**Embedding Scenario Analysis into S&OP - Managing Demand Uncertainty through Capacity Optimization Using Linear Programming and Monte Carlo Simulation**

Every company that sells a product wants to produce the right product at the right time in the right quantity. Producing too much can cause unnecessary waste and inventory costs. On the other hand, producing too little can leave customers unhappy, if they are not able to buy the products they want. Nevertheless, balancing supply and demand is difficult in the global and volatile business environment of today.

In a world that is characterized by economic and geopolitical instability, fast technological development, and global supply chains, it is necessary to be able to make decisions despite uncertainties. Therefore, companies need to be able to swiftly adjust to demand changes, both such that have already happened, and those that might happen in the future.

One company that faces these difficulties is Ericsson. To enhance their ability to manage demand uncertainty, Ericsson uses scenario planning to study how various demand levels affect the company's ability to produce. For example, it can be of great importance to understand the consequences of questions such as "What if a customer places their order for 2028 instead?", or, "What if the demand goes up by 20%?". To further enhance the scenario planning process already in place, this thesis develops a standardized and data-driven scenario analysis framework with the objective of creating a basis for rational decision-making under uncertainty.

In this context, this thesis establishes methods for determining how to manage possible demand changes using scenario analysis. To maintain a reasonable scope, the thesis is limited to study capacity allocation at a single production facility under demand uncertainty. To do this, the classic Operations Research tools linear programming and Monte Carlo simulation are used.

Two proof-of-concept models are developed: a linear programming model for cost-optimal capacity planning under a known demand change, and a Monte Carlo simulation that stress-tests production configurations across a range of uncertain demand outcomes. The models quantify delays and investment requirements by providing cost breakdowns, utilization heatmaps, and service level distributions across demand scenarios.

To conclude, the findings in this thesis demonstrate that linear programming and Monte Carlo simulation together can operationalize scenario planning by standardizing and quantifying decision alternatives in capacity constraining situations.