Supply Chain Management

Part 3

Drivers of Supply Chain Performance

Efficient VS Responsive Supply Chain

- An efficient supply chain strives to do more with less. (Large-scale facilities, longer production lead times, and larger batch sizes that allow the efficient firm to produce at a low unit cost).
- A responsive supply chain is more flexible and operates with the ability to change and adapt to changes in the surrounding environment. (Small-scale facilities, short production leadtimes, and small batch sizes that allow the responsive firm to adapt quickly to market demand).

Efficient VS Responsive Supply Chain

	Efficient	Responsive
Primary goal	Lowest cost	Quick response
Product design strategy	Min product cost	Modularity to allow postponement
Pricing strategy	Lower margins	Higher margins
Mfg strategy	High utilization	Capacity flexibility
Inventory strategy	Minimize inventory	Buffer inventory
Lead time strategy	Reduce but not at expense of greater cost	Aggressively reduce even if costs are significant
Supplier selection strategy	Cost and low quality	Speed, flexibility, quality
Transportation strategy	Greater reliance on low cost modes	Greater reliance on responsive (fast) modes

Drivers of Supply Chain Performance

- A company's supply chain should achieve the balance between responsiveness and efficiency that best supports the company's competitive strategy.
- A supply chain's performance in terms of responsiveness and efficiency is based on the interaction between the following logistical and cross-functional drivers of supply chain performance: facilities, inventory, transportation, information, sourcing, and pricing.

Facilities

- Facilities are the actual physical locations in the supply chain network where product is stored, assembled, or fabricated.
- Flexibility, location and capacity are the main components of facilities decisions.
- Remember Toyota strategy.

Facility-related metrics

- ***Capacity*** measures the maximum amount a facility can process.
- ***Utilization*** measures the fraction of capacity that is currently being used in the facility.
- ***Processing/setup/down/idle time*** measures the fraction of time that the facility was processing units, being set up to process units, unavailable because it was down, or idle.
- ***Production cost per unit*** measures the average cost to produce a unit of output.
- ***Quality losses*** measure the fraction of production lost as a result of defects.

Facility-related metrics

- ***Flow time*** the time needed to produce one unit of product.
- ***Product variety*** is the number of different products which are available for the customers.
- ***Stock Keeping Unit (SKU)*** is a kind of product having its own barcode.
- ***Average production batch size*** measures the average amount produced in each production batch.
- ***Production service level*** measures the fraction of production orders completed on time and in full.
- Questions. (A) What is the connection of total set-up time and average production batch size? (B) What is the connection of average production batch size and stock level?

Inventory

- Reasons for the existence of inventory (stock) are (i) anticipation of future demand, (ii) economic of scale.
- Higher stock improves responsiveness.
- Stock is a major source of cost.
- Trade-off is needed. The result of the trade-off depends on the segment of the market.
- Inventory also has a significant impact on the material flow time (the time between entering and leaving.)

Inventory-related metrics

- ***Cycle Inventory:*** is the average amount of inventory used to satisfy demand between receipts of supplier shipments.

Important decision: cost of holding larger lots of inventory (when cycle inventory is high) versus the cost of ordering more frequently.

- ***Safety Inventory:*** inventory held in case demand exceeds expectation.

Important decision: how much safety inventory to hold.

- ***Seasonal Inventory:*** is built up to counter predictable seasonal variability in demand.

Important decision: whether to build seasonal inventory and, if they do build it, in deciding how much to build.

Inventory-related metrics

- ***Level of Product Availability:*** is the fraction of demand that is served on time from product held in inventory.
- ***Average Inventory:*** measures the average amount of inventory carried. It can be expressed in day and/or in financial value.
- ***Products with more than a specified number of days of inventory:*** identifies the products for which the firm is carrying a high level of inventory.
- ***Average replenishment batch size:*** is the average size order in natural units.

Transportation

- Transportation is another main source of costs (≈21%).
- Faster transportation is more expensive but allows a supply chain to be more responsive. As a result, the supply chain may carry lower inventories and have fewer facilities.
- Air, truck, rail, sea, and pipeline are modes of transport for products.

Transportation

- Air(expensive, low quantity, good for sensitive items),
- Truck(for sensitive items better than train, limited capacity, sensitive to the weather),
- Rail (large quantity, good packing is necessary),
- Ship(10 times cheaper than rail, large quantity),
- and Pipe (special products: liquid, gas, and powder).
- Rule of thumb is that the transportation of large quantity is relatively cheap and the transportation of small quantity, e.g. boxes, is relatively expensive.

Transportation-related metrics

- ***Average inbound transportation cost*** : measures the cost of bringing product into a facility.
- ***Average incoming shipment size:*** measures the average number of units or dollars in each incoming shipment at a facility.
- ***Average outbound transportation cost:*** measures the cost of sending product out of a facility to the customer.
- ***Average outbound shipment size*** measures the average number of units or dollars on each outbound shipment at a facility.

Information

- Connects the members of the supply chain.
- Sharing more information is not always better.
- Push/Pull systems: The direction of the flow of information is the opposite.
- Push systems start with forecasts for creating schedules for suppliers with part types, quantities, and delivery dates.

Information

- Pull systems require information on actual demand to be transmitted extremely quickly throughout the entire chain so production and distribution of products can reflect the real demand accurately.
- Supply chain coordination occurs when all stages share information.

Information-related metrics

- ***Forecast horizon:*** identifies how far in advance of the actual event a forecast is made.
- ***Frequency of update:*** identifies how frequently each forecast is updated.
- ***Forecast error:*** measures the difference between the forecast and actual demand.

We will talk more about different methods of forecasting.

Sourcing

- Sourcing is "What and from whom shall the supply chain buy?".
- Main decisions in sourcing:

1- In-sourcing or out-sourcing (make or buy)

Insourcing means that the product or service is produced within the supply chain.

Outsourcing means that the product or service is bought.

In-sourcing or out-sourcing

- ***Insourcing***

▪ Something is too important like dying the textile at Benetton ("united colors")

▪ It is cheaper inside (Cleaning the rooms)

- ***Outsourcing***

▪ Something is cheaper outside, like last mile delivery by private mail (DHL, etc.) versus own service (economies of scale).

▪ No technology exists in the supply chain

Single supplier or multiple suppliers

2- Single supplier versus multiple suppliers:

Reasons for single supplier:

Establish a good relationship, steady quality, lower cost (quantity discount). But increase dependency and risk of interruption.

Reasons for Multi suppliers :

More capacity, low risk of interruption, competition. But purchasing cost and different quality.

Supply Selection

3- Supply Selection:

Managers must identify the criteria along which suppliers will be evaluated and how they will be selected.

Example. Zara has a sourcing strategy that varies by product type. For basic products are sourced from suppliers in low cost countries. For trendy products, Zara sources from company-owned factories in Europe.

Sourcing-related metrics

- ***Days payable outstanding:*** measures the number of days between when a supplier performed a supply chain task and when it was paid for (It is more than 36 days at Dell).
- ***Average purchase price:*** measures the average price at which a good or service was purchased during the year.
- ***Range of purchase price:*** measures the fluctuation in purchase price during a specified period [min, max].
- ***Supply quality:*** measures the quality of product supplied.

Pricing

- Pricing is the determination of the prices of products and services.
- Pricing affects the customer segments that choose to buy the product
- It affects demand and supply.
- Includes short term discounts (elimination of surplus).

Discounts

- 1. Incremental discount: If the purchased quantity is q and it exceeds a limit quantity L, i.e. q > L, then the part above L has a lower unit price.
- Example. Potato is 5 TL/kg up to 10 kg and 4 TL above 10 kg, then the price of 16 kg is 10*5 + 6*4 = 74 TL.
- 2. All-unit discount: If the purchased quantity is q and it exceeds a limit quantity L, i.e. q > L, then the unit price drops for the whole quantity.
- Example. Potato is 5 TL/kg up to 10 kg and 4 TL if the purchased quantity is greater than 10 kg, then the price of 16 kg is 16*4 = 64 TL.
- 3- Other discounts: "Buy three, get four".

Pricing-related metrics

- ***Profit margin*** measures profit as a percentage of revenue
- ***Days sales outstanding*** measures the average time between when a sale is made and when the cash is collected .
- ***Incremental fixed cost per order*** any fixed cost which added to the price.
- ***Range of sale price*** measures the maximum and the minimum of sale price per unit over a specified time horizon.