

Aggregate Production Planning

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Overview of Planning Levels

- Long-range plans
 - Product and service design
 - Location / layout
 - Long term capacity
- Intermediate plans (General levels)
 - Employment
 - Output and inventories
 - Subcontracting and backorders
- Short-range plans (Detailed plans)
 - Machine loading
 - Job assignments
 - Production lot size and order quantities

Aggregate Plan

Aggregate Plan: A statement of a company's **production rates, workforce levels, and inventory** holding based on estimates of customer requirements and capacity limitations

Service Industry

- **Staffing Plan**
- Regarding staffs and labor related factors

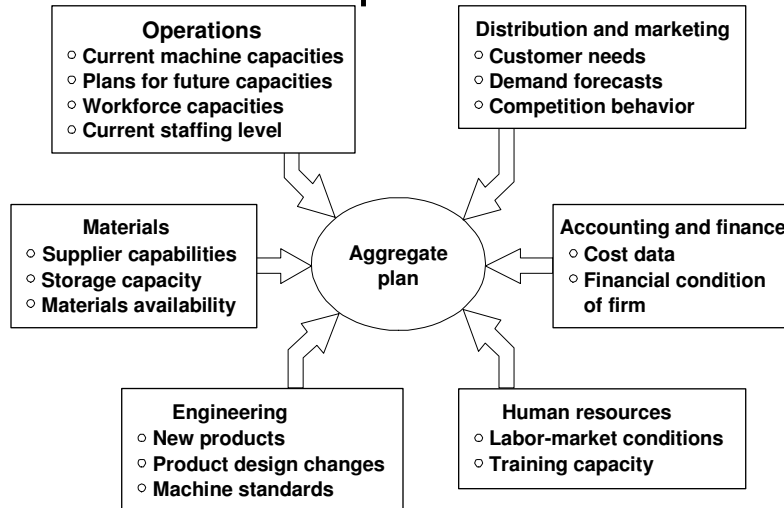
Manufacturing Industry

- **Production Plan**
- Regarding production rates and inventory

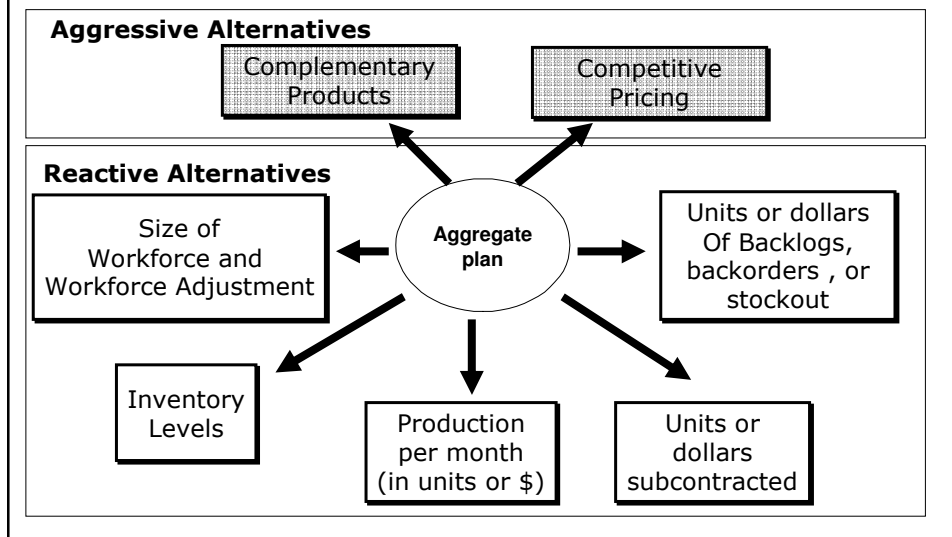
Aggregate Production Planning (APP)

- Determines resource capacity to meet demand
- For intermediate time horizon, 6-12 months
- Not feasible to build new facility
- May be feasible to hire/lay off workers, overtime, or subcontract
- Adjusting capacity OR managing demand

Aggregate Plan – Managerial Inputs



Aggregate Plan – Outputs

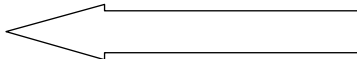
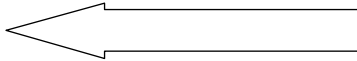
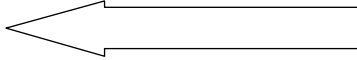
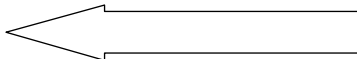


Aggregate Planning Strategies

- Proactive
 - Alter demand to match capacity
- Reactive
 - Alter capacity to match demand
- Mixed
 - Some of each



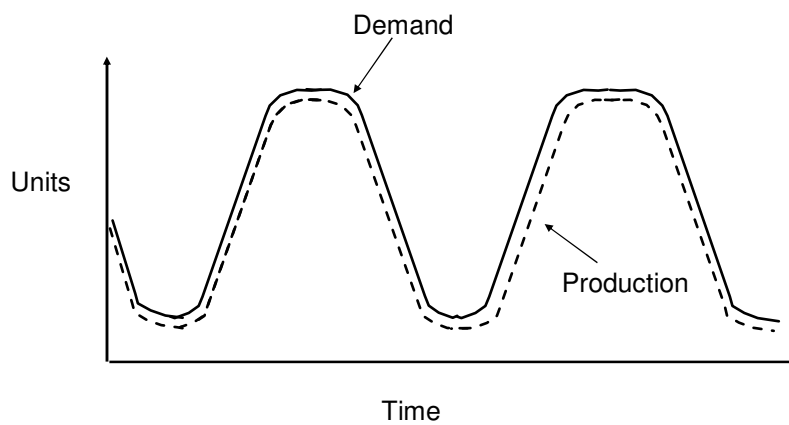
Demand Options

- Pricing 
- Promotion 
- Back orders 
- New demand 

Capacity Options

- Hire and layoff workers
- Overtime/slack time
- Part-time workers
- Inventories
- Subcontracting

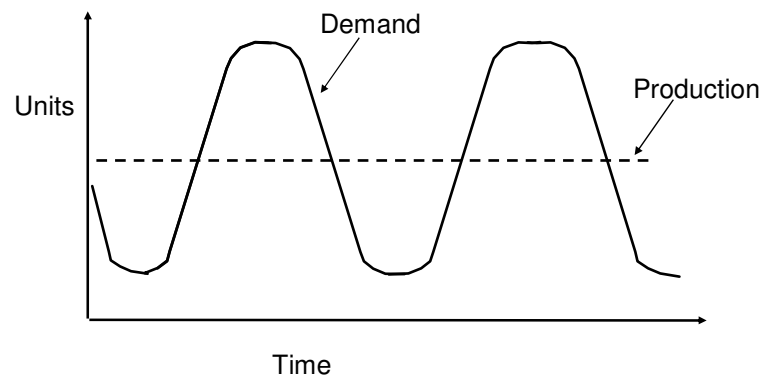
Chase Demand



Chase Approach

- Advantages
 - Investment in inventory is low
 - Labor utilization is high (overtime)
- Disadvantages
 - The cost of adjusting output rates and/or workforce levels

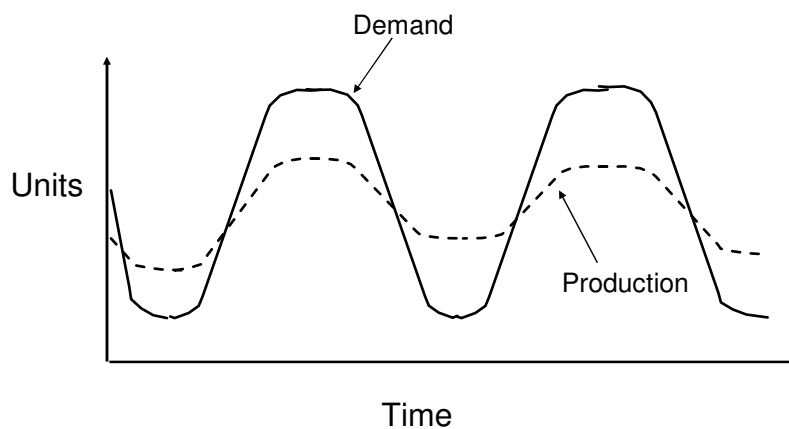
Level Production



Level Approach

- Advantages
 - Stable output rates and workforce
- Disadvantages
 - Greater inventory costs
 - Increased overtime and idle time
 - Resource utilizations vary over time

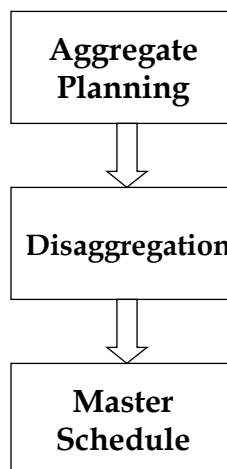
Mixed Strategy



Aggregate Planning Strategies

Strategy	Possible Alternatives during Slack Season	Possible Alternatives during Peak Season
1. Chase #1: vary <i>workforce level</i> to match demand	Layoffs	Hiring
2. Chase #2: vary <i>output rate</i> to match demand	Layoffs, undertime, vacations	Hiring, overtime, subcontracting
3. Level #1: constant <i>workforce level</i>	No layoffs, building anticipation inventory, undertime, vacations	No hiring, depleting anticipation inventory, overtime, subcontracting, backorders, stockouts
4. Level #2: constant <i>output rate</i>	Layoffs, building anticipation inventory, undertime, vacations	Hiring, depleting anticipation inventory, overtime, subcontracting, backorders, stockouts

Aggregate Plan to Master Schedule



Disaggregating the Aggregate Plan

Aggregate plan	Month Planned output*	Jan.	Feb.	Mar.
		200	300	400

**Aggregate units*

Master schedule	Month Planned output*	Jan.	Feb.	Mar.
	Push	100	100	100
	Self-propelled	75	150	200
	Riding	25	50	100
	Total	200	300	400

**Actual units*

Disaggregating the Aggregate Plan

- **Master schedule:** The result of disaggregating an aggregate plan; shows quantity and timing of specific end items for a scheduled horizon.
- **Rough-cut capacity planning:** Approximate balancing of capacity and demand to test the feasibility of a master schedule.

Lessons

- Aggregate production planning is a powerful tool for resources management
- Suitable aggregate production planning strategy for an organization depends on various organizational and environmental factors

Management of Suppliers

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Supply Management: Objectives

- Support the operational requirements
- Effectively and efficiently manage the suppliers and related process.
- Understand the methodology for selection/evaluation of suppliers
- Develop strategies that improves supply chain efficiency and effectiveness

Process of Buying

- *Obtaining the right material*
- *In Right quantities*
- *With right delivery (time and place)*
- *From the right source*
- *and at the right price*

Sourcing Decisions: The Make-or-Buy Decision

- ***Outsourcing*** -buying materials and components from suppliers instead of making them in-house. The trend has moved toward outsourcing.

The Make or Buy decision is a strategic decision.

Sourcing Decisions: The Make-or-Buy Decision- Cont.

Reasons for Buying or Outsourcing

- 1. Cost advantage**
- 2. Insufficient capacity**
- 3. Lack of expertise**
- 4. Quality**

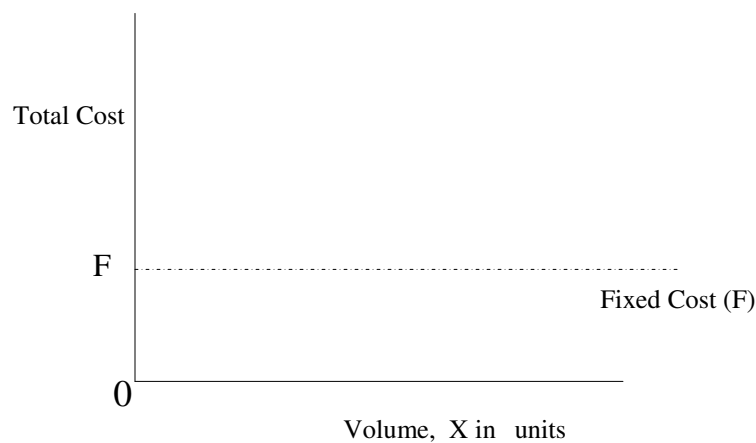
Sourcing Decisions: The Make-or-Buy Decision- Cont.

Reasons for Making

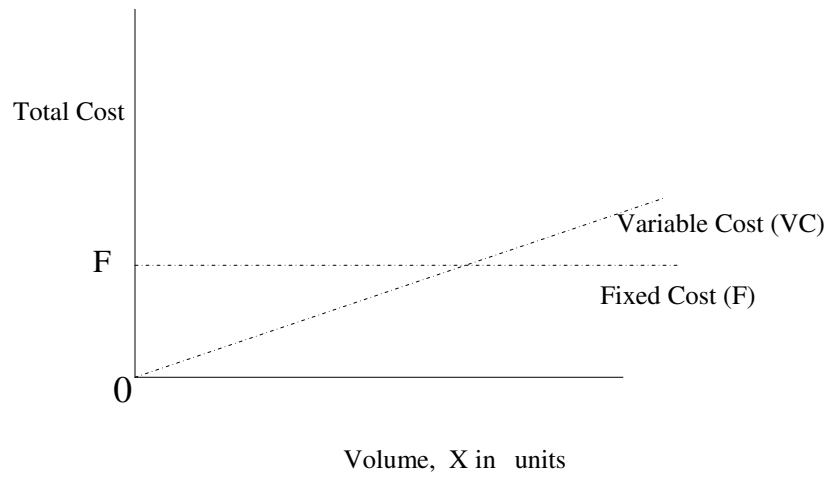
- **Protect proprietary technology**
- **No competent supplier**
- **Better quality control**
- **Use existing idle capacity**
- **Control of logistics-** lead-time transportation, and warehousing cost
- **Lower cost**



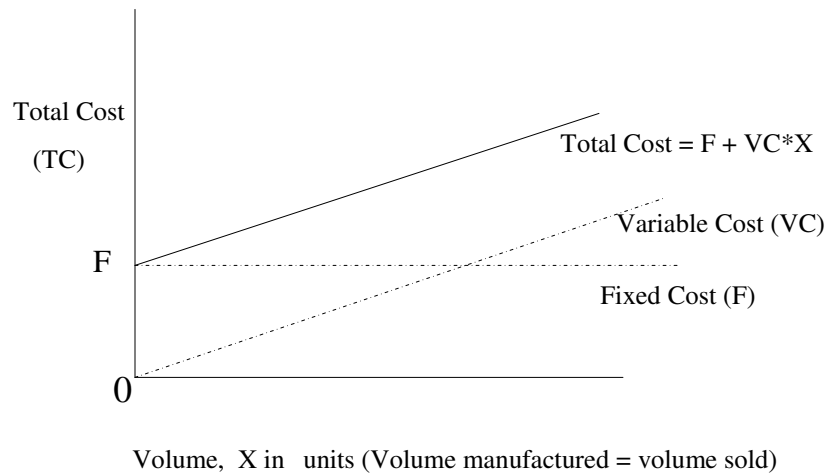
Economic Evaluation criteria: Make or Buy Break Even Chart..1



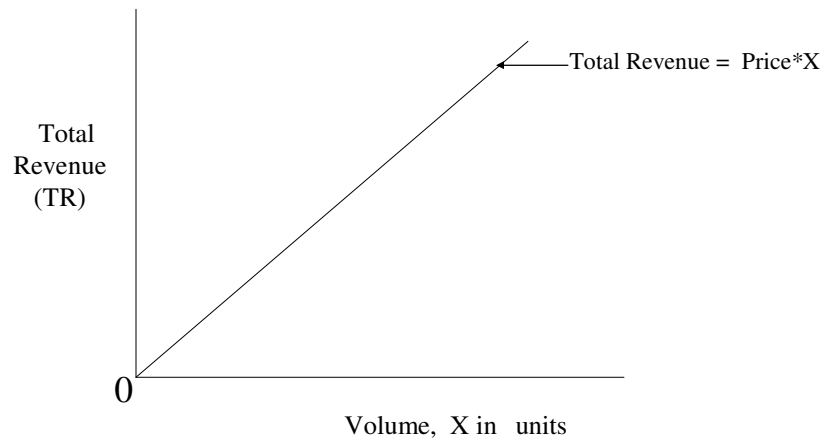
Break Even Chart..2



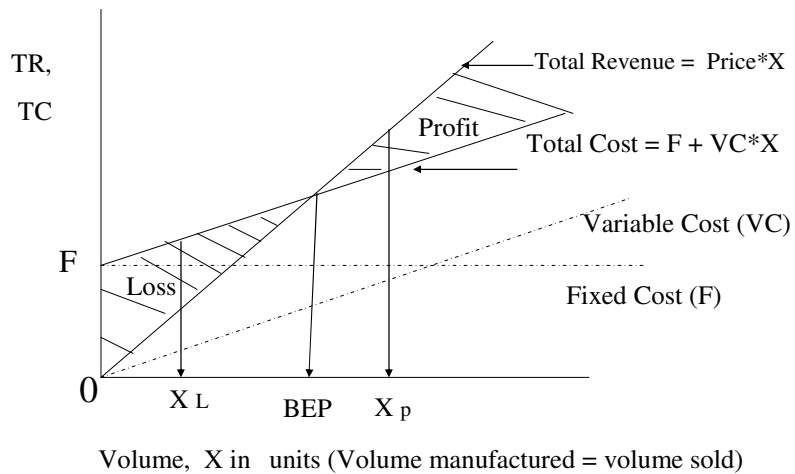
Break Even Chart..3



Break Even Chart..4



Break Even Chart..5



Break Even point calculations

- At Break even point

Total revenue = Total cost

Thus,

$$\text{Price} \times X = F + \text{VC} \times X$$

$$\text{Break Even Volume (X)} = \frac{\text{Fixed cost (F)}}{(\text{Price} - \text{Variable cost})}$$

Type of Sourcing

- a) Sole Sourcing** : Only one supplier is available
- b) Single Sourcing**: Planned decision to select one supplier for an item where several suppliers are available
- c) Multiple sourcing**: More than one supplier for an item.

How Many Suppliers to Use

Single-sourcing- a risky proposition. Although trends favor fewer sources, avoid single source.

Reasons Favoring a Single Supplier

- To establish a good relationship
- Less quality variability
- Lower cost
- Transportation economies
- Proprietary product or process
- Volume too small to

Reasons Favoring More than One Supplier

- Need capacity
- Spread risk of supply interruption
- Create competition
- Information
- Dealing with special kinds of business

Supplier Selection and evaluation

The process of selecting suppliers, is complex and should be based on multiple criteria:

- Technical ability
- Manufacturing capability
- Quality
- Cost
- Reliability
- Order System and cycle time
- Capacity
- Price
- Location
- Service

OTHER PRACTICAL CONSIDERATIONS

Supplier Evaluation Cont.

Table 3.3		Supplier Scorecard Used for the XYZ Company			
Performance Measure	Rating	×	Weight	=	Final Value
Technology	80		0.10		8.00
Quality	90		0.25		22.50
Responsiveness	95		0.15		14.25
Delivery	90		0.15		13.50
Cost	80		0.15		12.00
Environmental	90		0.05		4.50
Business	90		0.15		13.50
	Total score		1.00		88.25

Note: Based on the total score of 88.25, the XYZ Company is considered a certified supplier.

Some Recent Trends

Local or Global suppliers???

Reasons to Globalize Operations

Tangible



- Reduce costs (labor, taxes, tariffs, etc.)
- Improve the supply chain
- Provide better goods and services
- Attract new markets
- Learn to improve operations
- Attract and retain global talent

Intangible

Global Process Design & Technology

- Information technology enables management of integrated, globally dispersed operation
- Texas Instruments: 50 plants in 19 countries
- Hewlett-Packard - product development teams in U.S., Japan, Great Britain, and Germany
- Reduces time-to-market

Examples of Global Strategies

- Boeing – both sales and production are worldwide.

- Sony – purchases components from suppliers in Thailand, Malaysia, and around the world.

- GM is building four similar plants in Argentina, Poland, China, and Thailand



Boeing 777 Suppliers

Firm	Country	Parts
Alenia	Italy	Wing flaps
AeroSpace Technologies	Australia	Rudder
CASA	Spain	Ailerons
Fuji	Japan	Landing gear doors, wing section
GEC Avionics	United Kingdom	Flight computers
Korean Air	Korea	Flap supports
Menasco Aerospace	Canada	Landing gears
Short Brothers	Ireland	Landing gear doors
Singapore Aerospace	Singapore	Landing gear doors

Management of Suppliers and Distributors

- Plans to help achieve company mission
- Affect long-term competitive position
- Strategic options
 - Few suppliers
 - Keiretsu network
 - Local/Global Suppliers



Keiretsu network : Supplier as Partner Case Volkswagen

- Brazilian plant employs 1000 workers
 - 200 work for VW
 - 800 work for other contractors:
 - Rockwell International, Cummins Engines, Deluge Automotiva, MWM, Remon and VDO, etc.
- VW responsible for overall quality, marketing, research and design

Learning's : Eicher Motors Pithampur

Suppliers to work on shop floor to deliver product

Strategic Alliance and Supplier Certification Programs

Supplier certification programs

-one way to identify strategic alliance candidates.

-Firms often develop their own formal certification programs, & most require **ISO 9000** or similar certifications as one part of the certification process.



Early Supplier Involvement

Early supplier involvement (ESI) is perhaps one of the most effective supply chain integrative techniques.

Under ESI, key suppliers become more involved in the internal operations of the firm, particularly with respect to new product and process design and **design for manufacturability** techniques.

Value engineering activities help the firm to reduce cost, improve quality, and reduce new product development time.

e-Procurement Systems

E-procurement systems enable the concentration of a large volume of small purchases with a few suppliers in ***electronic catalogues***, which are made available to the organization's users.

Reverse auctions- suppliers enter Web site. At a pre-designated time and date, qualified suppliers try to underbid their competitors and can monitor the bid prices until the session is over.

Typical benefits of the e-Procurement System

- Time savings
- Cost savings
- Accuracy
- Real time
- Mobility
- Trackability
- Management
- Benefits to the suppliers



Lessons:: Key for successful partnerships

- Building Trust
- Shared Vision and objectives
- Personal Relationships
- Mutual benefits
- Commitment and Top management Support
- Change Management
- Information Sharing
- Shared Measurements
- Continuous Improvements

Summary and Learning's

- Supplier plays an important role in improving the efficiency and effectiveness of supply chain
- Selection and evaluation is a strategic decision
- Effective and efficient partnership rests on the pillars of trust.

Thank you