Managing variability in supply and demand

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Responding to Predictable Variability in a Supply Chain

- Predictable variability is change in demand that can be forecasted
- Can cause increased costs and decreased responsiveness in the supply chain
- Two broad approaches
  1. Manage supply using capacity, inventory, subcontracting and backlogs
  2. Manage demand using short-term price discounts and trade promotions

Managing Supply

- Managing capacity
  - Time flexibility for workforce
  - Use of seasonal workforce
  - Use of subcontracting
  - Use of dual facilities – specialized and flexible
  - Designing product flexibility into production processes
- Managing inventory
  - Using common components across multiple products
  - Build inventory of high demand or predictable demand products

Inventory/Capacity Trade-off

- Leveling capacity forces inventory to build up in anticipation of seasonal variation in demand
- Carrying low levels of inventory requires capacity to vary with seasonal variation in demand or enough capacity to cover peak demand during season

The Timing of a Promotion

- Impact of the promotion on demand
- Cost of holding inventory
- Cost of changing the level of capacity
- Product margins
- Increase in demand from
  - Market growth
  - Gaining share
  - Forward buying

When to Promote

- Is it more effective to promote during the peak period or off-peak?
- Analyze the impact of a promotion on demand and the resulting optimal aggregate plan

Conclusions on Promotion

1. Average inventory increases if a promotion is run during the peak period and decreases if the promotion is run during the off-peak period
2. Promoting during a peak-demand month may decrease overall profitability if there is a small increase in consumption and a significant fraction of the demand increase results from a forward buy

Conclusions on Promotion

3. As consumption increase from discounting grows and forward buying becomes a smaller fraction of the demand increase from a promotion, it is more profitable to promote during the peak period
4. As the product margin declines, promoting during the peak-demand period becomes less profitable

Demand volatility

The bullwhip effect is used to describe the amplification of demand variance that occurs along a supply chain from manufacturer to retailer as a result of coordination failures and nonstationary demand.

Strategies to manage volatile demand efficiently include:

- Supply Buffer Management — Inventory Buffers — Capacity Buffers
- Cycle Time Reduction Strategies
- Postponement Strategies
- Collaborative Processes

Managing risk in global supply chain networks: postponement

Postponement is defined as a strategy that intentionally delays the execution of a task, instead of starting it with incomplete or unreliable information input.

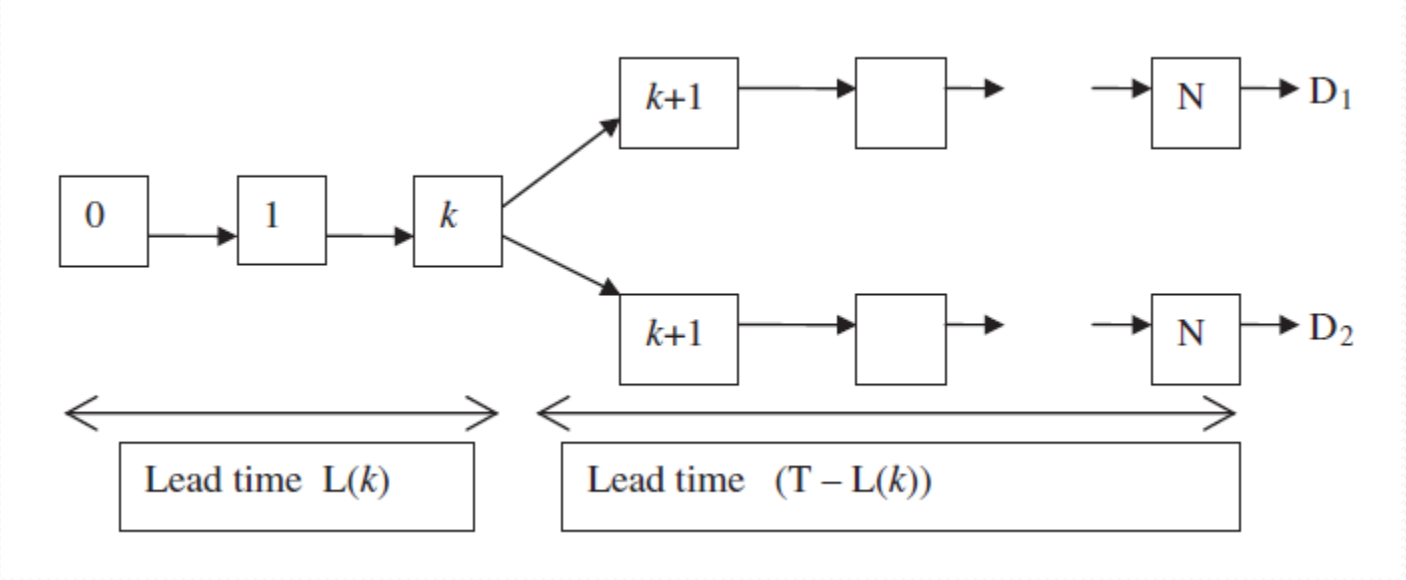
The aim of postponement is to increase the efficiency of the supply chain by moving product differentiation (at the decoupling point) closer to the end user.

Postponing the decoupling point reduces the risk of being out of stock for long periods at the retailer and of holding too much stock of products that are not required.

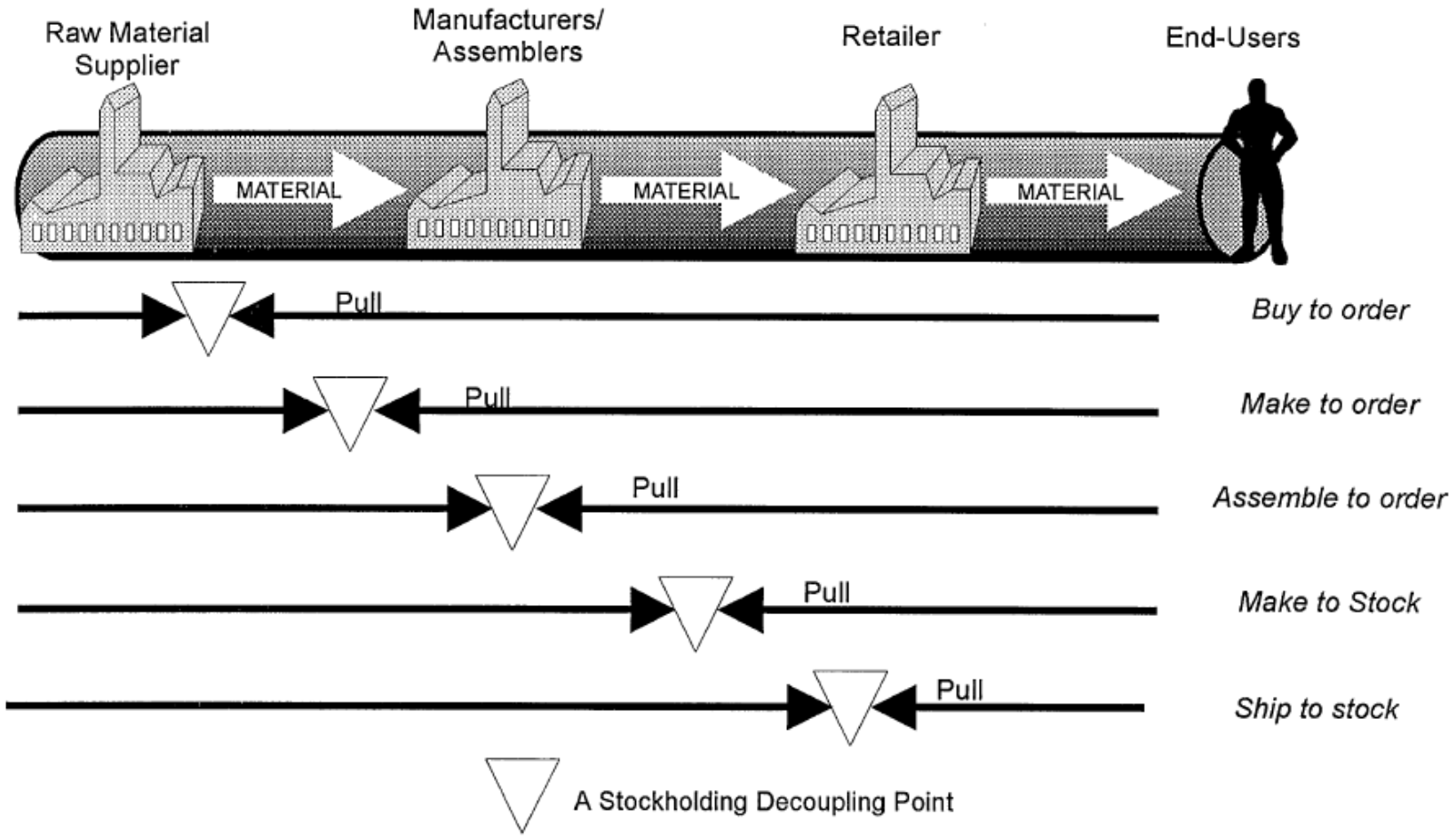
The well-known Benetton example demonstrates the use of postponement in the fashion trade. Benetton delayed the dyeing of their jumpers, which is the point at which the jumpers are differentiated, until the end of the process. Postponement is also essential where products have, or are likely to have, a short life cycle as in the Benetton example or for PC manufacturers.

Managing risk in global supply chain networks: postponement

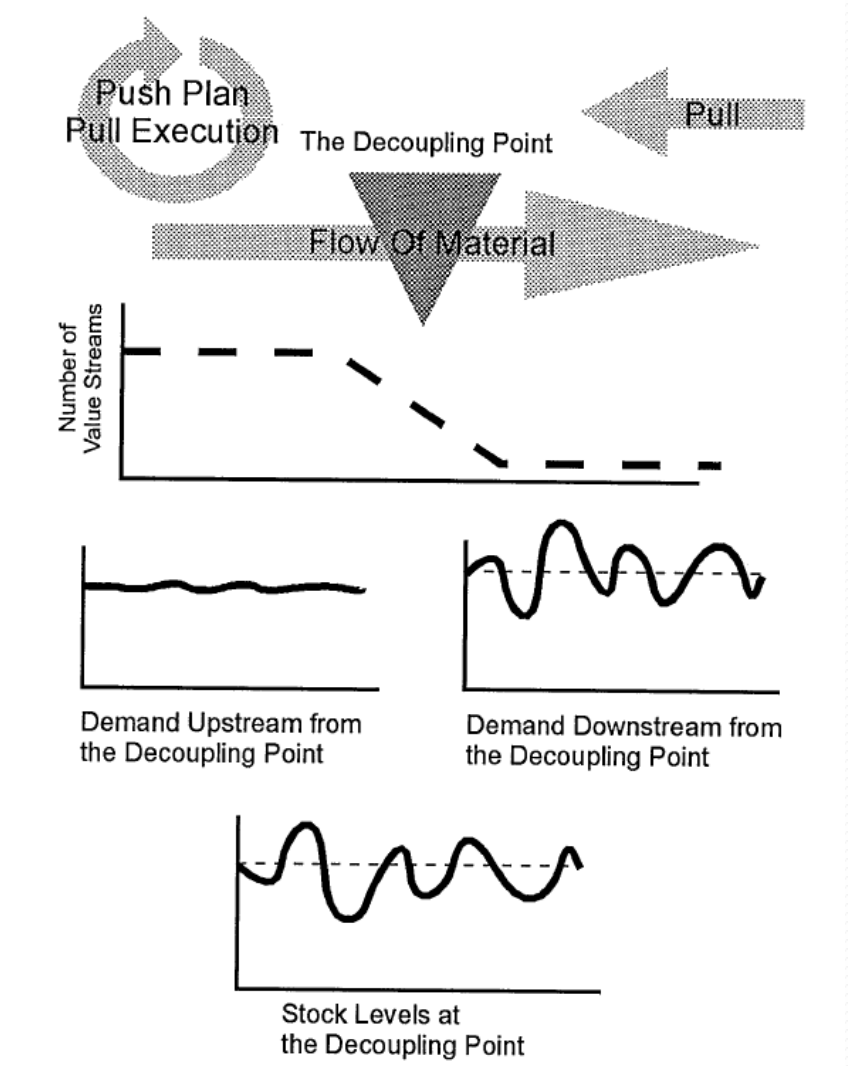
The decoupling point separates the part of the organization [supply chain] oriented towards customer orders from the part of the organization [supply chain] based on planning.



Managing risk in global supply chain networks: postponement



Managing risk in global supply chain networks: postponement



Role of Forecasting in a Supply Chain

- The basis for all strategic and planning decisions in a supply chain
- Used for both push and pull processes
- Examples:
  - Production: scheduling, inventory, aggregate planning
  - Marketing: sales force allocation, promotions, new production introduction
  - Finance: plant/equipment investment, budgetary planning
  - Personnel: workforce planning, hiring, layoffs
- All of these decisions are interrelated

Characteristics of Forecasts

- Forecasts are always inaccurate. They should include expected values and measures of error
- Long-term forecasts are less accurate than short-term forecasts (forecast horizon is important)
- Aggregate forecasts are more accurate than disaggregate forecasts.

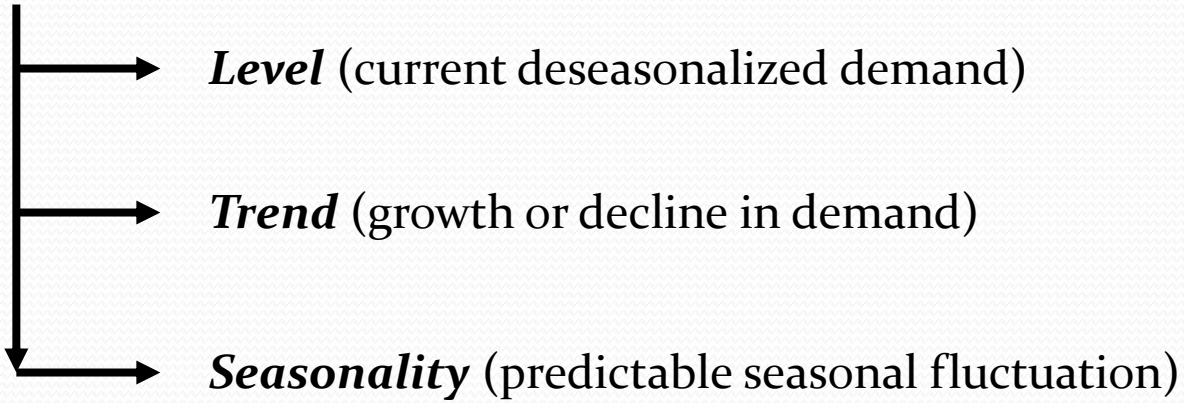
Forecasting Methods

- Qualitative: primarily subjective; rely on judgment and opinion
- Time Series: use historical demand only
  - Static
  - Adaptive
- Causal: use the relationship between demand and some other factor to develop forecast
- Simulation
  - Imitate consumer choices that give rise to demand
  - Can combine time series and causal methods

Components of an Observation

Observed demand (O) =

Systematic component (S) + Random component (R)



- Systematic component: Expected value of demand
- Random component: The part of the forecast that deviates from the systematic component
- Forecast error: difference between forecast and actual demand