UNIT- I

INTRODUCTION

Role of Logistics and Supply chain Management: Scope and importance-Evolution of Supply Chain-Decision Phases in Supply Chain-Competitive and Supply chain Strategies- Drivers of Supply Chain Performance and Obstacles.

PART A

1. What is a supply chain?

A supply chain a network of all parties involved, either directly (or) indirectly, in fulfilling a customer request. The supply chain includes manufacturers, suppliers, transporters, warehouse, retailers and customers.

2. What is Supply Chain Management?

Supply Chain Management can be defined as the management of flow of products and services, which begins from the origin of products and ends at the product's consumption. It also comprises movement and storage of raw materials that are involved in work in progress, inventory and fully furnished goods.

3. Define LSCM.

Logistics management is that part of the supply chain that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customer requirements.

4. What is the objective of supply chain?

- To maximize the overall value generated.
- To maximize the overall profit.
- To maximize the overall profit.

5. What is supply chain surplus?

Supply chain surplus is the value addition by supply chain function of an organization. It is calculated by the following formula:

Supply chain surplus = Customer value – Supply chain cost

6. Write any three importance of SCM.

- Improves customer satisfaction as well as service
- Reduces inventory costs
- Increase cash flow
- Provides better medium for information sharing between partners
- Improves bottom line(decreasing the use fixed assets in the supply chain)

7. What are factors to be measure supply chain management?

- Responsiveness
- Efficiency

8. List down the Supply chain drivers.

Logistic drivers

- Facilities
- Inventory
- Transportation

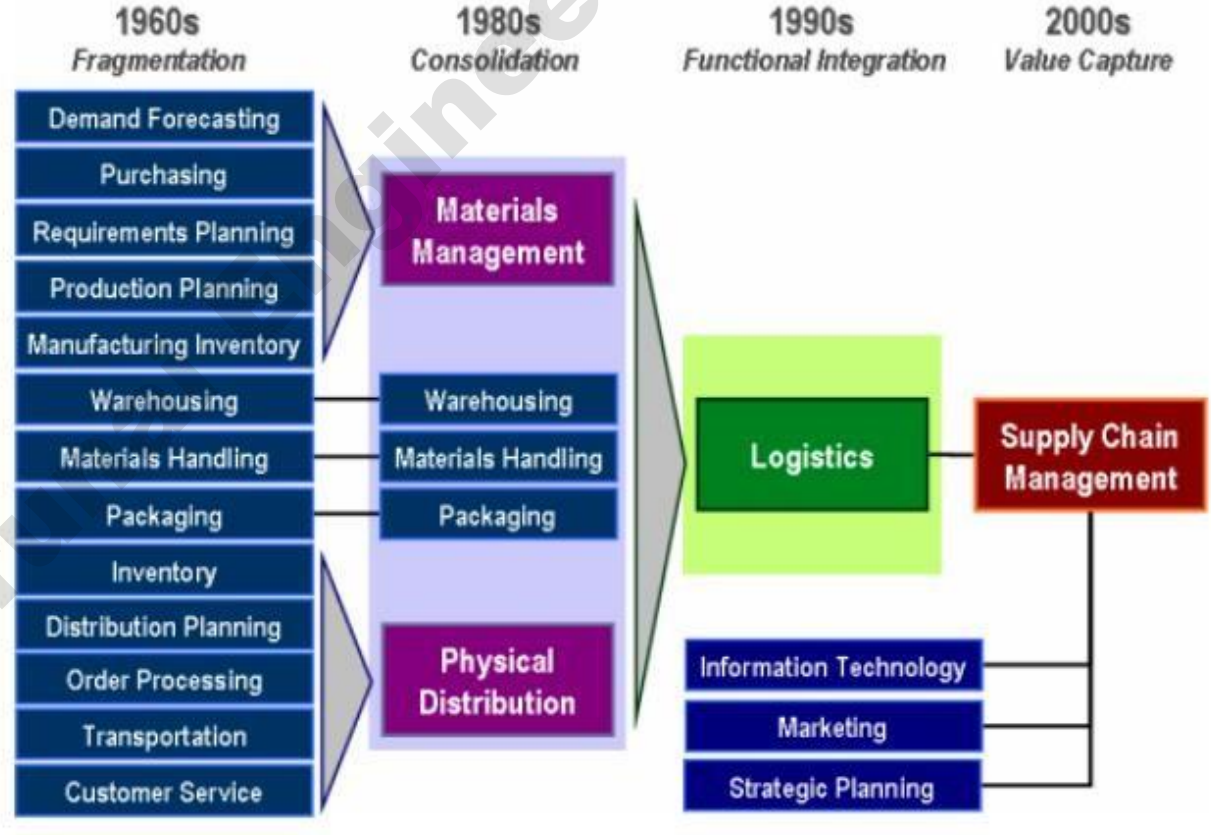
Cross functional drivers

- Information
- Sourcing
- Pricing

9. What is Value?

The value a supply chain generates is the difference between what the final product is worth to the customer and the costs the supply chain incurs in filling the customer request.

10. What are the evolution of Supply Chain Management?



Evolution of Supply Chain Management

11. Define Inventory Planning.

Inventory management supervises the flow of goods from manufacturer's warehouses and from these facilities to point of sale. A key function of inventory management is to keep a detailed record of each new or returned product as it enters or leaves a warehouse or point of sale.

12. Define Transportation.

Transportation means movement of products from the beginning of the supply chain to the customer. Transportation plays a significant role in any supply chain because products are rarely produced and consumed at the same location.

13. What is the role of Transport in Logistics?

1. Truck Transport
2. Package Carriers
3. Railways
4. Water Ways
5. Air Transport
6. Pipeline
7. Intermodal Transport

14. Define Packaging.

The roles of packaging are to protect the contents from the elements, allow for the ease of transportation, provide information, add convenience in stocking, marketing and communicating the value of the product.

15. What are the three Levels of Packaging?

- Primary Packaging
- Secondary Packaging
- Tertiary Packaging

16. What is the role of Packaging in Logistics?

- Protection for the product
- Convenience
- Image
- Sustainability

17. Define Warehousing.

Warehouse logistics ensures the storage and management of goods before shipping them to the delivery destination. They manage the time, volume, sequence and packaging for your goods, which are required for the onward transport operations.

18. What is the role of Warehousing in Logistics

- Inventory control
- Centralizing the products
- An emergency buffer
- Adding value

- Keeping goods safe

19. Define Information System.

Supply Chain and Information Systems (SC&IS) is a boundary-spanning field of supply chain networks, which organizations use to acquire, produce, and deliver goods and services all over the world.

20. What is the role of Information System in Logistics?

- Cost reduction
- Productivity
- Improvement and product/market strategies

21. What is the role of Order processing in logistics?

- It reduces hard costs
- It minimizes soft costs
- It improves visibility across the board
- It enhances the customer experience

22. Define Customer Service.

Customer service is everywhere along the supply chain, it affects the way it begins when products are sold to the customer and it is there when products are delivered.

23. What are the decision phases of supply chain?

- Supply chain strategy or design
  How to structure the supply chain over the next several years
- Supply chain planning
  Decisions over the next quarter or year
- Supply chain operation
  Daily or weekly operational decisions

22. **What is Supply Chain Strategy or Design?**

Strategic supply chain decisions Locations and capacities of facilities
Products to be made or stored at various locations Modes of transportation
Information systems.

24. What is Supply Chain Planning?

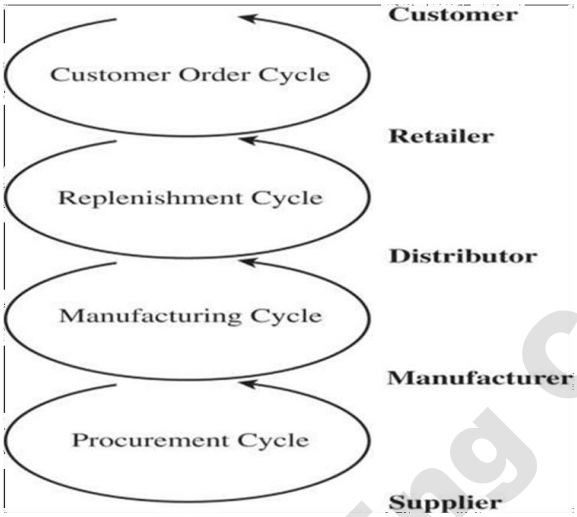
- Definition of a set of policies that govern short-term operations.
- Fixed by the supply configuration from previous phase.
- Starts with a forecast of demand in the coming year.

25. What is Supply Chain Operation?

- Time horizon is weekly or daily.
- Decisions regarding individual customer orders.
- Supply chain configuration is fixed and operating Policies are determine.

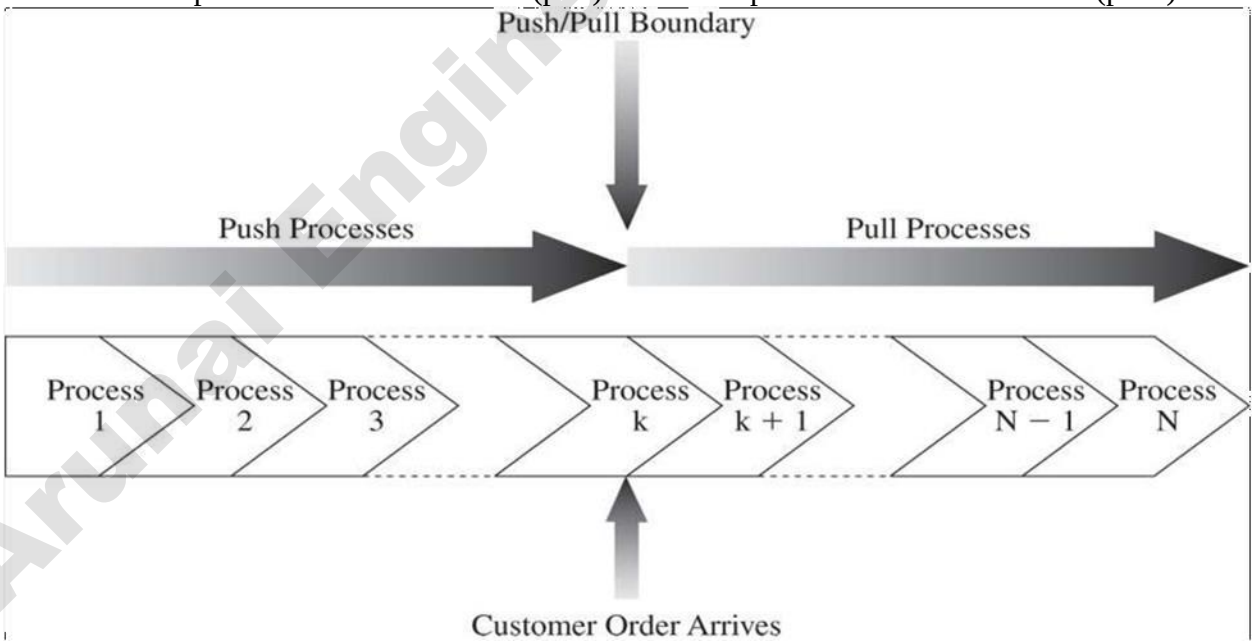
26. Define Cycle view.

Processes in a supply chain are divided into a series of cycles, each performed at the interfaces between two successive supply chain stages.



27. What is Push/Pull view?

Processes in a supply chain are divided into two categories depending on whether they are executed in response to a customer order (pull) or in anticipation of a customer order (push).



28. Define Pull.

Here execution is initiated in response to a customer order (reactive).

29. Define Push.

Here execution is initiated in anticipation of customer orders (speculative).

30. What is Supply Chain Macro Processes?

It classified into:

- Customer Relationship Management (CRM)
- Internal Supply Chain Management (ISCM)
- Supplier Relationship Management (SRM)

31. What is Competitive Strategies?

"A company's competitive strategy defines, relative to its competitors, the set of customer needs that it seeks to satisfy through its products and services".

32. What is Strategy?

Strategy refers to what each process or function will try to do particularly well

33. What are the Types Of Strategy?

1. Product development strategy
2. Marketing and sales strategy
3. Supply chain strategy

34. Define Product development strategy.

- A product development strategy specifies the portfolio of new products that a company will try to develop.
- It also dictates whether the development effort will be made internally or outsourced.

35. Define Marketing and Sales Strategy.

- A marketing and sales strategy specifies how the market will be segmented and how the product will be positioned, priced, and promoted

36. What is Supply chain strategy?

A supply chain strategy determines

- Nature of procurement of raw materials

- Transportation of materials to and from the company
- Manufacture of the product or operation to provide the service
- Distribution of the product to the customer, along with any follow-up service and a specification of whether these processes will be performed in-house or outsourced.
- Supply chain strategy specifies what the operations, distribution, and service functions, whether performed in-house or outsourced, should do particularly well.

37. How drivers help in Supply Chain Performance?

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

1. Facilities
2. Inventory
3. Transportation
4. Information
5. Sourcing
6. pricing

38. What is the Obstacles in Supply Chain Management?

Any factor that leads to either local optimization by different stages of the supply chain or an increase in information delay, distortion, and variability within the supply chain is an obstacle to coordination. If managers in a supply chain are able to identify the key obstacles, they can then take suitable actions to help achieve coordination.

39. What are the Major obstacles are divided into five categories?

• Incentive obstacles
• Information-processing obstacles
• Operational obstacles
• Pricing obstacles
• Behavioral obstacles

40. Define Strategic fit.

- Consistency between customer priorities of competitive strategy and supply chain capabilities specified by the supply chain strategy
- Competitive and supply chain strategies have the same goals
- A company may fail because of a lack of strategic fit or because its processes and resources do not provide the capabilities to execute the desired strategy
- Example of strategic fit – Dell

41. Define Demand uncertainty.

Uncertainty of customer demand for a product

42. Define Implied demand uncertainty.

resulting uncertainty for the supply chain given the portion of the demand the supply chain must handle and attributes the customer desires

43. Define Supply chain responsiveness.

- ability to
  – respond to wide ranges of quantities demanded
  – meet short lead times
  – handle a large variety of products
  – build highly innovative products
  – meet a very high service level
  – handle supply uncertainty

44. Define Supply chain efficiency.

Inverse of the cost of making and delivering the product to the customer

45. What are the advantages of Supply Chain Management?

Let's take a look at the major advantages of supply chain. The key benefits of supply chain management are as follows: Develops better customer relationship and service.

- Creates better delivery mechanisms for products and services in demand with
- Minimum delay. Improvises productivity and business functions
- Minimizes warehouse and transportation costs.
- Minimizes direct and indirect costs.
- Assists in achieving shipping of right products to the right place at the right time.
- Enhances inventory management, supporting the successful execution of just-intime stock models.
- Assists companies in adapting to the challenges of globalization, economic
- Upheaval, expanding consumer expectations, and related differences. Assists companies in minimizing waste, driving out costs, and achieving
- Efficiencies throughout the supply chain process.

46. What are the goals of Supply Chain Management?

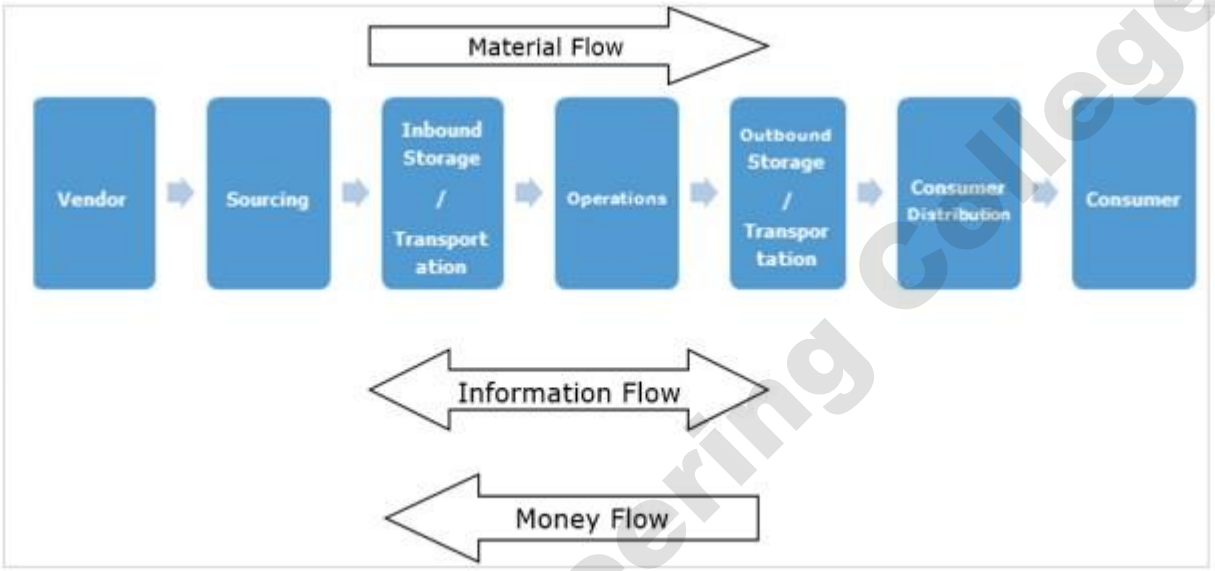
Supply chain partners work collaboratively at different levels to maximize resource productivity, construct standardized processes, remove duplicate efforts and minimize inventory levels. Minimization of supply chain expenses is very essential, especially when there are

- Economic uncertainties in companies regarding their wish to conserve capital. Cost efficient and cheap products are necessary, but supply chain managers need
- To concentrate on value creation for their customers. Supply Chain Management 3 Exceeding the customers' expectations on a regular basis is the best way to
- Satisfy them. Increased expectations of clients for higher product variety, customized goods,
- Off-season availability of inventory and rapid fulfillment at a cost comparable to in-store offerings should be matched. To meet consumer expectations, merchants need to leverage inventory as a
- Shared resource and utilize the distributed order management technology to complete orders from the optimal node in the supply chain.

47. What are the Types of flow in supply chain management?

There are three different types of flow in supply chain management:

- Material flow
- Information/Data flow
- Money flow



48. Define Material Flow.

Material flow includes a smooth flow of an item from the producer to the consumer. This is possible through various warehouses among distributors, dealers and retailers. The main challenge we face is in ensuring that the material flows as inventory quickly without any stoppage through different points in the chain. The quicker it moves, the better it is for the enterprise, as it minimizes the cash cycle.

49. Define Information Flow.

Information/data flow comprises the request for quotation, purchase order, monthly schedules, engineering change requests, quality complaints and reports on supplier performance from customer side to the supplier. From the producer's side to the consumer's side, the information flow consists of the presentation of the company, offer, confirmation of purchase order, reports on action taken on deviation, dispatch details, report on inventory, invoices, etc.

50. Define Money Flow.

On the basis of the invoice raised by the producer, the clients examine the order for correctness. If the claims are correct, money flows from the clients to the respective producer. Flow of money is also observed from the producer side to the clients in the form of debit notes. In short, to achieve an efficient and effective supply chain, it is essential to manage all three flows properly with minimal efforts. It is a difficult task for a supply chain manager to identify which information is critical for decision-making. Therefore, he or she would prefer to have the visibility of all flows on the click of a button.

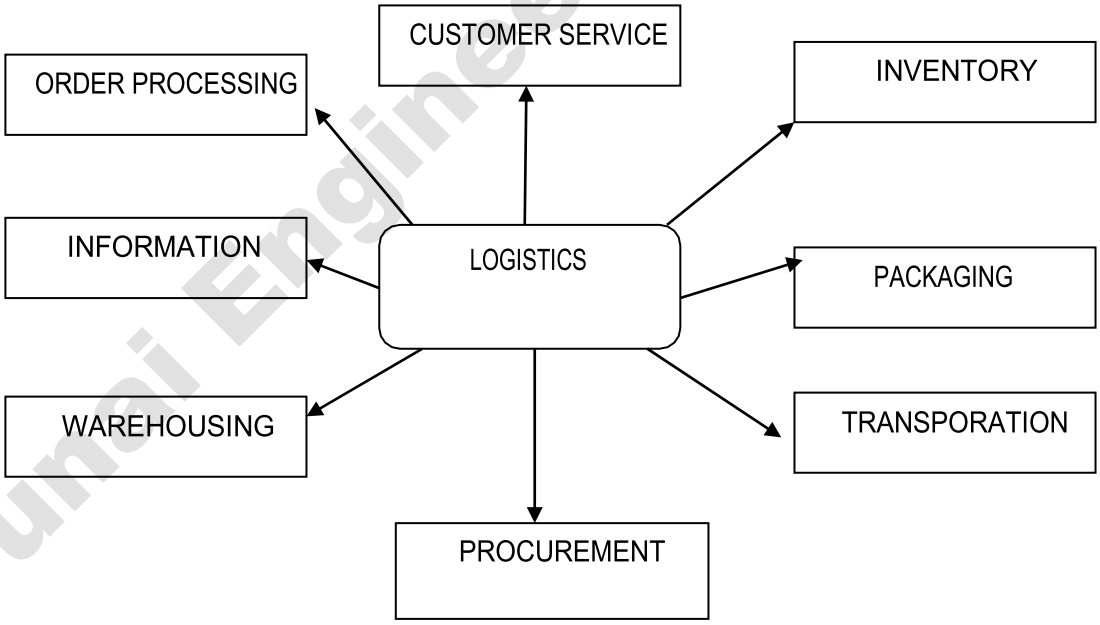
PART B

1. What is meant by Logistics? Explain Role of Logistics and Supply chain Management

Logistics is an essential component of supply chain management. It involves the planning, carrying out and management of goods, services, and information from the point of origin to the point of consumption. Logistics aligns the complex pattern of traffic and transportation, shipping and receiving, import and export operations, warehousing, inventory management, purchasing, production planning, and customer service.

- Companies see logistics as a critical **blueprint** of the supply chain.
- It is used to manage, coordinate and monitor resources needed to move products in a smooth, timely, cost-effective and reliable manner**.**

Basic Components of Logistics and SCM



1. Inventory Planning
2. Transportation
3. Packaging
4. Warehousing
5. Information System

6. Order Processing
7. Customer Service

1. INVENTORY PLANNING

Inventory management supervises the flow of goods from manufacturers to **warehouses** and from these facilities to point of sale. A key function of inventory management is to keep **a detailed record of each new or returned product** as it enters or leaves a warehouse or point of sale.

Role of inventory management in Logistics

1. **Purchasing inventory**

   Raw materials or components are bought and delivered to the warehouse.

2. **Storing inventory**

   Inventory is stored until needed. Raw materials are moved to production facilities to be made into finished goods and returned to stock areas until ready for shipment.

3. **Profiting from inventory**

   The amount of product for sale is controlled. Finished goods are pulled to fulfill orders. Products are shipped to customers.

2. TRANSPORTATION

Transportation means **movement of products** from the beginning of the supply chain to the customer. Transportation plays a significant role in any supply chain because products are rarely produced and consumed at the same location.

Role of Transport in Logistics

8. **Truck Transport**

   It is one of the most dominant modes of transport. The truck industry consists of two sectors i.e. TL – Truck load and LTL – Less than truck load

9. **Package Carriers**

   It carry small packages ranging from letters to shipment weighing about 200-250 kgs.

10. **Railways**

Railways are priced to encourage large shipment over a long distance

11. **Water Ways**

    It includes transportation by ships and boats used for bulk products

12. **Air Transport**

    Includes small packages which are costly and time specific

13. **Pipeline**

    Used for transport of natural gas, petroleum, oil and water

14. **Intermodal Transport**

    It uses more than one mode of transportation eg – truck and rail

3. PACKAGING

The roles of packaging are to **protect the contents** from the elements, allow for the ease of transportation, provide information, add convenience in stocking, marketing and communicating the value of the product,

Three Levels of Packaging

Primary Packaging

Primary packaging refers to the materials that make direct physical contact with your product. Primary packaging serves two purposes. The **first** is to provide ample protection for your product, whether that means keeping out moisture with barrier protection or cushioning against impact. The **second** purpose of primary packaging is usually to inform the customer and provide details about that product's uses and features.

Secondary Packaging

Secondary packaging is another level of protection that is commonly used for protection, bundling, and marketing purposes. The secondary packaging of a product often combines multiple items together, such as the box that holds multiple cans of soda together in one convenient pack. The soda cans would be your primary packaging and the box that keeps them together is considered the secondary level of packaging.

Tertiary Packaging

Tertiary packaging is provide protection during shipping and storage, although, some companies choose to use minimal marketing at this level. Tertiary packaging also provides a convenient way to move inventory quickly with easy handling.

Role of Packaging in Logistics

1. **Protection f**or the product: transportation without spoiling and/or breaking; for the consumer: reduces worry and increases safety
2. **Convenience** - ease of use and decision making, simplifies life
3. **Image** - shelf-appeal, brand awareness, and product/company/consumer values
4. **Sustainability** - Reduction of environmental impact, consumers can make a difference

4. WAREHOUSING

Warehouse logistics ensures the storage and management of goods before shipping them to the delivery destination. They manage the time, volume, sequence and packaging for your goods, which are required for the onward transport operations

Role of Warehousing in Logistics

Inventory control

- It is much easier for businesses to manage a large amount of inventory. Warehouses can help when a company needs to match supply with demand in a fast-changing environment..

Centralizing the products

- With all its products in one place, a business will have a much easier time of receiving, storing and distributing its goods.

An emergency buffer

- Warehouses have an unusual role in maintaining the integrity of a business because if an emergency strikes, such as faulty products or delays to transportation, the business has spare goods in stock to turn to.

Adding value

- All goods are kept together in one place, available to access whenever the time is right. They are there, ready, for other necessary activities to take place, such as order consolidation and mixing products

Keeping goods safe

- Warehouse's role is also to protect a business's goods. Warehouses have both security

personnel and excellent security technology to ensure sites can't be accessed without permission.

5. INFORMATION SYSTEM

Supply Chain and Information Systems (SC&IS) is a boundary-spanning field of supply chain networks, which organizations use to acquire, produce, and deliver goods and services all over the world.

Role of Information System in Logistics

- **Cost reduction** − The advancement of technology has further led to ready availability of all the products with different offers and discounts. This leads to reduction of costs of products.
- **Productivity** − The growth of information technology has improved productivity because of inventions of new tools and software. That makes productivity much easier and less time consuming.
- **Improvement and product/market strategies** − Recent years have seen a huge growth in not only the technologies but the market itself. New strategies are made to allure customers and new ideas are being experimented for improving the product.

6. ORDER PROCESSING

It consists in taking and collecting articles in a specified quantity before shipment to satisfy customers' orders. It is a basic warehousing process and has an important influence on supply chain's productivity

Role of Order processing in logistics

It reduces hard costs

- Automated order management works by transforming traditional, paper-based processes into an electronic workflow**.**
- Many hard costs can be reduced by eliminating reliance on paper, office consumables and equipment needed to manually process sales orders.
- Automation avoids costly errors by removing the possibility of human error and using

intelligent technology such as Optical Character Recognition (OCR) to accurately extract order data.

It minimizes soft costs

- With automation, order data is instantly captured and accurately fed into the supply chain, freeing up CSRs to better serve customers and providing more time for staff to coordinate the delivery of goods and eliminate added costs.

It improves visibility across the board

- Automation delivers added oversight via customizable dashboards containing Key Performance Indicators (KPIs) that enable users to facilitate daily tasks, monitor performances and react quickly to prevent problems or spot opportunities early.

It enhances the customer experience

- The customer experience is the product of a customer's journey with a company from beginning to end.
- To improve the customer experience, CSRs need the time to communicate, engage and grow relationships with customers
- One of the best ways to empower CSRs to provide a top-notch customer experience is to repurpose them to more value-added tasks (e.g., resolving customer claims, answering customer questions, etc.).

7. CUSTOMER SERVICE

Customer service is everywhere along the supply chain, it affects the way it begins when products are sold to the customer and it is there when products are delivered.

Role of Customer Service in logistics

1. **Integrate with order entry system**

   Integrating a systematic order fulfillment process tends to reduce manual labor that saves time, increases profitability and customer satisfaction

   E.g. Order received in night and make delivery in the day time.

2. **Build in adaptability**

Companies can meet this challenge by proving to be adaptable with the customer wants makes changes in their orders right from the purchase and even up to and after shipment

E.g. Tailor made transportation system like packaging facility as per weather.

3. **Confirm with bar codes**

By changing the bar coding into an automated one ,the company can save a large amount of its time and energy and even implement perfection in planning as it presents real time data instead of mere projections.

E.g. In the ware house material arranged with bar-code easy to locate particular product with the bar-code system we can easily shift goods as per priority of delivery and delivery places.

4. **Conducting automated pickings**

Automated technologies are easily fulfills the needs of customer thereby increasing customer satisfaction and bringing in repeated business in a shorter time span. **E.g.** Goods collection from customer destination is one of good example of automated pickings it's save time and money of customers which bringing repeated business.

5. **Automated shipping plans**

Using automated shipping plan the workers can pick to a predesigned way of stacking the containers without going for trial and error methods. This saves a lot of time and energy of the workers engaged in stacking the containers and speeding the delivery with less expense than without automated shipping plan.

E.g. Bar-code system on containers and on the area of ware house which easily track the goods and easily stacking and speeding the delivery.

6. **Automate shipment verification**

By applying automated verification together with automated picking and using bar codes, more time can be saved on packing, verifying and shipping process.

7. **Sourcing orders based on facility workload**

Logistic managers should use the method of best utilize of space when multiple warehousing and distribution facilities are available in order to improve responsiveness and maximize flexibility.

2. Explain in detail about the Scope and importance in supply chain

Introduction

- Supply chain design, planning, and operation decisions play a significant role in the success or failure of a firm.
- To stay competitive, supply chains must adapt to changing technology and customer expectations.
- There is a close connection between the design and management of supply chain flows (product, information, and funds) and the success of a supply chain
- **Walmart, Amazon, and Seven-Eleven Japan** are examples of companies that have built their success on superior design, planning, and operation of their supply chain.
- In contrast, the failure of many online businesses, such as **Webvan**, can be attributed to weaknesses in their supply chain design and planning
- **Dell Computer** is another example of a company that had to revise its supply chain design in response to changing technology and customer needs.

Importance of Supply Chain for Success Scenario

Example: 1 Walmart

- **Walmart** has been a leader at using supply chain design, planning, and operation to achieve success
- From its beginning, the company invested heavily in transportation and information infrastructure to facilitate the effective flow of goods and information
- Walmart designed its supply chain with clusters of stores around distribution centers to facilitate frequent replenishment at its retail stores in a cost-effective manner
- Frequent replenishment allows stores to match supply and demand more effectively than the competition.
- Walmart has been a leader in sharing information and collaborating with suppliers to bring down costs and improve product availability
- The results are impressive. In its **2013 annual report**, the company reported a net income of about $17 billion on revenues of about **$469 billion.**
- These are dramatic results for a company that reached annual sales of only **$1 billion in**

1980. The **growth in sales** represents an annual compounded growth rate of more than **20 percent.**

Example: 2 Seven-Eleven Japan

- Seven-Eleven Japan is another example of a company that has used excellent supply chain design, planning, and operation to drive growth and profitability.
- It has used a very responsive replenishment system along with an outstanding information system to ensure that products are available when and where customers need them.
- Its responsiveness allows it to change the merchandising mix at each store by time of day to precisely match customer demand.
- As a result, the company has grown from sales of 1 billion yen in 1974 to almost 1.9 trillion yen in 2013, with profits in 2013 totaling 222 billion yen.

Example: 3 Dell

- Dell is another example of a company that enjoyed tremendous success based on its supply chain design, planning, and operation but then had to adapt its supply chain in response to shifts in technology and customer expectations.
- Between 1993 and 2006, Dell experienced unprecedented growth of both revenue and profits by structuring a supply chain that provided customers with customized PCs quickly and at reasonable cost.
- By 2006, Dell had a net income of more than $3.5 billion on revenues of just over $56 billion.
- This success was based on **two key supply chain features** that supported rapid, low-cost customization.
- The first was Dell's decision to **sell directly to the end customer**, bypassing distributors and retailers.
- The second key aspect of Dell's **supply chain was the centralization of manufacturing and inventories in a few locations** where final assembly was postponed until the customer order arrived.
- As a result, Dell was able to provide a large variety of PC configurations while keeping low levels of component inventories.

Failure Scenario

- The **failure** of many online businesses, such as **Webvan and Kozmo**, can be attributed to their inability to design appropriate supply chains or manage supply chain flows effectively
- **Webvan** designed a supply chain with **large warehouses** in several major cities in the United States, from which **groceries** were delivered to customers' homes.
- This supply chain design **could not compete** with **traditional supermarket** supply chains in terms of cost.
- **Traditional supermarket** chains bring product to a supermarket close to the consumer using full truckloads, resulting in very **low transportation costs.**
- They turn their inventory relatively quickly and let the customer perform most of the picking activity in the store.
- In contrast, **Webvan** turned its inventory marginally faster than supermarkets but incurred much **higher transportation costs for home delivery**, as well as high labor costs to pick customer orders.
- The result was a company that folded in 2001, within two years of a very successful initial public offering.
- **Borders, along with Barnes & Noble**, dominated the selling of books and music in the 1990s by implementing the superstore concept.
- Compared with small local bookstores that dominated the industry prior to that, Borders was able to offer greater variety (about 100,000 titles at superstores, relative to fewer than 10,000 titles at a local bookstore) to customers at a lower cost by aggregating operations in large stores.
- This allowed the company to achieve higher inventory turns than local bookstores with lower operating costs per dollar of sales.
- In **2004, Borders** achieved **sales** of almost **$4 billion**, with **profits of $132 million**.
- **Amazon** offered much greater variety than Borders at **lower cost by selling online** and stocking its inventories in a few distribution centers.
- Borders' inability to adapt its supply chain to compete with Amazon led to a rapid decline.
- By 2009, sales had dropped to $2.8 billion; the company lost $109 million that year.

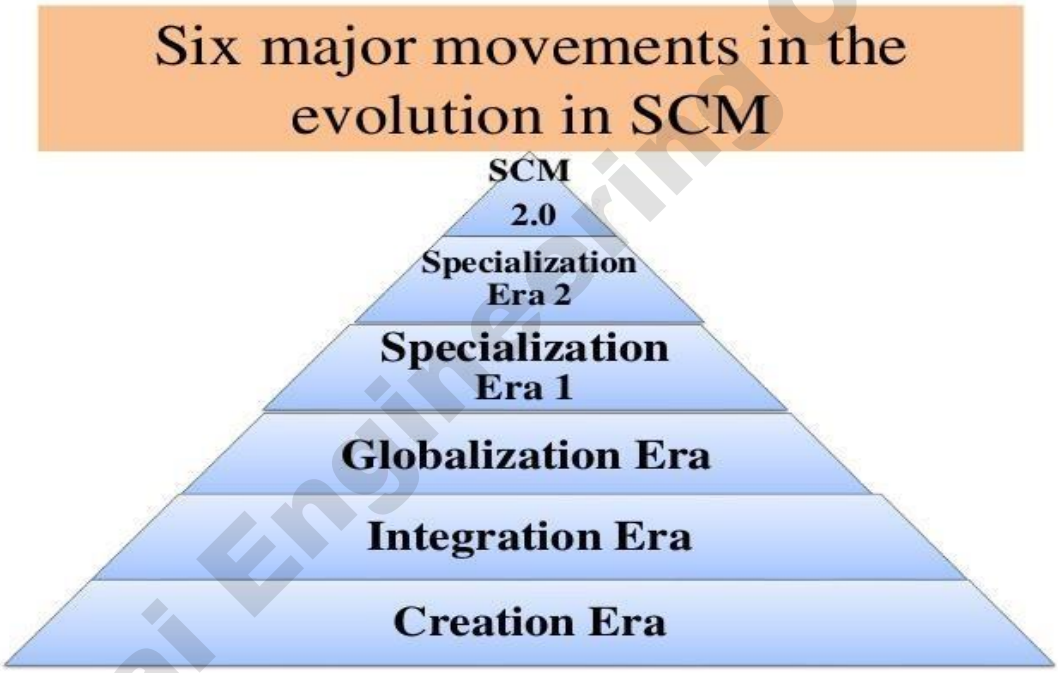
3. Discuss in detail about Evolution of Supply Chain

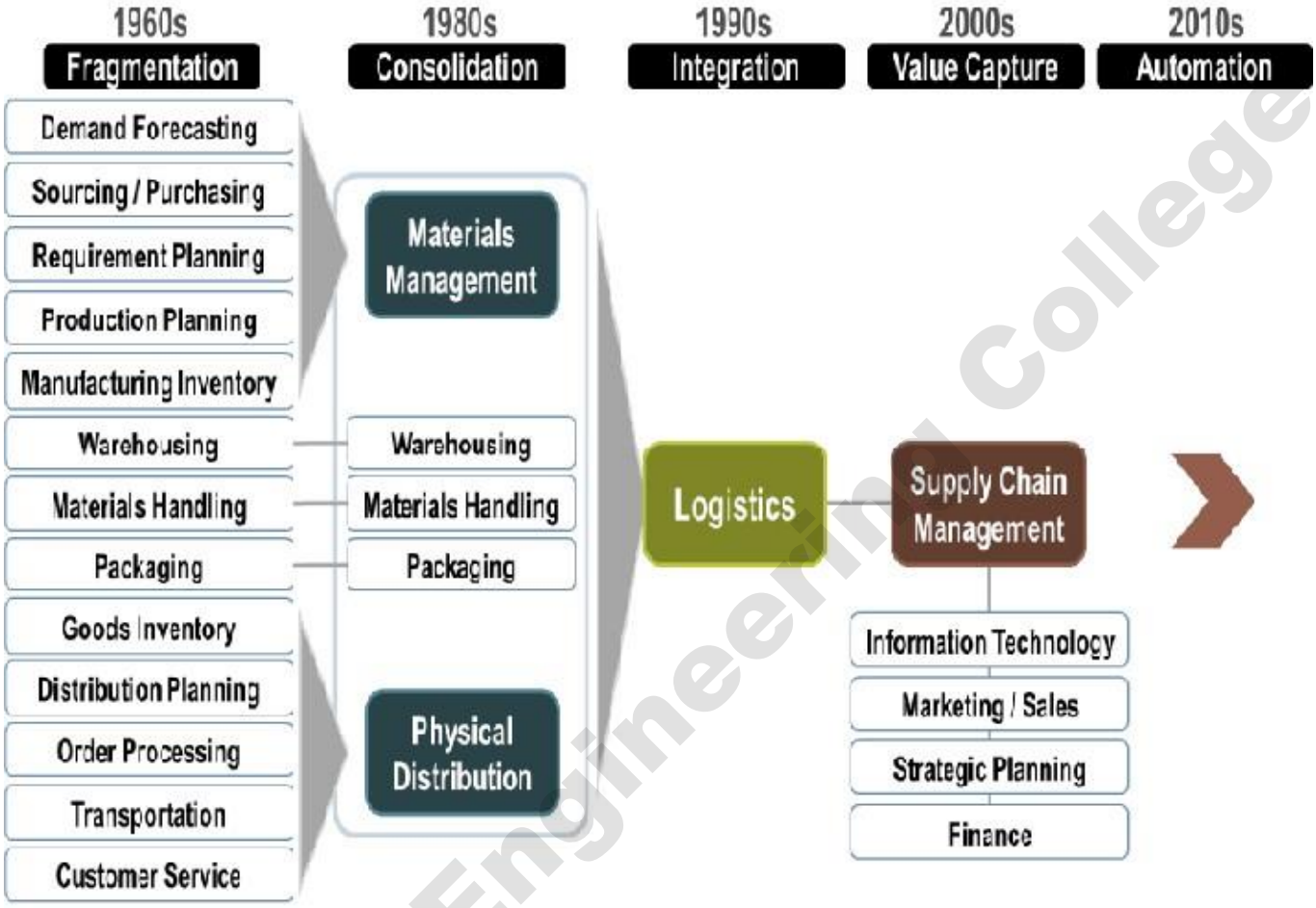
Supply Chain Management (SCM)

SCM is the management of flow of goods and services that involves the movement and storage of raw materials.

CREATION ERA

- The term supply chain management was first coined by **Keith Oliver in 1982**
- The characteristics of this era of supply chain management include the need for large scale changes, re-engineering and downsizing driven by cost reduction programs.





INTEGRATION ERA

- This era of supply chain management studies was highlighted with the development of electronic data interchange (EDI) systems in 1960s and developed through the 1990s by the introduction of enterprise resource planning (ERP) systems
- This era has continued to develop into the 21st century with the expansion of Internet based collaborative systems
- This era of supply chain evolution is characterized by both increasing value added and cost reductions through integration

GLOBALIZATION ERA

- The third movement of supply chain management development, the organization era, cab be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains beyond national boundaries and into other continents

Specialization Era 1

- This specialization model creates manufacturing and distribution networks composed of several individual supply chain specific to producer to end customer.
- Supply chain management works as a service

Specialization Era 2

There are many functions of this era

- Transportation management
- Storage and Inventory management
- Planning Development Management
- Performance management

SCM 2.0

- SCM 2.0 is a trend in the use of the **WWW** that means to increase creativity, information sharing and collaboration among users(END users)
- SCM2.0 designed to rapidly deliver results with the quickly management of future change for continuous flexibility, value and success

4. What are the different types of decision phases in supply chain? Explain each phases with suitable examples

Introduction

- Successful supply chain management requires many decisions relating to the flow of information, product, and funds
- Each decision should be made to raise the **supply chain surplus**

These decisions fall into **three categories**

1. Supply chain strategy or design
2. Supply chain planning
3. Supply chain operation

1. SUPPLY CHAIN STRATEGY OR DESIGN

- During this phase, a company decides **how to structure** the supply chain over the next several years
- It decides **what** the chain's configuration will be, **how resources** will be allocated, and **what processes** each stage will perform
- Strategic decisions made by companies include
- Whether to **outsource** or perform a supply chain function **in-house**
- Location and capacities of production and warehousing facilities
- Products to be manufactured or stored at various locations
- Modes of transportation to be made available along different shipping modes
- Type of information system to be used

Example

- PepsiCo Inc.'s **decision in 2009** to purchase two of its largest bottlers is a supply chain design or strategic decision
- **PepsiCo CEO** announced in a news release on **August 4- :**'' while the existing model has served the system very well, the fully integrated beverage business will enable us to bring innovative products and packages to market faster**"**

2. SUPPLY CHAIN PLANNING

- For decisions made during this phase, the **time frame** considered is a quarter to a year
- supply chain's configuration determined in the strategic phase is **fixed**
- Goal of planning is to **maximize the supply chain surplus**
- Companies start the planning phase with a forecast for the coming year of demand and other factors, such as costs and prices in different markets

Planning includes **making decisions** regarding

1. Which markets will be supplied from which locations
2. Subcontracting of manufacturing
3. Inventory policies to be followed
4. Timing and size of marketing and price promotion

Example

- **Steel giant ArcelorMittal's** decisions regarding markets supplied by a production facility and target production quantities at each location are classified as planning decisions.
- In the **planning phase**, companies must **include uncertainty in demand**, exchange rates, and competition over this time horizon in their decisions
- Given a shorter time frame and better forecasts than in the design phase, companies in the **planning phase try to incorporate** any flexibility built into the supply chain in the design phase and exploit it to **optimize performance**.
- As a result of the planning phase, companies define a set of operating policies that govern short-term operations.

3. SUPPLY CHAIN OPERATION

- The time horizon here is weekly or daily
- During this phase, companies make decisions regarding individual customer orders
- At the operational level, supply chain configuration is considered fixed and planning policies are already defined.
- The goal of supply chain operations is to handle incoming customer orders in the best possible manner.

During this phase, firms allocate

1. Inventory or production to individual orders
2. Set a date by which an order is to be filled
3. Generate pick lists at a warehouse
4. Allocate an order to a particular shipping mode and shipment
5. Set delivery schedules of trucks, and place replenishment orders.

- Because operational decisions are being made in the short term (minutes, hours, or days), there is less uncertainty about demand information.
- Given the constraints established by the configuration and planning policies, the goal during the operation phase is to exploit the reduction of uncertainty and optimize performance
- The design, planning, and operation of a supply chain have a strong impact on overall profitability and success

Example

- Large part of the success of firms such as **Walmart and Seven-Eleven Japan** can be attributed to their effective supply chain design, planning, and operation

Competitive and Supply chain Stratergies

Definition

"A company's competitive strategy defines, relative to its competitors, the set of customer needs that it seeks to satisfy through its products and services"

Example 1

- **Walmart** aims to provide high availability of a variety of products of reasonable quality at low prices
- Most products sold at Walmart are commonplace (everything from home appliances to clothing) and can be purchased elsewhere
- Walmart provides a **low price** and **product availability**

Example 2

- **McMaster- Carr** sells maintenance, repair, and operations (MRO) products
- Its competitive strategy is built around providing the customer with convenience, availability, and responsiveness.
- With this focus on responsiveness, McMaster **does not compete based on low price.**
- The **competitive strategy** at Walmart is different from that at McMaster.

Example 3

- **Blue Nile,** is a online retailing model for diamonds
- Blue Nile has emphasized the variety of diamonds available from its website and the fact that its margins are significantly lower
- Customers, however, have to wait to get their jewelry and do not have any opportunity to touch and see it before purchase
- Blue Nile does provide a 30-day return period, though

Example 4

- **Zales** sells diamond jewelry through retail outlets
- At **Zales**, in contrast, a customer can walk into the retail store, be helped by a salesperson, and leave immediately with a diamond ring
- The amount of variety available at a Zales store is limited.
- Whereas Blue Nile offers more than 90,000 stones on its site

Comparison of various Competitive Strategy for each Example

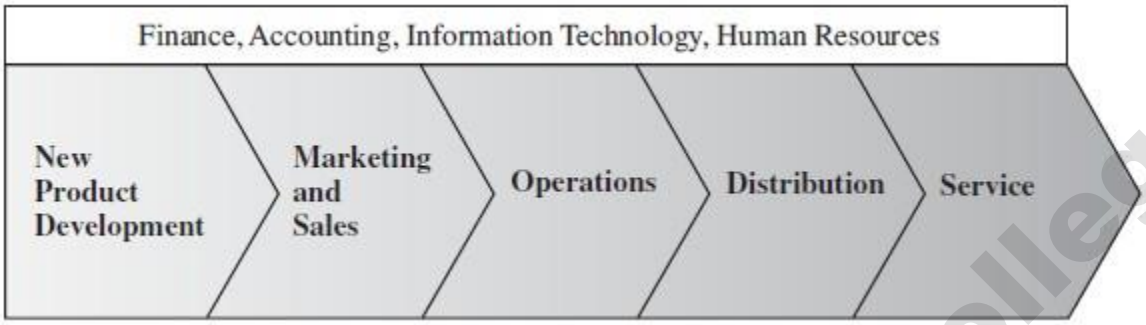
- In each case, the **competitive strategy** is defined based on how the customer prioritizes product cost, delivery time, variety, and quality

Walmart	McMaster-Carr	Blue Nile	Zales
A Walmart customer, in contrast, places greater emphasis on cost.	A McMaster-Carr customer places greater emphasis on product variety and response time than on cost	A Blue Nile customer, purchasing online, places great emphasis on product variety and cost.	A customer purchasing jewelry at Zales is most concerned with fast response time and help in product selection

Conclusion:

- Thus, a firm's competitive strategy will be defined based on its customers' priorities. Competitive strategy targets one or more customer segments and aims to provide products and services that satisfy these customers' needs.

Relationship between competitive and supply chain strategies



VALUE CHAIN IN A COMPANY

- Value chain for a typical organization is shown in the above diagram
- The value chain begins with **new product development**, which creates specifications for the product.
- **Marketing and sales** generate demand by publicizing the customer priorities that the products and services will satisfy.
- Marketing also brings customer input back to new product development.
- An **operation** transforms inputs to outputs to create the product according to new product specifications.
- **Distribution** either takes the product to the customer or brings the customer to the product.
- **Service** responds to customer requests during or after the sale.
- These are core processes or functions that must be performed for a successful sale. Finance, accounting, information technology, and human resources support and facilitate the functioning of the value chain.
- To execute a company's competitive strategy, all these functions play a role, and each must develop its own strategy

STRATEGY

Strategy refers to what each process or function will try to do particularly well

TYPES OF STRATEGY

1. Product development Strategy
2. Marketing and sales strategy
3. Supply chain strategy

Product development strategy

- A **product development strategy** specifies the portfolio of new products that a company will try to develop.
- It also dictates whether the development effort will be made internally or outsourced.

Marketing and Sales Strategy

- A marketing and sales strategy specifies how the market will be segmented and how the product will be positioned, priced, and promoted

Supply chain strategy

A supply chain strategy determines

- Nature of procurement of raw materials
- Transportation of materials to and from the company
- Manufacture of the product or operation to provide the service
- Distribution of the product to the customer, along with any follow-up service and a specification of whether these processes will be performed **in-house or outsourced**.
- Supply chain strategy specifies what the operations, distribution, and service functions, whether performed in-house or outsourced, should do particularly well.

Example

- **Dell's** initial decision to sell direct, its 2007 decision to start selling PCs through resellers
- **Cisco's** decisions to use contract manufacturers defines the broad structure of their supply chains and are all part of their supply chain strategies
- **Amazon's** decisions to build warehouses to stock some products and to continue using distributors as a source of other products are part of its supply chain strategy
- **Toyota's** decision to have production facilities in each of its major markets is part of its supply chain strategy

- **Seven-Eleven Japan's** success can be related to the excellent fit among its functional strategies. Marketing at Seven-Eleven has emphasized convenience in the form of easy access to stores and availability of a wide range of products and services.

5. Explain how Drivers help in Supply Chain Performance

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

1. Facilities
2. Inventory
3. Transportation
4. Information
5. Sourcing
6. pricing

1. FACILITIES

- Facilities are the **actual physical locations** in the supply chain network where product is stored, assembled, or fabricated.
- The two major types of facilities are **production sites and storage sites.**
- Decisions regarding the role, location, capacity, and flexibility of facilities have a significant impact on the supply chain's performance.

Example

- In 2013, **Amazon** increased the number of warehousing facilities (and, as a result, experienced an increase in PP&E) located close to customers to improve its responsiveness.
- In contrast, **Best Buy** tried to improve its efficiency in 2013 by shutting down retail facilities even though it reduced responsiveness.
- Facility costs show up under PP&E if facilities are owned by the firm or under selling, general, and administrative if they are leased.

2. Inventory

- Inventory encompasses all raw materials, work in process, and finished goods within a supply chain.
- The inventory belonging to a firm is reported under **assets.**
- Changing inventory policies can dramatically alter the supply chain's efficiency and responsiveness.

Example

W.W. Grainger makes itself responsive by stocking large amounts of inventory and satisfying customer demand from stock even though the high inventory levels reduce efficiency.

- Such a practice makes sense for Grainger because its products hold their value for a long time.
- A strategy using **high inventory levels** can be **dangerous in the fashion apparel business**, though, in which inventory loses value relatively quickly with changing seasons and trends.
- Rather than hold high levels of inventory, Spanish apparel retailer Zara has worked hard to shorten new product and replenishment lead times.
- As a result, the company is very responsive but carries low levels of inventory.

3. Transportation

- Transportation entails **moving inventory from point to point** in the supply chain.
- Transportation can take the form of many combinations of modes and routes, each with its own performance characteristics.
- Transportation choices have a large impact on supply chain responsiveness and efficiency.

Example

- A mail-order catalog company can use a faster mode of transportation such as **FedEx to ship products**, thus making its supply chain more responsive—but also less efficient, given the high costs associated with using FedEx.
- **McMaster-Carr and W.W. Grainger**, however, have structured their supply chains to

provide **next-day service** to most of their customers using ground transportation.

- They are providing a high level of responsiveness at lower cost.
- **Outbound transportation** costs of shipping to the customer are typically included in selling, general, and administrative expense, whereas **inbound transportation** costs are typically included in the cost of goods sold.

4. Information

- Information consists of data and analysis concerning facilities, inventory, transportation, costs, prices, and customers throughout the supply chain.
- Information is potentially the biggest driver of performance in the supply chain because it directly affects each of the other drivers.
- Information presents management with the opportunity to make supply chains more responsive and more efficient.

Example

- **Seven-Eleven Japan** has used information to better match supply and demand while achieving production and distribution economies.
- The result is a high level of responsiveness to customer demand while production and replenishment costs are lowered.
- Information technology-related expenses are typically included under either operating expense (typically under selling, general, and administrative expense) or assets.
- For **example**, in 2012, Amazon included $4.54 billion in technology expense under operating expense and another $454 million under fixed assets to be depreciated

5. Sourcing

- Sourcing is the choice of **who will perform a particular supply chain activity**, such as production, storage, transportation, or the management of information.
- At the strategic level, these decisions determine what functions a firm performs and what functions the firm outsources.
- Sourcing decisions affect both the responsiveness and efficiency of a supply chain.

Example

- After **Motorola outsourced** much of its production to contract manufacturers in China, for instance, it saw its efficiency improve but its responsiveness suffer because of the long lead times.
- To make up for the drop in responsiveness, Motorola started flying in some of its cell phones from China even though this choice increased transportation cost.
- **Flextronics**, an electronics contract manufacturer, is hoping to offer both responsive and efficient sourcing options to its customers.
- It is trying to make its production facilities in high-cost locations very responsive while keeping its facilities in low-cost countries efficient.
- Flextronics hopes to become an effective source for all customers using this combination of facilities.
- Sourcing costs show up in the cost of goods sold, and monies owed to suppliers are recorded under accounts payable.

6. Pricing

- Pricing determines **how much a firm will charge for the goods** and services that it makes available in the supply chain.
- Pricing affects the behavior of the buyer of the good or service, thus affecting demand and supply chain performance.

Example

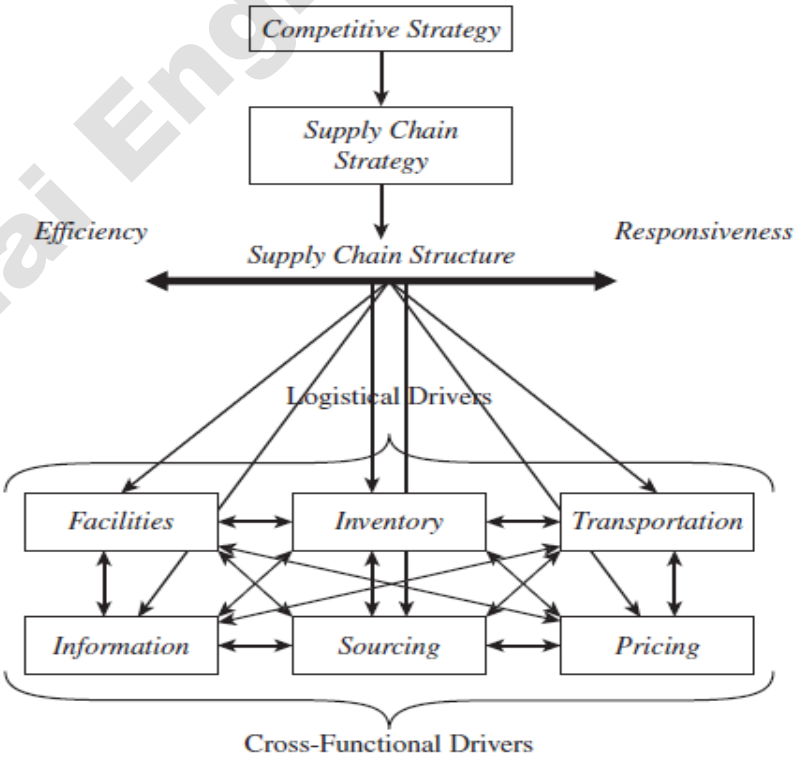
- If a transportation company varies its charges based on the lead time provided by the customers, it is likely that customers who value efficiency will order early and customers who value responsiveness will be willing to wait and order just before they need a product transported.
- Differential pricing provides responsiveness to customers that value it and low cost to customers that do not value responsiveness as much.
- Any change in pricing affects revenues directly but could also affect costs based on the impact of this change on the other drivers.

FRAMEWORK FOR STRUCTURING DRIVERS

- Supply chain management includes the use of logistical and cross-functional drivers to increase the supply chain surplus.
- Cross-functional drivers have become increasingly important in raising the supply chain surplus in recent years.
- Although logistics remains a major part, supply chain management is increasingly becoming focused on the three cross-functional drivers.

  Example: Consider sale of furniture at **IKEA.** The primary goal of this supply chain is to deliver a low price and acceptable quality.
- Modular design and unassembled furniture allows IKEA to carry components in inventory at its stores
- The low component variety and stable replenishment orders allow IKEA's suppliers to focus on efficiency
- Given the available inventory, low-cost modes of transportation are used to ship densely packed components.

Supply Chain Decision-Making Framework



6. Explain obstacles in Supply Chain Management in detail

Definition

Any factor that leads to either local optimization by different stages of the supply chain or an increase in information delay, distortion, and variability within the supply chain is an obstacle to coordination. If managers in a supply chain are able to identify the key obstacles, they can then take suitable actions to help achieve coordination.

The Major obstacles are divided into five categories

- Incentive obstacles
- Information-processing obstacles
- Operational obstacles
- Pricing obstacles
- Behavioral obstacles

1. Incentive Obstacles

Incentive obstacles occur in situations when incentives offered to different stages or participants in a supply chain lead to actions that increase variability and reduce total supply chain profits.

- Local Optimization within functions or Stages of a Supply Chain Incentives that focus only on the local impact of an action result in decisions that do not maximize total supply chain surplus.

Example

- If the compensation of a **transportation manager** at a firm is linked to the average transportation cost per unit, the manager is likely to take actions that **lower transportation costs** even if they increase inventory costs or hurt customer service.
- It is natural for any participant in the supply chain to take actions that optimize performance measures along which they are evaluated.

Example:

- Managers at a retailer such as **Kmart** make all their purchasing and inventory decisions to **maximize Kmart profits, not total supply chain profits.**
- Buying decisions based on maximizing profits at a single stage of the supply chain lead to ordering policies that do not maximize supply chain profits
- Sales Force incentives improperly structured sales force incentives are a significant obstacle to coordination in a supply chain.
- In many firms, sales force incentives are based on exceeding sales thresholds during an evaluation period of a month or quarter.
- The sales typically measured by a manufacturer are the quantity sold to distributors or retailers (**sell-in**), not the quantity sold to final customers (sell-through).

Example

- **Barilla** offered its sales force incentives based on the quantity sold to distributors during a four- to six-week promotion period.
- To maximize their bonuses, the Barilla sales force urged distributors to buy more **pasta** toward the **end of the evaluation period**, even if **distributors were not selling as much to retailers.**
- The sales force offered discounts they controlled to spur end-of-period sales. This **increased variability** in the order pattern, with a jump in orders toward the end of the evaluation period followed by few orders at the beginning of the next evaluation period.
- Order sizes from distributors to Barilla fluctuated by a factor of up to 70 from one week to the next.
- A sales force incentive based on **sell-in** thus results in **order variability** being **larger** than **customer demand variability** because the sales force tends to push product toward the end of the incentive period.

2. Information-Processing Obstacles

Information-processing obstacles occur when **demand information is distorted** as it moves between different stages of the supply chain, leading to increased variability in orders within the supply chain.

Forecasting Based on Orders and Not Customer Demand

- When stages within a supply chain make forecasts that are based on orders they receive, any variability in customer demand is magnified as orders move up the supply chain to manufacturers and suppliers.
- In supply chains where the fundamental means of communication among different stages are the orders that are placed, information is distorted as it moves up the supply chain
- Each stage views its primary role within the supply chain as one of filling orders placed by its downstream partner. Thus, each stage views its demand as the stream of orders received and produces a forecast based on this information.

Lack of Information Sharing

- A retailer such as **Walmart** may increase the size of a particular order because of a planned promotion.
- If the manufacturer is not aware of the planned promotion, it may interpret the larger order as a permanent increase in demand and place orders with suppliers accordingly.
- The manufacturer and suppliers thus have much inventory right after Walmart finishes its promotion.
- Given the excess inventory, as future Walmart orders return to normal, manufacturer orders will be smaller than before.
- The lack of information sharing between the retailer and manufacturer thus leads to a large fluctuation in manufacturer orders

3. Operational Obstacles

Operational obstacles occur when actions taken in the course of placing and filling orders lead to an increase in variability.

Ordering in Large Lots

- When a firm places orders in lot sizes that are much larger than those in which demand arises, variability of orders is magnified up the supply chain.
- **Figure** 10-2 **shows both the demand and the order stream** for a firm that places an order every five weeks

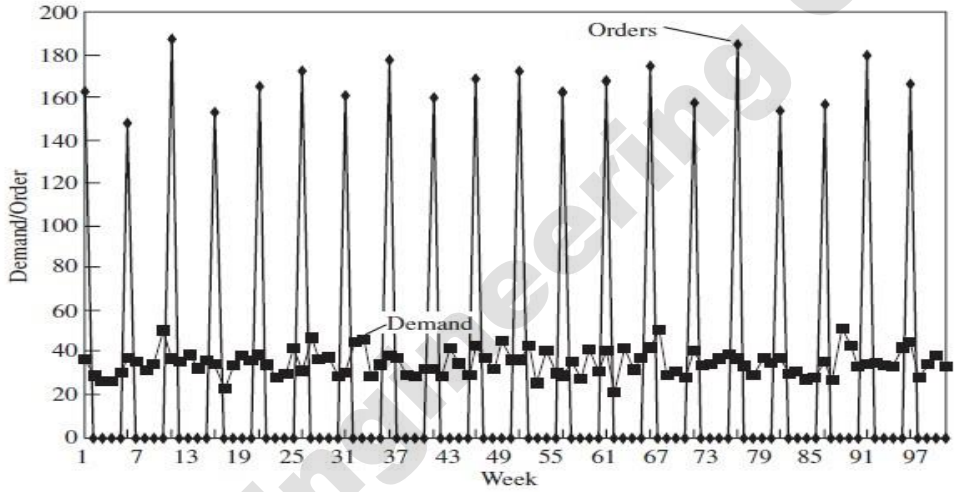


FIGURE 10-2 Demand and Order Stream with Orders Every Five Weeks

- Because orders are batched and placed every five weeks, the order stream has four weeks without orders followed by a large order that equals five weeks of demand.
- A manufacturer supplying several retailers that batch their orders faces an order stream that is much more variable than the demand the retailers experience.
- If the manufacturer batches its orders to suppliers, the effect is further magnified.
- In many instances, there are certain focal-point periods, such as the first or the last week of a month, when a majority of the orders arrive. This synchronization of orders further exacerbates the impact of batching.

Rationing and Shortage Gaming

- Rationing scheme results in a game in which retailers try to increase the size of their orders to increase the amount supplied to them.

- A retailer needing 75 units orders 100 units in the hope of getting 75. The net impact of this rationing scheme is to artificially inflate orders for the product.
- In addition, a retailer ordering based on what it expects to sell gets less and as a result loses sales, whereas a retailer that inflates its order is rewarded.
- This phenomenon is fairly common in the electronics industry, in which alternating periods of component shortages followed by a component surplus are often observed.

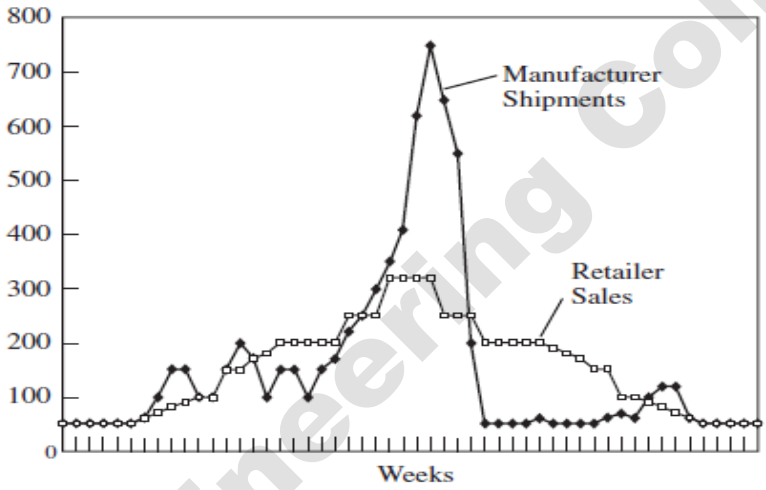


FIGURE 10-3 Retailer Sales and Manufacturer Shipments of Soup
Source: Adapted from Marshall L. Fisher, "What Is the Right Supply Chain for Your Product?" by *Harvard Business Review* (March–April 1997): 83–93. Copyright © 1997 by the Harvard Business School Publishing Corporation; all rights reserved. Reprinted by permission of *Harvard Business Review*.

4. Pricing Obstacles

Pricing obstacles arise when the pricing policies for a product lead to an increase in variability of orders placed.

- **Lot-Size–Based Quantity Discounts** Lot-size–based quantity discounts increase the lot size of orders placed within the supply chain because lower prices are offered for larger lots.
- As discussed earlier, the resulting large lots magnify the bullwhip effect within the supply chain.

Price Fluctuations

- Trade promotions and other short-term discounts offered by a manufacturer result in forward buying, by which a wholesaler or retailer purchases large lots during the discounting period to cover demand during future periods.

- **Forward buying** results in large orders during the promotion period followed by very small orders after that as shown in Figure 10-3 for **chicken noodle soup**.
- Observe that the shipments during the peak period are higher than the sales during the peak period because of a promotion offered.
- The peak shipment period is followed by a period of low shipments from the manufacturer, indicating significant forward buying by distributors.
- The promotion thus results in a variability in manufacturer shipments that is significantly higher than the variability in retailer sales.

Behavioral Obstacles

Behavioral obstacles are problems in learning within organizations that contribute to information distortion. These problems are often related to the supply chain structure and the communications among different stages.

Some of the behavioral obstacles are as follows:

1. Each stage of the supply chain views its **actions locally** and is unable to see the impact of its actions on other stages.

2. Different stages of the supply chain **react to the current local situation** rather than trying to identify the root causes.

3. Based on local analysis, different stages of the supply chain blame one another for the fluctuations, with successive stages in the supply chain becoming **enemies rather than partners.**

4. No stage of the supply chain learns from its actions over time because the most **significant consequences of its actions occur elsewhere**. The result is a vicious cycle in which actions taken by one stage create the very problems that the stage blames on others.

5. A **lack of trust** among supply chain partners causes them to be opportunistic at the expense of overall supply chain performance. The lack of trust also results in significant duplication of effort. More important, information available at different stages either is not shared or is ignored because it is not trusted.

UNIT- II

INTRODUCTION

Role of Distribution in Supply Chain- Factors Influencing Distribution Network Design- Design Options for Distribution Network in Practice- Role of network design in Supply design- Framework for Network Decisions

PART A

1. What is meant by Distribution?

Distribution refers to the steps taken to move and store a product from the **supplier stage to a customer stage** in the supply chain. Distribution occurs between every pair of stages in the supply chain. Raw materials and components are moved from suppliers to manufacturers, whereas finished products are moved from the manufacturer to the end consumer. Distribution is a key driver of the overall profitability of a firm because it affects both the supply chain cost and the customer value directly

2. What are the factors that influence distribution Network design?

FACTORS INFLUENCING DISTRIBUTION NETWORK DESIGN

- Response time
- Product variety
- Product availability
- Customer experience
- Time to market
- Order visibility
- Returnability

3. What is meant by Inbound Transportation?

- **Inbound transportation** costs are the costs incurred in bringing material into a facility.

4. What is meant by outbound Transportation?

- **Outbound transportation** costs are the costs of sending material out of a facility.
- Outbound transportation costs per unit tend to be higher than inbound costs because inbound lot sizes are typically larger.

5. What are the different design options for distribution network in practice

Design Options for Distribution Network in Practice

1. Manufacturer storage with direct shipping
2. Manufacturer storage with direct shipping and in-transit merge
3. Distributor storage with carrier delivery
4. Distributor storage with last-mile delivery
5. Manufacturer/distributor storage with customer pickup
6. Retail storage with customer pickup

6. What is meant by Manufacturer storage with direct shopping?

MANUFACTURER STORAGE WITH DIRECT SHIPPING

- Product is shipped directly from the manufacturer to the end customer, bypassing the retailer
- This option is also referred to as **drop-shipping.**

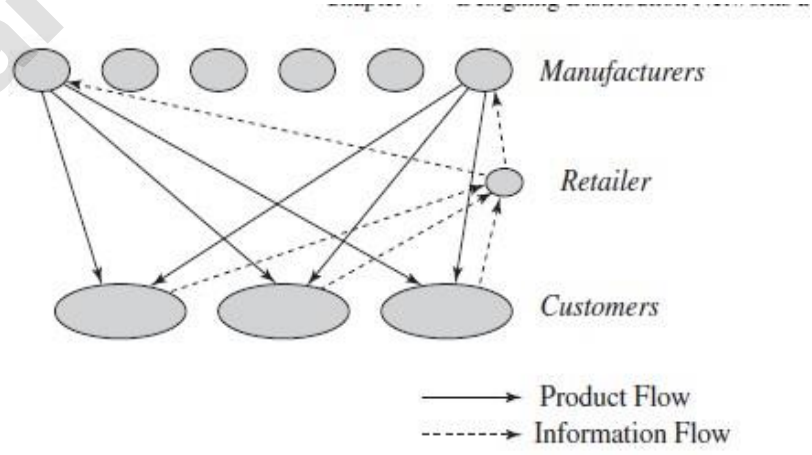


FIGURE 4-6 Manufacturer Storage with Direct Shipping

7. What is meant by Manufacturer storage with direct shopping and in-Transit Merge?

MANUFACTURER STORAGE WITH DIRECT SHIPPING AND IN-TRANSIT MERGE

- Each product in the order is sent directly from its manufacturer to the end customer, **in-transit merge** combines pieces of the order coming from different locations so the customer gets a single delivery

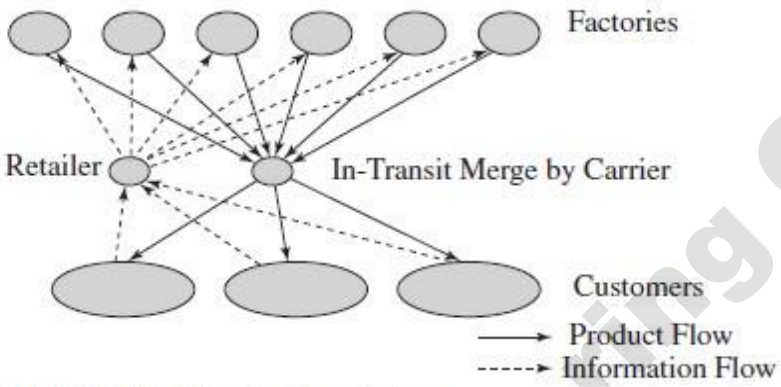


FIGURE 4-7 In-Transit Merge Network

8. What is meant by Distribution storage with carrier delivery?

DISTRIBUTOR STORAGE WITH CARRIER DELIVERY

- Inventory is held not by manufacturers at the factories, but by distributors/ retailers in intermediate warehouses, and package carriers are used to transport products from the intermediate location to the final customer

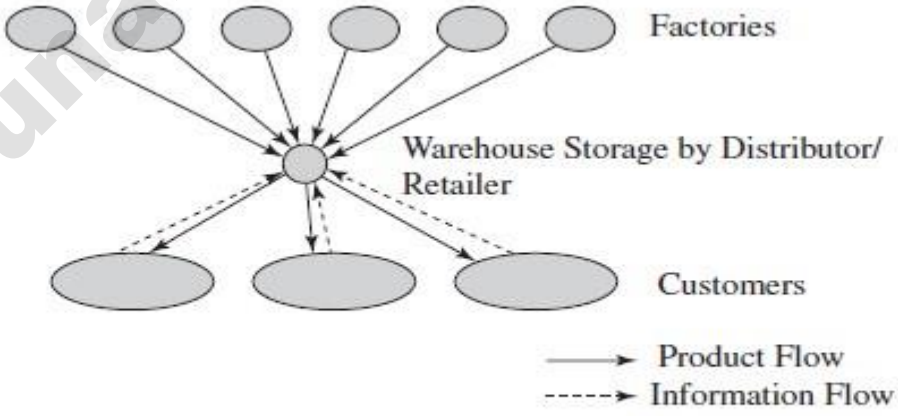


FIGURE 4-8 Distributor Storage with Carrier Delivery

9. What is meant by Distribution storage with Last-Mile Delivery?

DISTRIBUTOR STORAGE WITH LAST-MILE DELIVERY

- **Last-mile delivery** refers to the distributor/retailer delivering the product to the customer's home instead of using a package carrier.

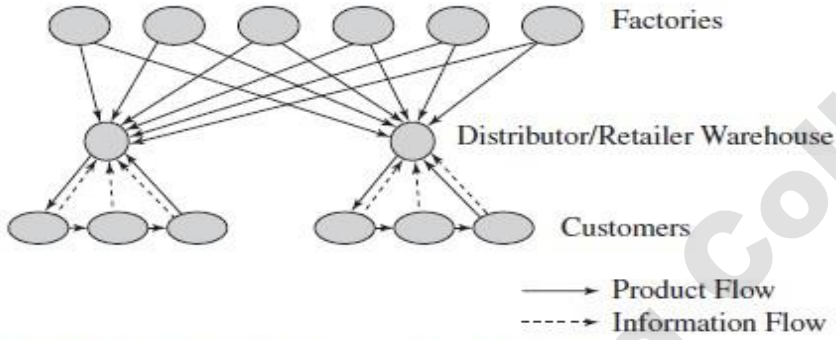


FIGURE 4-9 Distributor Storage with Last-Mile Delivery

10. What is meant by Manufacturer OR Distribution storage with customer pickup?

MANUFACTURER OR DISTRIBUTOR STORAGE WITH CUSTOMER PICKUP

- In this approach, inventory is stored at the manufacturer or distributor warehouse, but customers place their orders online or on the phone and then travel to designated pickup points to collect their merchandise.
- Orders are shipped from the storage site to the pickup points as needed.

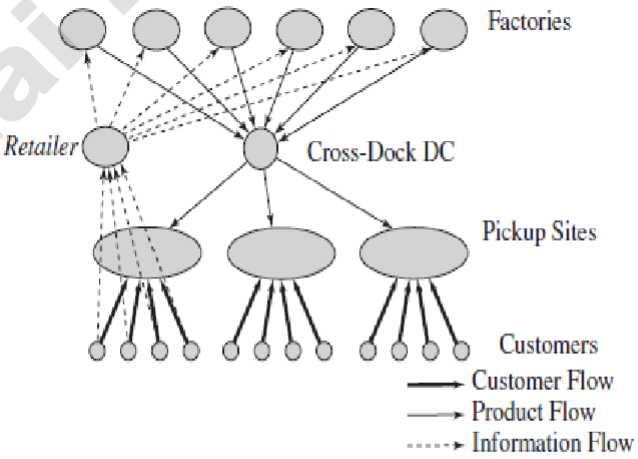


FIGURE 4-10 Manufacturer or Distributor Warehouse Storage with Consumer Pickup

11. How changing distribution network affects supply chain costs?

Changing the distribution network design affects the following supply chain costs

- Inventories
- Transportation
- Facilities and
- Handling Information

12. What is logistics cost?

Total logistics costs are the sum of inventory, transportation, and facility costs for a supply chain network. As the number of facilities increases, total logistics costs first decrease and then increase.

13. What are the two key decisions made by Manager when designing a distribution network?

1. Will product be delivered to the customer location or picked up from a prearranged site?
2. Will product flow through an intermediary (or intermediate location)?

14. What is meant by drop-shipping?

Product is shipped directly from the manufacturer to the end customer, bypassing the retailer (who takes the order and initiates the delivery request). This option is also referred to as **drop-shipping.** The retailer carries no inventory. The biggest advantage of drop-shipping is the ability to centralize inventories at the manufacturer, which can aggregate demand across all retailers that it supplies

15. What is the performance characteristic of Manufacturer storage with direct shipping network?

TABLE 4-1 Performance Characteristics of Manufacturer Storage with Direct Shipping Network

Cost Factor	Performance
Inventory	Lower costs because of aggregation. Benefits of aggregation are highest for low-demand, high-value items. Benefits are large if product customization can be postponed at the manufacturer.
Transportation	Higher transportation costs because of increased distance and disaggregate shipping.
Facilities and handling	Lower facility costs because of aggregation. Some saving on handling costs if manufacturer can manage small shipments or ship from production line.
Information	Significant investment in information infrastructure to integrate manufacturer and retailer.
Service Factor	**Performance**
Response time	Long response time of one to two weeks because of increased distance and two stages for order processing. Response time may vary by product, thus complicating receiving.
Product variety	Easy to provide a high level of variety.
Product availability	Easy to provide a high level of product availability because of aggregation at manufacturer.
Customer experience	Good in terms of home delivery but can suffer if order from several manufacturers is sent as partial shipments.
Time to market	Fast, with the product available as soon as the first unit is produced.
Order visibility	More difficult but also more important from a customer service perspective.
Returnability	Expensive and difficult to implement.

16. What is the performance characteristic of In-Transit Merge?

TABLE 4-2 Performance Characteristics of In-Transit Merge

Cost Factor	Performance
Inventory	Similar to drop-shipping.
Transportation	Somewhat lower transportation costs than drop-shipping.
Facilities and handling	Handling costs higher than drop-shipping at carrier; receiving costs lower at customer.
Information	Investment is somewhat higher than for drop-shipping.
Service Factor	**Performance**
Response time	Similar to drop-shipping; may be marginally higher.
Product variety	Similar to drop-shipping.
Product availability	Similar to drop-shipping.
Customer experience	Better than drop-shipping because only a single delivery is received.
Time to market	Similar to drop-shipping
Order visibility	Similar to drop-shipping.
Returnability	Similar to drop-shipping.

17. Identify the key factors to be considered when designing a distribution network.

A manager must consider the customer needs to be met and the cost of meeting these needs when designing the distribution network. Some key customer needs to be considered include response time, product variety/availability, convenience, order visibility, and returnability. Important costs that managers must consider include inventories, transportation, facilities and handling, and information. Increasing the number of facilities decreases the response time and transportation cost but increases inventory and facility cost.

18. State the performance of delivery networks for different product/customer characteristics

TABLE 4-8 Performance of Delivery Networks for Different Product/Customer Characteristics

	Retail Storage with Customer Pickup	Manufacturer Storage with Direct Shipping	Manufacturer Storage with In-Transit Merge	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last-Mile Delivery	Manufacturer Storage with Pickup
High-demand product	+2	−2	−1	0	+1	−1
Medium-demand product	+1	−1	0	+1	0	0
Low-demand product	−1	+1	0	+1	−1	+1
Very-low-demand product	−2	+2	+1	0	−2	+1
Many product sources	+1	−1	−1	+2	+1	0
High product value	−1	+2	+1	+1	0	+2
Quick desired response	+2	−2	−2	−1	+1	−2
High product variety	−1	+2	0	+1	0	+2
Low customer effort	−2	+1	+2	+2	+2	−1

Key: +2 = very suitable; +1 = somewhat suitable; 0 = neutral; −1 = somewhat unsuitable; −2 = very unsuitable.

19. Discuss the strengths and weaknesses of various distribution options.

Distribution networks that ship directly to the customer are better suited for a large variety of high-value products that have low and uncertain demand. These networks carry low levels of inventory but incur high transportation cost and provide a slow response time. Distribution networks that carry local inventory are suitable for products with high demand, especially if transportation is a large fraction of total cost. These networks incur higher inventory cost but lower transportation cost and provide a faster response time.

20. How online sales have affected the design of distribution networks in different industries.

The rise of online sales has affected both customer service and costs in supply chains. Online sales allow a firm to offer greater product variety and improve product availability by centralizing inventories. This is especially beneficial for low-volume, high-variety products. The online channel also improves the customer experience by providing 24-hour access and allowing a more customized experience. Selling a product online, however, increases the response time relative to a retail store.

PART B

1. Explain in detail about the Role of Distribution in Supply Chain.

ROLE OF DISTRIBUTION IN SUPPLY CHAIN

Distribution

Definition

Distribution refers to the steps taken to move and store a product from the **supplier stage to a customer stage** in the supply chain. Distribution occurs between every pair of stages in the supply chain. Raw materials and components are moved from suppliers to manufacturers, whereas finished products are moved from the manufacturer to the end consumer. Distribution is a key driver of the overall profitability of a firm because it affects both the supply chain cost and the customer value directly.

Example

Walmart and **Seven-Eleven Japan**, have built the success of their entire business around outstanding distribution design and operation. In the case of **Walmart**, distribution allows the company to provide **high availability levels** of relatively common products at a very low cost. In the case of **Seven-Eleven Japan**, effective distribution provides a very **high level of customer responsiveness** at a reasonable cost.

Process of designing a distribution network has two broad phases

First phase

- The broad structure of the supply chain network is visualized.
- This phase **decides the number of stages** in the supply chain and the role of each stage.

Second phase

- It takes the broad structure and converts it into **specific locations** and their capability, capacity, and demand allocation.

Industry Examples with Distribution Network

Example 1: Dell

- Until 2007, **Dell** distributed its PCs directly to end consumers, whereas companies such as **HP** distributed through resellers.
- Dell customers waited several days to get a PC, whereas customers could walk away with an HP computer from a reseller.
- Starting in June 2007, Dell also started selling its PCs through retailers such as Walmart
- In the late 1990s, **Gateway** opened Gateway Country stores, wherein customers could examine the products and have salespeople help them configure a PC that suited their needs.
- Gateway, however, chose to sell no products at the stores; all PCs were shipped directly from the factory to the customer.
- By April 2004, Gateway had closed all its stores because of their poor financial performance.
- **Apple Computer**, in contrast, has opened many retail stores that sell computers.

Example 2: P&G

- **P&G** has chosen to distribute directly to large supermarket chains while obligating smaller players to buy P&G products from distributors.
- Products move directly from P&G to the larger chains but move through an additional stage when going to smaller supermarkets.
- Texas Instruments, which once used only direct sales, now sells about 30 percent of its volume to 98 percent of its customers through distributors, while serving the remaining 2 percent of customers with 70 percent of the volume directly

Example 3: W.W.Grainger

- **W.W. Grainger** stocks about **300,000 SKUs** that can be sent to customers within a day of order placement.
- The remaining slower-moving products are not stocked but instead are shipped directly from the manufacturer when a customer places an order.
- It takes several days for the customer to receive the product in such cases

2. What are the factors that influence Distribution Network Design?

FACTORS INFLUENCING DISTRIBUTION NETWORK DESIGN

At the highest level, performance of a distribution network should be evaluated along two dimensions:

1. Value provided to the customer
2. Cost of meeting customer needs

Factors influenced by the structure of the distribution network:

- Response time
- Product variety
- Product availability
- Customer experience
- Time to market
- Order visibility
- Returnability

Response time is the amount of time it takes for a customer to receive an order.
Product variety is the number of different products or configurations that are offered by the distribution network.
Product availability is the probability of having a product in stock when a customer order arrives.
Customer experience includes the ease with which customers can place and receive orders and the extent to which this experience is customized. It also includes purely experiential aspects, such as the possibility of getting a cup of coffee and the value that the sales staff provides.
Time to market is the time it takes to bring a new product to the market.
Order visibility is the ability of customers to track their orders from placement to delivery.
Returnability is the ease with which a customer can return unsatisfactory merchandise and the ability of the network to handle such returns.

Example:

- Customers ordering a book at **Amazon** are willing to wait longer than those who drive to a nearby **Barnes & Noble** store to get the same book.
- In contrast, customers can find a much larger variety of books at Amazon compared with the selection at the Barnes & Noble store.
- Thus, Amazon customers trade off fast response times for high levels of variety.
- A decrease in the desired response time increases the number of facilities required in the network, as shown in **Figure 4-1.**
- For example, Barnes & Noble provides its customers with books on the same day but requires hundreds of stores to achieve this goal for most of the United States.
- Amazon, in contrast, takes a few days to deliver a book to its U.S. Customers, but it uses only about forty locations to store its books.
- Changing the distribution network design affects the following supply chain costs
    1. Inventories
    2. Transportation
    3. Facilities and handling
    4. Information

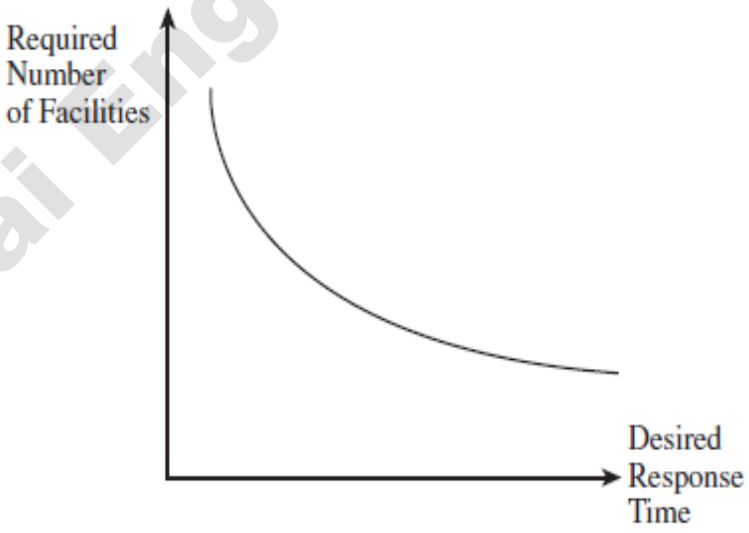


FIGURE 4-1 Relationship Between Desired Response Time and Number of Facilities

- As the number of facilities in a supply chain increases, the required inventory increases as shown in **Figure 4-2.**
- To decrease inventory costs, firms try to consolidate and limit the number of facilities in their supply chain network.
- For example, Amazon is able to turn its inventory about twice as frequently as Barnes & Noble because it has far fewer facilities.

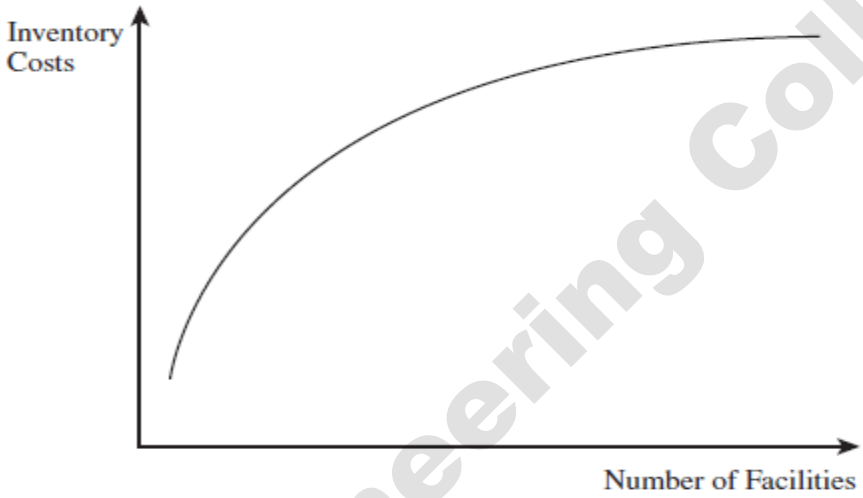


FIGURE 4-2 Relationship Between Number of Facilities and Inventory Costs

- **Inbound transportation** costs are the costs incurred in bringing material into a facility.
- **Outbound transportation** costs are the costs of sending material out of a facility.
- Outbound transportation costs per unit tend to be higher than inbound costs because inbound lot sizes are typically larger.
- For example, an Amazon warehouse receives full truckload shipments of books on the inbound side, but ships out small packages with only a few books per customer on the outbound side.
- Increasing the number of warehouse locations decreases the average outbound distance to the customer and makes outbound transportation distance a smaller fraction of the total distance traveled by the product.
- Thus, as long as inbound transportation economies of scale are maintained, increasing the number of facilities decreases total transportation cost, as shown in

- **Figure 4-3.** If the number of facilities is increased to a point at which inbound lot

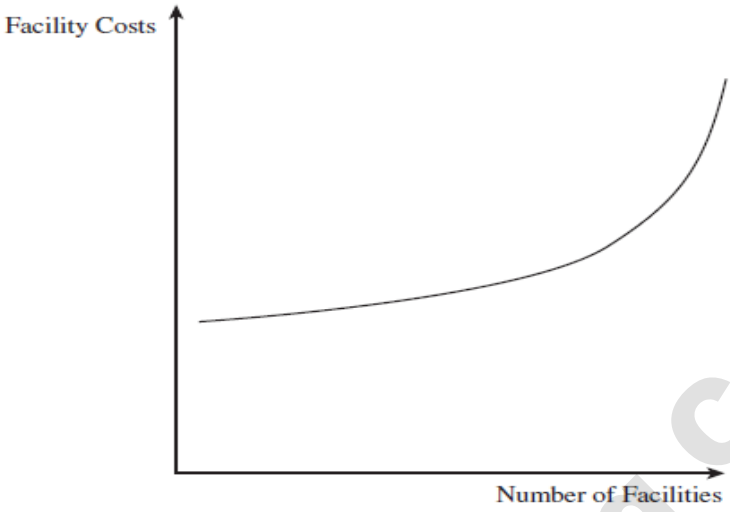


FIGURE 4-4 Relationship Between Number of Facilities and Facility Costs

sizes are also very small and result in a significant loss of economies of scale in inbound transportation, increasing the number of facilities increases total transportation cost, as shown in **Figure 4-3.**

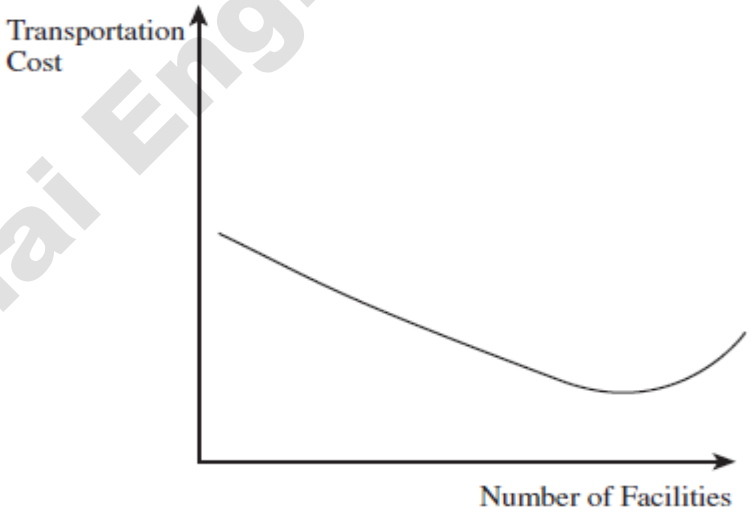


FIGURE 4-3 Relationship Between Number of Facilities and Transportation Cost

Facility costs decrease as the number of facilities is reduced, as shown in **Figure 4-4,** Because a consolidation of facilities allows a firm to exploit economies of scale.

As the number of facilities increases, total logistics costs first decrease and then increase, as shown in **Figure 4-5.** Each firm should have at least the number of facilities that minimizes total logistics costs.

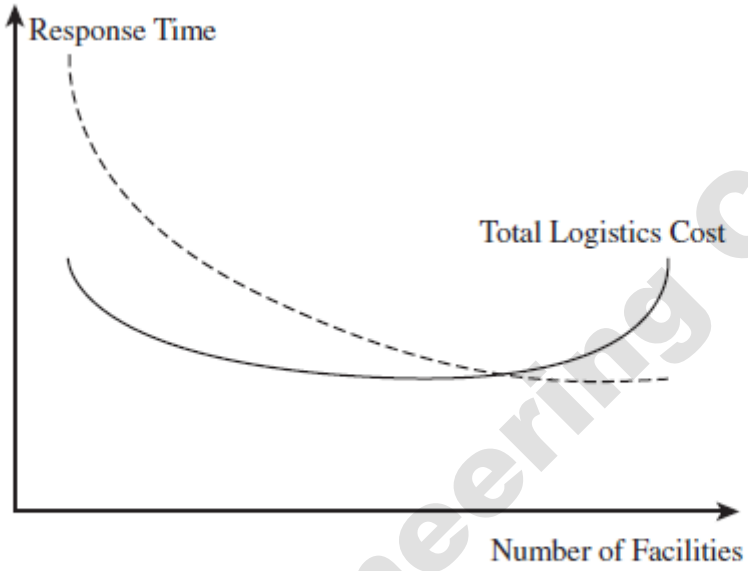


FIGURE 4-5 Variation in Logistics Cost and Response Time with Number of Facilities

A firm should add facilities beyond the cost-minimizing point only if managers are confident that the increase in revenues because of better responsiveness will be greater than the increase in costs because of the additional facilities.

3. What are the design options for Distribution Network? Explain each design option in detail.

Design Options for Distribution Network in Practice

Distribution network designs used to move products from factory to customer

1. Manufacturer storage with direct shipping
2. Manufacturer storage with direct shipping and in-transit merge
3. Distributor storage with carrier delivery
4. Distributor storage with last-mile delivery
5. Manufacturer/distributor storage with customer pickup
6. Retail storage with customer pickup

MANUFACTURER STORAGE WITH DIRECT SHIPPING

- Product is shipped directly from the manufacturer to the end customer, bypassing the retailer
- This option is also referred to as **drop-shipping.**
- The retailer carries no inventory.
- Information flows from the customer, via the retailer, to the manufacturer, and product is shipped directly from the manufacturer to customers, as shown in Figure 4-6.

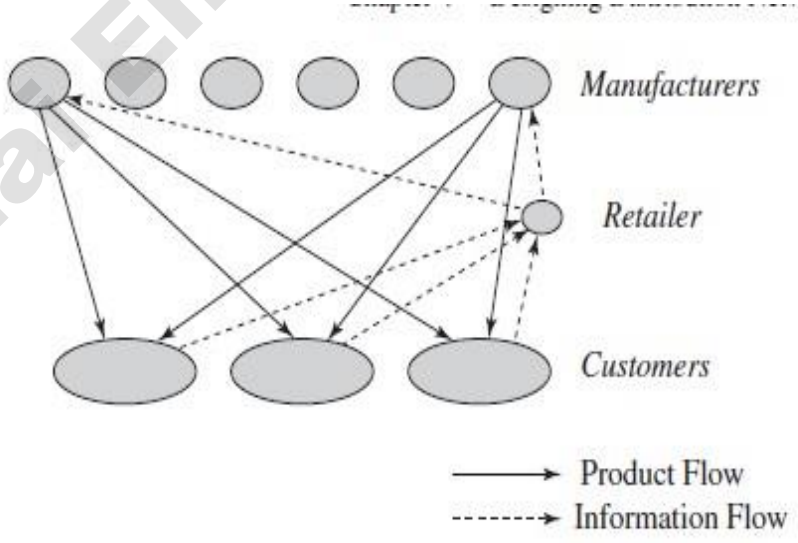


FIGURE 4-6 Manufacturer Storage with Direct Shipping

- Online retailers such as **eBags** and **Nordstrom.com** use drop-shipping to deliver goods to the end consumer.
- **eBags** holds few bags in inventory.
- **Nordstrom** carries some products in inventory and uses the **drop-ship model** for slow-moving footwear.
- **W.W. Grainger** also uses drop-shipping to deliver slow-moving items to customers
- The **biggest advantage of drop-shipping** is the ability to centralize inventories at the manufacturer, which can aggregate demand across all retailers that it supplies.
- As a result, the supply chain is able to provide a **high level of product availability** with lower levels of inventory.
- A key issue with regard to drop-shipping is the ownership structure of the inventory at the manufacturer.
- Although inventory costs are typically low with drop-shipping, transportation costs are high because manufacturers are farther from the end consumer.
- **Response times** tend to be long when drop-shipping is used because the order must be transmitted from the retailer to the manufacturer and shipping distances are generally longer from the manufacturer's centralized site

Example

- eBags, for example, states that order processing may take from 1 to 5 days and ground transportation after that may take from 3 to 11 business days.
- This implies that customer response time at eBags will be 4 to 16 days using ground transportation and drop-shipping.

MANUFACTURER STORAGE WITH DIRECT SHIPPING AND IN-TRANSIT MERGE

- Each product in the order is sent directly from its manufacturer to the end customer, **in-transit merge** combines pieces of the order coming from different locations so the customer gets a single delivery
- Information and product flows for the in-transit merge network are shown in **Figure 4-7.**

Example

- In-transit merge has been used by **Dell** and can be used by companies implementing drop-shipping.
- When a customer ordered a PC from Dell along with a Sony monitor (during Dell's direct selling period), the package carrier picked up the PC from the Dell factory and the monitor from the Sony factory; it then merged the two at a hub before making a single delivery to the customer.
- Although an increase in coordination is required, in-transit merge decreases transportation costs relative to drop-shipping by aggregating the final delivery.
- Facility and processing costs for the manufacturer and the retailer are similar to those for drop-shipping.
- The party performing the in-transit merge has higher facility costs because of the merge capability required. Receiving costs at the customer are lower because a single delivery is received.
- Overall supply chain facility and handling costs are somewhat higher than with drop-shipping.

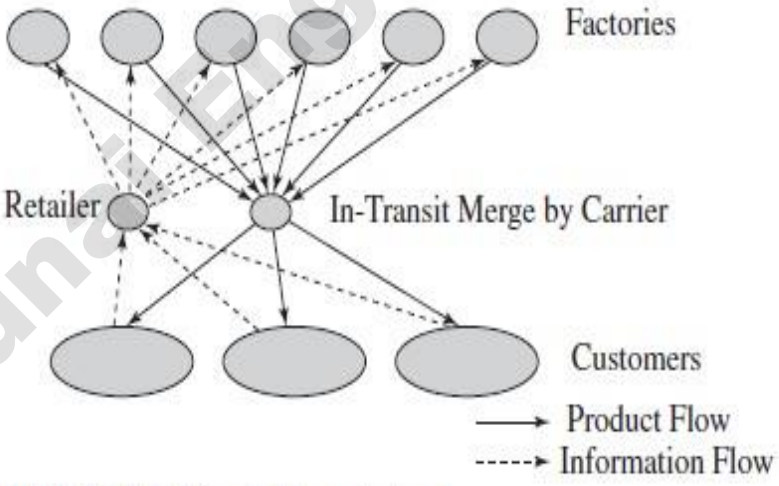


FIGURE 4-7 In-Transit Merge Network

- The performance characteristics of drop-shipping along various dimensions are summarized in **Table 4-1.**
- Given its performance characteristics, manufacturer storage with direct shipping is best suited for a large variety of low-demand, high-value items for which customers are willing to wait for delivery and accept several partial shipments.
- Manufacturer storage is also suitable if it allows the manufacturer to postpone customization, thus reducing inventories.
- It is thus ideal for direct sellers that are able to build to order. For drop- shipping to be effective, there should be few sourcing locations per order.

TABLE 4-1 Performance Characteristics of Manufacturer Storage with Direct Shipping Network

Cost Factor	Performance
Inventory	Lower costs because of aggregation. Benefits of aggregation are highest for low-demand, high-value items. Benefits are large if product customization can be postponed at the manufacturer.
Transportation	Higher transportation costs because of increased distance and disaggregate shipping.
Facilities and handling	Lower facility costs because of aggregation. Some saving on handling costs if manufacturer can manage small shipments or ship from production line.
Information	Significant investment in information infrastructure to integrate manufacturer and retailer.
Service Factor	**Performance**
Response time	Long response time of one to two weeks because of increased distance and two stages for order processing. Response time may vary by product, thus complicating receiving.
Product variety	Easy to provide a high level of variety.
Product availability	Easy to provide a high level of product availability because of aggregation at manufacturer.
Customer experience	Good in terms of home delivery but can suffer if order from several manufacturers is sent as partial shipments.
Time to market	Fast, with the product available as soon as the first unit is produced.
Order visibility	More difficult but also more important from a customer service perspective.
Returnability	Expensive and difficult to implement.

- The **performance** of factory storage with in-transit merge is compared with that of **drop shipping** in **Table 4-2.**
- The main advantages of in-transit merge over drop-shipping are lower transportation cost and improved customer experience.
- The major disadvantage is the additional effort during the merge itself.
- Given its performance characteristics, manufacturer storage with in-transit merge is best suited for low- to medium-demand, high-value items the retailer is sourcing from a limited number of manufacturers.

DISTRIBUTOR STORAGE WITH CARRIER DELIVERY

- Inventory is held not by manufacturers at the factories, but by distributors/ retailers in intermediate warehouses, and package carriers are used to transport products from the intermediate location to the final customer
- **Amazon** and industrial distributors such as **W.W. Grainger** and **McMaster- Carr** have used this approach combined with drop-shipping from a manufacturer (or distributor).
- Information and product flows when using distributor storage with delivery by a package carrier are shown in **Figure 4-8.**

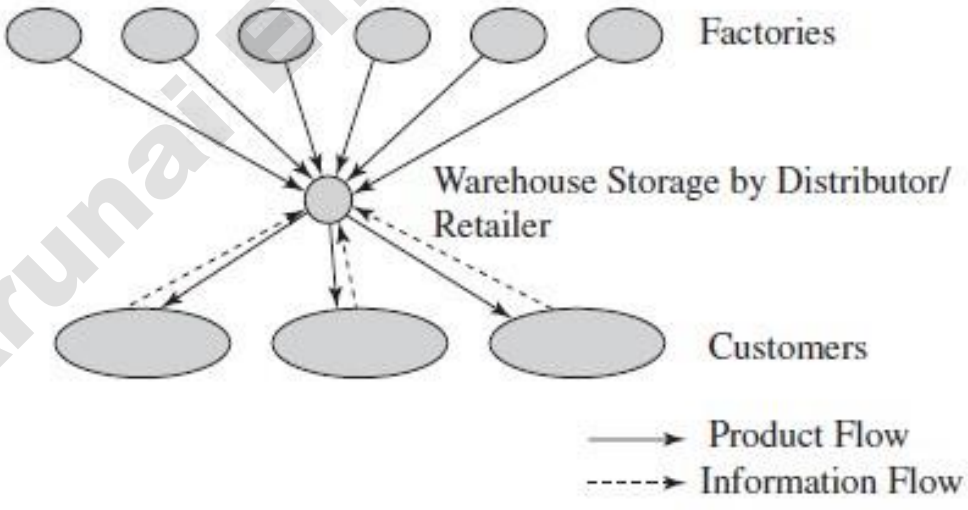


FIGURE 4-8 Distributor Storage with Carrier Delivery

- Relative to manufacturer storage, distributor storage requires a higher level of inventory because of a loss of aggregation.
- From an inventory perspective, distributor storage makes sense for products with somewhat higher demand.
- This is seen in the operations of both Amazon and W.W. Grainger.
- They stock only the slow- to fast-moving items at their warehouses, with very slow- moving items stocked farther upstream

Example

- In 2013, Amazon used warehouse storage to turn its inventory about twice as fast as the retail network of Barnes & Noble
- The **performance** of distributor storage with carrier delivery is summarized in **Table 4-3.**
- Distributor storage with carrier delivery is well suited for slow- to fast-moving items.
- Distributor storage also makes sense when customers want delivery faster than is offered by manufacturer storage but do not need delivery immediately. Distributor storage can handle somewhat lower variety than manufacturer storage but can handle a much higher level of variety than a chain of retail stores

TABLE 4-3 Performance Characteristics of Distributor Storage with Carrier Delivery

Cost Factor	Performance
Inventory	Higher than manufacturer storage. Difference is not large for faster-moving items but can be large for very-slow-moving items.
Transportation	Lower than manufacturer storage. Reduction is highest for faster-moving items.
Facilities and handling	Somewhat higher than manufacturer storage. The difference can be large for very-slow-moving items.
Information	Simpler infrastructure compared with manufacturer storage.
Service Factor	**Performance**
Response time	Faster than manufacturer storage.
Product variety	Lower than manufacturer storage.
Product availability	Higher cost to provide the same level of availability as manufacturer storage.
Customer experience	Better than manufacturer storage with drop-shipping.
Time to market	Higher than manufacturer storage.
Order visibility	Easier than manufacturer storage.
Returnability	Easier than manufacturer storage.

DISTRIBUTOR STORAGE WITH LAST-MILE DELIVERY

- **Last-mile delivery** refers to the distributor/retailer delivering the product to the customer's home instead of using a package carrier.
- **Amazon Fresh, Peapod, and Tesco** have used last-mile delivery in the grocery industry.
- Companies such as **Kozmo and Urbanfetch** tried to set up home-delivery networks for a variety of products, but they failed to survive.
- Given the limited radius that can be served with last-mile delivery, more warehouses are required compared to when package delivery is used.
- The warehouse storage with last-mile delivery network is as shown in **Figure 4-9.**

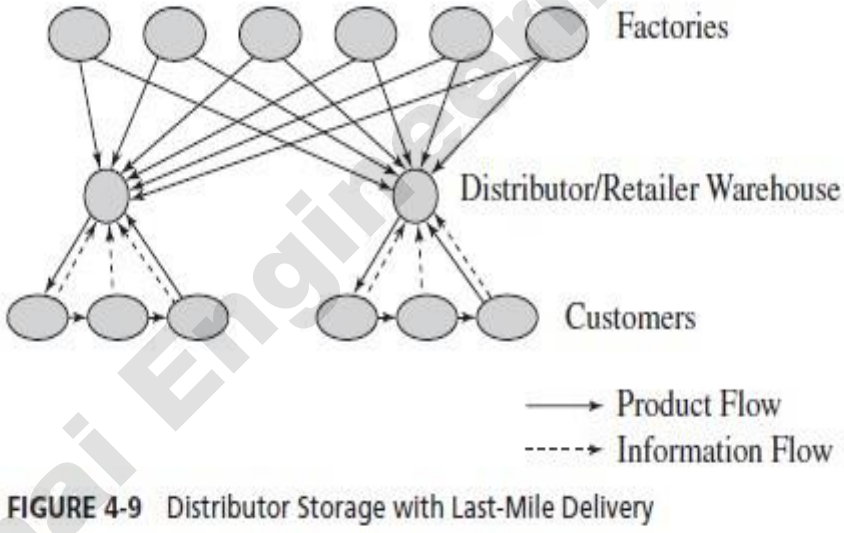


FIGURE 4-9 Distributor Storage with Last-Mile Delivery

Among all the distribution networks, **transportation costs** are **highest for last-mile delivery,** especially when delivering to individuals.
This is because package carriers aggregate delivery across many retailers and are able to obtain better economies of scale than are available to a distributor/retailer attempting last-mile delivery

- The performance characteristics of distributor storage with last-mile delivery are summarized in **Table 4-4.**
- In areas with high labor costs, it is hard to justify last-mile delivery to individual consumers on the basis of efficiency or improved margin.
- Last-mile delivery may be justifiable if customer orders are large enough to provide some economies of scale and customers are willing to pay for this convenience.

TABLE 4-4 Performance Characteristics of Distributor Storage with Last-Mile Delivery

Cost Factor	Performance
Inventory	Higher than distributor storage with package carrier delivery.
Transportation	Very high cost, given minimal scale economies. Higher than any other distribution option.
Facilities and handling	Facility costs higher than manufacturer storage or distributor storage with package carrier delivery, but lower than a chain of retail stores.
Information	Similar to distributor storage with package carrier delivery.
Service Factor	**Performance**
Response time	Very quick. Same-day to next-day delivery.
Product variety	Somewhat less than distributor storage with package carrier delivery but larger than retail stores.
Product availability	More expensive to provide availability than any other option except retail stores.
Customer experience	Very good, particularly for bulky items.
Time to market	Slightly higher than distributor storage with package carrier delivery.
Order visibility	Less of an issue and easier to implement than manufacturer storage or distributor storage with package carrier delivery.
Returnability	Easier to implement than other previous options. Harder and more expensive than a retail network.

MANUFACTURER OR DISTRIBUTOR STORAGE WITH CUSTOMER PICKUP

- In this approach, inventory is stored at the manufacturer or distributor warehouse, but customers place their orders online or on the phone and then travel to designated pickup points to collect their merchandise.
- Orders are shipped from the storage site to the pickup points as needed.

Examples

- **Include 7dream.com** and **Otoriyose-bin**, operated by Seven-Eleven Japan, which allow customers to pick up online orders at a designated store.

- Tesco has implemented such a service in the United Kingdom, where customers can pick up orders they have placed online.
- **Amazon i**s also experimenting with Amazon lockers, where customers can pick up their shipments.
- A **business-to-business (B2B) example is W.W. Grainger**, whose customers can pick up their orders at one of the W.W. Grainger retail outlets.
- Some items are stored at the pickup location, whereas others may come from a central location.
- In the case of **7dream.com**, the order is delivered from a manufacturer or distributor warehouse to the pickup location.
- In **2007**, **Walmart** launched its "**Site to Store" service**, which allows customers to order thousands of products online at Walmart.com and have them shipped free to a local Walmart store.
- Items arrive in stores 7 to 10 business days after the order is processed, and customers receive an e-mail notification when their order is ready for pickup.
- The **information and product flows shown in Figure 4-10** are similar to those in the Seven- Eleven Japan network.

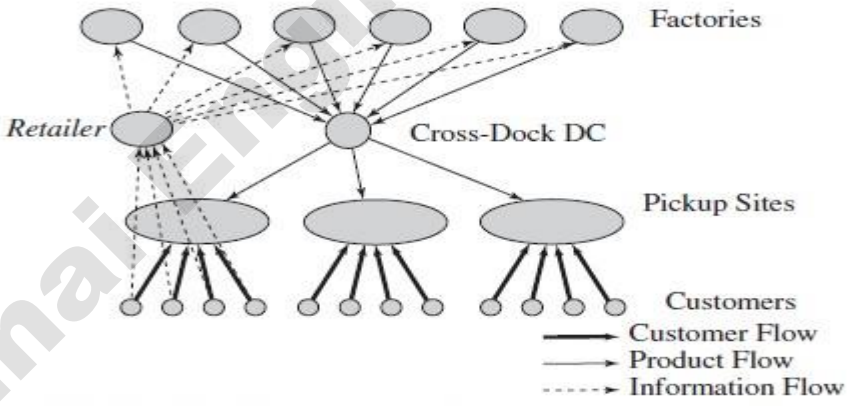


FIGURE 4-10 Manufacturer or Distributor Warehouse Storage with Consumer Pickup

- Seven-Eleven has distribution centers where product from manufacturers is cross-docked and sent to retail outlets on a daily basis.
- An online retailer delivering an order through Seven-Eleven can be treated as one of the manufacturers, with deliveries cross-docked and sent to the appropriate Seven-Eleven outlet.

- Serving as an outlet for online orders allows Seven-Eleven to improve utilization of its existing logistical assets.
- **Inventory costs** using this approach can be kept low, with either manufacturer or distributor storage to exploit aggregation.
- **Transportation cost** is lower than for any solution using package carriers because significant aggregation is possible when delivering orders to a pickup site
- Facility costs are high if new pickup sites have to be built. A solution using existing sites can lower the additional facility costs.
- **Example,** is the case with **7dream.com, Walmart, and W.W. Grainger**, for which the stores already exist. Processing costs at the manufacturer or the warehouse are comparable to those of other solutions
- The performance characteristics of manufacturer or distributor storage with consumer pickup sites are summarized in **Table 4-5.**

TABLE 4-5 Performance Characteristics of Network with Consumer Pickup Sites

Cost Factor	Performance
Inventory	Can match any other option, depending on the location of inventory.
Transportation	Lower than the use of package carriers, especially if using an existing delivery network.
Facilities and handling	Facility costs can be high if new facilities have to be built. Costs are lower if existing facilities are used. The increase in handling cost at the pickup site can be significant.
Information	Significant investment in infrastructure is required.
Service Factor	**Performance**
Response time	Similar to package carrier delivery with manufacturer or distributor storage. Same-day delivery is possible for items stored locally at pickup site.
Product variety	Similar to other manufacturer or distributor storage options.
Product availability	Similar to other manufacturer or distributor storage options.
Customer experience	Lower than other options because of the lack of home delivery. Experience is sensitive to capability of pickup location.
Time to market	Similar to manufacturer storage options.
Order visibility	Difficult but essential.
Returnability	Somewhat easier, given that pickup location can handle returns.

RETAIL STORAGE WITH CUSTOMER PICKUP

- In this option, often viewed as the most traditional type of supply chain, inventory is stored locally at retail stores.
- Customers walk into the retail store or place an order online or by phone and pick it up at the retail store.
- Examples of companies that offer multiple options of order placement include **Walmart and Tesco.**
- In either case, customers can walk into the store or order online.
- A **B2B example is W.W. Grainge**r: Customers can order online, by phone, or in person and pick up their order at one of W.W. Grainger's retail outlets
- Good response times can be achieved with this system because of local storage. For example, both **Tesco and W.W. Grainger** offer same-day pickup from their retail locations.
- Product variety stored locally is lower than that under other options.
- It is more expensive than with all other options to provide a high level of product availability.
- Customer experience depends on whether or not the customer likes to shop. **Time to market** is the highest with this option because the new product must penetrate through the entire supply chain before it is available to customers. Order visibility is extremely important for customer pickups when orders are placed online or by phone.
- Returns can be handled at the pickup site.
- Overall, **returnability** is fairly good using this option.
- The performance characteristics of a network with customer pickup sites and local retail storage are summarized in **Table 4-6.**

TABLE 4-6 Performance Characteristics of Retail Storage at Consumer Pickup Sites

Cost Factor	Performance
Inventory	Higher than all other options.
Transportation	Lower than all other options.
Facilities and handling	Higher than other options. The increase in handling cost at the pickup site can be significant for online and phone orders.
Information	Some investment in infrastructure required for online and phone orders.
Service Factor	**Performance**
Response time	Same-day (immediate) pickup possible for items stored locally at pickup site.
Product variety	Lower than all other options.
Product availability	More expensive to provide than all other options.
Customer experience	Related to whether shopping is viewed as a positive or negative experience by customer.
Time to market	Highest among distribution options.
Order visibility	Trivial for in-store orders. Difficult, but essential, for online and phone orders.
Returnability	Easier than other options because retail store can provide a substitute.

SELECTING A DISTRIBUTION NETWORK DESIGN

- In **Table 4-7,** the various delivery networks are ranked relative to one another along different performance dimensions.
- A ranking of 1 indicates the best performance along a given dimension; as the relative performance worsens, the ranking number increases.

TABLE 4-7 Comparative Performance of Delivery Network Designs

	Retail Storage with Customer Pickup	Manufacturer Storage with Direct Shipping	Manufacturer Storage with In-Transit Merge	Distributor Storage with Package Carrier Delivery	Distributor Storage with Last-Mile Delivery	Manufacturer Storage with Pickup
Response time	1	4	4	3	2	4
Product variety	4	1	1	2	3	1
Product availability	4	1	1	2	3	1
Customer experience	Varies from 1 to 5	4	3	2	1	5
Time to market	4	1	1	2	3	1
Order visibility	1	5	4	3	2	6
Returnability	1	5	5	4	3	2
Inventory	4	1	1	2	3	1
Transportation	1	4	3	2	5	1
Facility and handling	6	1	2	3	4	5
Information	1	4	4	3	2	5

Key: 1 corresponds to the strongest performance and 6 the weakest performance.

4. What are the various Distribution Network in Practice?

DISTRIBUTION NETWORK IN PRACTICE

1. The ownership structure of the distribution network can have as big an impact as the type of distribution network.

Distribution networks that have exactly the same physical flow but different ownership structures can have vastly different performance.

EXAMPLE

A manufacturer that owns its distribution network can control the network's actions. However, if the manufacturer does not own the distribution network, as is more often the case, a wide variety of issues must be taken into account to optimize over the network. Obviously, an independent distributor wants to optimize its own enterprise, not necessarily the entire supply chain. Attempting to optimize over a distribution network with multiple enterprises requires great skill in coordinating the incentives of each of the players and in creating the right relationships.

2. It is important to have adaptable distribution networks.

Distribution networks must be able to adapt to changing technology and environments. An inability to adapt can be very damaging in these times of rapid change.

EXAMPLE

Blockbuster in the movie rental business and Borders in the bookselling business had great success with a network of retail stores. Their inability to adapt to the arrival of the Internet, however, allowed competitors such as Amazon and Netflix to gain market share at their expense. If either Blockbuster or Borders had adapted to take advantage of the Internet to create a tailored distribution network, it can be argued that they could have continued their dominance. Walmart is an example of a company that, through trial and error, adapted its distribution network to take advantage of the Internet along with its existing retail store network.

3. Product price, commoditization, and criticality affect the type of distribution system preferred by customers.

Interactions between a buyer and a seller take time and resources. As a result, it is much more convenient for a buyer to deal with a single enterprise that can deliver a full line of products. For high-value, specialized, or critical products, customers are willing to have a relationship solely around that particular product. For low-value, commoditized products like office supplies, however, most customers prefer a one-stop shop. Whereas Apple has been successful with stores selling only Apple products, it is highly unlikely that a stapler manufacturer could succeed without distributing through general stationery stores. As hardware has become more commoditized, customers have shifted purchase to locations that are not manufacturer specific even for products such as computers and smartphones.

4. Integrate the Internet with the existing physical network.

To extract maximum benefit from the online channel for physical goods, firms should integrate it with their existing supply chain networks. Separating the two networks often results in inefficiencies within the supply chain. They should be coupled in a tailored manner that exploits the strengths of each channel.

5. Explain in detail about Role of Network Design in Supply Chain.

ROLE OF NETWORK DESIGN IN THE SUPPLY CHAIN

Supply chain network design decisions are classified as follows:

1. Facility role:

What role should each facility play? What processes are performed at each facility?

2. Facility location:

Where should facilities be located?

3. Capacity allocation:

How much capacity should be allocated to each facility?

4. Market and supply allocation:

What markets should each facility serve? Which supply sources should feed each facility?

Introduction

- Network design decisions have a significant impact on performance because they determine the supply chain configuration and set constraints within which the other supply chain drivers can be used either to decrease supply chain cost or to increase responsiveness

EXAMPLE

- **Toyota** has plants located worldwide, in each market that it serves.
- Before **1997**, each plant was capable of serving only its local market.
- This hurt Toyota when the Asian economy went into a **recession** in the late 1990s. The local plants in Asia had idle capacity that could not be used to serve other markets that were experiencing excess demand.
- Toyota has added flexibility to each plant to be able to serve markets other than the local one.
- This additional flexibility helps Toyota deal more effectively with changing global market conditions.
- Similarly, the **flexibility of Honda's U.S**. plants to produce both SUVs and cars in the same plant was helpful in 2008 when SUV demand dropped but small-car demand did not.

FACILITY LOCATION

- **Facility location** decisions have a long-term impact on a supply chain's performance because it is expensive to shut down a facility or move it to a different location.
- A **good location** decision can help a supply chain be responsive while keeping its costs low.
- Toyota, for example, built its first U.S. assembly plant in Lexington, Kentucky, in 1988, and has continued to build new plants in the United States since then.
- The **U.S**. plants proved profitable for Toyota when the yen strengthened and cars produced in Japan were too expensive to be cost competitive with cars produced in the United States. Local plants allowed Toyota to be responsive to the U.S. market while keeping costs low.

CAPACITY ALLOCATION

- Capacity allocation can be altered more easily than location, but capacity decisions do tend to stay in place for several years.
- Allocating too much capacity to a location results in poor utilization and, as a result, higher costs.
- Allocating too little capacity results in poor responsiveness if demand is not satisfied or high cost if demand is filled from a distant facility.

NETWORK DESIGN

- Network design decisions must be revisited as market conditions change or when two companies merge.
- For example, as its subscriber base grew, **Netflix** had 58 DCs by 2010 across the United States to lower transportation cost and improve responsiveness. With the growth in video streaming and the corresponding drop in DVD rentals, Netflix closed almost 20 DCs by the end of 2013.
- In contrast, **Amazon** increased the number of DCs in the United States from about 20 in 2009 to about 40 in 2013.
- Changing the number, location, and demand allocation of DCs with changing demand has been critical to maintaining low cost and responsiveness at both Netflix and Amazon.

CONCLUSION

- The allocation of supply sources and markets to facilities has a significant impact on performance because it affects total production, inventory, and transportation costs incurred by the supply chain to satisfy customer demand.
- This decision should be reconsidered on a **regular basis** so the allocation can be changed as production and transportation costs, market conditions, or plant capacities change.
- Of course, the allocation of markets and supply sources can be changed only if the facilities are flexible enough to serve different markets and receive supply from different sources.
- Following a merger, consolidating some facilities and changing the location and role of others can often help reduce cost and improve responsiveness bcos of the redundancies and differences in markets served by either of the 2 separate firms.

- Network design decisions may also need to be revisited if factor costs such as transportation have changed significantly.
- In 2008, **P&G** announced that it would rethink its distribution network, which was implemented when the "cost of oil was $10 per barrel."

6. How Framework for Network design decisions is implemented. Explain each phase in detail.

FRAMEWORK FOR NETWORK DESIGN DECISIONS

Global network design decisions are made in four phases, as shown in **Figure 5-2.**

Phase I : Define a Supply Chain Strategy/Design

Phase II : Define the Regional Facility Configuration

Phase III : Select a Set of Desirable Potential Sites

Phase IV **:** Location Choices

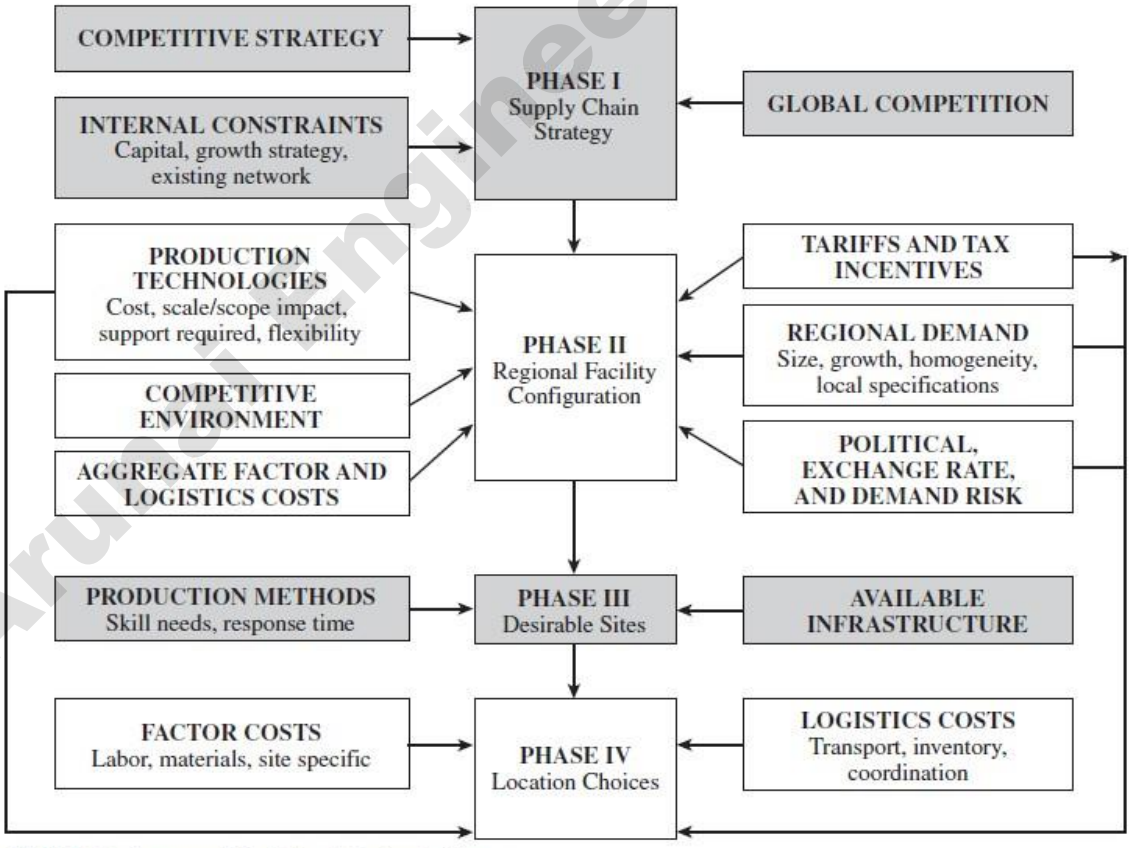


FIGURE 5-2 Framework for Network Design Decisions

Phase I: Define a Supply Chain Strategy/Design

- The objective of the first phase of network design is to define a firm's broad supply chain design.
- This includes determining the stages in the supply chain and whether each supply chain function will be performed **in-house or outsourced**
- Phase I starts with a clear definition of the firm's **competitive strategy** as the set of customer needs that the supply chain aims to satisfy.
- The supply chain strategy then specifies what capabilities the supply chain network must have to support the competitive strategy
- Next, managers must forecast the likely evolution of global competition and whether competitors in each market will be local or global players.
- **Managers** must also identify constraints on available capital and whether growth will be accomplished by acquiring existing facilities, building new facilities, or partnering.
- Based on the competitive strategy of the firm, its resulting supply chain strategy, an analysis of the competition, any economies of scale or scope, and any constraints, managers must determine the broad supply chain design for the firm.

Phase II: Define the Regional Facility Configuration

- The objective of the second phase of network design is to **identify regions** where facilities will be located, their potential roles, and their approximate capacity.
- An analysis of Phase II starts with a **forecast of the demand** by country or region.
- Such a forecast must include a **measure of the size of the demand** and a determination of the homogeneity or variability of customer requirements across different regions.
- Homogeneous requirements favor large consolidated facilities, whereas requirements that vary across countries favor flexible facilities or smaller, localized, dedicated facilities.
- The next step is for managers to identify whether economies of scale or scope can play a significant role in reducing costs, given available production technologies.
- If economies of scale or scope are significant, it may be better to have a few facilities serving many markets.

EXAMPLE

- **Semiconductor manufacturers** such as **Advanced Micro Devices** have few plants for their global markets, given the economies of scale in production.
- If economies of scale or scope are not significant, it may be better for each market to have its own facility.
- Next, **managers** must **identify demand risk**, exchange-rate risk, and political risk associated with regional markets.
- They must also identify regional tariffs, any requirements for local production, tax incentives, and any export or import restrictions for each market.
- The goal is to **design a network that maximizes** after-**tax profits**.
- Managers must identify competitors in each region and make a case for whether a facility needs to be located close to or far from a competitor's facility. The desired response time for each market and logistics costs at an aggregate level in each region must also be identified.

Phase III: Select a Set of Desirable Potential Sites

- The objective of Phase III is to **select a set of desirable potential sites** within **each region** where facilities are to be located.
- Sites should be selected based on an analysis of infrastructure availability to support the desired production methodologies.
- **Hard infrastructure** requirements include the availability of suppliers, transportation services, communication, utilities, and warehousing facilities.
- **Soft infrastructure** requirements include the availability of a skilled workforce, workforce turnover, and the community receptivity to business and industry

Phase IV: Location Choices

- The objective of Phase IV is to **select, from among the potential sites, a precise location** and capacity allocation for each facility.
- The network is designed to maximize total profits, taking into account the expected margin and demand in each market, various logistics and facility costs, and the taxes and tariffs at each location.

UNIT III

UNIT III LOGISTICS IN SUPPLY CHAIN 9

Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation.

PART A

1. What is the role of transportation in supply chain?

   Transportations refers to movement of products from one location to another as its makes it way from the beginning of SC to customer's hand.
   Its play an important role since the products are rarely produced and consumed in the same location.
   Freight transportation cost is high (6% American's GDP-1997)
   Transportation is a significant link between different stages in a global supply chain.
   Example:
   Wal-Mart,
   7-Eleven, Matahari Dept. Store, Ramayana, Hero Super Market, etc.

2. List the modes of transportation done in supply chain.
   - Air
   - Package carriers
   - Truck
   - Rail
   - Water
   - Pipeline
   - Intermodal

3. Discuss the key issues in air transportation.

   Key issues
   - Location/number of hubs
   - Fleet assignment
   - Maintenance schedules
   - Crew scheduling
   - Prices and availability

4. Discuss the pros and cons in direct shipping.

   Pros:
   No intermediate warehouse Simple to coordinate
   Cons:
   High inventories (due to large lot size)
   Significant receiving expense

5. Discuss the role of IT in transportation?
   - The complexity of transportation decisions demands use of IT systems
   - IT software can assist in:
     a. Identification of optimal routes by minimizing costs subject to delivery constraints
     b. Optimal fleet utilization
     c. GPS applications

6. What is meant by shipper & carrier?

Shipper is the person or company who is usually the supplier or owner of commodities shipped. Also called Consignor.

Carrier is a person or company that transports goods or people for any person or company and that is responsible for any possible loss of the goods during transport.

7. Define trade-off in transportation design.
   - All transportation decision in SC must be made taking into account their impact on: inventory cost, facility and processing cost, cost of coordinating operation, as well as the level of responsiveness provided to customers.
   - Manager must consider trade-off:
     a. Transportation and inventory cost
     b. Transportation and customer responsiveness

8. Discuss the merits and demerits of water carrier.

Merits:
Larger Capacity
Flexible Service
Safety
Flexible Service
Low Cost
Less Maintenance Cost
Useful During Natural Calamities

Demerits:
Slow Speed
More Risky

9. What are the risks to be considered in transportation?
   - Three main risks to be considered in transportation are
     1. Risk that the shipment is delayed
     2. Risk of disruptions
     3. Risk of hazardous material
   - Risk mitigation strategies
     – Decrease the probability of disruptions
     – Alternative routings
     – In case of hazardous materials the use of modified containers, low-risk transportation models, modification of physical and chemical properties can prove to be effective.

10. What are all the decisions in practice for making in transportation?
    1. Align transportation strategy with competitive strategy
    2. Consider both in-house and outsourced transportation
    3. Use technology to improve transportation performance
    4. Design flexibility into the transportation network.

11. What is tailored transportation?

Tailored transportation is the use of different transportation modes and networks based on product and customer characteristics. Most firms sell a variety of products and servemany different customer segments.

12. What are the Trade-offs in Transportation Design?

Transportation and inventory cost trade-off Choice of transportation mode

Inventory aggregation

Transportation cost and responsiveness trade-off.

13. Define milk run transport.

A **Milk Run** is a delivery method used to **transport** mixed loads from various suppliers to one customer. Instead of each supplier sending a truck every week to meet the needs of one customer, one truck (or vehicle) visits the suppliers to pick up the loads for that customer.

14. What is Cross-docking?

Cross-docking is a logistics strategy when carrier immediately unloads the cargo from an incoming container and then loads it directly to an outbound carrier. It is a practice that keeps supply chains moving in a productive, effective manner.

15. What are the Design Options for a Transportation Network?

1. Direct shipping network
2. Direct shipping with Milk Runs:
3. All shipment via central DC
4. Shipping via DC using Milk Runs

16. What are the Factors affecting Shippers decision?

Transportation cost
Inventory cost
Facility cost
processing cost
Service level cost

17. What are the Factor affecting carrier decision?

Vehicle related cost
Fixed operating cost
Trip-related cost
Quality related cost
Overhead cost.

18. Define Intermodal.

Intermodal freight is products and raw materials that are transported in a container by a variety of vehicles such as container ships, semi-trailer trucks, and trains.

19. Define routing in transportation.

Routing (also called route planning) can be defined as the process of creating the most cost-effective route by minimizing distance or traveled time necessary to reach a set of planned stops.

20. Define Scheduling in transportation.

Scheduling involves taking orders or service requests, determining how many employees you need to have working to cover those orders, and assigning workers to orders during specific times.

PART B

1. Discuss the role of transportation in supply chain

Four parties in transportation

Transportation refers to the movement of product from one location to another as it makes its way from the beginning of a supply chain to the customer.
The four parties involved in transportation are the shipper, carrier, owner and operator and regulatory bodies.

1. The shipper is the party that requires the movement of the product between two points in the supply chain.
2. The carrier is the party that moves or transports the product.
3. The owners and operators of transportation infrastructure such as roads, ports, canals, and airports.
4. The bodies that set transportation policy worldwide.

Perspectives of the four parties

- A carrier makes investment decisions regarding the transportation equipment (locomotives, trucks, airplanes, etc.) and in some cases infrastructure (rail)
- Then makes operating decisions to try to maximize the return from these assets.
- A shipper, uses transportation to minimize the total cost (transportation, inventory, information, sourcing, and facility) while providing an appropriate level of responsiveness to the customer.
- The effectiveness of carriers is influenced by infrastructure such as ports, roads, waterways, and airports.
- Most transportation infrastructure throughout the world is owned and managed as a public good.
- It is important that infrastructure be managed in such a way that monies are available for maintenance and investment in further capacity as needed.
- Transportation policy sets direction for the amount of national resources that go into improving transportation infrastructure.
- Transportation policy also aims to prevent abuse of monopoly power; promote fair competition; and balance environmental, energy, and social concerns in transportation.

Modes of Transportation

- The effectiveness of any mode of transport is affected by
  1. Equipment investments
  2. Operating decisions by the carrier
  3. Available infrastructure
  4. Transportation policies.
- The carrier's primary objective is to ensure good utilization of its assets while providing customers with an acceptable level of service.

Example:

1. FedEx designed a hub-and-spoke airline network for transporting packages to provide fast, reliable delivery times.
2. UPS uses a combination of aircrafts, rail, and trucks to provide less expensive transportation with somewhat longer delivery times.

FedEx next day delivery charges are based primarily on package size.
UPS charges based on both size and destination.
From a supply chain perspective,

- A hub-and-spoke air network is more appropriate when prices are independent of destination and rapid delivery is important, whereas
- A trucking network is more appropriate when prices vary with destination and a somewhat slower delivery is acceptable.

2. Explain the different Modes of Transportation and their Performance Characteristics

- Air
- Package carriers
- Truck
- Rail
- Water
- Pipeline
- Intermodal

Air

- Cost components
  - Fixed infrastructure and equipment
  - Labor and fuel
  - Variable – passenger/cargo
- Key issues
  - Location/number of hubs
  - Fleet assignment
  - Maintenance schedules
  - Crew scheduling
  - Prices and availability

Package Carriers

- Small packages up to about 150 pounds
- Expensive
- Rapid and reliable delivery
- Small and time-sensitive shipments
- Provide other value-added services
- Consolidation of shipments a key factor

Truck

- Significant fraction of the goods moved
- Truckload (TL)
  - Low fixed cost
  - Imbalance between flows
- Less than truckload (LTL)
  - Small lots
  - Hub and spoke system
  - May take longer than TL

Rail

- Move commodities over large distances
- High fixed costs in equipment and facilities
- Scheduled to maximize utilization
- Transportation time can be long

– Trains 'built' not scheduled

Water

- Limited to certain geographic areas
- Ocean, inland waterway system, coastal waters
- Very large loads at very low cost
- Slowest
- Dominant in global trade
- Containers

Pipeline

- High fixed cost
- Primarily for crude petroleum, refined petroleum products, natural gas
- Best for large and stable flows
- Pricing structure encourages use for predicable component of demand

Intermodal

- Use of more than one mode of transportation to move a shipment
- Grown considerably with increased use of containers
- May be the only option for global trade
- More convenient for shippers – one entity
- Key issue – exchange of information to facilitate transfer between different modes

3. Discuss the Factors affecting transportation decisions

- Two key players:
  - Shipper: requires the movement of products
  - Carrier : move or transport the products

- Factor to be considered varies depending on perspective: shipper or carrier

- Factor affecting carrier decision:
  - Vehicle related cost
  - Fixed operating cost
  - Trip-related cost
  - Quality related cost
  - Overhead cost

- A Carrier decision also affected by the responsiveness it seeks to provide its target segment and the price.

- Example:
  - Fed ex
  - UPS
  - PT POS Indonesia
  - TIKI, etc

- Factors affecting Shippers decision
  - Transportation cost
  - Inventory cost
  - Facility cost
  - Processing cost
  - Service level cost

We should also consider:

- ✓ The owners of the infrastructure (Ports, highways, railroads)
- ✓ Government and/or bodies that set worldwide transportation policy

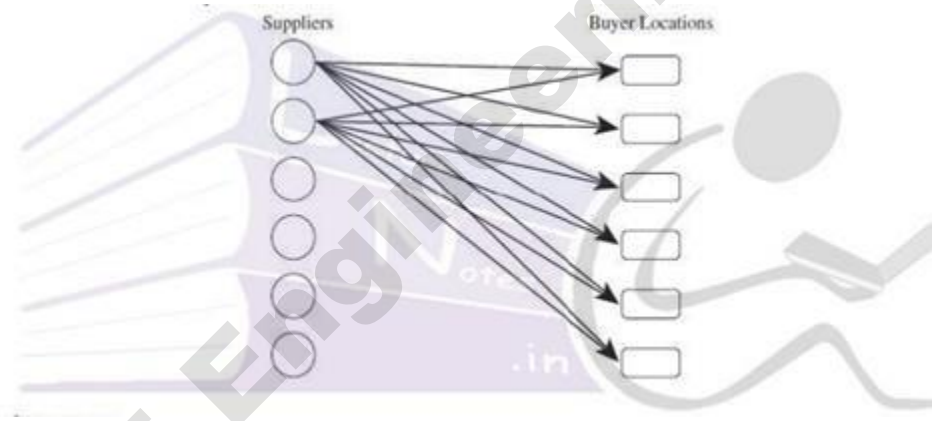
4. Explain Design options for a transportation network

DESIGN OPTIONS FOR A TRANSPORTATION NETWORK

- Affects the performance of a supply chain by establishing the infrastructure within which operation transportation decisions regarding scheduling and routing are made.
- Helps to achieve desired degree of responsiveness at a low cost.
- Three basic questions need to be considered when designing a transportation network:
  1. Should transportation be direct or through an intermediate site?
  2. Should the intermediate site stock product or only serve as a cross-docking location?
  3. Should each delivery route supply a single destination or multiple destinations (milk run)?

Direct Shipment Network

- The buyer structures his transportation network so that all shipments come directly from each supplier to each buyer location.
- Supply chain manager only needs to decide on the quantity to ship and the mode of transportation to use.



Advantage

- Elimination of intermediate warehouses
- Simplicity of operation and coordination

Disadvantage

- Tends to be costlier for smaller buyer locations
- High fixed cost of each truck results in large lots moving
- Receiving costs are also high

Features

- Decision is completely local
- Decision made for one shipment does not influence others.
- Transportation time is short.
- Justified if demand is closer to a TL.

Direct Shipping with Milk Run

- A milk run is a route on which a truck either delivers product from a single supplier to multiple retailers or goes from multiple suppliers to single buyer location.
- SC manager has to decide on the routing of each milk run.
- In Japan, Toyota has many assembly plants located close together (milk run from a single supplier)

- In the USA, Toyota uses milk runs from many suppliers to each assembly plant.

Advantages

Lowers transportation cost by consolidating shipments

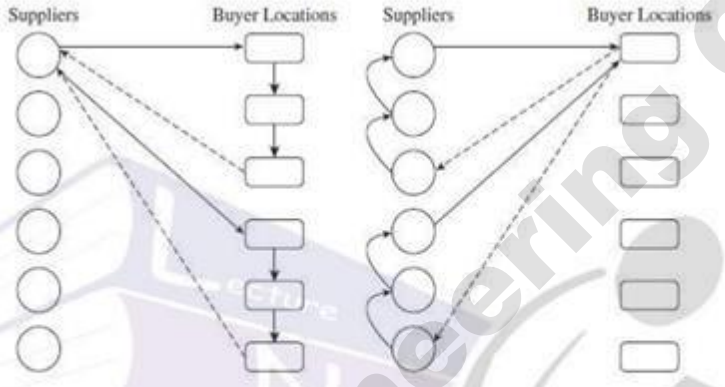
- Better utilisation of the truck

When to use

- If very frequent small deliveries are needed on a regular basis and either a set of suppliers or a set of retailers is in geographic proximity.

Nandini Milk

- ✓ From collection centres to milk processing centre
- ✓ From milk processing centre to milk depots



Milk Runs from Multiple Suppliers or to Multiple Buyer Locations

ALL SHIPMENT VIA CENTRAL DC

- Suppliers do not send shipment directly to buyer locations
- The buyer divides locations by geographic region and a DC is built for each region.
- Supplier send their shipments to the DC and DC then forward appropriate shipments to each buyer location.

DC is an extra layer between suppliers and buyer locations

Two Roles: i) Storage location ii) transfer location

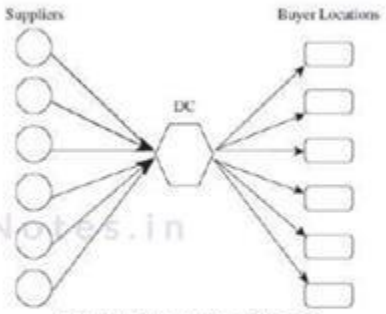
All Shipments via Intermediate Distribution Center with Storage

- **Storage location:** If the lot size on the inbound side is much larger than the sum of the lot sizes for the stores served by the DC.
- Suppliers send their shipments to a central distribution centre
- Stored until needed by buyers
- Shipped to each buyer location

Importance of DC

- The presence of DCs can help reduce supply chain costs when suppliers are located far from the buyer locations and transportation costs are high.
- The presence of a DC allows a supply chain to achieve EoS for inbound transportation to a point close to the final destination (Each supplier sends a large shipment to the DC that contains product for all locations).

- DC holds inventory and send product to buyer locations in smaller replenishment lots (E.g. Walmart sources large volumes from an overseas supplier).



All Shipments via DC

All Shipments via Intermediate Transit Point with Cross-Docking

- **Transfer location (Cross Docking):** If the replenishment lots for the buyer locations served by a DC are large enough to achieve EoS on inbound transportation
- Suppliers send their shipments to an intermediate transit point
- They are cross-docked and sent to buyer locations without storing them
- The DC can cross-dock product arriving from many suppliers on inbound trucks by breaking each inbound shipment into smaller shipments that are then loaded onto trucks going to each buyer location.
- The total shipment from all the suppliers to DC = sum of the requirements of the retailers.
- When a DC cross-docks product, each inbound truck contains product from a supplier for several buyer locations
- Whereas each outbound truck contains product for a buyer location from several suppliers

Benefit

- Little inventory has to be held and product flows faster in the supply chain
- Saves on handling cost because product does not have to be moved into and out of storage.

Issues

- Successful cross-dock requires a significant degree of coordination and synchronisation between the incoming and outgoing shipments

Appropriateness

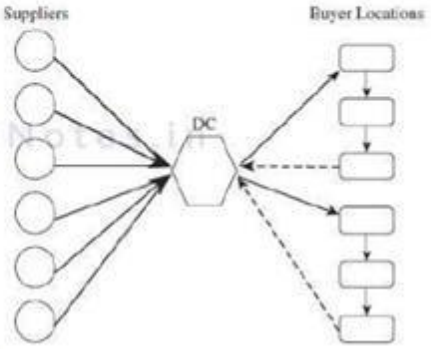
- For products with large predictable demands and requires that DCs be set up such that EoS in transportation are achieved on both the inbound and outbound sides.
- E.g. Walmart, Big Bazaar

Advantage

- DC allows SC to achieve EoS for inbound transportation to a point close to the final destination
- Reason: Each supplier sends a large shipments to the DC that contains product for all locations the DC serves
- Outbound transportation cost is not large

Shipping via DC using Milk Run

- Milk runs can be used from a DC if lot sizes to be delivered to each buyer location are small. Milk runs reduce out bound transportation costs by consolidating small shipments.
- E.g. @Fresh, More.



Tailored Network

- Tailored network transportation uses a combination of cross-docking, milk Runs, TL and LTL carriers and package carriers in some cases.
- Goal is to reduce the cost and improves responsiveness
- High-demand products to high-demand retail outlets may be shipped directly.
- Low-demand products or shipments to low-demand retail outlets are consolidated to and from the DC.
- The complexity of managing is high (different shipping procedures are used for each product and retail outlet).
- Requires significant investment in information infrastructure to facilitate the coordination

Pros and Cons of Different Transportation Networks

Transportation Network	Pros	Cons
Direct Shipment Network	✓ No intermediate W/H house. ✓ Simple to coordinate	✓ High inventories. ✓ Significant receiving expense
Direct Shipping With Milk Runs	✓ Lower transportation costs for small lots ✓ Lower inventories	✓ Increased coordination complexity
All Shipment via Central DC with inventory storage	✓ Lower inbound transportation cost through consolidation	✓ Increased inventory cost and increase handling at DC
All Shipment via Central DC with cross-dock	✓ Very low inventory requirement and lower transportation cost through consolidation.	✓ Increased Coordination complexity
Shipping via Dc Using Milk Runs	✓ Lower out bound transportation cost for small lots.	✓ Further increase in coordination complexity.
Tailored Network	✓ Transportation choice best matches needs of individual product and store.	✓ Highest coordination complexity

Trade-offs in Transportation Design

- Transportation decisions must take into account their impact on inventory costs, facility and processing cost, the cost of coordination and the level of responsiveness (E.g. Dell).
- Transportation and inventory cost trade-off
  - Choice of transportation mode
  - Inventory aggregation
- Transportation cost and responsiveness trade-off

5. Discuss tailored transportation in brief

Tailored Transportation

- The use of different transportation networks and modes based on customer and product characteristics
- Factors affecting tailoring:
- Customer distance and density
- Customer size
- Product demand and value

Transportation options based on customer density and distance

	Short Distance	Medium Distance	Long Distance
High Density	Private fleet with milk run	Cross-Dock with milk runs	Cross-Dock with milk runs
Medium Density	Third-party milk runs	LTL carrier	LTL or package carrier
Low Density	Third-party milk runs or LTL carrier	LTL or package carrier	Package carrier

Aggregation Strategies based on value/demand

Product	High value	Low value
High Demand	✓ Disaggregate cycle inventory. ✓ Aggregate safety inventory. ✓ Inexpensive mode of transportation for replenishing cycle inventory and ✓ Fast mode when using safety inventory	✓ Disaggregate all inventories and use inexpensive mode of transportation for replenishment

Product	High value	Low value
Low Demand	✓ Aggregate all inventories. ✓ If needed, use fast mode of transportation for filling customer orders.	✓ Aggregate only safety inventories. ✓ Use inexpensive mode of transportation for replenishing cycle inventory

6. Discuss the role of IT in transportation & risk management in transportation

Role of IT in Transportation

- Temporal aggregation is the process of combining orders across time
- The complexity of transportation decisions demands to use of IT systems
- IT software can assist in:
- Identification of optimal routes by minimizing costs subject to delivery constraints
- Optimal fleet utilization
- GPS applications

Risk Management in Transportation

- Three main risks to be considered in transportation are:
- Risk that the shipment is delayed
- Risk of disruptions
- Risk of hazardous material
- Risk mitigation strategies:
- Decrease the probability of disruptions
- Alternative routings
- In case of hazardous materials the use of modified containers, low-risk transportation modes, modification of physical and chemical properties can prove to be effective

7. Explain in detail about routing and scheduling in transportation

The Distribution center manager must first assign customers to be served by each vehicle and then decide on each vehicle's route. After the initial assignment, route sequencing and route improvement procedures are used to decide on the route for each vehicle. The DC manager decides to use the following computational procedures to support his decision:

- The savings matrix method
- The generalized assignment method

The savings matrix method

This method is simple to implement and can be used to assign customers to vehicles even when delivery time windows or other constraints exist.
The major steps in the savings matrix method are:

1. Identify the distance matrix.

$$\text{Dist}(A,B) = \sqrt{(x_A - x_B)^2 + (y_A - y_B)^2}.$$

2. Identify the savings matrix.

$$S(x,y) = Dist(\text{DC}, x) + Dist(\text{DC}, y) - Dist(x, y).$$

3. Assign customers to vehicles or routes.
4. Sequence customers within routes.

The generalized assignment method

The generalized assignment method is more sophisticated than the savings matrix method and usually results in better solutions when there are few delivery constraints to be satisfied. The procedure for routing and sequencing of vehicles consists of the following steps:

1. Assign seed points for each route.
2. Evaluate insertion cost for each customer.
3. Assign customers to routes.
4. Sequence customers within routes.

Need for planning transport

- Balance between cost & customer service
- Maximise vehicle assets at minimum cost
- Meet customer service expectations
- Manage drivers safely & efficiently
- Vehicle maintenance & replacement
- Security of goods
- Track & trace

Role of fleet management

Needed for long term reliability of vehicles

Consists of:

- Maintenance scheduling
- Fleet administration
  - Maintenance records, licensing, insurance etc
- Fleet costing
  - Vehicle & driver cost analysis

Use data to manage fleet cost effectively

Difference between routing & scheduling

Scheduling method

- How loads are organised to meet customer service expectations

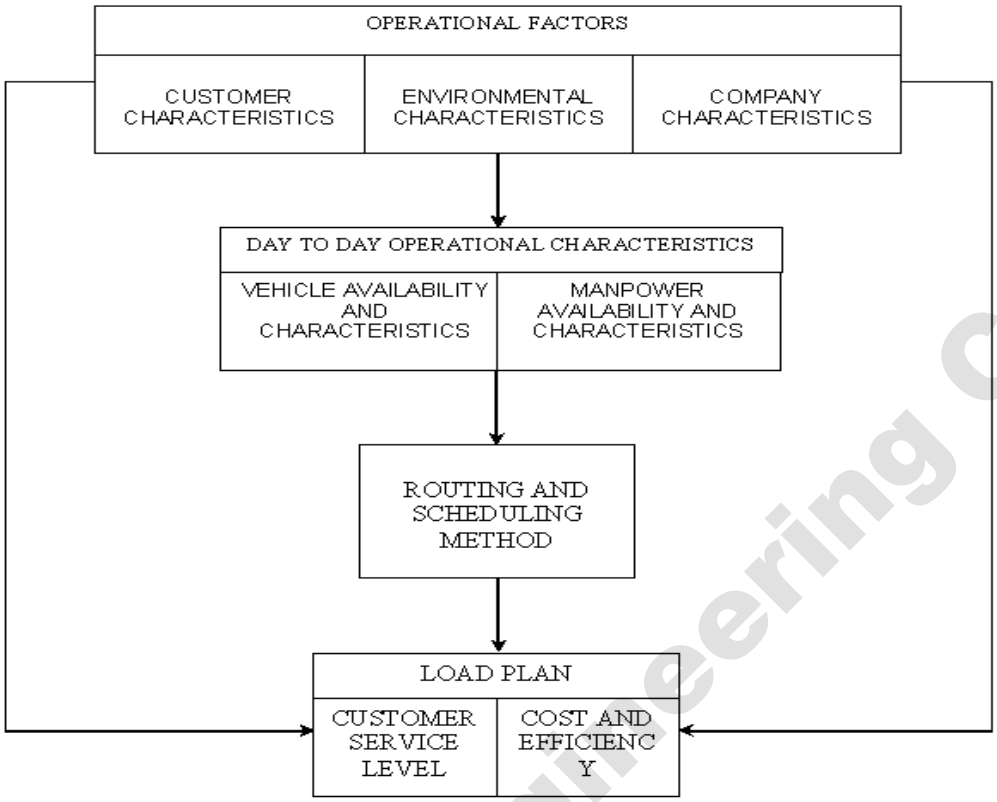
Routing principle

- The principle used to match the scheduled load to the geography

Trunking & stem mileage principles

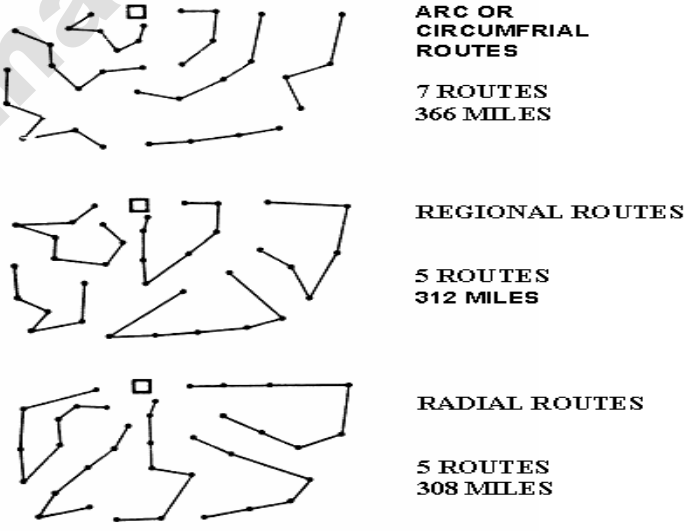
- Combining different routing principles eg hub

Routing & scheduling choices



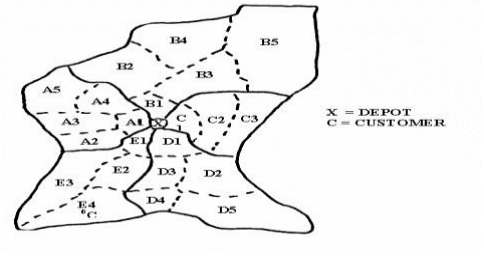
Routing principles

- ARC or CIRCUMFERAL routes, which link customers in an arc shape at various distances from the depot.
- AREA routes, which link customers in concentrated areas.
- RADIAL routes, which link customers along radial patterns to and from the depot.

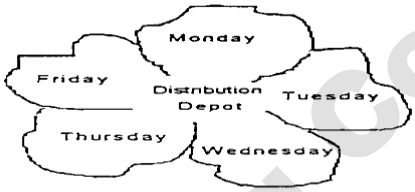


Scheduling principles

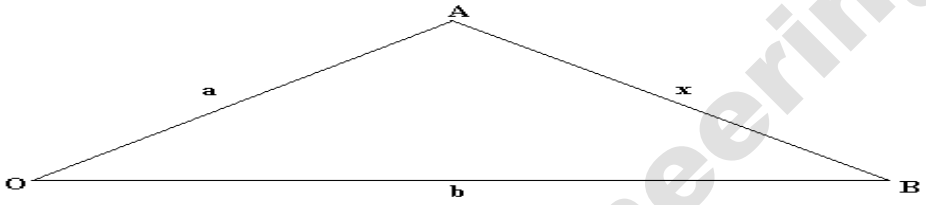
- Simplified delivery system
  - Consolidation in small geographical area
- The petal method
  - Milk runs & set delivery days
- The savings method
  - Deliver goods enroute



SDS



Petal



Savings

Vehicle scheduling & routing Objectives

- Maximise payload
- Maximise utilisation
- Minimise distance
- Minimise time

Constraints

- Meeting customer requirements
- Meeting legal requirements

List of loads to be delivered to include:

- Geographical address to the postcode level
- Any physical unloading restraints
  - Loading bay is very low, small vehicles only
- Any customer service constraints
  - Closed for lunch break, delivery day and time
- Vehicle resources available to load
- Routing method

UNIT IV

SOURCING AND COORDINATION IN SUPPLY CHAIN

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration-sourcing planning and analysis- supply chain co-ordination – Bull Whip effect – Effect- Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

PART A

1. **What is role of sourcing chain?**
   Sourcing is the entire set of business processes required to purchase goods and services. If you are in **supply chain** field, you should know that it's a major decision whether you outsource your production/**function** or perform in-house. **Outsourcing** results in the **supply chain** functions being performed by a third party.

2. **What are the benefits of Effective Sourcing Decisions?**
   - Better economies of scale can be achieved if orders are aggregated
   - More efficient procurement transactions can significantly reduce the overall cost of purchasing
   - Design collaboration can result in products that are easier to manufacture and distribute, resulting in lower overall costs
   - Good procurement processes can facilitate coordination with suppliers
   - Appropriate supplier contracts can allow for the sharing of risk
   - Firms can achieve a lower purchase price by increasing competition through the use of auctions

3. **What are the Sourcing processes include?**
   a. Outsource or perform in-house
   b. Supplier scoring and assessment
   c. Supplier selection and contract negotiation
   d. Design collaboration
   e. Procurement
   f. Sourcing planning and analysis

4. **Define Sealed-bid first-price auctions.**
   A **first-price sealed-bid auction** (FPSBA) is a common type of **auction**. It is also known as blind **auction**. In this type of **auction**, all bidders simultaneously submit **sealed bids** so that no bidder knows the **bid** of any other participant. The highest bidder pays the **price** that was submitted.

5. **Define English auctions.**
   An **English auction** is a process of selling goods and the most common form of **auction**. The price starts low and increases as buyers bid for the item until one buyer is left willing to pay a certain amount and a higher bid isn't received during the given time period.

6. **Define Dutch auctions.**
   A **Dutch auction** is a public offering **auction** structure in which the price of the offering is set after taking in all bids to determine the highest price at which the total offering can be sold. In this type of **auction**, investors place a bid for the amount they are willing to buy in terms of quantity and price

7. **Define Second-price (Vickery) auctions.**
   A **Vickrey auction** is a type of sealed-bid **auction**. Bidders submit written bids without knowing the bid of the other people in the **auction**. The highest bidder wins but the **price** paid is the **second**-highest bid.

8. **What is Buyback Contracts?**
   A **buyback** is a **contract** provision in which the seller agrees outright to **repurchase** the item or property at a predetermined price if or when a particular event occurs.

9. **What is Revenue-Sharing Contracts?**
   Under a **revenue-sharing contract**, a retailer pays a supplier a wholesale price for each unit purchased, plus a percentage of the **revenue** the retailer generates. Such **contracts** have become more prevalent in the videocassette rental industry relative to the more conventional wholesale price **contract**.

10. **What is Quantity Flexibility Contracts?**
    The **Quantity Flexibility** (QF) **contract** is a method for coordinating materials and information flows in supply chains operating under rolling-horizon planning. It stipulates a maximum percentage revision each element of the period-by-period replenishment schedule is allowed per planning iteration.

11. **What is Design collaboration?**

Design Collaboration

- 50-70 percent of spending at a manufacturer is through procurement
- 80 percent of the cost of a purchased part is fixed in the design phase
- Design collaboration with suppliers can result in reduced cost, improved quality, and decreased time to market
- Important to employ design for logistics, design for manufacturability
- Manufacturers must become effective design coordinators throughout the supply chain

12. Define Procurement Process

The process in which the supplier sends product in response to orders placed by the buyer
Goal is to enable orders to be placed and delivered on schedule at the lowest possible overall cost
Two main categories of purchased goods:

- Direct materials: components used to make finished goods
- Indirect materials: goods used to support the operations of a firm
- Differences between direct and indirect materials listed in Table 13.2

Focus for direct materials should be on improving coordination and visibility with supplier
Focus for indirect materials should be on decreasing the transaction cost for each order
Procurement for both should consolidate orders where possible to take advantage of economies of scale and quantity discounts

13. What is Sourcing Planning and Analysis?

Sourcing Planning and Analysis

A firm should periodically analyze its procurement spending and supplier performance and use this analysis as an input for future sourcing decisions
Procurement spending should be analyzed by part and supplier to ensure appropriate economies of scale
Supplier performance analysis should be used to build a portfolio of suppliers with complementary strengths

- Cheaper but lower performing suppliers should be used to supply base demand
- Higher performing but more expensive suppliers should be used to buffer against variation in demand and supply from the other source

14. Define supply chain co-ordination.

Channel **coordination** (or **supply chain coordination**) aims at improving **supply chain** performance by aligning the plans and the objectives of individual enterprises. It usually focuses on inventory **management** and ordering decisions in distributed inter- company settings.

15. What is Bull Whip effect?

The **bullwhip effect** refers to the phenomenon where order variability increases as the orders move upstream in the supply chain. This paper provides a review of the **bullwhip** literature which adopts empirical, experimental and analytical methodologies. Early econometric evidence of **bullwhip** is highlighted.

16. What are the obstacles to coordination in a supply chain?

- Incentive obstacles
- Information processing obstacles
- Operational obstacles
- Pricing obstacles
- Behavioral obstacles

PART B

1. Explain briefly about the Role of Sourcing in a Supply Chain.

The Role of Sourcing in a Supply Chain

Sourcing:

- Sourcing is the entire set of business processes required to purchase goods and services.
- The most significant decision is outsource or perform in-house.
- Outsourcing results in the supply chain function performed by a third party.
    a. Will the third party increase the supply chain surplus relative to performing the activity in house?
    b. To what extend do risks grow upon outsourcing?

Sourcing Processes

Once the outsourcing decision is made, sourcing processes include:

- Outsource or perform in-house
- Supplier scoring and assessment
- Supplier selection and contract negotiation
- Design collaboration
- Procurement
- Sourcing planning and analysis

Basic Principles of Negotiation

- Sometimes a third party is identified to perform a SC function and firm starts negotiation with them.
- Negotiation is likely to result in a positive outcome if the value the buyer places on outsourcing to this supplier is at least as large as the value the supplier places on performing the function for the buyer.
- The difference between the values of the buyer and seller is the bargaining surplus. Recommendations:
    - Buyer should have a clear idea of its own value and a good estimate of the Supplier's value.
    - Look for a fair outcome based on evenly dividing the bargaining surplus.
    - To have a win-win outcome, introduce more than one issue to negotiate.

Benefits of Effective Sourcing Decisions

- Better economies of scale can be achieved if orders are aggregated
- More efficient procurement transactions can significantly reduce the overall cost of purchasing
- Design collaboration can result in products that are easier to manufacture and distribute, resulting in lower overall costs
- Good procurement processes can facilitate coordination with suppliers
- Appropriate supplier contracts can allow for the sharing of risk
- Firms can achieve a lower purchase price by increasing competition through the use of auctions

2. Explain briefly about Sourcing Processes.

Sourcing Processes

Sourcing processes include:

- Outsource or perform in-house
- Supplier scoring and assessment
- Supplier selection and contract negotiation
- Design collaboration
- Procurement
- Sourcing planning and analysis

1) Outsource or perform in-house

In-house or Outsource How do third parties increase surplus?

Third parties increase the SC surplus effectively if they are able to aggregate SC assets or flows to a higher level than a firm itself!

- Capacity aggregation
- Inventory aggregation
- Transportation aggregation by transportation intermediaries
- Transportation aggregation by storage intermediaries
- Warehousing aggregation
- Procurement aggregation
- Information aggregation
- Receivables aggregation
- Relationship aggregation
- Lower costs and higher quality

In-house or Outsource Risks of Using a Third Party

- The process is broken
- Underestimation of the cost of coordination
- Reduced customer supplier contact
- Loss of internal capability and growth in third party power
- Leakage of sensitive data and information
- Ineffective contracts

2) Supplier Scoring and Assessment

Supplier performance should be compared on the basis of the supplier's impact on total cost. There are several other factors besides purchase price that influence total cost.

- Replenishment Lead Time
- On-Time Performance
- Supply Flexibility
- Delivery Frequency / Minimum Lot Size
- Supply Quality
- Inbound Transportation Cost
- Pricing Terms
- Information Coordination Capability

- Design Collaboration Capability
- Exchange Rates, Taxes, Duties
- Supplier Viability

The impact of Supplier Performance Factors on Total Cost

	Purchase Price of Component	Inventory		Transportation Cost	Production Introduction Time
		Cycle	Safety		
Replenishment lead time			X		
On-time performance			X		
Supply flexibility			X		
Delivery frequency		X	X	X	
Supply quality	X		X		
Inbound transport cost				X	
Pricing terms	X	X			
Information coordination			X	X	
Design collaboration	X	X	X	X	X
Exchange rates and taxes	X				
Supplier viability			X		X

3) <u>Supplier selection and contract negotiation</u>

- Supplier selection can be performed through offline competitive bids, reverse auctions, and direct negotiations
- Supplier evaluation is based on total cost of using a supplier and not just the purchase price.
- A buyer is better off with a multi-attribute auction but buyers usually set specifications on various attributes and use a price-only auction.
- Auctions:

(i) Sealed-bid first-price auctions
(ii) English auctions
(iii) Dutch auctions
(iv) Second-price (Vickery) auctions

Identifying the auction to use

- The firm wants to minimize the price it pays; however the suppliers may make false bids that are not consistent with their cost structure!
- In sealed bidds the winner realizes that it could have raised its bid and still win, thus he has left money on the table which is referred to as winner's curse. This causes it to adjust its initial bid higher.
- Factors that influence the performance of an auction:
  - Is the supplier's cost structure private?
  - Are suppliers symmetric (expected to have similar cost structures)
  - Do suppliers have all the information for a precise cost estimation?
  - Does the buyer specify a maximum price it is willing to pay for the SC?
- If suppliers are symmetric with costs that are independent and correlated, English auction is likely to provide the lowest price for the buyer.
- Under auction mechanisms (with symmetric bidders) the buyer pays less if all information are revealed.

- Auctioneers must try to avoid collusion among bidders.
  - Second price auctions are vulnerable to collusion among bidders.
  - Collusion results in increased bidds in multiunit auctions where each unit is supplied at a different price, i.e., multiunit Dutch auction and multiunit English auction (or uniform price auction).

4) Contracts and Supply Chain Performance

a) Contracts for Product Availability and Supply Chain Profits
   (i) Buyback Contracts
   (ii) Revenue-Sharing Contracts
   (iii) Quantity Flexibility Contracts
b) Contracts to Coordinate Supply Chain Costs
c) Contracts to Increase Agent Effort
d) Contracts to Induce Performance Improvement

a) Contracts for Product Availability and Supply Chain Profits

- Many shortcomings in supply chain performance occur because the buyer and supplier are separate organizations and each tries to optimize its own profit
- Total supply chain profits might therefore be lower than if the supply chain coordinated actions to have a common objective of maximizing total supply chain profits
- Recall Chapter 10: double marginalization results in suboptimal order quantity
- An approach to dealing with this problem is to design a contract that encourages a buyer to purchase more and increase the level of product availability
- The supplier must share in some of the buyer's demand uncertainty, however

(i) Buyback Contracts

- Allows a retailer to return unsold inventory up to a specified amount at an agreed upon price
- Increases the optimal order quantity for the retailer, resulting in higher product availability and higher profits for both the retailer and the supplier
- Most effective for products with low variable cost, such as music, software, books, magazines, and newspapers
- Downside is that buyback contract results in surplus inventory that must be disposed of, which increases supply chain costs
- Can also increase information distortion through the supply chain because the supply chain reacts to retail orders, not actual customer demand

(ii) Revenue Sharing Contracts

- The buyer pays a minimal amount for each unit purchased from the supplier but shares a fraction of the revenue for each unit sold
- Decreases the cost per unit charged to the retailer, which effectively decreases the cost of overstocking
- Can result in supply chain information distortion, however, just as in the case of buyback contracts

(iii) Quantity Flexibility Contracts

- Allows the buyer to modify the order (within limits) as demand visibility increases closer to the point of sale
- Better matching of supply and demand
- Increased overall supply chain profits if the supplier has flexible capacity
- Lower levels of information distortion than either buyback contracts or revenue sharing contracts

b) Contracts to Coordinate Supply Chain Costs

- Differences in costs at the buyer and supplier can lead to decisions that increase total supply chain costs
- Example: Replenishment order size placed by the buyer. The buyer's EOQ does not take into account the supplier's costs.
- A quantity discount contract may encourage the buyer to purchase a larger quantity (which would be lower costs for the supplier), which would result in lower total supply chain costs
- Quantity discounts lead to information distortion because of order batching

c) Contracts to Increase Agent Effort

- There are many instances in a supply chain where an agent acts on the behalf of a principal and the agent's actions affect the reward for the principal
- Example: A car dealer who sells the cars of a manufacturer, as well as those of other manufacturers
- Examples of contracts to increase agent effort include two-part tariffs and threshold contracts
- Threshold contracts increase information distortion, however

d) Contracts to Induce Performance Improvement

- A buyer may want performance improvement from a supplier who otherwise would have little incentive to do so
- A shared savings contract provides the supplier with a fraction of the savings that result from the performance improvement
- Particularly effective where the benefit from improvement accrues primarily to the buyer, but where the effort for the improvement comes primarily from the supplie

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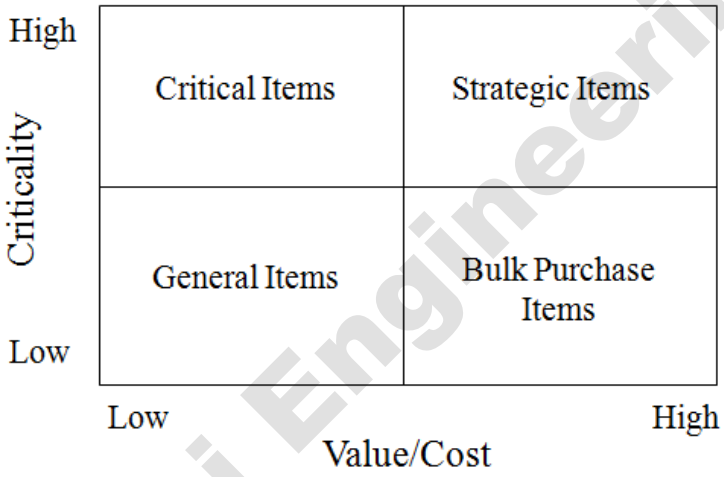
Product Categorization by Value and Criticality (Figure 14.2)



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5. Discuss building strategic partnerships and trust within a supply chain

Building Strategic Partnerships and Trust

- Managers find it easier to use the levers discussed earlier to achieve coordination if trust and strategic partnerships are built within the supply chain.
- Sharing of accurate information that is trusted by every stage results in a better matching of supply and demand throughout the supply chain and a lower cost.
- A better relationship also tends to lower the transaction cost between supply chain stages.

For example, a supplier can eliminate its forecasting effort if it trusts orders and forecast information received from the retailer.

- Similarly, the retailer can lessen the receiving effort by decreasing counting and inspections if it trusts the supplier's quality and delivery.
- In general, stages in a supply chain can eliminate duplicated effort on the basis of improved trust and a better relationship.
- This lowering of transaction cost along with accurate shared information helps improve coordination.

Walmart and P&G have been trying to build a strategic partnership that will better coordinate their actions and be mutually beneficial.

- Research showed that the more retailers trusted their suppliers, the less likely they were to develop alternate sources while significantly increasing sales of their products.
- In general, a high level of trust allows a supply chain to become more responsive at lower cost.
- Actions such as information sharing, changing of incentives, operational improvements, and stabilization of pricing typically help improve the level of trust.
- Growing the level of cooperation and trust within a supply chain requires a clear identification of roles and decision rights for all parties, effective contracts, and good conflict resolution mechanisms.

6. Explain the obstacles to coordination in a supply chain

OBSTACLES TO COORDINATION IN A SUPPLY CHAIN

Any factor that leads to either local optimisation by different stages of the SC, or an increase in information delay, distortion, and variability within the SC.

1. Incentive Obstacles
2. Information Processing Obstacles
3. Operational Obstacles
4. Pricing Obstacles
5. Behavioral Obstacles

Incentive obstacles

Incentive obstacles occur in situations when incentives offered to different stages or participants in a supply chain lead to actions that increase variability and reduce total supply chain profits.

Local optimisation within functions or stages

- If the compensation of a transportation manager at a firm is linked to the average transportation cost per unit – increase inventory costs or hurt customer service.

Sales Force Incentives

Improperly structured sales force incentives are a significant obstacle to coordination in a supply chain.

- Based on the amount the sales force sells during an evaluation period
- The sales measured by a manufacturer are the quantity sold to distributors or retailers (sell-in), not the quantity sold to final customers (sell-through).
- Measuring performance based on sell-in is often justified on the grounds that the manufacturer's sales force does not control sell-through.

Information-Processing Obstacles

This occurs when demand information is distorted as it moves different stages of the supply chain, leading to increased variability in orders within the SC.

Forecasting based on orders and not customer demand

Each stage views its primary role within the SC as one of filling orders placed by its downstream partner.

Lack of Information Sharing

- If a manufacturer is not aware of the planned promotion by a retailer, it may interpret the larger order as a permanent increase in demand and place orders with suppliers accordingly.
- The lack of information sharing between the retailer and manufacturer leads to a large fluctuation in manufacturer orders.

Operational Obstacles

Occur when actions taken in the course of placing and filling orders lead to an increase in variability.

Ordering in large lots: When a firm places orders in lot sizes that are much larger than the lot sizes in which demand arises, variability of orders is magnified up the SC.

- Firms order in large lots to cut down fixed costs associate with placing, receiving, or transporting an order.
- Large lots may also occur if the supplier offers quantity discounts
- Order every five weeks (figure).

The figure shows both the demand and the order stream for a firm that places an order every five weeks. Observe that the order stream is far more erratic than the demand stream.

- Because orders are batched and placed every five weeks, the order stream has four weeks without orders followed by a large order that equals five weeks of demand.
- Manufacturer supplying several retailers that batch their orders faces an order stream that is much more variable than the demand the retailer's experience.
- The concentration of orders (last week of a month or first week) exacerbates the impact of batching.

Pricing Obstacles

This arise when the pricing policies for a product lead to an increase in variability of orders place.

Lot Size-Based Quantity Discounts

- Lot size–based quantity discounts increase the lot size of orders placed within the supply chain because lower prices are offered for larger lots.

Price Fluctuations

- Trade promotions and other short-term discounts offered by a manufacturer result in forward buying, by which a wholesaler or retailer purchases large lots during the discounting period to cover demand during future periods.
- Forward buying results in large orders during the promotion period followed by very small orders after that.
- The promotion thus results in a variability in manufacturer shipments that is significantly higher than the variability in retailer sales.

Behavioural Obstacles

- Are problems in learning within organisations that contribute to information distortion.
- These problems are often related to the way the supply chain is structured and the communications between different stages. Some of the behavioural obstacles are
  1. Each stage of the supply chain view its actions locally and is unable to see the impact.
  2. Different stages of the SC react to the current local situation rather than trying to identify the root causes.
  3. Based on local analysis, different stages of SC blame each other for the fluctuations – become enemies rather than partners.
  4. No stage of the SC learn from its actions over time.
  5. A lack of trust among supply chain partners cause them to be opportunistic at the expense of overall SC performance – duplication of efforts and information not shared.

7. Explain the effect of lack of coordination in a supply chain and Bull Whip effect

Lack of supply chain coordination and the bullwhip effect

- SC coordination improves if all stages of the chain take actions that together increase total SC profits.
- Requires each stage of the supply chain to take into account the impact its actions have on other stages.
- Lack of coordination:
  1. Different stages having different objectives.
  2. Because information moving between stages is delayed and distorted.

As a result, each stage tries to maximize its own profits, resulting in actions that often diminish total supply chain profits.

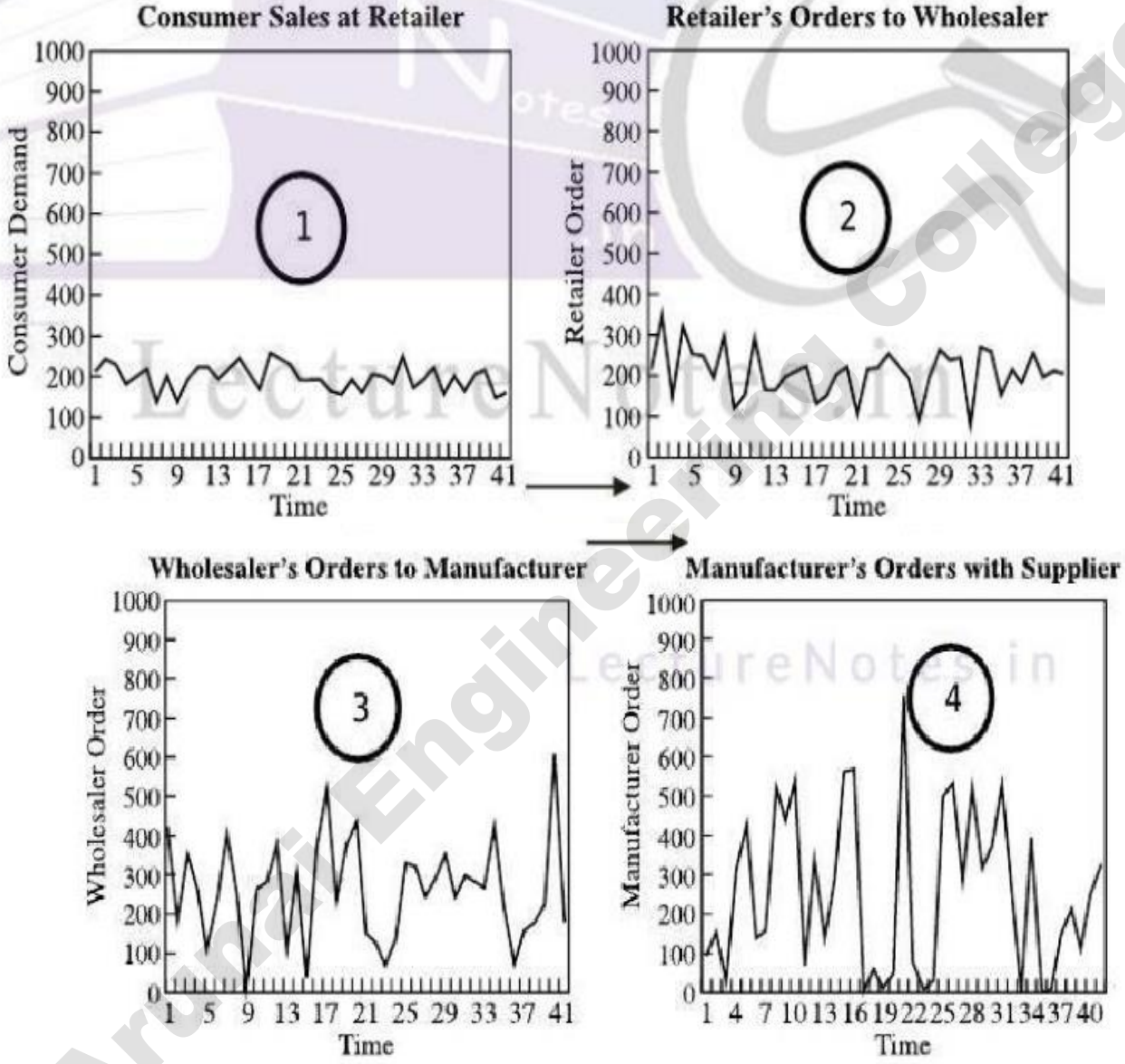
The fundamental challenge today is for supply chains to achieve coordination in spite of multiple ownership and increased product variety.

One outcome of the lack of supply chain coordination is the bullwhip effect

- **Bullwhip Effect:** Fluctuations in orders increase as they move up the supply chain from retailers to wholesalers to manufacturers to suppliers.
- The effect distorts demand information within the supply chain, with each stage having a different estimate of what demand look like.

Examples: Proctor & Gamble (Pampers); HP (printers); Barilla (pasta).

Demand Fluctuations at different stages of a supply Chain



The effect on performance of lack of coordination

- If each stage optimises only its local objective without considering the impact on the complete chain, it results in lack of SC coordination.

- End up hurting the performance of the entire SC.

Manufacturing Cost Increases

- An organisation suffering from bullwhip effect should respond to the increased variability by building excess capacity.

Inventory Cost Increases

- To handle the increased variability in demand, a high level of inventory than the normal has to be carried.
- This increases the warehousing space required; in turn warehousing cost increases.

Replenishment Lead Time Increases

- Bullwhip effect makes scheduling very difficult at the company as well as supplier level.
- Sometimes capacity and inventory not adequate.

Transportation Cost Increases

- The transportation requirement at the company and its suppliers are correlated with the orders being filled.
- Surplus transportation capacity needs to be maintained.

Labour Cost for Shipping and Receiving Increases

- Labour requirements for shipping at the company and its suppliers fluctuate with orders.
- A similar fluctuation occurs for the labour requirement for receiving at the distributors and retailers.

Level of Product Availability Decreases

- The large fluctuations in orders make it harder for the company to supply all distributor and retailer orders on time.
- This may result in stock out and in turn lost sales.

Relationship across the supply chain deteriorates

- Negative effect on performance at every stage hurts the relationships between the stages of the supply chain.
- Tendency to assign blame to other stages of the SC.
- Thus leads to a loss of trust and make any potential coordination efforts more difficult.

The lack of coordination hurts both responsiveness and cost in a supply chain by making it more expensive to provide a given level of product availability.

Impact of the Lack of Coordination on Supply Chain Performance

Performance Measure	Impact of the Lack of Coordination
Manufacturing cost	Increases
Inventory cost	Increases
Replenishment lead time	Increases
Transportation cost	Increases
Shipping and receiving cost	Increases
Level of product availability	Decreases
Profitability	Decreases

UNIT- V

Role of IT in Supply chain-Supply chain IT Framework Customer Relationship Management- Internal Supply Chain Management- Supplier Relationship Management-Future of IT in Supply Chain-E-Business in Supply chain- University Questions Revision

PART A

1. What is the role of IT in supply chain?

- IT consists of the hardware, software, and people throughout a supply chain that gather, analyze, and execute upon information.
- IT serves as the eyes and ears of management in a supply chain, capturing and analyzing the information necessary to make a good decision

2. What are the characteristics of information used for supply chain decision?

- Information must be accurate
- Information must be accessible in a timely manner
- Information must be of the right kind
- Information must be shared

3. State the various supply chain drivers.

- Facility
- Inventory
- Transportation
- Sourcing
- Pricing and revenue management

4. What are the three macro supply chain processes?

- Customer relationship management (CRM)
- Internal supply chain management (ISCM)
- Supplier relationship management (SRM

5. What is meant by Customer Relationship Management (CRM)?

CRM macro process consists of processes that take place between **an enterprise and its customers downstream** in the supply chain. The goal of the CRM macro process is to generate customer demand and facilitate transmission and tracking of orders. Weakness in this process results in demand being lost and a poor customer experience because orders are not processed and executed effectively.

6. What are the various key processes under CRM?

- Marketing.
- Sell.
- Order management
- Call/service center

7. What is meant by Internal Supply Chain Management (ISCM)?

ISCM is focused on **operations internal to the enterprise**. ISCM includes all processes involved in planning for and fulfilling a customer order

8. What are the various processes in Internal Supply Chain Management (ISCM)?

- Strategic planning
- Demand planning
- Supply planning
- Fulfillment.
- Field service.

9. What is meant by Strategic Planning?

This process focuses on the network design of the supply chain. Key decisions include location and capacity planning of facilities.

10. What is meant by Demand Planning?

Demand planning consists of forecasting demand and analyzing the impact on demand of demand management tools such as pricing and promotions

11. What is meant by Supply Planning?

The supply planning process takes as an input the demand forecasts produced by demand planning and the resources made available by strategic planning, and then produces an optimal plan to meet this demand. Factory planning and inventory planning capabilities are typically provided by supply planning software

12. What is meant by Supplier Relationship Management (SRM)?

SRM includes those processes focused on the interaction between the enterprise and suppliers that are upstream in the supply chain

13. What are the various SRM processes?

- Design collaboration
- Source
- Negotiate
- Buy
- Supply collaboration

14. What are the important trends will affect IT in SCM?

- The growth in cloud and software as a service (SaaS)
- Increased availability of real-time data
- Increased use of mobile technology
- Increased use of social media

15. What are the Supply chains IT manager's decision in Practice?

1. Select an IT system that addresses the company's key success factors
2. Take incremental steps and measure value
3. Align the level of sophistication with the need for sophistication
4. Use IT systems to support decision making, not to make decisions
5. Think about the future

16. What is the role of IT in Forecasting?

- A good forecasting package provides forecasts across a wide range of products that are updated in real time by incorporating any new demand information. This helps firms respond quickly to changes in the marketplace and avoid the costs of a delayed reaction
- A positive outcome of the investment in **ERP systems** has been a significant improvement in supply chain transparency and data integration, thus allowing potentially better forecasts.

17. What is the role of IT in Inventory Management?

- IT systems have also played a significant role in better integrating different stages of the supply chain.
- A classic example is the continuous replenishment program (CRP) set up between Procter and Gamble (P&G) and Walmart that allowed P&G to replenish inventory at Walmart based on the visibility of available inventories and sales at Walmart.
- This coordination allowed the two firms to improve service levels while reducing inventories

18. What is the role of IT in Transportation?

- The use of software to determine transportation routes has been the most common IT application in transportation.
- This software takes the location of customers, shipment size, desired delivery times, information on the transportation infrastructure and vehicle capacity as inputs
- IT also comes into play in the use of global positioning systems (GPSs) for tracking real-time location of vehicles and electronic notification of impending arrivals. The availability of current information also allows for real-time dynamic optimization of transportation routes and deliveries.

19. What is the role of Strategic framework E-Business in Supply chain? A Strategic Framework

- An Internet strategy must be considered within the context of the company's overall business plan.
- The framework starts from the premise that supply chain decisions must be evaluated in a strategic context based on the answers to the following three questions:
  1. What is the firm's desired strategic position?
  2. Given the firm's strategic position, what supply chain capabilities are needed to support the strategy?
  3. Given the desired supply chain capabilities, how should the supply chain be structured?

20. Write the scorecard for e-business in Dell Supply Chain

EXHIBIT 4

Scorecard for e-Business in Dell Supply Chain

Revenue Opportunities	Cost Opportunities
Direct sales: $$ Increased margin from eliminating intermediaries Product information: $$ Flexibility on price and promotions $$ Wider product portfolio offering Time to market: $$ Faster time to market Negotiating prices and contract terms: $ Price and service customization -$ Downward price pressure due to increased competition Order placement and tracking: $$ Access at any time from any place Fulfillment: 0 Increased availability by aggregating information -$ Shorter response time 0 Increased choice of delivery options Payment: $ Efficient funds transfer may improve cash flow	Facility costs: $$ Site costs: eliminate intermediaries or retail and distribution warehouses $$ Processing costs: customer participation, smoothed capacity requirements Inventory costs: $ Reduced cycle stock (geographic centralization) $$ Reduced safety stock (statistical aggregation) $$ Postponing product differentiation to after order placement Transportation costs: 0 Inbound -$ Outbound Information sharing improves supply chain coordination: $ Reduced bullwhip effect $ Shared planning and forecasting

Impact: -$$ Very Negative ← -$ ← 0 Marginal → $ → $$ Very Positive

PART B

1. **Explain in detail about the Role of IT in Supply Chain.**

ROLE OF IT IN SUPPLY CHAIN

Transportation

Definition

IT consists of the hardware, software, and people throughout a supply chain that gather, analyze, and execute upon information. IT serves as the eyes and ears of management in a supply chain, capturing and analyzing the information

Introduction

- Using IT systems to capture and analyze information can have a significant impact on a **firm's performance**.
- Using the IT system enabled the company to **cut its inventory in half**, because managers could now make decisions based on customer demand information rather than manufacturing's educated guesses

To support effective supply chain decisions, information must have the following characteristics:

1. **Information must be accurate.**
   All information must be 100 percent correct

2. **Information must be accessible in a timely manner.**
   To make good decisions, a manager needs to have up-to-date information that is easily accessible.

3. **Information must be of the right kind.**
   Companies must think about what information should be recorded so that valuable resources are not wasted collecting meaningless data while important data go unrecorded.

4. **Information must be shared.**
   A supply chain can be effective only if all its stakeholders share a common view of the information that they use to make business decisions.

Information is used as a wide variety of decisions about each supply chain Driver

1. **Facility.**
   - Determining the location, capacity, and schedules of a facility requires information
   - on the trade-offs among efficiency and flexibility, demand, exchange rates and taxes **Walmart** uses demand information to determine where to place its new stores and cross-docking facilities.

2. **Inventory.**
   - Setting optimal inventory policies requires information that includes demand patterns, cost of carrying inventory, costs of stocking out, and costs of ordering.
   - **Walmart** collects detailed demand, cost, margin, and supplier information to make these inventory policy decisions.

3. **Transportation.**
   - Deciding on transportation networks, routings, modes, shipments, and vendors requires information about costs, customer locations, and shipment sizes to make good decisions
   - **Walmart** uses information to tightly integrate its operations with those of its suppliers. This integration allows Walmart to implement cross-docking in its transportation network, saving on both inventory and transportation costs.

4. **Sourcing.**
   - Information on product margins, prices, quality, delivery lead times, and so on are all important in making sourcing decisions. Given sourcing deals with inter-enterprise transactions, a wide range of transactional information must be recorded to execute operations, even once sourcing decisions have been made.

5. **Pricing and revenue management.**
   - To set pricing policies, one needs information on demand, both its volume and various customer segments' willingness to pay, and on many supply issues, such as the product margin, lead time, and availability. Using this information, firms can make intelligent pricing decisions to improve their supply chain profitability.

2. Explain Supply Chain IT framework with a neat diagram.

- IT provides access and reporting of supply chain transaction data.
- Advanced IT systems uses transaction data to proactively improve supply chain performance.
- **For example**, as a baseline, good IT systems will record and report demand, inventory, and fulfillment information for Amazon.
- IT systems that provide analytics then allow Amazon to decide whether to open new distribution centers and how to stock them.

The Supply Chain Macro Processes

From an enterprise's perspective, all processes within its supply chain can be categorized into **three main areas**:

- Processes focused downstream
- Processes focused internally and
- processes focused upstream

Three macro supply chain processes

• Customer relationship management (CRM).

Processes that focus on downstream interactions between the enterprise and its customers.

• Internal supply chain management (ISCM).

Processes that focus on internal operations within the enterprise. In our definition, supply chain management includes all three macro processes—CRM, ISCM, and SRM.

• Supplier relationship management (SRM).

Processes that focus on upstream interactions between the enterprise and its suppliers.

FIGURE 1 The Macro Processes in a Supply Chain

All operation and analytics related to the macro processes rest on the **transaction management foundation (TMF)**, which includes basic enterprise resource planning **(ERP)** systems (and its components, such as financials and human resources), infrastructure software, and integration software. TMF software is necessary for the three macro processes to function and to communicate with one another. The relationship between the three macro processes and the transaction management foundation can be seen in **Figure 1.**

Example

- Apple is an example of a company that has coordinated all macro processes to introduce and sell blockbuster products such as the **iPhone.**
- Apple has been very successful in its interactions with customers not only in designing products that meet their needs but also in operating Apple retail as a successful and profitable endeavor.
- All its products are designed in-house but manufactured by a **third party**.
- Despite this, Apple has managed the release of new products to effectively meet huge demand.
- Strong coordination across all the macro processes has been fundamental for the level of success achieved by Apple.

3. Explain Customer Relationship Management in detail

- The CRM macro process consists of processes that take place between an enterprise and its customers downstream in the supply chain.
- The goal of the CRM macro process is to generate customer demand and facilitate transmission and tracking of orders.

The key processes under CRM are as follows

marketing.

- Marketing processes involve decisions regarding **which customers to target**, how to target customers, and what products to offer, how to price products, and how to manage the actual campaigns that target customers.
- Good IT systems in the marketing area within CRM provide analytics that improve

the marketing decisions on pricing, product profitability, and customer profitability, among other functions.

Sell.

- The sell process focuses on making an actual sale to a customer
- The sell process includes providing the sales force with the information it needs to make a sale and then execute the actual sale.
- Executing the sale may require the salesperson (or the customer) to build and configure orders by choosing among a variety of options and features.
- The sell process also requires such functionality as the ability to quote due dates and access information related to a customer order.
- Good IT systems support sales force automation, configuration, and personalization to improve the sell process.

Order management.

- The process of managing customer orders as they flow through an enterprise is important for the customer to track an order and for the enterprise to plan and execute order fulfillment.
- This process ties together demand from the customer with supply from the enterprise. Good IT systems enable visibility of orders across the various stages that an order flows through before reaching the customer.

Call/service center.

- A call/service center is often the primary point of contact between a company and its customers. A call/service center helps customers place orders, suggests products, solves problems, and provides information on order status.
- Good IT systems have helped improve call/service center operations by facilitating and reducing work done by customer service representatives and by routing customers to representatives who are best suited to service their request.

Example

- **Amazon** has done an excellent job of using IT to enhance its CRM process.
- The company customizes the products presented to suit the individual customer
- Quick ordering is facilitated by systems that allow one-click orders.
- The order is then visible to the customer until it is delivered.

- In the rare instances that a customer uses the call center, systems are in place to support a positive experience, including offering a callback if the call center is heavily loaded.

The five largest CRM software providers in 2012 (as reported by Gartner) were Salesforce. Com (14.0 percent), SAP (12.9 percent), Oracle (11.1 percent), Microsoft (6.3 percent), and IBM (3.6 percent).

4. Explain Internal Supply Chain Management in detail.

- ISCM is focused on operations internal to the enterprise.
- ISCM includes all processes involved in planning for and fulfilling a customer order.

The various processes included in ISCM are as follows:

• Strategic planning.

This process focuses on the network design of the supply chain. Key decisions include location and capacity planning of facilities.

• Demand planning.

Demand planning consists of forecasting demand and analyzing the impact on demand of demand management tools such as pricing and promotions.

• Supply planning.

The supply planning process takes as an input the demand forecasts produced by demand planning and the resources made available by strategic planning, and then produces an optimal plan to meet this demand.

Factory planning and inventory planning capabilities are typically provided by supply planning software.

• Fulfillment.

Once a plan is in place to supply the demand, it must be executed. The fulfillment process links each order to a specific supply source and means of transportation. The software applications that typically fall into the fulfillment segment are transportation and warehousing management applications.

• **Field service.**

Finally, after the product has been delivered to the customer, it eventually must be serviced. Service processes focus on setting inventory levels for spare parts as well as Scheduling service calls. Some of the scheduling issues here are handled in a similar manner to aggregate planning, and the inventory issues are the typical inventory management problems.

- Given that the ISCM macro process aims to fulfill demand that is generated by CRM processes, strong integration is needed between the ISCM and CRM macro processes.
- When forecasting demand, interaction with CRM is essential, as the CRM applications are touching the customer and have the most data and insight on customer behavior.
- Similarly, the ISCM processes should have strong integration with the SRM macro process.
- Supply planning, fulfillment, and field service are all dependent on suppliers and therefore on the SRM processes.
- Successful ISCM software providers have helped improve decision making within ISCM processes.
- Good integration with CRM and SRM, however, is still largely inadequate at both the organizational and software levels.
- Future opportunities are likely to arise partly in improving each ISCM process, but even more so in improving integration with CRM and SRM.
- The **top five ISCM vendors in 2012** were SAP, Oracle, JDA, Manhattan Associates, and Epicor. SAP ($1.721 billion) and Oracle ($1.453 billion) had significantly higher revenues than the other three ($0.724 billion combined)

5. Explain Supply Relationship Management in detail.

- SRM includes those processes focused on the **interaction between the enterprise and suppliers** that are upstream in the supply chain.

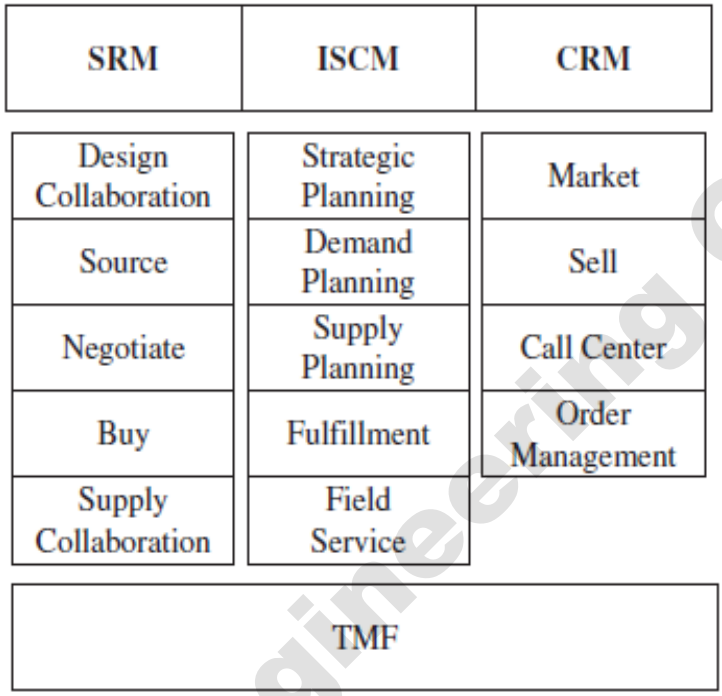


FIGURE 2 The Macro Processes and Their Associated Processes

The major SRM processes are as follows:

Design collaboration.

- This software aims to improve the design of products through collaboration between manufacturers and suppliers.
- The software facilitates the joint selection (with suppliers) of components that have positive supply chain characteristics such as ease of manufacturability or commonality across several end products.
- Other design collaboration activities include the sharing of engineering change orders between a manufacturer and its suppliers.
- This eliminates the costly delays that occur when several suppliers are designing components for the manufacturer's product concurrently.

Source

- Sourcing software assists in the qualification of suppliers and helps in supplier selection, contract management, and supplier evaluation.
- An important objective is to analyze the amount that an enterprise spends with each supplier, often revealing valuable trends or areas for improvement.
- Suppliers are evaluated along several key criteria, including lead time, reliability, quality, and price.
- This evaluation helps improve supplier performance and aids in supplier selection.
- Contract management is also an important part of sourcing, as many supplier contracts have complex details that must be tracked (such as volume-related price reductions).
- Successful software in this area helps analyze supplier performance and manage contracts.

Negotiate.

- Negotiations with suppliers involve many steps, starting with a request for quote (RFQ).
- The negotiation process may also include the design and execution of auctions.
- The goal of this process is to negotiate an effective contract that specifies price and delivery parameters for a supplier in a way that best matches the enterprise's needs.
- Successful software automates the RFQ process and the execution of auctions.

Buy.

- "Buy" software executes the actual procurement of material from suppliers.
- This includes the creation, management, and approval of purchase orders.
- Successful software in this area automates the procurement process and helps decrease processing cost and time.

Supply collaboration.

- Once an agreement for supply is established between the enterprise and a supplier, supply chain performance can be improved by collaborating on forecasts, production plans, and inventory levels.
- The goal of collaboration is to ensure a common plan across the supply chain
- Good software in this area should be able to facilitate collaborative forecasting and planning in a supply chain.

Significant improvement in supply chain performance can be achieved if SRM processes are well integrated with appropriate CRM and ISCM processes.

For instance, when designing a product, incorporating input from customers is a natural way to improve the design.

This requires inputs from processes within CRM. Sourcing, negotiating, buying, and collaborating tie primarily into ISCM, as the supplier inputs are needed to produce and execute an optimal plan.

However, even these segments need to interface with CRM processes such as order management.

Again, the theme of integrating the three macro processes is crucial for improved supply chain performance.

The SRM space is highly fragmented in terms of software providers and not as well defined as CRM and ISCM.

Among the larger players, SAP and Oracle have SRM functionality in their software.

6. Explain Future of IT in Supply Chain

- At the highest level, we believe that the three SCM macro processes will continue to drive the evolution of supply chain IT.
- Although there is still plenty of room to improve the visibility and reporting of supply chain information, the relative focus on improved analysis to support decision making will continue to grow.

The following important trends will affect IT in the supply chain:

1. The growth in cloud and software as a service (SaaS)
2. Increased availability of real-time data
3. Increased use of mobile technology
4. Increased use of social media

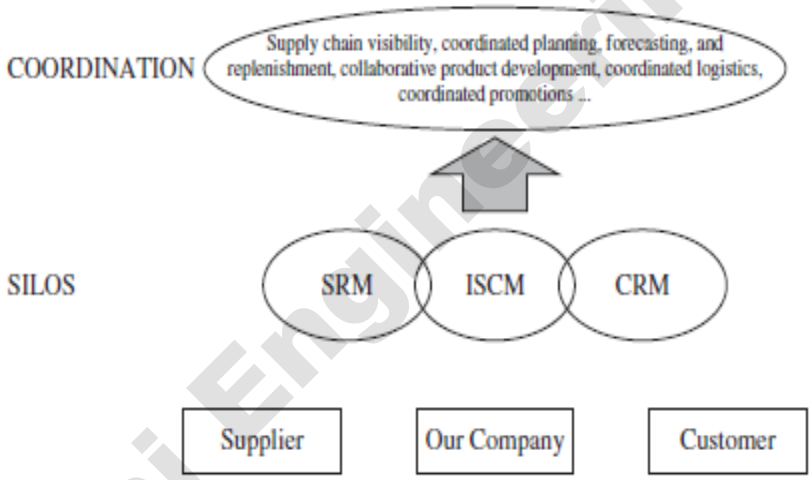


FIGURE 3 The Goal of Supply Chain IT: From Silos to Coordination

- **SaaS** is defined as software that is owned, delivered, and managed remotely through the cloud.
- **Salesforce.com** is one of the best-known pure SaaS supply chain software providers (in CRM).
- **Gartner** has predicted that SaaS will grow from **$13.5 billion in 2011 to $32.8 billion in 2016**.
- CRM will continue to be the largest sector within SaaS, forecast to grow at a rate

of over 16 percent annually to $9 billion in 2016.

- Another example is **transportation management systems**, for which roughly a quarter of the revenues are from SaaS applications.
- This shift is likely to occur because SaaS provides lower startup and maintenance costs compared with applications that are deployed onsite.
- These factors are particularly important for **small and mid-sized companies.** Traditional enterprise software vendors, such as SAP, Oracle, and Microsoft, are increasing the availability of their software using the SaaS model.

- **Cloud-based solutions** fit naturally with supply chain management because they allow geographically dispersed entities to view common information and make decisions.
- The availability of real-time information has exploded in most supply chains.
- The increased use of mobile technology coupled with real-time information offers some supply chains an opportunity to better match demand to supply using differential pricing.
- **An example** is an initiative by **Groupon called Groupon** Now, which offers mobile users deals that are time and location specific.
- Businesses can improve profitability by offering deals when business is slow at specific locations.
- **Consumers** benefit from getting a deal **when and where they want it.**
- Such an approach is likely to be applicable in many supply chain settings.
- Mobile technology, along with real-time information, has also allowed improved use of existing supply chain assets, often at a person-to-person level.
- The increased use of social **media coupled with mobile technology** has the potential to alter supply chains, especially around the last mile.
- **In Stockholm, Sweden, the DHL** supply chain has worked on **MyWays,** a new model for last-mile delivery.
- Through an app available on mobile devices, customers sign up for this delivery option.
- **MyWays members** are notified of the need for delivery and sign up for the delivery if it is close to a route they normally take—to their college,
- Once delivery is made, the member gets credits that can be exchanged for cash.

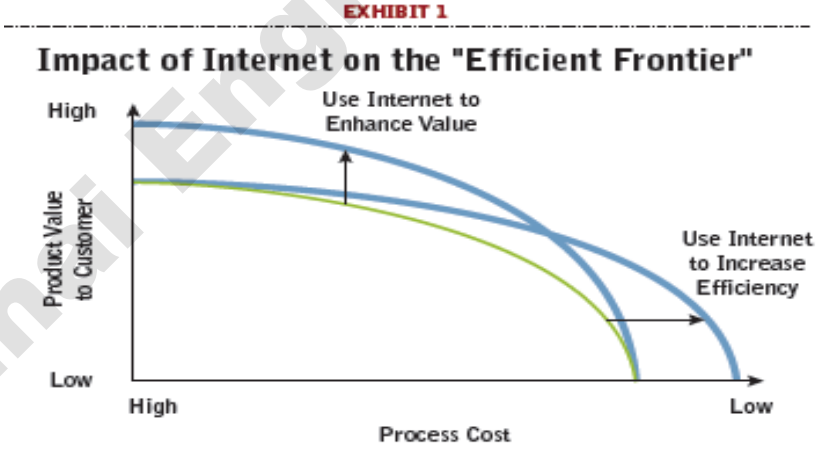
- **Airbnb** and **Uber** are **two examples of companies** that have used social media and mobile devices to link individuals to **rooms or transportation.**
- There is a real opportunity in the future to use existing assets (such as a person traveling a route for MyWays or an idle car for Uber) to make supply chains more effective, as mobile technology and social media are used to connect the existing asset to the supply chain task at hand.

7. Explain E-Business in Supply chain

A Strategic Framework

- An Internet strategy must be considered within the context of the company's overall business plan.
- The framework starts from the premise that supply chain decisions must be evaluated in a strategic context based on the answers to the following three questions:
  1. What is the firm's desired strategic position?
  2. Given the firm's strategic position, what supply chain capabilities are needed to support the strategy?
  3. Given the desired supply chain capabilities, how should the supply chain be structured?

EXHIBIT 1



- **First step** is to create a fit between the desired strategic position and the supply chain capabilities and processes used to satisfy customer needs and priorities.
- A company defines its desired strategic position by first ranking its **customers' top priorities** and then articulating how it plans to respond to these needs.

- Typical customer needs include timeliness, accessibility, availability, customizability, quality of service, and price.
- At the same time, the company must consider the trade-off between how it would like to respond to customer needs and the supply chain costs incurred to meet those needs.
- The **efficient frontier** represents the lowest cost of meeting a given level of customer need using the best available supply chain processes.
- Each point on the frontier corresponds to a particular supply chain structure, employing the best available technologies, managerial policies, and inputs to meet the desired level of a customer need at the lowest cost

Revenue and Cost Impacts of e-Business

- The **next step** in the framework, then, is to characterize and understand how e-Business would affect a company's revenues and costs using a simple **scorecard**
- First, e-business allows companies to enhance revenues by direct sales to customers.
- Manufacturers and other supply chain members that do not have direct contact with customers in traditional retail channels can use the Internet to shrink the supply chain by bypassing retailers and selling direct to customers

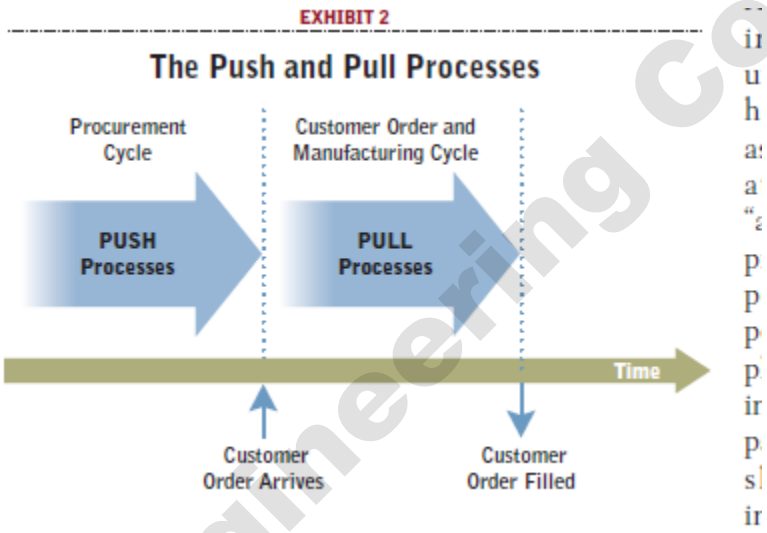
Example

- **Dell** Computers sells PCs online direct to customers.
- As a result, Dell enjoys higher margins than do traditional PC manufacturers that must share some margin with retailers.
- E-business can enhance revenues by speeding up collection of funds.
- An example comes from **John McCain's 2000 presidential campaign**.
- **Within 48 hours** of his primary victory in New Hampshire, McCain's campaign collected **$1 million** over his Web site.
- Receiving and processing $1 million in checks would have taken considerably more time and effort than the online collection did.

Cost Impact of e-Business

Impact of ebusiness on supply chain costs by considering **four key drivers** of supply chain performance—

- Facilities
- Inventory
- Transportation and
- Information**.**



- Postponing assembly or product differentiation allows a company to "assemble to order" customized products from common components.
- Conceptually, postponement decreases the supply processes that are operated in "**push" mode** (i.e., in anticipation of a customer order, as shown in Exhibit 2), while increasing the processes that operate in **"pull" mode** (i.e., after a particular customer order arrives).
- By separating ordering from fulfillment, e-business increases flexibility in operations and allows the company to implement postponement

A Scorecard for e-Business Evaluation

- The different revenue and cost factors influenced by e-business are summarized
- in a **scorecard**, as shown in **Exhibit 3**.
- Evaluating the various factors gives insight into how e-business affects a particular supply chain and whether this value can most easily be captured by existing players or by new entrants.

EXHIBIT 3

e-Business - Supply Chain Scorecard

Revenue Opportunities	Cost Opportunities
Direct sales: ■ Increased margin from eliminating intermediaries Product information: ■ Flexibility on price and promotions ■ Wider product portfolio offering Time to market: ■ Faster time to market Negotiating prices and contract terms: ■ Price and service customization ■ Downward price pressure due to increased competition Order placement and tracking: ■ Access at any time from any place Fulfillment: ■ Increased availability by aggregating information ■ Shorter response time ■ Increased choice of delivery options Payment: ■ Efficient funds transfer may improve cash flow	Facility costs: ■ Site costs: eliminate intermediaries or retail and distribution sites ■ Processing costs: customer participation, smoothed capacity requirements Inventory costs: ■ Reduced cycle stock (geographic centralization) ■ Reduced safety stock (statistical aggregation) ■ Postponing product differentiation to after order placement Transportation costs: ■ Inbound ■ Outbound Information sharing improves supply chain coordination: ■ Reduced bullwhip effect ■ Shared planning and forecasting

B2C in the Computer Industry: Dell Computer Online

- **Dell** Computer is one company that has **succeeded** in using the **Internet** to increase both value and efficiency.
- The success story of how **Michael Dell** started selling computers directly to the consumer in **1984** has become a classic introduction to the "direct business model,"
- Internet has become a logical extension of Dell's direct model. This becomes apparent by analyzing the scorecard for e-business in Dell's supply chain, as summarized in **Exhibit 4.**

EXHIBIT 4

Scorecard for e-Business in Dell Supply Chain

Revenue Opportunities	Cost Opportunities
Direct sales: $$ Increased margin from eliminating intermediaries Product information: $$ Flexibility on price and promotions $$ Wider product portfolio offering Time to market: $$ Faster time to market Negotiating prices and contract terms: $ Price and service customization -$ Downward price pressure due to increased competition Order placement and tracking: $$ Access at any time from any place Fulfillment: o Increased availability by aggregating information -$ Shorter response time o Increased choice of delivery options Payment: $ Efficient funds transfer may improve cash flow	Facility costs: $$ Site costs: eliminate intermediaries or retail and distribution warehouses $$ Processing costs: customer participation, smoothed capacity requirements Inventory costs: $ Reduced cycle stock (geographic centralization) $$ Reduced safety stock (statistical aggregation) $$ Postponing product differentiation to after order placement Transportation costs: o Inbound -$ Outbound Information sharing improves supply chain coordination: $ Reduced bullwhip effect $ Shared planning and forecasting

	-$$	-$	o	$	$$
Impact:	Very Negative	→	Marginal	→	Very Positive

B2C in the Grocery Industry: Peapod.com

- The scorecard approach can also be used to evaluate the opportunities for **Online grocers.**
- **Peapod.com** is one of the oldest **online grocers**.
- The company started in **Chicago** in a collaborative arrangement with the supermarket chain Jewel where Peapod's pickers would fill an order before delivering it.
- Peapod now has moved to supplying orders from centralized fulfillment centers in areas that the company serves.
- Each fulfillment center is much larger than a supermarket and is comparable to a warehouse

- An online grocer such as Peapod can offer several services of value to the consumer. Online grocers allow **order placement anytime and from anywhere**.
- They can attract customers who do not like to go to a supermarket

EXHIBIT 5

Scorecard for e-Business in Peapod.com Supply Chain

Revenue Opportunities	Cost Opportunities
Direct sales: o Increased margin from eliminating intermediaries Product information: $ Flexibility on price and promotions $ Wider product portfolio offering Time to market: o Faster time to market Negotiating prices and contract terms: $ Price and service discrimination -$ Downward price pressure due to increased competition Order placement and tracking: $$ Anytime and anywhere Fulfillment: o Increased availability by aggregating information -$ Shorter response time o Increased choice of delivery options Payment: o Efficient funds transfer may improve cash flow	Facility costs: $ Site costs: eliminate intermediaries or retail and distribution warehouses -$$ Processing costs: customer participation, smoothed capacity requirements Inventory costs: o Reduced cycle stock (geographic centralization) o Reduced safety stock (statistical aggregation) o Postponing product differentiation to after order placement Transportation costs: o Inbound -$$ Outbound Information sharing improves supply chain coordination: o Reduced bullwhip effect o Shared planning and forecasting

	-$$	-$	0	$	$$
Impact:	Very Negative	⟶	Marginal	⟶	Very Positive

B2B in the Parts-Supply Industry: W.W. Grainger

- **W.W. Grainger** is an example of a company that can seize both revenue and cost-saving opportunities by going online.
- W.W. Grainger is a business-to-business distributor of maintenance, repair, and operating (MRO) supplies ranging from consumables, like machine lubricants, to hardware items, like nuts and bolts for repairs.
- Grainger is famous for its fourinch thick catalogs with thousands of parts that customers can order over the phone or buy at one of its 380 U.S. branches, which are similar to large retail stores.
- In **1995**, the **company** set up **Grainger.com**, allowing customers to place orders on its Web site, which offers more than **200,000 products.**