Customer Behavior Analysis

Code Presentation

MARCH 31, 2025

SHOPEASY
SUNIL KUMAR G T

1. **Download CSV Files**

Download all the CSV files required for the project and keep them in same project folder

2. Clean Datasets

Clean all the six datasets as per the requirements:

- Install packages required for packages

```
#Package Installation
!pip install pandas
!pip install mysql-connector-python
```

- Import Packages

```
3]: #Import Packages
    import pandas as pd
    import mysql.connector as db
```

- Create DataFrame to read all the CSV files

```
#Creating Dataframes and read CSV files
df1 = pd.read_csv("customers.csv")
df2 = pd.read_csv("customer_reviews.csv")
df3 = pd.read_csv("customer_journey.csv")
df4 = pd.read_csv("products.csv")
df5 = pd.read_csv("engagement_data.csv")
df6 = pd.read_csv("geography.csv")
```

- Check for duplicates in all the dataframes, we can make sure there were no duplicates in all the dataframes

```
#Check duplicates all the dataframes

# df1.duplicated().sum()
# df2.duplicated().sum()
# df3.duplicated().sum()
#df4.duplicated().sum()
#df5.duplicated().sum()
df6.duplicated().sum()
```

```
0
```

- Check for null values listed in all the six dataframes

```
#Check for null values
df3 = pd.read_csv("customer_journey.csv")
df3.isnull().sum()
```

```
JourneyID      0
CustomerID     0
ProductID      0
VisitDate      0
Stage          0
Action         0
Duration      14
dtype: int64
```

```
#check for null values
df3 = pd.read_csv("customer_journey.csv")
df3.isnull()
```

	JourneyID	CustomerID	ProductID	VisitDate	Stage	Action	Duration
0	False	False	False	False	False	False	True
1	False	False	False	False	False	False	True
2	False	False	False	False	False	False	False
3	False	False	False	False	False	False	True

- After identifying the null values, drop them in all the dataframes

```
#Drop null values
df3.dropna(inplace=True)
df3.rename(columns={'Action':'Action_by_customers'},inplace=True)
df3 = df3.reset_index(drop=True)
```

- Split combined header values if required for all the dataframes

```
#Split combined columns
df5[['Views', 'Clicks']] = df5['ViewsClicksCombined'].str.split('-', expand = True)
df5.drop(columns=['ViewsClicksCombined'], inplace = True)
df5
```

	EngagementID	ContentID	ContentType	Likes	EngagementDate	CampaignID	ProductID	Views	Clicks
0	1	39	Blog	190	2023-08-30	1	9	1883	671
1	2	48	Blog	114	2023-03-28	18	20	5280	532
2	3	16	video	32	2023-12-08	7	14	1905	204
3	4	43	Video	17	2025-01-21	19	20	2766	257
4	5	16	newsletter	306	2024-02-21	6	15	5116	1524
...	...	...	...	...	...	...	...	...	...
95	96	17	Blog	32	2024-07-15	14	13	712	142
96	97	34	blog	3	2025-07-01	16	7	696	47
97	98	44	blog	0	2025-08-20	11	8	231	10
98	99	26	Blog	119	2024-04-15	17	4	3511	479

- Once after cleaning up all the dataframes, establish connection with mysql datsource

```
#Setup connection
user  = 'newuser'
passcode = "Apps@5566"
host = 'localhost'
db_name = "shopeasy"
```

```
#db connection
db_connection = db.connect(

                host  = host,
                user = user,
                password = passcode,
                database = db_name
)
```

```
db_connection
```

```
<mysql.connector.connection_cext.CMySQLConnection at 0x251bf57a9f0>
```

- After setting up connection with shopeasy datasource, create six tables to load values for analysis

```sql
-- Create Table Customers

CREATE TABLE customers(
CustomerID INT,
CustomerName VARCHAR(100),
Email VARCHAR(10),
Age INT,
GeographyID INT
);

-- Create Table Customers_reviews

CREATE TABLE customer_reviews(
ReviewID INT,
CustomerID INT,
ProductID INT,
ReviewDate date,
Rating INT,
ReviewText VARCHAR(255)
);

-- Create Table Customer_journey

CREATE TABLE customer_journey(
JourneyID INT,
CustomerID INT,
```

```
JourneyID INT,
CustomerID INT,
ProductID INT,
VisitDate DATE,
Stage VARCHAR(50),
Action_by_customers VARCHAR(10),
Duration INT
);


-- Create Table Products

CREATE TABLE products(
ProductID INT,
ProductName VARCHAR(50),
Category VARCHAR(50),
Price FLOAT
);

-- Create Table Engangement_data

CREATE TABLE engagement_data(
EngagementID INT,
ContentID INT,
ContentType VARCHAR(50),
Likes INT,
```

- After creating tables, get back to jupyter notebook to load values to all the created tables in mysql . Create *cursor()* for data connection , which acts as intermediate between mysql datasource and jupyter notebook python scripts. Which helps in execute all the SQL queries from Jupyter notebook

```
#Create Cursor for db_connection
cursor = db_connection.cursor()

#Insert into Customer table
insert_query = """
INSERT INTO customers (CustomerID, CustomerName, Email, Gender, Age, GeographyID)
VALUES (%s, %s, %s, %s, %s, %s) """

#Convert df1 to list
cursor.executemany(insert_query, df1.values.tolist())
db_connection.commit()
```

```
#Insert into Customer_reviews table
insert_query = """
INSERT INTO customer_reviews (ReviewID, CustomerID, ProductID, ReviewDate, Rating, ReviewText)
VALUES (%s, %s, %s, %s, %s, %s)
"""
#Convert df2 to list
cursor.executemany(insert_query, df2.values.tolist())
db_connection.commit()
```

```
#Insert into Products table
insert_query = """
INSERT INTO products (ProductID, ProductName, Category, Price)
VALUES (%s, %s, %s, %s)
"""
#Convert df4 to list
cursor.executemany(insert_query, df4.values.tolist())
db_connection.commit()
```

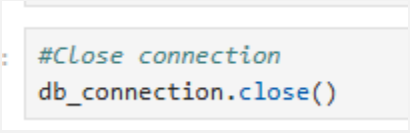
```
#Insert into Engagement_data table
insert_query = """
INSERT INTO engagement_data (EngagementID, ContentID, ContentType, Likes, EngagementDate, CampaignID, ProductID, Views, Clicks)
VALUES (%s, %s, %s, %s, %s, %s, %s, %s, %s)
"""
#Convert df5 to list

cursor.executemany(insert_query, df5.values.tolist())
db_connection.commit()
```

```
#Insert into Geography table
insert_query = """
INSERT INTO geography (GeographyID, Country, City)
VALUES (%s, %s, %s)
"""

#Convert df6 to list
cursor.executemany(insert_query, df6.values.tolist())
```

- After loading all the values to SQL tables, close the cursor which helps to prevent excessive memory usage also avoids connection issues



Once after updating values to the tables, work on executing the queries to provide insights based on the data and propose strategy for ShopEasy company.

Factors Influencing Customer Engagement

```
SELECT cj.Stage, AVG(cj.Duration) AS AvgDuration, COUNT(cj.CustomerID) AS VisitCount
FROM customer_journey cj
GROUP BY cj.Stage
ORDER BY AvgDuration DESC;
```

Customer Drop-off Stages

```
SELECT Stage, COUNT(*) AS DropoffCount
FROM customer_journey
WHERE Action_by_customers = 'View'
GROUP BY Stage
ORDER BY DropoffCount DESC;
```

Impact of Customer Reviews on Purchases

```
SELECT cr.ProductID, AVG(cr.Rating) AS AvgRating, COUNT(cr.ReviewID) AS ReviewCount
FROM customer_reviews cr
GROUP BY cr.ProductID
ORDER BY AvgRating DESC;
```

To identify negative reviews mentioning “price” or “quality concerns”:

```
SELECT * FROM customer_reviews
WHERE ReviewText LIKE '%price%' OR ReviewText LIKE '%quality%';
```

Best Performing Customer Segments:

```
SELECT c.Gender, c.Age, COUNT(cj.CustomerID) AS TotalEngagements
FROM customers c
JOIN customer_journey cj ON c.CustomerID = cj.CustomerID
GROUP BY c.Gender, c.Age
ORDER BY TotalEngagements DESC;
```

Best Performing locations:

```
SELECT g.Country, COUNT(c.CustomerID) AS CustomerCount
FROM customers c
JOIN geography g ON c.GeographyID = g.GeographyID
GROUP BY g.Country
ORDER BY CustomerCount DESC;
```

Best Performing Products:

```
SELECT cj.ProductID, COUNT(*) AS TotalViews
FROM customer_journey cj
WHERE cj.Stage = 'ProductPage'
GROUP BY cj.ProductID
ORDER BY TotalViews DESC;
```

Sentiment Analysis from Customer Reviews

```
SELECT cr.rating,COUNT(*) AS review_count
FROM customer_reviews cr
GROUP BY rating
ORDER BY rating DESC;
```

Identifying Key Complaints from Low Ratings

```
SELECT Rating, COUNT(*) AS frequency
FROM customer_reviews
WHERE rating <= 2
GROUP BY Rating
ORDER BY frequency DESC
LIMIT 10;
```

Customer Engagement and Purchase History

```
SELECT cj.CustomerID, c.CustomerName, COUNT(DISTINCT cj.ProductID) AS
Total_Products_Viewed,
    COUNT(DISTINCT ed.CampaignID) AS Total_Campaigns_Engaged,
    COUNT(DISTINCT cr.ReviewID) AS Reviews_Given
FROM customer_journey cj
LEFT JOIN customers c ON cj.CustomerID = c.CustomerID
LEFT JOIN engagement_data ed ON cj.ProductID = ed.ProductID
LEFT JOIN customer_reviews cr ON cj.CustomerID = cr.CustomerID
GROUP BY cj.CustomerID, c.CustomerName
ORDER BY Total_Products_Viewed DESC;
```

Mapping Engagement Data to Customer Satisfaction

```
SELECT ed.ContentType, ROUND(AVG(cr.rating),1) AS Avg_Rating,
        SUM(ed.Views) AS Total_Views, SUM(ed.Clicks) AS Total_Clicks
FROM engagement_data ed
LEFT JOIN customer_journey cj ON ed.ProductID = cj.ProductID
LEFT JOIN customer_reviews cr ON cj.CustomerID = cr.CustomerID
GROUP BY ed.ContentType
ORDER BY Avg_Rating DESC;
```