Business Case: Aerofit - Descriptive Statistics & Probability

In [2]:
```
#importing libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
import copy
```

In [14]:
```
# loading the dataset
df = pd.read_csv('aerofit_treadmill.txt')
```

In [6]:
```
df.head()
```

Out[6]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	18	Male	14	Single	3	4	29562	112
1	KP281	19	Male	15	Single	2	3	31836	75
2	KP281	19	Female	14	Partnered	4	3	30699	66
3	KP281	19	Male	12	Single	3	3	32973	85
4	KP281	20	Male	13	Partnered	4	2	35247	47

In [7]:
```
df.tail()
```

Out[7]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Mil
175	KP781	40	Male	21	Single	6	5	83416	2
176	KP781	42	Male	18	Single	5	4	89641	2
177	KP781	45	Male	16	Single	5	5	90886	1
178	KP781	47	Male	18	Partnered	4	5	104581	1
179	KP781	48	Male	18	Partnered	4	5	95508	1

In [8]:
```
df.shape
```

Out[8]:
```
(180, 9)
```

In [15]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   Product        180 non-null    object
 1   Age            180 non-null    int64 
 2   Gender         180 non-null    object
 3   Education      180 non-null    int64 
 4   MaritalStatus  180 non-null    object
 5   Usage          180 non-null    int64 
 6   Fitness        180 non-null    int64 
 7   Income         180 non-null    int64 
 8   Miles          180 non-null    int64 
dtypes: int64(6), object(3)
memory usage: 12.8+ KB
```

INSIGHTS:

From the above analysis, it is clear that, data has total of 9 features with mixed alpha numeric data. Also we can see that there is no missing data in the columns.

The data type of all the columns are matching with the data present in them. But we will change the datatype of Usage and Fitness into str(object).

In [11]:
```
#Changing the Datatype of Columns:

df['Usage'] = df['Usage'].astype('str')
df['Fitness'] = df['Fitness'].astype('str')
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 9 columns):
 #   Column         Non-Null Count  Dtype 
---  ------         --------------  ----- 
 0   Product        180 non-null    object
 1   Age            180 non-null    int64 
 2   Gender         180 non-null    object
 3   Education      180 non-null    int64 
 4   MaritalStatus  180 non-null    object
 5   Usage          180 non-null    object
 6   Fitness        180 non-null    object
 7   Income         180 non-null    int64 
 8   Miles          180 non-null    int64 
dtypes: int64(4), object(5)
memory usage: 12.8+ KB
```

In [16]:
```
#statisctical summary of object type column

df.describe(include = 'object')
```

Out[16]:

	Product	Gender	MaritalStatus
count	180	180	180
unique	3	2	2
top	KP281	Male	Partnered
freq	80	104	107

INSIGHTS: 1. Product - Over the past three months, the KP281 product demonstrated the highest sales performance among the three products, accounting for approximately 44% of total sales. 2. Gender - Based on the data of last 3 months, around 58% of the buyers were Male and 42% were female. 3. Marital Status - Based on the data of last 3 months, around 60% of the buyers were Married and 40% were single.

In [17]:
```
 # statisctical summary of numerical data type columns
df.describe()
```

Out[17]:

	Age	Education	Usage	Fitness	Income	Mile
count	180.000000	180.000000	180.000000	180.000000	180.000000	180.00000
mean	28.788889	15.572222	3.455556	3.311111	53719.577778	103.19444
std	6.943498	1.617055	1.084797	0.958869	16506.684226	51.86360
min	18.000000	12.000000	2.000000	1.000000	29562.000000	21.00000
25%	24.000000	14.000000	3.000000	3.000000	44058.750000	66.00000
50%	26.000000	16.000000	3.000000	3.000000	50596.500000	94.00000
75%	33.000000	16.000000	4.000000	4.000000	58668.000000	114.75000
max	50.000000	21.000000	7.000000	5.000000	104581.000000	360.00000

INSIGHTS:

1. Age - The age range of customers spans from 18 to 50 year, with an average age of 29 years.
2. Education - Customer education levels vary between 12 and 21 years, with an average education duration of 16 years.
3. Usage - Customers intend to utilize the product anywhere from 2 to 7 times per week, with an average usage frequency of 3 times per week.
4. Fitness - On average, customers have rated their fitness at 3 on a 5-point scale, reflecting a moderate level of fitness.
5. Income - The annual income of customers falls within the range of USD 30,000 to USD 100,000, with an average income of approximately USD 54,000.
6. Miles - Customers' weekly running goals range from 21 to 360 miles, with an average target of 103 miles per week.

In [19]:
```
#Duplicate Detection
df.duplicated().value_counts()
```

Out[19]:
```
False    180
Name: count, dtype: int64
```

INSIGHTS:

There are no duplicate entries in the dataset

Sanity Check for columns

In [25]:
```
#checking the unique values for columns
for i in df.columns:
    print('Unique Values in',i,'column are :-')
    print(df[i].unique())
    print('-'*70)
```

```
Unique Values in Product column are :-
['KP281' 'KP481' 'KP781']
----------------------------------------------------------------------
Unique Values in Age column are :-
[18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41
 43 44 46 47 50 45 48 42]
----------------------------------------------------------------------
Unique Values in Gender column are :-
['Male' 'Female']
----------------------------------------------------------------------
Unique Values in Education column are :-
[14 15 12 13 16 18 20 21]
----------------------------------------------------------------------
Unique Values in MaritalStatus column are :-
['Single' 'Partnered']
----------------------------------------------------------------------
Unique Values in Usage column are :-
[3 2 4 5 6 7]
----------------------------------------------------------------------
Unique Values in Fitness column are :-
[4 3 2 1 5]
----------------------------------------------------------------------
Unique Values in Income column are :-
[ 29562  31836  30699  32973  35247  37521  36384  38658  40932  34110
  39795  42069  44343  45480  46617  48891  53439  43206  52302  51165
  50028  54576  68220  55713  60261  67083  56850  59124  61398  57987
  64809  47754  65220  62535  48658  54781  48556  58516  53536  61006
  57271  52291  49801  62251  64741  70966  75946  74701  69721  83416
  88396  90886  92131  77191  52290  85906 103336  99601  89641  95866
 104581  95508]
----------------------------------------------------------------------
Unique Values in Miles column are :-
[112  75  66  85  47 141 103  94 113  38 188  56 132 169  64  53 106  95
 212  42 127  74 170  21 120 200 140 100  80 160 180 240 150 300 280 260
 360]
----------------------------------------------------------------------
```

INSIGHTS:

The dataset does not contain any abnormal values.

Adding new columns for better analysis

Creating New Column and Categorizing values in Age,Education,Income and Miles to different classes for better visualization

Age Column Categorizing the values in age column in 4 different buckets:

1. Young Adult: from 18 - 25
2. Adults: from 26 - 35
3. Middle Aged Adults: 36-45
4. Elder :46 and above

Education Column Categorizing the values in education column in 3 different buckets:

1. Primary Education: upto 12
2. Secondary Education: 13 to 15
3. Higher Education: 16 and above

Income Column Categorizing the values in Income column in 4 different buckets:

1. Low Income - Upto 40,000
2. Moderate Income - 40,000 to 60,000
3. High Income - 60,000 to 80,000
4. Very High Income - Above 80,000

Miles column Categorizing the values in miles column in 4 different buckets:

1. Light Activity - Upto 50 miles
2. Moderate Activity - 51 to 100 miles
3. Active Lifestyle - 101 to 200 miles
4. Fitness Enthusiast - Above 200 miles

In [26]:
```
 #binning the age values into categories
bin_range1 = [17,25,35,45,float('inf')]
bin_labels1 = ['Young Adults', 'Adults', 'Middle Aged Adults', 'Elder']

df['age_group'] = pd.cut(df['Age'],bins = bin_range1,labels = bin_labels1
```

In [33]:
```
#binning the education values into categories
bin_range2 = [0,12,15,float('inf')]
bin_labels2 = ['Primary Education', 'Secondary Education', 'Higher Educat
df['edu_group'] = pd.cut(df['Education'],bins = bin_range2,labels = bin_l
```

In [32]:
```
#binning the income values into categories
bin_range3 = [0,40000,60000,80000,float('inf')]
bin_labels3 = ['Low Income','Moderate Income','High Income','Very High In
df['income_group'] = pd.cut(df['Income'],bins = bin_range3,labels = bin_l
```

In [34]:
```
#binning the miles values into categories
bin_range4 = [0,50,100,200,float('inf')]
bin_labels4 = ['Light Activity', 'Moderate Activity', 'Active Lifestyle',
df['miles_group'] = pd.cut(df['Miles'],bins = bin_range4,labels = bin_lab
```

In [35]:
```
df.head()
```

Out[35]:

	Product	Age	Gender	Education	MaritalStatus	Usage	Fitness	Income	Miles
0	KP281	18	Male	14	Single	3	4	29562	112
1	KP281	19	Male	15	Single	2	3	31836	75
2	KP281	19	Female	14	Partnered	4	3	30699	66
3	KP281	19	Male	12	Single	3	3	32973	85
4	KP281	20	Male	13	Partnered	4	2	35247	47

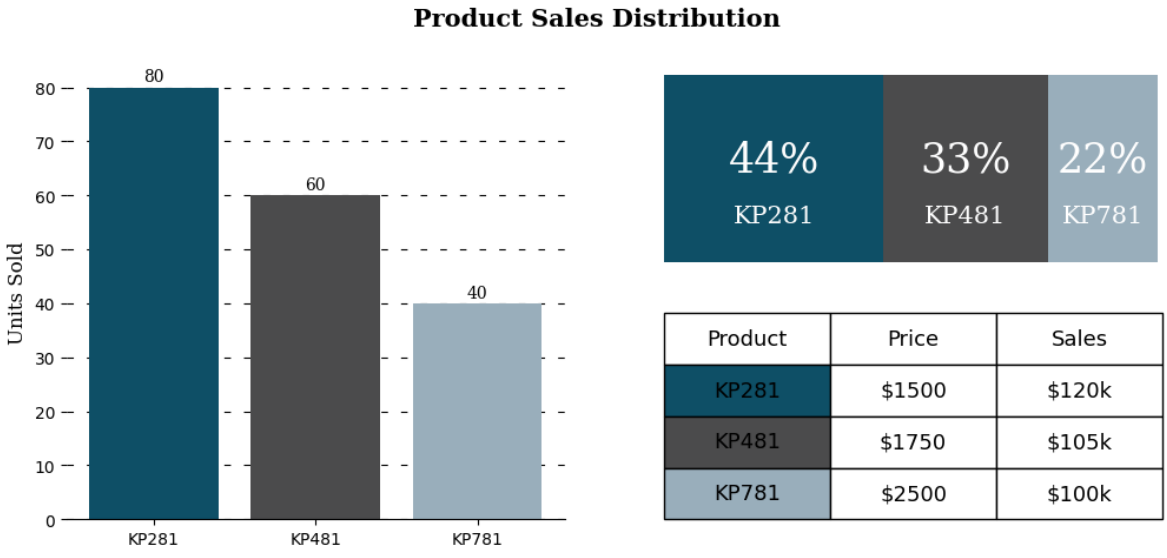
3. Univariate Analysis

3.1 Categorical Variables

3.1.1 Product Sales Distribution

In [40]:
```
#setting the plot style

fig = plt.figure(figsize = (12,5))
gs = fig.add_gridspec(2,2)

#creating plot for product column
ax0 = fig.add_subplot(gs[:,0])

product_count = df['Product'].value_counts()

color_map = ["#0e4f66", "#4b4b4c",'#99AEBB']

ax0.bar(product_count.index,product_count.values,color = color_map,zorder

#adding the value_counts
for i in product_count.index:
    ax0.text(i,product_count[i]+2,product_count[i],{'font':'serif','size'

#adding grid lines
ax0.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)

#adding axis label
ax0.set_ylabel('Units Sold',fontfamily='serif',fontsize = 12)

#creating a plot for product % sale
ax1 = fig.add_subplot(gs[0,1])

product_count['percent'] = ((product_count.values/df.shape[0])* 100).roun

ax1.barh(product_count.index[0],product_count.loc['percent'][0],color = "
ax1.barh(product_count.index[0],product_count.loc['percent'][1],left = pr
ax1.barh(product_count.index[0],product_count.loc['percent'][2],
```

```
          left = product_count.loc['percent'][0] + product_count.loc['per
ax1.set(xlim=(0,100))

# adding info to the each bar
product_count['info_percent'] =[product_count['percent'][0]/2,product_cou
                                product_count['percent'][0] + product_cou
for i in range(3):
    ax1.text(product_count['info_percent'][i],0.04,f"{product_count['perc
             va = 'center', ha='center',fontsize=25, fontweight='light',
    ax1.text(product_count['info_percent'][i],-0.2,product_count.index[i]
             va = 'center', ha='center',fontsize=15, fontweight='light',
#removing the axis lines
ax1.axis('off')


#creating a plot for product portfolio
ax2 = fig.add_subplot(gs[1,1])

product_portfolio = [['KP281','$1500','$120k'],['KP481','$1750','$105k'],

color_2d = [['#0e4f66','#FFFFFF','#FFFFFF'],['#4b4b4c','#FFFFFF','#FFFFFF

table = ax2.table(cellText = product_portfolio, cellColours=color_2d, cel
                  colLoc = 'center',bbox =[0, 0, 1, 1])
table.set_fontsize(13)

#removing axis
ax2.axis('off')

#adding title to the visual
fig.suptitle('Product Sales Distribution',fontproperties = {'family':'ser
plt.show()
```



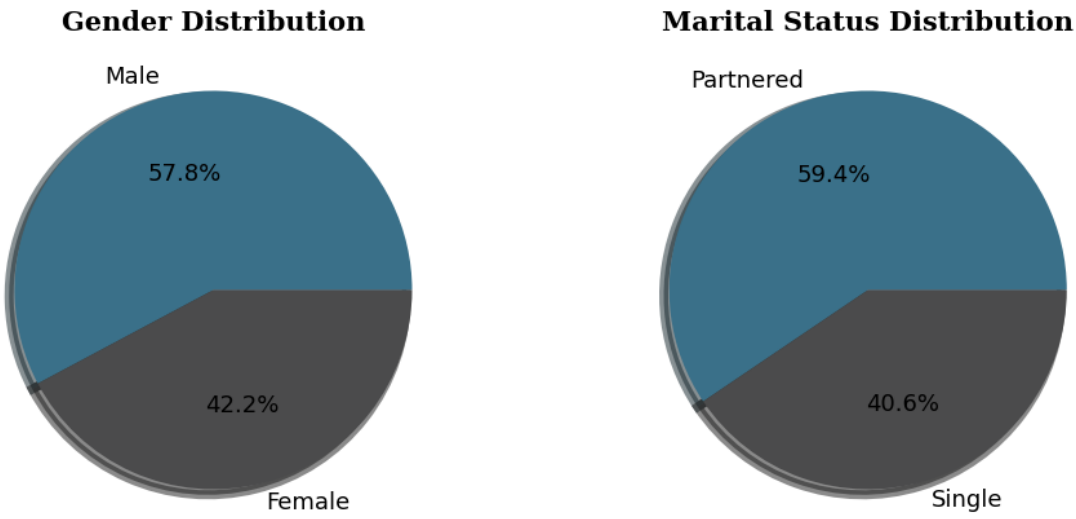
INSIGHTS:

The KP281 treadmill model, positioned as an entry-level product, has the highest number of units sold, trailed by the KP481 (mid-level) and KP781 (advanced) models.

All three models have nearly equal contributions in terms of generating sales revenue.

In [ ]:
```
3.1.2 Gender and Marital Status Disribution
```

In [42]:
```
 #setting the plot style
fig = plt.figure(figsize = (12,5))
gs = fig.add_gridspec(1,2)

ax0 = fig.add_subplot(gs[0,0])

# creating pie chart for gender disribution
color_map = ["#3A7089", "#4b4b4c"]
ax0.pie(df['Gender'].value_counts().values,labels = df['Gender'].value_co
        shadow = True,colors = color_map,wedgeprops = {'linewidth': 5},te

#setting title for visual
ax0.set_title('Gender Distribution',{'font':'serif', 'size':15,'weight':'

# creating pie chart for marital status
ax1 = fig.add_subplot(gs[0,1])
color_map = ["#3A7089", "#4b4b4c"]
ax1.pie(df['MaritalStatus'].value_counts().values,labels = df['MaritalSta
        shadow = True,colors = color_map,wedgeprops = {'linewidth': 5},te

#setting title for visual
ax1.set_title('Marital Status Distribution',{'font':'serif', 'size':15,'w

plt.show()
```

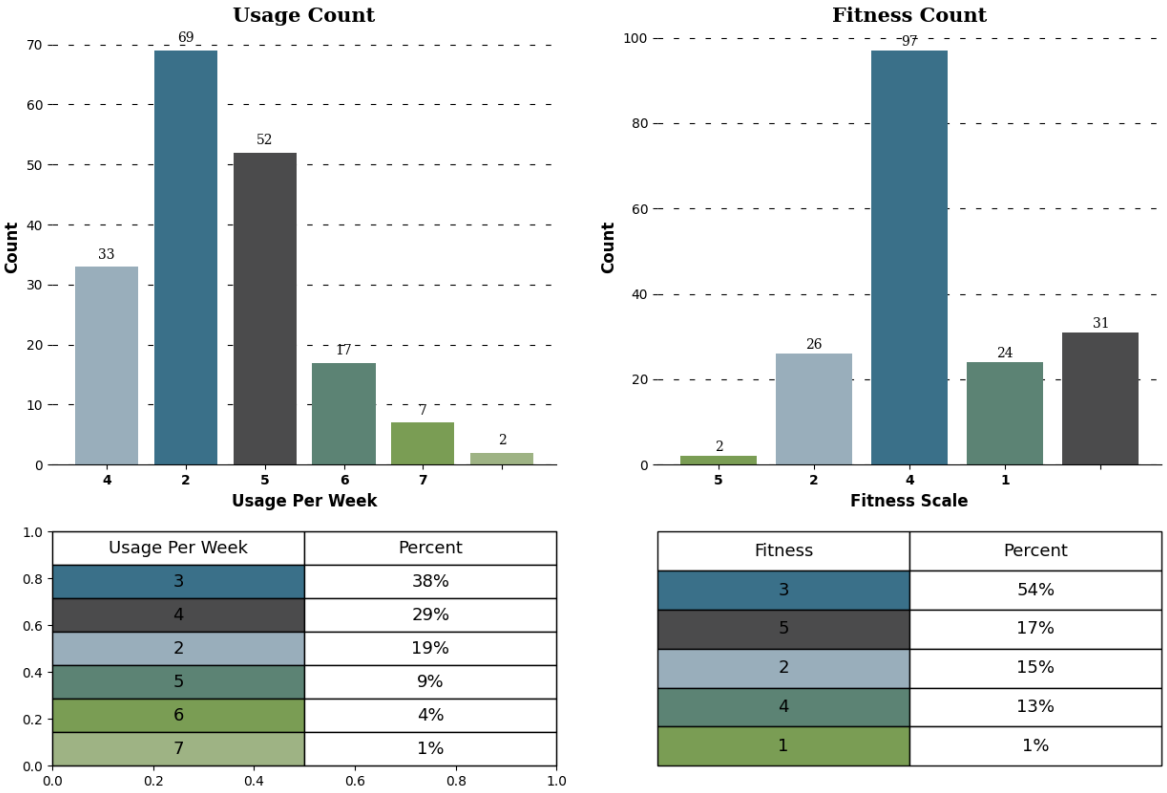


3.1.3 Buyer Fitness and Treadmill Usage

In [50]:
```
#SETTING the plot style

fig = plt.figure(figsize = (15,10))
gs = fig.add_gridspec(2,2,height_ratios=[0.65, 0.35])

# creating bar chart for usage disribution
ax0 = fig.add_subplot(gs[0,0])
temp = df['Usage'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374','#7A9D54','#9EB384'
ax0.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2)

#adding the value_counts
for i in temp.index:
```

```
    ax0.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente

#adding grid lines
ax0.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)


#adding axis label
ax0.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax0.set_xlabel('Usage Per Week',fontweight = 'bold',fontsize = 12)
ax0.set_xticklabels(temp.index,fontweight = 'bold')

#setting title for visual
ax0.set_title('Usage Count',{'font':'serif', 'size':15,'weight':'bold'})

#creating a info table for usage
ax1 = fig.add_subplot(gs[1,0])
usage_info = [['3','38%'],['4','29%'],['2','19%'],['5','9%'],['6','4%'],[
color_2d = [["#3A7089",'#FFFFFF'],["#4b4b4c",'#FFFFFF'],['#99AEBB','#FFFF
            ['#9EB384','#FFFFFF']]
table = ax1.table(cellText = usage_info, cellColours=color_2d, cellLoc='c
                  colLoc = 'center',bbox =[0, 0, 1, 1])
table.set_fontsize(13)


# creating bar chart for fitness scale
ax2 = fig.add_subplot(gs[0,1])
temp = df['Fitness'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374','#7A9D54','#9EB384'
ax2.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2)

#adding the value_counts
for i in temp.index:
    ax2.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente

#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax2.spines[s].set_visible(False)

#adding axis label
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax2.set_xlabel('Fitness Scale',fontweight = 'bold',fontsize = 12)
ax2.set_xticklabels(temp.index,fontweight = 'bold')

#setting title for visual
ax2.set_title('Fitness Count',{'font':'serif', 'size':15,'weight':'bold'}

#creating a info table for usage
ax1 = fig.add_subplot(gs[1,1])
fitness_info = [['3','54%'],['5','17%'],['2','15%'],['4','13%'],['1','1%'
color_2d = [["#3A7089",'#FFFFFF'],["#4b4b4c",'#FFFFFF'],['#99AEBB','#FFFF

table = ax1.table(cellText = fitness_info, cellColours=color_2d, cellLoc=
                  colLoc = 'center',bbox =[0, 0, 1, 1])
```

```
table.set_fontsize(13)

#removing axis
ax1.axis('off')

plt.show()
```



INSIGHTS:

Almost 85% of the customers plan to use the treadmill for 2 to 4 times a week and only 15% using 5 times and above each week.

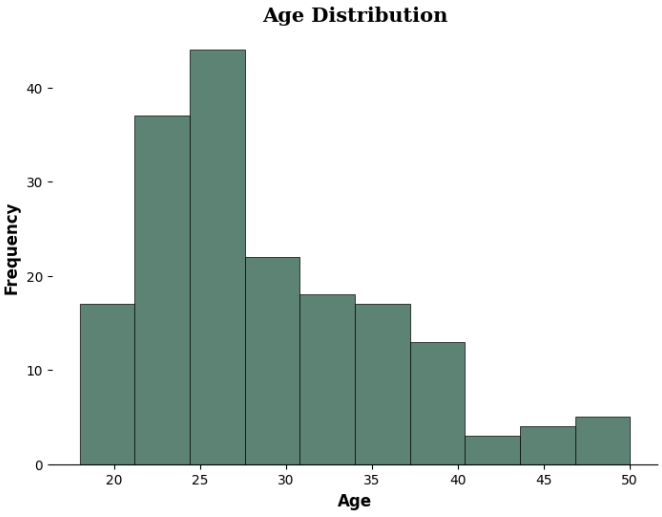
54% of the customers have self-evaluated their fitness at a level 3 on a scale of 1 to 5. Furthermore, a substantial 84% of the total customers have rated themselves at 3 or higher, indicating commendable fitness levels.

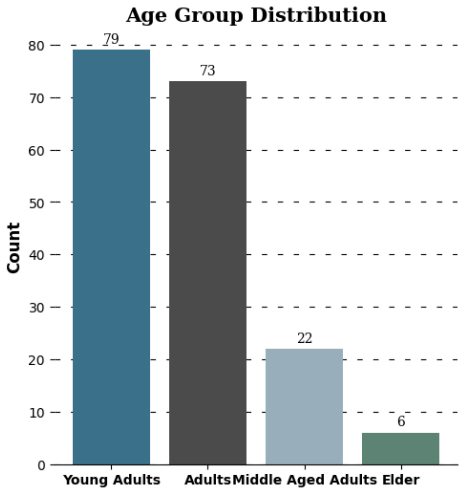
3.2 Numerical Variables 3.2.1 Customer Age Distribution

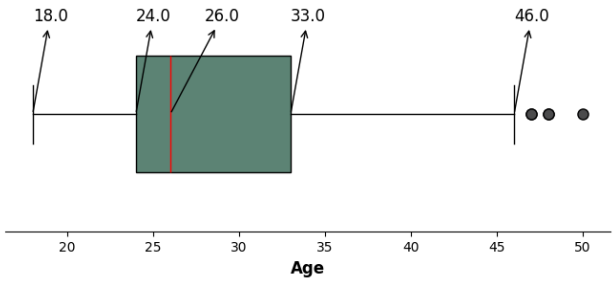
In [52]:
```
#Setting the plot style
fig = plt.figure(figsize = (15,10))
gs = fig.add_gridspec(2,2,height_ratios=[0.65, 0.35],width_ratios = [0.6,

#creating age histogram
ax0 = fig.add_subplot(gs[0,0])
ax0.hist(df['Age'],color= '#5C8374',linewidth=0.5,edgecolor='black')
ax0.set_xlabel('Age',fontsize = 12,fontweight = 'bold')
ax0.set_ylabel('Frequency',fontsize = 12,fontweight = 'bold')

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)

#setting title for visual
```

```
ax0.set_title('Age Distribution',{'font':'serif', 'size':15,'weight':'bol

#creating box plot for age
ax1 = fig.add_subplot(gs[1,0])
boxplot = ax1.boxplot(x = df['Age'],vert = False,patch_artist = True,widt

# Customize box and whisker colors
boxplot['boxes'][0].set(facecolor='#5C8374')

# Customize median line
boxplot['medians'][0].set(color='red')

# Customize outlier markers
for flier in boxplot['fliers']:
    flier.set(marker='o', markersize=8, markerfacecolor= "#4b4b4c")

#removing the axis lines
for s in ['top','left','right']:
    ax1.spines[s].set_visible(False)

#adding 5 point summary annotations
info = [i.get_xdata() for i in boxplot['whiskers']] #getting the upperlim

median = df['Age'].quantile(0.5) #getting Q2

for i,j in info: #using i,j here because of the output type of info list

    ax1.annotate(text = f"{i:.1f}", xy = (i,1), xytext = (i,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=
    ax1.annotate(text = f"{j:.1f}", xy = (j,1), xytext = (j,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=

#adding the median separately because it was included in info list
ax1.annotate(text = f"{median:.1f}",xy = (median,1),xytext = (median + 2,
             arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle="arc

#removing y-axis ticks
ax1.set_yticks([])

#adding axis label
ax1.set_xlabel('Age',fontweight = 'bold',fontsize = 12)

#creating age group bar chart
ax2 = fig.add_subplot(gs[0,1])
temp = df['age_group'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']

ax2.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2)


#adding the value_counts
for i in temp.index:
    ax2.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente

#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax2.spines[s].set_visible(False)
```

```
#adding axis label
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax2.set_xticklabels(temp.index,fontweight = 'bold')

#setting title for visual
ax2.set_title('Age Group Distribution',{'font':'serif', 'size':15,'weight

#creating a table for group info
ax3 = fig.add_subplot(gs[1,1])
age_info = [['Young Adults','44%','18 to 25'],['Adults','41%','26 to 35']
            ['Elder','3%','Above 45']]
color_2d = [["#3A7089","#FFFFFF","#FFFFFF"],["#4b4b4c","#FFFFFF","#FFFFFF
            ['#5C8374','#FFFFFF','#FFFFFF']]
table = ax3.table(cellText = age_info, cellColours=color_2d, cellLoc='cen
                  colLoc = 'center',bbox =[0, 0, 1, 1])

table.set_fontsize(13)
#removing axis
ax3.axis('off')

plt.show()
```







Age	Probability	Group
Young Adults	44%	18 to 25
Adults	41%	26 to 35
Middle Aged	12%	36 to 45
Elder	3%	Above 45

INSIGHTS

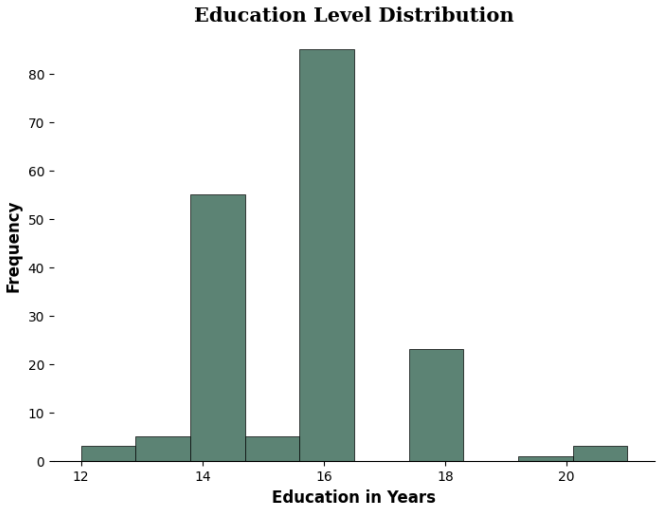
85% of the customers fall in the age range of 18 to 35 . with a median age of 26 , suggesting young people showing more interest in the companies products

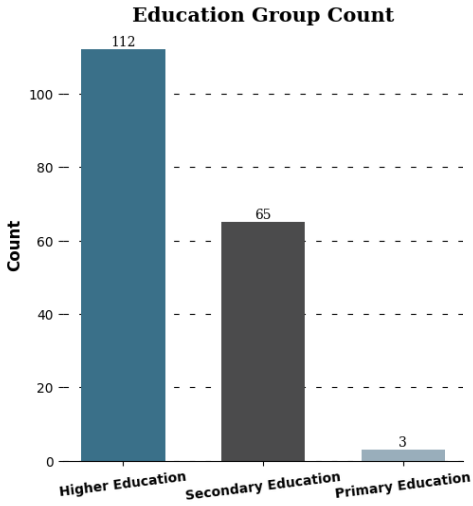
Outliers As we can see from the box plot, there are 3 outlier's present in the age data.

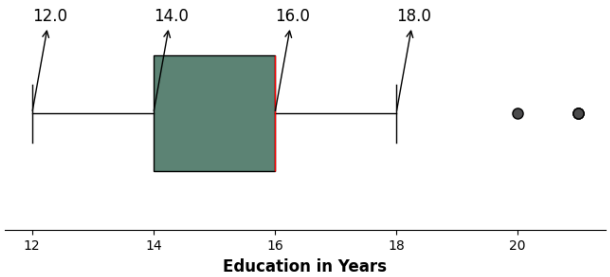
3.2.2 Customer Education Distribution

In [53]:
```
#Setting the plot style
fig = plt.figure(figsize = (15,10))
gs = fig.add_gridspec(2,2,height_ratios=[0.65, 0.35],width_ratios = [0.6,

#creating education histogram
ax0 = fig.add_subplot(gs[0,0])
ax0.hist(df['Education'],color= '#5C8374',linewidth=0.5,edgecolor='black'
ax0.set_xlabel('Education in Years',fontsize = 12,fontweight = 'bold')
ax0.set_ylabel('Frequency',fontsize = 12,fontweight = 'bold')

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)

#setting title for visual
ax0.set_title('Education Level Distribution',{'font':'serif', 'size':15,'

#creating box plot for education
ax1 = fig.add_subplot(gs[1,0])
boxplot = ax1.boxplot(x = df['Education'],vert = False,patch_artist = Tru

# Customize box and whisker colors
boxplot['boxes'][0].set(facecolor='#5C8374')

# Customize median line
boxplot['medians'][0].set(color='red')

# Customize outlier markers
for flier in boxplot['fliers']:
    flier.set(marker='o', markersize=8, markerfacecolor= "#4b4b4c")

#removing the axis lines
for s in ['top','left','right']:
    ax1.spines[s].set_visible(False)

#adding 5 point summary annotations
info = [i.get_xdata() for i in boxplot['whiskers']]

#getting the upperlimit,Q1,Q3 and lowerlimit
median = df['Education'].quantile(0.5)

#getting Q2
for i,j in info: #using i,j here because of the output type of info list
    ax1.annotate(text = f"{i:.1f}", xy = (i,1), xytext = (i,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=
    ax1.annotate(text = f"{j:.1f}", xy = (j,1), xytext = (j,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=

#removing y-axis ticks
ax1.set_yticks([]) #adding axis label
ax1.set_xlabel('Education in Years',fontweight = 'bold',fontsize = 12)

#creating education group bar chart
ax2 = fig.add_subplot(gs[0,1])
temp = df['edu_group'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB']
ax2.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2,wi

#adding the value_counts
```

```
for i in temp.index:
    ax2.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente

#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax2.spines[s].set_visible(False)

#adding axis label
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax2.set_xticklabels(temp.index,fontweight = 'bold',rotation = 7)

#setting title for visual
ax2.set_title('Education Group Count',{'font':'serif', 'size':15,'weight'

#creating a table for group info
ax3 = fig.add_subplot(gs[1,1])
edu_info = [['Higher','62%','Above 15'],['Secondary','36%','13 to 15'],['
color_2d = [["#3A7089",'#FFFFFF','#FFFFFF'],["#4b4b4c",'#FFFFFF','#FFFFFF
table = ax3.table(cellText = edu_info, cellColours=color_2d, cellLoc='cen
                  colLabels =['Education','Probability','Years'], colLoc
table.set_fontsize(13)
#removing axis
ax3.axis('off')
plt.show()
```







Education	Probability	Years
Higher	62%	Above 15
Secondary	36%	13 to 15
Primary	2%	0 to 12

INSIGHTS:

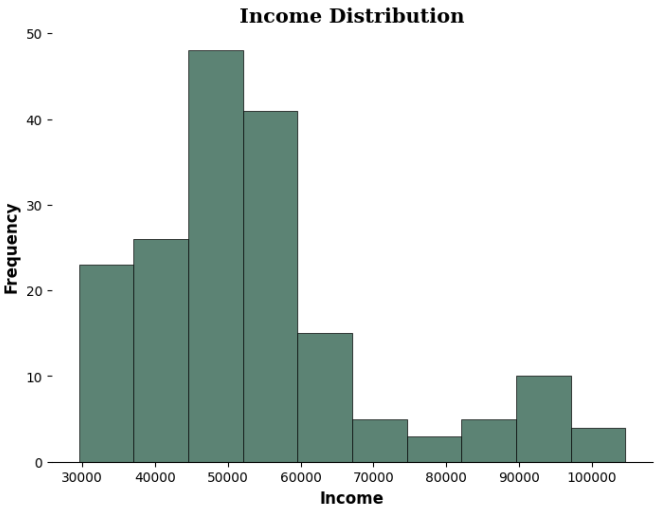
98% of the customers have education more than 13 years highlighting a strong inclination among well-educated individuals to purchase the products. It's plausible that health awareness driven by education could play a pivotal role in this trend.

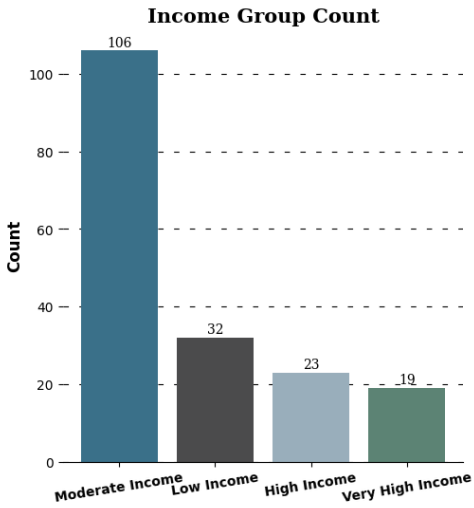
Outliers As we can see from the box plot, there are 2 outlier's present in the education data.

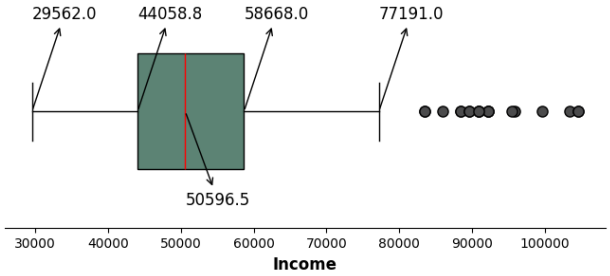
3.2.3 Customer Income Distribution

In [56]:
```
#Setting the plot style
fig = plt.figure(figsize = (15,10))
gs = fig.add_gridspec(2,2,height_ratios=[0.65, 0.35],width_ratios = [0.6,

#creating Income histogram
ax0 = fig.add_subplot(gs[0,0])
ax0.hist(df['Income'],color= '#5C8374',linewidth=0.5,edgecolor='black')
ax0.set_xlabel('Income',fontsize = 12,fontweight = 'bold')
ax0.set_ylabel('Frequency',fontsize = 12,fontweight = 'bold')

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)

#setting title for visual
ax0.set_title('Income Distribution',{'font':'serif', 'size':15,'weight':'

#creating box plot for Income
ax1 = fig.add_subplot(gs[1,0])
boxplot = ax1.boxplot(x = df['Income'],vert = False,patch_artist = True,w

# Customize box and whisker colors
boxplot['boxes'][0].set(facecolor='#5C8374')

# Customize median line
boxplot['medians'][0].set(color='red')

# Customize outlier markers
for flier in boxplot['fliers']:
    flier.set(marker='o', markersize=8, markerfacecolor= "#4b4b4c")

#removing the axis lines
for s in ['top','left','right']:
    ax1.spines[s].set_visible(False)

#adding 5 point summary annotations
info = [i.get_xdata() for i in boxplot['whiskers']] #getting the upperlim

median = df['Income'].quantile(0.5) #getting Q2

for i,j in info: #using i,j here because of the output type of info list
    ax1.annotate(text = f"{i:.1f}", xy = (i,1), xytext = (i,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=
    ax1.annotate(text = f"{j:.1f}", xy = (j,1), xytext = (j,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=

#adding the median separately because it was included in info list
ax1.annotate(text = f"{median:.1f}",xy = (median,1),xytext = (median,0.6)
             arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle="arc

#removing y-axis ticks
ax1.set_yticks([])

#adding axis label
```

```
ax1.set_xlabel('Income',fontweight = 'bold',fontsize = 12)

#creating Income group bar chart
ax2 = fig.add_subplot(gs[0,1])
temp = df['income_group'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']
ax2.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2)

#adding the value_counts
for i in temp.index:
    ax2.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente

#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax2.spines[s].set_visible(False)

#adding axis label
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax2.set_xticklabels(temp.index,fontweight = 'bold',rotation = 9)

#setting title for visual
ax2.set_title('Income Group Count',{'font':'serif', 'size':15,'weight':'b

#creating a table group info
ax3 = fig.add_subplot(gs[1,1])
inc_info = [['Low','18%','Below 40k'],['Moderate','59%','40k to 60k'],['H
            ['Vey High','10%','Above 80k']]
color_2d = [["#4b4b4c",'#FFFFFF','#FFFFFF'],["#3A7089",'#FFFFFF','#FFFFFF
            ['#5C8374','#FFFFFF','#FFFFFF']]
table = ax3.table(cellText = inc_info, cellColours=color_2d, cellLoc='cen
                  colLoc = 'center',bbox =[0, 0, 1, 1])

table.set_fontsize(13)

#removing axis
ax3.axis('off')

bin_range3 = [0,40000,60000,80000,float('inf')]
bin_labels3 = ['Low Income','Moderate Income','High Income','Very High In

plt.show()
```







Income Grp	Probability	Income($)
Low	18%	Below 40k
Moderate	59%	40k to 60k
High	13%	60k to 80k
Vey High	10%	Above 80k

INSIGHTS: Almost 60% of the customers fall in the income group of (40k to 60k) dollars suggesting higher inclination of this income group people towards the products.

Surprisingly 18% of the customers fall in the income group of (<40) suggesting almost 77% of the total customers fall in income group of below 60k and only 23% of them falling in 60k and above income group

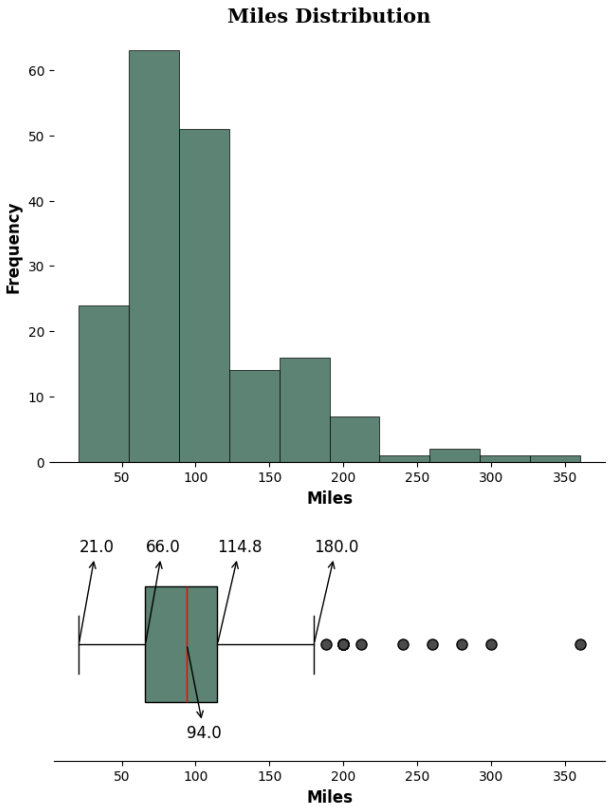
Outliers As we can see from the box plot, there are many outlier's present in the income data.

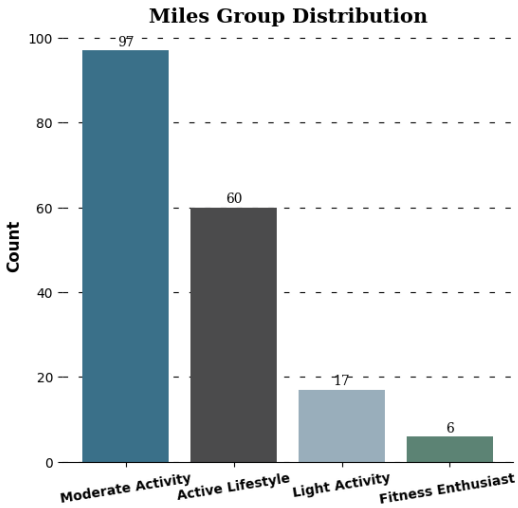
3.2.4 Customers Expected Weekly Mileage

In [58]:
```
#Setting the plot style
fig = plt.figure(figsize = (15,10))
gs = fig.add_gridspec(2,2,height_ratios=[0.65, 0.35],width_ratios = [0.55

#creating miles histogram
ax0 = fig.add_subplot(gs[0,0])
ax0.hist(df['Miles'],color= '#5C8374',linewidth=0.5,edgecolor='black')
ax0.set_xlabel('Miles',fontsize = 12,fontweight = 'bold')
ax0.set_ylabel('Frequency',fontsize = 12,fontweight = 'bold')

#removing the axis lines
for s in ['top','left','right']:
    ax0.spines[s].set_visible(False)

#setting title for visual
ax0.set_title('Miles Distribution',{'font':'serif', 'size':15,'weight':'b

#creating box plot for miles
ax1 = fig.add_subplot(gs[1,0])
```

```
boxplot = ax1.boxplot(x = df['Miles'],vert = False,patch_artist = True,wi

# Customize box and whisker colors
boxplot['boxes'][0].set(facecolor='#5C8374')

# Customize median line
boxplot['medians'][0].set(color='red')

# Customize outlier markers
for flier in boxplot['fliers']:
    flier.set(marker='o', markersize=8, markerfacecolor= "#4b4b4c")

#removing the axis lines
for s in ['top','left','right']:
    ax1.spines[s].set_visible(False)

#adding 5 point summary annotations
info = [i.get_xdata() for i in boxplot['whiskers']] #getting the upperlim

median = df['Miles'].quantile(0.5) #getting Q2

for i,j in info: #using i,j here because of the output type of info list
    ax1.annotate(text = f"{i:.1f}", xy = (i,1), xytext = (i,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=
    ax1.annotate(text = f"{j:.1f}", xy = (j,1), xytext = (j,1.4),fontsize
                 arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle=

#adding the median separately because it was included in info list
ax1.annotate(text = f"{median:.1f}",xy = (median,1),xytext = (median,0.6)
             arrowprops= dict(arrowstyle="<-", lw=1, connectionstyle="arc

#removing y-axis ticks
ax1.set_yticks([]) #adding axis label
ax1.set_xlabel('Miles',fontweight = 'bold',fontsize = 12)

#creating Miles group bar chart
ax2 = fig.add_subplot(gs[0,1])
temp = df['miles_group'].value_counts()
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']
ax2.bar(x=temp.index,height = temp.values,color = color_map,zorder = 2)

#adding the value_counts
for i in temp.index:
    ax2.text(i,temp[i]+2,temp[i],{'font':'serif','size' : 10},ha = 'cente
#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax2.spines[s].set_visible(False)

#adding axis label
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)
ax2.set_xticklabels(temp.index,fontweight = 'bold',rotation = 9)

#setting title for visual
ax2.set_title('Miles Group Distribution',{'font':'serif', 'size':15,'weig

#creating a table for group info
ax3 = fig.add_subplot(gs[1,1])
```

```
miles_info = [['Light Activity','9%','0 to 50'],['Moderate Activity','54%
              ['Fitness Enthusiast','3%','Above 200']]
color_2d = [['#99AEBB','#FFFFFF','#FFFFFF'],["#3A7089","#FFFFFF","#FFFFFF
            ['#5C8374','#FFFFFF','#FFFFFF']]
table = ax3.table(cellText = miles_info, cellColours=color_2d, cellLoc='c
                  colLoc = 'center',bbox =[0, 0, 1, 1])
table.set_fontsize(11)
#removing axis
ax3.axis('off')
plt.show()
```





Activity	Probability	Miles
Light Activity	9%	0 to 50
Moderate Activity	54%	51 to 100
Active Lifestyle	34%	101 to 200
Fitness Enthusiast	3%	Above 200

INSIGHTS:

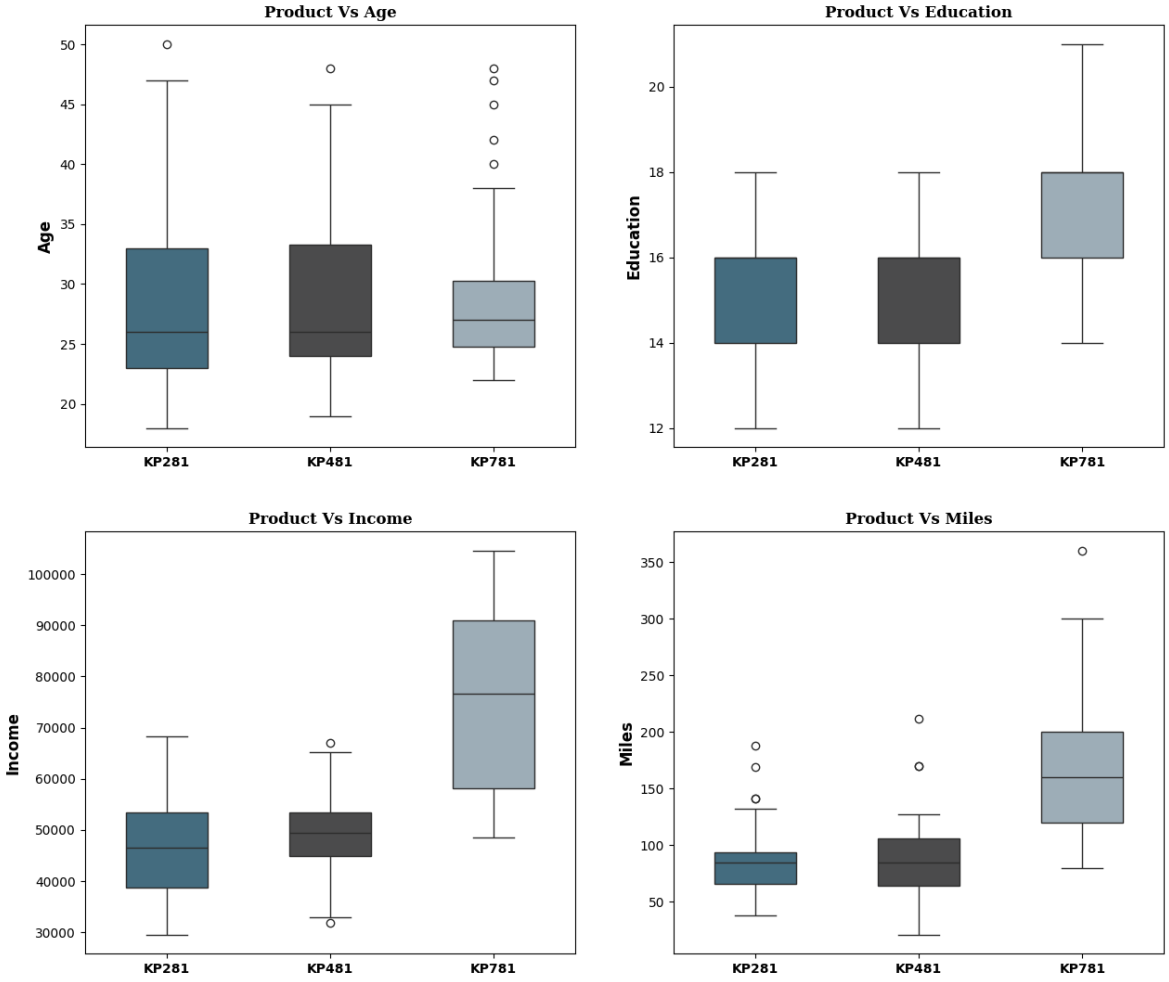
Almost 88% of the customers plans to use the treadmill for 50 to 200 miles per week with a median of 94 miles per week . Outliers

As we can see from the box plot, there are 8 outlier's present in the miles data.

4. Bivariate Analysis 4.1 Analysis of Product Type

In [61]:
```
#Setting the plot style
fig = plt.figure(figsize = (15,13))
gs = fig.add_gridspec(2,2)

for i,j,k in [(0,0,'Age'),(0,1,'Education'),(1,0,'Income'),(1,1,'Miles')]
    ax0 = fig.add_subplot(gs[i,j])
    #plot
    sns.boxplot(data = df, x = 'Product', y = k ,ax = ax0,width = 0.5, pa

    #plot title
    ax0.set_title(f'Product Vs {k}',{'font':'serif', 'size':12,'weight':'
    #customizing axis
    ax0.set_xticklabels(df['Product'].unique(),fontweight = 'bold')
```

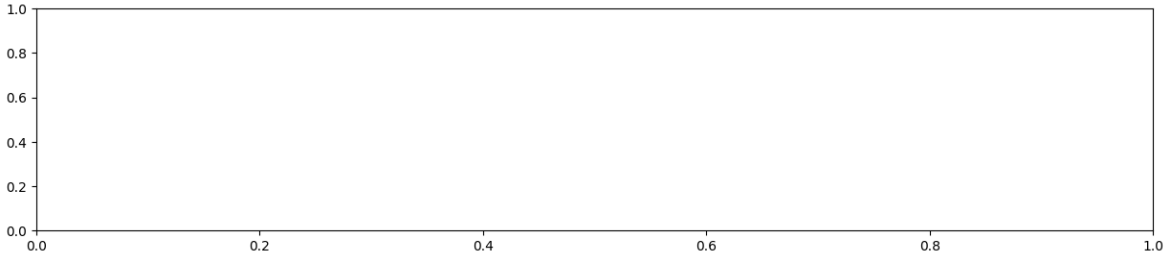
```
    ax0.set_ylabel(f'{k}',fontweight = 'bold',fontsize = 12)
    ax0.set_xlabel('')
plt.show()
```



In [ ]:
```
INSIGHTS:
The analysis presented above clearly indicates a strong preference for th
levels, and intend to engage in running activities exceeding 150 miles pe
```

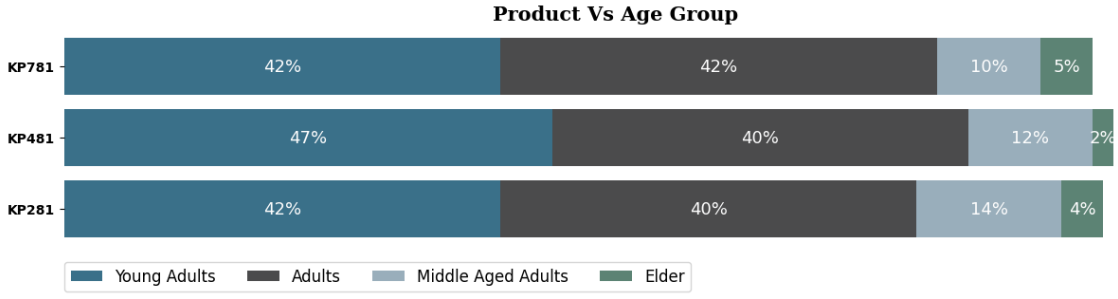
4.2 Product Preferences Across Age

In [74]:
```
```



In [77]:
```
fig,ax0 = plt.subplots(figsize = (15,3))
#product vs age group
val = 'age_group'

#creating required df
# df_grp = df.groupby('Product')[val].value_counts(normalize = True).roun
# df_grp = df_grp.pivot(columns = 'level_1',index = 'Product',values = va

# df_grp = df.groupby('Product')[val].value_counts(normalize=True).round(
```

```
# df_grp = df_grp.pivot(columns='age_group', index='Product').fillna(0)

# creating required df
df_grp = df.groupby('Product')[val].value_counts(normalize=True).round(2)
# pivot the DataFrame
df_grp = df_grp.pivot(index='Product', columns=val, values='level_1').fil

#for left parameter in ax.barh
temp = np.zeros(len(df_grp),dtype = float)
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']

#plotting the visual
for i,j in zip(df_grp.columns,color_map):
    ax0.barh(df_grp.index,width = df_grp[i],left = temp, label = i,color
    temp += df_grp[i].values

#inserting text
temp = np.zeros(len(df_grp),dtype = float)

for i in df_grp.columns:
    for j,k in enumerate(df_grp[i]):
        if k == 0:
            continue
        ax0.text(k/2 + temp[j],df_grp.index[j],f"{k:.0%}",va = 'center',
    temp += df_grp[i].values

#removing the axis lines
for s in ['top','left','right','bottom']:
    ax0.spines[s].set_visible(False)

#customizing ticks
ax0.set_xticks([])
ax0.set_yticklabels(df_grp.index,fontweight = 'bold')

#plot title
ax0.set_title('Product Vs Age Group',{'font':'serif', 'size':15,'weight':

#adding legend
ax0.legend(loc = (0,-0.2),ncol = 4,fontsize = 12)
plt.show()
```

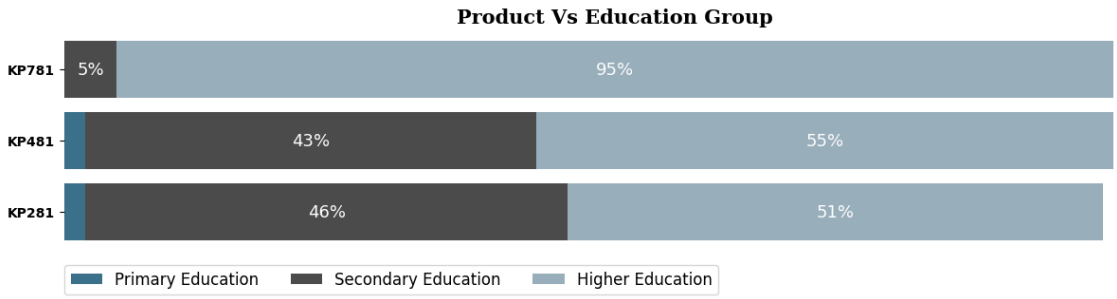


INSIGHTS: The analysis provided above distinctly demonstrates that there exists no strong correlation between age groups and product preferences.

This is evident from the nearly uniform distribution of age groups across all the products.

4.3 Product Preferences Across Education Levels

In [79]:
```
#Setting the plot style
fig,ax0 = plt.subplots(figsize = (15,3))

#product vs edu group
val = 'edu_group'
#creating required df
df_grp = df.groupby('Product')[val].value_counts(normalize = True).round(
df_grp = df_grp.pivot(columns = val,index = 'Product',values = 'level_1')



#for left parameter in ax.barh
temp = np.zeros(len(df_grp),dtype = float)
color_map = ["#3A7089", "#4b4b4c",'#99AEBB']

#plotting the visual
for i,j in zip(df_grp.columns,color_map):
    ax0.barh(df_grp.index,width = df_grp[i],left = temp, label = i,color
    temp += df_grp[i].values

#inserting text
temp = np.zeros(len(df_grp),dtype = float)
for i in df_grp.columns:
    for j,k in enumerate(df_grp[i]):
        if k < 0.05:
            continue
        ax0.text(k/2 + temp[j],df_grp.index[j],f"{k:.0%}",va = 'center',
    temp += df_grp[i].values

#removing the axis lines
for s in ['top','left','right','bottom']:
    ax0.spines[s].set_visible(False)

#customizing ticks
ax0.set_xticks([])
ax0.set_yticklabels(df_grp.index,fontweight = 'bold')

#plot title

ax0.set_title('Product Vs Education Group',{'font':'serif', 'size':15,'we
#adding legend
ax0.legend(loc = (0,-0.2),ncol = 4,fontsize = 12)
plt.show()
```



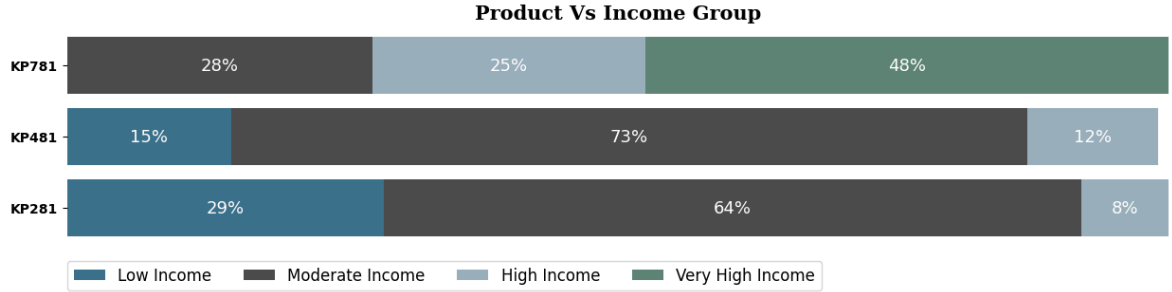
INSIGHTS:

The analysis provided above cleary demonstrates the preference of Highly Educated people for treadmill model KP781 For treadmill models KP481 and KP281 , the

distribution of customer with Secondary Education and with Higher Education is almost equal

4.4 Product Preference Across Income Group

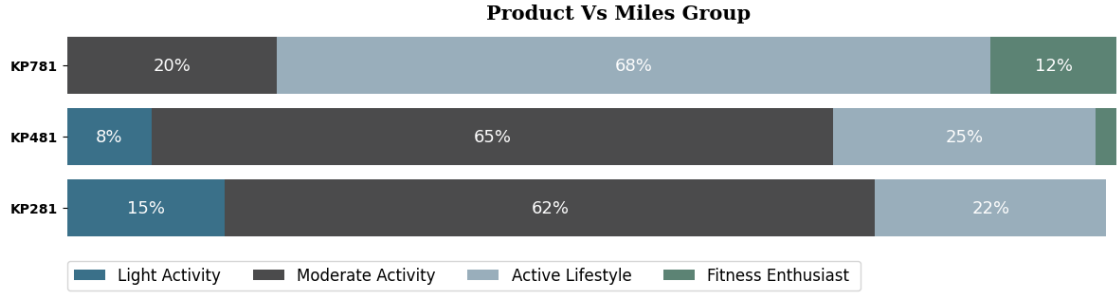
In [81]:
```
#Setting the plot style

fig,ax0 = plt.subplots(figsize = (15,3))
#product vs income group
val = 'income_group'

#creating required df
df_grp = df.groupby('Product')[val].value_counts(normalize = True).round(
df_grp = df_grp.pivot(columns = val,index = 'Product',values = 'level_1')

#for left parameter in ax.barh
temp = np.zeros(len(df_grp),dtype = float)
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']

#plotting the visual
for i,j in zip(df_grp.columns,color_map):
    ax0.barh(df_grp.index,width = df_grp[i],left = temp, label = i,color
    temp += df_grp[i].values

#inserting text
temp = np.zeros(len(df_grp),dtype = float)

for i in df_grp.columns:
    for j,k in enumerate(df_grp[i]):
        if k < 0.05:
            continue
        ax0.text(k/2 + temp[j],df_grp.index[j],f"{k:.0%}",va = 'center',
    temp += df_grp[i].values

#removing the axis lines
for s in ['top','left','right','bottom']:
    ax0.spines[s].set_visible(False)

#customizing ticks
ax0.set_xticks([])
ax0.set_yticklabels(df_grp.index,fontweight = 'bold')

#plot title
ax0.set_title('Product Vs Income Group',{'font':'serif', 'size':15,'weigh
#adding legend
ax0.legend(loc = (0,-0.2),ncol = 4,fontsize = 12)
plt.show()
```



INSIGHTS: Treadmill model KP781 is preferred more by customers with Very High Income Both treadmill models, KP481 and KP281 , are preferred more by customers with Moderate Income

4.5 Product preference across customer weekly mileage

In [82]:
```
#Setting the plot style
fig,ax0 = plt.subplots(figsize = (15,3))

#product vs miles group
val = 'miles_group'
#creating required df
df_grp = df.groupby('Product')[val].value_counts(normalize = True).round(
df_grp = df_grp.pivot(columns = val ,index = 'Product',values = 'level_1'

#for left parameter in ax.barh
temp = np.zeros(len(df_grp),dtype = float)
color_map = ["#3A7089", "#4b4b4c",'#99AEBB','#5C8374']

#plotting the visual
for i,j in zip(df_grp.columns,color_map):
    ax0.barh(df_grp.index,width = df_grp[i],left = temp, label = i,color
    temp += df_grp[i].values

#inserting text
temp = np.zeros(len(df_grp),dtype = float)
for i in df_grp.columns:
    for j,k in enumerate(df_grp[i]):
        if k < 0.05:
            continue
        ax0.text(k/2 + temp[j],df_grp.index[j],f"{k:.0%}",va = 'center',
    temp += df_grp[i].values

#removing the axis lines
for s in ['top','left','right','bottom']:
    ax0.spines[s].set_visible(False)

#customizing ticks
ax0.set_xticks([])
ax0.set_yticklabels(df_grp.index,fontweight = 'bold')

#plot title
ax0.set_title('Product Vs Miles Group',{'font':'serif', 'size':15,'weight

#adding legend
ax0.legend(loc = (0,-0.2),ncol = 4,fontsize = 12)

plt.show()
```



INSIGHTS:

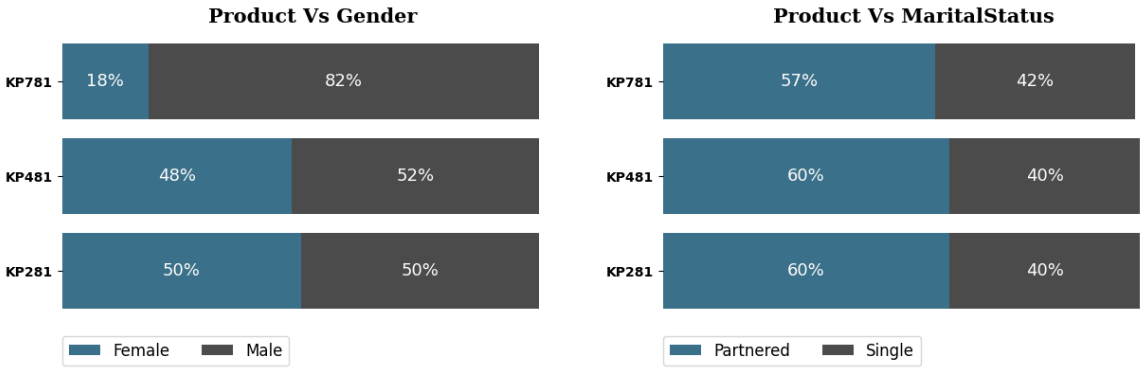
Treadmill model KP781 is preferred more by customers planning to run 100 to 200 miles per week

Both treadmill models, KP481 and KP281 , are preferred more by customers planning to run 50 to 100 miles per week

4.6 Product Preference across Gender and Marital Status

In [119…

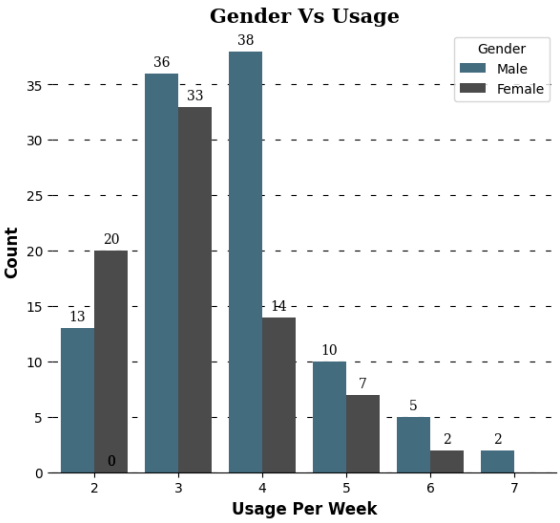
```
#Setting the plot style

fig = plt.figure(figsize = (15,4))
gs = fig.add_gridspec(1,2)

for r,c,val in [(0,0,'Gender'),(0,1,'MaritalStatus')]:
    ax0 = fig.add_subplot(gs[r,c])
    #creating required df
    df_grp = df.groupby('Product')[val].value_counts(normalize = True).ro
    df_grp.name = 'count'
    df_grp = df_grp.reset_index()
    df_grp = df_grp.pivot(columns = val ,index = 'Product',values = 'coun

    #for left parameter in ax.barh
    temp = np.zeros(len(df_grp),dtype = float)
    color_map = ["#3A7089", "#4b4b4c"]

    #plotting the visual
    for i,j in zip(df_grp.columns,color_map):
        ax0.barh(df_grp.index,width = df_grp[i],left = temp, label = i,co
        temp += df_grp[i].values

    #inserting text
    temp = np.zeros(len(df_grp),dtype = float)

    for i in df_grp.columns:
        for j,k in enumerate(df_grp[i]):
            if k < 0.05:
                continue
            ax0.text(k/2 + temp[j],df_grp.index[j],f"{k:.0%}",va = 'cente
        temp += df_grp[i].values

    #removing the axis lines
    for s in ['top','left','right','bottom']:
        ax0.spines[s].set_visible(False)

    #customizing ticks
    ax0.set_xticks([])
    ax0.set_yticklabels(df_grp.index,fontweight = 'bold')

    #plot title
    ax0.set_title(f'Product Vs {val}',{'font':'serif', 'size':15,'weight'

    #adding legend
    ax0.legend(loc = (0,-0.15),ncol = 2,fontsize = 12)

plt.show()
```

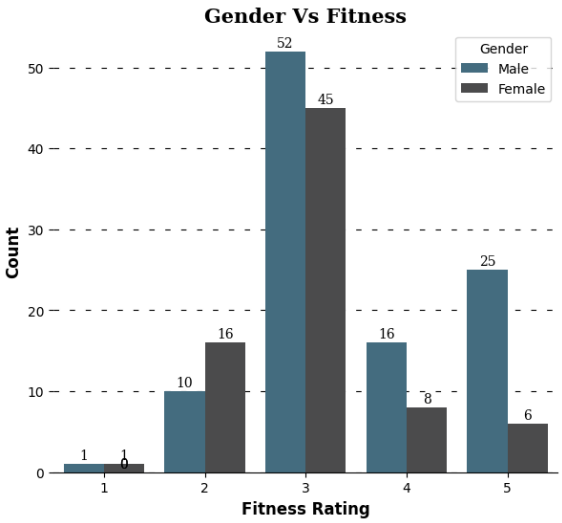


4.7 Gender vs Product Usage And Gender Vs Fitness

In [90]:
```
#Setting the plot style

fig = plt.figure(figsize = (15,6))
gs = fig.add_gridspec(1,2)

#creating bar plot
# Usage Vs Gender
ax1 = fig.add_subplot(gs[0,0])
plot = sns.countplot(data = df, x = 'Usage', hue = 'Gender',order = sorte
                     ax = ax1,palette = ["#3A7089","#4b4b4c"],zorder = 2)

#adding the value_counts
for i in plot.patches:
    ax1.text(i.get_x()+0.2,i.get_height()+1,f'{i.get_height():.0f}',{'fon

#adding grid lines
ax1.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
    ax1.spines[s].set_visible(False)

#adding axis label
ax1.set_xlabel('Usage Per Week',fontweight = 'bold',fontsize = 12)
ax1.set_ylabel('Count',fontweight = 'bold',fontsize = 12)

#setting title for visual
ax1.set_title('Gender Vs Usage',{'font':'serif', 'size':15,'weight':'bold

# Fitness Vs Gender

#creating bar plot
ax2 = fig.add_subplot(gs[0,1])
plot = sns.countplot(data = df, x = 'Fitness', hue = 'Gender',order = sor
                     ax = ax2,palette = ["#3A7089","#4b4b4c"],zorder = 2)

#adding the value_counts
for i in plot.patches:
    ax2.text(i.get_x()+0.2,i.get_height()+1,f'{i.get_height():.0f}',{'fon

#adding grid lines
ax2.grid(color = 'black',linestyle = '--', axis = 'y', zorder = 0, dashes

#removing the axis lines
for s in ['top','left','right']:
```

```
    ax2.spines[s].set_visible(False)

#customizing axis labels
ax2.set_xlabel('Fitness Rating',fontweight = 'bold',fontsize = 12)
ax2.set_ylabel('Count',fontweight = 'bold',fontsize = 12)

#setting title for visual
ax2.set_title('Gender Vs Fitness',{'font':'serif', 'size':15,'weight':'bo
plt.show()
```





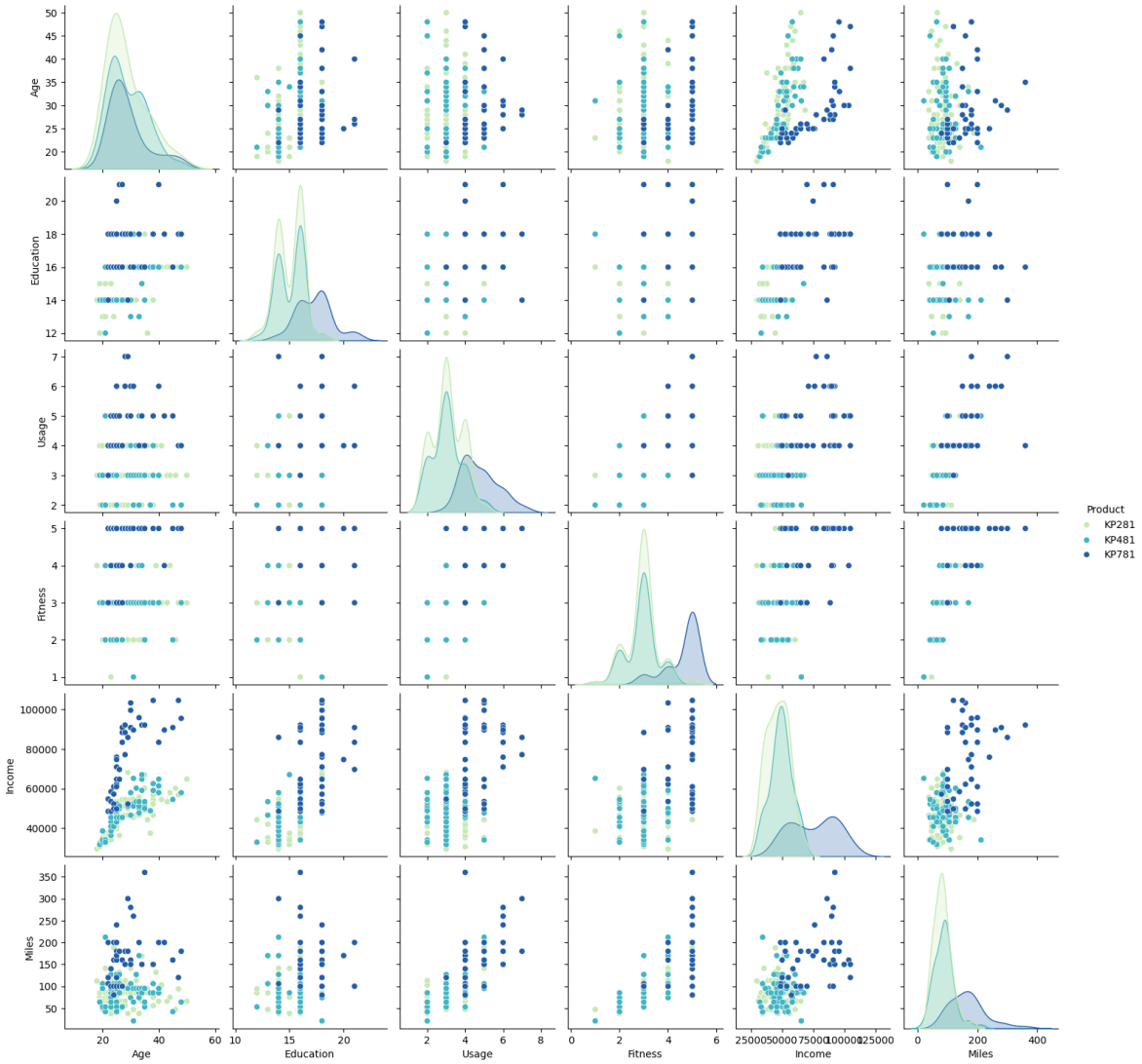
INSIGHTS:

1. Gender Vs Usage Almost 70% of Female customers plan to use the treadmill for 2 to 3 times a week whereas almost 70% of Male customer plan to use the treadmill for 3 to 4 times a week
2. Gender Vs Fitness Almost 80% of Female customers rated themselves between 2 to 3 whereas almost 90% of Male customer rated themselves between 3 to 5 on the fitness scale

5. Correlation between Variables 5.1 Pairplot 5.1 Pairplot

In [102…
```
df_copy = copy.deepcopy(df)
```

In [105…
```
sns.pairplot(df_copy, hue ='Product', palette= 'YlGnBu')
plt.show()
```



5.2 Heatmap

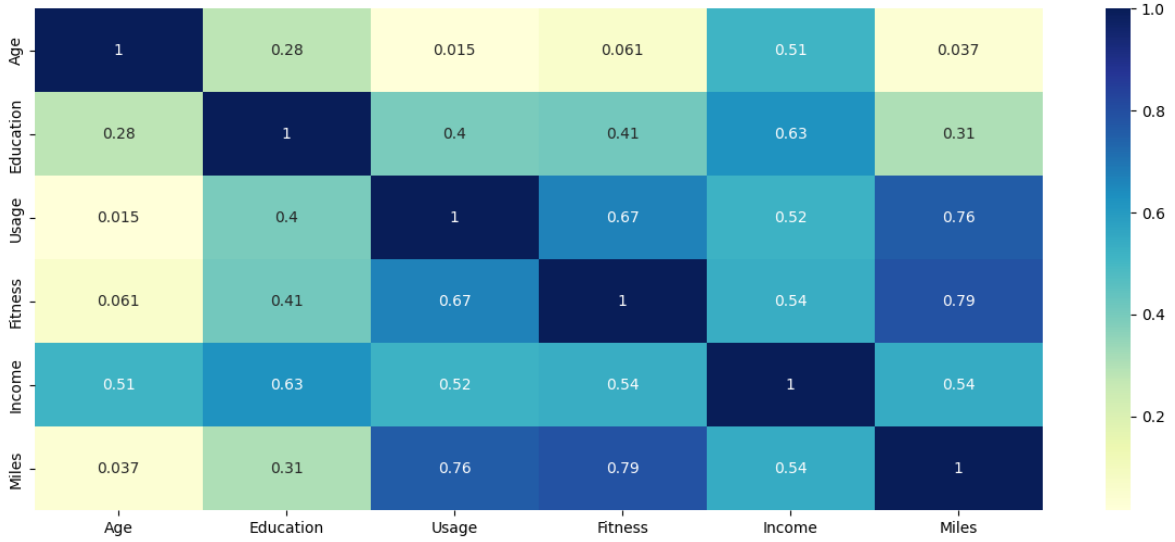
In [106…

```
 # First we need to convert object into int datatype for usage and fitnes
df_copy['Usage'] = df_copy['Usage'].astype('int')
df_copy['Fitness'] = df_copy['Fitness'].astype('int')
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 180 entries, 0 to 179
Data columns (total 13 columns):
 #   Column         Non-Null Count  Dtype   
---  ------         --------------  -----   
 0   Product        180 non-null    object  
 1   Age            180 non-null    int64   
 2   Gender         180 non-null    object  
 3   Education      180 non-null    int64   
 4   MaritalStatus  180 non-null    object  
 5   Usage          180 non-null    int64   
 6   Fitness        180 non-null    int64   
 7   Income         180 non-null    int64   
 8   Miles          180 non-null    int64   
 9   age_group      180 non-null    category
 10  edu_group      180 non-null    category
 11  income_group   180 non-null    category
 12  miles_group    180 non-null    category
dtypes: category(4), int64(6), object(3)
memory usage: 14.2+ KB
```

In [108…

```
# # Convert non-numeric values to NaN
# df_copy = df_copy.apply(pd.to_numeric, errors='coerce')

corr_mat = df_copy.corr(numeric_only = True)

plt.figure(figsize=(15,6))

sns.heatmap(corr_mat, annot = True, cmap="YlGnBu")

plt.show()
```



In [ ]:

```
INSIGHTS:

From the pair plot we can see Age and Income are positively correlated an

Eductaion and Income are highly correlated as its obvious. Eductation als
Usage of the treadmill.

Usage is highly correlated with Fitness and Miles as more the usage more
```

6. Computing Probability - Marginal, Conditional Probability 6.1 Probability of product purchase w.r.t. gender

In [109…
```
pd.crosstab(index =df['Product'],columns = df['Gender'],margins = True,no
```

Out[109…

Gender	Female	Male	All
Product			
KP281	0.22	0.22	0.44
KP481	0.16	0.17	0.33
KP781	0.04	0.18	0.22
All	0.42	0.58	1.00

In [ ]:
```
INSIGHTS:

1. The Probability of a treadmill being purchased by a female is 42%.
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 22%
For Treadmill model KP481 - 16%
For Treadmill model KP781 - 4%

2. Probability of a treadmill being purchased by a male is 58%.
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 22%
For Treadmill model KP481 - 17%
For Treadmill model KP781 - 18%
```

6.2 Probability of product purchase w.r.t. Age

In [110…
```
pd.crosstab(index =df['Product'],columns = df['age_group'],margins = True
```

Out[110…

age_group	Young Adults	Adults	Middle Aged Adults	Elder	All
Product					
KP281	0.19	0.18	0.06	0.02	0.44
KP481	0.16	0.13	0.04	0.01	0.33
KP781	0.09	0.09	0.02	0.01	0.22
All	0.44	0.41	0.12	0.03	1.00

In [ ]:
```
INSIGHTS:
1. The Probability of a treadmill being purchased by a Young Adult(18-25)
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 19%
For Treadmill model KP481 - 16%
For Treadmill model KP781 - 9%

2. Probability of a treadmill being purchased by a Adult(26-35) is 41%.
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 18%
For Treadmill model KP481 - 13%
```

```
For Treadmill model KP781 - 9%

Probability of a treadmill being purchased by a Middle Aged(36-45) is 12%
Probability of a treadmill being purchased by a Elder(Above 45) is only 3
```

6.3 Probability of product purchase w.r.t. Education level

In [111…
```
pd.crosstab(index =df['Product'],columns = df['edu_group'],margins = True
```

Out[111…

Product	Primary Education	Secondary Education	Higher Education	All
KP281	0.01	0.21	0.23	0.44
KP481	0.01	0.14	0.18	0.33
KP781	0.00	0.01	0.21	0.22
All	0.02	0.36	0.62	1.00

In [ ]:
```
INSIGHTS:
1.The Probability of a treadmill being purchased by a customer with Highe
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 23%
For Treadmill model KP481 - 18%
For Treadmill model KP781 - 21%

2. Probability of a treadmill being purchased by a customer with Secondar
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 21%
For Treadmill model KP481 - 14%
For Treadmill model KP781 - 1%

Probability of a treadmill being purchased by a customer with Primary Edu
```

6.4 Probability of product purchase w.r.t. Income

In [112…
```
pd.crosstab(index =df['Product'],columns = df['income_group'],margins = T
```

Out[112…

Product	Low Income	Moderate Income	High Income	Very High Income	All
KP281	0.13	0.28	0.03	0.00	0.44
KP481	0.05	0.24	0.04	0.00	0.33
KP781	0.00	0.06	0.06	0.11	0.22
All	0.18	0.59	0.13	0.11	1.00

INSIGHTS:

1. TheProbability of a treadmill being purchased by a customer with Low Income(<40k) is 18% . The conditional probability of purchasing the treadmill

model given that the customer has Low Income is - For Treadmill model KP281 - 13% For Treadmill model KP481 - 5% For Treadmill model KP781 - 0%

2. Probability of a treadmill being purchased by a customer with Moderate Income(40k - 60k) is 59% . The conditional probability of purchasing the treadmill model given that the customer has Moderate Income is - For Treadmill model KP281 - 28% For Treadmill model KP481 - 24% For Treadmill model KP781 - 6%

3. Probability of a treadmill being purchased by a customer with High Income(60k - 80k) is 13% The conditional probability of purchasing the treadmill model given that the customer has High Income is - For Treadmill model KP281 - 3% For Treadmill model KP481 - 4% For Treadmill model KP781 - 6%

4. Probability of a treadmill being purchased by a customer with Very High Income(>80k) is 11% The conditional probability of purchasing the treadmill model given that the customer has High Income is - For Treadmill model KP281 - 0% For Treadmill model KP481 - 0% For Treadmill model KP781 - 11%

6.5 Probability of product purchase w.r.t. Marital Status

In [113…
```
pd.crosstab(index =df['Product'],columns = df['MaritalStatus'],margins =
```

Out[113…

MaritalStatus	Partnered	Single	All
Product			
KP281	0.27	0.18	0.44
KP481	0.20	0.13	0.33
KP781	0.13	0.09	0.22
All	0.59	0.41	1.00

In [ ]:
```
INSIGHTS:
1. The Probability of a treadmill being purchased by a Married Customer i
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 27%
For Treadmill model KP481 - 20%
For Treadmill model KP781 - 13%

2. Probability of a treadmill being purchased by a Unmarried Customer is
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 18%
For Treadmill model KP481 - 13%
For Treadmill model KP781 - 9%
```

6.6 Probability of product purchase w.r.t. Weekly Usage

In [116…
```
pd.crosstab(index =df['Product'],columns = df['Usage'],margins = True,nor
```

Out[116…

Usage	2	3	4	5	6	7	All
Product							
KP281	0.11	0.21	0.12	0.01	0.00	0.00	0.44
KP481	0.08	0.17	0.07	0.02	0.00	0.00	0.33
KP781	0.00	0.01	0.10	0.07	0.04	0.01	0.22
All	0.18	0.38	0.29	0.09	0.04	0.01	1.00

In [ ]:
```
INSIGHTS:
1.The Probability of a treadmill being purchased by a customer with Usage
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 21%
For Treadmill model KP481 - 17%
For Treadmill model KP781 - 1%

2. Probability of a treadmill being purchased by a customer with Usage 4
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 12%
For Treadmill model KP481 - 7%
For Treadmill model KP781 - 10%

3. Probability of a treadmill being purchased by a customer with Usage 2
The conditional probability of purchasing the treadmill model given that
For Treadmill model KP281 - 11%
For Treadmill model KP481 - 8%
For Treadmill model KP781 - 0%
```

6.7 Probability of product purchase w.r.t. Customer Fitness

In [117…
```
pd.crosstab(index =df['Product'],columns = df['Fitness'],margins = True,n
```

Out[117…

Fitness	1	2	3	4	5	All
Product						
KP281	0.01	0.08	0.30	0.05	0.01	0.44
KP481	0.01	0.07	0.22	0.04	0.00	0.33
KP781	0.00	0.00	0.02	0.04	0.16	0.22
All	0.01	0.14	0.54	0.13	0.17	1.00

INSIGHTS:

1.The Probability of a treadmill being purchased by a customer with Average(3) Fitness is 54% . The conditional probability of purchasing the treadmill model given that the customer has Average Fitness is - For Treadmill model KP281 - 30% For Treadmill model KP481 - 22% For Treadmill model KP781 - 2%

Probability of a treadmill being purchased by a customer with Fitness of 2,4,5 is almost 15% . Probability of a treadmill being purchased by a customer with very low(1) Fitness is only 1% .

6.8 Probability of product purchase w.r.t. weekly mileage

In [118…
```
pd.crosstab(index =df['Product'],columns = df['miles_group'],margins = Tr
```

Out[118…

miles_group	Light Activity	Moderate Activity	Active Lifestyle	Fitness Enthusiast	All
Product					
KP281	0.07	0.28	0.10	0.00	0.44
KP481	0.03	0.22	0.08	0.01	0.33
KP781	0.00	0.04	0.15	0.03	0.22
All	0.09	0.54	0.33	0.03	1.00

INSIGHTS:

1. Probability of a treadmill being purchased by a customer with lifestyle of Light Activity(0 to 50 miles/week) is 9% . The conditional probability of purchasing the treadmill model given that the customer has Light Activity Lifestyle is - For Treadmill model KP281 - 7% For Treadmill model KP481 - 3% For Treadmill model KP781 - 0%

2.Probability of a treadmill being purchased by a customer with lifestyle of Moderate Activity(51 to 100 miles/week) is 54% . The conditional probability of purchasing the treadmill model given that the customer with lifestyle of Moderate Activity is - For Treadmill model KP281 - 28% For Treadmill model KP481 - 22% For Treadmill model KP781 - 4%

3.Probability of a treadmill being purchased by a customer has Active Lifestyle(100 to 200 miles/week) is 33% . The conditional probability of purchasing the treadmill model given that the customer has Active Lifestyle is - For Treadmill model KP281 - 10% For Treadmill model KP481 - 8% For Treadmill model KP781 - 15%

Probability of a treadmill being purchased by a customer who is Fitness nthusiast(>200 miles/week) is 3% onlY

7. CUSTOMER PROFILING

Based on above analysis: Probability of purchase of KP281 = 44% Probability of purchase of KP481 = 33% Probability of purchase of KP781 = 22%

Customer Profile for KP281 Treadmill: Age of customer mainly between 18 to 35 years with few between 35 to 50 years Education level of customer 13 years and above Annual Income of customer below USD 60,000 Weekly Usage - 2 to 4 times Fitness Scale - 2 to 4 Weekly Running Mileage - 50 to 100 miles

Customer Profile for KP481 Treadmill: Age of customer mainly between 18 to 35 years with few between 35 to 50 years Education level of customer 13 years and

above Annual Income of customer between USD 40,000 to USD 80,000 Weekly Usage - 2 to 4 times Fitness Scale - 2 to 4 Weekly Running Mileage - 50 to 200 miles

Customer Profile for KP781 Treadmill: Gender - Male Age of customer between 18 to 35 years Education level of customer 15 years and above Annual Income of customer USD 80,000 and above Weekly Usage - 4 to 7 times Fitness Scale - 3 to 5 Weekly Running Mileage - 100 miles and above

8. Recommendations: S Marketing Campaigns for KP781 The KP784 model exhibits a significant sales disparity in terms of gender, with only 18% of total sales attributed to female customers. To enhance this metric, it is recommended to implement targeted strategies such as offering special promotions and trials exclusively designed for the female customers.

Affordable Pricing and Payment Plans Given the target customer's age, education level, and income, it's important to offer the KP281 and KP481 Treadmill at an affordable price point. Additionally, consider providing flexible payment plans that allow customers to spread the cost over several months. This can make the treadmill more accessible to customers with varying budgets.

User-Friendly App Integration Create a user-friendly app that syncs with the treadmill. This app could track users' weekly running mileage, provide real-time feedback on their progress, and offer personalized recommendations for workouts based on their fitness scale and goals. This can enhance the overall treadmill experience and keep users engaged.