In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from scipy.stats import ttest_ind
```

In [5]:
```
df = pd.read_csv("FEV-data.csv")
df.head()  # Display first 5 rows
```

Out[5]:

	Car full name	Make	Model	Minimal price (gross) [PLN]	Engine power [KM]	Maximum torque [Nm]	Type of brakes	Drive type	Battery capacity [kWh]	Ran (WLT [k
0	Audi e-tron 55 quattro	Audi	e-tron 55 quattro	345700	360	664	disc (front + rear)	4WD	95.0	4
1	Audi e-tron 50 quattro	Audi	e-tron 50 quattro	308400	313	540	disc (front + rear)	4WD	71.0	3
2	Audi e-tron S quattro	Audi	e-tron S quattro	414900	503	973	disc (front + rear)	4WD	95.0	3
3	Audi e-tron Sportback 50 quattro	Audi	e-tron Sportback 50 quattro	319700	313	540	disc (front + rear)	4WD	71.0	3
4	Audi e-tron Sportback 55 quattro	Audi	e-tron Sportback 55 quattro	357000	360	664	disc (front + rear)	4WD	95.0	4

5 rows × 25 columns

Task 1: A customer has a budget of 350,000 PLN and wants an EV with a minimum range of 400 km. a) Your task is to filter out EVs that meet these criteria. b) Group them by the manufacturer (Make). c) Calculate the average battery capacity for each manufacturer.

In [6]:
```
# Filtering EVs
filtered_cars = df[(df["Minimal price (gross) [PLN]"] <= 350000) & (df["Range (WLTP

# Grouping by manufacturer and calculating average battery capacity
avg_battery_capacity = filtered_cars.groupby("Make")["Battery capacity [kWh]"].mean

print("Filtered EVs:")
```

```
print(filtered_cars[["Make", "Model", "Minimal price (gross) [PLN]", "Range (WLTP)

print("\nAverage Battery Capacity by Manufacturer:")
print(avg_battery_capacity)
```

```
Filtered EVs:
            Make                          Model  Minimal price (gross) [PLN]  \
0           Audi              e-tron 55 quattro                       345700
8            BMW                            iX3                       282900
15       Hyundai           Kona electric 64kWh                       178400
18           Kia                  e-Niro 64kWh                       167990
20           Kia                  e-Soul 64kWh                       160990
22  Mercedes-Benz                            EQC                       334700
39         Tesla  Model 3 Standard Range Plus                       195490
40         Tesla            Model 3 Long Range                       235490
41         Tesla           Model 3 Performance                       260490
47    Volkswagen          ID.3 Pro Performance                       155890
48    Volkswagen                     ID.3 Pro S                       179990
49    Volkswagen                       ID.4 1st                       202390

    Range (WLTP) [km]
0                 438
8                 460
15                449
18                455
20                452
22                414
39                430
40                580
41                567
47                425
48                549
49                500

Average Battery Capacity by Manufacturer:
Make
Audi             95.000000
BMW              80.000000
Hyundai          64.000000
Kia              64.000000
Mercedes-Benz    80.000000
Tesla            68.000000
Volkswagen       70.666667
Name: Battery capacity [kWh], dtype: float64
```

Task 2: You suspect some EVs have unusually high or low energy consumption. Find the outliers in the mean - Energy consumption [kWh/100 km] column.

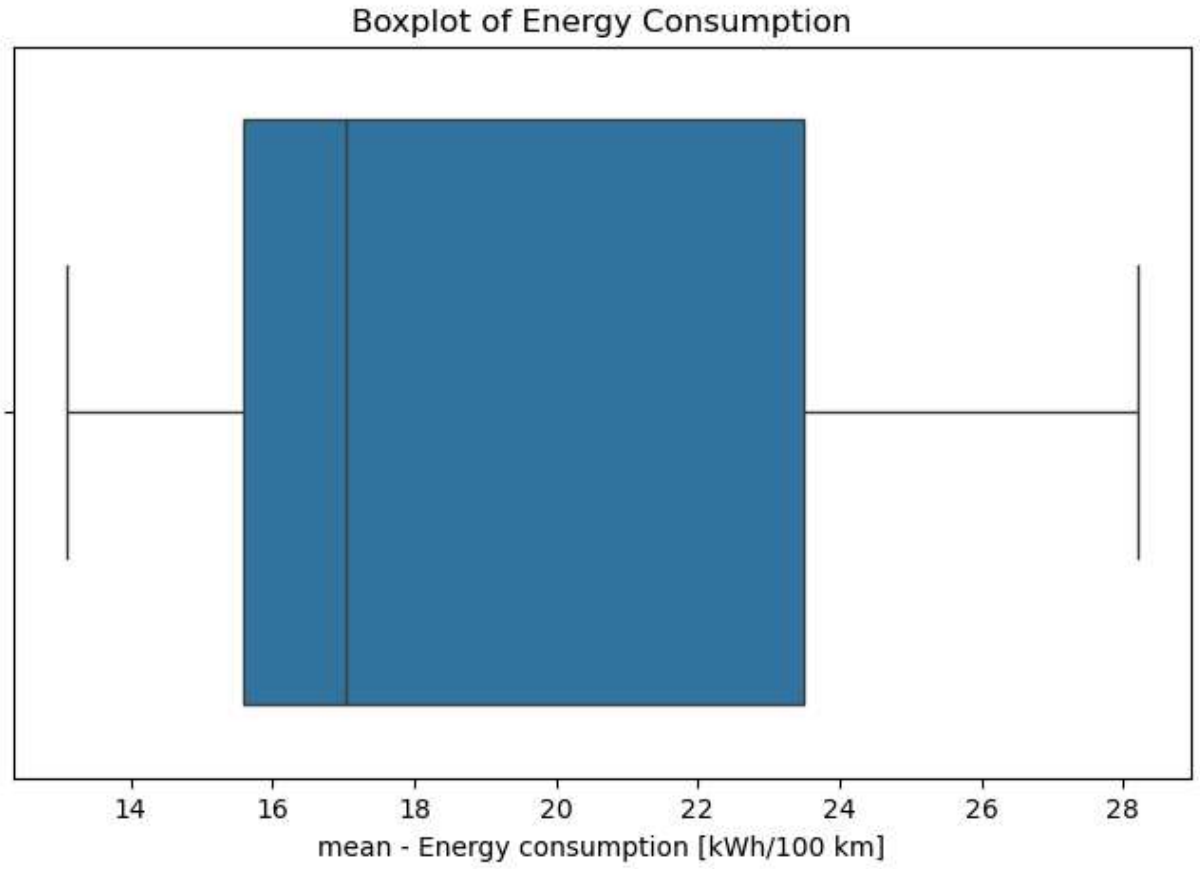
In [10]:
```
# Calculate mean and standard deviation
mean_value = df["mean - Energy consumption [kWh/100 km]"].mean()
std_dev = df["mean - Energy consumption [kWh/100 km]"].std()

# Define outlier range
lower_bound = mean_value - (2 * std_dev)
upper_bound = mean_value + (2 * std_dev)
```

```
# Find outliers
outliers_std = df[(df["mean - Energy consumption [kWh/100 km]"] < lower_bound) |
                  (df["mean - Energy consumption [kWh/100 km]"] > upper_bound)]

print("Outliers using Standard Deviation:")
print(outliers_std[["Make", "Model", "mean - Energy consumption [kWh/100 km]"]])
```

```
Outliers using Standard Deviation:
            Make       Model  mean - Energy consumption [kWh/100 km]
51  Mercedes-Benz  EQV (long)                                    28.2
```

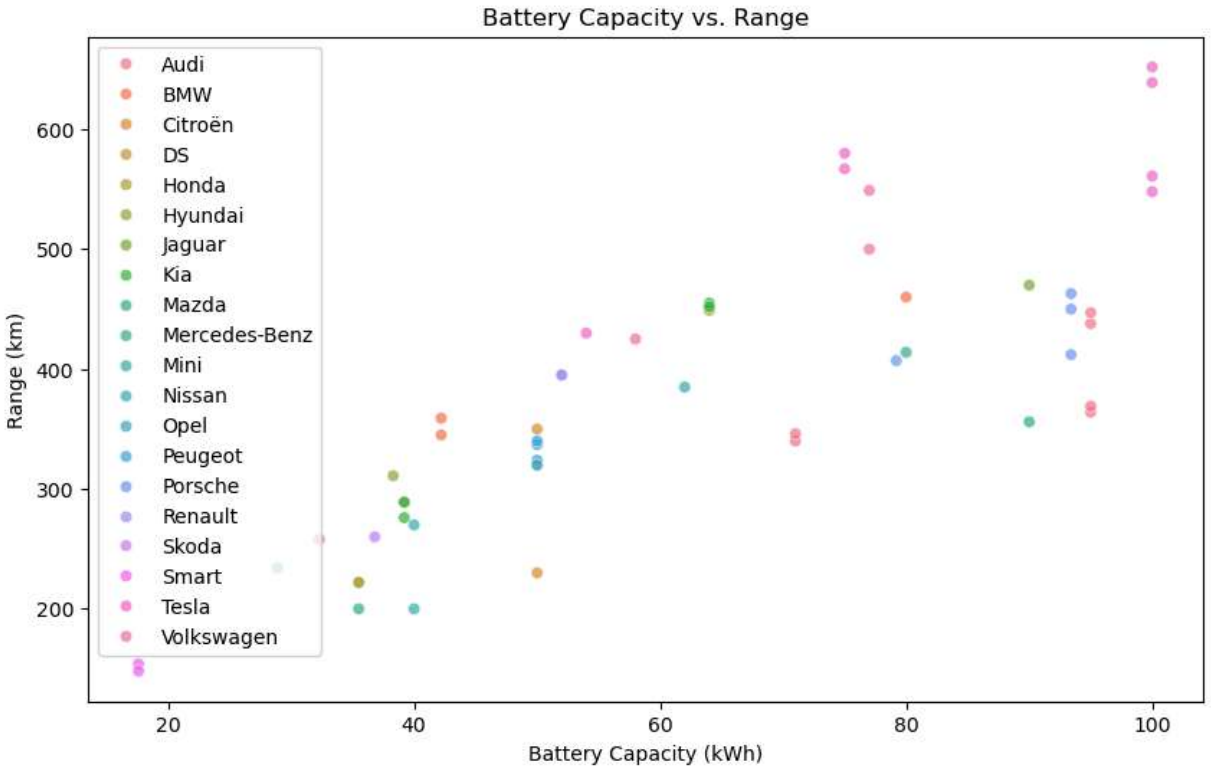
In [12]:

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

plt.figure(figsize=(8, 5))
sns.boxplot(x=df["mean - Energy consumption [kWh/100 km]"])
plt.title("Boxplot of Energy Consumption")
plt.show()
```



Task 3: Your manager wants to know if there's a strong relationship between battery capacity and range. a) Create a suitable plot to visualize. b) Highlight any insights.

In [13]:
```
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x="Battery capacity [kWh]", y="Range (WLTP) [km]", hue="Ma
plt.xlabel("Battery Capacity (kWh)")
plt.ylabel("Range (km)")
plt.title("Battery Capacity vs. Range")
plt.legend(loc="best")
plt.show()
```



Task 4: Build an EV recommendation class. The class should allow users to input their budget, desired range, and battery capacity. The class should then return the top three EVs matching their criteria.

In [14]:
```
class EVRecommender:
    def __init__(self, df):
        self.df = df

    def recommend(self, budget, min_range, min_battery):
        recommendations = self.df[
            (self.df["Minimal price (gross) [PLN]"] <= budget) &
            (self.df["Range (WLTP) [km]"] >= min_range) &
            (self.df["Battery capacity [kWh]"] >= min_battery)
        ]
        return recommendations[["Make", "Model", "Minimal price (gross) [PLN]", "Ra

# Example usage
recommender = EVRecommender(df)
budget = 350000
range_needed = 400
battery_needed = 60
```

```
print("Top EV Recommendations:")
print(recommender.recommend(budget, range_needed, battery_needed))
```

```
Top EV Recommendations:
       Make                Model  Minimal price (gross) [PLN]  \
0      Audi    e-tron 55 quattro                       345700
8       BMW                  iX3                       282900
15  Hyundai  Kona electric 64kWh                       178400

    Range (WLTP) [km]  Battery capacity [kWh]
0                 438                   95.0
8                 460                   80.0
15                449                   64.0
```

Task 5: Inferential Statistics – Hypothesis Testing: Test whether there is a significant difference in the average Engine power [KM] of vehicles manufactured by two leading manufacturers i.e. Tesla and Audi. What insights can you draw from the test results? Recommendations and Conclusion: Provide actionable insights based on your analysis. (Conduct a two sample t-test using ttest_ind from scipy.stats module)

In [15]:
```
tesla_power = df[df["Make"] == "Tesla"]["Engine power [KM]"]
audi_power = df[df["Make"] == "Audi"]["Engine power [KM]"]

# Perform two-sample t-test
t_stat, p_value = ttest_ind(tesla_power, audi_power, equal_var=False)

print("T-Statistic:", t_stat)
print("P-Value:", p_value)

# Interpretation
alpha = 0.05
if p_value < alpha:
    print("There is a significant difference in engine power between Tesla and Audi
else:
    print("No significant difference in engine power between Tesla and Audi.")
```

```
T-Statistic: 1.7939951827297178
P-Value: 0.10684105068839565
No significant difference in engine power between Tesla and Audi.
```

task 6: video

link:https://drive.google.com/file/d/1JwHvkaJal2MV9jyNZpB0iLHC22yn5hOc/view?usp=sharing

In [ ]:
```
```