Effectiveness Analysis of the Recent Campaign launched by a Company

Step 1: Load Data

In [2]:
```
import pandas as pd

user_interaction = pd.read_csv('../Campaign Performance Analysis/UserInteractions.cs
user_interaction.head()
```

Out[2]:

	Customer ID	Interaction Date	Interaction Type	Interaction Channel
0	1	2/28/2024	share	website
1	2	4/27/2024	view	social media
2	3	2/26/2024	share	email
3	4	2/13/2024	click	email
4	5	4/1/2024	share	social media

In [4]:
```
sales_transaction = pd.read_csv('../Campaign Performance Analysis/SalesTransactions.
sales_transaction.head()
```

Out[4]:

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity
0	1	1/19/2024	213	345	Books	295.15	7
1	2	6/11/2024	59	134	Electronics	457.78	1
2	3	1/10/2024	178	89	Electronics	423.84	2
3	4	5/30/2024	359	423	Home & Kitchen	497.52	1
4	5	3/21/2024	384	139	Clothing	164.21	7

In [6]:
```
customer_demographic = pd.read_csv('../Campaign Performance Analysis/CustomerDemogra
customer_demographic.head()
```

Out[6]:

	Customer ID	Age	Gender	Location	Income Level
0	1	65	Male	Martinezmouth	61083
1	2	43	Non-binary	South Anne	90419
2	3	58	Non-binary	West Darrellport	38260
3	4	53	Non-binary	Stevenshire	34649
4	5	69	Female	South Kellychester	70420

Step 2: Clean the Data

i) Check if the numeric & string columns are assigned incorrect datatypes [This can cause problems while processing data for Analysis]

In [8]:
```
user_interaction.dtypes
```

Out[8]:
```
Customer ID              int64
Interaction Date        object
Interaction Type        object
Interaction Channel     object
dtype: object
```

In [10]:
```
#Interaction Date is set to object type but should rather be datetime
user_interaction['Interaction Date']=user_interaction['Interaction Date'].astype('da
user_interaction.dtypes
```

Out[10]:
```
Customer ID                      int64
Interaction Date        datetime64[ns]
Interaction Type                object
Interaction Channel             object
dtype: object
```

In [11]:
```
sales_transaction.dtypes
```

Out[11]:
```
Transaction ID        int64
Transaction Date     object
Customer ID           int64
Product ID            int64
Product Category     object
Sales Amount        float64
Quantity              int64
dtype: object
```

In [16]:
```
#Again change the datatype for Transaction Date to Datetime
sales_transaction['Transaction Date'] = sales_transaction['Transaction Date'].astype
sales_transaction.dtypes
```

Out[16]:
```
Transaction ID               int64
Transaction Date    datetime64[ns]
Customer ID                  int64
Product ID                   int64
Product Category            object
Sales Amount               float64
Quantity                     int64
dtype: object
```

In [17]:
```
customer_demographic.dtypes
```

Out[17]:
```
Customer ID      int64
Age              int64
Gender          object
Location        object
Income Level     int64
dtype: object
```

ii) Handle Null/Missing Values

In [22]:
```
print(user_interaction.shape)
user_interaction.isnull().sum()
```

```
(1000, 4)
```

Out[22]:
```
Customer ID            0
Interaction Date       0
Interaction Type       0
Interaction Channel    11
dtype: int64
```

In [24]:
```
#11 out 1000 rows have NULL for Interaction Channel which is a catagorical Data fiel
#Solution - Replace the Missing fileds with the most representative values as the nu
#are less compared to the total sample size
user_interaction['Interaction Channel'].value_counts()
```

Out[24]:
```
website         334
email           329
social media    326
Name: Interaction Channel, dtype: int64
```

In [31]:
```
#Website is ti the most representative value. So, replace NaN's with 'Website'
user_interaction['Interaction Channel'].fillna('website',inplace=True)
user_interaction.isnull().sum()
#No Null Values in this dataset anymore
```

Out[31]:
```
Customer ID            0
Interaction Date       0
Interaction Type       0
Interaction Channel    0
dtype: int64
```

In [32]:
```
sales_transaction.isnull().sum()
```

Out[32]:
```
Transaction ID      0
Transaction Date    0
Customer ID         0
Product ID          0
Product Category    0
Sales Amount        0
Quantity            0
dtype: int64
```

In [33]:
```
customer_demographic.isnull().sum()
```

Out[33]:
```
Customer ID     0
Age             0
Gender          0
Location        0
Income Level    0
dtype: int64
```

Step 3: Analysis

Problem 1- Determine User Engagement Rate

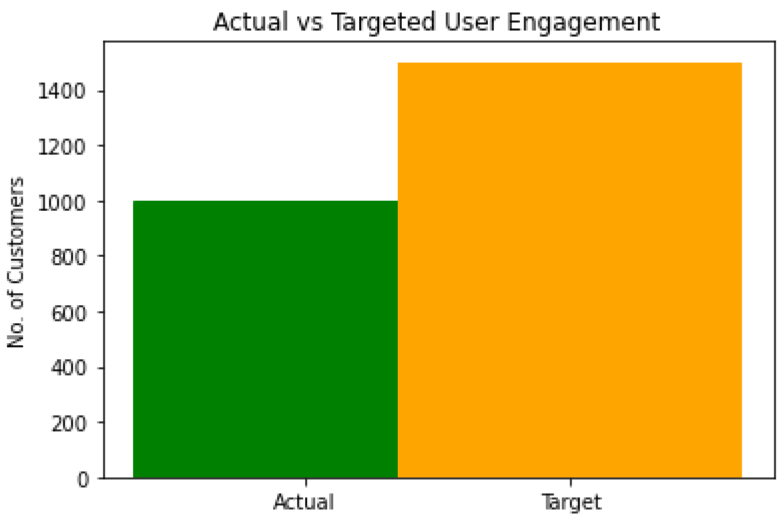
In [60]:
```
import matplotlib.pyplot as plt
import seaborn as sns

#Find Total Interaction
total_interactions = user_interaction.shape
print("Total Interactions: ",total_interactions[0])
unique_customer_interactions = user_interaction['Customer ID'].nunique()
print("Unique Customer Interactions: ",unique_customer_interactions)
target_engagement=1500
engagement_rate = (unique_customer_interactions/target_engagement)*100
print(f"User Engagement Rate: {'%.2f'%engagement_rate}%")
```

```
Total Interactions:  1000
Unique Customer Interactions:  1000
```

```
User Engagement Rate: 66.67%
```

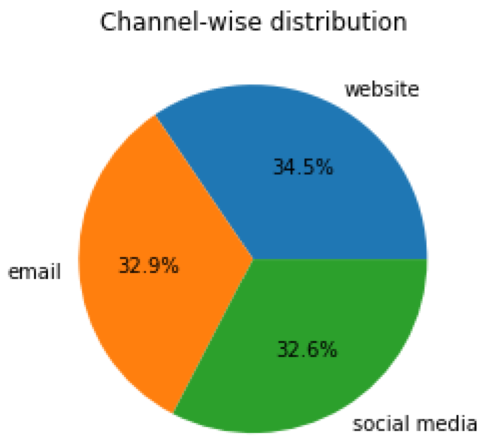
In [83]:
```
barch = plt.bar(['Actual','Target'],[unique_customer_interactions,1500], color='oran
barch[0].set_color('green')
plt.title("Actual vs Targeted User Engagement")
plt.ylabel("No. of Customers")
plt.show()
#Target hasn't been achieved in terms of expected engagement
```



In [50]:
```
#Channel-wise interaction %
channel_interactions = (user_interaction['Interaction Channel'].value_counts()/total
channel_interactions
```

Out[50]:
```
website         34.5
email           32.9
social media    32.6
Name: Interaction Channel, dtype: float64
```

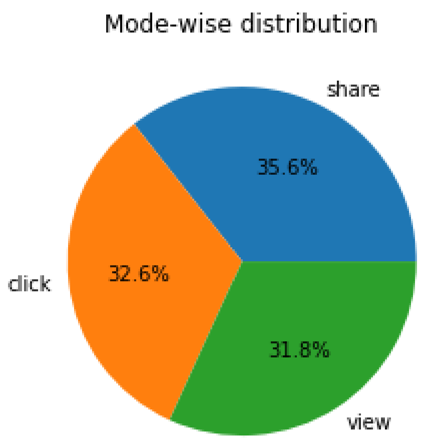
In [64]:
```
plt.pie(channel_interactions,labels=channel_interactions.index,autopct='%.1f%%')
plt.title("Channel-wise distribution")
plt.show()
```



In [65]:
```
#Mode-wise Interaction %
type_interactions = (user_interaction['Interaction Type'].value_counts()/total_inter
type_interactions
```

Out[65]:
```
share    35.6
click    32.6
view     31.8
Name: Interaction Type, dtype: float64
```

In [67]:
```
plt.pie(type_interactions,labels=type_interactions.index,autopct='%.1f%%')
plt.title("Mode-wise distribution")
plt.show()
```



Problem 2- Determine how many Users converted to Customers

In [89]:
```
#Consider the customers common in Sales and User Interaction tables
#Merge tables based on common Customer ID
cust_conversion = sales_transaction.merge(user_interaction, on='Customer ID', how='i
cust_conversion.head()
```

Out[89]:

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Interaction Date	Interactio Ty
0	1	2024-01-19	213	345	Books	295.15	7	2024-04-22	vie
1	656	2024-02-10	213	99	Toys	94.82	7	2024-04-22	vie
2	823	2024-06-24	213	362	Toys	13.47	6	2024-04-22	vie
3	1177	2024-01-15	213	89	Electronics	475.05	4	2024-04-22	vie
4	2	2024-06-11	59	134	Electronics	457.78	1	2024-04-16	vie

In [94]:
```
#Filter the customers who purchased after their interaction with the Company's campa
cust_conversion=cust_conversion[cust_conversion['Transaction Date']>=cust_conversion
#Find the number of unique customers from the filtered list - they've been converted
converted_cust = cust_conversion['Customer ID'].nunique()
print(converted_cust)
```

```
419
```

Calculate Conversion Rate

In [103…
```
e_conversion_rate = (converted_cust/unique_customer_interactions)*100
print(f"Engaged Customer Conversion Rate: {'%.1f'%e_conversion_rate} %")
#Targeted coversion rate is 35% of 1500 engaged customers
t_conversion_rate = (converted_cust/1500)*100
```

```
print(f"Conversion rate based on targeted engagement: {round(t_conversion_rate,2)} %
#We haven't achieved the expected Customer numbers who made a purchase after engagin
```

```
Engaged Customer Conversion Rate: 41.9 %
Conversion rate based on targeted engagement: 27.93 %
```

Problem 3 - Determine the impact of campaign on Sales numbers

In [105…

```
#Campaign Duration: 1 Jan,2024 - 30 Apr,2024
print(f"Earliest Sales date: {min(sales_transaction['Transaction Date'])}")
print(f"Latest Sales date: {max(sales_transaction['Transaction Date'])}")
```

```
Earliest Sales date: 2024-01-01 00:00:00
Latest Sales date: 2024-07-06 00:00:00
```

In [106…

```
sales_transaction.head()
```

Out[106…

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity
0	1	2024-01-19	213	345	Books	295.15	7
1	2	2024-06-11	59	134	Electronics	457.78	1
2	3	2024-01-10	178	89	Electronics	423.84	2
3	4	2024-05-30	359	423	Home & Kitchen	497.52	1
4	5	2024-03-21	384	139	Clothing	164.21	7

In [110…

```
#Calculate Total Sales per transaction by multiplying Sales Amount with Quantity
#Add new column Sales
sales_transaction['Sales'] = sales_transaction['Sales Amount']*sales_transaction['Qu
sales_transaction.head()
```

Out[110…

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Sales
0	1	2024-01-19	213	345	Books	295.15	7	2066.05
1	2	2024-06-11	59	134	Electronics	457.78	1	457.78
2	3	2024-01-10	178	89	Electronics	423.84	2	847.68
3	4	2024-05-30	359	423	Home & Kitchen	497.52	1	497.52
4	5	2024-03-21	384	139	Clothing	164.21	7	1149.47

In [112…

```
#Extract month from Transaction Date
sales_transaction['Month'] = sales_transaction['Transaction Date'].dt.month
sales_transaction.head()
```

Out[112…

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Sales	Month
0	1	2024-01-19	213	345	Books	295.15	7	2066.05	1
1	2	2024-06-11	59	134	Electronics	457.78	1	457.78	6
2	3	2024-01-10	178	89	Electronics	423.84	2	847.68	1

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Sales	Month
3	4	2024-05-30	359	423	Home & Kitchen	497.52	1	497.52	5
4	5	2024-03-21	384	139	Clothing	164.21	7	1149.47	3

In [119…

```
#Sales during campaign
sales_dur_camp = round(sum(sales_transaction[sales_transaction['Month']<5]['Sales'])
print(f"Sales during Campaign period: {sales_dur_camp}")
sales_after_camp = round(sum(sales_transaction[sales_transaction['Month']>=5]['Sales
print(f"Sales after Campaign period: {sales_after_camp}")
```

```
Sales during Campaign period: 1308551.48
Sales after Campaign period: 637323.82
```

In [122…

```
#Calculate the Sales Growth during campaign
sales_growth = ((sales_dur_camp - sales_after_camp)/sales_after_camp)*100
print(f"Sales growth during Campaign: {round(sales_growth,2)}%")
#Sales increased during the Campaign period
```

```
Sales growth during Campaign: 105.32%
```

Problem 4: Calculate ROI on the Campaign & compare with the previous one

In [125…

```
#Calculate ROI on the revenue generated by the campaign
#Re-utilize the Sales and Interaction merged table here
#The idea is to find ales generated from users during the campaign after they intera
cust_conversion.head()
```

Out[125…

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Interaction Date	Interactio Ty
2	823	2024-06-24	213	362	Toys	13.47	6	2024-04-22	vie
4	2	2024-06-11	59	134	Electronics	457.78	1	2024-04-16	vie
5	486	2024-06-23	59	499	Electronics	256.80	3	2024-04-16	vie
6	3	2024-01-10	178	89	Electronics	423.84	2	2024-01-02	cli
9	5	2024-03-21	384	139	Clothing	164.21	7	2024-02-15	sha

In [127…

```
#Calculate Sales for each transaction
cust_conversion["Sales"] = cust_conversion["Sales Amount"]*cust_conversion["Quantity
cust_conversion.head()
```

Out[127…

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Interaction Date	Interactio Ty
2	823	2024-06-24	213	362	Toys	13.47	6	2024-04-22	vie
4	2	2024-06-11	59	134	Electronics	457.78	1	2024-04-16	vie
5	486	2024-06-23	59	499	Electronics	256.80	3	2024-04-16	vie
6	3	2024-01-10	178	89	Electronics	423.84	2	2024-01-02	cli

	Transaction ID	Transaction Date	Customer ID	Product ID	Product Category	Sales Amount	Quantity	Interaction Date	Interactic Typ
9	5	2024-03-21	384	139	Clothing	164.21	7	2024-02-15	sha

In [144…

```
revenue_thru_camp = sum(cust_conversion[(cust_conversion['Transaction Date']>cust_co
print(f"Revenue generated through campaign: ${round(revenue_thru_camp,2)}")
print("Revenue generated through last campaign: $268000")
```

```
Revenue generated through campaign: $467310.38
Revenue generated through last campaign: $268000
```

In [149…

```
#ROI = ((Revenue - Budget)/Budget)*100
curr_camp_roi = ((revenue_thru_camp - 50000)/50000)*100
print(f"ROI on current Campaign: {round(curr_camp_roi,2)} %")
prev_camp_roi = ((268000-57000)/57000)*100
print(f"ROI on previous Campaign: {round(prev_camp_roi,2)} %")
#This Campaign has given a better return on Investments than the previous one
```

```
ROI on current Campaign: 834.62 %
ROI on previous Campaign: 370.18 %
```