

Operations Management Study Guide

Inventory Management

Amazon.com example

Wanted to be a “virtual retailer” (no inventory, no warehouse, no overhead)

Now, they are one of the largest retailers

Obtain knowledge through inventory management

Functions of inventory

1. to decouple the production process
2. to decouple the firm fluctuations in demand and provide a stock of goods that will provide a selection for customers
3. to take advantage of quantity discounts because purchases in larger quantities may reduce the costs of goods to their delivery
4. to hedge against inflation and upward price changes

Types of Inventory

-raw materials-inventory that is purchased but not processed

-work in process-inventory that has undergone some changes

-maintenance/repair/operating inventory-process to keep machinery and process productive

-finished goods-inventory that has been completed and is awaiting shipment

ABC Analysis (know what and when it applies)

-when inventory is classified into 3 different categories (A-high annual dollar value, B the middle, and C the lowest annual dollar value)

-total inventory A (15%); B (30%); C (55%)

-total annual dollar value-A (70-80%); B (15%-25%); C (5%)

-criteria other than annual dollar value that can influence ABC analysis-

engineering changes, delivery problems, quantity problems, high unit costs

-policies that may be based on ABC Analysis:

1. Purchasing resource expanded on supplier development should be much tighter for individual A items
2. Should be more physical inventory control on A items (more secure area)
3. Forecasting A items should warrant more care than forecasting other items

Cycle counting (def)

-part of ABC analysis, periodic counting of inventory so that inventory records are maintained

-a continuing audit to verify records

-you inspect different classes at different times (A-once a month-every 20 days;

B-once a quarter-once every 60 days; C-once every six months-every 120 days)

-advantages: eliminates annual physical inventories, eliminates annual inventory adjustments, trainer personnel audit the accuracy of inventory, allows the cause of the errors to be identified and remedial action to be taken

Independent versus Dependent Demand

Independent demand-the demand for an item is independent of the demand for any other item in inventory

Dependent demand-the demand for an item is dependent upon the demand for some other item in the inventory

Basic Economic Order Quantity (not equation, know what goes into the equation and if you change a number-ex: if you doubt a part of the equation how will it affect it?)

-an inventory control technique that minimizes the total for holding and ordering costs

-one of the most commonly used models and oldest

-has several assumptions (6)

1. demand is known, constant, and independent
2. lead time is constant
3. receipt of an order is instantaneous and complete
4. quantity discounts are not possible
5. the only variable costs are holding costs and setup costs
6. stockouts (shortages) are completely avoided

-because demand is constant over a period of time, inventory drops at a uniform rate and when it reaches zero every time, the new order is placed and the inventory level jumps again (this process continues indefinitely)

-graph has a saw tooth shape

-significant costs are holding costs and setup costs

-overall goal is to find the optimal order quantity and minimize total cost

-as order quantity increases, setup costs decrease and holding costs increase

-optimal order quantity=where holding cost and setup cost intersect

-robust model (gives satisfactory answers even with substantial variation in its parameters)

Quantity Discount Models

Process: -For each discount, calculate optimal order quantity Q^*

-if Q^* for a discount doesn't qualify, chose the smallest possible order size to get the discount

-compute the total cost for Q^* or adjusted value from step 2

-chose the Q^* that gives the lowest total cost

-when you get a discount for ordering a higher amount of goods

Safety Stock-the amount of goods that you have in reserve in case of a stockout

Fixed Period Systems-(P) when you count inventory at the review period, usually at the end of the period

-done with routine systems @ convenient times

-may require safety stock

Aggregate Planning

Aggregate planning (def and the time horizons)

-an approach to determine the quantity and the timing of production for the immediate future (3 to 18 months)

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Aggregate Planning Strategies and what technique applies to it

Capacity Options (know difference between level and changing strategy)

Slides 14-19

1. varying inventory size
Advantages-change in HR are gradual or none, no abrupt production plan
Disadvantages-holding costs are increased, may result in shortages
Comments: used mainly in production, not services
2. varying workforce by size
Advantages-avoids costs of other alternatives
Disadvantages-hiring, layoff, and training costs are significant
Comment-used where labor pools are high
3. varying workforce by overtime and idle time
Advantages-matches seasonality fluctuations without hiring/training
Disadvantages-tired workers, overtime premiums, may not get quality you want
Comments-allows flexibility in aggregation plan
4. sub-contracting
Advantages-permits flexibility and smoothing of the firms output
Disadvantages-loss of quality control, reduces profits, loss of future business
Comments-applies mainly to production
5. part-time workers
Advantages-less costly and more flexible than full time workers
Disadvantages-high turnover/training, quality suffers, scheduling is difficult
Comments: used in large labor pools for unskilled tasks
6. influencing demand
Advantages-tries to use excess capacity; discounts draw new customers
Disadvantages-uncertainty in demand, hard to match demand, exactly to supply capacity
Comments-creates marketing concerns, overbooking in some stores
7. backordering during high demand periods
Advantages-may avoid overtime, keeps capacity constant
Disadvantages-although customer may be willing to wait, goodwill is lost
Comments-allows flexibility in aggregate plan
8. counter-seasonal products and service products
Advantages-fully utilizes resources, allows stable workforce|
Disadvantages-may require skills that is outside of the company's expertise
Comments: risky finding product with opposite demand patterns

Disaggregation (what and where we use it)

-breaks the plan into greater detail

-happens in the master plan schedule

Objective for aggregate planning

-objective: minimize cost over the planning period by adjusting production rates, labor levels, inventory levels, overtime work, subcontracting, other controllable variables

Tools necessary for aggregate planning-

- a logical overall unit of measurement for sales and outputs
- a forecast of demand for intermediate planning period in these aggregate units
- a method to determine cost
- a model that combines the forecasts and costs so that scheduling decisions can be made for the planning period

Time horizon (the slide on planning process)

Short term (up to 3 months)-OM, foremen, supervisors

-job scheduling, job assignments, ordering, overtime, dispatching, part time help

Intermediate term (3 to 18 months)-OM

-sales planning, production/planning/budgeting, setting employment/inventory/subcontracting, analyzing/operating plans

Long Term (over a year)-top management

-R&D, new product plans, capital investments, facility location/expansion

Demand Options

-influencing demand

-backordering during high demand periods

-counter-seasonal products and service mixing

Aggregate planning options (adv/disadvantages good overview slides)-already covered

Know Graphical and Charting Methods

-easy to understand and use

-popular techniques

-trial and error approaches that do not guarantee an optimal solution

-require only limited computations

Mathematical Approaches

-transportation method of linear programming-produces an OPTIMAL plan

-management coefficient model-based on management experience and performance, related to CORRELATION AND LINEAR REGRESSION

Yield Management-allowing resources to customers at prices that will maximize your yield/return

-where product or service can be sold before consumption

-demand fluctuates

- demand can be segmented
- capacity is relatively fixed
- variable costs are low and fixed costs are high

Material Requirements Planning (MRP) and ERP

-watch abbreviations in this chapter could get you in trouble

Know dependent and independent demand

- Dependent demand-the demand for one item is related to the demand for another item
- in general, used whenever a schedule can be established for an item
- give a quantity for the end item, the demand for all parts and components can be calculated

Benefits of MRP

- better response to customer orders
- faster response to market changes
- improved utilization of facilities
- reduced inventory levels

Master production schedule (MPS)-a plan of what is to be made and when it is to be made

- aggregate plan sets overall limit in broad terms, this must be within aggregate plan
- each step must be tested for feasibility
- established in terms of specific products
- must be followed for a reasonable amount of time(fixed, frozen for part of it)
- rolling schedule
- a statement of what is to be produced (NOT A FORECAST OF DEMAND)

Bills of Material

- list of components, ingredients, and materials needed to make a product
- items above a given level are parents, items below that level are children

Bills of Material example-know! (There is a question on the test about applying it)

Know difference between Modular Bill, Planning Bill, Phantom Bill and what each does

Modular bill-where modules are not the final product but components that can be assembled into multiple end items, can significantly simplify planning and scheduling

Planning bill-created to assign an artificial parent to the BOM, used to group subassemblies into the number of items planned and scheduled, kits

Phantom Bills-describe subassemblies that exist only temporarily, are never inventoried

Low level coding-items are coded at the lowest level at which it occurs, processed one level at a time

Accurate Records slide-possible question on 99%

- MRP require a 99% accuracy rate (at least)

Lead Times-know how to do a time based product structure

-the time required to purchase, produce, or assemble an item

-for purchased items-the time between the recognition of a need and the availability of the item for production

-for production-the sum of the order, wait, move, setup, store, and run times

Time-Phased Product Structure-chart

Gross Requirements Plan-a combination of the MRP and the time-phased product structure

MRP Management

-a dynamic system

-facilities re-planning when changes occur

-System nervousness-happens when they find errors and do nothing about them, fix it with time fences (limits on re-planning) and pegging (linking a item to a parent allowing effective analysis of change)

Finite Capacity Scheduling

-recognize actual capacity limits

-created with feasible capacity which facilitates rapid material movement

-Reality check-can we actually do this with our inventory

Know time buckets-unit of time to measure inventory

1. time buckets are reduced from weekly to daily to hourly
2. planned receipts are used internally to sequence production
3. inventory is moved throughout JIT production
4. completed products are moved to finished goods
5. back flush-used to deduct inventory that was used in production

Supermarket-area where items for many products are stored

-withdrawn as needed

-inventory is maintained using JIT

-common items are not planned by MRP system

Lot-sizing techniques

- lot for lot-order just what is required for production based on net requirements, may not always be feasible, if setup costs are high, costs will be high too
- basic economic order quantity-used when demand is know, but usually with MRP demand is unknown and variable
- part period balancing-ppb, looks at future orders to determine most economic size lot
- wagner-whitin algorithm-a complex dynamic programming technique, involves computationally burdensome equation, assumes a finite horizon

Lot-sizing summary (look over)

-use a lot-sizing with care as it can cause considerable distortion of requirements at lower levels of the BOM

-when setup costs are significant and demand is reasonably smooth you should use EOQ, PPB, or Wagner-Whitin model to get reasonable results

Know ERP is an extension of MRP

Know Distribution Resource Planning (DRP) and how it's different from MRP

-using dependent demand techniques through the supply chain to replenish the system

-Gross material requirements (same as expected demand, sales forecasts)

-minimum levels of inventory to meet customer service levels

-accurate lead times

-goal: small and frequent replenishment within the bounds of economic ordering and shipping

Enterprise Resource Planning (ERP)-used to tie in customers and suppliers with a common system

-allows automation and integration of business processes, shares a common database and produces information in real time

-coordinates business from supplier evaluation to customer invoicing

Advantages of ERP Systems (IMPORTANT)

What do you need to do to achieve ERP? (All have to be working with same data)

-provides integration of the supply chain production, and integration

-creates commonality of databases

-increases communication and collaboration between business units and sites

-has an off the shelf software database

-may provide a strategic advantage

Disadvantages of ERP Systems

-very expensive and more to customize

-implementation may require major changes in the company

-so complex that some companies cannot adjust

-involves ongoing, possibly never ending process for implementation

-expertise is limited with ongoing staffing problems

Common characteristics of ERP

Just-in-Time and Lean Production Systems

Just-in-time (know it's a philosophy)-of continuous and forced problem solving that supports lean production, it's a pull system

Waste Reduction-anything that does not add value from the customer point of view (storage, inspection, delay, wait in queues, and defective products do not add value and are a 100% waste)

Pull vs. Push systems

- pull system-uses signals to request production and delivery from upstream stations
 - By pulling materials in small lots, inventory cushions are removed, exposing problems and emphasizing continual movement
 - Manufacturing time is reduced
- push systems-dump orders on the downstream stations regardless of the need

JIT and competitive advantage (good overview slide)

Suppliers-JIT partnerships exist when a supplier and a purchaser work together to eliminate waste and drive down costs

- 4 goals: eliminate unnecessary activities, in-house inventory, in-transit inventory, poor suppliers

JIT partnerships (slides 19-23)

Distance Reduction-large lots and production lines with single purpose machinery are being replaced by small flexible cells

- often U-shaped for shorter paths and improved communication
- use group technology concepts

Impact on employees

- Cross trained? Make them do more
- improve communication to pass on info
- getting it right the first time is critical

Reduce Variability slide-trying to navigate through the water

- with a high inventory, manage it so you can get through it
- if you hide your problems, you will have a bumpy road ahead

Reduce setup costs

- high setup costs reflect large lot sizes
- can be reduced through preparation prior to shutdown and changeover

Kanban-signals used in a pull system

- the user removes from a standard container and the production department replenishes
- when producer and user are not visible, use a card
- when they are visible, they used light, flag
- When more than one component, multiple cards are to be used-one between the producer and the storage and another between the user and storage
- thought of as a build authorization
- type of pull system

The 5 S's (that become the 7 S's)

1. sort
2. shine

3. standardize
4. simplify
5. self discipline
6. support
7. safety

Seven wastes

1. overproduction
2. over processing
3. motion
4. inventory
5. queues
6. transportation
7. defective product