

# **E-Commerce Customer Behaviour Analysis Project Report**

**Project Title:** E-Commerce Customer Behaviour Analysis

Dashboard

**Prepared By:** Hitesh Ananth.UC

**Role:** Data Analyst

**Tools & Technologies:** Python, Power BI, Pandas, NumPy

**Dataset:** E-Commerce Sales Dataset

**Time Period Covered:** 2015

## Abstract

- This project presents an in-depth analysis of customer behaviour in an e-commerce environment using transactional sales data. The objective is to understand how customers interact with the platform across regions, segments, shipping modes, and product categories.
- Python was used for data cleaning, transformation, and feature engineering, while Power BI was used to create an interactive dashboard. The analysis provides insights into sales trends, profitability, delivery performance, customer contribution, and geographic distribution, enabling data-driven business decision-making.

## Introduction

- E-commerce businesses generate large volumes of transactional data through online customer interactions. While this data contains valuable insights about customer preferences, purchasing patterns, and operational efficiency, it often remains underutilized without structured analysis.
- Customer behaviour analysis plays a critical role in understanding buying trends, identifying profitable customer segments, evaluating delivery performance, and optimizing product offerings. By analyzing historical e-commerce data, businesses can improve customer experience, streamline logistics, and maximize profitability.
- This project focuses on analyzing e-commerce customer behaviour using Python for data preprocessing and Power BI for visualization, following a complete analytics workflow from raw data to actionable insights.

## Problem Statement

- The raw e-commerce dataset contained several challenges that made direct analysis difficult. Monetary fields such as sales, profit, and shipping cost were stored as text values with currency symbols and commas. Date fields were not standardized, and missing values were present across multiple categorical columns.
- Additionally, business stakeholders lacked an interactive reporting solution to explore customer behaviour across regions, segments, and time periods. Static reporting limited the ability to identify trends, high-value customers, and delivery performance issues.
- The problem addressed by this project was to clean and structure the raw e-commerce data and build an interactive dashboard that enables efficient exploration of customer behaviour and business performance.

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## **Project Objectives**

The primary objective of this project is to analyze customer behaviour in an e-commerce business using historical transaction data. The specific objectives include:

- Cleaning and transforming raw e-commerce data using Python
- Standardizing currency, numeric, and date fields
- Analyzing total sales, profit, and order volume
- Studying customer segments and purchasing behaviour
- Evaluating delivery performance across shipping modes
- Identifying high-value customers and profitable categories
- Visualizing geographic distribution of sales and profit
- Designing an interactive Power BI dashboard for business users

All objectives are strictly aligned with the implemented analysis and dashboard.

## Scope of the Project

- The scope of this project is limited to descriptive analysis of historical e-commerce transaction data. The analysis focuses on customer behaviour, sales performance, profit distribution, delivery timelines, and regional performance.
- The project does not include predictive modeling, customer lifetime value modeling, recommendation systems, or machine learning techniques. All insights are derived solely from the provided dataset and visualized using Power BI.

## Dataset Description

- The dataset used in this project contains transactional records from an e-commerce platform. Each row represents an individual customer order.
- Key attributes include order date, ship date, customer ID, customer segment, region, product category, sales amount, profit, quantity, discount, shipping cost, and shipping mode. The dataset spans multiple years, allowing trend and behaviour analysis over time.

Order ID	Order Date	Ship Date	Aging	Ship Mode	Product Category	Product	Sales	Quantity	Discount	Profit	Shipping Co	Order Priorit	Customer ID	Customer Name	Segment	City	State	Country	Region	Months
AU-2015-1	11-09-2015	11/17/15	8	First Class	Auto & Accessori	Car Media Players	\$140.00	2	0.05	\$46.00	\$4.60	Medium	LS-001	Lane Daniels	Consumer	Brisbane	Queensland	Australia	Oceania	Nov
AU-2015-2	6/30/15	07-02-2015	2	First Class	Auto & Accessori	Car Speakers	\$211.00	3	0.09	\$112.00	\$11.20	Medium	IZ-002	Alvarado Kriz	Home Office	Berlin	Berlin	Germany	Central	Jun
AU-2015-3	12-05-2015	12/13/15	8	First Class	Auto & Accessori	Car Body Covers	\$117.00	5	0.01	\$31.20	\$3.10	Critical	EN-003	Moon Weien	Consumer	Porirua	Wellington	New Zealand	Oceania	Dec
AU-2015-4	05-09-2015	5/16/15	7	First Class	Auto & Accessori	Car & Bike Care	\$118.00	2	0.05	\$26.20	\$2.60	High	AN-004	Sanchez Bergman	Corporate	Kabul	Kabul	Afghanistan	Central Asia	May
AU-2015-5	07-09-2015	7/18/15	9	First Class	Auto & Accessori	Tyre	\$250.00	1	0.04	\$160.00	\$16.00	Critical	ON-005	Rowe Jackson	Corporate	Townsville	Queensland	Australia	Oceania	Jul
AU-2015-6	2/25/15	03-05-2015	8	First Class	Auto & Accessori	Bike Tyres	\$72.00	3	0.04	\$24.00	\$2.40	Critical	TO-006	Carter Barreto	Corporate	Bytom	Silesia	Poland	EMEA	Feb
AU-2015-7	04-09-2015	04-10-2015	1	First Class	Auto & Accessori	Car Mat	\$54.00	1	0.05	\$54.00	\$5.40	High	OM-007	Macconnell Tom	Consumer	Chicago	Illinois	United States	Central	Apr
AU-2015-8	3/30/15	04-06-2015	7	First Class	Auto & Accessori	Car Seat Covers	\$114.00	5	0.02	\$32.60	\$3.30	Critical	AN-008	Dennis Holloman	Corporate	Suzhou	Anhui	China	North Asia	Mar
AU-2015-9	02-09-2015	2/16/15	7	First Class	Auto & Accessori	Car Pillow & Neck Re	\$231.00	5	0.09	\$116.40	\$11.60	Critical	EN-009	Walt Olsen	Consumer	Juarez	Chihuahua	Mexico	North	Feb
AU-2015-10	4/21/15	05-01-2015	10	First Class	Auto & Accessori	Car Media Players	\$140.00	2	0.02	\$54.40	\$5.40	Critical	TT-010	Shepard Witt	Consumer	Soyapango	San Salvador	El Salvador	Central	Apr
AU-2015-11	11/16/15	11/26/15	10	First Class	Auto & Accessori	Car Speakers	\$211.00	4	0.01	\$122.60	\$12.30	Critical	ED-011	Johns Reed	Corporate	Taipei	Taipei City	Taiwan	North Asia	Nov
AU-2015-12	09-01-2015	09-02-2015	1	First Class	Auto & Accessori	Car Body Covers	\$117.00	4	0.04	\$18.30	\$1.80	High	ON-012	Doyle Knutson	Home Office	Los Angeles	California	United States	West	Sep
AU-2015-13	07-09-2015	7/16/15	7	First Class	Auto & Accessori	Car & Bike Care	\$118.00	1	0.02	\$35.60	\$3.60	Critical	WN-013	Butler Brown	Corporate	Saint-Brieuc	Brittany	France	Central	Jul
AU-2015-14	7/22/15	7/27/15	5	First Class	Auto & Accessori	Tyre	\$250.00	3	0.04	\$140.00	\$14.00	High	AN-014	Johnson Abelman	Corporate	Kamina	Katanga	Democratic Republic of the Co	Africa	Jul
AU-2015-15	10-12-2015	10/21/15	9	First Class	Auto & Accessori	Bike Tyres	\$72.00	4	0.01	\$18.00	\$1.80	Medium	EY-015	Greene Decherney	Consumer	Brisbane	Queensland	Australia	Oceania	Oct
AU-2015-16	2/23/15	03-05-2015	10	First Class	Auto & Accessori	Car Mat	\$54.00	2	0.01	\$27.00	\$2.70	Critical	RN-016	Bentley Zypem	Consumer	Berlin	Berlin	Germany	Central	Feb
AU-2015-17	05-04-2015	05-08-2015	4	First Class	Auto & Accessori	Car Seat Covers	\$114.00	2	0.05	\$32.60	\$3.30	High	CK-017	Rivera Black	Consumer	Shouguang	Shandong	China	North Asia	May
AU-2015-18	06-12-2015	6/19/15	7	First Class	Auto & Accessori	Car Pillow & Neck Re	\$231.00	5	0.05	\$99.30	\$9.30	High	RE-018	Wong Macintyre	Consumer	New York City	New York	United States	East	Jun
AU-2015-19	5/13/15	5/20/15	7	First Class	Auto & Accessori	Car Media Players	\$140.00	2	0.05	\$46.00	\$4.60	Critical	ON-019	Hendricks Wilson	Consumer	Behshahr	Mazandaran	Iran	EMEA	May
AU-2015-20	7/17/15	08-02-2015	6	First Class	Auto & Accessori	Car Speakers	\$211.00	2	0.02	\$122.60	\$12.30	Critical	ED-020	Johns Reed	Corporate	Taipei	Taipei City	Taiwan	North Asia	Jul
AU-2015-21	12-09-2015	12/13/15	4	First Class	Auto & Accessori	Car Body Covers	\$117.00	5	0.01	\$31.20	\$3.10	Critical	AM-021	Bar Sundaresam	Consumer	Bhopal	Madhya Pradesh	India	Central Asia	Dec
AU-2015-22	02-09-2015	2/16/15	7	First Class	Auto & Accessori	Car & Bike Care	\$118.00	2	0.05	\$30.90	\$3.10	High	KE-022	Holt Glocke	Corporate	Seattle	Washington	United States	West	Feb
AU-2015-23	7/20/15	7/26/15	6	First Class	Auto & Accessori	Tyre	\$250.00	4	0.02	\$150.00	\$15.00	High	LL-023	Gaines O'Carroll	Consumer	Geelongton	Western Australia	Australia	Oceania	Jul
AU-2015-24	11/22/15	11/24/15	2	First Class	Auto & Accessori	Bike Tyres	\$72.00	4	0.02	\$18.00	\$1.80	Critical	CO-024	Copeland Lomonaco	Corporate	Celle	Lower Saxony	Germany	Central	Nov
AU-2015-25	2/22/15	03-02-2015	8	First Class	Auto & Accessori	Car Mat	\$54.00	1	0.05	\$54.00	\$5.40	High	NA-025	Vasquez Dona	Consumer	Seville	Andalusia	Spain	South	Feb
AU-2015-26	04-06-2015	04-10-2015	4	First Class	Auto & Accessori	Car Seat Covers	\$114.00	4	0.02	\$24.90	\$2.50	Critical	LL-026	Freeman Castelli	Corporate	Raipur	Uttarakhand	India	Central Asia	Apr
AU-2015-27	7/17/15	08-04-2015	8	First Class	Auto & Accessori	Car Pillow & Neck Re	\$231.00	1	0.09	\$144.10	\$14.40	Critical	LE-027	Reid Engle	Home Office	Kharkiv	Ukraine	EMEA	Jul	
AU-2015-28	9/29/15	10-05-2015	First Class	Auto & Accessori	Car Media Players	\$140.00	1	0.05	\$55.80	\$5.60	High	NG-028	Harris Armstrong	Corporate	Jinan	Shandong	China	North Asia	Sep	
AU-2015-29	04-11-2015	4/18/15	7	First Class	Auto & Accessori	Car Speakers	\$211.00	3	0.09	\$112.00	\$11.20	Medium	ED-029	Everett Sweed	Consumer	Chinandega	Chinandega	Nicaragua	Central	Apr
AU-2015-30	1/23/15	1/27/15	4	First Class	Auto & Accessori	Car Body Covers	\$117.00	1	0.02	\$34.70	\$3.50	High	AS-030	Poole Lucas	Corporate	Palembang	Sumatera Selatan	Indonesia	Southeast As	Jan
AU-2015-31	3/31/15	04-09-2015	9	First Class	Auto & Accessori	Car & Bike Care	\$118.00	3	0.05	\$27.40	\$2.70	Critical	WN-031	Gonzales Brown	Consumer	Duisburg	North Rhine-Westphalia	Germany	Central	Mar
AU-2015-32	11/24/15	11/29/15	5	First Class	Auto & Accessori	Tyre	\$250.00	1	0.02	\$165.00	\$16.50	Medium	AN-032	Perry Brennan	Consumer	Tongi	Dhaka	Bangladesh	Central Asia	Nov
AU-2015-33	8/24/15	09-03-2015	10	First Class	Auto & Accessori	Bike Tyres	\$72.00	4	0.05	\$13.50	\$1.40	High	KI-033	Ganmer Hirasaki	Consumer	Suzhou	Anhui	China	North Asia	Aug
AU-2015-34	05-04-2015	05-09-2015	5	First Class	Auto & Accessori	Car Mat	\$54.00	4	0.05	\$13.50	\$1.40	Critical	EK-034	Norton Magee	Corporate	Henderson	Nevada	United States	West	May
AU-2015-35	7/15/15	7/16/15	1	First Class	Auto & Accessori	Car Seat Covers	\$114.00	4	0.01	\$29.40	\$2.90	High	ON-035	Bean Thompson	Corporate	Manila	National Capital	Philippines	Southeast As	Jul
AU-2015-36	10-03-2015	10-07-2015	4	First Class	Auto & Accessori	Car Pillow & Neck Re	\$231.00	2	0.05	\$127.90	\$12.80	High	SH-036	Bond Overcash	Consumer	Graz	Styria	Austria	Central	Oct
AU-2015-37	6/28/15	07-04-2015	6	First Class	Auto & Accessori	Car Media Players	\$140.00	5	0.04	\$32.00	\$3.20	Medium	KE-037	Holt Glocke	Corporate	Puebla	Puebla	Mexico	North	Jun
AU-2015-38	08-01-2015	08-04-2015	3	First Class	Auto & Accessori	Car Speakers	\$211.00	4	0.01	\$122.60	\$12.30	Critical	YD-038	Moran Lovid	Consumer	Auesburg	Bavaria	Germany	Central	Aug

## Data Challenges

Several data quality issues were identified during initial exploration:

- Currency fields contained symbols and commas
- Numeric columns were stored as text
- Date columns were not in datetime format
- Missing values existed in categorical fields
- Inconsistent spacing in text fields

Without resolving these issues, accurate analysis and visualization would not be possible.

## Tools and Technologies

This project uses Python and Power BI to perform end-to-end analytics.

Python was used for:

- Data loading

- Data cleaning and transformation
- Currency normalization
- Date standardization
- Feature engineering

Power BI was used for:

- KPI creation
- Interactive visualizations
- Geographic analysis
- Customer and segment analysis
- Dashboard design

This tool combination ensures analytical accuracy and business-friendly reporting.

## **Data Preprocessing**

- Data preprocessing was conducted using Python with Pandas and NumPy libraries. The preprocessing pipeline included currency cleaning, numeric conversion, date standardization, handling missing values, and feature engineering.
- Each step was carefully implemented to ensure the dataset was suitable for business analysis and Power BI integration.

```
import pandas as pd # Import library for data manipulation (DataFrames)
import numpy as np  # Import library for mathematical operations

# --- 1. LOAD DATA ---
df = pd.read_csv('ecommerce.csv')
```

**import pandas as pd:** Imports the Pandas library, which is the primary tool for data manipulation and creating "DataFrames" (tables).

**import numpy as np:** Imports the NumPy library, used for high-speed mathematical operations and handling numerical data.

**df = pd.read\_csv('ecommerce.csv'):** This line reads your raw data file and stores it in a variable called df (DataFrame).

```
# --- 2. CLEANING FUNCTION ---

def clean_currency(value):
    if pd.isna(value):
        return 0.0 # If the cell is empty, return zero

    # Remove dollar signs, commas, and extra spaces
    clean_val = str(value).replace('$', '').replace(',', '').strip()

    # Convert to a number. 'coerce' means if it sees "abc" or "test", it sets it to NaN (null)
    return pd.to_numeric(clean_val, errors='coerce')
```

This custom function is the "brain" of the script. It handles the messy text found in currency columns:

**def clean\_currency(value):** Defines a rule to process individual cells.

**if pd.isna(value): return 0.0:** If a cell is empty (NaN), it returns 0.0 so calculations don't break later.

**.replace('\$', '').replace(',', '').strip():** Removes dollar signs and commas, and trims accidental spaces from the text.



**pd.to\_numeric(..., errors='coerce')**: Converts the cleaned text into a real decimal number. If it encounters non-numeric "garbage" text, it sets it to NaN (null) instead of crashing the program.

```
# --- 3. DATA TRANSFORMATION ---

for col in ['Sales', 'Profit', 'Shipping Cost']:
    df[col] = df[col].apply(clean_currency).fillna(0.0)

# Cleaning the Quantity column: converts to integer, replaces errors with 0
df['Quantity'] = pd.to_numeric(df['Quantity'], errors='coerce').fillna(0).astype(int)

# Cleaning the Discount column: converts to decimal number
df['Discount'] = pd.to_numeric(df['Discount'], errors='coerce').fillna(0.0)
```

**for col in ['Sales', 'Profit', 'Shipping Cost']:** A loop that applies the `clean_currency` function to all three financial columns at once.

**.fillna(0.0):** Ensures any remaining empty values are set to zero for accurate totals in Power BI.

**df['Quantity']...astype(int):** Converts the Quantity column into whole numbers (integers), as you cannot sell half a product.

**df['Discount']:** Converts discounts into decimal numbers so you can calculate profit margins accurately.

```
# --- 4. DATE STANDARDIZATION ---
|
df['Order Date'] = pd.to_datetime(df['Order Date'], errors='coerce')
df['Ship Date'] = pd.to_datetime(df['Ship Date'], errors='coerce')

# Remove any row that is missing an 'Order Date' as it breaks timeline analysis
df.dropna(subset=['Order Date'], inplace=True)
```

**pd.to\_datetime(...):** Converts text dates (like "01/01/2015") into a standardized format that Power BI recognizes as a timeline.

**df.dropna(subset=['Order Date']):** Removes any rows missing an Order Date, as a transaction without a date cannot be used in trend analysis.

```
# --- 5. FEATURE ENGINEERING (Adding Business Insights) ---

df['Delivery Days'] = (df['Ship Date'] - df['Order Date']).dt.days

# Handle missing text: Replace 'NaN' with 'Unknown' so charts look clean in Power BI
categorical_columns = ['Segment', 'Region', 'Order Priority', 'Customer ID']
for col in categorical_columns:
    df[col] = df[col].fillna('Unknown').str.strip()
```

**df['Delivery Days'] = ... .dt.days:** This creates a new metric by subtracting the Order Date from the Ship Date. It calculates the "aging" or lead time for every order.

**categorical\_columns loop:** Searches for missing text in columns like 'Segment' or 'Region' and replaces them with 'Unknown' so your Power BI slicers and charts look professional and don't show blank spaces.

```
# --- 6. OUTPUT ---
df.to_csv('Cleaned_Ecommerce_Data.csv', index=False)

# Summary for the console to verify work
print("Successfully cleaned", len(df), "rows.")
print("The file 'Cleaned_Ecommerce_Data.csv' is ready for download.")
```

**df.to\_csv(..., index=False):** Saves the fully cleaned data into a new file. The index=False part ensures no extra row-number column is added to your clean data.

**print(...):** Provides a summary in the console to confirm exactly how many rows were successfully processed.

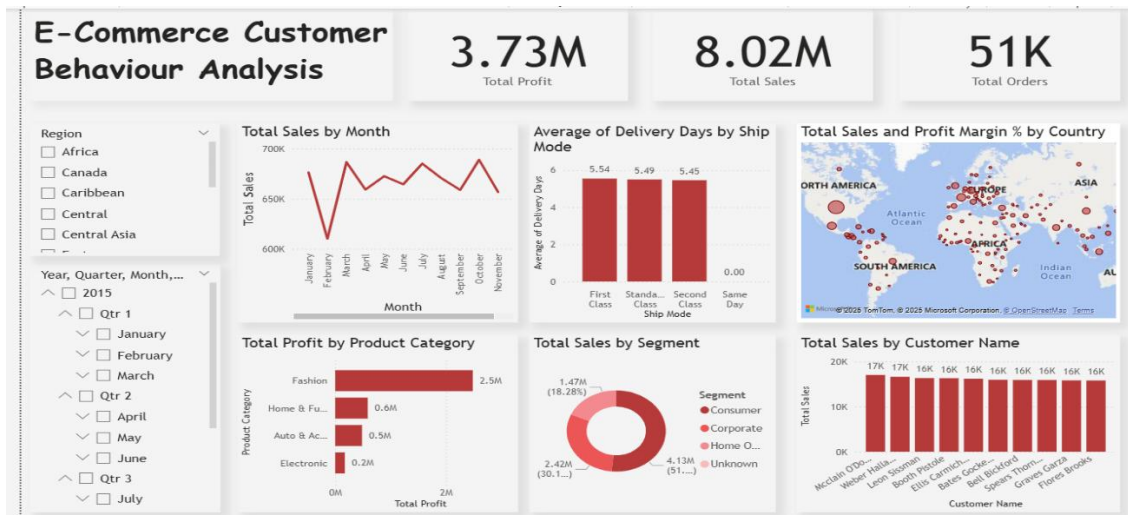
# Cleaned Dataset

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Order ID	Order Date	Ship Date	Aging	Ship Mode	Product Category	Product	Sales	Quantit	Discoun	Profit	Shipping	Cost	Order Priorit	Customer ID	Customer Name	Segment	City	State	Country	Region	Month	Delivery Days
1	AU-2015-1	09-11-2015	17-11-2015	8	First Class	Auto & Accessori	Car Media Players	140	2	0.05	46	4.6	Medium	LS-001	Lane Daniels	Consumer	Brisbane	Queensland	Australia	Oceania	Nov	8
1	AU-2015-2	30-06-2015	02-07-2015	2	First Class	Auto & Accessori	Car Speakers	211	3	0.03	112	11.2	Medium	IZ-002	Alvarado Kriz	Home Offic	Berlin	Berlin	Germany	Central	Jun	2
1	AU-2015-3	05-12-2015	13-12-2015	8	First Class	Auto & Accessori	Car Body Covers	117	5	0.01	31.2	3.1	Critical	EN-003	Moon Weien	Consumer	Porirua	Wellington	New Zealand	Oceania	Dec	8
1	AU-2015-4	09-05-2015	16-05-2015	7	First Class	Auto & Accessori	Car & Bike Care	118	2	0.05	26.2	2.6	High	AN-004	Sanchez Bergman	Corporate	Kabul	Kabul	Afghanistan	Central Asia	May	7
1	AU-2015-5	09-07-2015	18-07-2015	9	First Class	Auto & Accessori	Tyre	250	1	0.04	160	16	Critical	ON-005	Rowe Jackson	Corporate	Townsville	Queensland	Australia	Oceania	Jul	9
1	AU-2015-6	25-02-2015	05-03-2015	8	First Class	Auto & Accessori	Bike Tyres	72	3	0.04	24	2.4	Critical	TO-006	Carter Barreto	Corporate	Bytom	Silesia	Poland	EMEA	Feb	8
1	AU-2015-7	09-04-2015	10-04-2015	1	First Class	Auto & Accessori	Car Mat	54	1	0.05	54	5.4	High	OM-007	Mconnell Tom	Consumer	Chicago	Illinois	United States	Central	Apr	1
1	AU-2015-8	30-03-2015	06-04-2015	7	First Class	Auto & Accessori	Car Seat Covers	114	5	0.02	22.6	2.3	Critical	AN-008	Dennis Holloman	Corporate	Suzhou	Anhui	China	North Asia	Mar	7
1	AU-2015-9	09-02-2015	16-02-2015	7	First Class	Auto & Accessori	Car Pillow & Neck Re	231	5	0.03	116	11.6	Critical	EN-009	Wall Olsen	Consumer	Juárez	Chihuahua	Mexico	North	Feb	7
1	AU-2015-10	21-04-2015	01-05-2015	10	First Class	Auto & Accessori	Car Media Players	140	2	0.02	54.4	5.4	Critical	TT-0010	Shepard Witt	Consumer	Soyapango	San Salvador	El Salvador	Central	Apr	10
2	AU-2015-11	16-11-2015	26-11-2015	10	First Class	Auto & Accessori	Car Speakers	211	4	0.01	123	12.3	Critical	ED-0011	Johns Reed	Corporate	Taipei	Taipei City	Taiwan	North Asia	Nov	10
1	AU-2015-12	01-09-2015	02-09-2015	1	First Class	Auto & Accessori	Car Body Covers	117	4	0.04	18.3	1.8	High	ON-0012	Doyle Knutson	Home Offic	Los Angeles	California	United States	West	Sep	1
1	AU-2015-13	09-07-2015	16-07-2015	7	First Class	Auto & Accessori	Car & Bike Care	118	1	0.02	35.6	3.6	Critical	WN-0013	Butler Brown	Corporate	Saint-Brieuc	Brittany	France	Central	Jul	7
1	AU-2015-14	22-07-2015	27-07-2015	5	First Class	Auto & Accessori	Tyre	250	3	0.04	140	14	High	AN-0014	Johnson Abelman	Corporate	Kamina	Katanga	Democratic Republic of the Co	Africa	Jul	5
1	AU-2015-15	12-10-2015	21-10-2015	9	First Class	Auto & Accessori	Bike Tyres	72	4	0.01	18	1.8	Medium	EY-0015	Greene Decherney	Consumer	Brisbane	Queensland	Australia	Oceania	Oct	9
1	AU-2015-16	23-02-2015	05-03-2015	7	First Class	Auto & Accessori	Car Mat	54	2	0.01	27	2.7	Critical	RN-0016	Bentley Zypem	Consumer	Berlin	Berlin	Germany	Central	Feb	10
1	AU-2015-17	04-05-2015	08-05-2015	4	First Class	Auto & Accessori	Car Seat Covers	114	2	0.05	22.6	2.3	High	OK-0017	Rivera Black	Consumer	Shouguang	Shandong	China	North Asia	May	4
1	AU-2015-18	12-06-2015	19-06-2015	7	First Class	Auto & Accessori	Car Pillow & Neck Re	231	5	0.05	93.3	9.3	High	RE-0018	Wong Macintyre	Consumer	New York City	New York	United States	East	Jun	7
3	AU-2015-19	13-05-2015	20-05-2015	7	First Class	Auto & Accessori	Car Media Players	140	2	0.05	46	4.6	Critical	ON-0019	Hendricks Wilson	Consumer	Beitshahr	Mazandaran	Iran	EMEA	May	7
1	AU-2015-20	27-07-2015	02-08-2015	6	First Class	Auto & Accessori	Car Speakers	211	2	0.02	123	12.3	Critical	ED-0020	Johns Reed	Corporate	Taipei	Taipei City	Taiwan	North Asia	Jul	6
2	AU-2015-21	09-12-2015	13-12-2015	4	First Class	Auto & Accessori	Car Body Covers	117	5	0.01	31.2	3.1	Critical	AM-0021	Barri Sundaresam	Consumer	Bhopal	Madhya Pradesh	India	Central Asia	Dec	4
3	AU-2015-22	09-02-2015	16-02-2015	7	First Class	Auto & Accessori	Car & Bike Care	118	2	0.03	30.9	3.1	High	KE-0022	Holt Glocke	Corporate	Seattle	Washington	United States	West	Feb	7
4	AU-2015-23	20-07-2015	26-07-2015	6	First Class	Auto & Accessori	Tyre	250	4	0.02	150	15	High	LL-0023	Gaines O'Carroll	Consumer	Geraldton	Western Australia	Australia	Oceania	Jul	6
5	AU-2015-24	22-11-2015	24-11-2015	2	First Class	Auto & Accessori	Bike Tyres	72	4	0.02	18	1.8	Critical	CO-0024	Copeland Lomonaco	Corporate	Celle	Lower Saxony	Germany	Central	Nov	2
5	AU-2015-25	22-02-2015	02-03-2015	8	First Class	Auto & Accessori	Car Mat	54	1	0.05	54	5.4	High	NA-0025	Vasquez Dona	Consumer	Seville	Andalusí-a	Spain	South	Feb	8
7	AU-2015-26	06-04-2015	10-04-2015	4	First Class	Auto & Accessori	Car Seat Covers	114	4	0.02	24.9	2.5	Critical	LL-0026	Freeman Castell	Corporate	Rajpur	Uttarakhand	India	Central Asia	Apr	4
3	AU-2015-27	27-07-2015	04-08-2015	8	First Class	Auto & Accessori	Car Pillow & Neck Re	231	1	0.03	144	14.4	Critical	LE-0027	Reid Engle	Home Offic	Kharkiv	Kharkiv	Ukraine	EMEA	Jul	8
3	AU-2015-28	29-09-2015	05-10-2015	7	First Class	Auto & Accessori	Car Media Players	140	1	0.03	55.8	5.6	High	NG-0028	Harris Armstrong	Corporate	Jinan	Shandong	China	North Asia	Sep	6
7	AU-2015-29	11-04-2015	18-04-2015	7	First Class	Auto & Accessori	Car Speakers	211	3	0.03	112	11.2	Medium	ED-0029	Everett Sweed	Consumer	Chinandega	Chinandega	Nicaragua	Central	Apr	7
1	AU-2015-30	23-01-2015	27-01-2015	4	First Class	Auto & Accessori	Car Body Covers	117	1	0.02	34.7	3.5	High	AS-0030	Poolie Lucas	Corporate	Palembang	Sumatera Selatan	Indonesia	Southeast As	Jan	4
2	AU-2015-31	31-03-2015	09-04-2015	9	First Class	Auto & Accessori	Car & Bike Care	118	3	0.03	27.4	2.7	Critical	WN-0031	Gonzales Brown	Consumer	Duisburg	North Rhine-Westphalia	Germany	Central	Mar	9
3	AU-2015-32	24-11-2015	29-11-2015	5	First Class	Auto & Accessori	Tyre	250	1	0.02	165	16.5	Medium	AN-0032	Perry Brennan	Consumer	Tongi	Dhaka	Bangladesh	Central Asia	Nov	5
4	AU-2015-33	24-08-2015	03-09-2015	10	First Class	Auto & Accessori	Bike Tyres	72	4	0.05	18	1.8	High	KI-0033	Garner Hirasaki	Consumer	Suzhou	Anhui	China	North Asia	Aug	10
5	AU-2015-34	04-05-2015	09-05-2015	5	First Class	Auto & Accessori	Car Mat	54	4	0.05	13.5	1.4	Critical	EE-0034	Norton Magee	Corporate	Henderson	Nevada	United States	West	May	5
5	AU-2015-35	15-07-2015	16-07-2015	1	First Class	Auto & Accessori	Car Seat Covers	114	4	0.01	29.4	2.9	High	ON-0035	Bean Thompson	Corporate	Manila	National Capital	Philippines	Southeast As	Jul	1
7	AU-2015-36	09-10-2015	07-10-2015	4	First Class	Auto & Accessori	Car Pillow & Neck Re	231	2	0.05	128	12.8	High	SH-0036	Bond Overcash	Consumer	Graz	Styria	Austria	Central	Oct	4
3	AU-2015-37	28-06-2015	04-07-2015	6	First Class	Auto & Accessori	Car Media Players	140	5	0.04	32	3.2	Medium	KE-0037	Holt Glocke	Corporate	Puebla	Puebla	Mexico	North	Jun	6
3	AU-2015-38	01-08-2015	04-08-2015	3	First Class	Auto & Accessori	Car Socks	211	4	0.01	123	12.3	Critical	YD-0038	Moran Llovd	Consumer	Auesbure	Bavaria	Germany	Central	Aug	3

# Power BI Dashboard

- This Power BI dashboard presents a comprehensive analysis of **e-commerce customer behaviour and sales performance for the year 2015**. The dashboard is designed to transform cleaned transactional data into clear, interactive visual insights that support business understanding and decision-making.
- At a high level, the dashboard highlights key performance indicators such as **Total Sales, Total Profit, and Total Orders**, providing an immediate snapshot of overall business performance. Detailed visuals further explore **monthly sales trends, customer segments, product category profitability, delivery performance by shipping mode, and geographic distribution of sales and profit**.

- Interactive slicers enable users to filter data by **region**, **time period**, and **customer attributes**, allowing deeper exploration of customer behaviour and operational patterns. By combining financial metrics with customer and logistics insights, this dashboard helps stakeholders identify revenue drivers, understand purchasing behaviour, and evaluate delivery efficiency within the e-commerce business.



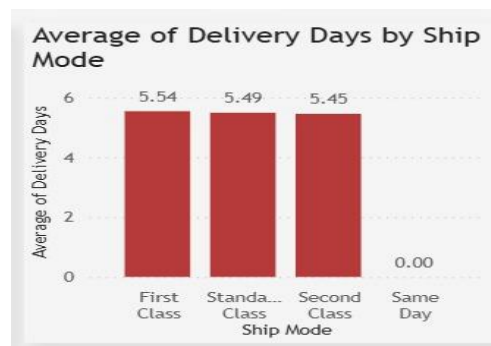
## KPI Cards

- These cards provide the "Executive Pulse" of the business:
- **Total Sales (8M):** The total gross revenue generated.
- **Total Profit (3.73M):** The bottom-line earnings after all costs.
- **Total Orders (51K):** The total volume of customer transactions.
- **Business Value:** These cards give an immediate sense of scale, showing that we are managing a high-volume, multi-million dollar operation.



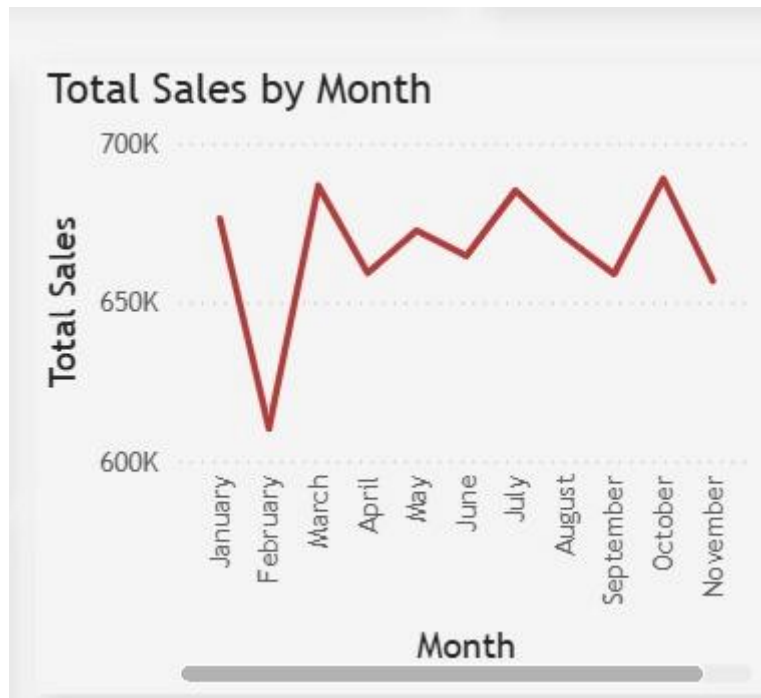
## Operational Efficiency (Delivery Days)

- **Visual:** Average of Delivery Days by Ship Mode.
- **The Goal:** To identify which shipping methods are meeting our promises.
- **Insight:** We can see that "Same Day" shipping is hitting a 0.00-day average, while professional classes like "First Class" and "Standard Class" are averaging about 5.5 days.
- **Action:** This allows us to hold our logistics partners accountable and see if we can reduce lead times for Standard shipping.



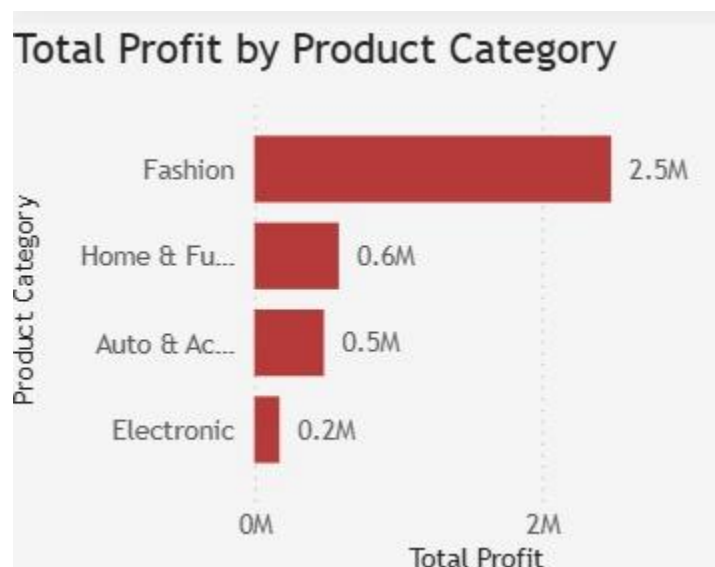
## Sales Trends & Seasonality

- **Visual:** Total Sales by Month.
- **The Goal:** To identify "Peaks and Gaps" in our revenue cycle.
- **Insight:** The line chart reveals specific volatility, such as a surge in March and a dip in February.
- **Business Value:** This helps us plan inventory—stocking up for surge months and managing costs during slow periods.



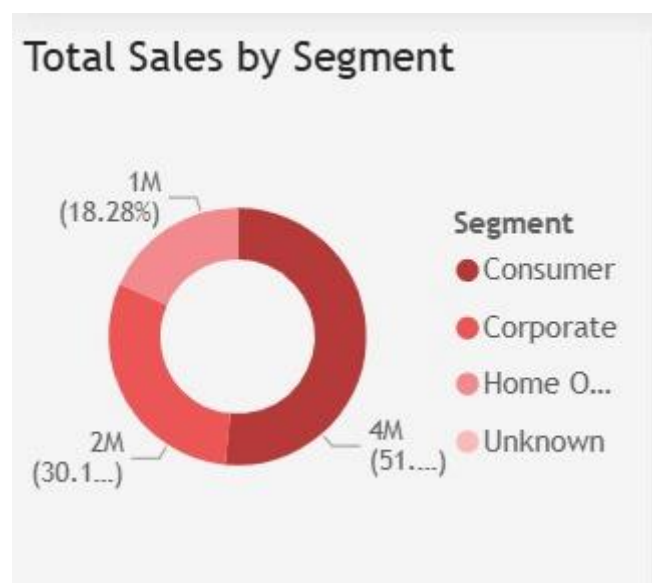
## Profit by Category (The Profit Engine)

- **What it is:** A bar chart ranking our three main product categories—Fashion, Electronics, and Auto&Accessories—by the actual net profit they generated.
- **The 2015 Data:** This visual shows that Fashion is our undisputed leader, generating ₹2.5M in profit. This is significantly higher than Electronics or Auto &Accessories



## Segment Mix (The Customer Profile)

- **What it is:** A donut chart breaking down our total sales by the type of buyer: Consumer, Corporate, and Home Office.
- **The 2015 Data:** Consumers make up 51% of our total sales volume.
- **The "So What?" (Strategic Insight):** This proves that our business model is primarily B2C (Business-to-Consumer). While we have corporate clients, over half of our revenue comes from individual shoppers.



## Top 10 Customers (The VIP List)

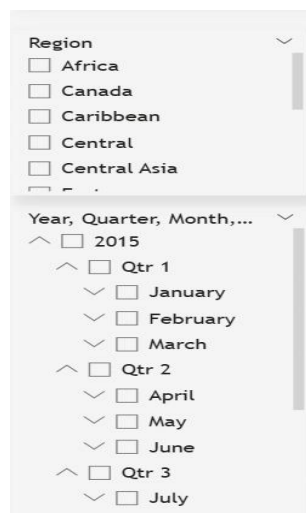
- **What it is:** A ranked bar chart showing the 10 individuals who spent the most money with us during the 2015 calendar year.
- **The 2015 Data:** Names like McClain and Weber appear at the top, with individual spends nearing ₹20k.





## The Control Center (Interactive Slicers)

- **Function:** I added Slicers for Region and Date Hierarchy.
- **Self-Service Analysis:** Unlike a static report, you can click these buttons to get answers instantly.
- **Example:** "Sir, if you want to see how EMEA performed specifically in 2015, you just click these buttons, and the entire dashboard updates in real-time".





## Visual: Global Sales Distribution (The Map)

What the Visual Represents:

- **Location:** Each bubble represents a country where we successfully processed an order in 2015.
- **Bubble Size:** The size of the bubble is tied to Total Sales. Larger bubbles indicate our "Power Markets."
- **Scope:** This visual covers our entire global footprint across 38+ countries.



## Business Insights

Key insights from the analysis include:

- Strong contribution from consumer segment
- High profitability in fashion category

- Stable monthly sales with seasonal variations
- Efficient delivery timelines across shipping modes
- Revenue concentration among top customers

These insights can guide marketing, pricing, and logistics decisions.

## **Conclusion**

- This project demonstrates how Python and Power BI can be effectively used to analyze e-commerce customer behaviour. By transforming raw transactional data into a structured and interactive dashboard, valuable insights were generated to support strategic decision-making.
- The project highlights the importance of data cleaning, thoughtful feature engineering, and intuitive visualization in real-world analytics applications.

## **References:**

- <https://github.com/uchitesh8-web/E-Commerce-Customer-Behaviour-Analysis/tree/main>