MIT SCALE RESEARCH REPORT

The MIT Global Supply Chain and Logistics Excellence (SCALE) Network is an international alliance of leading-edge research and education centers, dedicated to the development and dissemination of global innovation in supply chain and logistics.

The Global SCALE Network allows faculty, researchers, students, and affiliated companies from all six centers around the world to pool their expertise and collaborate on projects that will create supply chain and logistics innovations with global applications.

This reprint is intended to communicate research results of innovative supply chain research completed by faculty, researchers, and students of the Global SCALE Network, thereby contributing to the greater public knowledge about supply chains.

For more information, contact
MIT Global SCALE Network

Postal Address:
Massachusetts Institute of Technology 77
Massachusetts Avenue, Cambridge, MA 02139 (USA)

Location:
Building E40, Room 267
1 Amherst St.

Access:
Tel: +1 617-253-5320
Fax: +1 617-253-4560

Email: *scale@mit.edu*
Website: *scale.mit.edu*

Research Report: ZLC-2005-13
Strategic Supply Chain Network Design for a New Product Line at Sun Microsystems, Inc
Anna Y. Tatashina

For Full Thesis Version Please Contact:
Marta Romero
ZLOG Director
Zaragoza Logistics Center (ZLC) Edificio
Náyade 5, C/Bari 55 – PLAZA 50197
Zaragoza, SPAIN
Email: mromero@zlc.edu.es
Telephone: +34 976 077 605

Anna Y. Tatashina,
MIT-Zaragoza International Logistics Program 2005,
Executive Summary

Strategic Supply Chain Network Design
for a New Product Line
at Sun Microsystems, Inc

As life cycles of products in the computer industry get shorter, it is essential for manufacturers to possess knowledge on the trade-offs between the time it takes to deliver a product and the total cost of that production. In this project we developed a model which supports a strategic supply chain network design for Sun Microsystems, Inc (Sun). Utilizing this model, we analyzed the trade-offs between the lead time and the total cost in regards to the different supply chain designs.

Sun is about to introduce a new product line to the market. This product line requires the supply chain management at Sun to gain more knowledge in regards to the association between the lead time and the total cost because this new line has a shorter product life cycle than the products Sun has worked with before.

To evaluate the relationship between the lead time and the total cost we use a multi-period mixed integer linear program, which optimizes supply chain design in terms of overall cost. The unique part of this model is a specific lead time constraint. We allow the user to specify a time frame within which every single product in the supply chain must be delivered to the customer. After this lead time is defined, the model finds an optimal supply chain design that meets this constraint.

Sun's supply chain options to deliver the new product are the following:

Option 1: build the basic configuration and perform testing/rework at the plant, and deliver the product to the xDock (cross-dock is used as a supply chain node where the demand is fulfilled from).

Option 2: build the basic configuration at the plant, perform testing/rework at the GCC (Geographical Configuration Center located closer to the customer market); deliver the product to the xDock.

Option 3: combine options 1 and 2. This implies that the basic configuration is built at the plant; testing/rework is split between the GCC and the plant, and then products are delivered to the xDock from both the GCC and the plant.

The initial result given by the model suggests building the basic configuration, performing testing/rework and keeping the safety stock (SS) at the plant. In this configuration, the products will be delivered within a lead time of 17.9 days. We

conducted multiple experiments to determine the impact on the total cost by reducing the lead time; the results are illustrated in the graph below:

Impact of change in user entered lead time on total cost
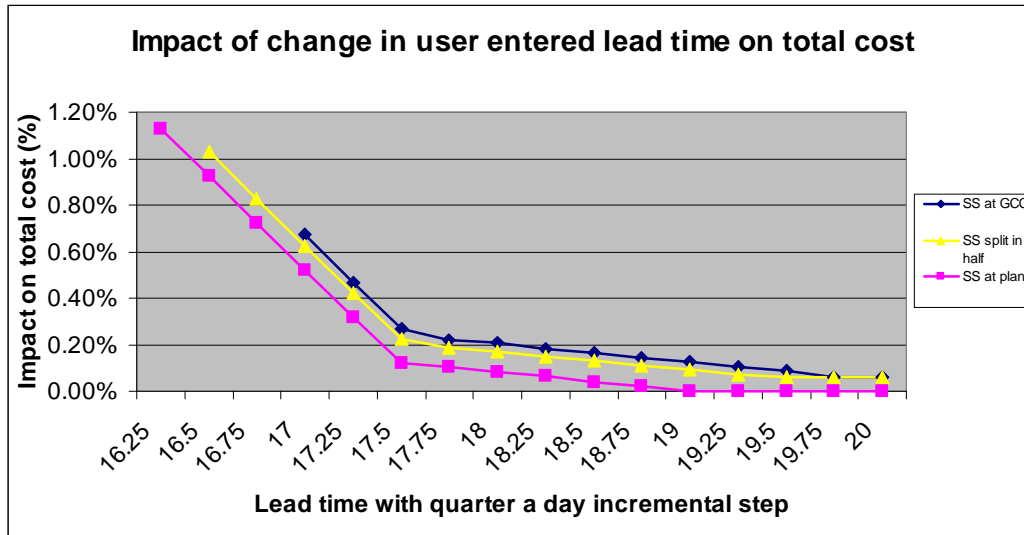
Reducing the lead time by 6 hours when the lead time is greater than 17.5 days will result in an increase of per unit cost of $7.00; reducing the lead time by 6 hours when the lead time is less than 17.5 days will cost a company an additional $20.00 per product.

At the point when lead time equals 17.5 days, a lead time reduction of 6 hours will increase total cost by 0.2%, while increasing lead time by 6 hours will reduce total cost by only 0.02%. The optimal solution associated with a lead time of 17.5 days should be chosen if this lead time is sufficient to meet market requirements.

The longest time and the least expensive supply chain design option suggests keeping the safety stock at the plant and performing testing/rework there as well, while the shortest LT and the most expensive supply chain design option suggests performing testing/rework at the GCC but keeping the safety stock at the plant. Shifting from the first option to the second one will increase the total cost by 3% and reduce an average lead time by 3 days.

From this project Sun received a model which allows their supply chain management to evaluate the network design options in relation to the total cost and lead time trade-offs for the new product line.

To a supply chain society this project gives a new view on how to approach supply chain design. We are not just considering the cost of the system to produce a product, but also investigating the influence of the lead time on the total cost.