

# Business Case Study: Advancing Smart Mobility and Manufacturing with AI at AUTODRIVE Motors

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## Company Profile

AUTODRIVE Motors is a European automotive company with a strong presence in the electric vehicle (EV) market. Known for its innovation in sustainable mobility, AUTODRIVE operates three manufacturing plants and sells over 300,000 vehicles annually. The firm generated 6.2 billion in revenue last year and is aggressively investing in connected car technology and intelligent automation.

## Departmental Focus: Smart Mobility and Manufacturing Efficiency

The company has identified two strategic areas for AI-driven transformation:

- **Smart Mobility:** Enhance connected car features using real-time data and predictive services.
- **Manufacturing:** Optimize production line efficiency and predictive maintenance with industrial IoT.

## Challenge

To remain competitive in the smart vehicle space, AUTODRIVE aims to:

- Improve EV route optimization and battery prediction
- Reduce factory downtime through predictive maintenance
- Personalize in-car user experiences based on behavior and voice

## Proposed AI Integration

The strategy includes:

- **In-Car AI:** NLP for voice assistants, route forecasting with time-series and geospatial AI
- **Factory AI:** Anomaly detection in sensor data, computer vision for quality control

## Implementation Plan

- **Q1:** Aggregate vehicle telemetry, voice logs, and factory sensor data
- **Q2:** Deploy route prediction model and launch pilot of predictive maintenance on one plant
- **Q3:** Implement driver preference learning and production-line visual inspection
- **Q4:** Evaluate KPIs and prepare rollout across fleet and factories

## Expected Impact

- Reduce production downtime by 20%
- Improve battery range estimation accuracy by 30%
- Enhance customer satisfaction through smart personalization

## Fictional Financials

### Balance Sheet – End of Year (in millions)

Assets	Current Year	Previous Year
Cash	450	400
Inventory	620	580
Plants and Equipment	1,800	1,700
Accounts Receivable	750	720
<b>Total Assets</b>	<b>3,620</b>	<b>3,400</b>
<b>Liabilities &amp; Equity</b>		
Short-term Debt	300	290
Long-term Debt	1,200	1,150
Accounts Payable	720	690
Shareholder Equity	1,400	1,270
<b>Total Liabilities &amp; Equity</b>	<b>3,620</b>	<b>3,400</b>

## Profit and Loss Statement (in millions)

Item	Current Year	Previous Year
Vehicle Sales Revenue	5,800	5,300
After-Sales and Services	400	380
<b>Total Revenue</b>	<b>6,200</b>	<b>5,680</b>
Cost of Goods Sold	4,000	3,700
R&D Expenses	700	650
<b>Operating Profit</b>	<b>1,500</b>	<b>1,330</b>
Taxes	300	260
<b>Net Profit</b>	<b>1,200</b>	<b>1,070</b>

## Data Challenge: AI-Driven Automotive Innovation

Students are challenged to explore how AI can transform the vehicle lifecycle and manufacturing using:

- **Structured:** Telemetry logs, maintenance records, parts inventory
- **Text:** Driver voice commands, maintenance reports
- **Images/Video:** Production line footage, vehicle inspection images
- **Time Series:** Engine performance, battery temperature, GPS tracking

### Objectives:

1. Pick a use case: predictive maintenance, driver profiling, factory automation, route optimization
2. Choose relevant models: LSTM, CNN, NLP, decision trees, XGBoost, anomaly detection
3. Identify Python libraries (`scikit-learn`, `OpenCV`, `transformers`, `pandas`, `Prophet`, `TensorFlow`)
4. Suggest preprocessing and evaluation strategies
5. Design a way to present insights to factory managers or product designers

**Bonus:** Design a real-time dashboard concept for predictive maintenance or vehicle usage insights.

## Discussion Questions

1. What challenges does AUTODRIVE face in deploying AI across physical and digital domains?
2. How can AUTODRIVE protect privacy in connected car data?
3. What role can AI play in supporting sustainability and reducing carbon footprint?
4. How should AUTODRIVE manage risks related to algorithmic errors in safety-critical contexts?

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