Problem Statement

Problem Statement Sales management has gained importance to meet increasing competition and the need for improved methods of distribution to reduce cost and to increase profits. Sales management today is the most important function in a commercial and business enterprise.

Do ETL : Extract-Transform-Load some Amazon dataset and find for me Sales-trend -> month wise , year wise , yearly_month wise

In [294]:

```
#Importing Libraries

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

In [295]:

```
# Importing Data set

sales_data=pd.read_csv("Downloads\\Amazon_Sales.csv")

```

In [296]:

```
# Checking the records in the dataset by using head command
sales_data.head()
```

Out[296]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Order ID	Ship Date	Units Sold	Unit Price	Un Cos
0	Australia and Oceania	Tuvalu	Baby Food	Offline	H	5/28/2010	669165933	6/27/2010	9925	255.28	159.4
1	Central America and the Caribbean	Grenada	Cereal	Online	C	8/22/2012	963881480	9/15/2012	2804	205.70	117.1
2	Europe	Russia	Office Supplies	Offline	L	5/2/2014	341417157	5/8/2014	1779	651.21	524.9
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	C	6/20/2014	514321792	7/5/2014	8102	9.33	6.9
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	L	2/1/2013	115456712	2/6/2013	5062	651.21	524.9

In [297]:

```
#Describe the different data types and if there is any NAN values in the given d
sales_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 14 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Region          100 non-null    object
 1   Country         100 non-null    object
 2   Item Type       100 non-null    object
 3   Sales Channel   100 non-null    object
 4   Order Priority  100 non-null    object
 5   Order Date      100 non-null    object
 6   Order ID        100 non-null    int64
 7   Ship Date       100 non-null    object
 8   Units Sold      100 non-null    int64
 9   Unit Price      100 non-null    float64
 10  Unit Cost       100 non-null    float64
 11  Total Revenue   100 non-null    float64
 12  Total Cost      100 non-null    float64
 13  Total Profit    100 non-null    float64
dtypes: float64(5), int64(2), object(7)
memory usage: 11.1+ KB
```

Data Cleaning and Manipulation

In [298]:

```
# Dropping column Order Id

sales_data.drop(['Order ID'],axis = 1, inplace = True )
```

In [299]:

```
sales_data.head()
```

Out[299]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Tot Revenu
0	Australia and Oceania	Tuvalu	Baby Food	Offline	H	5/28/2010	6/27/2010	9925	255.28	159.42	2533654.(
1	Central America and the Caribbean	Grenada	Cereal	Online	C	8/22/2012	9/15/2012	2804	205.70	117.11	576782.8
2	Europe	Russia	Office Supplies	Offline	L	5/2/2014	5/8/2014	1779	651.21	524.96	1158502.5
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	C	6/20/2014	7/5/2014	8102	9.33	6.92	75591.6
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	L	2/1/2013	2/6/2013	5062	651.21	524.96	3296425.(

In [300]:
```
# Checking size if the Order Id column has been deleted or not
sales_data.shape
```

Out[300]: (100, 13)

```
# We have two time related columns Order Date & Ship Date. We will first convert
these column to datatime data type of pandas.
```

In [301]:
```
sales_data['Order Date'] = pd.to_datetime(sales_data['Order Date'])
sales_data['Ship Date'] = pd.to_datetime(sales_data['Ship Date'])
```

In [302]:
```
#Checking data
sales_data.head()
```

Out[302]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	To
0	Australia and Oceania	Tuvalu	Baby Food	Offline	H	2010-05-28	2010-06-27	9925	255.28	159.42	2533654.00	158
1	Central America and the Caribbean	Grenada	Cereal	Online	C	2012-08-22	2012-09-15	2804	205.70	117.11	576782.80	32
2	Europe	Russia	Office Supplies	Offline	L	2014-05-02	2014-05-08	1779	651.21	524.96	1158502.59	93
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	C	2014-06-20	2014-07-05	8102	9.33	6.92	75591.66	5
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	L	2013-02-01	2013-02-06	5062	651.21	524.96	3296425.02	265

In [303]:

```
sales_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   Region          100 non-null    object
 1   Country         100 non-null    object
 2   Item Type       100 non-null    object
 3   Sales Channel   100 non-null    object
 4   Order Priority  100 non-null    object
 5   Order Date      100 non-null    datetime64[ns]
 6   Ship Date       100 non-null    datetime64[ns]
 7   Units Sold      100 non-null    int64
 8   Unit Price      100 non-null    float64
 9   Unit Cost       100 non-null    float64
 10  Total Revenue   100 non-null    float64
 11  Total Cost      100 non-null    float64
 12  Total Profit    100 non-null    float64
dtypes: datetime64[ns](2), float64(5), int64(1), object(5)
memory usage: 10.3+ KB
```

In [304]:

```
#We will create new features from these ship day name & Shipping duration
# Create 'Shipping duration' column using np.timedelta64(1,'D')
sales_data['Shipping duration'] = (sales_data['Ship Date'] - sales_data['Order D

# create 'Ship day' column using 'Ship Date' column using day_name()
sales_data['Ship day'] = sales_data['Ship Date'].dt.day_name()

```

In [305]:

```
#Checking records
print(sales_data.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 15 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Region             100 non-null    object
 1   Country            100 non-null    object
 2   Item Type          100 non-null    object
 3   Sales Channel      100 non-null    object
 4   Order Priority     100 non-null    object
 5   Order Date         100 non-null    datetime64[ns]
 6   Ship Date          100 non-null    datetime64[ns]
 7   Units Sold         100 non-null    int64
 8   Unit Price         100 non-null    float64
 9   Unit Cost          100 non-null    float64
 10  Total Revenue      100 non-null    float64
 11  Total Cost         100 non-null    float64
 12  Total Profit       100 non-null    float64
 13  Shipping duration  100 non-null    float64
 14  Ship day           100 non-null    object
dtypes: datetime64[ns](2), float64(6), int64(1), object(6)
memory usage: 11.8+ KB
None
```

In [306]:

```
# Checking missing values for each column - use .isnull().sum
sales_data.isnull().sum()
```

Out[306]:

```
Region               0
Country              0
Item Type            0
Sales Channel        0
Order Priority       0
Order Date           0
Ship Date            0
Units Sold           0
Unit Price           0
Unit Cost            0
Total Revenue        0
Total Cost           0
Total Profit         0
Shipping duration    0
Ship day             0
dtype: int64
```

From the table we observe that we have no missing values

In [307]:

```
#We have 'Order Priority' column given in terms of letters H, C, L, M
#Assuming H - High, C - Critical, L - Low, M- Medium priorities changing it to u
# defining a function for this

def ord_pri(x):
    if x=='H':
        return 'High'
    elif x=='C':
        return 'Critical'
    elif x=='L':
        return 'Low'
    elif x=='M':
        return 'Medium'

```

In [308]:

```
# use .apply to the order priority column to apply the function created

sales_data['Order Priority'] = sales_data['Order Priority'].apply(ord_pri)

```

In [309]:
```
sales_data.head()
```

Out[309]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	To
0	Australia and Oceania	Tuvalu	Baby Food	Offline	High	2010-05-28	2010-06-27	9925	255.28	159.42	2533654.00	158
1	Central America and the Caribbean	Grenada	Cereal	Online	Critical	2012-08-22	2012-09-15	2804	205.70	117.11	576782.80	32
2	Europe	Russia	Office Supplies	Offline	Low	2014-05-02	2014-05-08	1779	651.21	524.96	1158502.59	93
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	Critical	2014-06-20	2014-07-05	8102	9.33	6.92	75591.66	5
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	Low	2013-02-01	2013-02-06	5062	651.21	524.96	3296425.02	265

In [310]:
```
# saving it as new file, cleaned csv file in the same folder

sales_data.to_csv("Downloads\\Amazon_New_Sales.csv",index = False)
```

Data Analysis & Visualisation

In [311]:
```
sales_data=pd.read_csv("Downloads\\Amazon_New_Sales.csv")
```

In [312]:
```
sales_data.head()
```

Out[312]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	To
0	Australia and Oceania	Tuvalu	Baby Food	Offline	High	2010-05-28	2010-06-27	9925	255.28	159.42	2533654.00	158
1	Central America and the Caribbean	Grenada	Cereal	Online	Critical	2012-08-22	2012-09-15	2804	205.70	117.11	576782.80	32
2	Europe	Russia	Office Supplies	Offline	Low	2014-05-02	2014-05-08	1779	651.21	524.96	1158502.59	93
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	Critical	2014-06-20	2014-07-05	8102	9.33	6.92	75591.66	5
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	Low	2013-02-01	2013-02-06	5062	651.21	524.96	3296425.02	265

In [313]:
```
#According to given problem statement we need to find out the Sales-trend -> mor
#find key metrics and factors and to show the meaningful relationships between c

#Univariate Analysis

```

CONTINUOUS VARIABLE DISTRIBUTION

In [314]:
```
ce,Unit Cost, Total Revenue ,Total Cost , Total Profit , Unit Price , Units Sold , S
s_var = ['Unit Price','Unit Cost','Total Revenue','Total Cost','Total Profit','Unit
```

In [315]:
```
sales_data[continuous_var].head()
```

Out[315]:

	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	Unit Price	Units Sold	Shipping duration
0	255.28	159.42	2533654.00	1582243.50	951410.50	255.28	9925	30.0
1	205.70	117.11	576782.80	328376.44	248406.36	205.70	2804	24.0
2	651.21	524.96	1158502.59	933903.84	224598.75	651.21	1779	6.0
3	9.33	6.92	75591.66	56065.84	19525.82	9.33	8102	15.0
4	651.21	524.96	3296425.02	2657347.52	639077.50	651.21	5062	5.0

In [316]:

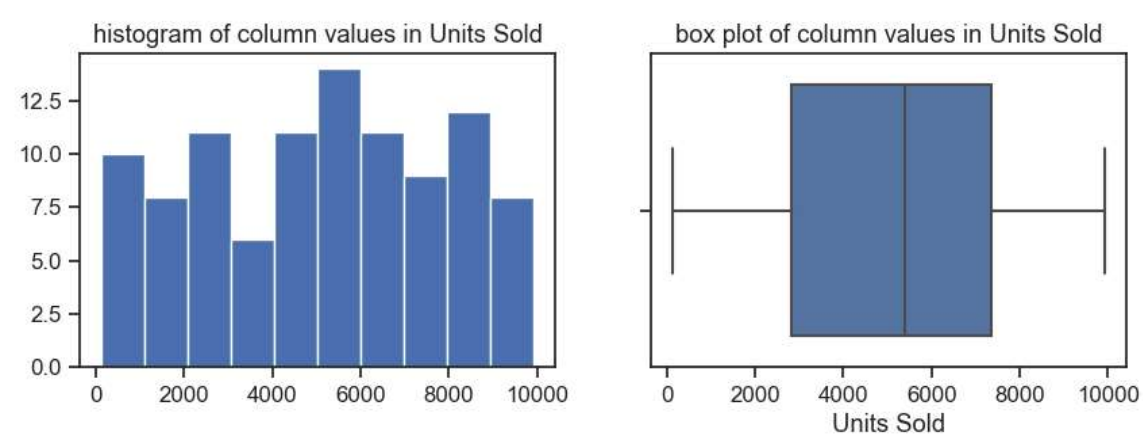
```
#For statistical value
sales_data[continuous_var].describe()
```

Out[316]:

	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	Unit Price	Units Sold	S
count	100.000000	100.000000	1.000000e+02	1.000000e+02	1.000000e+02	100.000000	100.000000	100
mean	276.761300	191.048000	1.373488e+06	9.318057e+05	4.416820e+05	276.761300	5128.710000	23
std	235.592241	188.208181	1.460029e+06	1.083938e+06	4.385379e+05	235.592241	2794.484562	14
min	9.330000	6.920000	4.870260e+03	3.612240e+03	1.258020e+03	9.330000	124.000000	0
25%	81.730000	35.840000	2.687212e+05	1.688680e+05	1.214436e+05	81.730000	2836.250000	9
50%	179.880000	107.275000	7.523144e+05	3.635664e+05	2.907680e+05	179.880000	5382.500000	23
75%	437.200000	263.330000	2.212045e+06	1.613870e+06	6.358288e+05	437.200000	7369.000000	36
max	668.270000	524.960000	5.997055e+06	4.509794e+06	1.719922e+06	668.270000	9925.000000	50

In [317]:

```
# for loop for continuous_columns variable
# Plotting all the variables at once so as to compare
for feature in continuous_var:
    import warnings  #to ignore warnings
    warnings.filterwarnings('ignore')
 # We created two variables, plot and ax
    plot,ax = plt.subplots(1,2,figsize=(10,3))

    ax[0].hist(sales_data[feature])
    ax[0].set_title('histogram of column values in '+feature)
    sns.boxplot(sales_data[feature],ax=ax[1])
# using ax.set_title for box plot
    ax[1].set_title('box plot of column values in '+feature)
# seaborn style setting
    sns.set(style='ticks', palette='deep', font_scale=1.1)
# matplotlib command for displaying plots
    plt.show()
```



CATEGORICAL VARIABLE DISTRIBUTION

In [318]:
```
#Following columns are categorical in nature:Order Date , Ship Date , Ship day n
categorial_var = ['Order Date', 'Ship Date','Ship day name','Region','Country',
```

In [319]:
```
#To know records of sales channel
sales_data['Sales Channel'].value_counts()
# Both channels are equally used
```

Out[319]:
```
Offline    50
Online     50
Name: Sales Channel, dtype: int64
```

In [320]:
```
# Finding the counts of different item types by creating a data frame

Items = sales_data['Item Type'].value_counts().reset_index()

Items

```

Out[320]:

	index	Item Type
0	Clothes	13
1	Cosmetics	13
2	Office Supplies	12
3	Fruits	10
4	Personal Care	10
5	Household	9
6	Beverages	8
7	Baby Food	7
8	Cereal	7
9	Vegetables	6
10	Snacks	3
11	Meat	2

In [321]:

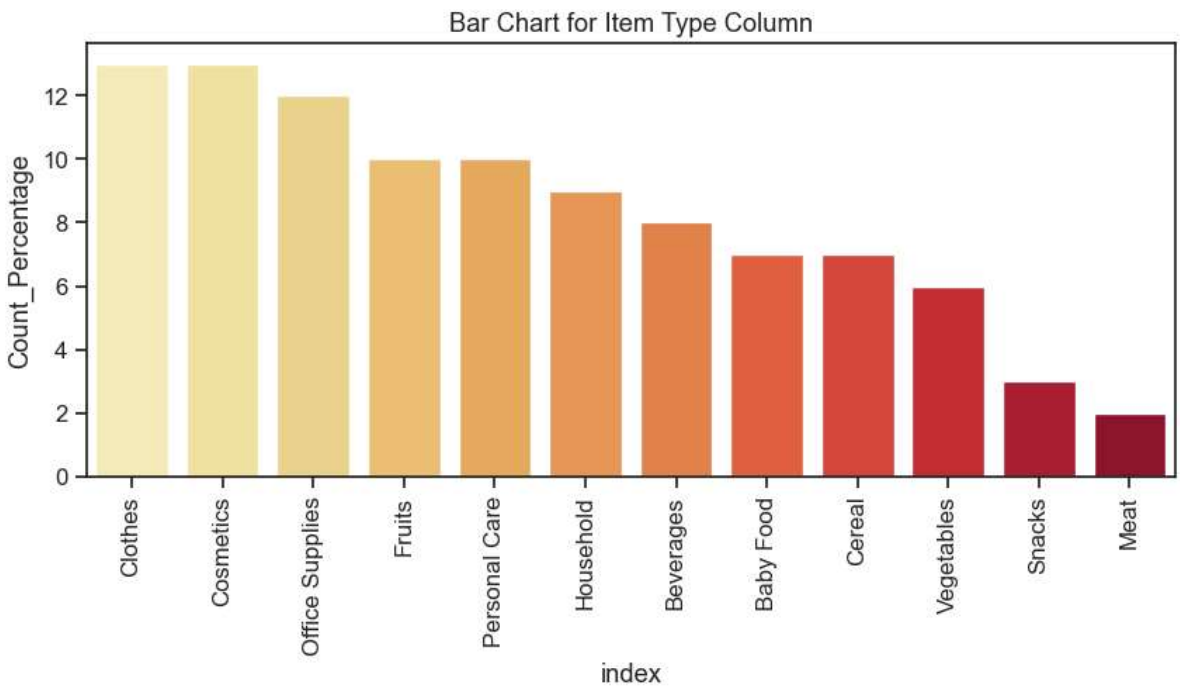
```
#count% for comparison - create count_percent col

Items['Count_Percentage'] = (Items['Item Type']/sales_data.shape[0])*100

# print the data frame
Items
```

Out[321]:

	index	Item Type	Count_Percentage
0	Clothes	13	13.0
1	Cosmetics	13	13.0
2	Office Supplies	12	12.0
3	Fruits	10	10.0
4	Personal Care	10	10.0
5	Household	9	9.0
6	Beverages	8	8.0
7	Baby Food	7	7.0
8	Cereal	7	7.0
9	Vegetables	6	6.0
10	Snacks	3	3.0
11	Meat	2	2.0

In [322]:

```
# first step is to create plot, ax object using plt.subplots (creating environme

plot1,ax = plt.subplots(figsize=(10,4))

#  plotting the bar graph with index x & y

sns.barplot(x = 'index', y = 'Count_Percentage', data = Items, ax = ax,palette=

plt.xticks(rotation=90)  # to change index vertically

ax.set_title('Bar Chart for Item Type Column')   # changing the title of graph

#  set up seaborn style setting

sns.set()

# use plt.show() for showing the plots

plt.show()
```



In [323]:

```
##From above graph it can be seen that most of the categories land on clothes ,
```

In [324]:

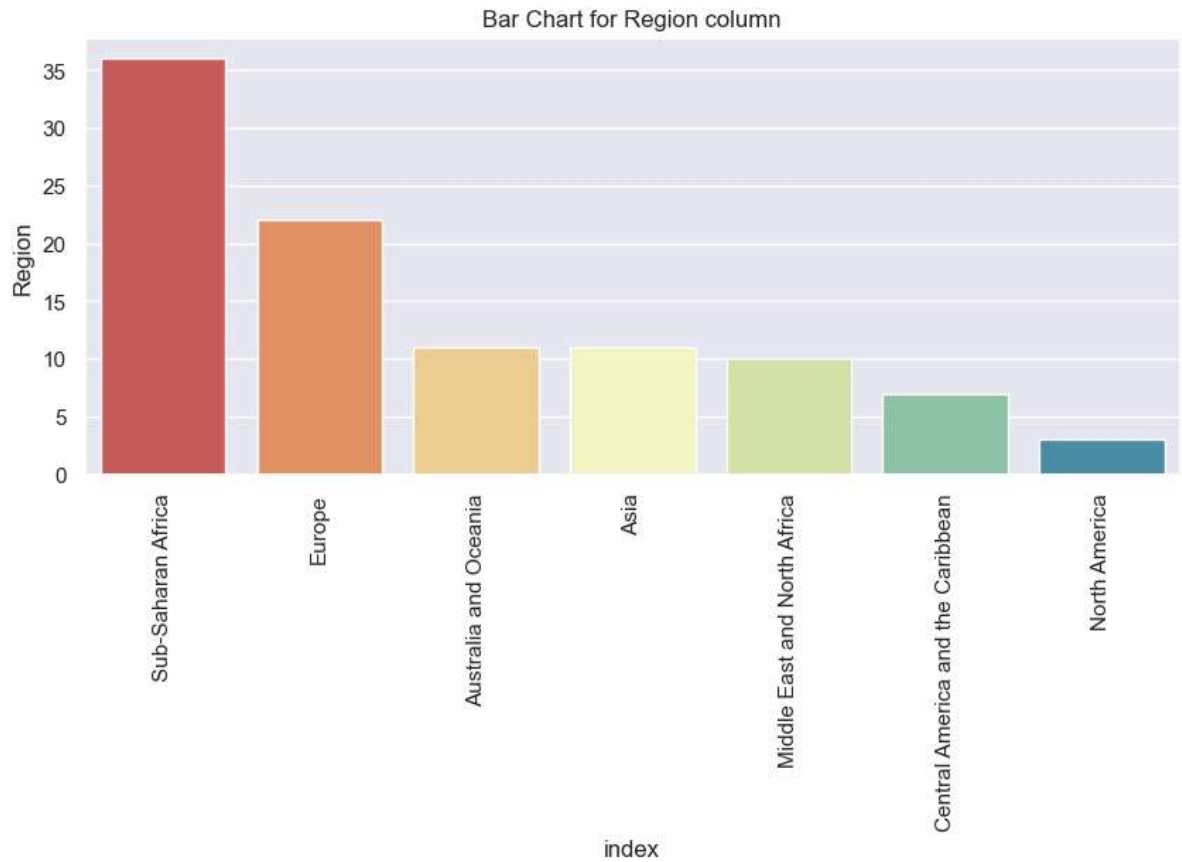
```
# counts of different regions

Country_counts = sales_data['Region'].value_counts().reset_index()

# print the dataframe formed

Country_counts
```

Out[324]:

	index	Region
0	Sub-Saharan Africa	36
1	Europe	22
2	Australia and Oceania	11
3	Asia	11
4	Middle East and North Africa	10
5	Central America and the Caribbean	7
6	North America	3

In [325]:

```
#  create plot, ax object using plt.subplots

plot2,ax = plt.subplots(figsize=(10,4))

#  sns.barplot for plotting bar graphs

sns.barplot(x = 'index', y = 'Region', data = Country_counts, ax = ax , palette=
plt.xticks(rotation=90)

#  just set the title as ax.set_title()

ax.set_title('Bar Chart for Region column')

#set up seaborn style setting

sns.set()

#  plt.show() for showing the plots

plt.show()
```



We can see that most of the orders are from Sub-Sahara Africa , Europe and Australia & Oceania Regions

In [326]:

```
#counts of different countrys

Countries_counts = sales_data['Country'].value_counts().reset_index()

# print the dataframe formed

Countries_counts
```

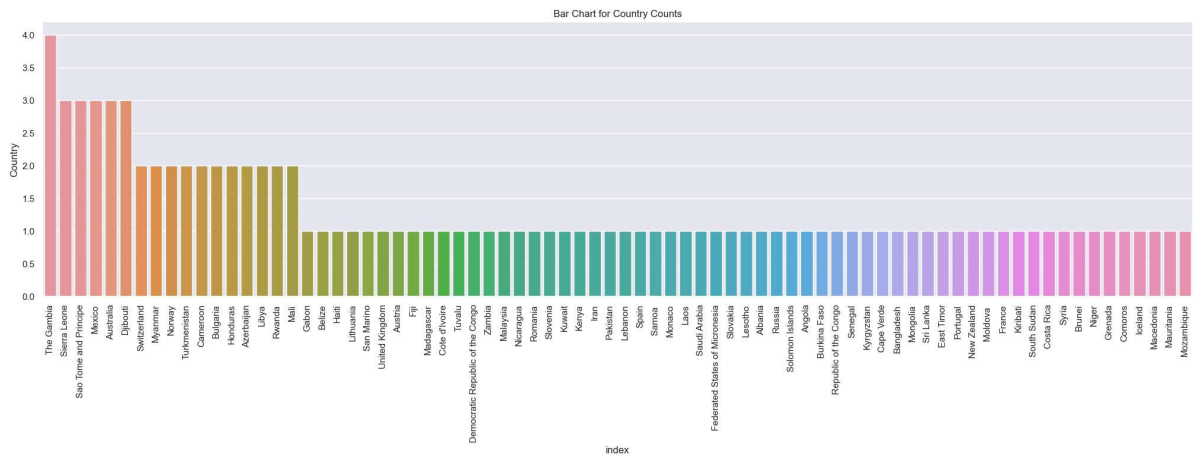
Out[326]:

	index	Country
0	The Gambia	4
1	Sierra Leone	3
2	Sao Tome and Principe	3
3	Mexico	3
4	Australia	3
...	...	...
71	Comoros	1
72	Iceland	1
73	Macedonia	1
74	Mauritania	1
75	Mozambique	1

76 rows × 2 columns

In [327]:

```
#create plot, ax object using plt.subplots

plot3,ax = plt.subplots(figsize=(25,6))

#  sns.barplot(x,y, data, ax) for plotting bar graphs

sns.barplot(x = 'index', y = 'Country', data = Countries_counts, ax = ax)
plt.xticks(rotation=90)
#  use ax object to change plot properties

ax.set_title('Bar Chart for Country Counts')

#  set up seaborn style setting

sns.set()

# use plt.show() for showing the plots

plt.show()
```



Graph shows that The Gambia has multiple orders compared to rest of the countries, also many countries have only 1 order.

In [328]:

```
#For exact percentage we can redefine the dataframe

Countries_counts = Countries_counts.loc[Countries_counts['Country'] > 1]

print('Number of countries having enteries > 1 are ' + str(Countries_counts.sha

Countries_counts
```

```
Number of countries having enteries > 1 are 17%
```

Out[328]:

	index	Country
0	The Gambia	4
1	Sierra Leone	3
2	Sao Tome and Principe	3
3	Mexico	3
4	Australia	3
5	Djibouti	3
6	Switzerland	2
7	Myanmar	2
8	Norway	2
9	Turkmenistan	2
10	Cameroon	2
11	Bulgaria	2
12	Honduras	2
13	Azerbaijan	2
14	Libya	2
15	Rwanda	2
16	Mali	2

In [329]:

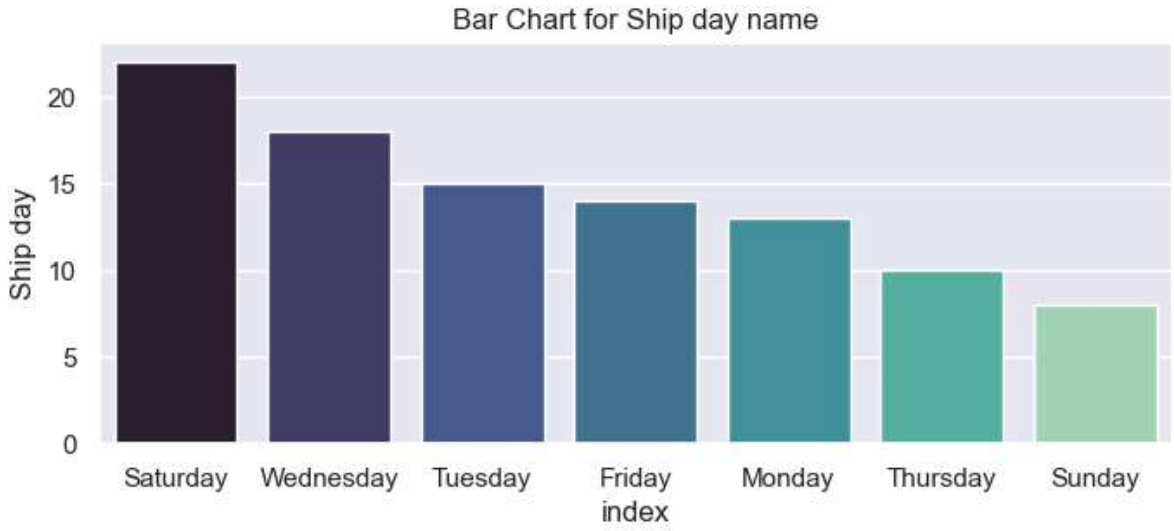
```
# Time based categorical variables Ship day  ,Order Date ,Ship Date
Ship_day = sales_data['Ship day'].value_counts().reset_index()

# print the dataframe formed

Ship_day
```

Out[329]:

	index	Ship day
0	Saturday	22
1	Wednesday	18
2	Tuesday	15
3	Friday	14
4	Monday	13
5	Thursday	10
6	Sunday	8

In [330]:

```
#  creating the Bar Chart
plot3,ax = plt.subplots(figsize=(8,3))

sns.barplot(x = 'index', y = 'Ship day', data = Ship_day, ax = ax, palette='mak

ax.set_title('Bar Chart for Ship day name')

sns.set()

plt.show()
```



It can be seen in the graph that most of the orders are shipped on Saturday and Wednesday. Where highest is 22 orders on Saturday.

In [331]:

```
#Now we are having two date fields i.e. Order Date and Ship Date.  Finding the r
# Sales-trend -> month wise , year wise , yearly_month wise

#Hence, we will need to add 'Month' and 'Year' as new columns to the data set fr

sales_data['Year'] = pd.DatetimeIndex(sales_data['Order Date']).year
sales_data['Month'] = pd.DatetimeIndex(sales_data['Order Date']).month
sales_data.head()
```

Out[331]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	To
0	Australia and Oceania	Tuvalu	Baby Food	Offline	High	2010-05-28	2010-06-27	9925	255.28	159.42	2533654.00	158
1	Central America and the Caribbean	Grenada	Cereal	Online	Critical	2012-08-22	2012-09-15	2804	205.70	117.11	576782.80	32
2	Europe	Russia	Office Supplies	Offline	Low	2014-05-02	2014-05-08	1779	651.21	524.96	1158502.59	93
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	Critical	2014-06-20	2014-07-05	8102	9.33	6.92	75591.66	5
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	Low	2013-02-01	2013-02-06	5062	651.21	524.96	3296425.02	265

In [332]:

```
# Converting month numbers into month names
sales_data['Month'] = pd.to_datetime(sales_data['Month'], format='%m').dt.month_
sales_data.head()
```

Out[332]:

	Region	Country	Item Type	Sales Channel	Order Priority	Order Date	Ship Date	Units Sold	Unit Price	Unit Cost	Total Revenue	To
0	Australia and Oceania	Tuvalu	Baby Food	Offline	High	2010-05-28	2010-06-27	9925	255.28	159.42	2533654.00	158
1	Central America and the Caribbean	Grenada	Cereal	Online	Critical	2012-08-22	2012-09-15	2804	205.70	117.11	576782.80	32
2	Europe	Russia	Office Supplies	Offline	Low	2014-05-02	2014-05-08	1779	651.21	524.96	1158502.59	93
3	Sub-Saharan Africa	Sao Tome and Principe	Fruits	Online	Critical	2014-06-20	2014-07-05	8102	9.33	6.92	75591.66	5
4	Sub-Saharan Africa	Rwanda	Office Supplies	Offline	Low	2013-02-01	2013-02-06	5062	651.21	524.96	3296425.02	265

In [333]:

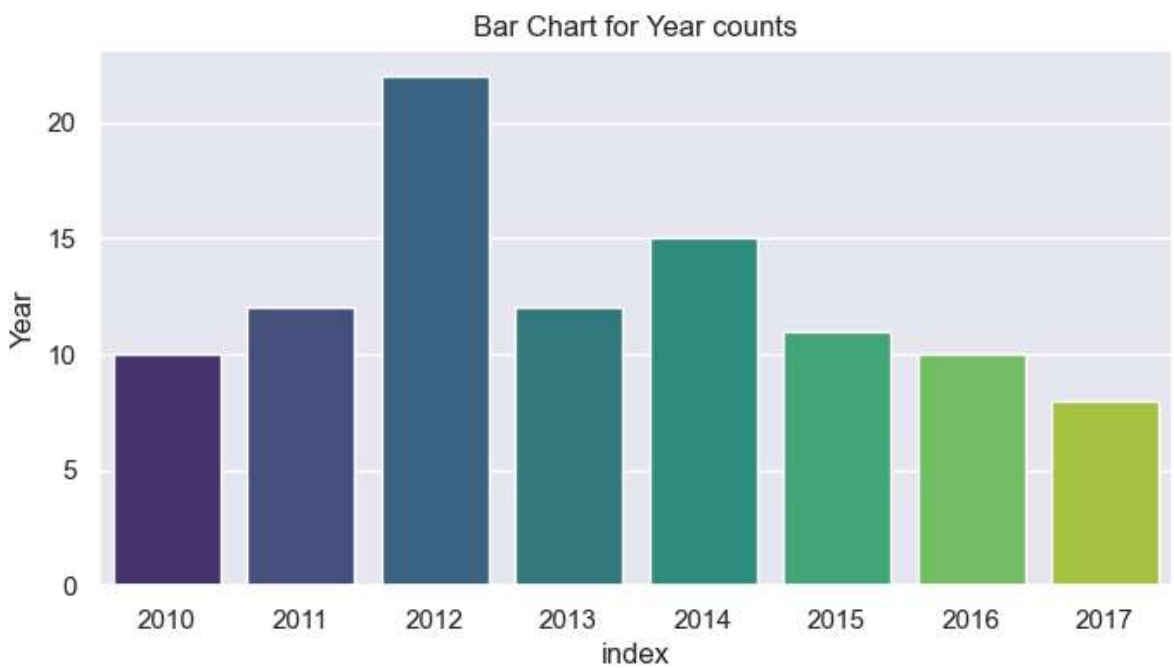
```
Year_count = sales_data['Year'].value_counts().reset_index()

Year_count
```

Out[333]:

	index	Year
0	2012	22
1	2014	15
2	2013	12
3	2011	12
4	2015	11
5	2010	10
6	2016	10
7	2017	8

In [334]:

```
# we can make a bar chart for this representation
plot4,ax = plt.subplots(figsize=(8,4))

sns.barplot(x = 'index', y = 'Year', data = Year_count, ax = ax,palette='viridi

ax.set_title('Bar Chart for Year counts')

sns.set()

plt.show()
```




```
Here we can observe that most of the orders were in year 2012 which are 22 and in
2014 i.e, 15. From the year period 2010-2017.
```

In [335]:

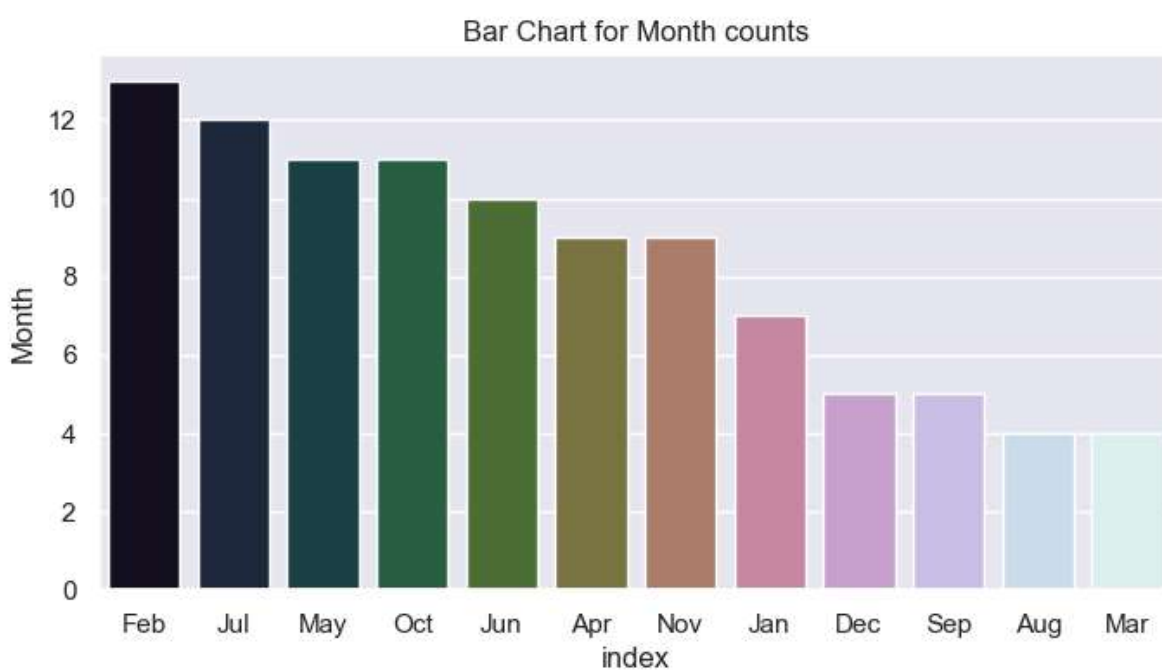
```
#For month analysis
Month_counts = sales_data['Month'].value_counts().reset_index()

Month_counts
```

Out[335]:

	index	Month
0	Feb	13
1	Jul	12
2	May	11
3	Oct	11
4	Jun	10
5	Apr	9
6	Nov	9
7	Jan	7
8	Dec	5
9	Sep	5
10	Aug	4
11	Mar	4

In [336]:

```
#plotting for month
plot4,ax = plt.subplots(figsize=(8,4))

sns.barplot(x = 'index', y = 'Month', data = Month_counts, ax = ax, palette='cul

ax.set_title('Bar Chart for Month counts')

sns.set()
plt.show()
```



It can be seen that most of the orders are in Feb with 13 orders and followed by july with 10 orders.

Bivariate Analysis

In [337]:

```
# find out Sales-trend -> month wise , year wise , yearly_month wise
# We can explore the relationship of these with continous variables such as Toto
#Next we can find relationship of item types with: Unit Profit , Units Sold

#Total Profit vs Month
# applying groupby() function to group the data into month column

month_tp = sales_data.groupby(['Month'])
```

In [338]:

```
month_tp = month_tp.sum().reset_index() # Sum of month
# Sorting by month
month_tp = month_tp.sort_values('Month', key = lambda x : pd.to_datetime(x, forr
month_tp

```

Out[338]:

	Month	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	Shipping duration	Year
4	Jan	35742	2718.95	2059.80	10482467.12	7665610.10	2816857.02	148.0	14095
3	Feb	71079	4496.69	3178.91	24740517.77	17668467.26	7072050.51	236.0	26172
7	Mar	14497	647.19	381.82	2274823.87	1346472.81	928351.06	71.0	8058
0	Apr	44680	2888.93	2043.29	16187186.33	11426977.98	4760208.35	231.0	18118
8	May	63651	2948.46	2038.25	13215739.99	8633047.69	4582692.30	210.0	22150
6	Jun	34893	2006.48	1276.50	5230325.77	3044946.34	2185379.43	208.0	20129
5	Jul	76201	2264.28	1446.97	15669518.50	10091055.44	5578463.06	297.0	24162
1	Aug	17251	333.64	166.79	1128164.91	548888.24	579276.67	119.0	8054
11	Sep	30101	719.20	403.94	5314762.56	2970596.53	2344166.03	154.0	10062
10	Oct	55472	3321.94	2312.23	15287576.61	10780653.36	4506923.25	335.0	22143
9	Nov	53261	3410.23	2392.13	20568222.76	14110622.11	6457600.65	229.0	18115
2	Dec	16043	1920.14	1404.17	7249462.12	4893232.05	2356230.07	98.0	10065

In [341]:

```
# Plotting by line graph to understand time frame

plot5, ax = plt.subplots(figsize=(8,4))

sns.lineplot(x = month_tp['Month'],y = month_tp['Total Profit'], data = month_tp

ax.set_title(' Total Profit vs Months')

plt.show()
```

From Line graph we can say that maximum total profit appears in months Feb and Nov , and least in Mar and Aug.

In [342]:

```
##Units Sold vs Month
# plot units sold vs month using the same dataframe

plot6, ax = plt.subplots(figsize=(9,4))

sns.lineplot(x = month_tp['Month'],y = month_tp['Units Sold'], data = month_tp,

ax.set_title(' Total Units Sold vs Month')

plt.show()
```

We can see highest units sold are in Jul month followed by Feb, and least in Aug, March and Dec

Sales trend using 'Year' column

In [343]:

```
# applying groupby() function to group the data into month column

year_tp = sales_data.groupby(['Year'])

year_tp = year_tp.sum().reset_index()

year_tp
```

Out[343]:

	Year	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	Shipping duration
0	2010	61571	2868.06	1884.69	19186024.92	12556457.49	6629567.43	259.0
1	2011	54768	2701.68	1976.81	11129166.07	8388157.84	2741008.23	304.0
2	2012	97967	7766.50	5632.23	31898644.52	22685634.40	9213010.12	491.0
3	2013	64663	3818.29	2567.39	20330448.66	13615028.62	6715420.04	300.0
4	2014	92040	2943.57	1971.26	16630214.43	10750752.75	5879461.68	341.0
5	2015	49480	2706.04	1833.40	12427982.86	8431443.42	3996539.44	283.0
6	2016	43156	2713.61	1744.73	12372867.22	7469029.21	4903838.01	225.0
7	2017	49226	2158.38	1494.29	13373419.63	9284066.18	4089353.45	133.0

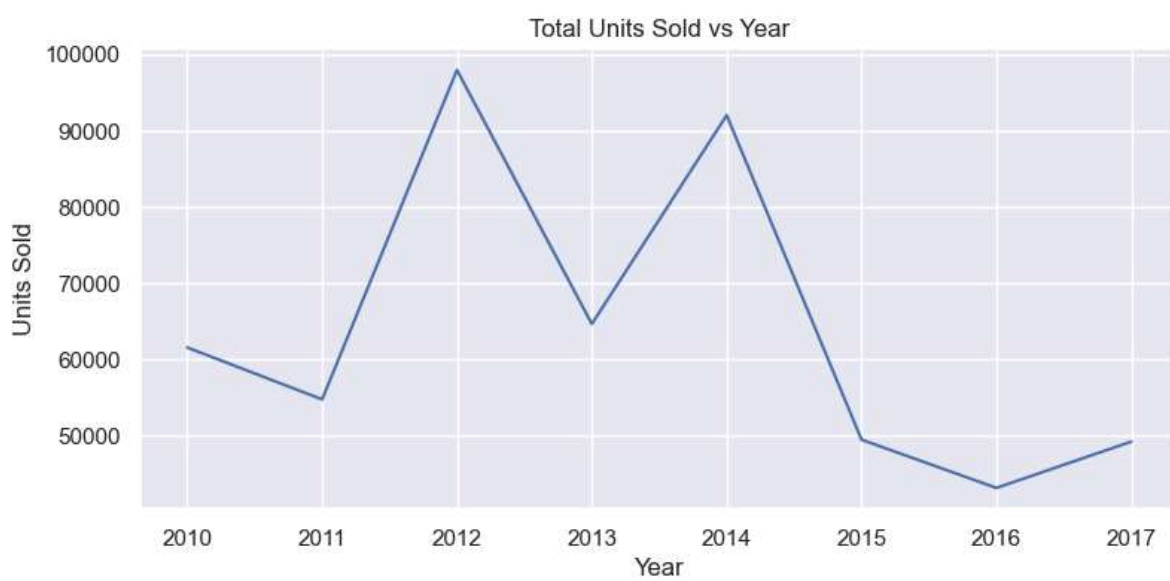
In [344]:

```
#Plotting line graph for year profit
plot7, ax = plt.subplots(figsize=(9,4))

sns.lineplot(x = year_tp['Year'],y = year_tp['Total Profit'], data = year_tp, a

ax.set_title('Total Profit vs Year')

plt.show()
```

The total profit is maximum for year 2012 and least in 2011

In [345]:

```
#Units Sold vs Year
plot8, ax = plt.subplots(figsize=(9,4))

sns.lineplot(x = year_tp['Year'],y = year_tp['Units Sold'], data = year_tp, ax

ax.set_title('Total Units Sold vs Year')

plt.show()
```



At years 2012 and next at 2014 we saw it has been peaked for sold items.

In [346]:

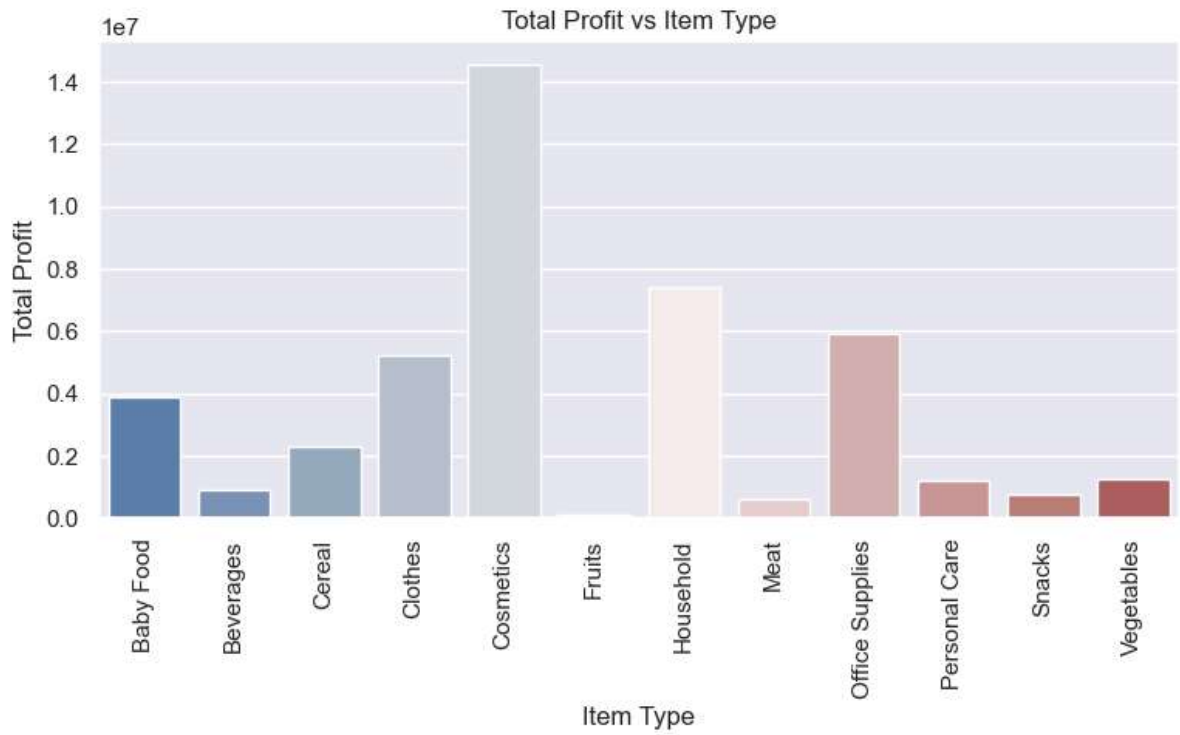
```
#Total Profit vs Item type
# applying groupby() function to group the data into Item Type column

itemtype = sales_data.groupby(['Item Type'])

# now we need to find the sum of other feilds to make the comparison

itemtype = itemtype.sum().reset_index()

itemtype
```

Out[346]:

	Item Type	Units Sold	Unit Price	Unit Cost	Total Revenue	Total Cost	Total Profit	Shipping duration	Year
0	Baby Food	40545	1786.96	1115.94	10350327.60	6463683.90	3886643.70	180.0	14093
1	Beverages	56708	379.60	254.32	2690794.60	1802747.32	888047.28	180.0	16106
2	Cereal	25877	1439.90	819.77	5322898.90	3030455.47	2292443.43	152.0	14097
3	Clothes	71260	1420.64	465.92	7787292.80	2553958.40	5233334.40	389.0	26168
4	Cosmetics	83718	5683.60	3423.29	36601509.60	22045460.94	14556048.66	305.0	26178
5	Fruits	49998	93.30	69.20	466481.34	345986.16	120495.18	263.0	20127
6	Household	44727	6014.43	4522.86	29889712.29	22477106.58	7412605.71	209.0	18115
7	Meat	10675	843.78	729.38	4503675.75	3893065.75	610610.00	51.0	4029
8	Office Supplies	46967	7814.52	6299.52	30585380.07	24655796.32	5929583.75	241.0	24151
9	Personal Care	48708	817.30	566.70	3980904.84	2760282.36	1220622.48	190.0	20141
10	Snacks	13637	457.74	292.32	2080733.46	1328789.28	751944.18	27.0	6044
11	Vegetables	20051	924.36	545.58	3089057.06	1823237.43	1265819.63	149.0	12074

In [349]:

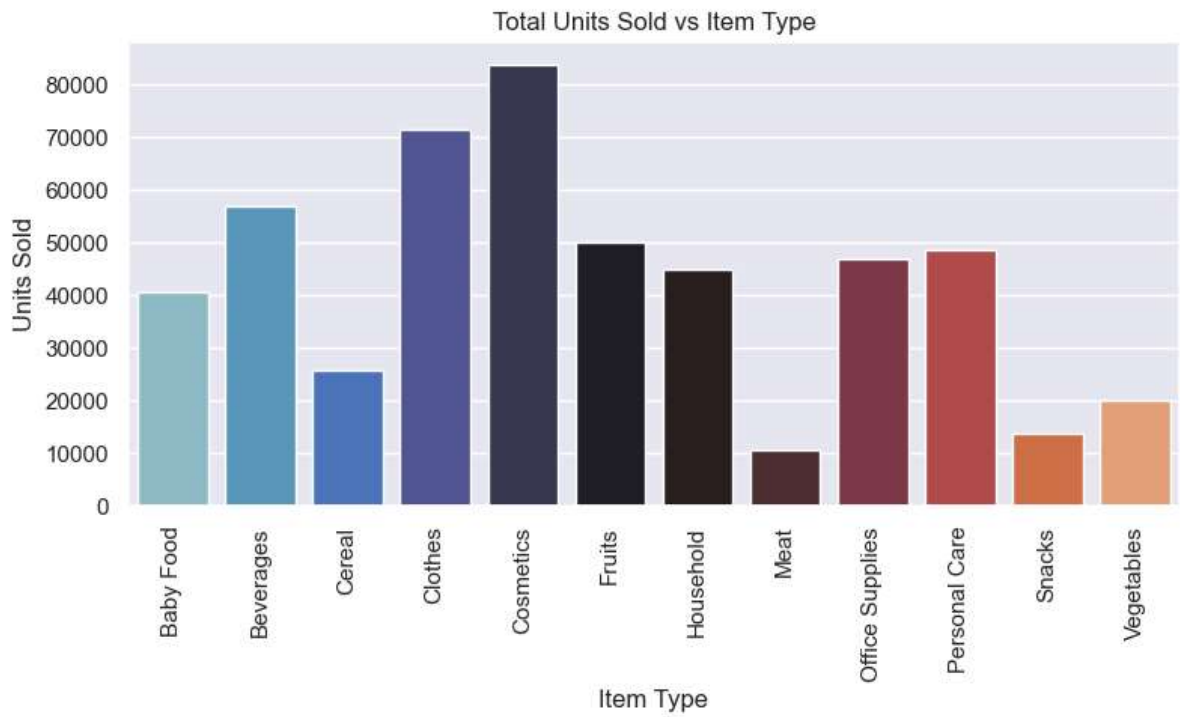
```
plot9, ax = plt.subplots(figsize=(9,4))

sns.barplot(x = itemtype['Item Type'],y = itemtype['Total Profit'], data = item
plt.xticks(rotation=90)

ax.set_title('Total Profit vs Item Type')

plt.show()
```



Maximum profit is obtained from cosmetics and minimum with food items such as Fruits, beverages and meat.

In [352]:

```
#Units Sold vs Item type
plot10, ax = plt.subplots(figsize=(9,4))

sns.barplot(x = itemtype['Item Type'],y = itemtype['Units Sold'], data = itemty
plt.xticks(rotation=90)

ax.set_title('Total Units Sold vs Item Type')

plt.show()
```



Here we can see Clothes and Cosmetics have the maximum units sold and meat is minimum

Final results from EDA

Here are the insights derived from the above analysis for better business sales:

The Unit Price of the product sold are mostly under 180 dollars as shown in the box plot median values, also there are no outliers that are shown. Highest price of the product is shown as 668.27 dollars .

Most of the unit cost is within 107 dollars also as shown witnh the help of respective median values and there are no outliers that can be seen in box plot. The max value is 525 dollarsmin the unit cost.

Total Profit -

.As indicated by the median value, the majority of the Total Profit values fall within 2.9e+05 dollars.

.We can observe that there are more than three outliers in this column from the box plot.

.February and November have the highest total profit, while March and August show the lowest.

.Additionally, the overall profit is lowest in 2011 and highest in 2012.

. Additionally, the most profit is made from cosmetics, while the lowest profit is made from food products including fruits, drinks, and meat

Units Sold -

.The median number indicates that the majority of the sold units are within the range of 5383 units. Box plots allow us to confirm once more that there are no outliers, with a maximum of 9925 units sold and a minimum of 124 units.

.As we can see, July has the most unit sales, followed by February, while August, March, and December have the lowest.

.The highest number of units were sold in 2012 and again in 2014.

.Meat sales are minimal, whereas clothing and cosmetics have the highest unit sales.

Shipping Duration- The median shipping time figure indicates that the majority of values fall inside a 24-day window, and the data variation or spread is also less. There are obviously no outliers in this data; the largest and lowest numbers are 50 and 0 days, respectively.

Item Type - Most of the item types which have higher of large categories are Clothes, Cosmetics and Office Supplies

Region - The most common regions are Sub-Saharan Africa (37) and Europe (24).

Shipping day - Most of the shipping is happening on Saturdays and Wednesdays comparatively least on Sundays

In [ ]:

```
1
```