Unit 9: Planning Demand and Supply In Supply Chain

LH 3

Outline

- Characteristic and role of forecasting
- Role of IT in forecasting
- Role of aggregate planning with problems in supply chain
- Role of IT in aggregate Planning
- Inventory Planning with known and uncertain demand

Characteristic and Role of Forecasting

- Forecasts are always inaccurate and should thus include both the expected value of the forecast and a measure of forecast error (1, 2, 3 %)

- Long term forecasts are usually less accurate that short term forecast
  - Due to complicated data, e.g weather forecasting (tomorrow and after six months), selling forecast
  - Development of capacity planning

- Aggregate forecasts are usually more accurate than disaggregate forecasts

- The farther up a supply chain, of a company, greater is the distortion of information it receives. (Bullwhip effect)

Components

- Past demand, lead time of product planned
  - High lead time needs forecast; enterprise must acquire raw material before demand if lead time of supplier is long
- Advertising or marketing efforts
- State of the economy
- Planned price discounts actions that competitors have taken

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 (close coordination)

Used for all activities of value chain

Role of IT in Forecasting

- **Demand planning module** (commercial demand planning modules)
  - demand planning module (software) that is specifically designed to provide the user with the ability to predict required inventory based on historical demand or sales forecasts. This innovative tool offers the right balance of powerful functionality and ease-of-use to help you manage your inventory more efficiently.
  - Excel was used before the demand planning module but dpm has / accuracy in dpm
- Also used for products and categories
  - *Aggregated forecasting of products*
- Updated in real time by incorporating any new information
  - *New data automatically changes the forecast*
- Customer sales information
  - *POS data and forecasting updating*
- Facilitate shaping of demand these tools help analyze the impact of promotions on demand and can be used to determine the extent and timing of promotions

Aggregate Planning

- Aggregate planning is the process of developing, analyzing, and maintaining a preliminary, approximate schedule of the overall operations of an organization.

- The aggregate plan generally contains targeted sales forecasts, production levels, inventory levels, and customer backlogs. This schedule is intended to satisfy the demand forecast at a minimum cost.

- *The goal of aggregate planning is to build a plan that satisfies demand while maximizing profit*

- *This considers the nature of demand (e.g. seasonal, promotion, discounts) and make the aggregate plan*

Role of Aggregate Planning in Supply Chain

- Aggregate planning:
  - Process by which a company determines levels of capacity, production, subcontracting, inventory, stockouts, and pricing over a specified time horizon
  - Goal is to maximize profit
  - Decisions made at a product family (not SKU) level
  - Time frame of 3 to 18 months
- How can a firm best use the facilities it has?

Role of Aggregate Planning in Supply Chain

- Object is to Specify operational parameters over the time horizon:
  - **Production rate**: no. of units per completed unit of time
  - **Workforce: workers needed for prodn**
  - **Overtime**
  - **Machine capacity level**
  - Subcontracting
  - Backlog
  - Inventory on hand
- All supply chain stages should work together on an aggregate plan that will optimize supply chain performance
- The output from aggregate planning is also of value to the upstream and downstream partners
  - *Production plan for a firm define demand for suppliers and establish supply constraints for customers*

THE AGGREGATE PLANNING PROBLEM

- Given the demand forecast for each period in the planning horizon, determine the production level, inventory level, and the capacity level for each period that maximizes the firm's (supply chain's) profit over the planning horizon
- Specify the planning horizon (typically 3-18 months)
- Specify the duration of each period within the planning horizon (e.g weeks, months, quarter)
- Specify key information required to develop an aggregate plan

Information Needed for an Aggregate Plan

- Aggregate demand forecast Ft for each Period t over T periods
- Production costs
  - Labor costs, regular time ($/hr) and overtime ($/hr)
  - Subcontracting costs ($/hr or $/unit)
  - Cost of changing capacity
    - *hiring or layoff ($/worker), adding or reducing machine capacity ($/machine)*
- *Labor/machine hours required per unit*
- *Inventory holding cost ($/unit/period)*
- *Stockout or backlog cost ($/unit/period)*
- ***Constraints** – limit on: overtime, layoffs, capital available, stockouts, backlogs, from suppliers to the enterprise*

OUTPUTS OF AGGREGATE PLAN

Finally determines the following

- **Production quantity from regular time, overtime, and subcontracted time:** *used to determine number of workers and supplier purchase levels*
- **Inventory held:** *used to determine warehouse space and working capital required*
- **Backlog/stockout quantity:** *to determine service level*
- **Workforce hired/laid off:** *determine the labor issued to be encountered*
- **Machine capacity increase/decrease:** *used to determine if new production equipment should be purchased or available equipment idled*

A poor aggregate plan can result in lost sales, lost profits, excess inventory, or excess capacity

Role of IT in Aggregate Planning

1. The ability to handle large problems

2. The ability to handle complex problems
    i. (through either nonlinear optimization or linear approximations)/

3. The ability to interact with other core IT systems such as inventory management and sourcing

Thank You