Prosche Motors*

Prosche Motors is a European company that designs, manufactures and sells electric cars. You have just been appointed as the new COO and are in charge of handling some delicate issues around the production and shipment of a new model nicknamed Tycoon, a highly customizable electric roadster aimed to compete with the company's rivals in the North-American market. In this mini-case, we will focus on the company's operations during the first quarter of next year. **Figure 1** below depicts a brief schematic of the supply chain for the Tycoon.

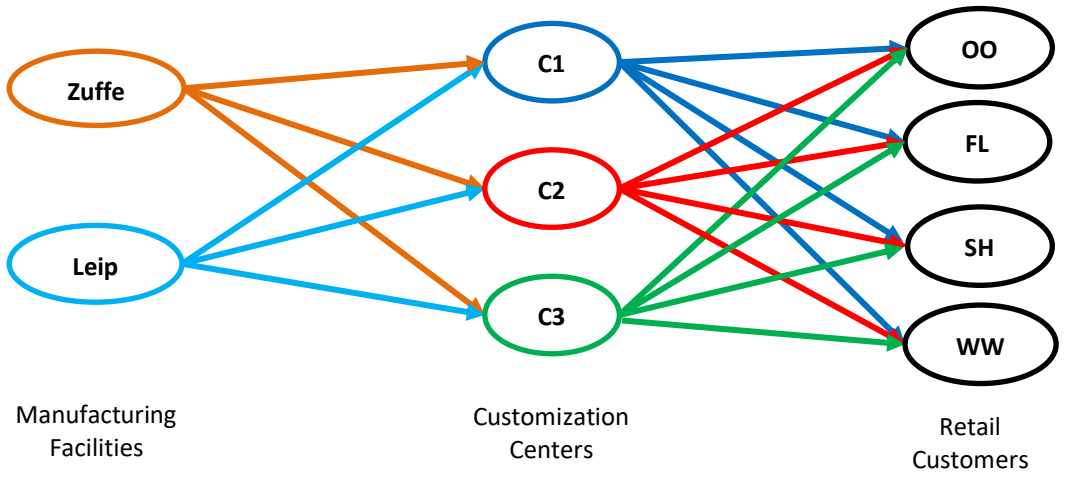

Figure 1. The supply chain for the Tycoon.

Production. Prosche manufactures a bare-bones version of the Tycoon at its facilities in Zuffe and Leip. **Table 1** provides an overview of the production capacities and costs in these facilities. Zuffe is a large, modern facility whereas Leip is a smaller and slightly older facility, with a lower capacity and a higher per-unit cost. The costs are different at the facilities, due to sourcing and transporting the necessary materials and components (such as batteries, rare minerals, etc.) and the different energy and labor market conditions.

	Cost (€ per unit)	Quarterly Capacity (units)
Zuffe	54,000	5,000
Leip	58,500	2,000

Table 1. Per-unit costs and production capacities at the two facilities.

Customization process. From the facilities, the cars are then transported to three special-purpose centers nicknamed **C1**, **C2** and **C3**, where they undergo customization to fit the requirements of the clients. **Table 2** displays the per-unit costs involved in handling and transporting cars from factories to customization centers, which heavily depend on the precise origin and destination. Each customization center has been designed to be as flexible as possible, with processes capable of handling multiple types of configurations. However, due to the highly specialized nature of the designs, the centers must rely heavily on manual labor and can only handle a limited number of units each quarter, at fairly high costs. The costs and capacities are recorded in **Table 3**.

	C1	C2	C3
Zuffe	€ 1,000	€ 2,500	€ 2,000
Leip	€ 2,000	€ 1,500	€ 1,800

Table 2. Transportation cost (per unit) from factories to customization centers.

	Staffing Cost (€ per unit)	Quarterly Capacity (units)
C1	€ 3,000	2,000
C2	€ 6,000	2,200
C3	€ 7,500	3,300

Table 3. Staffing costs and quarterly capacities at customization centers.

*This mini-case was prepared by Professor Dan Iancu (daniancu@stanford.edu) as a basis for class discussion. It is not intended to serve as an endorsement, source of primary data, or illustration of effective or ineffective management.

Retail Clients. Prosche has received pre-orders for the coming quarter from four major retail clients, code-named OO, FL, SH, and WW. Each client has specific requests for customization and is located in a very different region, which means that Prosche will incur very different costs when customizing and transporting the cars to their final destinations. The costs are recorded in **Table 4**, for every customization center and every retailer. The pre-orders placed by the clients and the per-unit prices paid to Prosche vary substantially and are recorded in Table 5.

	OO	**FL**	**SH**	**WW**
C1	€ 4,000	€ 6,000	€ 3,000	€ 5,000
C2	€ 6,000	€ 6,000	€ 2,000	€ 4,500
C3	€ 4,500	€ 7,000	€ 6,000	€ 3,000

Table 4. Customization and transportation cost (per unit) from centers to clients.

	OO	**FL**	**SH**	**WW**
Pre-orders (units)	5,000	2,500	1,600	550
Price (per unit)	€ 71,000	€ 74,000	€ 69,000	€ 71,000

Table 5. Pre-orders and per-unit prices for the next quarter for four major retail clients.

Rationing Supply. Prosche has been facing severe shortages in the supply of key components, so for the past few quarters it was never able to meet all the pre-orders it received. **Customers only pay for the orders that are filled**, but to avoid angering the clients, the outgoing COO had used **a specific policy to handle rationing: each client would receive enough orders to ensure their fill rate (i.e., the ratio of shipments received to pre-orders placed) exceeds some required threshold**, which management would usually set based on discussions. Historically, the required threshold was 50%, but you are reconsidering that value…

Data Science Team. Your data science team implemented an AI model that recommends how many units to produce at each manufacturing facility and how to customize and ship these to clients. The team was unsure how to handle rationing, so they are leaving some choices up to you!