In [ ]:
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Customer Lifetime Value Analysis
```

In [ ]:
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In [ ]:
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In [ ]:
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Objective :
>> Make Visualization for distribution of Customer Acquisition Cost.
>> Create Visualization for the Revenue Generated by Customers.
>> Compare the acquisition cost by various channels.
>> Calculate the total revenue generated by each channel.
>> Calculate the return of investment by each channel.
```

In [ ]:
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In [1]:
```
#Importing important libraries :

import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:
```
#Reading CSV file :

df = pd.read_csv("customer_data.csv")
df
```

Out[2]:

	customer_id	channel	cost	conversion_rate	revenue
0	1	referral	8.320327	0.123145	4199
1	2	paid advertising	30.450327	0.016341	3410
2	3	email marketing	5.246263	0.043822	3164
3	4	social media	9.546326	0.167592	1520
4	5	referral	8.320327	0.123145	2419
...	...	...	...	...	...
795	796	social media	9.546326	0.167592	2813
796	797	email marketing	5.246263	0.043822	3439
797	798	social media	9.546326	0.167592	2101
798	799	paid advertising	30.450327	0.016341	813
799	800	email marketing	5.246263	0.043822	4820

800 rows × 5 columns

In [3]:
```
#Top 5 values :

df.head(5)
```

Out[3]:

	customer_id	channel	cost	conversion_rate	revenue
0	1	referral	8.320327	0.123145	4199
1	2	paid advertising	30.450327	0.016341	3410
2	3	email marketing	5.246263	0.043822	3164
3	4	social media	9.546326	0.167592	1520
4	5	referral	8.320327	0.123145	2419

In [4]:
```
#Bottom 5 values :

df.tail(5)
```

Out[4]:

	customer_id	channel	cost	conversion_rate	revenue
795	796	social media	9.546326	0.167592	2813
796	797	email marketing	5.246263	0.043822	3439
797	798	social media	9.546326	0.167592	2101
798	799	paid advertising	30.450327	0.016341	813
799	800	email marketing	5.246263	0.043822	4820

In [5]:
```
#Checking number of rows and columns :

df.shape
```

Out[5]:
```
(800, 5)
```

In [6]:
```
#Checking Null Values :

df.isna()
```

Out[6]:

	customer_id	channel	cost	conversion_rate	revenue
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...	...	...	...	...	...
795	False	False	False	False	False
796	False	False	False	False	False
797	False	False	False	False	False
798	False	False	False	False	False
799	False	False	False	False	False

800 rows × 5 columns

In [7]:
```
#Sum of all null values :

df.isna().sum()
```

Out[7]:
```
customer_id        0
channel            0
cost               0
conversion_rate    0
revenue            0
dtype: int64
```

In [8]:
```
#Statistical description of columns having numbers :

df.describe()
```

Out[8]:

	customer_id	cost	conversion_rate	revenue
count	800.0000	800.000000	800.000000	800.000000
mean	400.5000	13.148052	0.086305	2769.151250
std	231.0844	9.922337	0.059611	1259.543706
min	1.0000	5.246263	0.016341	500.000000
25%	200.7500	5.246263	0.043822	1694.000000
50%	400.5000	8.320327	0.043822	2764.000000
75%	600.2500	9.546326	0.123145	3824.250000
max	800.0000	30.450327	0.167592	4998.000000

In [9]:
```
#Checking Unique values in channel column :

channel_type = df['channel'].unique()
channel_type
```

Out[9]:
```
array(['referral', 'paid advertising', 'email marketing', 'social media'],
      dtype=object)
```

In [10]:
```
#Number of Unique values in channel column :

channel_type_number = df['channel'].nunique()
print("The Number of Channel are : ",channel_type_number)
```

```
The Number of Channel are :  4
```

In [11]:
```
#Counts of each channel type :

channel_counts = df['channel'].value_counts()
channel_counts
```

Out[11]:
```
email marketing     214
referral            207
paid advertising    194
social media        185
Name: channel, dtype: int64
```

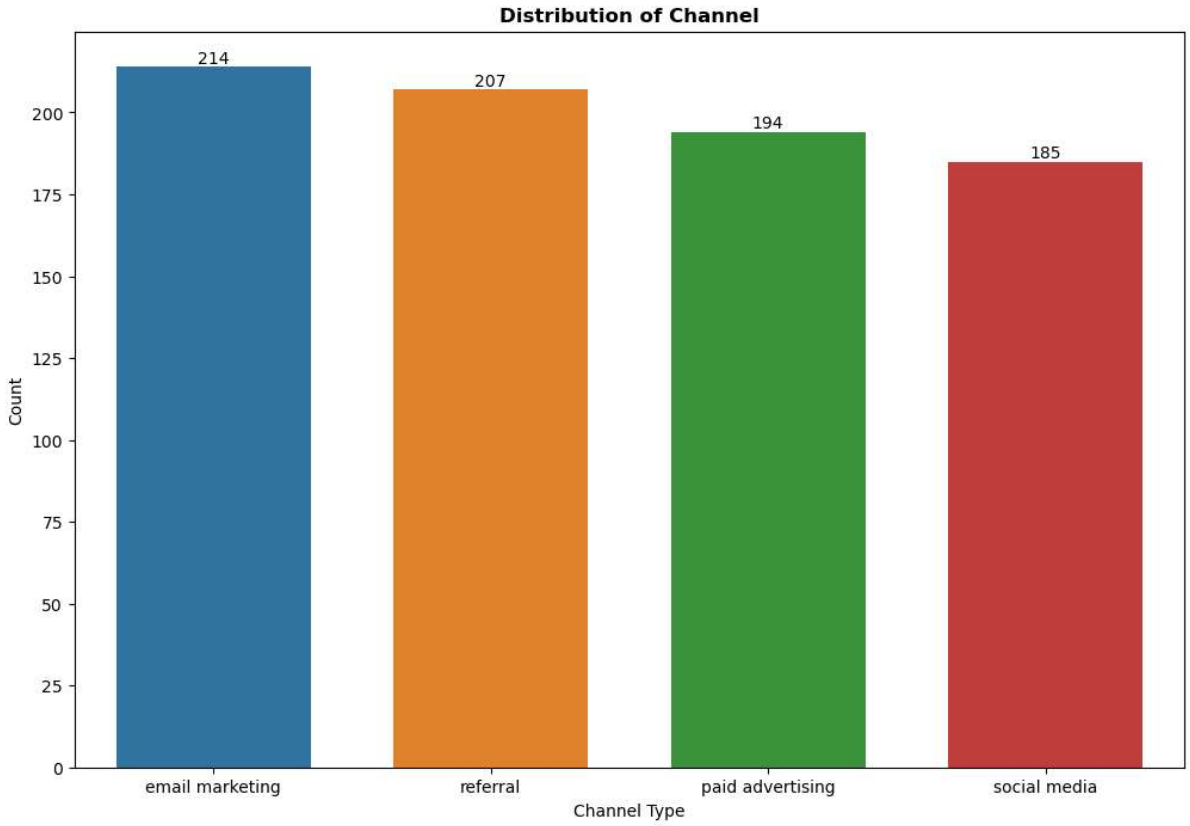
In [12]:
```
# Set the figure size
plt.figure(figsize=(12, 8))

# Create a bar plot using Seaborn
ax = sns.barplot(x = channel_counts.index , y = channel_counts.values, width = 0.7)

for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Channel Type")
plt.ylabel("Count")
plt.title("Distribution of Channel", fontweight = 'bold')

plt.show()
```



In [ ]:
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Conclusion :
    The highest distribution is observed in Email marketing.
```

In [ ]:
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In [13]:
```
cost_count = df['cost'].value_counts()
cost_count
```

Out[13]:
```
5.246263     214
8.320327     207
30.450327    194
9.546326     185
Name: cost, dtype: int64
```

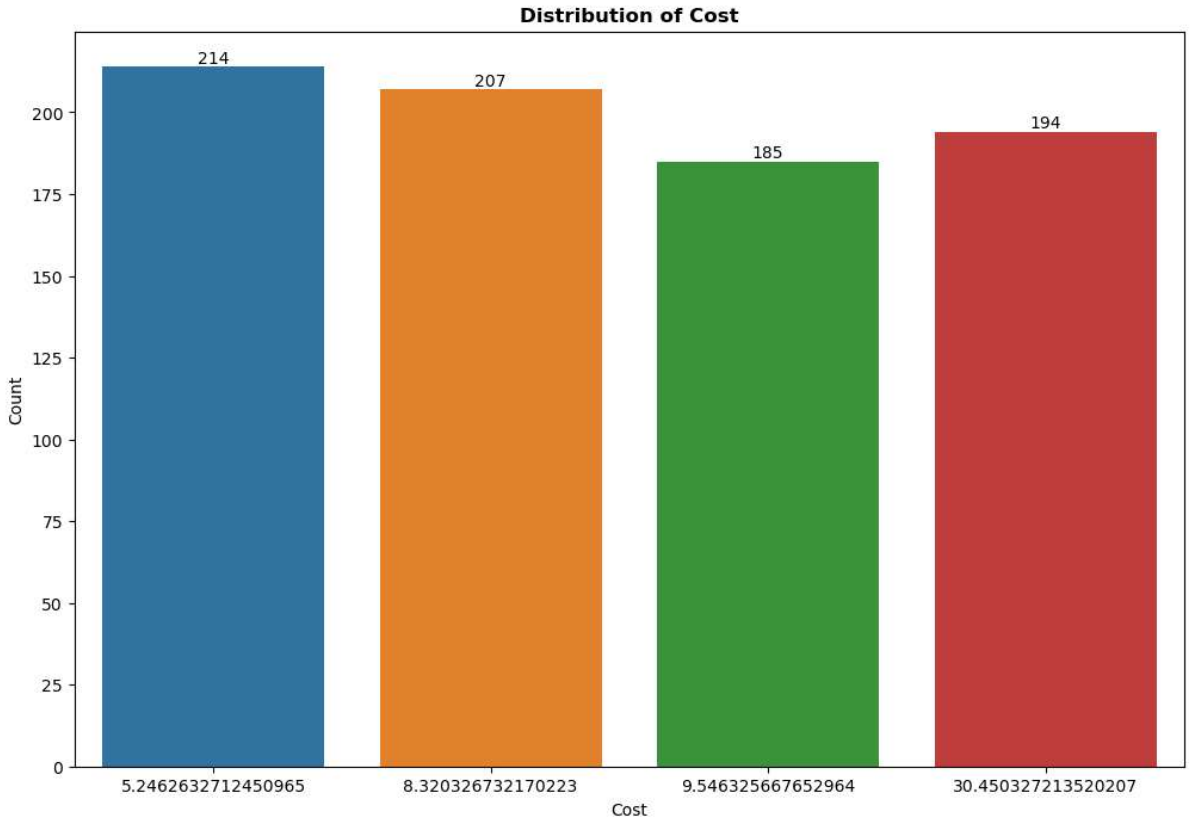
In [14]:
```
# Set the figure size
plt.figure(figsize=(12, 8))

# Create a bar plot using Seaborn
ax = sns.barplot(x = cost_count.index, y = cost_count.values)


for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Cost")
plt.ylabel("Count")
plt.title("Distribution of Cost", fontweight = 'bold')
```

```
plt.show()
```

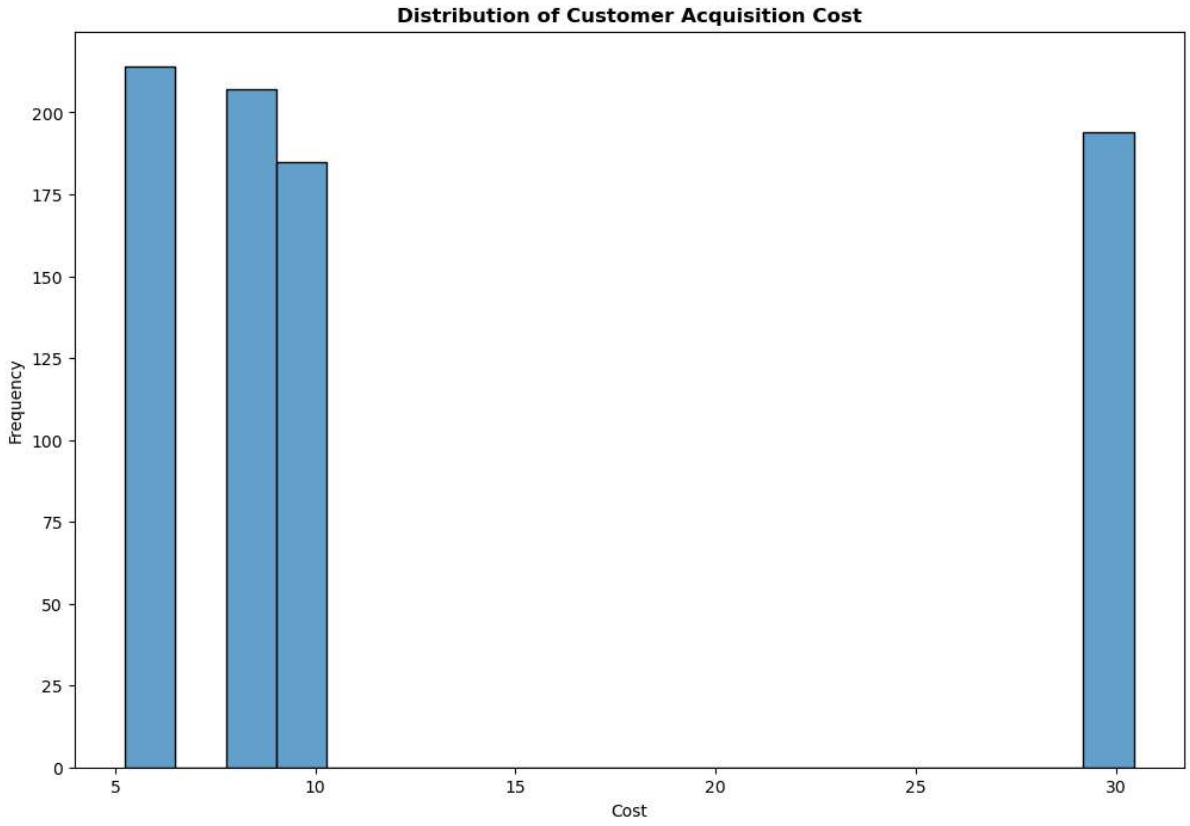


In [ ]:

In [ ]:
```
#Customer Acquisition Cost
```

In [15]:
```
plt.figure(figsize=(12,8))

sns.histplot(df['cost'], bins=20, kde=False, alpha=0.7)
plt.title('Distribution of Customer Acquisition Cost', fontweight = 'bold')
plt.xlabel('Cost')
plt.ylabel('Frequency')
plt.show()
```



In [ ]:

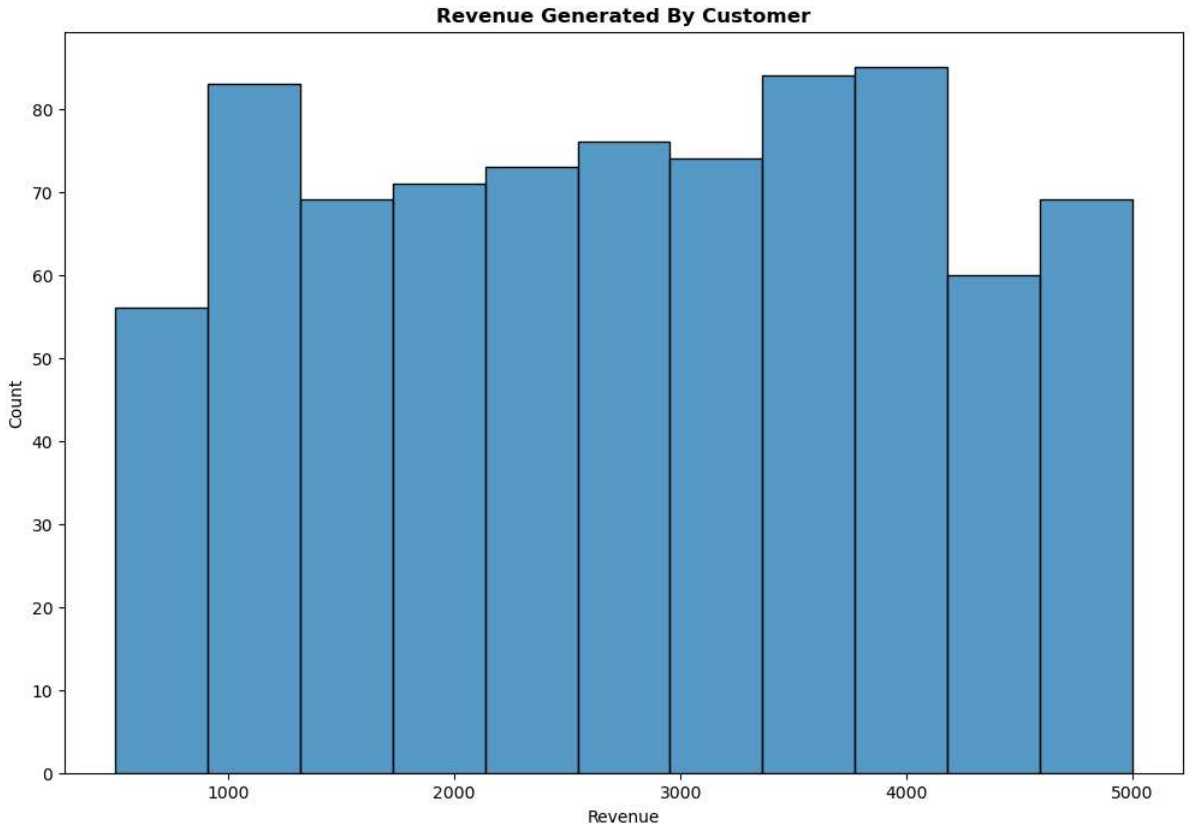
In [ ]:
```
#Revenue Generation
```

In [16]:
```
revenue_count = df['revenue'].value_counts()
revenue_count
```

Out[16]:
```
1303    3
2949    3
3436    3
4947    3
3326    3
       ..
3377    1
1171    1
4155    1
3175    1
2101    1
Name: revenue, Length: 722, dtype: int64
```

In [17]:
```
plt.figure(figsize=(12,8))

sns.histplot(df['revenue'])
plt.title('Revenue Generated By Customer', fontweight = 'bold')
plt.xlabel('Revenue')
plt.ylabel('Count')
plt.show()
```



In [ ]:
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Conclusion :
    The peak revenue is attained within the range of 3000 to 4000.
```

In [ ]:
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In [ ]:
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#Cost of Aquisition by Channel
```

In [18]:
```
cost_channel = df.groupby('channel')['cost'].mean()
cost_channel
```

Out[18]:
```
channel
email marketing      5.246263
paid advertising    30.450327
referral             8.320327
social media         9.546326
Name: cost, dtype: float64
```

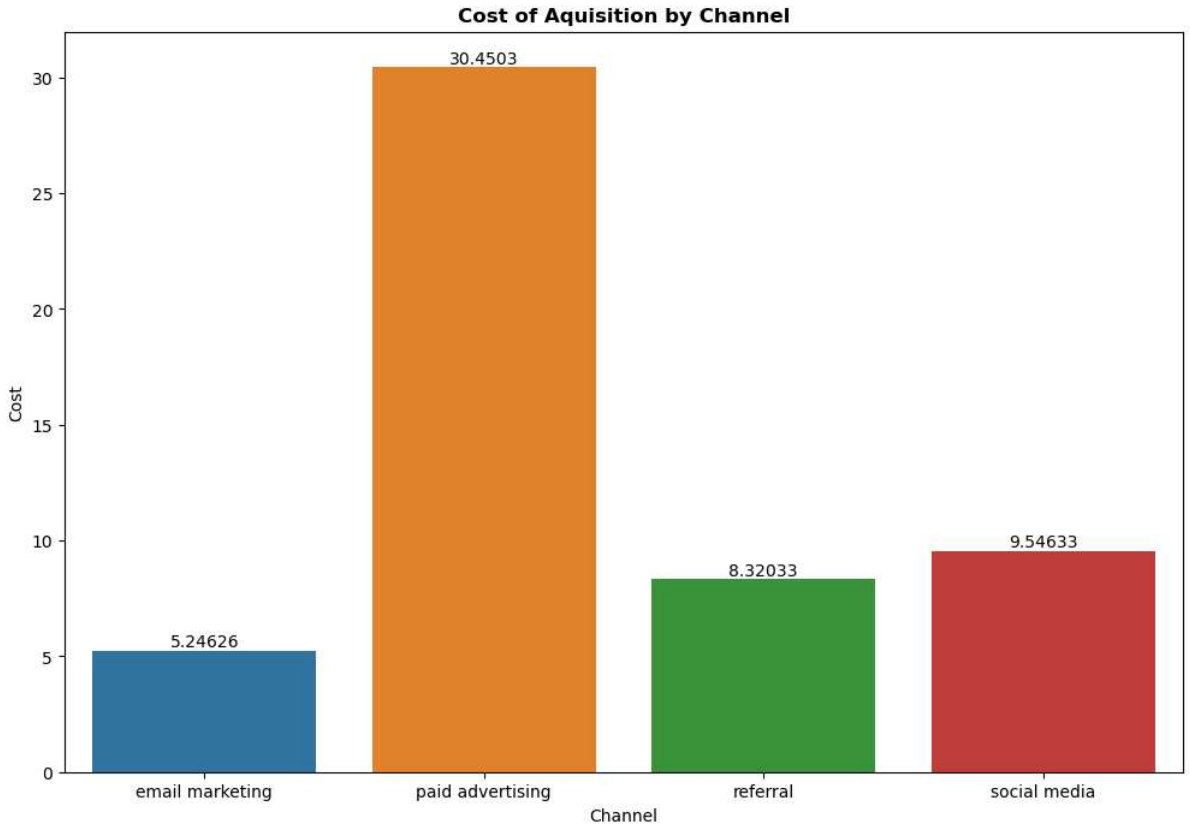
In [39]:
```
# Set the figure size
plt.figure(figsize=(12, 8))

ax = sns.barplot(x = cost_channel.index, y = cost_channel.values)

for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Channel")
plt.ylabel("Cost")
plt.title("Cost of Aquisition by Channel", fontweight = 'bold')
```

```
plt.show()
```



In [ ]:
```
Conclusion :
    Acquisition through paid advertising incurs the highest potential cost.
```

In [ ]:
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In [ ]:
```
#Revenue Generated By Channels
```

In [20]:
```
channnel_revenue = df.groupby('channel')['revenue'].sum()
channnel_revenue
```

Out[20]:
```
channel
email marketing     604706
paid advertising    548396
referral            569552
social media        492667
Name: revenue, dtype: int64
```

In [21]:
```
# Set the figure size
plt.figure(figsize=(12, 8))

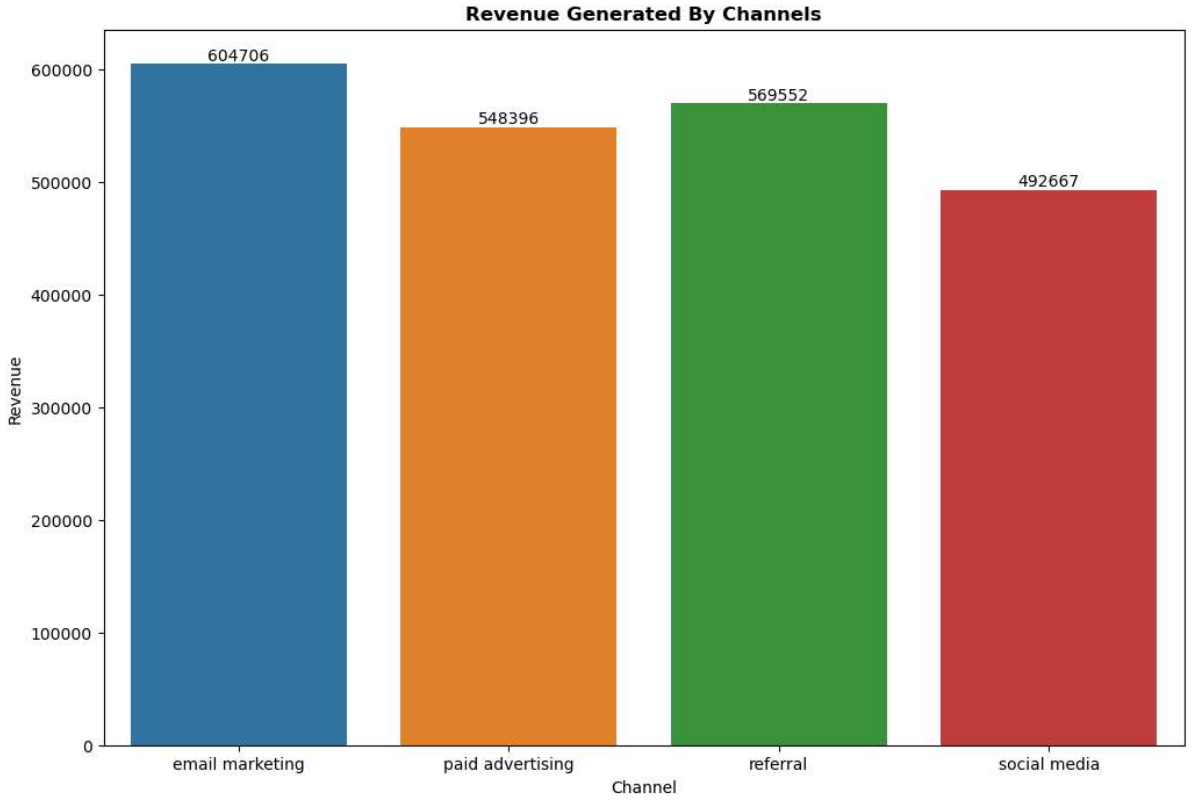
ax = sns.barplot(x = channnel_revenue.index, y = channnel_revenue.values)

for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Channel")
```

```
plt.ylabel("Revenue")
plt.title("Revenue Generated By Channels", fontweight = 'bold')

plt.show()
```



In [29]:
```
labels = channnel_revenue.index
counts = channnel_revenue.values



fig, ax = plt.subplots(figsize=(10, 10))  # Adjust the width and height as needed

# Create a simple pie chart
ax.pie(counts, labels=labels, autopct="%0.0f%%", startangle=90, pctdistance=0.87)

# Equal aspect ratio ensures that the pie is drawn as a circle.
ax.axis('equal')

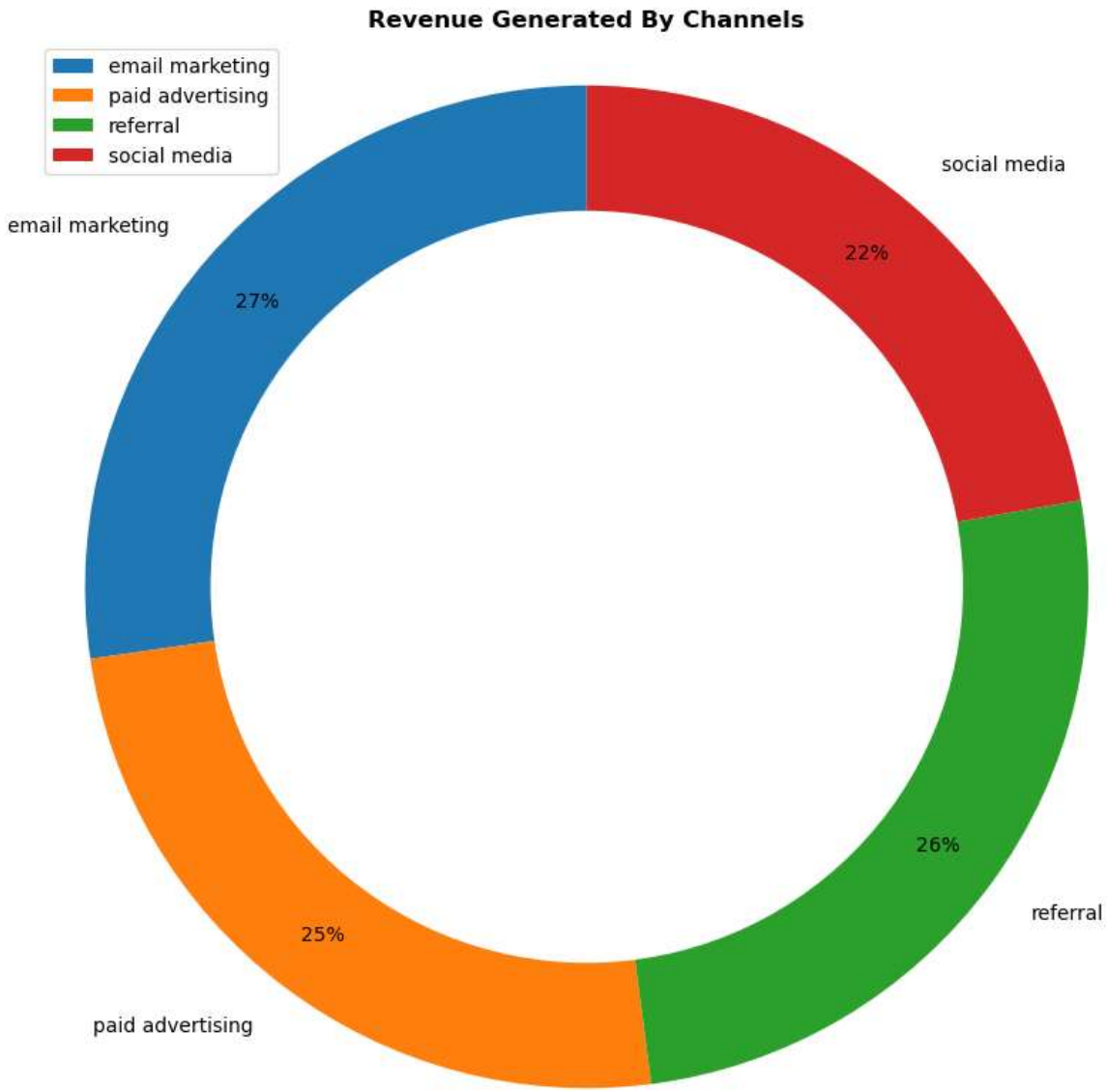
# Add a legend
ax.legend(labels, loc="upper left")

# Add a title
plt.title("Revenue Generated By Channels", fontweight = 'bold')

# Hole - a white-colored circle of radius 0.75
hole = plt.Circle((0, 0), 0.75, facecolor='white')

plt.gcf().gca().add_artist(hole)

# Display the plot
plt.show()
```



In [ ]:
```
Conclusion :
    Email marketing stands as the unrivaled champion in generating maximum revenue.
```

In [ ]:
```
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In [ ]:
```
#Customer Conversion_Rate By Cahnnel
```

In [24]:
```
conversion = df.groupby('channel')['conversion_rate'].mean()
conversion
```

Out[24]:
```
channel
email marketing     0.043822
paid advertising    0.016341
referral            0.123145
social media        0.167592
Name: conversion_rate, dtype: float64
```

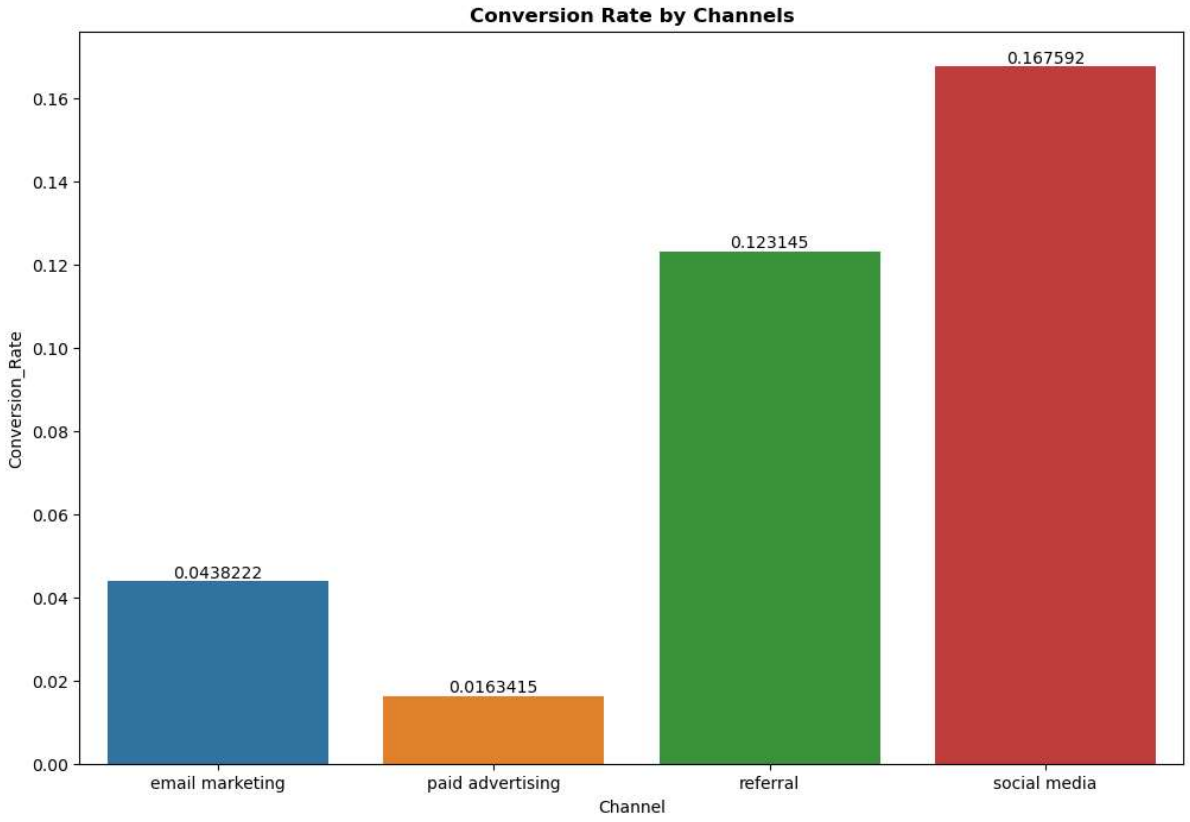
In [26]:
```
# Set the figure size
plt.figure(figsize=(12, 8))
```

```
ax = sns.barplot(x = conversion.index, y = conversion.values)

for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Channel")
plt.ylabel("Conversion_Rate")
plt.title("Conversion Rate by Channels", fontweight = 'bold')

plt.show()
```



In [ ]:
```
Conclusion :
    The channel that exhibits the highest customer conversion rate is social media.
```

In [ ]:
```

```

In [ ]:
```
#Return of Investment by Channels:
```

In [31]:
```
#Return of Investment (ROI)

df['roi'] = df['revenue']/df['cost']
roi
```

Out[31]:
```
0      504.667681
1      111.985660
2      603.095925
3      159.223564
4      290.733775
          ...
795    294.668347
796    655.514186
797    220.084677
798     26.699220
799    918.749165
Length: 800, dtype: float64
```

In [35]:
```
roi_by_channel = df.groupby('channel')['roi'].mean()
roi_by_channel
```

Out[35]:
```
channel
email marketing     538.617455
paid advertising     92.832615
referral            330.691213
social media        278.962290
Name: roi, dtype: float64
```

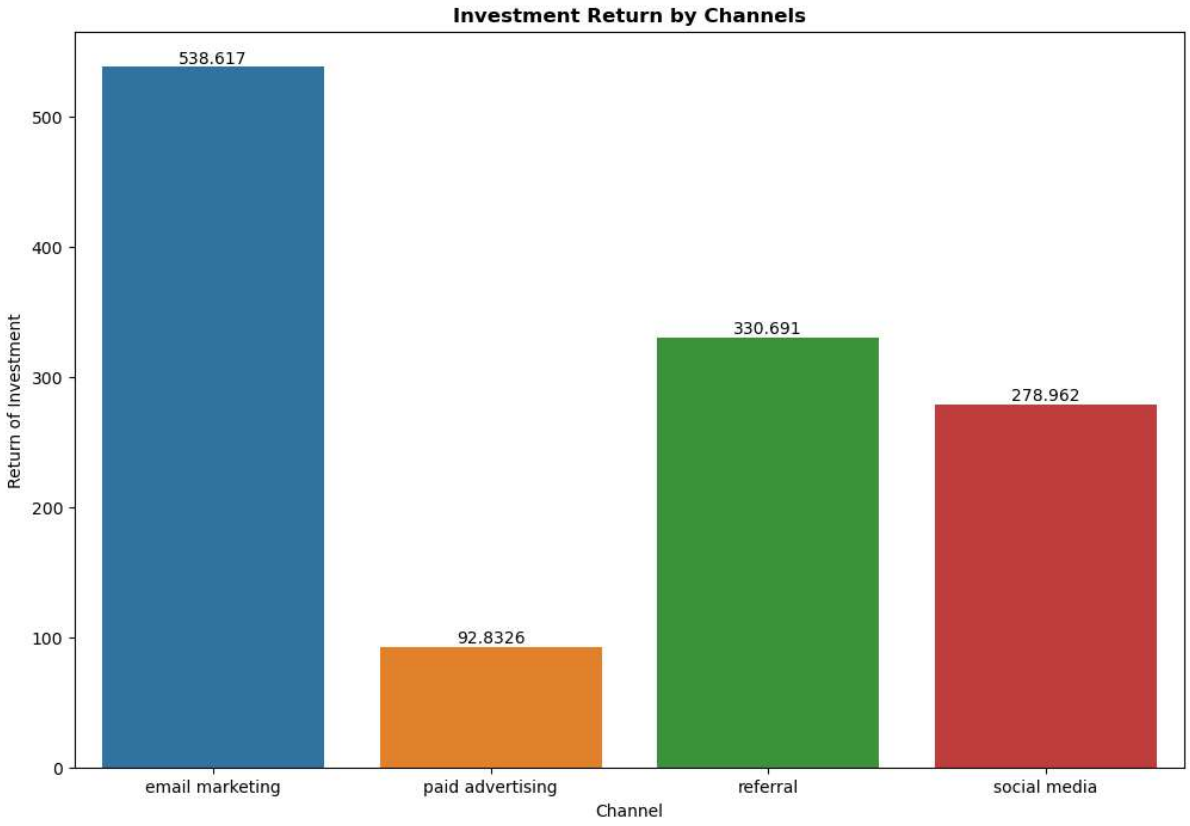
In [38]:
```
# Set the figure size
plt.figure(figsize=(12, 8))

ax = sns.barplot(x = roi_by_channel.index, y = roi_by_channel.values)

for bars in ax.containers:
    ax.bar_label(bars)

# Set labels and title
plt.xlabel("Channel")
plt.ylabel("Return of Investment")
plt.title("Investment Return by Channels", fontweight = 'bold')

plt.show()
```



In [ ]:
```
Conclusion :
    The email marketing channel boasts the highest Return on Investment (ROI).
```