Bullwhip Effect in Semiconducto

Supply Chains

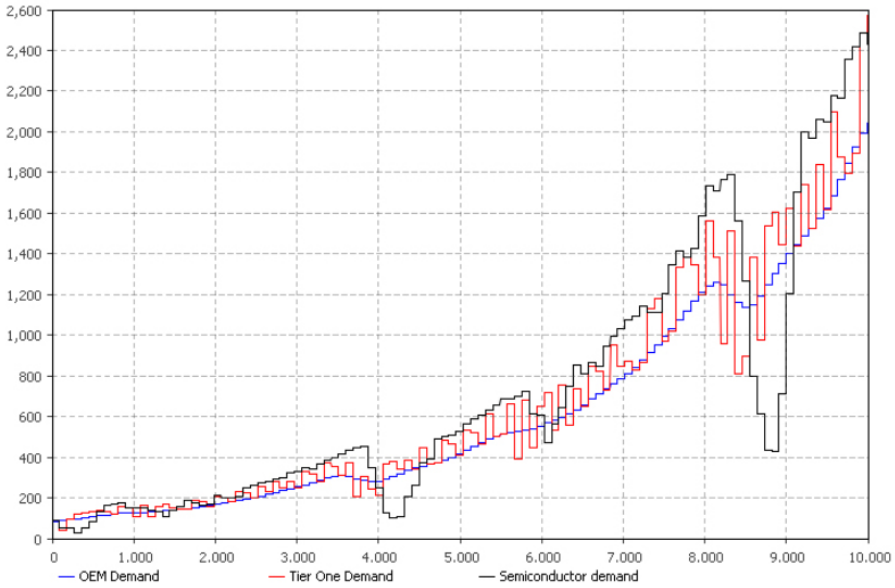
The supply chain management at Infineon, a large semiconductor manufacturer, wanted to investigate the bullwhip effect in their market in order to decrease expenses and better forecast market behavior. They used AnyLogic software to build a model of a supply chain – from raw materials to the market.

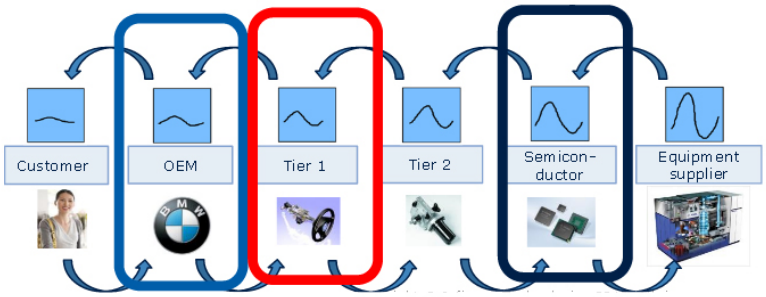
Problem

wanted to explore the following:

- What the bullwhip effect looks like in their supply chain and to what extremes it exists.
- What connection there is between market demand fluctuation and the fluctuation in demand they received from direct customers.

Resulting demand fluctuations:





Solution

The modelers created agents for each of the major players in the supply chain and gave them behaviors based on the well known "Beer Distribution Game"

parts:

- Planning and control – a branch where capacity decisions were taken and where forecasts and orders were made.
- Base system – a branch where material flowed and orders were executed.

The agents, Infineon, and the market were then all linked together using Discrete Event simulation method to combine a hybrid model with a highly realistic structure.

All agents outside the semiconductor manufacturer (Infineon) were modeled identically:

1. Agents produced generic output (information flow was delayed in the supply chain)
2. Agents had two states, anxious and careless, determined by inventory reach:
    - Agents over-ordered when anxious (+ 20 % of demand)
    - Agents under-ordered when careless (-50 % of demand)

Outcome

The modelers reproduced the typical behaviors of the agents in a supply chain with the bullwhip effect.

The model:

- Helped to analyze particular situations emerging in the market, the consequences of a bullwhip effect, and the amplification of demand along the supply

bullwhip effect.

AnyLogic software was utilized by the Supply Chain Innovations team at Infineon. The specialists were not familiar with simulation software or programming before this project. All the necessary knowledge was obtained from the available AnyLogic tutorials. They chose AnyLogic because it allowed them to combine Agent Based and Discrete Event modeling approaches. The Infineon team thought this was the main advantage of the software, along with its ease of use.

Watch Hans Ehm from Infineon presenting this project at the AnyLogic Conference 2012 or download his presentation:

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