Super Store Sales Analysis

Dataset Link : https://www.kaggle.com/datasets/rohitsahoo/sales-forecasting (https://www.kaggle.com/datasets/rohitsahoo/sales-forecasting)

In [3]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [4]:
```
data = pd.read_excel('Global_Superstore.xlsx')
```

In [5]:
```
data.head()
```

Out[5]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	Postal Code	City	...	Sub-Category	Product Name	Sales
0	40098	CA-2014-AB10015140-41954	2014-11-11	2014-11-13	First Class	AB-100151402	Aaron Bergman	Consumer	73120.0	Oklahoma City	...	Phones	Samsung Convoy 3	221.980
1	26341	IN-2014-JR162107-41675	2014-02-05	2014-02-07	Second Class	JR-162107	Justin Ritter	Corporate	NaN	Wollongong	...	Chairs	Novimex Executive Leather Armchair, Black	3709.395
2	25330	IN-2014-CR127307-41929	2014-10-17	2014-10-18	First Class	CR-127307	Craig Reiter	Consumer	NaN	Brisbane	...	Phones	Nokia Smart Phone, with Caller ID	5175.171
3	13524	ES-2014-KM1637548-41667	2014-01-28	2014-01-30	First Class	KM-1637548	Katherine Murray	Home Office	NaN	Berlin	...	Phones	Motorola Smart Phone, Cordless	2892.510
4	47221	SG-2014-RH9495111-41948	2014-11-05	2014-11-06	Same Day	RH-9495111	Rick Hansen	Consumer	NaN	Dakar	...	Copiers	Sharp Wireless Fax, High-Speed	2832.960

5 rows × 26 columns

In [6]:
```
data.shape
```

Out[6]:
```
(36596, 26)
```

In [7]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 36596 entries, 0 to 36595
Data columns (total 26 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Row ID                   36596 non-null  int64
 1   Order ID                 36596 non-null  object
 2   Order Date               36596 non-null  datetime64[ns]
 3   Ship Date                36596 non-null  datetime64[ns]
 4   Ship Mode                36596 non-null  object
 5   Customer ID              36596 non-null  object
 6   Customer Name            36596 non-null  object
 7   Segment                  36596 non-null  object
 8   Postal Code              6020 non-null   float64
 9   City                     36596 non-null  object
 10  State                    36596 non-null  object
 11  Country                  36596 non-null  object
 12  Region                   36596 non-null  object
 13  Market                   36596 non-null  object
 14  Product ID               36596 non-null  object
 15  Category                 36596 non-null  object
 16  Sub-Category             36596 non-null  object
 17  Product Name             36596 non-null  object
 18  Sales                    36596 non-null  float64
 19  Quantity                 36596 non-null  int64
 20  Discount                 36596 non-null  float64
 21  Profit                   36596 non-null  float64
 22  Profit Category-Updated  36596 non-null  object
 23  Profit Category          36596 non-null  object
 24  Shipping Cost            36596 non-null  float64
 25  Order Priority           36596 non-null  object
dtypes: datetime64[ns](2), float64(5), int64(2), object(17)
memory usage: 7.3+ MB
```

Checking the null values

In [8]:
```
data.isnull().sum()
```

Out[8]:
```
Row ID                       0
Order ID                     0
Order Date                   0
Ship Date                    0
Ship Mode                    0
Customer ID                  0
Customer Name                0
Segment                      0
Postal Code              30576
City                         0
State                        0
Country                      0
Region                       0
Market                       0
Product ID                   0
Category                     0
Sub-Category                 0
Product Name                 0
Sales                        0
Quantity                     0
Discount                     0
Profit                       0
Profit Category-Updated      0
Profit Category              0
Shipping Cost                0
Order Priority               0
dtype: int64
```

Handling the null values

as the Postal Code column as multiple null values we will drop that column

In [9]:
```
data.drop(['Postal Code'], axis= 1, inplace=True)
```

In [10]:
```
data.isnull().sum()
```

Out[10]:
```
Row ID                    0
Order ID                  0
Order Date                0
Ship Date                 0
Ship Mode                 0
Customer ID               0
Customer Name             0
Segment                   0
City                      0
State                     0
Country                   0
Region                    0
Market                    0
Product ID                0
Category                  0
Sub-Category              0
Product Name              0
Sales                     0
Quantity                  0
Discount                  0
Profit                    0
Profit Category-Updated   0
Profit Category           0
Shipping Cost             0
Order Priority            0
dtype: int64
```

checking the columns present in the dataset

In [12]:
```
data.columns
```

Out[12]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Region', 'Market', 'Product ID', 'Category', 'Sub-Category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Profit Category-Updated', 'Profit Category', 'Shipping Cost',
       'Order Priority'],
      dtype='object')
```

Create a new column "year" and "month" from "Order date" and "Ship date"

In [13]:
```
import datetime as dt
```

In [14]:
```
data['order_month'] = data['Order Date'].dt.month
data['order_year'] = data['Order Date'].dt.year
data['ship_month'] = data['Ship Date'].dt.month
data['ship_year'] = data['Ship Date'].dt.year
```

In [15]:
```
data.head()
```

Out[15]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	City	State	...	Discount	Profit	P Categ Upda
0	40098	CA-2014-AB10015140-41954	2014-11-11	2014-11-13	First Class	AB-100151402	Aaron Bergman	Consumer	Oklahoma City	Oklahoma	...	0.0	62.1544	W
1	26341	IN-2014-JR162107-41675	2014-02-05	2014-02-07	Second Class	JR-162107	Justin Ritter	Corporate	Wollongong	New South Wales	...	0.1	-288.7650	W
2	25330	IN-2014-CR127307-41929	2014-10-17	2014-10-18	First Class	CR-127307	Craig Reiter	Consumer	Brisbane	Queensland	...	0.1	919.9710	W
3	13524	ES-2014-KM1637548-41667	2014-01-28	2014-01-30	First Class	KM-1637548	Katherine Murray	Home Office	Berlin	Berlin	...	0.1	-96.5400	W
4	47221	SG-2014-RH9495111-41948	2014-11-05	2014-11-06	Same Day	RH-9495111	Rick Hansen	Consumer	Dakar	Dakar	...	0.0	311.5200	W

5 rows × 29 columns

Checking the unique values in each column

In [17]:
```
data['order_year'].unique()
```

Out[17]:
```
array([2014, 2012, 2013, 2015], dtype=int64)
```

In [18]:
```
data['ship_year'].unique()
```

Out[18]:
```
array([2014, 2012, 2013, 2015, 2016], dtype=int64)
```

In [19]:
```
data['Ship Mode'].unique()
```

Out[19]:
```
array(['First Class', 'Second Class', 'Same Day', 'Standard Class'],
      dtype=object)
```

In [20]:
```
data.Segment.unique()
```

Out[20]:
```
array(['Consumer', 'Corporate', 'Home Office'], dtype=object)
```

In [21]:
```
data.Region.unique()
```

Out[21]:
```
array(['Central US', 'Oceania', 'Western Europe', 'Western Africa',
       'Western US', 'Southern Asia', 'Western Asia', 'South America',
       'Eastern Asia', 'Southern Europe', 'Eastern Africa',
       'Eastern Europe', 'Northern Europe', 'Central America',
       'Eastern US', 'Caribbean', 'Central Africa', 'Southeastern Asia',
       'Southern US', 'North Africa', 'Southern Africa', 'Canada',
       'Central Asia'], dtype=object)
```

In [22]:
```
data.Market.unique()
```

Out[22]:
```
array(['USCA', 'Asia Pacific', 'Europe', 'Africa', 'LATAM'], dtype=object)
```

In [23]:
```
data.Category.unique()
```

Out[23]:
```
array(['Technology', 'Furniture', 'Office Supplies'], dtype=object)
```

In [24]:
```
data['Sub-Category'].unique()
```

Out[24]:
```
array(['Phones', 'Chairs', 'Copiers', 'Tables', 'Bookcases', 'Art',
       'Appliances', 'Storage', 'Fasteners', 'Machines', 'Accessories',
       'Furnishings', 'Binders', 'Labels', 'Paper', 'Supplies',
       'Envelopes'], dtype=object)
```

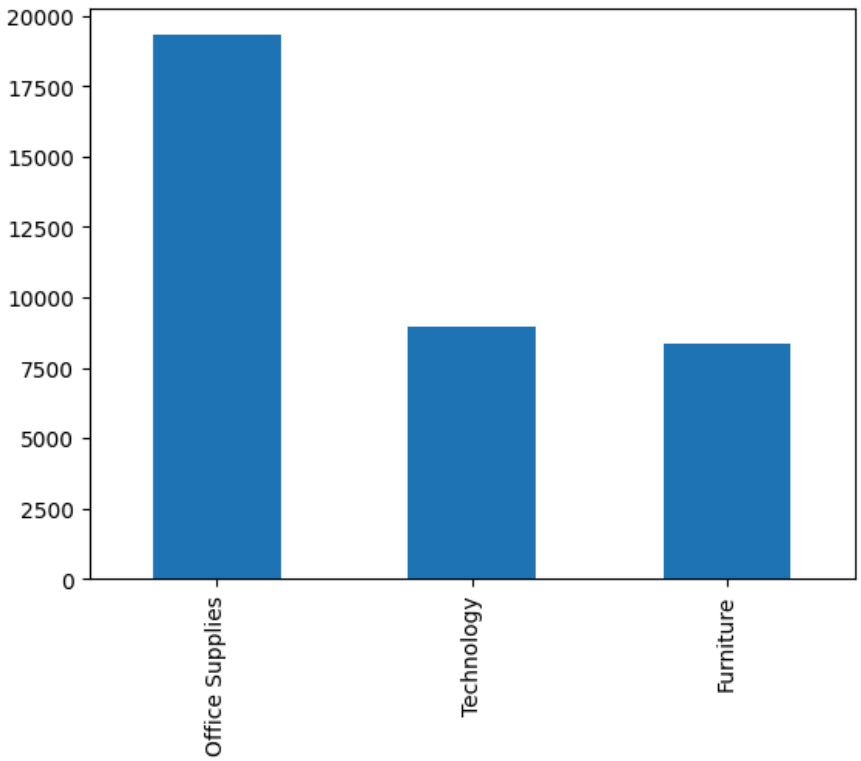
Which category products are sold most of the time

In [25]:
```
data.Category.value_counts()
```

Out[25]:
```
Office Supplies    19306
Technology          8942
Furniture           8348
Name: Category, dtype: int64
```

In [26]:
```
data.Category.value_counts().plot(kind='bar')
```

Out[26]:
```
<Axes: >
```



Office Supplies followed by Technology and Furniture and sold most no of times

which subcategory are most sold?

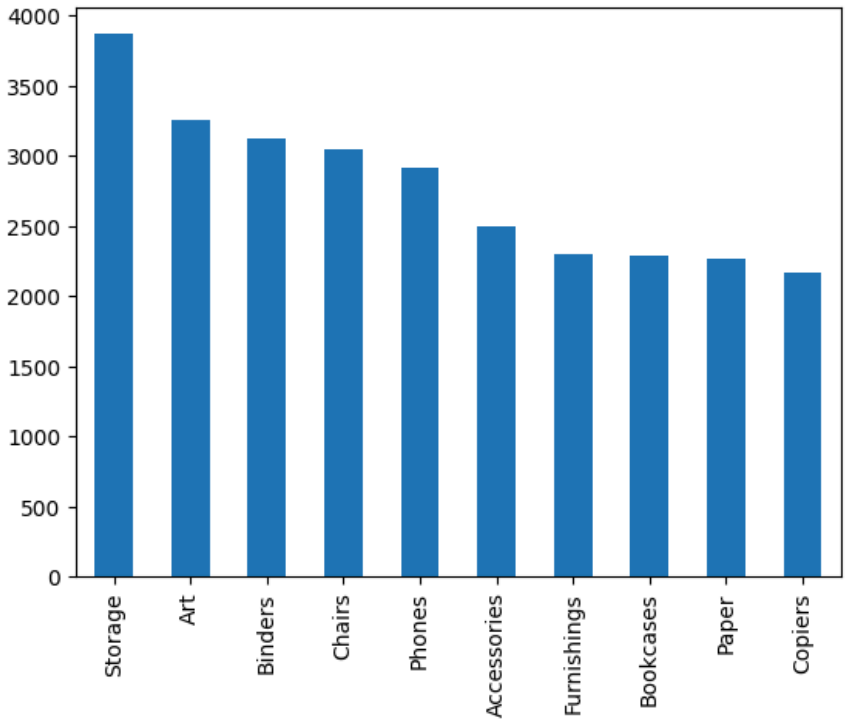
In [28]:
```
data.rename({'Sub-Category' : 'sub_category'}, axis=1,inplace= True)
```

In [29]:
```
data.sub_category.value_counts().head(10)
```

Out[29]:
```
Storage        3868
Art            3253
Binders        3121
Chairs         3046
Phones         2911
Accessories    2495
Furnishings    2296
Bookcases      2289
Paper          2263
Copiers        2172
Name: sub_category, dtype: int64
```

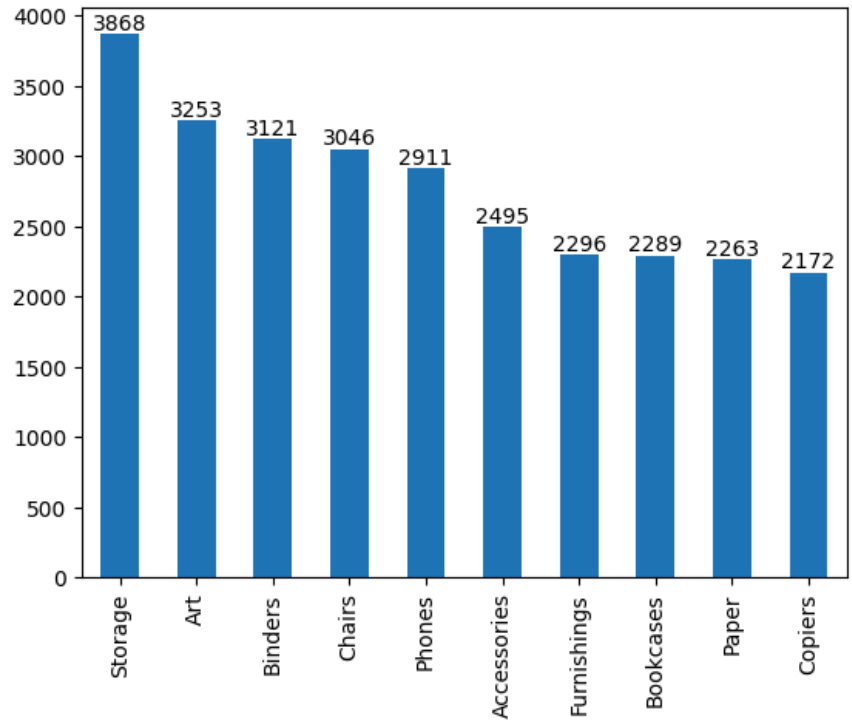
In [30]:
```
data.sub_category.value_counts().head(10).plot(kind='bar')
```

Out[30]: <Axes: >



In [31]:
```
top_category = data.sub_category.value_counts().head(10)
ax= top_category.plot(kind='bar')

for i, value in enumerate(top_category):
    ax.text(i, value + 0.1, str(value), ha='center', va='bottom')
```



The Storage sub-category has the highest sales, followed by Art and Paper, while Copiers is the least sold sub-category.

Top 10 products sold

In [33]:
```
data.columns
```

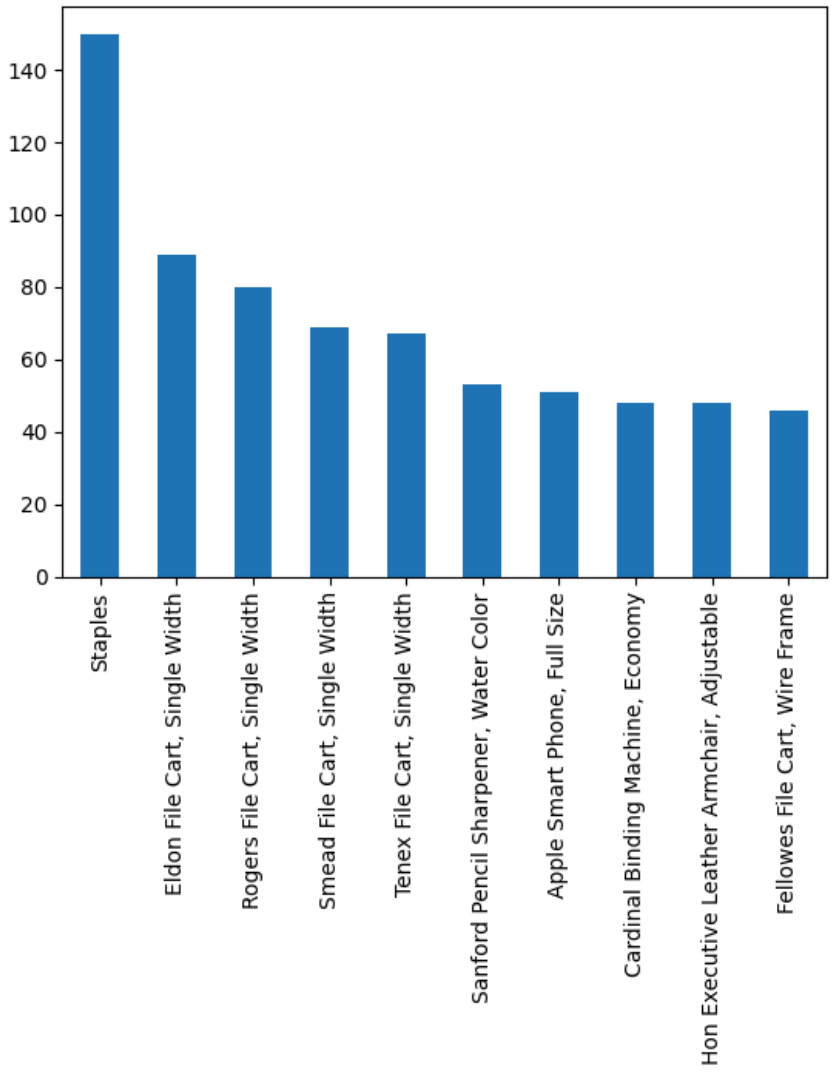
Out[33]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Region', 'Market', 'Product ID', 'Category', 'sub_category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Profit Category-Updated', 'Profit Category', 'Shipping Cost',
       'Order Priority', 'order_month', 'order_year', 'ship_month',
       'ship_year'],
      dtype='object')
```

In [34]:
```
data['Product Name'].value_counts().head(10)
```

Out[34]:
```
Staples                                        150
Eldon File Cart, Single Width                   89
Rogers File Cart, Single Width                  80
Smead File Cart, Single Width                   69
Tenex File Cart, Single Width                   67
Sanford Pencil Sharpener, Water Color           53
Apple Smart Phone, Full Size                    51
Cardinal Binding Machine, Economy               48
Hon Executive Leather Armchair, Adjustable      48
Fellowes File Cart, Wire Frame                  46
Name: Product Name, dtype: int64
```

In [35]:
```
data['Product Name'].value_counts().head(10).plot(kind='bar')
```

Out[35]: <Axes: >



Staples is the top-selling item, with sales that are 69% higher than those of the Fellowes File Carts and Wire Frames.

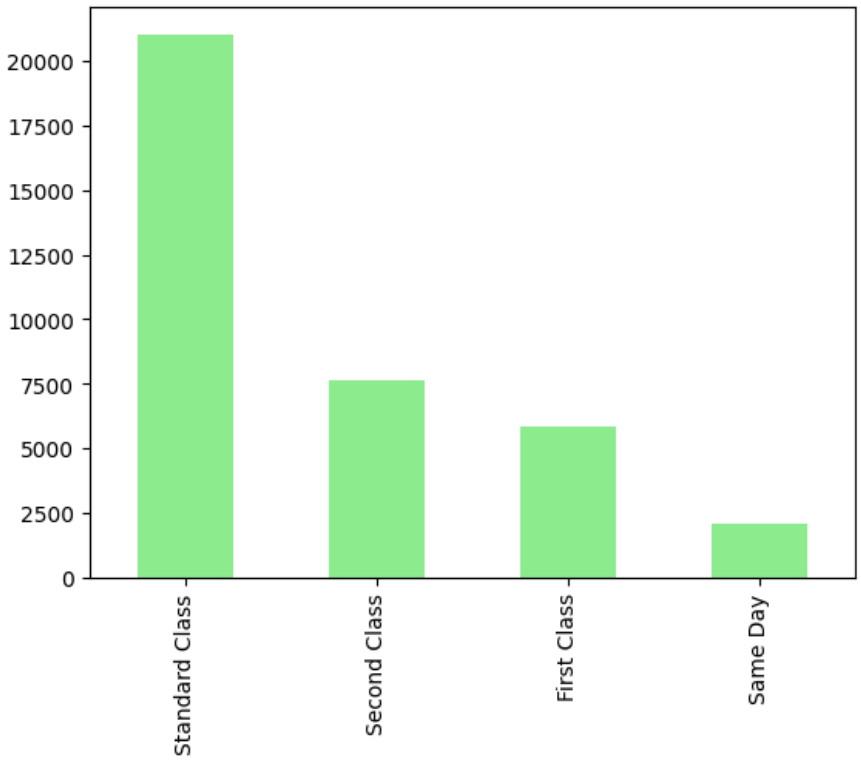
Which shipping mode was more prefered?

In [37]:
```
data['Ship Mode'].value_counts()
```

Out[37]:
```
Standard Class    21021
Second Class       7634
First Class        5873
Same Day           2068
Name: Ship Mode, dtype: int64
```

In [38]:
```
data['Ship Mode'].value_counts().plot(kind='bar', color='lightgreen')
```

Out[38]: <Axes: >



Standard shipping mode was the most likely pefered.

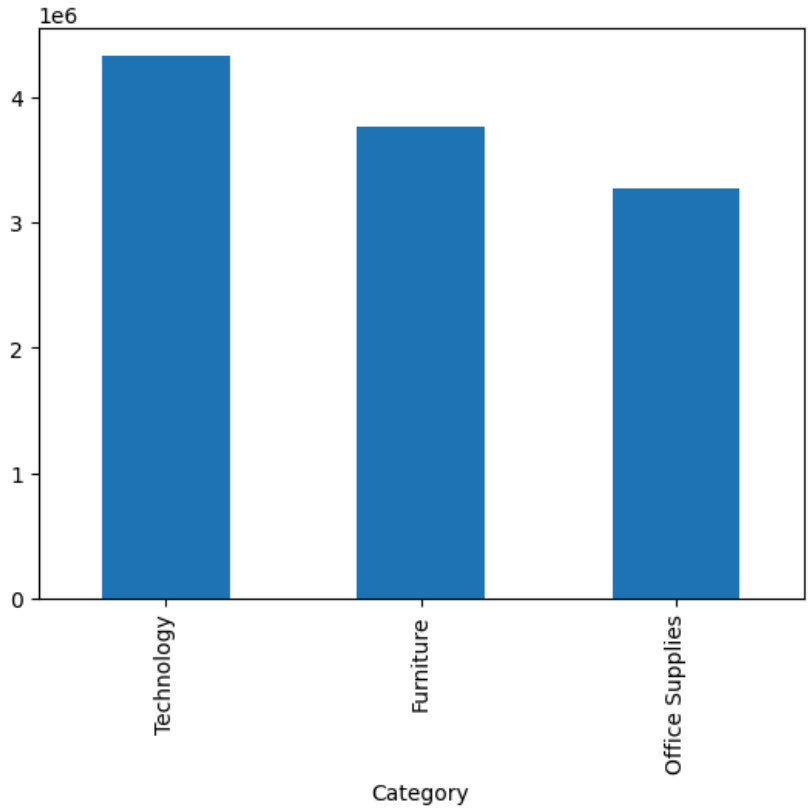
which category has highest sales?

In [40]:
```
data.groupby('Category').Sales.sum().sort_values(ascending=False)
```

Out[40]:
```
Category
Technology         4.328241e+06
Furniture          3.756977e+06
Office Supplies    3.265103e+06
Name: Sales, dtype: float64
```

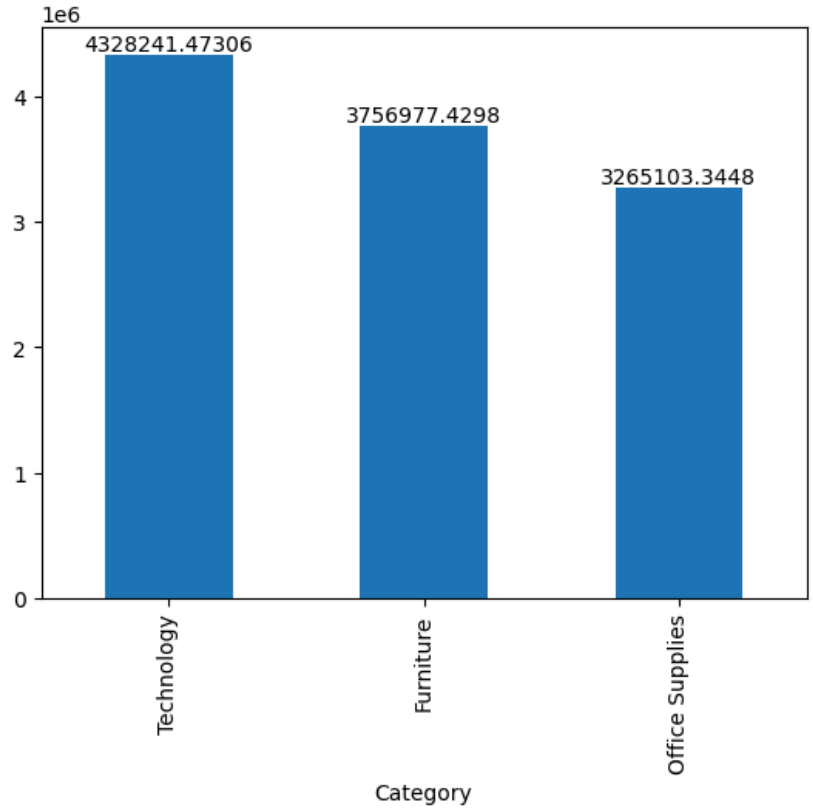
In [41]:
```
data.groupby('Category').Sales.sum().sort_values(ascending=False).plot(kind='bar')
```

Out[41]: <Axes: xlabel='Category'>



In [42]:
```
top_sales = data.groupby('Category').Sales.sum().sort_values(ascending=False)
ax = top_sales.plot(kind='bar')

for i, value in enumerate(top_sales):
    ax.text(i, value + 0.1, str(value), ha='center', va='bottom')
```




```
The Technology category has the highest sales, while the Office Supplies category has the lowest.
```

whcih sub_category has highest sales?

In [43]:
```
data.columns
```

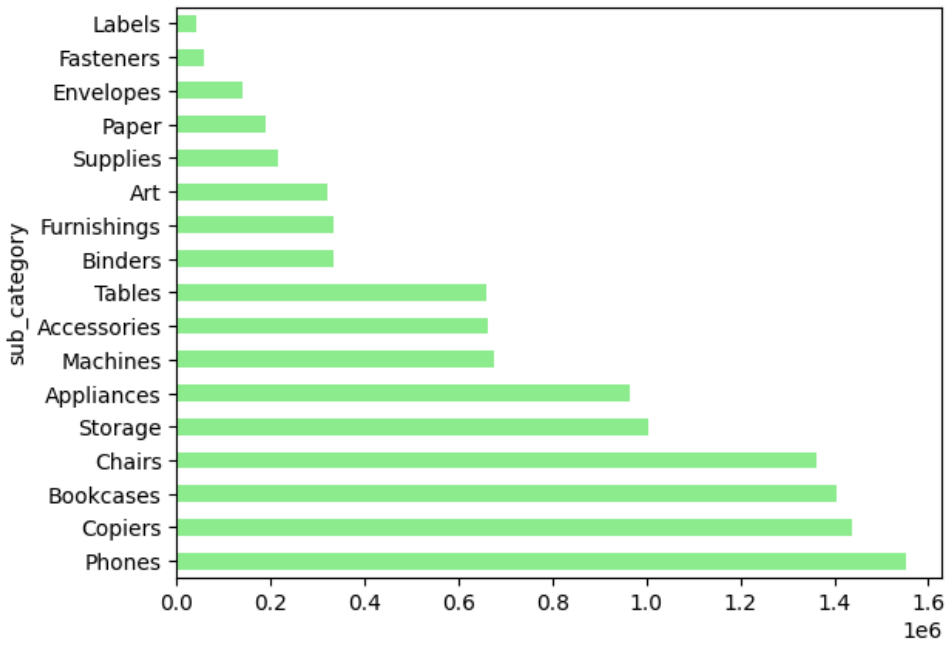
Out[43]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Region', 'Market', 'Product ID', 'Category', 'sub_category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Profit Category-Updated', 'Profit Category', 'Shipping Cost',
       'Order Priority', 'order_month', 'order_year', 'ship_month',
       'ship_year'],
      dtype='object')
```

In [44]:
```
data.groupby('sub_category').Sales.sum().sort_values(ascending= False)
```

Out[44]:
```
sub_category
Phones         1.551886e+06
Copiers        1.437049e+06
Bookcases      1.404026e+06
Chairs         1.360429e+06
Storage        1.003250e+06
Appliances     9.638492e+05
Machines       6.759680e+05
Accessories    6.633376e+05
Tables         6.600070e+05
Binders        3.339208e+05
Furnishings    3.325148e+05
Art            3.216713e+05
Supplies       2.149840e+05
Paper          1.903842e+05
Envelopes      1.393333e+05
Fasteners      5.760524e+04
Labels         4.010487e+04
Name: Sales, dtype: float64
```

In [45]:
```
data.groupby('sub_category').Sales.sum().sort_values(ascending= False).plot(kind= 'barh', color= 'lightgreen'
```

Out[45]:
```
<Axes: ylabel='sub_category'>
```



Phones have the highest sales at approximately 1.55 million, while Labels have the lowest sales at around 40,100.

sales by sub_category within the category

In [48]:
```
pd.pivot_table(data, index =['Category', 'sub_category'], values= 'Sales', aggfunc=sum).round()
```

Out[48]:

		Sales
Category	**sub_category**	
Furniture	**Bookcases**	1404026.0
	Chairs	1360429.0
	Furnishings	332515.0
	Tables	660007.0
Office Supplies	**Appliances**	963849.0
	Art	321671.0
	Binders	333921.0
	Envelopes	139333.0
	Fasteners	57605.0
	Labels	40105.0
	Paper	190384.0
	Storage	1003250.0
	Supplies	214984.0
Technology	**Accessories**	663338.0
	Copiers	1437049.0
	Machines	675968.0
	Phones	1551886.0

The subcategory and product with the highest sales in each category:

Furniture: Bookcases - 1,404,026.0 Office Supplies: Appliances - 963,849.0 Technology: Phones - 1,551,886.0

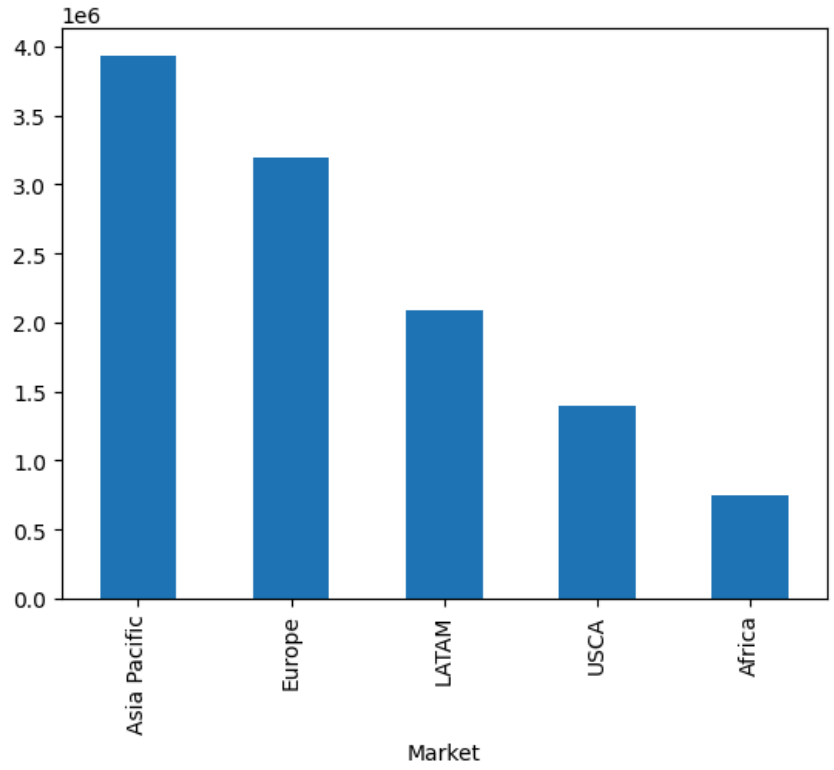
which market has more sales?

In [50]:
```
data.groupby('Market').Sales.sum().sort_values(ascending=False)
```

Out[50]:
```
Market
Asia Pacific    3.933582e+06
Europe          3.197821e+06
LATAM           2.083453e+06
USCA            1.391237e+06
Africa          7.442288e+05
Name: Sales, dtype: float64
```

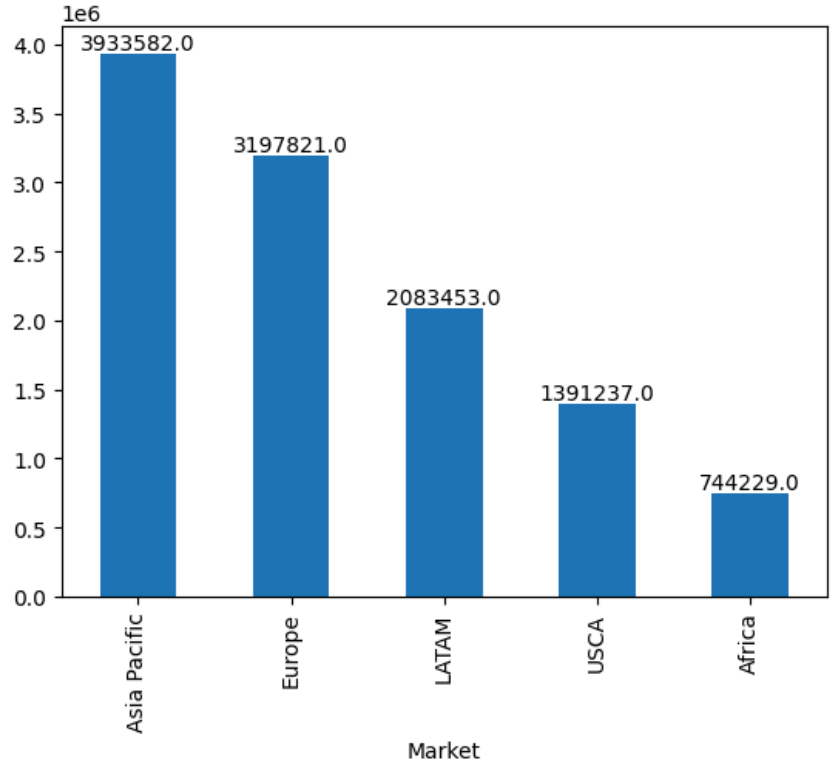
In [51]:
```
data.groupby('Market').Sales.sum().sort_values(ascending=False).plot(kind='bar')
```

Out[51]: <Axes: xlabel='Market'>



In [52]:
```
market_sales = data.groupby('Market').Sales.sum().sort_values(ascending=False).round()
ax = market_sales.plot(kind='bar')

for i, value in enumerate(market_sales):
    ax.text(i,value + 0.1, str(value), ha='center', va='bottom')
```



Asia Pacific leads with approximately 3.93 million in sales, while Africa has the lowest at around 744,228.

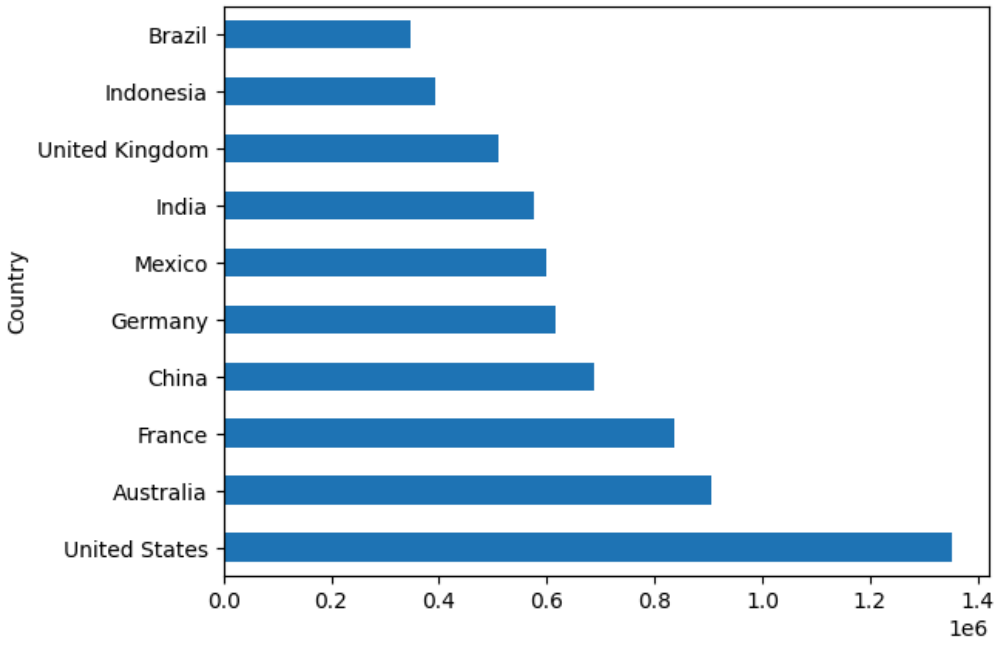
top 10 countries with the most sales

In [53]:
```
data.groupby('Country').Sales.sum().sort_values(ascending = False).head(10)
```

Out[53]:
```
Country
United States     1.352142e+06
Australia         9.064591e+05
France            8.373994e+05
China             6.882290e+05
Germany           6.154545e+05
Mexico            5.994244e+05
India             5.776659e+05
United Kingdom    5.113115e+05
Indonesia         3.921533e+05
Brazil            3.476441e+05
Name: Sales, dtype: float64
```

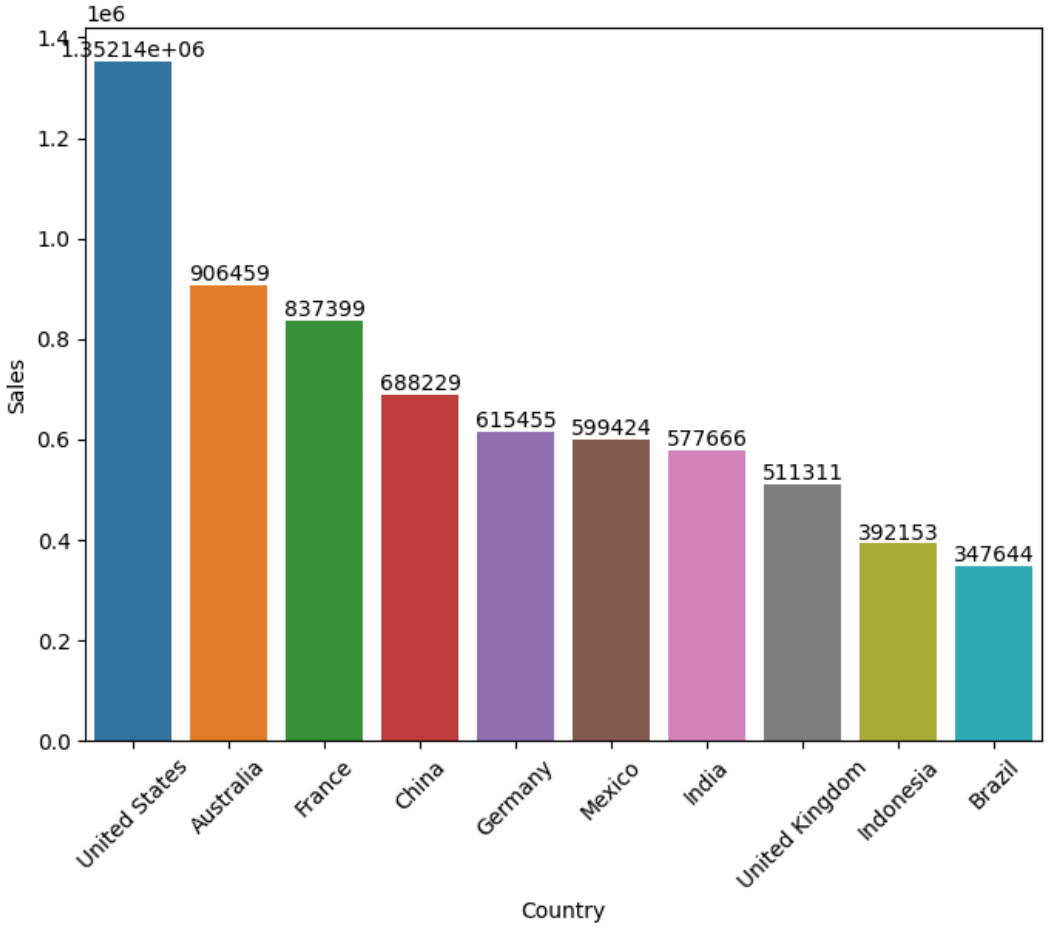
In [54]:
```
data.groupby('Country').Sales.sum().sort_values(ascending = False).head(10).plot(kind='barh')
```

Out[54]:
```
<Axes: ylabel='Country'>
```



In [55]:
```
country_sales= data.groupby('Country').Sales.sum().sort_values(ascending = False).head(10).round()
country_sales = country_sales.reset_index()
plt.figure(figsize=(8, 6))
ax = sns.barplot(data= country_sales, x='Country', y='Sales')
plt.xticks(rotation= 45)

for bars in ax.containers:
    ax.bar_label(bars)
plt.show()
```



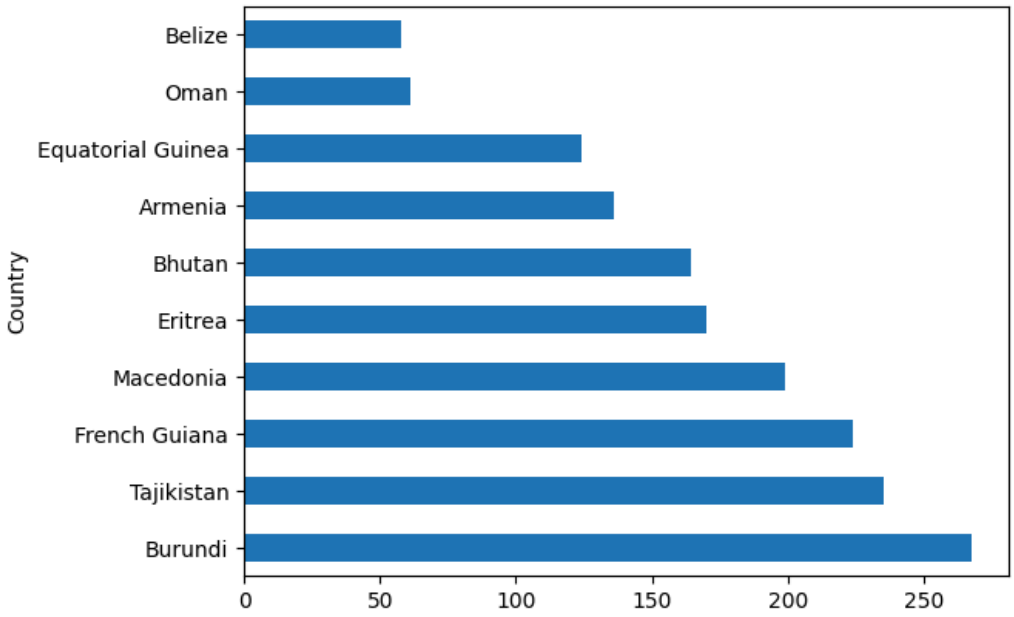
which are the countries with the least sales ?

In [56]:
```
data.groupby('Country').Sales.sum().sort_values(ascending = False).tail(10)
```

Out[56]:
```
Country
Burundi              267.720
Tajikistan           235.332
French Guiana        224.060
Macedonia            198.660
Eritrea              169.920
Bhutan               164.070
Armenia              136.260
Equatorial Guinea    124.290
Oman                  61.080
Belize                57.720
Name: Sales, dtype: float64
```

In [57]:
```
data.groupby('Country').Sales.sum().sort_values(ascending = False).tail(10).plot(kind='barh')
```

Out[57]: <Axes: ylabel='Country'>



Among the listed countries, Burundi has the highest sales at 267.720, while Belize has the lowest at 57.720.

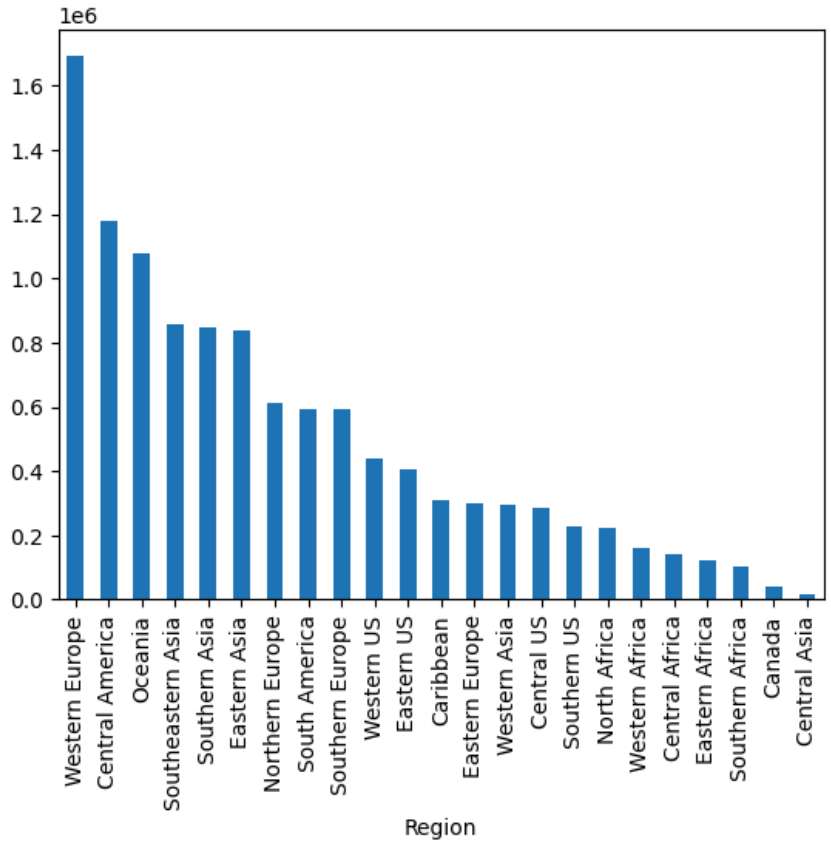
How does the sales vary along the differnet regions?

In [59]:
```
data.groupby('Region').Sales.sum().sort_values(ascending = False).round()
```

Out[59]:
```
Region
Western Europe       1691004.0
Central America      1178008.0
Oceania              1077807.0
Southeastern Asia     858453.0
Southern Asia         846198.0
Eastern Asia          838468.0
Northern Europe       614199.0
South America         594450.0
Southern Europe       594069.0
Western US            437138.0
Eastern US            403407.0
Caribbean             310995.0
Eastern Europe        298549.0
Western Asia          294997.0
Central US            284421.0
Southern US           227176.0
North Africa          220955.0
Western Africa        160366.0
Central Africa        139187.0
Eastern Africa        121637.0
Southern Africa       102084.0
Canada                 39094.0
Central Asia           17660.0
Name: Sales, dtype: float64
```

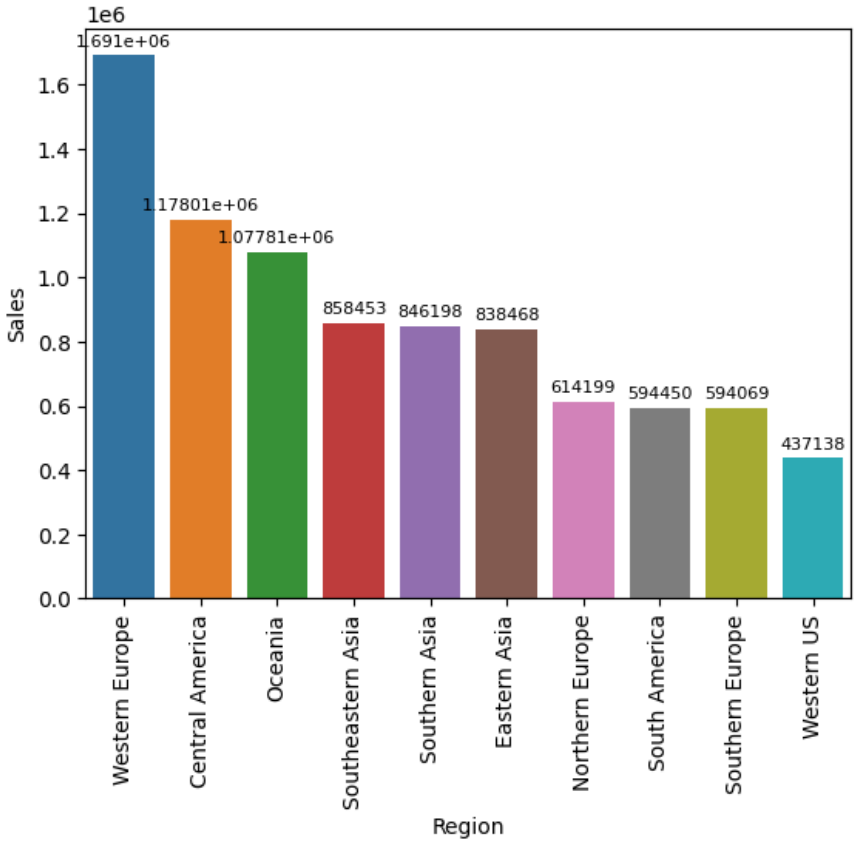
In [60]:
```
data.groupby('Region').Sales.sum().sort_values(ascending = False).plot(kind='bar')
```

Out[60]: <Axes: xlabel='Region'>



Western Europe has the highest sales at 1,691,004.0, while Central Asia has the lowest at 17,660.0.

In [61]:
```
region_sale = data.groupby('Region').Sales.sum().sort_values(ascending = False).head(10)
region_sale = region_sale.reset_index()
ax = sns.barplot(data= region_sale, x='Region', y= 'Sales')
plt.xticks(rotation=90)
for bars in ax.containers:
    ax.bar_label(bars,  fontsize=8, padding=3)
```



The above graph highlights the top regions with comparatively high sales figures relative to others.

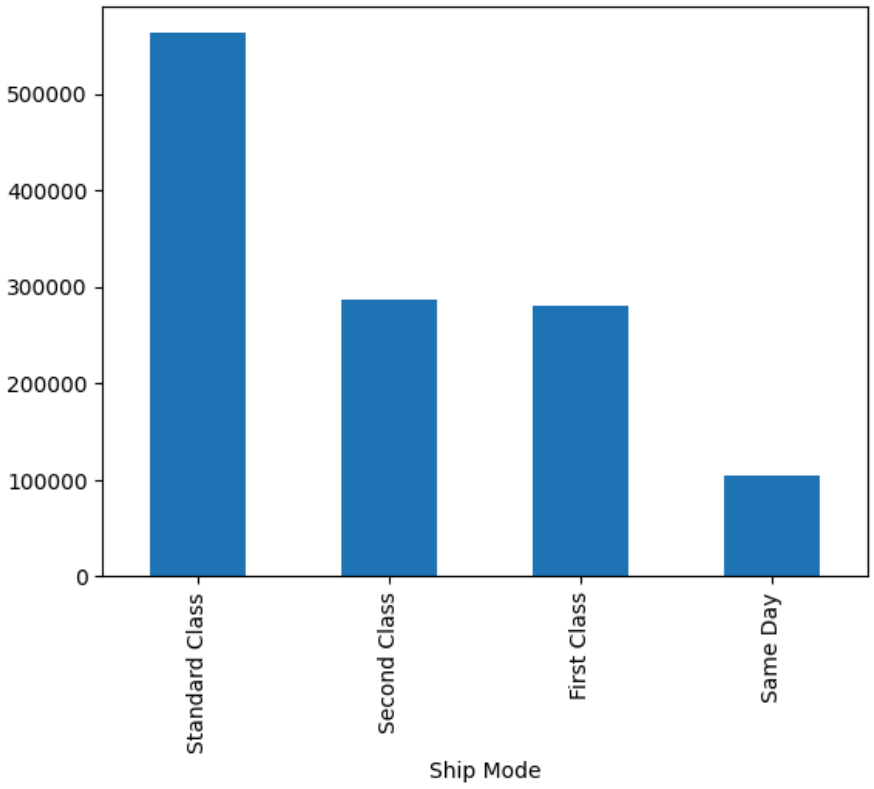
which shipping mode has collected the most shipping charges in total?

In [63]:
```
data.rename({'Shipping Cost': 'Shipping_Cost'},axis=1, inplace=True)
data.groupby('Ship Mode').Shipping_Cost.sum().sort_values(ascending = False)
```

Out[63]:
```
Ship Mode
Standard Class    562735.09700
Second Class      286618.52936
First Class       280150.85600
Same Day          104537.58300
Name: Shipping_Cost, dtype: float64
```

In [64]:
```
data.groupby('Ship Mode').Shipping_Cost.sum().sort_values(ascending = False).plot(kind='bar')
```

Out[64]: <Axes: xlabel='Ship Mode'>



Since most people prefer Standard Class shipping, the shipping charges are also higher for this option.

what is the maximum and minimum shipping cost?

In [66]:
```
data.groupby('Ship Mode').Shipping_Cost.min().sort_values(ascending = False)
```

Out[66]:
```
Ship Mode
First Class       1.03
Second Class      1.03
Standard Class    1.02
Same Day          1.01
Name: Shipping_Cost, dtype: float64
```

```
Mimimum shipping cost is  1
```

In [68]:
```
data.groupby('Ship Mode').Shipping_Cost.max().sort_values(ascending = False)
```

Out[68]:
```
Ship Mode
Second Class      923.63
First Class       915.49
Same Day          903.04
Standard Class    878.38
Name: Shipping_Cost, dtype: float64
```

```
The maximum shipping cost is around 930 and varies depending on the shipping mode.
```

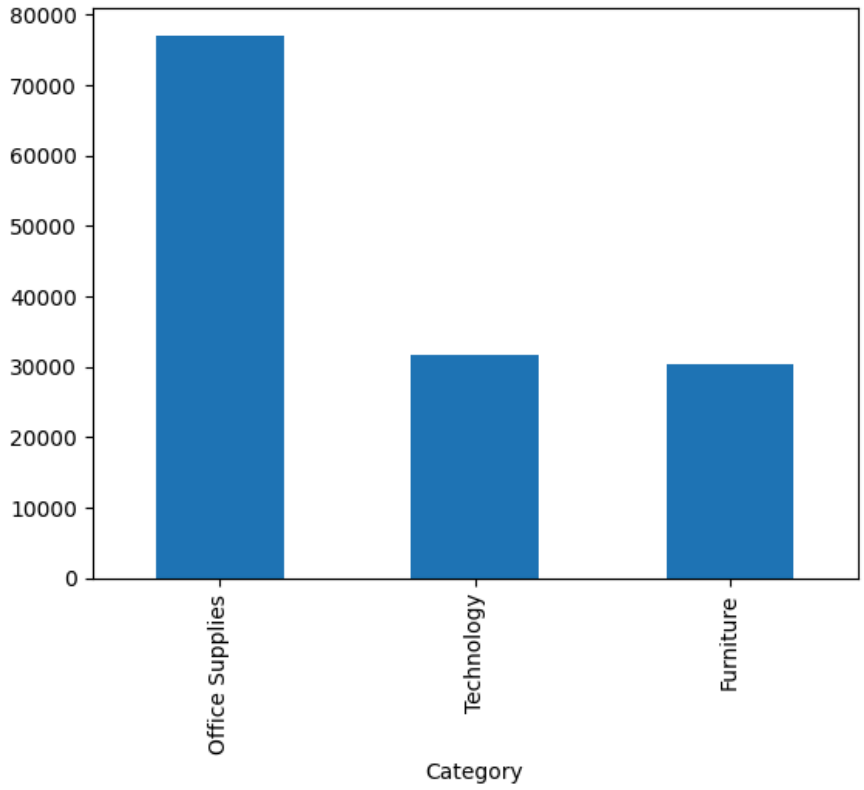
which category sold has sold most number of quantity?

In [69]:
```
data.groupby('Category').Quantity.sum().sort_values(ascending=False)
```

Out[69]:
```
Category
Office Supplies    77048
Technology         31617
Furniture          30374
Name: Quantity, dtype: int64
```

In [70]:
```
data.groupby('Category').Quantity.sum().sort_values(ascending=False).plot(kind='bar')
```

Out[70]:
```
<Axes: xlabel='Category'>
```




```
Office supplies has sold most no of quantities.
```

Within the category which sub category products are ordered most of the times?

In [71]:
```
pd.pivot_table(data, values='Quantity', index=['Category','sub_category'], aggfunc=sum)
```

Out[71]:

		Quantity
Category	**sub_category**	
Furniture	**Bookcases**	7900
	Chairs	11145
	Furnishings	8793
	Tables	2536
Office Supplies	**Appliances**	5237
	Art	12593
	Binders	13061
	Envelopes	6080
	Fasteners	5302
	Labels	4579
	Paper	9248
	Storage	13953
	Supplies	6995
Technology	**Accessories**	9281
	Copiers	7327
	Machines	4626
	Phones	10383

Here's the product with the most and least orders within each category:

Furniture:

Most Ordered: Chairs - 11,145 orders Least Ordered: Tables - 2,536 orders Office Supplies:

Most Ordered: Binders - 13,061 orders Least Ordered: Labels - 4,579 orders Technology:

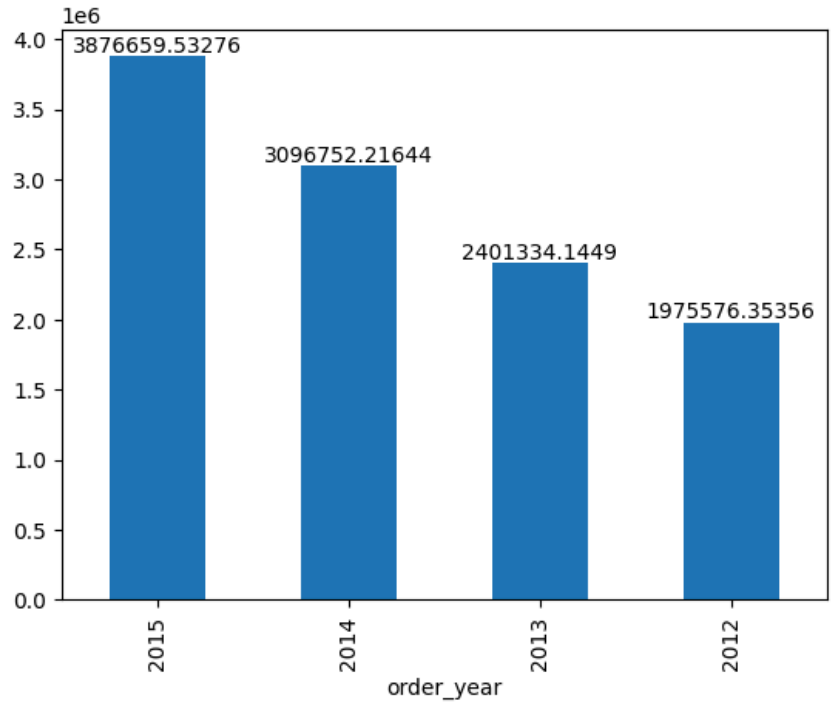
Most Ordered: Phones - 10,383 orders Least Ordered: Machines - 4,626 orders

In which year the sale was highest ?

In [73]:
```
data.groupby('order_year').Sales.sum().sort_values(ascending = False).round()
```

Out[73]:
```
order_year
2015    3876660.0
2014    3096752.0
2013    2401334.0
2012    1975576.0
Name: Sales, dtype: float64
```

In [74]:
```
year_sale= data.groupby('order_year').Sales.sum().sort_values(ascending = False)
ax= year_sale.plot(kind='bar')
for i, value in enumerate(year_sale):
    ax.text(i,value + 0.1, str(value), ha='center', va='bottom')
```




```
The sales were highest in 2015, with 3,876,660.0, while the lowest was in 2012, with 1,975,576.0.
```

How does different category performed in different year?

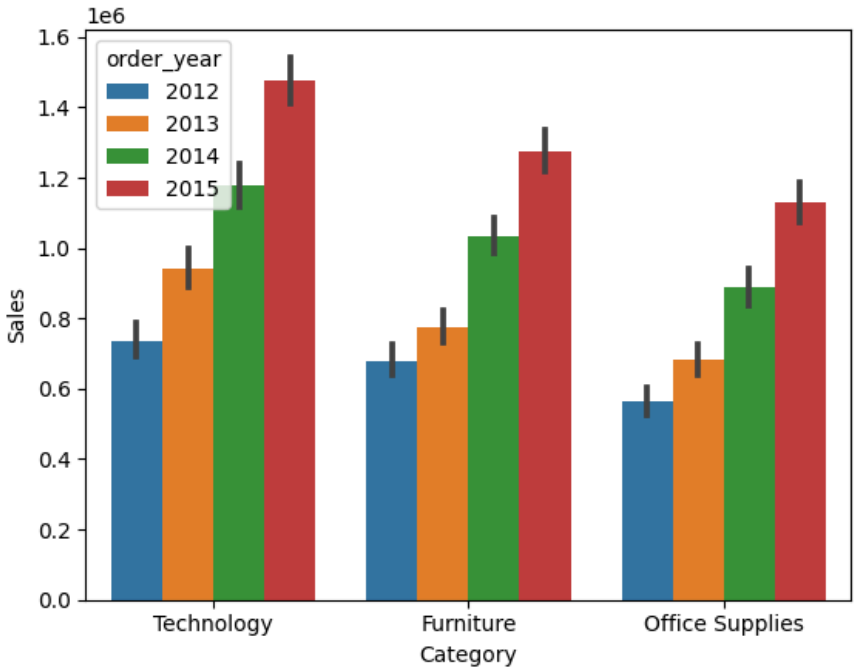
In [76]:
```
pd.pivot_table(data, index=['order_year', 'Category'], values='Sales', aggfunc= sum).round()
```

Out[76]:

		Sales
order_year	**Category**	
2012	**Furniture**	677020.0
	Office Supplies	563343.0
	Technology	735214.0
2013	**Furniture**	775446.0
	Office Supplies	683890.0
	Technology	941998.0
2014	**Furniture**	1032129.0
	Office Supplies	888291.0
	Technology	1176332.0
2015	**Furniture**	1272382.0
	Office Supplies	1129580.0
	Technology	1474697.0

In [77]:
```
sns.barplot(data, x='Category', y= 'Sales', hue='order_year', estimator=sum)
```

Out[77]: <Axes: xlabel='Category', ylabel='Sales'>




```
Sales have shown a steady increase across different categories as the years progress.
```

Year wise sales for category and sub_category ?

In [79]:
```
pd.pivot_table(data, values='Sales', index=['order_year','Category','sub_category'], aggfunc=sum).round()
```

Out[79]:

			Sales
order_year	**Category**	**sub_category**	
2012	**Furniture**	**Bookcases**	250904.0
		Chairs	252744.0
		Furnishings	54133.0
		Tables	119239.0
	Office Supplies	**Appliances**	165318.0
...	**...**	**...**	...
2015	**Office Supplies**	**Supplies**	76271.0
	Technology	**Accessories**	223970.0
		Copiers	514780.0
		Machines	237408.0
		Phones	498540.0

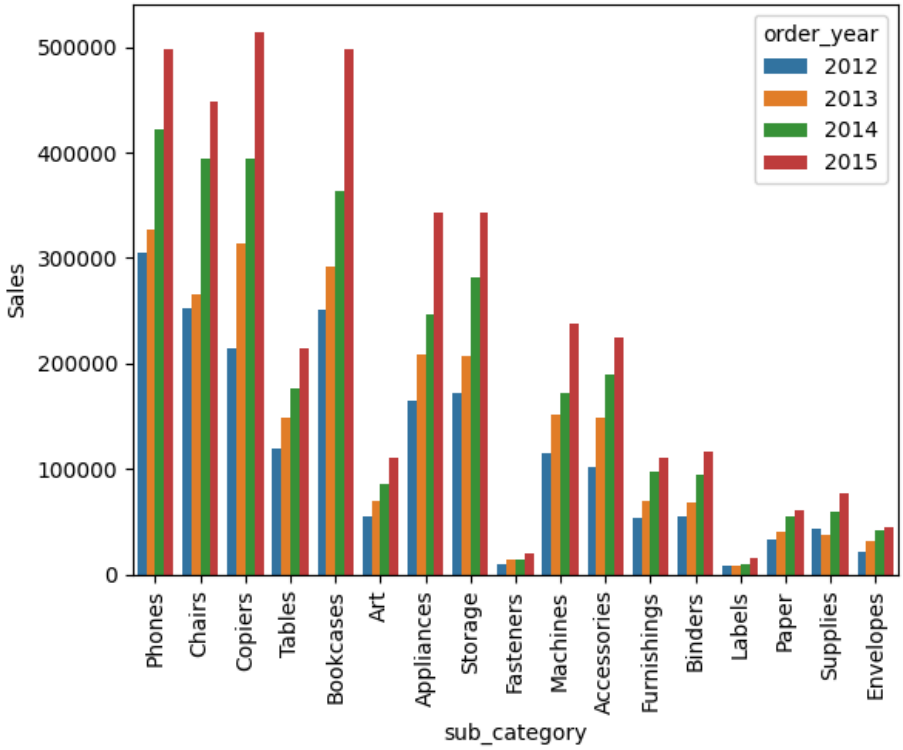
68 rows × 1 columns

In [80]:
```
sns.barplot(data, x= 'sub_category', y='Sales', hue='order_year',ci=None, estimator= sum)
plt.xticks(rotation=90)
plt.show()
```

```
C:\Users\bhargavi\AppData\Local\Temp\ipykernel_13004\2433390378.py:1: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(data, x= 'sub_category', y='Sales', hue='order_year',ci=None, estimator= sum)
```



Sales of various subcategories, including Phones, Chairs, Tables, Bookcases, and Application Storages, saw an increase in both 2014 and 2015.

Year wise profit

In [82]:
```
data.groupby('order_year').Profit.sum().sort_values(ascending= False)
```

Out[82]:
```
order_year
2015    462864.40066
2014    376636.05184
2013    283046.90600
2012    221914.95526
Name: Profit, dtype: float64
```

year wise profit for each category

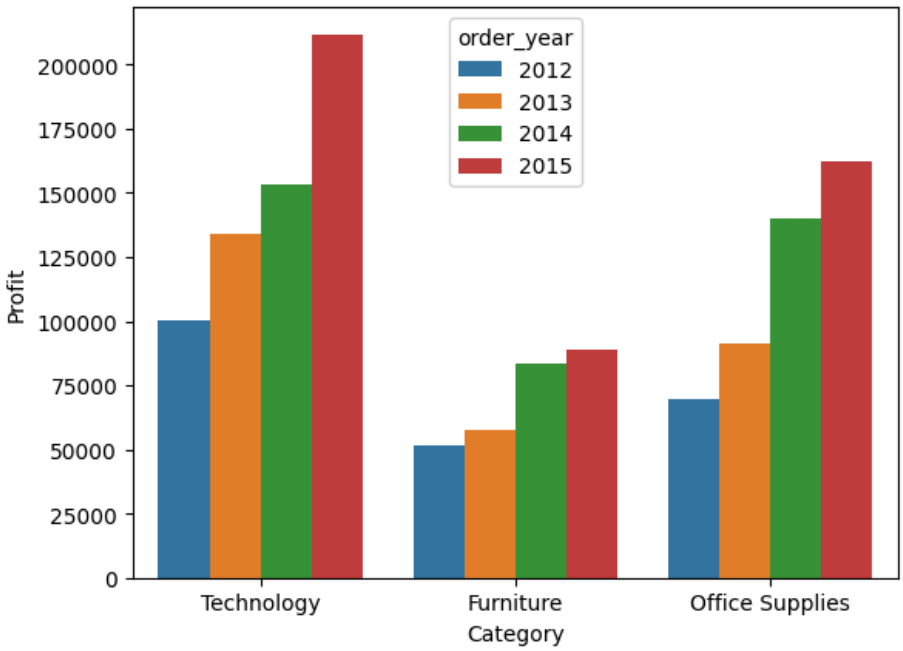
In [83]:
```
pd.pivot_table(data, index= ['order_year', 'Category'], values= 'Profit', aggfunc=sum).round()
```

Out[83]:

		Profit
order_year	Category	
2012	Furniture	51849.0
	Office Supplies	69626.0
	Technology	100440.0
2013	Furniture	57569.0
	Office Supplies	91387.0
	Technology	134090.0
2014	Furniture	83266.0
	Office Supplies	140240.0
	Technology	153131.0
2015	Furniture	88575.0
	Office Supplies	162523.0
	Technology	211766.0

In [84]:
```
sns.barplot(data, x='Category', y= 'Profit', hue='order_year', estimator=sum,errorbar=None)
```

Out[84]: <Axes: xlabel='Category', ylabel='Profit'>



As sales gradually increased from 2012 to 2015, there was also a significant rise in profit.

which category and sub category had the most profit year wise?

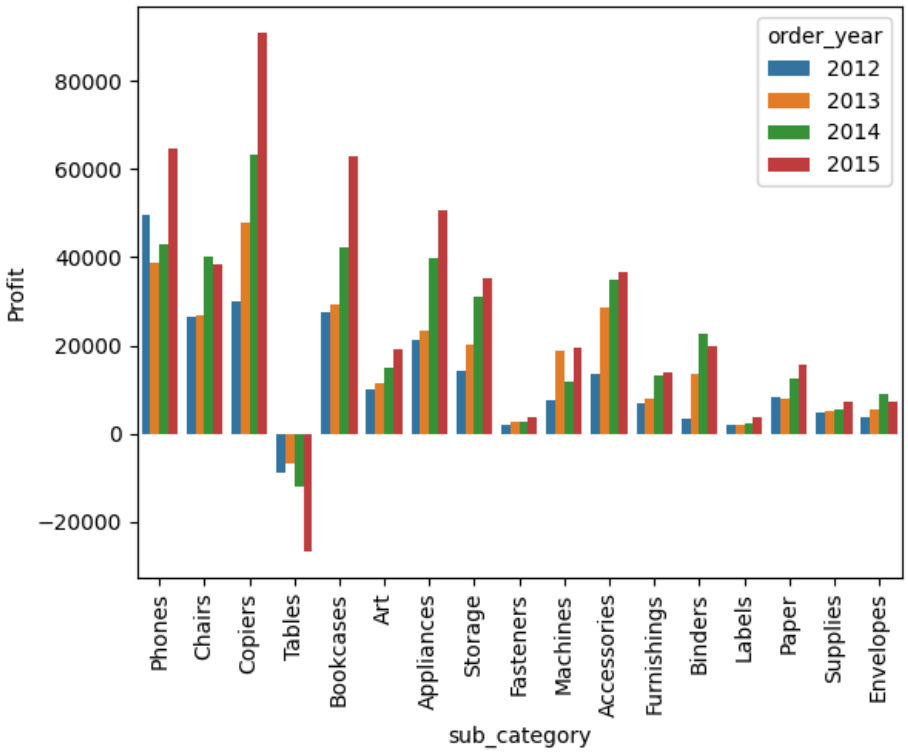
In [85]:
```
pd.pivot_table(data, values='Profit', index= ['order_year', 'Category', 'sub_category'], aggfunc=sum)
```

Out[85]:

			Profit
order_year	**Category**	**sub_category**	
2012	**Furniture**	**Bookcases**	27700.23970
		Chairs	26372.34290
		Furnishings	6825.24720
		Tables	-9048.71410
	Office Supplies	**Appliances**	21103.59320
...	**...**	**...**	...
2015	**Office Supplies**	**Supplies**	7392.97840
	Technology	**Accessories**	36475.06990
		Copiers	91009.14346
		Machines	19589.63000
		Phones	64692.10450

68 rows × 1 columns

In [86]:
```
sns.barplot(data, x='sub_category', y='Profit', hue='order_year',errorbar=None,estimator=sum)
plt.xticks(rotation=90)
plt.show()
```




```
Profits for subcategories like Phones, Chairs, and Copiers have increased, while the profit for Tables has
turned negative.
```

how much if the profit in different Regions?

In [87]:
```
data.columns
```

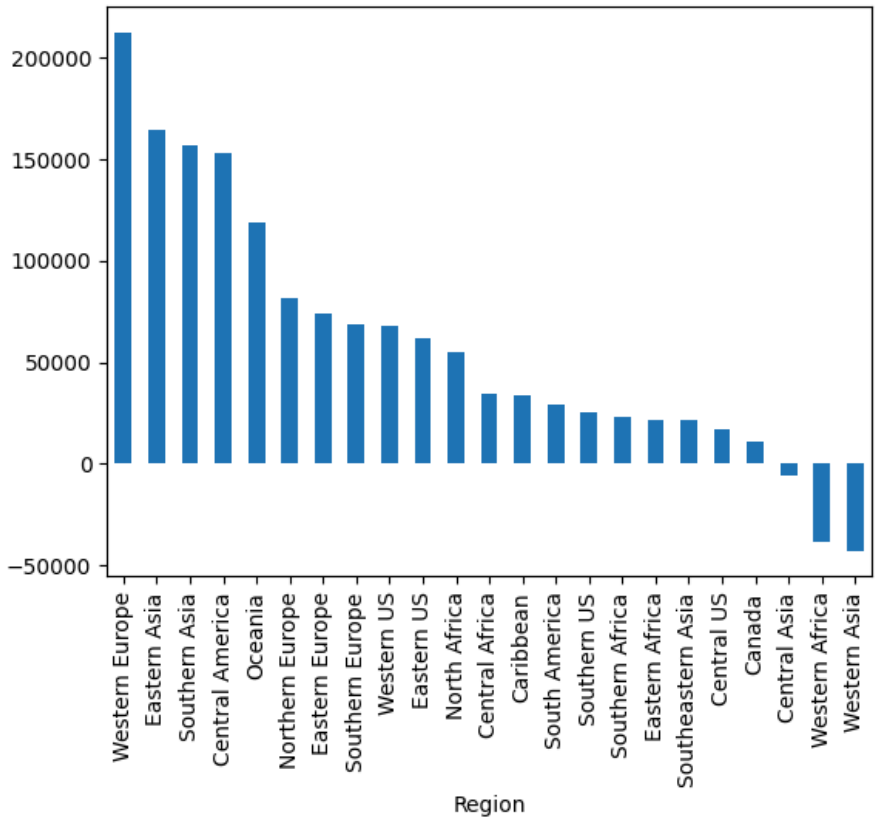
Out[87]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Region', 'Market', 'Product ID', 'Category', 'sub_category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Profit Category-Updated', 'Profit Category', 'Shipping_Cost',
       'Order Priority', 'order_month', 'order_year', 'ship_month',
       'ship_year'],
      dtype='object')
```

In [88]:
```
data.groupby('Region').Profit.sum().sort_values(ascending= False)
```

Out[88]:
```
Region
Western Europe       212501.03850
Eastern Asia         164597.63100
Southern Asia        156649.99000
Central America      153252.92380
Oceania              118511.47800
Northern Europe       81551.44200
Eastern Europe        74061.93000
Southern Europe       68369.39700
Western US            68101.98490
Eastern US            61833.58690
North Africa          54863.01000
Central Africa        34299.57000
Caribbean             33452.82208
South America         29416.07008
Southern US           25212.19370
Southern Africa       23312.61000
Eastern Africa        21838.14300
Southeastern Asia     21298.55340
Central US            17131.77540
Canada                10907.91000
Central Asia          -5841.27600
Western Africa       -38186.21700
Western Asia         -42674.25300
Name: Profit, dtype: float64
```

In [89]:
```
data.groupby('Region').Profit.sum().sort_values(ascending= False).plot(kind='bar')
```

Out[89]:
```
<Axes: xlabel='Region'>
```



Western Europe, Eastern Asia, and Southern Asia have high profits, while Western Africa and Western Asia show negative profits.

How is the profit performing in different segments?

In [90]:
```
data.Segment.value_counts()
```

Out[90]:
```
Consumer       18936
Corporate      11159
Home Office     6501
Name: Segment, dtype: int64
```

In [91]:
```
data.groupby('Segment').Profit.sum().sort_values(ascending= False)
```

Out[91]:
```
Segment
Consumer       694265.17110
Corporate      402676.79310
Home Office    247520.34956
Name: Profit, dtype: float64
```

In terms of profit, the Consumer segment leads with 694,265.17, followed by Corporate with 402,676.79, and Home Office with 247,520.35.

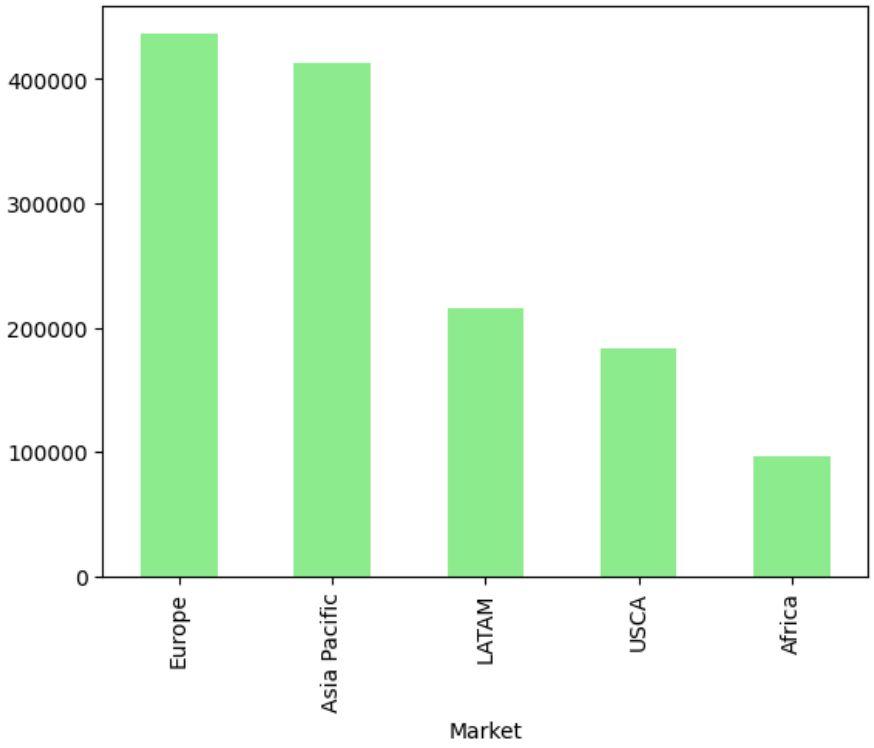
which market place have more profit

In [92]:
```
data.groupby('Market').Profit.sum().sort_values(ascending= False)
```

Out[92]:
```
Market
Europe          436483.80750
Asia Pacific    412542.12340
LATAM           216121.81596
USCA            183187.45090
Africa           96127.11600
Name: Profit, dtype: float64
```

In [93]:
```
data.groupby('Market').Profit.sum().sort_values(ascending= False).plot(kind='bar', color='lightgreen')
```

Out[93]:
```
<Axes: xlabel='Market'>
```



In the marketplace, Europe and Asia Pacific generate higher profits, while Africa shows lower profits.

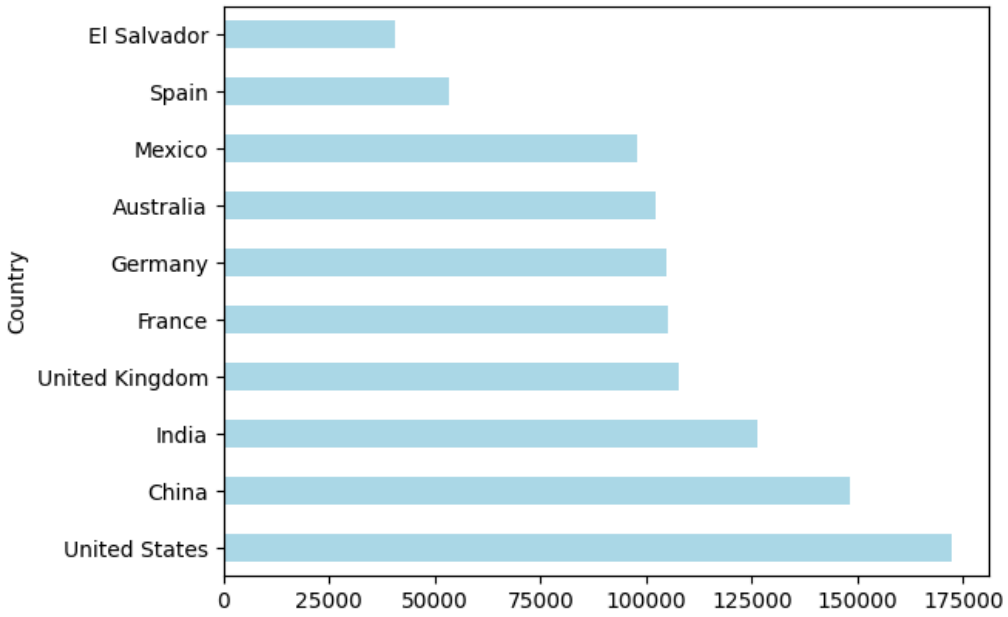
which are the top 10 countries with highest profit?

In [94]:
```
data.groupby('Country').Profit.sum().sort_values(ascending= False).head(10)
```

Out[94]:
```
Country
United States     172279.54090
China             148278.88500
India             126176.73000
United Kingdom    107799.72900
France            105183.28500
Germany           104708.65950
Australia         102345.87900
Mexico             97984.36444
Spain              53325.45300
El Salvador        40625.54336
Name: Profit, dtype: float64
```

In [95]:
```
data.groupby('Country').Profit.sum().sort_values(ascending= False).head(10).plot(kind='barh', color='lightblu
```

Out[95]:
```
<Axes: ylabel='Country'>
```




```
The United States leads in profit, followed by China and Indi,while El Salvador has the lowest profit
```

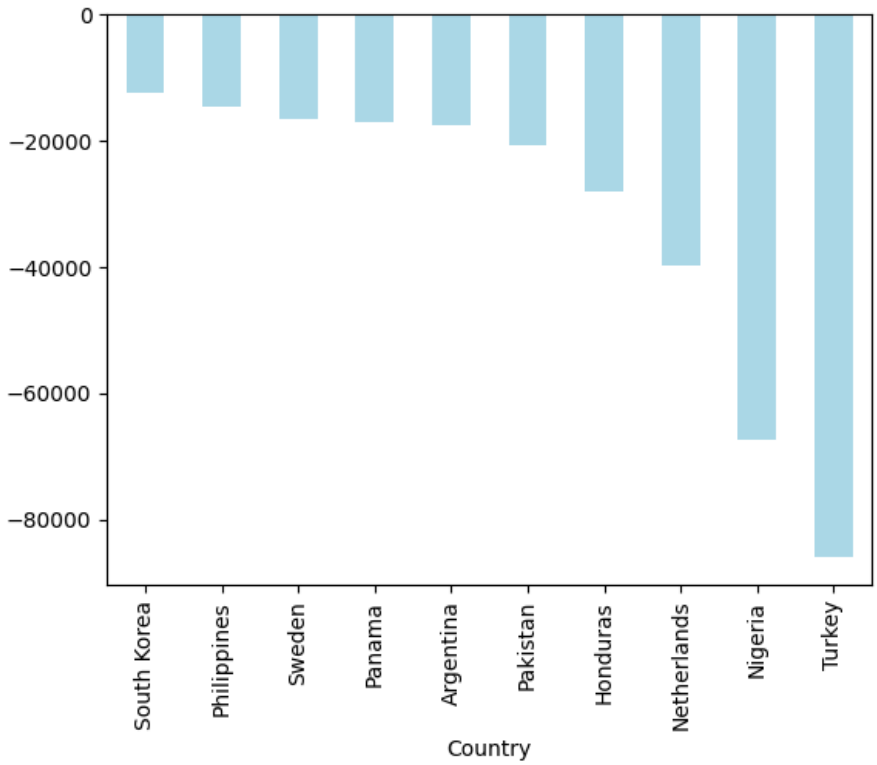
Which are the bottom 10 countries with negative profit?

In [96]:
```
data.groupby('Country').Profit.sum().sort_values(ascending= False).tail(10)
```

Out[96]:
```
Country
South Korea    -12254.15100
Philippines    -14587.97250
Sweden         -16411.60200
Panama         -17009.10448
Argentina      -17548.50052
Pakistan       -20696.91000
Honduras       -27995.06276
Netherlands    -39775.10100
Nigeria        -67342.34700
Turkey         -86107.33800
Name: Profit, dtype: float64
```

In [97]:
```
data.groupby('Country').Profit.sum().sort_values(ascending= False).tail(10).plot(kind='bar', color= 'lightblu
```

Out[97]: <Axes: xlabel='Country'>



South Korea, the Philippines, and Sweden are the countries with negative profit.

How many phones sold, profit, sales?

In [98]:
```
phone_sales = data[data['sub_category']=='Phones']
```

In [99]:
```
phone_sales.head()
```

Out[99]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	City	State	...	Discount	Profit	P Categ Upd
0	40098	CA-2014-AB10015140-41954	2014-11-11	2014-11-13	First Class	AB-100151402	Aaron Bergman	Consumer	Oklahoma City	Oklahoma	...	0.0	62.1544	W
2	25330	IN-2014-CR127307-41929	2014-10-17	2014-10-18	First Class	CR-127307	Craig Reiter	Consumer	Brisbane	Queensland	...	0.1	919.9710	W
3	13524	ES-2014-KM1637548-41667	2014-01-28	2014-01-30	First Class	KM-1637548	Katherine Murray	Home Office	Berlin	Berlin	...	0.1	-96.5400	W
5	22732	IN-2014-JM156557-41818	2014-06-28	2014-07-01	Second Class	JM-156557	Jim Mitchum	Corporate	Sydney	New South Wales	...	0.1	763.2750	W
12	45794	SA-2012-MM7260110-41269	2012-12-26	2012-12-28	Second Class	MM-7260110	Magdelene Morse	Consumer	Jizan	Jizan	...	0.0	1151.4000	C

5 rows × 29 columns

In [100]:
```
# total no of phones
phone_sales.sub_category.value_counts()
```

Out[100]:
```
Phones    2911
Name: sub_category, dtype: int64
```

In [101]:
```
pd.pivot_table(phone_sales, index=['sub_category', 'order_year'], values= ['Sales', 'Profit', 'Quantity'],agg
```

Out[101]:

		Profit	Quantity	Sales
sub_category	**order_year**			
Phones	**2012**	49460.5364	1928	304675.1007
	2013	38822.1611	2210	327282.5414
	2014	43036.0458	2797	421389.1185
	2015	64692.1045	3448	498539.6581

The sales, number of orders, and total revenue for Phones increased each year from 2012 to 2015.

- 2013: -21.5% decrease compared to 2012
- 2014: 10.8% increase compared to 2013
- 2015: 50.6% increase compared to 2014

How many tables sold, their sales and profit?

In [104]:
```
table_sales= data[data['sub_category']=='Tables']
```

In [105]:
```
table_sales
```

Out[105]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	City	State	...	Discount	Profit
7	31192	IN-2013-MB1808592-41378	2013-04-14	2013-04-18	Standard Class	MB-1808592	Mick Brown	Consumer	Hamilton	Waikato	...	0.0	996.4800
11	28879	ID-2013-AJ107801-41383	2013-04-19	2013-04-22	First Class	AJ-107801	Anthony Jacobs	Corporate	Kabul	Kabul	...	0.0	647.5500
20	46630	PL-2013-AB600103-41494	2013-08-08	2013-08-10	First Class	AB-600103	Ann Blume	Corporate	Bytom	Silesia	...	0.0	276.8400
25	3484	MX-2015-VD2167039-42252	2015-09-05	2015-09-08	First Class	VD-2167039	Valerie Dominguez	Consumer	Soyapango	San Salvador	...	0.2	526.4960
26	30191	IN-2012-PB19210127-41259	2012-12-16	2012-12-19	First Class	PB-19210127	Phillip Breyer	Corporate	Taipei	Taipei City	...	0.0	720.3600
...	...	...	...	...	...	...	...	...	...	...	...	...	...
35611	38411	US-2014-LW16990140-41765	2014-05-06	2014-05-07	First Class	LW-169901404	Lindsay Williams	Corporate	Henderson	Nevada	...	0.0	320.3172
35616	32651	CA-2015-LW16990140-42129	2015-05-05	2015-05-10	Standard Class	LW-169901404	Lindsay Williams	Corporate	San Francisco	California	...	0.2	11.2839
35801	33574	CA-2012-LM17065140-41086	2012-06-26	2012-06-30	Standard Class	LM-170651408	Liz MacKendrick	Consumer	Southaven	Mississippi	...	0.0	22.3548
35908	39564	CA-2015-LP17095140-42035	2015-01-31	2015-02-07	Standard Class	LP-170951402	Liz Preis	Consumer	Aurora	Illinois	...	0.5	-47.1750
35941	33644	CA-2014-LT17110140-41712	2014-03-14	2014-03-19	Standard Class	LT-171101402	Liz Thompson	Consumer	San Antonio	Texas	...	0.3	0.0000

717 rows × 29 columns

In [106]:
```
table_sales.sub_category.value_counts()
```

Out[106]:
```
Tables    717
Name: sub_category, dtype: int64
```

In [107]:
```
pd.pivot_table(table_sales, index=['sub_category', 'order_year'], values= ['Sales', 'Profit', 'Quantity'],agg
```

Out[107]:

		Profit	Quantity	Sales
sub_category	**order_year**			
Tables	**2012**	-9048.7141	441	119239.1388
	2013	-6650.4680	524	148757.6268
	2014	-12147.0435	701	176985.3521
	2015	-26665.2189	870	215024.9018

The negative profit for Tables increased each year from 2012 to 2015, meaning the losses became larger.

Analysis on INDIA

In [108]:
```
india_sales= data[data['Country']=='India']
```

In [109]:
```
india_sales
```

Out[109]:

	Row ID	Order ID	Order Date	Ship Date	Ship Mode	Customer ID	Customer Name	Segment	City	State	...	Discount	P
29	22999	IN-2013-BP1123058-41329	2013-02-24	2013-02-24	Same Day	BP-1123058	Benjamin Patterson	Consumer	Surat	Gujarat	...	0.0	58
41	29272	IN-2015-BF1100558-42319	2015-11-11	2015-11-15	Standard Class	BF-1100558	Barry Franz	Home Office	Gorakhpur	Haryana	...	0.0	63
42	25795	IN-2015-VG2180558-42273	2015-09-26	2015-09-28	Second Class	VG-2180558	Vivek Grady	Corporate	Thiruvananthapuram	Kerala	...	0.0	209
48	28701	IN-2015-SW2027558-42125	2015-05-01	2015-05-01	Same Day	SW-2027558	Scott Williamson	Consumer	Jamshedpur	Jharkhand	...	0.0	50
55	29047	IN-2013-SG2047058-41424	2013-05-30	2013-05-31	First Class	SG-2047058	Sheri Gordon	Consumer	Bhopal	Madhya Pradesh	...	0.0	73
...	...	...	...	...	...	...	...	...	...	...	...	...	
36494	23165	IN-2014-TS2143058-41808	2014-06-18	2014-06-24	Standard Class	TS-2143058	Tom Stivers	Corporate	Vijayawada	Andhra Pradesh	...	0.0	
36508	20454	IN-2015-JW1522058-42270	2015-09-23	2015-09-27	Standard Class	JW-1522058	Jane Waco	Corporate	Barddhaman	West Bengal	...	0.0	2
36538	27162	IN-2012-AH1069058-41177	2012-09-25	2012-09-29	Standard Class	AH-1069058	Anna Häberlin	Corporate	Raipur	Uttarakhand	...	0.0	
36558	26498	IN-2015-YS2188058-42136	2015-05-12	2015-05-18	Standard Class	YS-2188058	Yana Sorensen	Corporate	Hyderabad	Telangana	...	0.0	
36571	23127	IN-2013-CC1214558-41429	2013-06-04	2013-06-06	Second Class	CC-1214558	Charles Crestani	Consumer	Pimpri	Maharashtra	...	0.0	

1301 rows × 29 columns

Total sales in india

In [110]:
```
india_sales.Sales.sum().round()
```

Out[110]:
```
577666.0
```

The total sales in India is 577,666.00.

which shipping method is most prefered in India?

In [112]:
```
india_sales.value_counts('Ship Mode')
```

Out[112]:
```
Ship Mode
Standard Class    784
Second Class      288
First Class       171
Same Day           58
dtype: int64
```

In [ ]:
```
india_sales.value_counts('Ship Mode').plot(kind='bar')
```

Standard class is the shipping mode prefered by indian.

Maximum and minimum shipping cost in india?

In [114]:
```
data.columns
```

Out[114]:
```
Index(['Row ID', 'Order ID', 'Order Date', 'Ship Date', 'Ship Mode',
       'Customer ID', 'Customer Name', 'Segment', 'City', 'State', 'Country',
       'Region', 'Market', 'Product ID', 'Category', 'sub_category',
       'Product Name', 'Sales', 'Quantity', 'Discount', 'Profit',
       'Profit Category-Updated', 'Profit Category', 'Shipping_Cost',
       'Order Priority', 'order_month', 'order_year', 'ship_month',
       'ship_year'],
      dtype='object')
```

In [115]:
```
india_sales.Shipping_Cost.min()
```

Out[115]:
```
3.12
```

In [116]:
```
india_sales.Shipping_Cost.max()
```

Out[116]:
```
704.08
```

```
In India, the minimum shipping cost is 3, while the maximum is 700.
```

Profit in India

In [117]:
```
india_sales.Profit.sum()
```

Out[117]:
```
126176.73
```

The profit is india is 1,26,176.

which segment is prefered in inida?

In [119]:
```
india_sales.value_counts('Segment')
```

Out[119]:
```
Segment
Consumer       686
Corporate      355
Home Office    260
dtype: int64
```

consumer is the segment mostly prefered in India

which category is most prefered in India?

In [120]:
```
india_sales.Category.value_counts()
```

Out[120]:
```
Office Supplies    609
Technology         348
Furniture          344
Name: Category, dtype: int64
```

Office Supplies are prefered in india

which sub categories are most preferred in india?

In [121]:
```
india_sales.sub_category.value_counts()
```

Out[121]:
```
Chairs         134
Phones         118
Accessories     98
Bookcases       97
Storage         91
Furnishings     89
Paper           88
Copiers         83
Binders         83
Envelopes       73
Supplies        71
Art             59
Fasteners       57
Machines        49
Labels          46
Appliances      41
Tables          24
Name: sub_category, dtype: int64
```

In India, Chairs, Phones, and Accessories are the most preferred segments, while Appliances and Tables are the least preferred.

Year wise sales in India

In [123]:
```
india_sales.groupby('order_year').Sales.sum().sort_values(ascending = False)
```

Out[123]:
```
order_year
2015    201740.370
2014    149061.915
2013    138987.750
2012     87875.865
Name: Sales, dtype: float64
```

There has been a consistent increase in sales in India each year, with sales growing from 87,875.87 in 2012 to 201,740.37 in 2015.

year and category wise sales in india

In [124]:
```
pd.pivot_table(india_sales, index=['order_year', 'Category'], values='Sales', aggfunc=sum)
```

Out[124]:

		Sales
order_year	**Category**	
2012	**Furniture**	33110.415
	Office Supplies	14293.665
	Technology	40471.785
2013	**Furniture**	47922.345
	Office Supplies	31323.690
	Technology	59741.715
2014	**Furniture**	52784.700
	Office Supplies	26222.625
	Technology	70054.590
2015	**Furniture**	80721.585
	Office Supplies	49903.695
	Technology	71115.090

year wise profit in india

In [125]:
```
india_sales.groupby('order_year').Profit.sum().sort_values(ascending = False)
```

Out[125]:
```
order_year
2015    48056.880
2014    32403.615
2013    27008.940
2012    18707.295
Name: Profit, dtype: float64
```

There has been a consistent increase in profit in India each year, with profits growing from 18,707.30 in 2012 to 48,056.88 in 2015.

Year and category wise profit in india

In [126]:
```
pd.pivot_table(india_sales, index=['order_year', 'Category'], values='Profit', aggfunc=sum)
```

Out[126]:

		Profit
order_year	**Category**	
2012	**Furniture**	6404.145
	Office Supplies	3313.995
	Technology	8989.155
2013	**Furniture**	7846.935
	Office Supplies	6606.030
	Technology	12555.975
2014	**Furniture**	9272.670
	Office Supplies	6479.055
	Technology	16651.890
2015	**Furniture**	18625.365
	Office Supplies	11769.615
	Technology	17661.900

State wise profit in India

In [127]:
```
india_sales.State.unique()
```

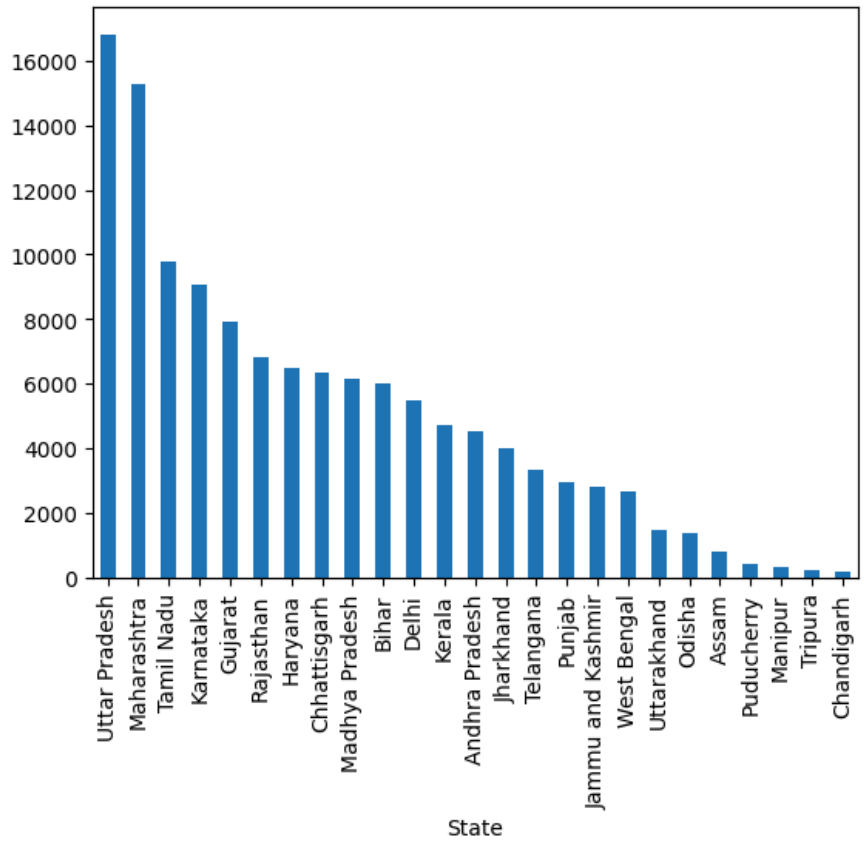
Out[127]:
```
array(['Gujarat', 'Haryana', 'Kerala', 'Jharkhand', 'Madhya Pradesh',
       'Delhi', 'Uttarakhand', 'West Bengal', 'Bihar', 'Uttar Pradesh',
       'Chhattisgarh', 'Tamil Nadu', 'Maharashtra', 'Karnataka',
       'Rajasthan', 'Manipur', 'Andhra Pradesh', 'Jammu and Kashmir',
       'Telangana', 'Punjab', 'Odisha', 'Puducherry', 'Assam',
       'Chandigarh', 'Tripura'], dtype=object)
```

In [128]:
```
india_sales.groupby('State').Profit.sum().sort_values(ascending= False)
```

Out[128]:
```
State
Uttar Pradesh        16802.22
Maharashtra          15253.95
Tamil Nadu            9774.00
Karnataka             9091.17
Gujarat               7944.63
Rajasthan             6833.19
Haryana               6497.94
Chhattisgarh          6345.84
Madhya Pradesh        6174.57
Bihar                 6004.08
Delhi                 5498.10
Kerala                4743.66
Andhra Pradesh        4512.18
Jharkhand             4005.36
Telangana             3349.14
Punjab                2958.87
Jammu and Kashmir     2830.32
West Bengal           2694.96
Uttarakhand           1487.73
Odisha                1382.70
Assam                  824.52
Puducherry             422.34
Manipur                354.42
Tripura                213.54
Chandigarh             177.30
Name: Profit, dtype: float64
```

In [129]:
```
india_sales.groupby('State').Profit.sum().sort_values(ascending= False).plot(kind='bar')
```

Out[129]:
```
<Axes: xlabel='State'>
```



Uttar Pradesh, Maharashtra, Tamil Nadu, and Karnataka have the highest profits, while Manipur, Tripura, and Chandigarh have the lowest profits.

summary

- Sales and Performance:

Office Supplies leads in items sold, followed by Technology and Furniture. Storage has the highest sales, with Art and Paper also performing well. Copiers are the least sold. Staples outperforms Fellowes File Carts and Wire Frames by 69% in sales.

- Shipping and Costs:

Standard Class is the most popular shipping mode despite higher costs, ranging from 1 to 930. Phones have the highest sales at approximately 1.55 million, while Labels have the lowest at around 40,100. Top Products by Category:

- Furniture:

Bookcases with 1,404,026 in sales. Office Supplies: Appliances with 963,849 in sales. Technology: Phones with 1,551,886 in sales.

- Regional Insights:

Asia Pacific leads with 3.93 million in sales, while Africa has the lowest at 744,228. Burundi has the highest sales among countries at 267.720, while Belize has the lowest at 57.720. Western Europe has the highest regional sales at 1,691,004, while Central Asia has the lowest at 17,660.

- Profit Trends:

Profits increased each year from 2012 to 2015, with the highest in 2015 at 3,876,660. Phones, Chairs, and Copiers saw rising profits, while Tables saw increasing negative profit. Western Europe, Eastern Asia, and Southern Asia report high profits, whereas Western Africa and Western Asia show negative profits.

- India-Specific Insights:

Total sales in India are 577,666.00, with Standard Class being the preferred shipping mode. Profit in India stands at 126,176, with consistent annual increases in sales and profit from 2012 to 2015. Chairs, Phones, and Accessories are the most preferred segments in India, while Appliances and Tables are the least preferred.

- Conclusion

The market exhibits strong growth, particularly in Technology and Office Supplies. Rising profits in Asia Pacific and Western Europe highlight robust performance, while Tables' increasing negative profit suggests areas for improvement. In India, steady growth in Chairs and Phones reflects a positive market trend.

In [ ]:

In [ ]: