, 2017	Tuesday, November 28, 2003	S052107	606	22583	8	1	\$39.99	\$359.99
Sunday, January 15, 2017	Friday, December 28, 2003	S052157	584	22998	9	1	\$39.99	\$359.99
Monday, January 16, 2017	Tuesday, October 14, 2003	S052232	604	23321	9	1	\$39.99	\$359.99
Tuesday, January 17, 2017	Sunday, November 23, 2003	S052284	605	22988	9	1	\$39.99	\$359.99
Wednesday, January 18, 2017	Sunday, November 9, 2003	S052344	606	23314	9	1	\$39.99	\$359.99
Wednesday, January 18, 2017	Monday, October 27, 2003	S052346	604	29068	9	1	\$39.99	\$359.99
Wednesday, January 18, 2017	Thursday, October 9, 2003	S052345	584	28534	9	1	\$39.99	\$359.99
Thursday, January 19, 2017	Tuesday, November 4, 2003	S052394	605	23101	9	1	\$39.99	\$359.99
Thursday, January 19, 2017	Tuesday, November 4, 2003	S052395	584	23125	9	1	\$39.99	\$359.99
Friday, January 20, 2017	Saturday, December 6, 2003	S052470	584	28393	9	1	\$39.99	\$359.99
Friday, January 20, 2017	Wednesday, September 24, 2003	S052458	598	12251	9	1	\$39.99	\$359.99
Monday, January 23, 2017	Thursday, October 9, 2003	S052627	584	27514	9	1	\$39.99	\$359.99
Tuesday, January 24, 2017	Thursday, December 4, 2003	S052659	584	23325	9	1	\$39.99	\$359.99
Thursday, January 26, 2017	Saturday, October 11, 2003	S052819	584	27511	9	1	\$39.99	\$359.99
Thursday, January 26, 2017	Friday, October 31, 2003	S052807	598	12252	9	1	\$39.99	\$359.99
Friday, January 27, 2017	Sunday, October 5, 2003	S052863	596	16161	9	1	\$39.99	\$359.99

Figure 28: Create Sales Column

Create the Totalsale Measure using `TotalSale = sum('Order'[Sales])`

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure, 'TotalSale', is being defined with the formula `sum('Order'[Sales])`. The 'Format' dropdown is set to 'Currency'. The 'Data category' is 'Uncategorized'. The 'Fields' pane on the right lists various fields from the Order table, including OrderDate, StockDate, OrderNumber, ProductID, CustomerID, TerritoryID, OrderLineItem, OrderQuantity, ProductPrice, and Sales.

Figure 29: Total Sales

Create the TotalQuantity Measure using `TotalQuantity = sum('Order'[OrderQuantity])`

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure, 'TotalQuantity', is being defined with the formula `sum('Order'[OrderQuantity])`. The 'Format' dropdown is set to 'Whole number'. The 'Data category' is 'Uncategorized'. The 'Fields' pane on the right lists various fields from the Order table, including OrderDate, StockDate, OrderNumber, ProductID, CustomerID, TerritoryID, OrderLineItem, OrderQuantity, ProductPrice, and Sales.

Figure 30: Total Quantity

Create the TotalCustomer Measure Total Customers = COUNTA(Customer[CustomerID])

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure, 'Total Customers', is being created. The formula is set to COUNTA(Customer[CustomerID]). The measure is categorized under 'Uncategorized'. The Fields pane on the right shows various columns from the 'Customer' table, with 'Total Customers' highlighted.

CustomerID	Customer's Name	BirthDate	MaritalStatus	Gender	EmailAddress	AnnualIncome	EducationLevel	Age
27148	Edwin Zhu	Tuesday, December 21, 1965	Single	Male	edwin15@adventure-works.com	70000	Bachelors	56
29188	Colin Kumar	Thursday, September 19, 1968	Single	Male	colin31@adventure-works.com	70000	Bachelors	53
27343	Dale Natt	Thursday, April 10, 1975	Single	Male	dale16@adventure-works.com	70000	Bachelors	46
13618	Jay Raman	Sunday, November 14, 1976	Single	Male	jay19@adventure-works.com	70000	Bachelors	45
25975	Miguel Edwards	Saturday, February 2, 1963	Single	Male	migue14@adventure-works.com	70000	Bachelors	58
14400	Brandon Brown	Friday, October 22, 1948	Single	Male	brandon42@adventure-works.com	70000	Bachelors	73
23432	Jordan Roberts	Thursday, October 10, 1962	Single	Male	jordan50@adventure-works.com	70000	Bachelors	53
13201	Nicholas Davis	Wednesday, August 23, 1944	Single	Male	nicholas7@adventure-works.com	70000	Bachelors	77
23538	Carlos Evans	Wednesday, July 27, 1963	Single	Male	carlos12@adventure-works.com	70000	Bachelors	58
20256	Javier Serrano	Monday, May 4, 1964	Single	Male	javier11@adventure-works.com	70000	Bachelors	57
20600	Dennis Hu	Tuesday, January 28, 1975	Single	Male	dennis22@adventure-works.com	70000	Bachelors	46
18298	Geoffrey Mallhortz	Wednesday, October 10, 1962	Single	Male	geoffrey5@adventure-works.com	70000	Bachelors	59
17235	Joshua Jackson	Sunday, October 13, 1974	Single	Male	joshua13@adventure-works.com	70000	Bachelors	47
20702	Oscar Ross	Sunday, September 8, 1963	Single	Male	oscar12@adventure-works.com	70000	Bachelors	58
25226	Robert Kumar	Tuesday, November 9, 1965	Single	Male	robert40@adventure-works.com	70000	Bachelors	56
23214	Roger Chander	Monday, February 4, 1963	Single	Male	roger43@adventure-works.com	70000	Bachelors	58
25976	Hunter Coleman	Wednesday, April 17, 1968	Single	Male	hunter19@adventure-works.com	70000	Bachelors	53
22298	Marcus Williams	Saturday, April 20, 1968	Single	Male	marcus2@adventure-works.com	70000	Bachelors	53
12067	Aaron Bryant	Tuesday, November 14, 1944	Single	Male	aaron17@adventure-works.com	70000	Bachelors	77
13620	Damien Ye	Sunday, February 1, 1976	Single	Male	damien7@adventure-works.com	70000	Bachelors	45
15123	Sergio Lopez	Friday, September 26, 1975	Single	Male	sergio17@adventure-works.com	70000	Bachelors	46
11761	Edgar Mehta	Wednesday, April 19, 1967	Single	Male	edgar13@adventure-works.com	70000	Bachelors	54
25228	Brad Ash	Wednesday, October 14, 1964	Single	Male	brad23@adventure-works.com	70000	Bachelors	57
18970	Pedro Rana	Wednesday, April 17, 1968	Single	Male	pedro11@adventure-works.com	70000	Bachelors	53
18292	Louis Tang	Sunday, August 9, 1964	Single	Male	louis21@adventure-works.com	70000	Bachelors	57
12339	Clayton Jai	Thursday, July 8, 1976	Single	Male	clayton29@adventure-works.com	70000	Bachelors	45
23539	Darren Munoz	Friday, January 4, 1963	Single	Male	darren29@adventure-works.com	70000	Bachelors	59

Table: Customer (10,502 rows) Column: Total Customers (0 distinct values)

Figure 31: Total Customer

Create the Number of Products Measure using Number of Products

DISTINCTCOUNT('Product'[ProductName])

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure, 'Number of Products', is being created. The formula is set to DISTINCTCOUNT(Product[ProductName]). The measure is categorized under 'Uncategorized'. The Fields pane on the right shows various columns from the 'Product' table, with 'Number of Products' highlighted.

ProductID	ProductSubcategoryKey	ProductName	ModelName	ProductDescription	ProductColor	ProductCost	ProductPrice	SubcategoryName	ProductCategoryK
529	37	Road Tire Tube	Road Tire Tube	Conventional all-purpose tube.	Others	\$1.49	\$3.99	Tires and Tubes	
214	31	Sport-100 Helmet, Red	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.	Red	\$13.09	\$34.99	Helmets	
540	37	HL Road Tire	HL Road Tire	Lightweight carbon reinforced; for an univaled ride at an	Others	\$12.19	\$32.60	Tires and Tubes	
377	2	Road-250 Black, 52	Road-250	Aluminum-alloy frame provides a light, stiff ride; whether	Black	\$1,320.68	\$2,181.56	Road Bikes	
215	31	Sport-100 Helmet, Black	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.	Black	\$12.03	\$33.64	Helmets	
229	21	Long-Sleeve Logo Jersey, M	Long-Sleeve Logo Jersey	Unise long-sleeve AWC logo microfiber cycling jersey	Multi	\$31.72	\$48.07	Jerseys	
528	37	Mountain Tire Tube	Mountain Tire Tube	Self-sealing tube.	Others	\$1.87	\$4.99	Tires and Tubes	
536	37	ML Mountain Tire	ML Mountain Tire	Great traction, high-density rubber.	Others	\$11.22	\$29.99	Tires and Tubes	
530	37	Touring Tire Tube	Touring Tire Tube	General purpose tube.	Others	\$1.87	\$4.99	Tires and Tubes	
223	19	AWC Logo Cap	Cycling Cap	Traditional style with a flip-up brim; one-size fits all.	Multi	\$5.71	\$8.64	Caps	
538	37	LL Road Tire	LL Road Tire	Same great tread as more expensive tire with a less exp	Others	\$8.04	\$21.49	Tires and Tubes	
584	2	Road-750 Black, 58	Road-750	Entry level adult bike; offers a comfortable ride cross-cou	Black	\$343.65	\$539.99	Road Bikes	
485	30	Fender Set - Mountain	Fender Set - Mountain	Clip-on fenders fit most mountain bikes.	Others	\$8.22	\$21.98	Fenders	
477	28	Water Bottle - 30 oz.	Water Bottle	AWC logo water bottle - holds 30 oz; leak-proof.	Others	\$1.87	\$4.99	Bottles and Cages	
479	28	Road Bottle Cage	Road Bottle Cage	Aluminum cage is lighter than our mountain version; perf	Others	\$3.36	\$8.99	Bottles and Cages	
488	21	Short-Sleeve Classic Jersey, S	Short-Sleeve Classic Jersey	Short sleeve classic breathable jersey with superior moist	Yellow	\$41.57	\$53.99	Jerseys	
580	2	Road-350-W Yellow, 40	Road-350-W	Cross-train, race, or just socialize on a sleek, aerodynamic	Yellow	\$1,082.51	\$1,700.99	Road Bikes	
583	2	Road-350-W Yellow, 48	Road-350-W	Cross-train, race, or just socialize on a sleek, aerodynamic	Yellow	\$1,082.51	\$1,700.99	Road Bikes	
220	31	Sport-100 Helmet, Blue	Sport-100	Universal fit, well-vented, lightweight , snap-on visor.	Blue	\$12.03	\$33.64	Helmets	
480	37	Patch Kit/BW Patches	Patch kit	Includes 8 different size patches, glue and sandpaper.	Others	\$0.86	\$2.29	Tires and Tubes	
484	29	Bike Wash - Dissolve	Bike Wash	Washes off the toughest road grime; dissolves grease, env	Others	\$2.97	\$7.95	Cleaners	
475	22	Women's Mountain Shorts, M	Women's Mountain Shorts	Heavy duty, abrasion-resistant shorts feature seamless, ly	Black	\$26.18	\$69.99	Shorts	
582	2	Road-350-W Yellow, 44	Road-350-W	Cross-train, race, or just socialize on a sleek, aerodynamic	Yellow	\$1,082.51	\$1,700.99	Road Bikes	
362	1	Mountain-200 Black, 46	Mountain-200	Serious back-country riding. Perfect for all levels of compre	Black	\$1,105.81	\$2,049.10	Mountain Bikes	
478	28	Mountain Bottle Cage	Mountain Bottle Cage	Tough aluminum cage holds bottle securely on tough terrain!	Others	\$3.74	\$9.99	Bottles and Cages	
354	1	Mountain-200 Silver, 42	Mountain-200	Serious back-country riding. Perfect for all levels of compre	Silver	\$1,117.86	\$2,071.42	Mountain Bikes	
483	26	Hitch Rack - 4-Ripe	Hitch Rack - 4-Ripe	Carries 4 bikes securely; steel construction, fits 2" receiver.	Others	\$44.88	\$120.00	Ride Racks	

Table: Product (102 rows) Column: Number of Products (0 distinct values)

Figure 32: Number of Products

Create number of location Count of Location = COUNTROWS(Location)

The screenshot shows the Power BI Desktop interface with the 'Measure tools' tab selected. A new measure named 'Count of Location' is being created, based on the 'Location' table. The measure is defined as COUNTROWS(Location). The Fields pane on the right lists various tables and columns, with 'Count of Location' highlighted under the 'Location' table.

TerritoryID	Region	Country	Continent
1	Northwest	United States	North America
4	Southwest	United States	North America
6	Canada	Canada	North America
10	United Kingdom	United Kingdom	Europe
8	Germany	Germany	Europe
9	Australia	Australia	Pacific
7	France	France	Europe
5	Southeast	United States	North America
3	Central	United States	North America
2	Northeast	United States	North America

Figure 33: Count of Location

Creating Age range range Using

Age Group = SWITCH(

```
TRUE(),  
Customer[Age]<=30, "18 - 30",  
Customer[Age]<=40, "31 - 40",  
Customer[Age]<=50, "41 - 50",  
Customer[Age]<=60, "51 - 60",  
"Over 60" )
```

The screenshot shows the Power BI Desktop interface with the 'Column tools' tab selected. A new column named 'Age Group' is being created, with the formula:

```
1 Age Group = SWITCH(
2   TRUE(),
3   Customer[Age]<=10, "1B - 30",
4   Customer[Age]<=40, "31 - 40",
5   Customer[Age]<=50, "41 - 50",
6   Customer[Age]<=60, "51 - 60",
7   "Over 60"
8 )
```

The Fields pane on the right lists various fields including 'Age' and 'Age Group'. The main table view shows customer data with the newly created 'Age Group' column.

Figure 34: Age Range

Creating Salary range Income Range = SWITCH()

```
TRUE(),
Customer[AnnualIncome]<=20000, "1k - 20k",
Customer[AnnualIncome]<=50000, "20k - 50k",
Customer[AnnualIncome]<=100000, "50k - 100k",
Customer[AnnualIncome]<=150000, "100k - 150k",
"150k - 200k")
```

The screenshot shows the Power BI Desktop interface with the 'Column tools' tab selected. A new column named 'Income Range' is being created, with the formula:

```
1 Income Range = SWITCH(
2   TRUE(),
3   Customer[AnnualIncome]<=20000, "1k - 20k",
4   Customer[AnnualIncome]<=50000, "20k - 50k",
5   Customer[AnnualIncome]<=100000, "50k - 100k",
6   Customer[AnnualIncome]<=150000, "100k - 150k",
7   Customer[AnnualIncome]<=150000, "150k - 200k"
8 )
```

The Fields pane on the right lists various fields including 'Income Range'. The main table view shows customer data with the newly created 'Income Range' column.

Figure 35: Salary Range



Inspiring success

**BUSINESS INTELLIGENCE SOLUTION FOR SALES DATA
SCHOOL OF COMPUTING, ENGINEERING AND DIGITAL
TECHNOLOGIES
APPLIED DATA SCIENCE**

Chukwuemeka Kenneth Akuneziri

B1236648

Section 2 Report

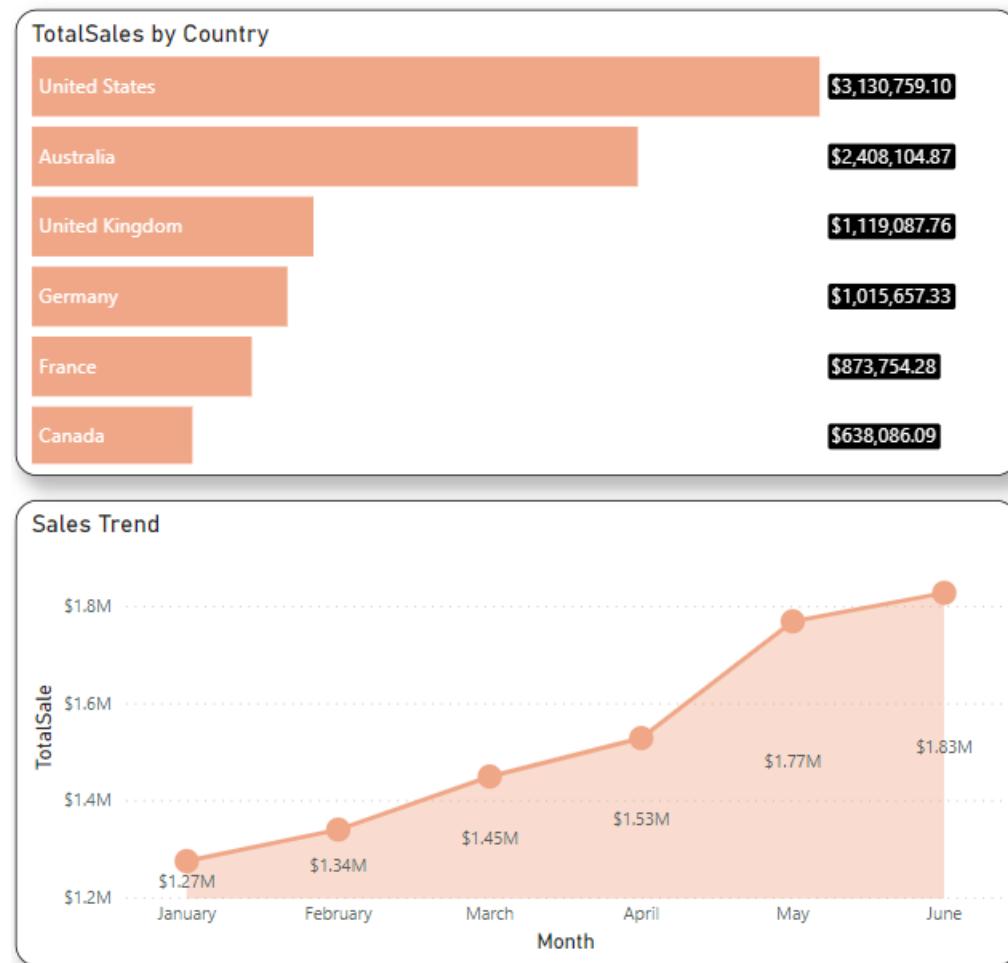
January 19, 2022

ICA Section 2 – Business Intelligence Solution

Executive Summary

The purpose of this report is to analyze the "SalesData" dataset in order to uncover insights that will assist the company or organization in improving their planning, productivity, and decision-making processes and procedures. Before proceeding with the analysis, the "SalesData" dataset, which contains Sales, Product, and Customer information such as marital status, income, gender, and education, was cleansed, divided into table groups, and relationships between tables were established in order to construct a model. Afterwards, the model was tested. The following are some of the most significant findings.

- Franklin Xu bought that's worth more combined compared to other customers
- Marco Lopez bought more products in terms of quantity compared to other customers
- Customers with income between 50k and 100k bought more Bikes compared to other customers with different income range
- More sales were made in June compared to other Months
- More sales were made in the United states compared to other countries



Recommendations

- Partnership could be made with sport organization in countries with low bike sales to promote a cycling competition.
- Partnership could be made with health organization in countries with low bike sales encourage more people to cycle as a form of exercise.
- More social media campaigns to increase sales across board

Introduction

The value of data to your sales team cannot be overstated. In addition to helping with decision-making, it can also improve future performance and help you better understand your customers. In other words, accurate sales insights can only be generated by a high-quality data set. Customers' information, such as marital status, income, gender, education, and the products they purchased in large and small quantities, was included in the SalesData dataset, which was then analyzed and used to bring about insights in order to answer the questions below.

- Which Location bought more product
- Which product sold more
- Which Age group bought more
- Product Category that sold more by Salary range
- Which product has the highest quantity sold
- Total number of Customers and Orders made

Finding based on analysis and evaluation

Following the normalization of the flat file, as discussed in the previous section, several dimension tables and a fact table were created. The data model and relationships between tables are created using the Power BI tool.

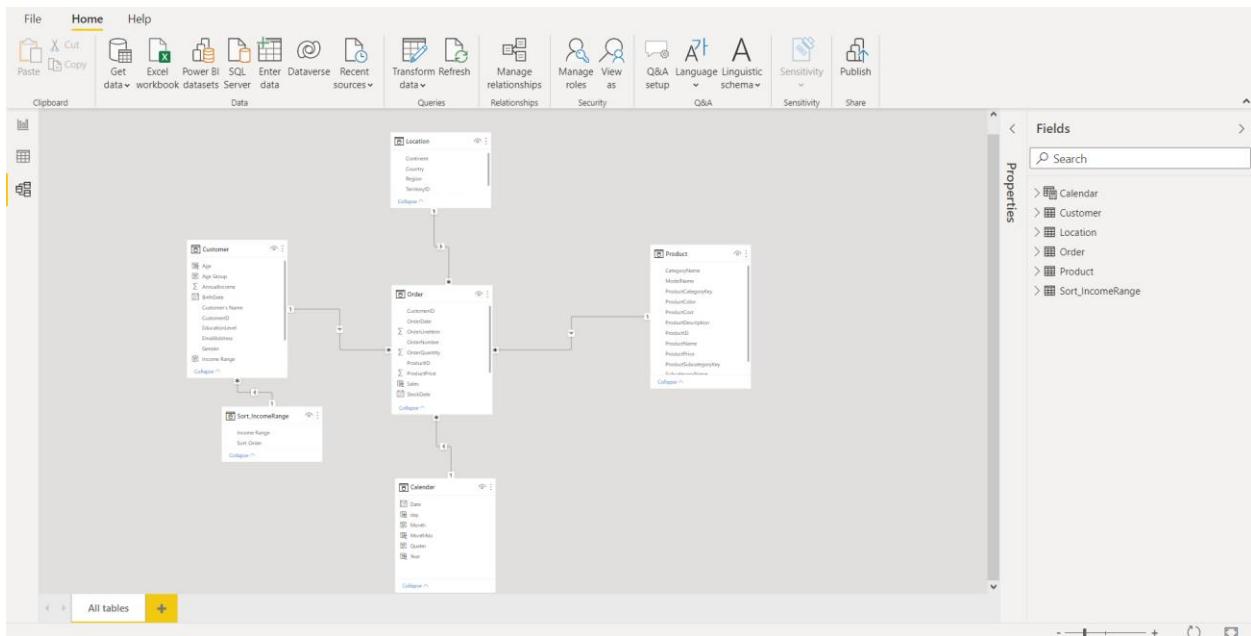


Figure 36: Star Schema Model

Power BI visuals with the description

Top 5 Customer By sales

This graphic (Figure 37) illustrates the most frequent purchasers of an item by sales. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Customer's name column and the Total sales calculated measures were used and filtered using the top 5 filter type. Franklin Xu was ranked first in the Top 5 category, while Marco Lopez was ranked fifth.

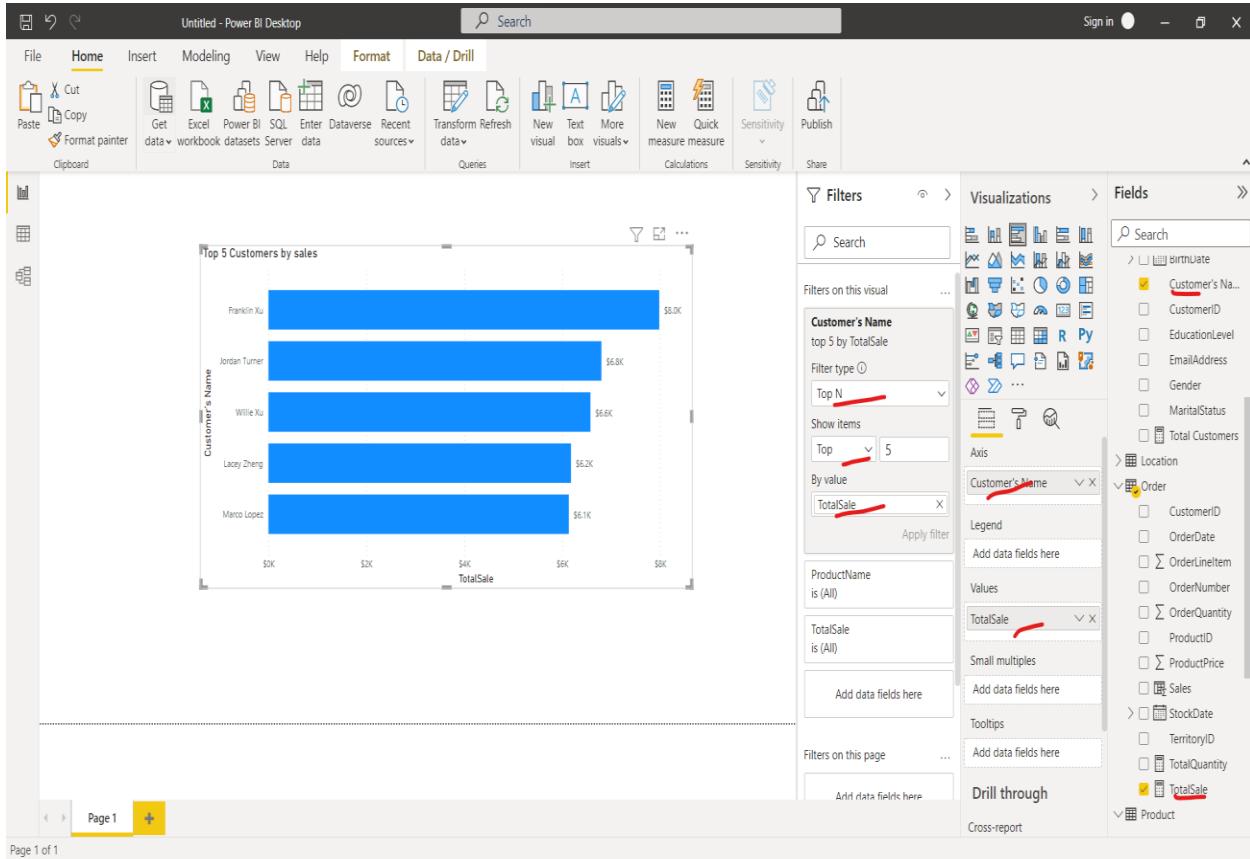


Figure 37: Top 5 Customer By sales

Top 5 Customer by Quantity

This graphic (Figure 38) illustrates the most frequent purchasers of an item by quantity. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Customer's name column and the Total Quantity calculated measures were used and filtered using the top 5 filter type. Marco Lopez was ranked first in the Top 5 category, while Willie Xu was ranked fifth.

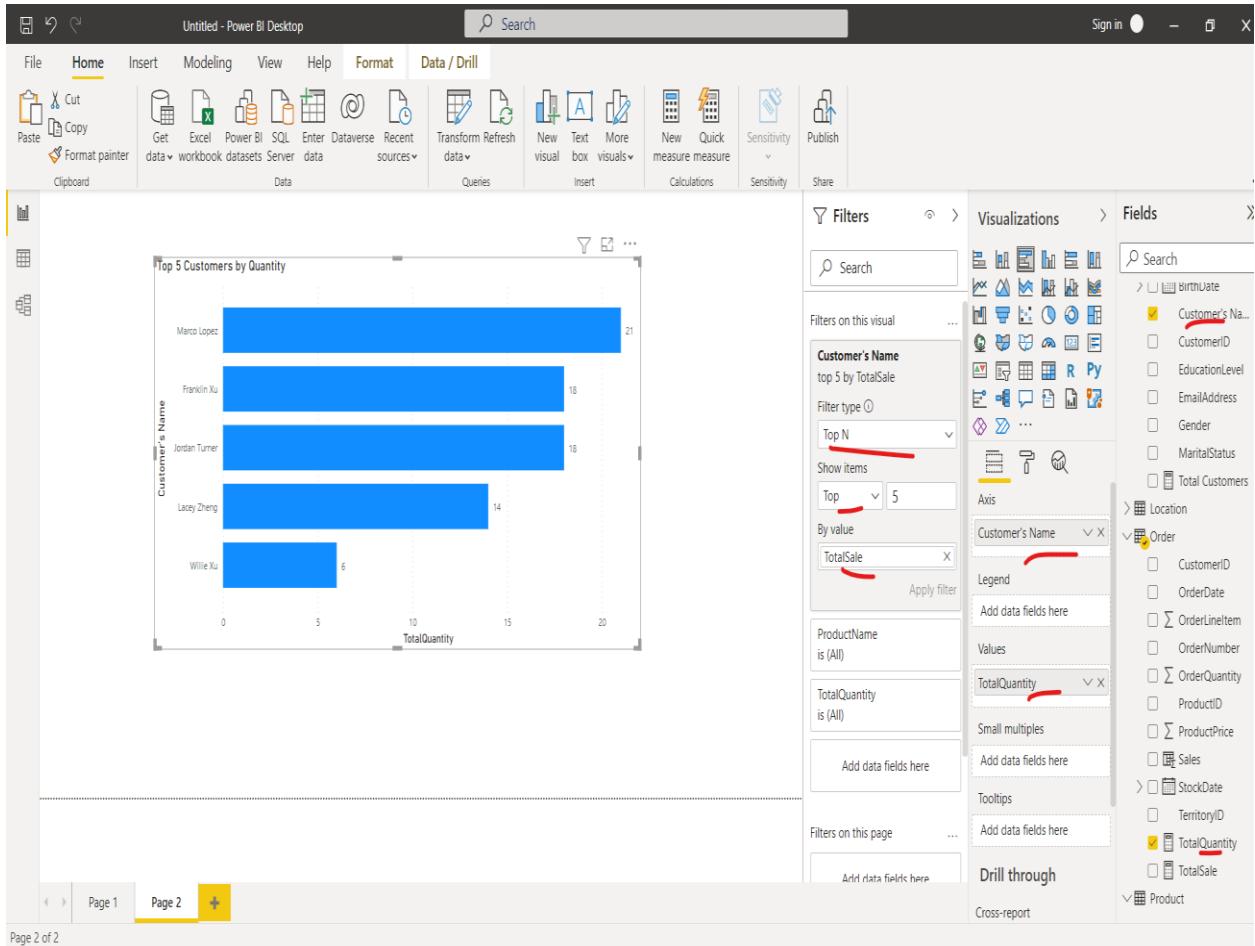


Figure 38: Top 5 Customer by Quantity

Quantity Sold Trend

This graphic (Figure 39) shows us which Month has the highest quantity sold. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Month column and the Total Quantity calculated measures were used. Highest quantity of product was sold in June while the Lowest was in February.

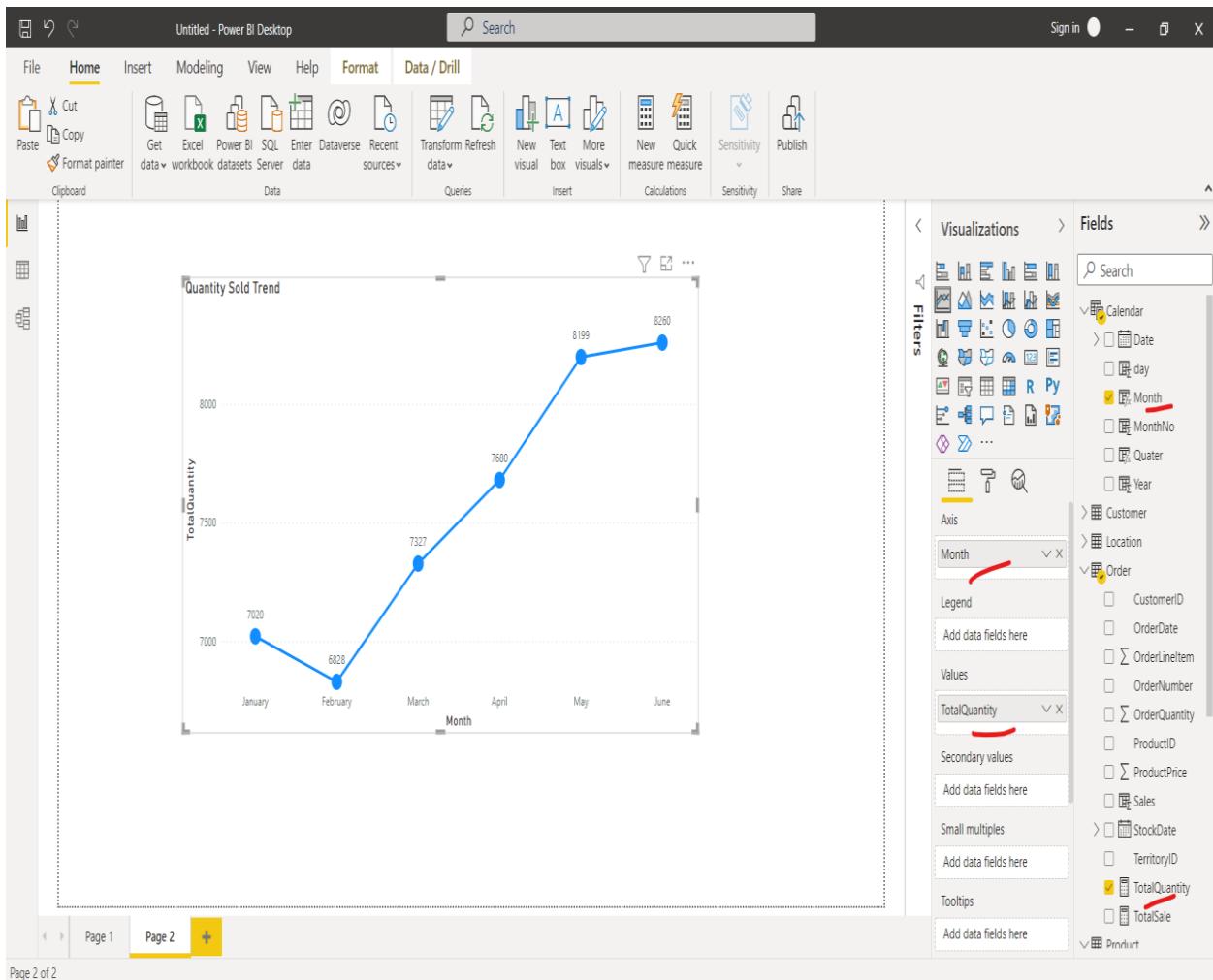


Figure 39: Quantity Sold Trend

Sales Trend

This graphic (Figure 40) shows us which Month has the highest sales. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Month column and the Total Sales calculated measures were used. Highest quantity of product was sold in June while the Lowest was in January.

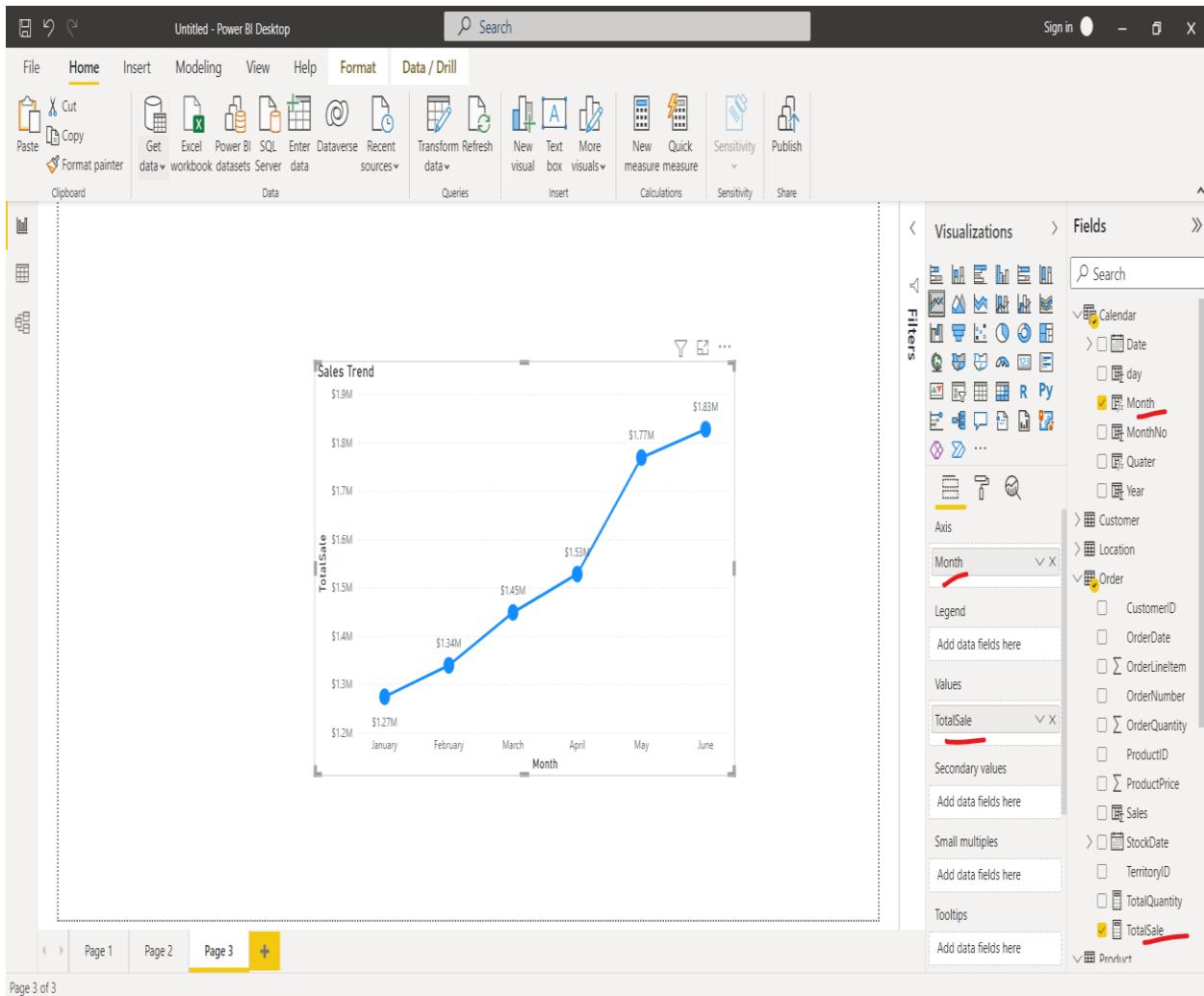


Figure 40: Sales Trend

Sales by Country

This graphic (Figure 41) illustrates the Countries that sold the highest. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Country column and the Total Sales calculated measures were used. United States made the highest with \$3.13 Million while Canada made the Lowest with \$640 Thousand.

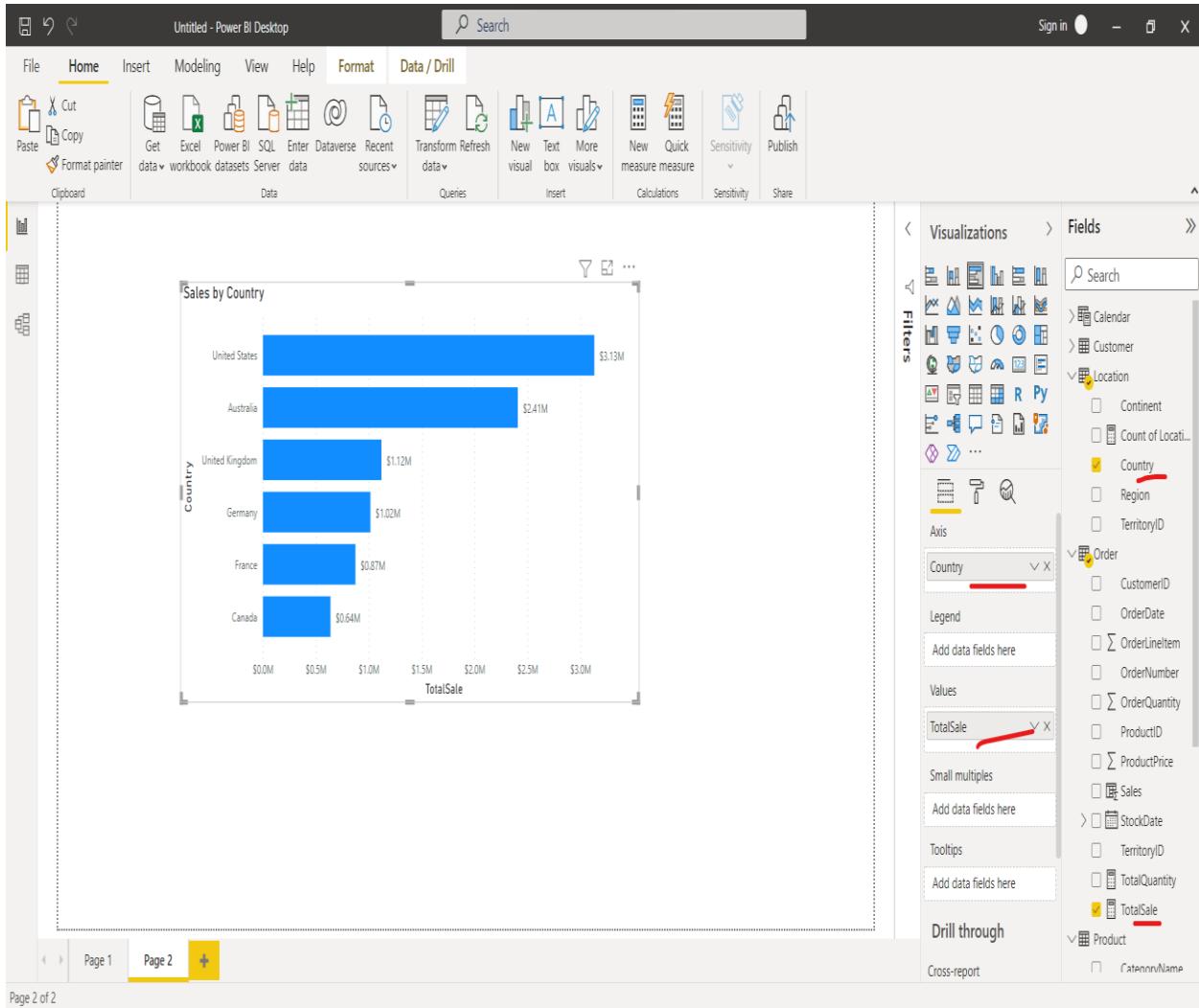


Figure 41: Sales by Country

Quantity by country

This graphic (Figure 42) illustrates the Countries that sold the highest in terms of quantity. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Country column and the Total Quantity calculated measures were used. United States bought the highest with 16,000 products while France bought the Lowest with 4,000 products

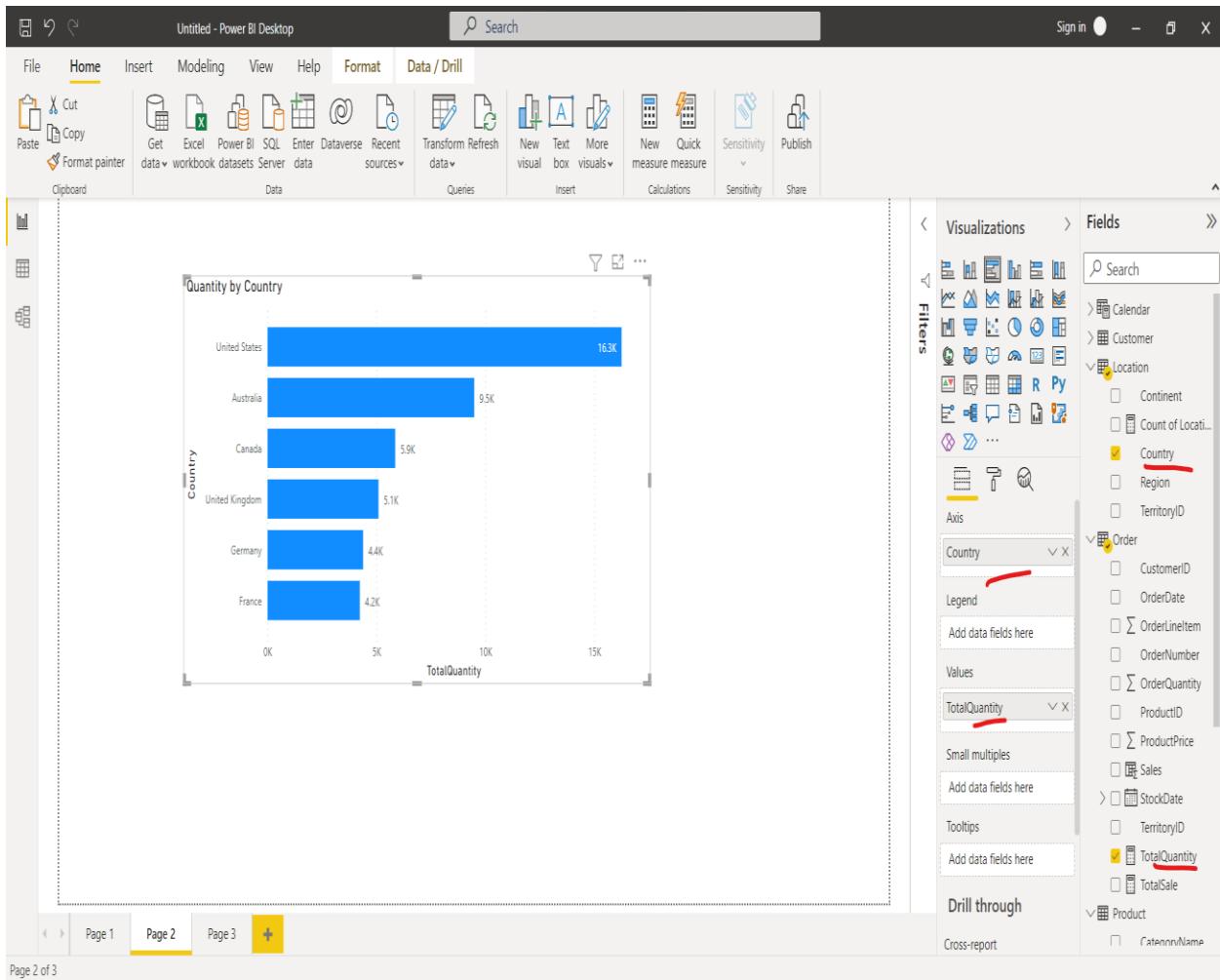


Figure 42: Quantity by country

Top 5 Product by sales

This graphic (Figure 43) illustrates the Product that sold the highest. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Product name column and the Total Sale calculated measures were used and filtered using the top 5 filter type. Mountain 200 Black 38 was ranked first in the Top 5 category with a sales of \$500,000, while Mountain 200 Black 42 with sales of \$470,000 was ranked 5th.

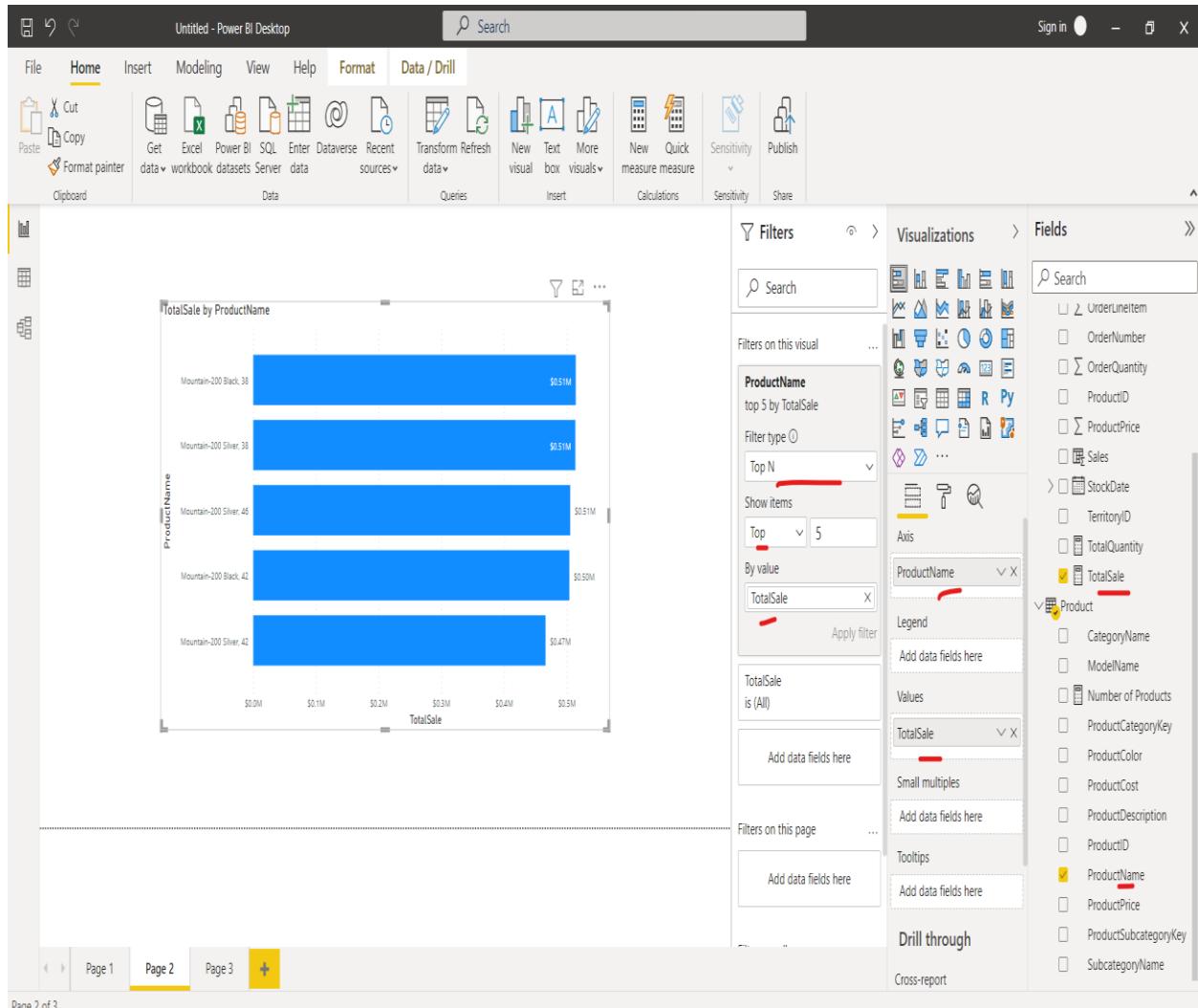


Figure 43: Top 5 Product by sales

Top 5 product by quantity

This graphic (Figure 44) illustrates the Product that sold the highest in terms of quantity. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Product name column and the Total Quantity calculated measures were used and filtered using the top 5 filter type. Water Bottle 30 oz was ranked first in the Top 5 category for selling almost 5,000 products, while Road Tire Tube was ranked 5th for selling about 2,500 products.

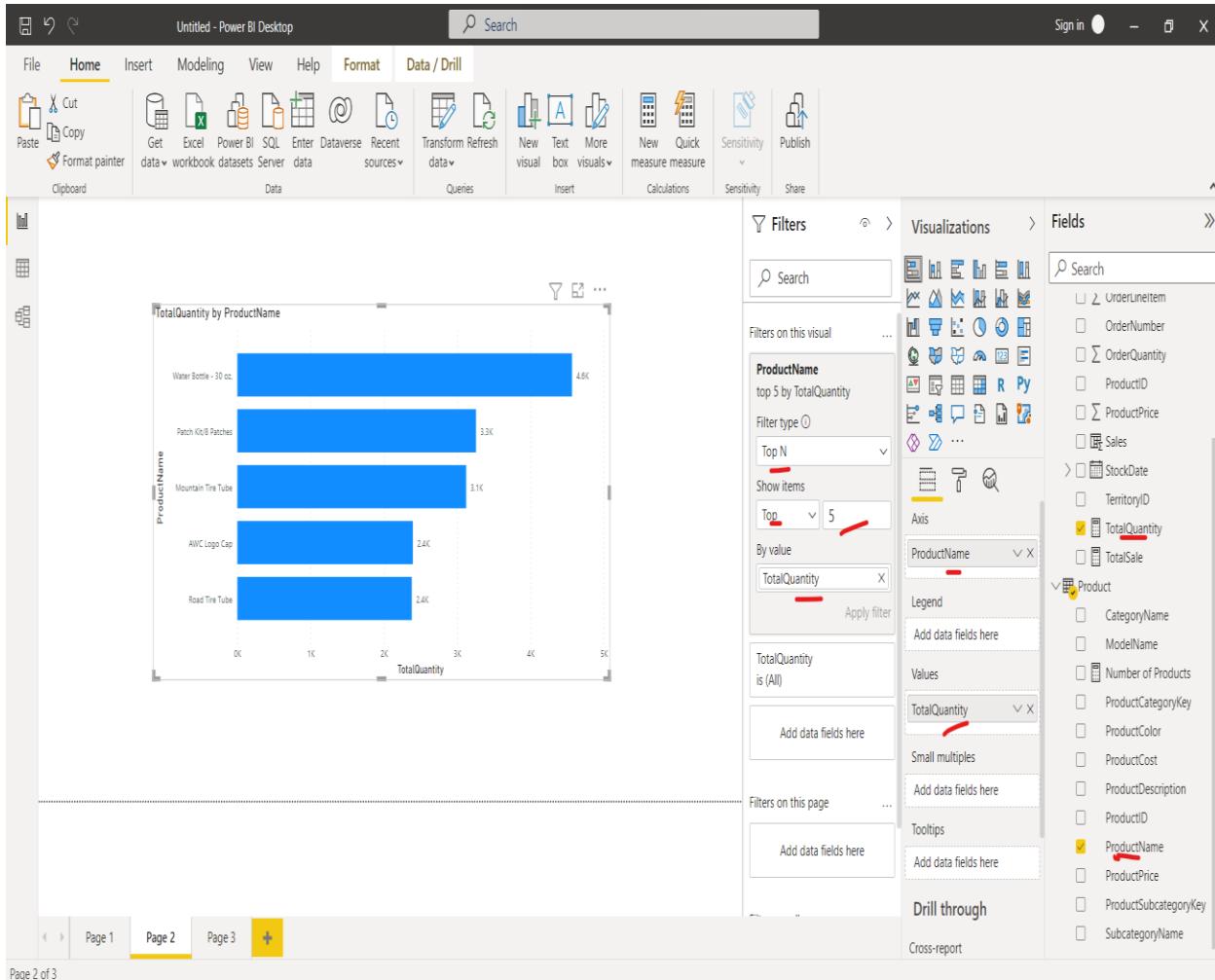


Figure 44: Top 5 product by quantity

Total Sales by Gender and Category Name

This graphic (Figure 45) illustrates the total sales made in each category and grouped by Gender. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Gender, Category name column and the Total Sales calculated measures were used. The sales ratio between male and female for Bike sales are equal while they slightly vary for Accessories and clothings.

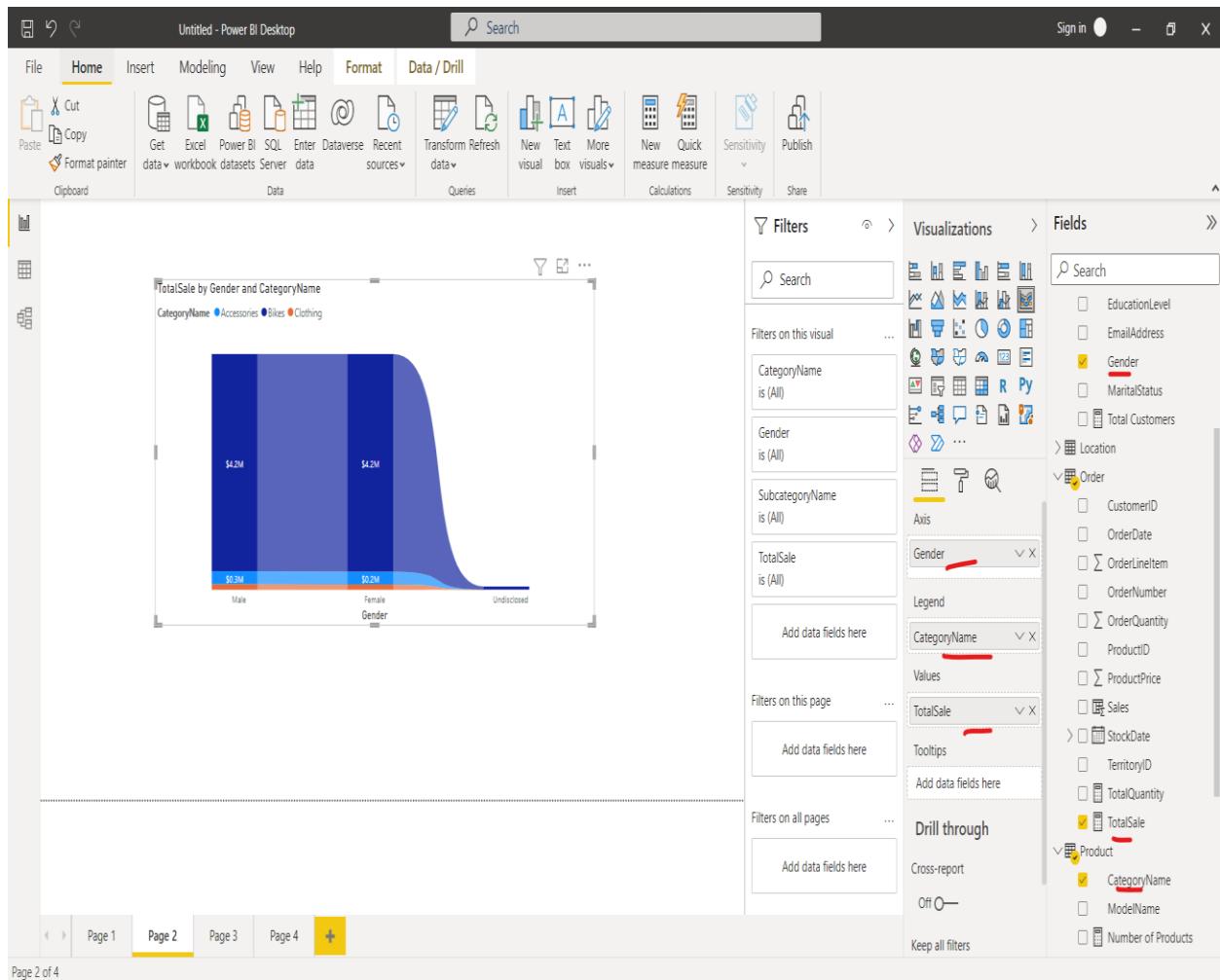


Figure 45: Total Sales by Gender and Category Name

Total sales by Age group and Category

This graphic (Figure 46) illustrates the total sales made in each category and grouped by Age group. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Age Group, Category name column and the Total Sales calculated measures were used. The sales ratio between male and female for Accessories sales are equal while they slightly vary for Bikes and clothings.

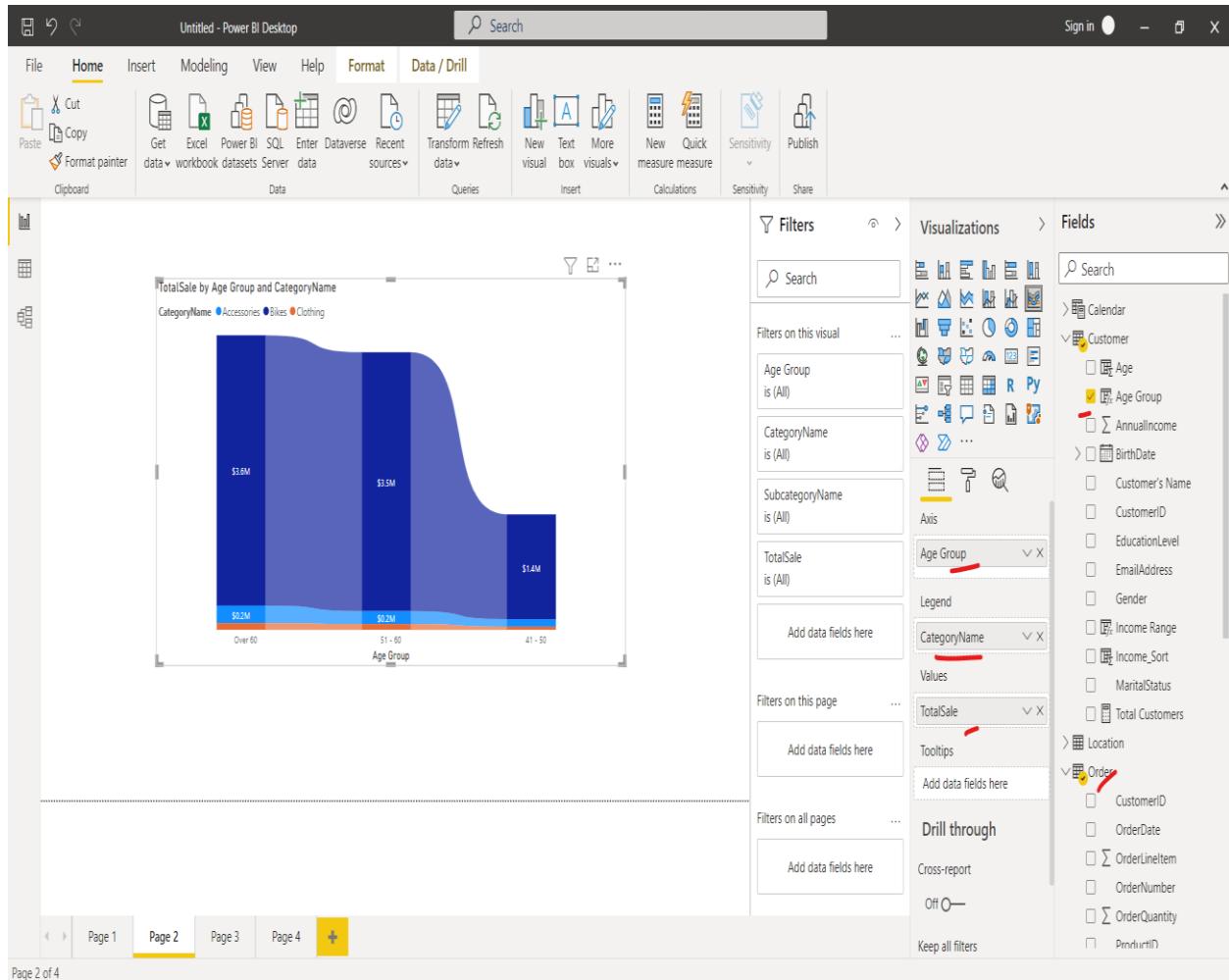


Figure 46: Total sales by Age group and Category

Total sales by Educational level and category

This graphic (Figure 47) illustrates the total sales made in each category and grouped by Education Level. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Education Level, Category name column and the Total Sales calculated measures were used. People with Bachelor's Degree bought more Bikes and Accessories compared to other educational level.

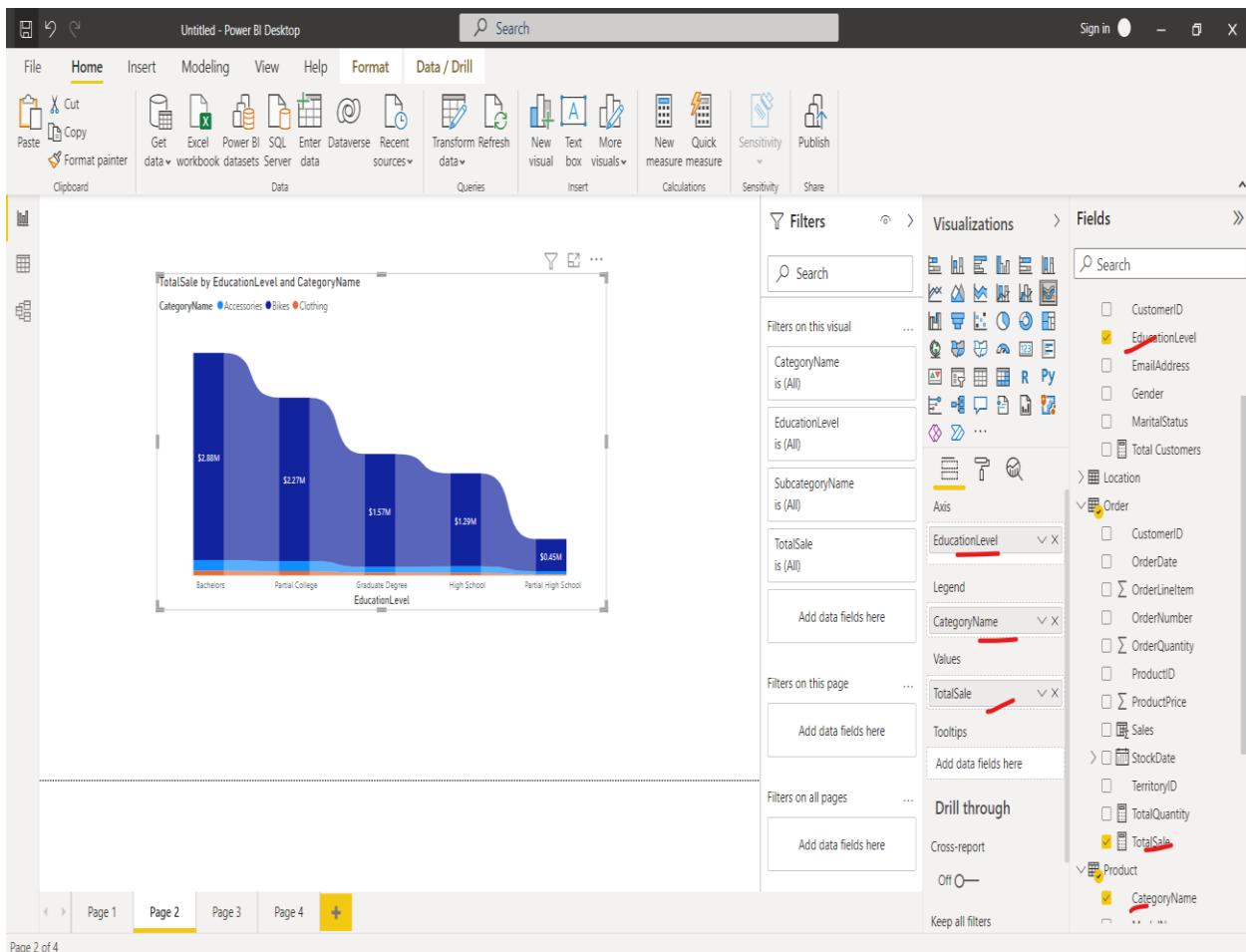


Figure 47: Total sales by educational level and category

Total sale by income range and category (but not sorted)

This graphic (Figure 48) illustrates the total sales made in each category and grouped by Income Range. Understanding how the metrics were used to create this visualization is quite straightforward. In this scenario, the Income Range, Category name column and the Total Sales calculated measures were used. People earning between 50k to 100k bought more Bikes and Accessories compared to other people with a different income range.

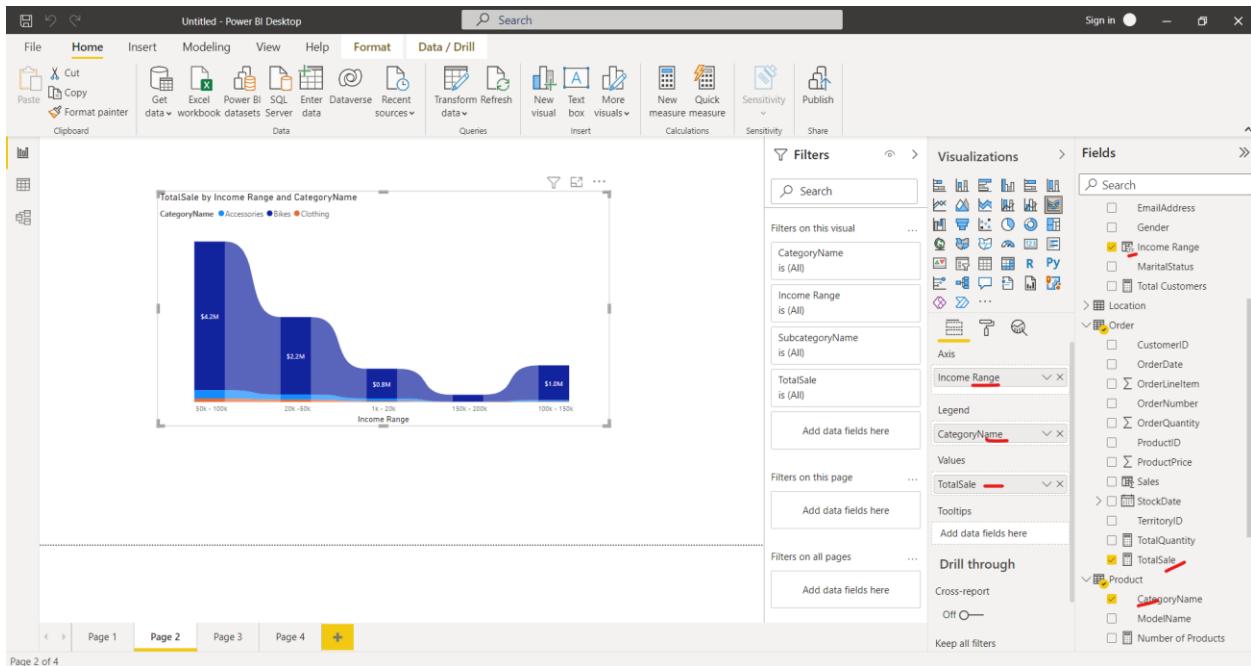


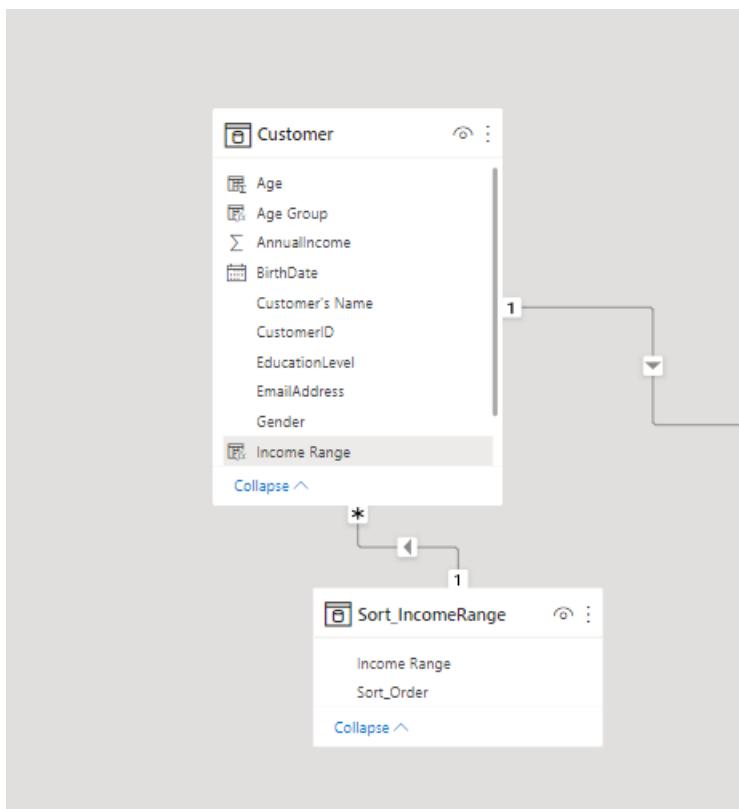
Figure 48: Total sale by income range and category

Screenshot of Power BI Desktop showing the 'Create Table' dialog box. The table being created is named 'Sort_IncomeRange' and contains two columns: 'Income Range' and 'Sort_Order'. The data is as follows:

	Income Range	Sort_Order
1	"1k - 20k"	1
2	"20k - 50k"	2
3	"50k - 100k"	3
4	"100k - 150k"	4
5	"150k - 200k"	5

The background shows a list of customer data with a selected row. The Power BI ribbon is visible at the top.

Sorting the income range



Create relationship in Model

Untitled - Power BI Desktop

File Home Help Table tools Column tools

Name: Income Sort Format: Whole number Summarization: Sum Data category: Uncategorized

Structure: Data type: Whole number \$ % 0.00 0

Formatting: Properties: Sort by column: Sort: Data groups: Groups: Manage relationships: Relationships: New column: Calculations

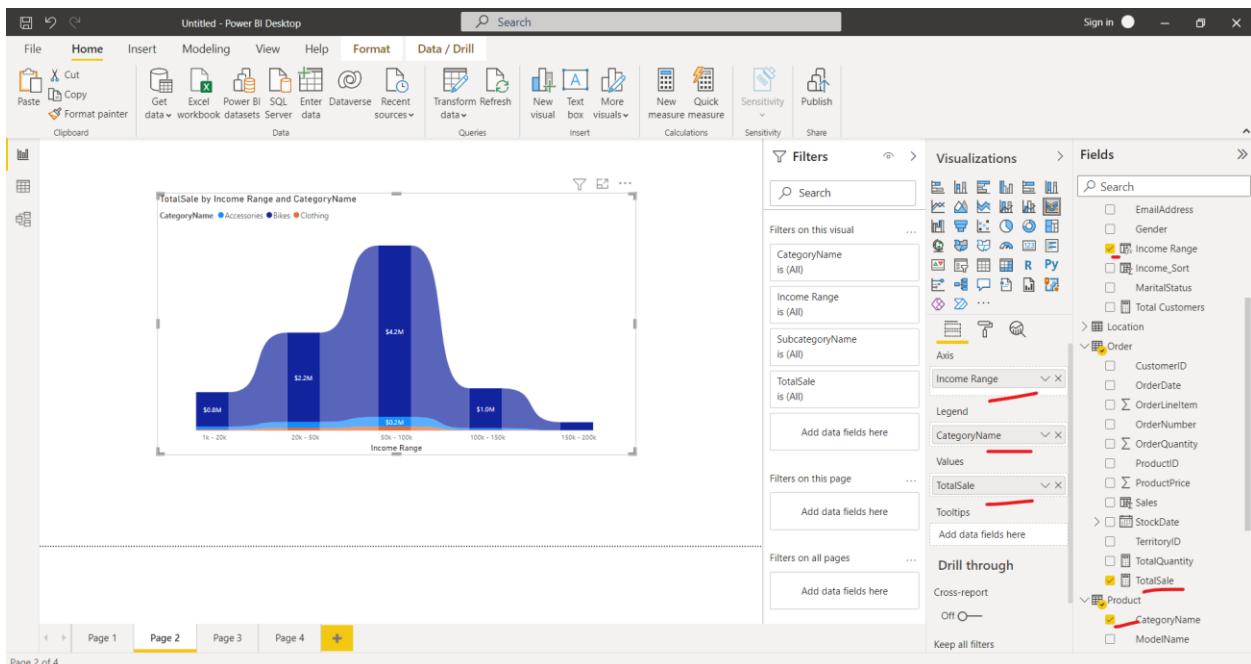
Fields

CustomerID Customer's Name BirthDate MaritalStatus Gender EmailAddress AnnualIncome EducationLevel Age Age Group Income Range Income Sort

27148 Edwin Zhu Tuesday, December 21, 1965 Single Male edwin15@adventure-works.com 70000 Bachelors 37 51 - 60 50k - 100k 3
 29188 Colin Kumar Thursday, September 19, 1968 Single Male colin31@adventure-works.com 70000 Bachelors 34 51 - 60 50k - 100k 3
 27343 Dale Natt Thursday, April 10, 1975 Single Male dale16@adventure-works.com 70000 Bachelors 47 41 - 50 50k - 100k 3
 13618 Jay Raman Sunday, November 14, 1976 Single Male jay19@adventure-works.com 70000 Bachelors 46 41 - 50 50k - 100k 3
 25979 Miguel Edwards Saturday, February 2, 1963 Single Male miguel44@adventure-works.com 70000 Bachelors 59 51 - 60 50k - 100k 3
 14400 Brandon Brown Friday, October 22, 1948 Single Male brandon42@adventure-works.com 70000 Bachelors 74 Over 60 50k - 100k 3
 23432 Jordan Roberts Thursday, October 10, 1968 Single Male jordan58@adventure-works.com 70000 Bachelors 54 51 - 60 50k - 100k 3
 13201 Nicholas Davis Wednesday, August 23, 1944 Single Male nicholas7@adventure-works.com 70000 Bachelors 78 Over 60 50k - 100k 3
 23538 Carlos Evans Wednesday, July 17, 1963 Single Male carlos28@adventure-works.com 70000 Bachelors 59 51 - 60 50k - 100k 3
 20256 Javier Serrano Monday, May 4, 1964 Single Male javier11@adventure-works.com 70000 Bachelors 58 51 - 60 50k - 100k 3
 20600 Dennis Hu Tuesday, January 28, 1975 Single Male deniss22@adventure-works.com 70000 Bachelors 47 41 - 50 50k - 100k 3
 18298 Geoffrey Mallhotra Wednesday, October 10, 1962 Single Male geoffrey5@adventure-works.com 70000 Bachelors 60 51 - 60 50k - 100k 3
 17235 Joshua Jackson Sunday, October 13, 1974 Single Male joshua13@adventure-works.com 70000 Bachelors 48 41 - 50 50k - 100k 3
 20702 Oscar Ross Sunday, September 8, 1963 Single Male oscar12@adventure-works.com 70000 Bachelors 59 51 - 60 50k - 100k 3
 25226 Robert Kumar Tuesday, November 9, 1965 Single Male robert40@adventure-works.com 70000 Bachelors 57 51 - 60 50k - 100k 3
 25214 Roger Chander Monday, February 4, 1963 Single Male roger43@adventure-works.com 70000 Bachelors 59 51 - 60 50k - 100k 3
 25976 Hunter Coleman Wednesday, April 17, 1968 Single Male hunter2@adventure-works.com 70000 Bachelors 54 51 - 60 50k - 100k 3
 22298 Marcus Williams Saturday, April 20, 1968 Single Male marcus2@adventure-works.com 70000 Bachelors 54 51 - 60 50k - 100k 3
 12067 Aaron Bryant Tuesday, November 14, 1944 Single Male aaron17@adventure-works.com 70000 Bachelors 78 Over 60 50k - 100k 3
 13620 Damien Ye Sunday, February 1, 1976 Single Male damien7@adventure-works.com 70000 Bachelors 46 41 - 50 50k - 100k 3
 15123 Sergio Lopez Friday, September 26, 1975 Single Male sergio17@adventure-works.com 70000 Bachelors 47 41 - 50 50k - 100k 3
 11761 Edgar Mehta Wednesday, April 29, 1967 Single Male edgar15@adventure-works.com 70000 Bachelors 55 51 - 60 50k - 100k 3
 25228 Brad Ashe Wednesday, October 14, 1964 Single Male brad23@adventure-works.com 70000 Bachelors 58 51 - 60 50k - 100k 3
 13970 Pedro Rana Wednesday, April 17, 1968 Single Male pedro11@adventure-works.com 70000 Bachelors 54 51 - 60 50k - 100k 3
 18292 Louis Tang Sunday, August 9, 1964 Single Male louis21@adventure-works.com 70000 Bachelors 58 51 - 60 50k - 100k 3
 12339 Clayton Jai Thursday, July 8, 1976 Single Male clayton29@adventure-works.com 70000 Bachelors 46 41 - 50 50k - 100k 3
 23539 Darren Munoz Friday, January 4, 1963 Single Male darren29@adventure-works.com 70000 Bachelors 59 51 - 60 50k - 100k 3

Tabel: Customer (11509 rows) (11 columns: Income_Sort (5 distinct values))

Add new Column and enter Income Sort = RELATED(Sort_IncomeRange[Sort_Order]) then sort incomeRange bu Income sort



Total sale by income range and category (sorted)

Power BI dashboards



Figure 49: Customer and Sales Trend Page



Figure 50: Location and Product page



Figure 51: Customer Criteria page

Key Findings

- Franklin Xu bought that's worth more combined compared to other customers
- Marco Lopez bought more products in terms of quantity compared to other customers
- Customers with income between 50k and 100k bought more Bikes compared to other customers with different income range
- More sales were made in June compared to other Months
- More sales were made in the United states compared to other countries

Conclusion and Recommendation

Now that we've implemented this solution, we're in a position to offer insights and generate insightful reports that aid us in taking action and making more informed decisions. Customers that have made the highest sales for a company should always be acknowledged, as this may increase sale by the customer using the word-of-mouth advertisement approach. Also, Partnership could be made with sport organization in countries with low bike sales to promote a cycling competition or with health organization in countries with low bike sales encourage more people to cycle as a form of exercise. More social media campaigns could also be planned and actioned in order to increase sales across board