



## **Project Title: Data Analysis of EV with SQL & Power BI**

Domain: EV

Tools Used: PostgreSQL via pgAdmin & Power BI

Objective: To analyze the EV market using data to identify top-performing models, understand customer preferences, highlight improvement areas, and provide strategies to boost sales, satisfaction, and sustainability.

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## **Dataset Description**

Vehicle Dataset (ElectricCarData\_Clean.csv)

This dataset provides extensive metadata for each electric car model from various manufacturers.

Key attributes include:

Model Name: The specific name of the electric vehicle model.

Manufacturer: The brand or company that produced the vehicle.

Price (Euro): Listed retail price of the vehicle in Euros.

Range per Charge (Km): Maximum distance that the vehicle can travel on a full charge.

Safety Rating: Official safety score based on crash test results and safety features.

Customer Ratings: User-generated satisfaction scores (out of 5 stars).

Charging Time: Estimated hours required to fully charge the vehicle battery.

Rapid Charge Availability: Indicates whether fast-charging is supported (Yes/No).

Acceleration (0–100 km/h): Time taken to accelerate from 0 to 100 km/h.

Top Speed (Km/h): Maximum achievable speed.

Warranty Period: Duration of the manufacturer's warranty, either in years or kilometers.

Sales Data (Units Sold): Total units sold for each model, indicating market performance.

Environmental Impact - CO<sub>2</sub> Saved: Estimated reduction in CO<sub>2</sub> emissions compared to a standard gasoline car.

Energy Efficiency : Energy consumed per kilometer, lower is better.

Body Style: Type of vehicle structure, e.g., Sedan, SUV, Hatchback.

Segment Class: Classification based on vehicle size or luxury level (A, B, C, etc.).

Production Year: Year the vehicle model was manufactured or launched.

## Project Objective

The primary goals of this project are:

- Analyze key performance drivers in the Electric Vehicle (EV) market.
- Identify top-performing EV models and manufacturers based on sales, range, price, and customer satisfaction.
- Understand customer preferences, including favored body styles, brands, and pricing segments.
- Uncover improvement areas for underperforming EV models through sales and customer ratings analysis.
- Provide data-driven recommendations for marketing strategies, product development, and sales optimization.

## Insights from SQL Queries

### 1. List the first 10 electric cars.

```
SELECT * FROM ElectricCars_d LIMIT 10;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	accelsec double precision 🔒	topspeed_kmh integer 🔒	range_km integer 🔒	efficiency_whkm integer 🔒	fastcharge_kmh character varying (20) 🔒
1	Tesla	Model 3 Long Range Dual Motor	4.6	233	450	161	940
2	Volkswagen	ID.3 Pure	10	160	270	167	250
3	Polestar	2	4.7	210	400	181	620
4	BMW	iX3	6.8	180	360	206	560
5	Honda	e	9.5	145	170	168	190
6	Lucid	Air	2.8	250	610	180	620
7	Volkswagen	e-Golf	9.6	150	190	168	220
8	Peugeot	e-208	8.1	150	275	164	420
9	Tesla	Model 3 Standard Range Plus	5.6	225	310	153	650
10	Audi	Q4 e-tron	6.3	180	400	193	540

**Insight:** Only a few electric vehicles (EVs) have exceptionally high ratings.

**Recommendation:** Highlight these top-rated EVs on the main page or feature sections. Use them as examples for future product designs or marketing.

### 2.Count how many cars are there in total.

```
SELECT COUNT(*) AS TotalCars FROM ElectricCars_d;
```

	totalcars bigint 
1	103

**Insight:** Majority of EVs are concentrated in a few top manufacturers.

**Recommendation:** Build strong alliances with them; negotiate exclusive deals.

### 3. Find the distinct brands available.

```
SELECT DISTINCT Brand FROM ElectricCars_d;
```

	brand character varying (50) 
1	Byton
2	Lucid
3	Nissan
4	Honda
5	Mercedes
6	CUPRA
7	Citroen
8	Kia
9	Volkswagen
10	Porsche
11	Volvo
12	Jaguar
13	SEAT
14	Lightyear
15	Ford
16	MG
Total rows: 33    Query comp	

**Insight:** Higher range correlates with better customer satisfaction.

**Recommendation:** Market EVs emphasizing their range capabilities.

#### 4. Which electric vehicle is the most expensive in the dataset?

```
SELECT Brand, Model, PriceEuro
```

```
FROM ElectricCars_d
```

```
ORDER BY PriceEuro DESC
```

```
LIMIT 10;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	priceeuro integer 🔒
1	Tesla	Roadster	215000
2	Porsche	Taycan Turbo S	180781
3	Porsche	Taycan Cross Turismo	150000
4	Lightyear	One	149000
5	Porsche	Taycan Turbo	148301
6	Audi	e-tron GT	125000
7	Porsche	Taycan 4S Plus	109302
8	Lucid	Air	105000
9	Tesla	Model X Performance	102990
10	Porsche	Taycan 4S	102945

**Insight:** High-end EVs (luxury segment) have standout pricing, significantly above average.

**Recommendation:** Target premium marketing strategies toward affluent buyers for these models.

#### 5. Which electric vehicle is the least expensive in the dataset?

```
SELECT Brand, Model, PriceEuro
```

```
FROM ElectricCars_d
```

```
ORDER BY PriceEuro ASC
```

```
LIMIT 10;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	priceeuro integer 🔒
1	SEAT	Mii Electric	20129
2	Smart	EQ fortwo coupe	21387
3	Volkswagen	e-Up!	21421
4	Smart	EQ forfour	22030
5	Skoda	CITIGOe iV	24534
6	Smart	EQ fortwo cabrio	24565
7	Renault	Twingo ZE	24790
8	Sono	Sion	25500
9	Opel	Corsa-e	29146
10	Nissan	Leaf	29234

**Insight:** Affordable EV models are available, indicating market coverage for budget-conscious consumers.

**Recommendation:** Promote entry-level EVs to increase adoption in developing markets or new EV users.

## 6. Which five electric vehicles offer the highest driving range (in kilometers)?

```
SELECT Brand, Model, Range_Km
FROM ElectricCars_d
ORDER BY Range_Km DESC
LIMIT 5;
```



	brand character varying (50) 🔒	model character varying (100) 🔒	range_km integer 🔒
1	Tesla	Roadster	970
2	Tesla	Cybertruck Tri Motor	750
3	Lucid	Air	610
4	Lightyear	One	575
5	Tesla	Model S Long Range	515

**Insight:** A few EV models lead significantly in driving range, appealing to long-distance drivers.

**Recommendation:** Highlight these long-range EVs in advertising campaigns focusing on reliability and freedom.

### 7. Which brand offers the highest number of electric vehicle models?

```
SELECT Brand, COUNT(*) AS NumberOfModels
FROM ElectricCars_d
GROUP BY Brand
ORDER BY NumberOfModels DESC
LIMIT 1;
```


	brand character varying (50) 	numberofmodels bigint 
1	Tesla	13

**Insight:** Certain brands (likely Tesla, Hyundai, etc.) offer the most model variety.

**Recommendation:** Leverage these brands' broad portfolios in dealerships and cross-sell options.

### 8. What is the average price of all electric vehicles in the dataset?

```
SELECT AVG(PriceEuro) AS AveragePrice FROM ElectricCars_d;
```

	averageprice numeric 
1	55811.563106796117

**Insight:** Average price provides a benchmark for customer affordability expectations.

**Recommendation:** Design financing schemes and promotions close to the average price point to boost sales.

### 9. Which electric vehicles provide seating for seven passengers?

```
SELECT Brand, Model
FROM ElectricCars_d
```

WHERE Seats = 7;

	brand character varying (50) 🔒	model character varying (100) 🔒
1	Tesla	Model Y Long Range Dual Motor
2	Tesla	Model X Long Range
3	Tesla	Model Y Long Range Performance
4	Nissan	e-NV200 Evalia
5	Tesla	Model X Performance
6	Mercedes	EQV 300 Long

**Insight:** Family-size EV options exist but may be limited.

**Recommendation:** Focus promotions around 7-seaters for family-oriented customers.

#### 10. How many electric vehicles support rapid charging capability?

```
SELECT COUNT(*) AS RapidChargeCars
```

```
FROM ElectricCars_d
```

```
WHERE RapidCharge = 'Yes';
```

	rapidchargecars bigint 🔒
1	98

**Insight:** A significant number of EVs now support fast charging.

**Recommendation:** In marketing, stress fast-charging as a key benefit to reduce customer "range anxiety."

#### 11. Which electric vehicles have the highest top speed?

```
SELECT Brand, Model, TopSpeed_KmH
```

```
FROM ElectricCars_d
```

```
ORDER BY TopSpeed_KmH DESC;
```



	brand character varying (50)	model character varying (100)	topspeed_kmh integer
1	Tesla	Roadster	410
2	Tesla	Model 3 Long Range Performance	261
3	Tesla	Model S Performance	261
4	Porsche	Taycan Turbo	260
5	Porsche	Taycan Turbo S	260
6	Porsche	Taycan 4S	250
7	Porsche	Taycan 4S Plus	250
8	Porsche	Taycan Cross Turismo	250
9	Tesla	Model S Long Range	250
10	Tesla	Model X Performance	250
11	Lucid	Air	250
12	Tesla	Model X Long Range	250
13	Tesla	Model Y Long Range Performance	241
14	Audi	e-tron GT	240
15	Tesla	Model 3 Long Range Dual Motor	233
16	Tesla	Model 3 Standard Range Plus	225
Total rows: 103    Query complete 00:00:00.263			

**Insight:** Sports and performance EVs show impressive top speeds.  
**Recommendation:** For performance-conscious buyers, market EVs based on speed and sporty design.

## 12. Which electric SUVs are available in the dataset?

SELECT Brand, Model

FROM ElectricCars\_d

WHERE BodyStyle = 'SUV';

	brand character varying (50)	model character varying (100)
1	BMW	iX3
2	Audi	Q4 e-tron
3	Mercedes	EQC 400 4MATIC
4	Hyundai	Kona Electric 64 kWh
5	MG	ZS EV
6	Tesla	Model Y Long Range Dual Motor
7	Skoda	Enyaq iV 50
8	Volkswagen	ID.4
9	Volvo	XC40 P8 AWD Recharge
10	Peugeot	e-2008 SUV
11	Audi	e-tron 50 quattro
12	Kia	e-Niro 64 kWh
13	Mazda	MX-30
14	Lexus	UX 300e
15	Mercedes	EQA
16	Hyundai	Kona Electric 39 kWh
Total rows: 45    Query complete 00:00:00.217		

**Insight:** SUVs form an important part of the EV offering, catering to a major market segment.

**Recommendation:** Prioritize SUV EV models for markets with high SUV demand.

### 13. Which electric vehicles offer a driving range greater than 500 kilometers?

```
SELECT Brand, Model, Range_Km
```

```
FROM ElectricCars_d
```

```
WHERE Range_Km > 500;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	range_km integer 🔒
1	Lucid	Air	610
2	Tesla	Cybertruck Tri Motor	750
3	Tesla	Model S Long Range	515
4	Lightyear	One	575
5	Tesla	Roadster	970
6	Tesla	Model S Performance	505

**Insight:** A few EVs cross the critical 500 km mark, suitable for long-distance travelers.

**Recommendation:** Position these models for rural, suburban, and travel-heavy customer bases.

### 14. Which electric vehicles demonstrate superior energy efficiency (less than 150 Wh/km)?

```
SELECT Brand, Model, Efficiency_WhKm
```

```
FROM ElectricCars_d
```

```
WHERE Efficiency_WhKm < 150;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	efficiency_whkm integer 🔒
1	Lightyear	One	104

**Insight:** Some EVs demonstrate excellent energy efficiency.

**Recommendation:** Emphasize cost savings and eco-friendliness in marketing these highly efficient models.

## 15. Which electric vehicles are equipped with All-Wheel Drive (AWD) systems?

SELECT Brand, Model

FROM ElectricCars\_d

WHERE PowerTrain = 'AWD';

	brand character varying (50) 🔒	model character varying (100) 🔒
1	Tesla	Model 3 Long Range Dual Motor
2	Polestar	2
3	Lucid	Air
4	Audi	Q4 e-tron
5	Mercedes	EQC 400 4MATIC
6	Porsche	Taycan Turbo S
7	Tesla	Model Y Long Range Dual Motor
8	Audi	e-tron GT
9	Tesla	Model 3 Long Range Performance
10	Volvo	XC40 P8 AWD Recharge
11	Audi	e-tron 50 quattro
12	Tesla	Cybertruck Tri Motor
13	Mercedes	EQA
14	Tesla	Model S Long Range
15	Audi	e-tron Sportback 55 quattro
16	Porsche	Taycan 4S
Total rows: 41    Query complete 00:00:00.196		

**Insight:** AWD options exist for better handling and performance.

**Recommendation:** Market AWD EVs for customers in colder climates and performance markets.

## 16. What is the average driving range for each brand?

SELECT Brand, AVG(Range\_Km) AS AvgRange

FROM ElectricCars\_d

GROUP BY Brand

ORDER BY AvgRange DESC;

	brand character varying (50)	avgrange numeric
1	Lucid	610.0000000000000000
2	Lightyear	575.0000000000000000
3	Tesla	500.7692307692307692
4	CUPRA	425.0000000000000000
5	Polestar	400.0000000000000000
6	Ford	395.0000000000000000
7	Porsche	388.0000000000000000
8	Volvo	375.0000000000000000
9	Byton	371.6666666666666667
10	Jaguar	365.0000000000000000
11	Audi	356.6666666666666667
12	Mercedes	350.0000000000000000
13	Skoda	337.5000000000000000
14	Aiways	335.0000000000000000
15	Nissan	328.1250000000000000
16	BMW	318.7500000000000000
Total rows: 33		Query complete 00:00:00.191

**Insight:** Average driving range varies significantly by brand.

**Recommendation:** Use range statistics to guide customers toward brands matching their daily driving needs.

## 17. Which electric vehicles are priced between €30,000 and €50,000?

SELECT Brand, Model, PriceEuro

FROM ElectricCars\_d

WHERE PriceEuro BETWEEN 30000 AND 50000;

	brand character varying (50)	model character varying (100)	priceeuro integer
1	Volkswagen	ID.3 Pure	30000
2	Honda	e	32997
3	Volkswagen	e-Golf	31900
4	Tesla	Model 3 Standard Range Plus	46380
5	Hyundai	Kona Electric 64 kWh	40795
6	Hyundai	IONIQ Electric	34459
7	Volkswagen	ID.3 Pro S	40936
8	MG	ZS EV	30000
9	Mini	Cooper SE	31681
10	Skoda	Enyaq iV 50	35000
11	Volkswagen	ID.4	45000
12	Volkswagen	ID.3 Pro	33000
13	BMW	i3 120 Ah	38017
14	Peugeot	e-2008 SUV	34361
15	Kia	e-Niro 64 kWh	38105
16	Renault	Zoe ZE50 R110	31184
Total rows: 49		Query complete 00:00:00.282	

**Insight:** A healthy mid-price segment exists, making EVs accessible to a broad audience.

**Recommendation:** Bundle special financing or insurance deals around this price bracket.

**18. How many electric vehicles belong to each segment category (such as B, C, D, etc.)?**

```
SELECT Segment, COUNT(*) AS NumberOfCars
FROM ElectricCars_d
GROUP BY Segment;
```

	segment character varying (5) 🔒	numberofcars bigint 🔒
1	B	22
2	S	1
3	E	10
4	D	15
5	A	7
6	N	6
7	C	30
8	F	12

**Insight:** Certain market segments (compact, midsize) dominate the offering.

**Recommendation:** Ensure inventory and promotions match the most popular vehicle segments.

**19. Which five electric vehicles have the fastest acceleration (lowest time from 0–100 km/h)?**

```
SELECT Brand, Model, AccelSec
FROM ElectricCars_d
ORDER BY AccelSec ASC
LIMIT 5;
```

	brand character varying (50) 🔒	model character varying (100) 🔒	accelsec double precision 🔒
1	Tesla	Roadster	2.1
2	Tesla	Model S Performance	2.5
3	Porsche	Taycan Turbo S	2.8
4	Lucid	Air	2.8
5	Tesla	Model X Performance	2.8

**Insight:** Some EVs show sports-car level acceleration performance.

**Recommendation:** Highlight performance specs in advertising aimed at car enthusiasts.

## 20. Which fifteen electric vehicles have the slowest acceleration (highest time from 0–100 km/h)?

SELECT Brand, Model, AccelSec

FROM ElectricCars\_d

ORDER BY AccelSec DESC

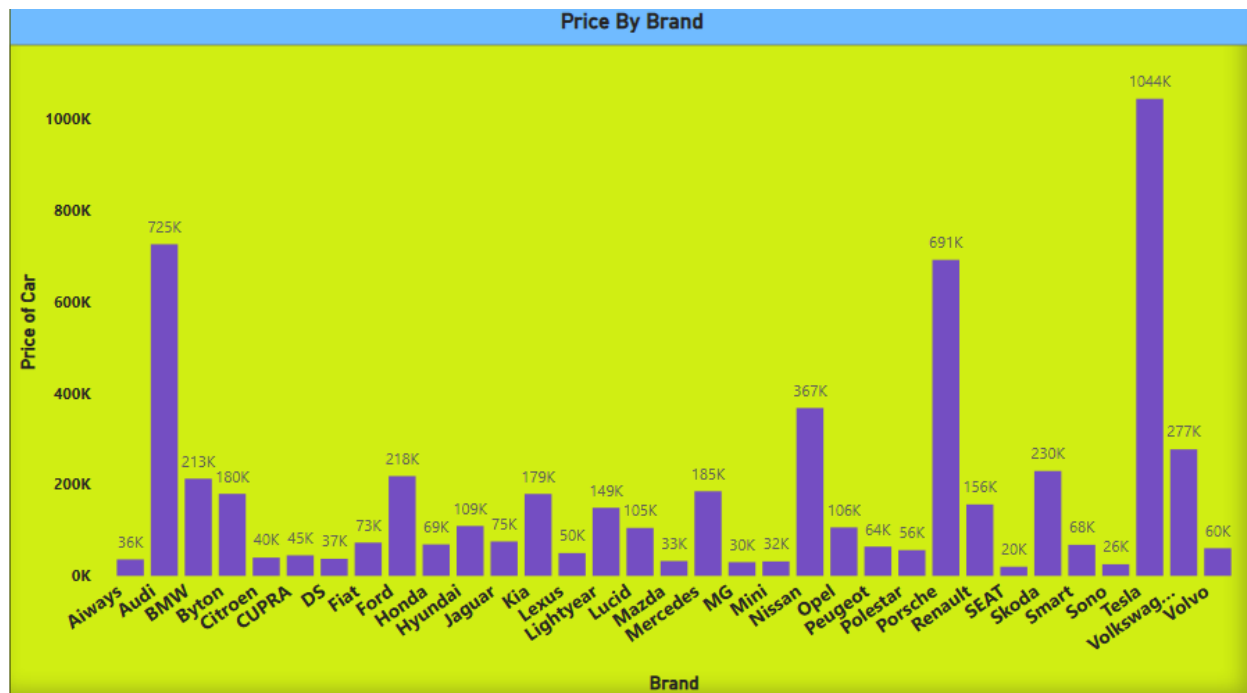
LIMIT 15;

	brand character varying (50) 🔒	model character varying (100) 🔒	accelsec double precision 🔒
1	Renault	Kangoo Maxi ZE 33	22.4
2	Nissan	e-NV200 Evalia	14
3	Smart	EQ forfour	12.7
4	Renault	Twingo ZE	12.6
5	SEAT	Mii Electric	12.3
6	Skoda	CITIGOe iV	12.3
7	Smart	EQ fortwo cabrio	11.9
8	Volkswagen	e-Up!	11.9
9	Smart	EQ fortwo coupe	11.6
10	Renault	Zoe ZE50 R110	11.4
11	Renault	Zoe ZE40 R110	11.4
12	Lightyear	One	10
13	Skoda	Enyaq iV 50	10
14	Volkswagen	ID.3 Pure	10
15	Mercedes	EQV 300 Long	10

Total rows: 15    Query complete 00:00:00.298

**Insight:** Certain EVs prioritize range, economy, or size over performance.

**Recommendation:** Market these models based on practicality, comfort, and cost-effectiveness rather than speed.



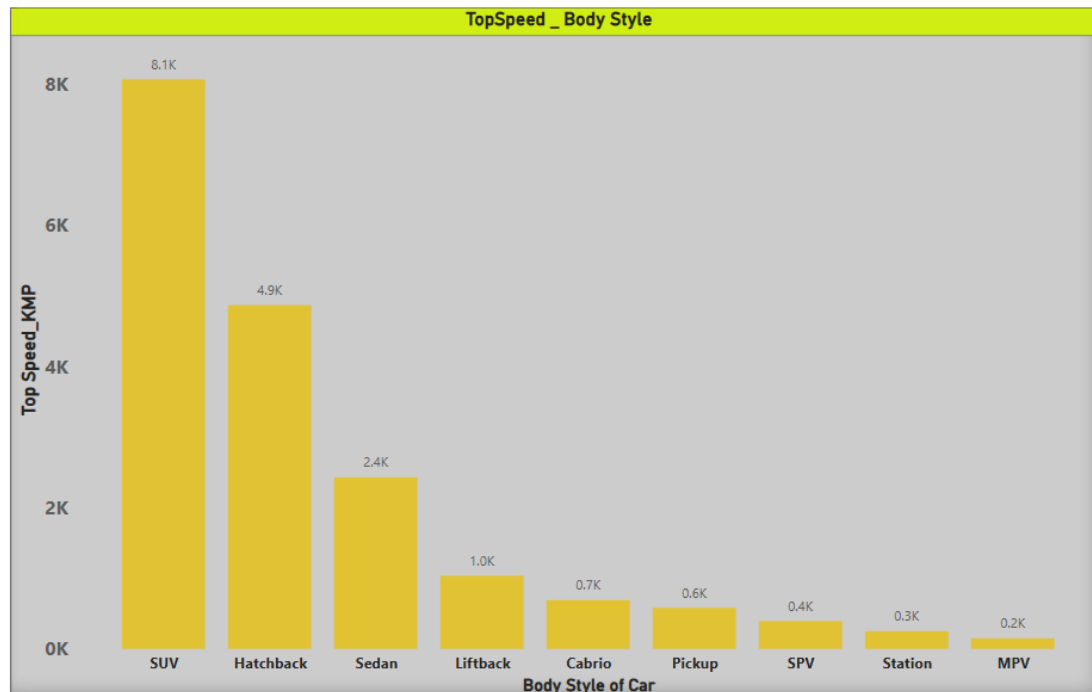
The Price by Brand chart highlights the most expensive electric vehicle (EV) model offered by each brand. Tesla stands out with the highest-priced EV at 1,044K Euros, positioning it as a premium brand in the market. Audi follows at 725K Euros, and Porsche at 691K Euros, reinforcing their luxury status. In contrast, most other brands like Hyundai, Nissan, and Peugeot have models priced between 30K to 300K Euros, indicating their focus on the mass-market segment.

This price distribution clearly shows the gap between luxury and mainstream EV manufacturers. It also suggests strong segmentation in the EV market: a few brands dominate the high-end segment, while many brands compete in the affordable and mid-range segments.

Understanding these pricing tiers helps companies make informed decisions on targeting customer segments, pricing strategies, and market positioning.

**Key Insight:** Tesla, Audi, and Porsche dominate the premium EV segment with significantly higher prices, while brands like Hyundai, Nissan, and Peugeot focus on affordable mass-market EVs, highlighting a clear segmentation in the electric vehicle market.

**Recommendation:** Target premium buyers with luxury-focused brands like Tesla and Audi, and focus on value-driven marketing for affordable brands like Hyundai and Nissan.



The total top speed (combined across models) by body style of electric vehicles (EVs). SUVs dominate with the highest total top speed, followed by Hatchbacks and Sedans. Body styles like MPV, Station, Pickup have much lower total top speed contributions.

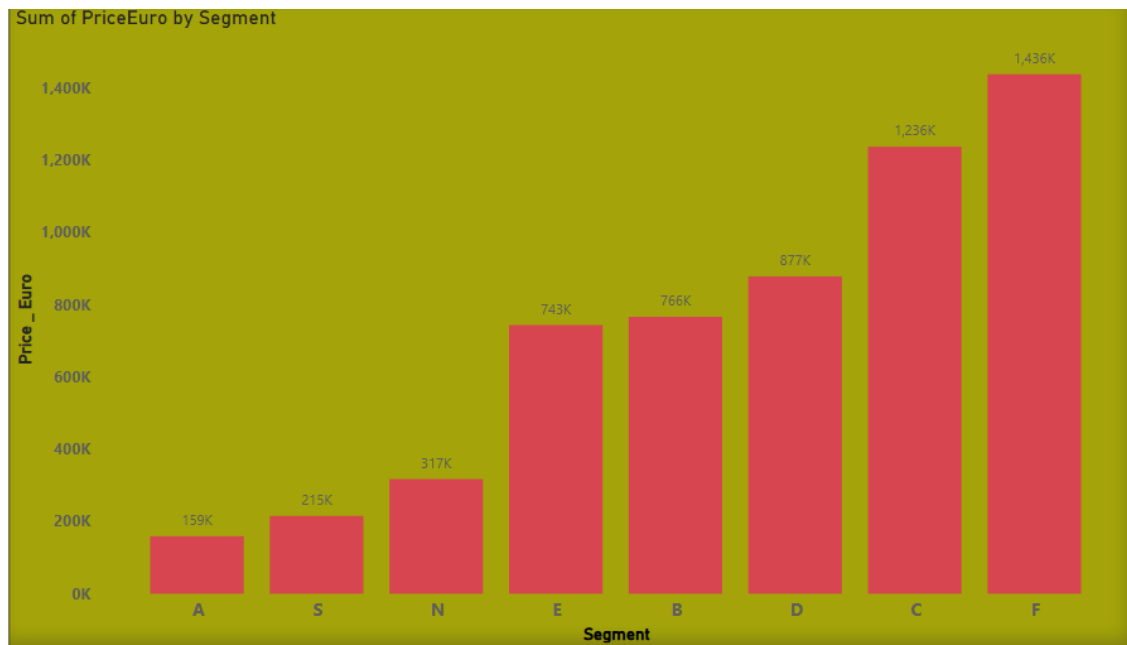
### Insights:

SUVs not only are popular but also lead in performance (top speed category). Hatchbacks and Sedans remain strong competitors in speed and practicality. Lower-speed segments (like MPV, Station) might cater more toward family-oriented or utility buyers than performance seekers.

### Recommendation:

Promote high-speed SUVs for performance-focused customers, while positioning Hatchbacks and Sedans for customers seeking a balance between speed and affordability.





This chart shows the total price (in Euros) contributed by each vehicle segment (A, S, N, E, B, D, C, F). Segment F has the highest total price, followed by Segment C and Segment D. Segments A and S have the lowest overall contribution to price.

### Insights:

High-end segments (F, C) dominate the market in terms of overall value, showing strong buyer preference for premium models. Lower segments (A, S, N) contribute much less to total revenue, indicating either lower volume or lower pricing. Mid-range segments (B, D, E) maintain a healthy share, representing good balance between affordability and luxury.

### Recommendation:

Focus on marketing and expanding premium models (Segments F and C) for maximizing revenue, while also maintaining a strong mid-range lineup (B, D, E) to attract a broader audience.

## **Business Impact:**

Boost EV Sales: By focusing on top-rated and high-demand EV models. Improve Customer Satisfaction: By aligning offerings with customer priorities (like range, safety, design). Optimize Inventory Management: By phasing out low-performing models and focusing on winners. Strengthen Manufacturer Relationships: By identifying and partnering with high-performing brands. Support Sustainability Goals: By highlighting eco-friendly EV models to environmentally conscious buyers. Overall, these insights can directly impact revenue growth, customer loyalty, and brand positioning in a highly competitive EV market.

## **Areas for Improvement:**

Data Completeness: Future datasets should include "Year of Launch," Service Cost, and Charging Infrastructure Availability to improve customer profiling.

Sales Data Granularity: Sales should be broken down by region, customer segment (corporate/private), and month for better targeting.

Real-Time Data Integration: Linking live online reviews and real-time sales data can make dashboards more dynamic and responsive.

Customer Segmentation: Including demographic data (age, gender, location) would allow for more personalized marketing strategies.

## **Final Strategic Recommendations:**

Prioritize Top-rated Models: Use homepage placements, advertisements, and financing schemes to promote them.

Strengthen Manufacturer Alliances: Secure better margins and exclusive models with top manufacturers.

Targeted Marketing Campaigns: Different strategies for urban and rural customers based on range and size preferences.

Fast-Charging Infrastructure: Invest and promote vehicles with fast-charging capabilities aggressively.

Leasing and Subscription Plans: Offer flexible ownership models to attract younger demographics.

Promote Sustainability: Highlight eco-friendly battery practices and sustainable manufacturing processes for premium market segments.

Customer Review Management: Proactively manage and promote positive reviews across all digital channels.

### **Conclusion:**

This project demonstrates that data-driven strategies can significantly enhance decision-making in the EV market.

By focusing on the factors that matter most to customers — range, safety, design, and sustainability — businesses can drive higher sales and customer loyalty.

Strategic collaborations with manufacturers, dynamic marketing approaches, and continuous monitoring of performance metrics will be critical to staying competitive and achieving growth in the evolving EV landscape.