

Chapter 2

- 1. Supply Chain Network Design*
- 2. Agile & Reverse Supply Chain Management*
- 3. Green Supply Chain Management*
- 4. Supply chain performance measure*

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1. Supply Chain Network Design

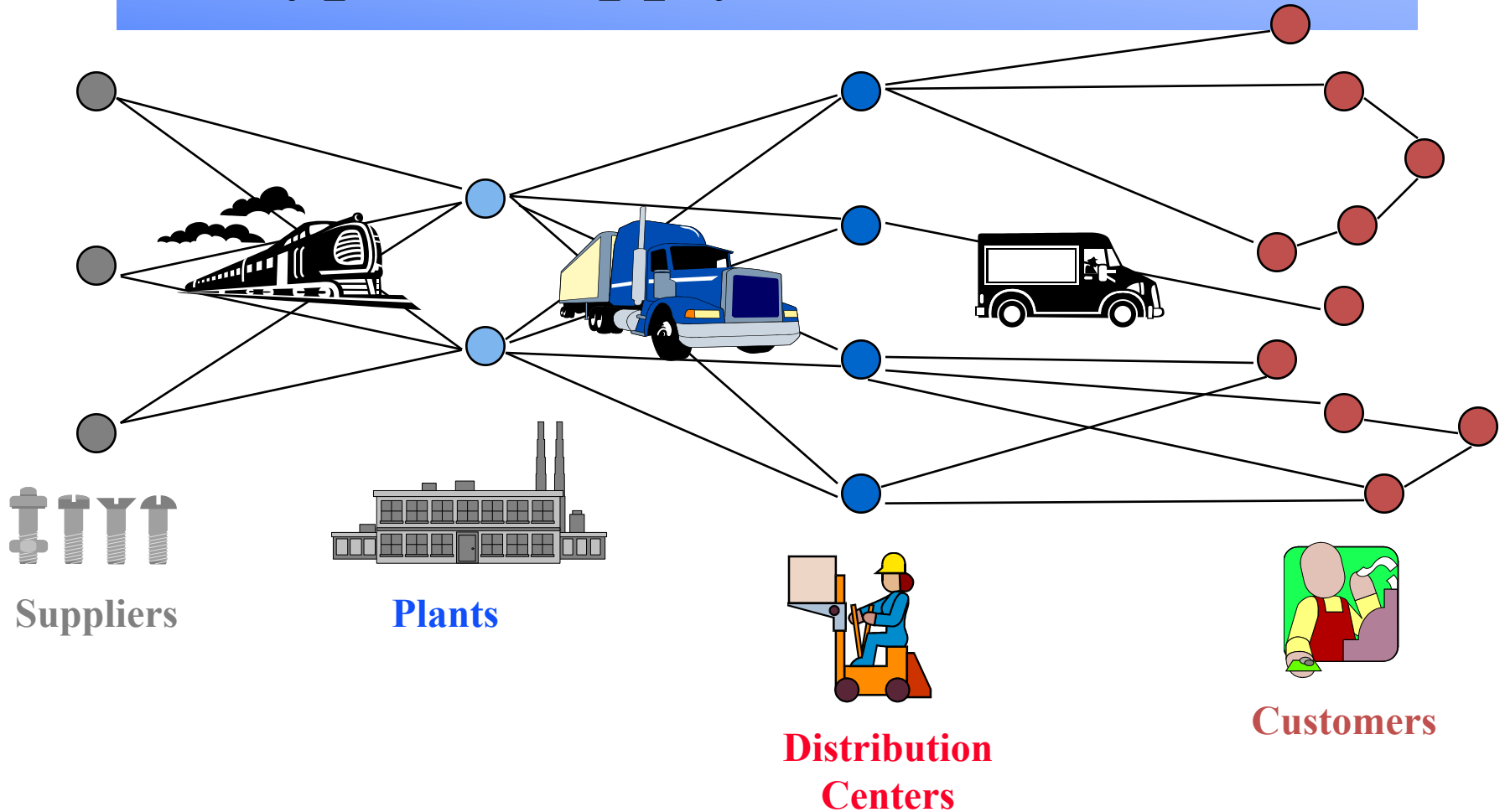
The network design in supply chain **determines**

- ❖ Its physical arrangement, design, structural layout and infrastructure of the supply chain.
- ❖ The major decisions to be made are on the number, locations and size of manufacturing plants and warehouses and the assignment of retail outlets to warehouses, etc.

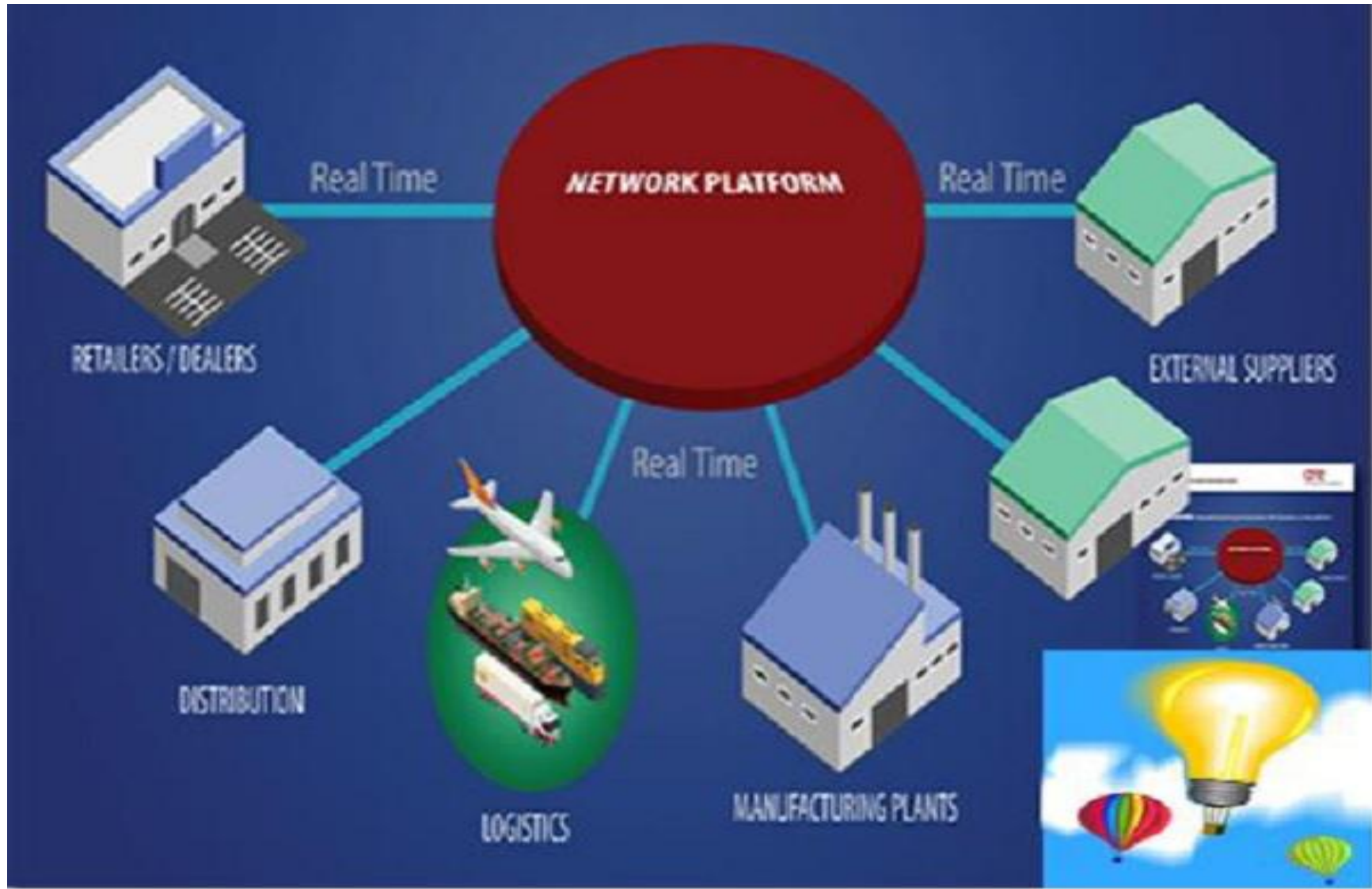
Supply Chain Network Design...

- ✓ Physical location of facilities and transportation links are the decision variables that allow used products to transfer from their former users to a producer and to future markets again (Cascini, 2015).
- ✓ **Network Configuration**
Determining the number and location of suppliers, warehouses, production/operations facilities, distribution centers.

Typical Supply Chain Network



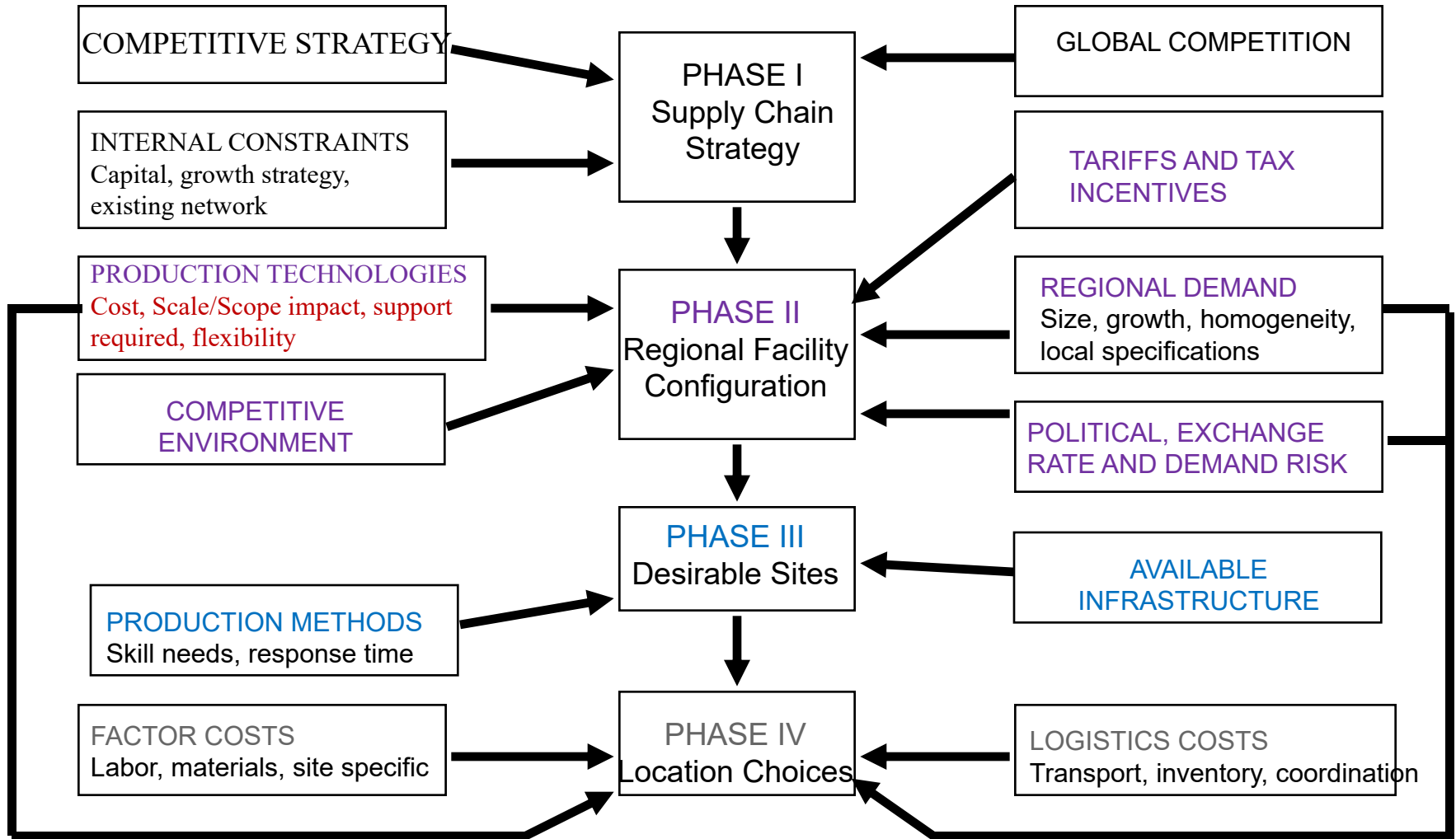
Supply Chain Network Design...



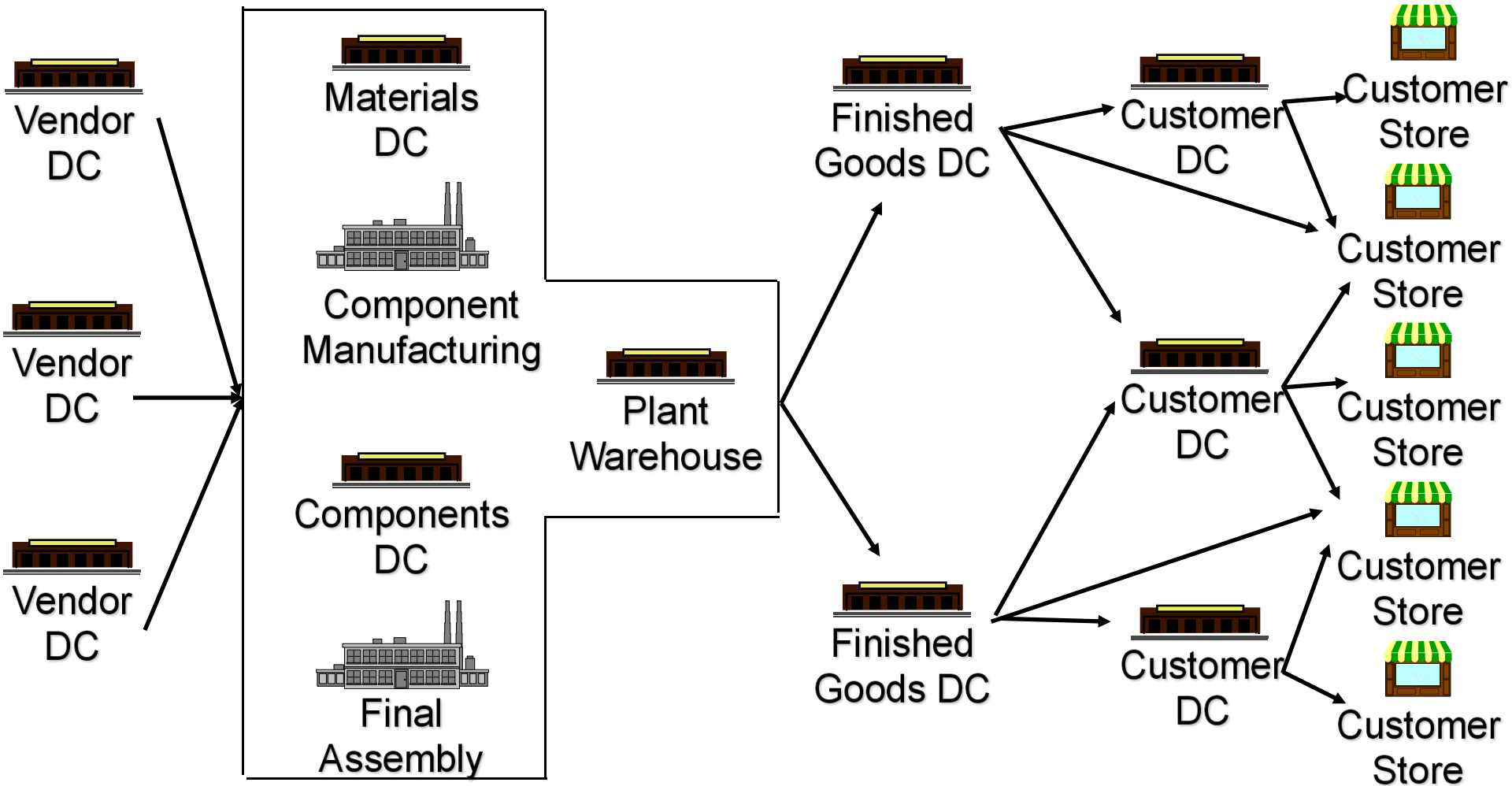
Network Design Decisions

- **Facility role:** What role should each facility play? What processes should be performed at each facility?
- **Facility location:** Where should facilities be located?
- **Capacity allocation:** How much capacity should be allocated to each facility?
- **Market and supply allocation:** What markets should each facility serve? Which supply sources should feed each facility?
- (How many plants, DC's, retail stores, etc. to build?)

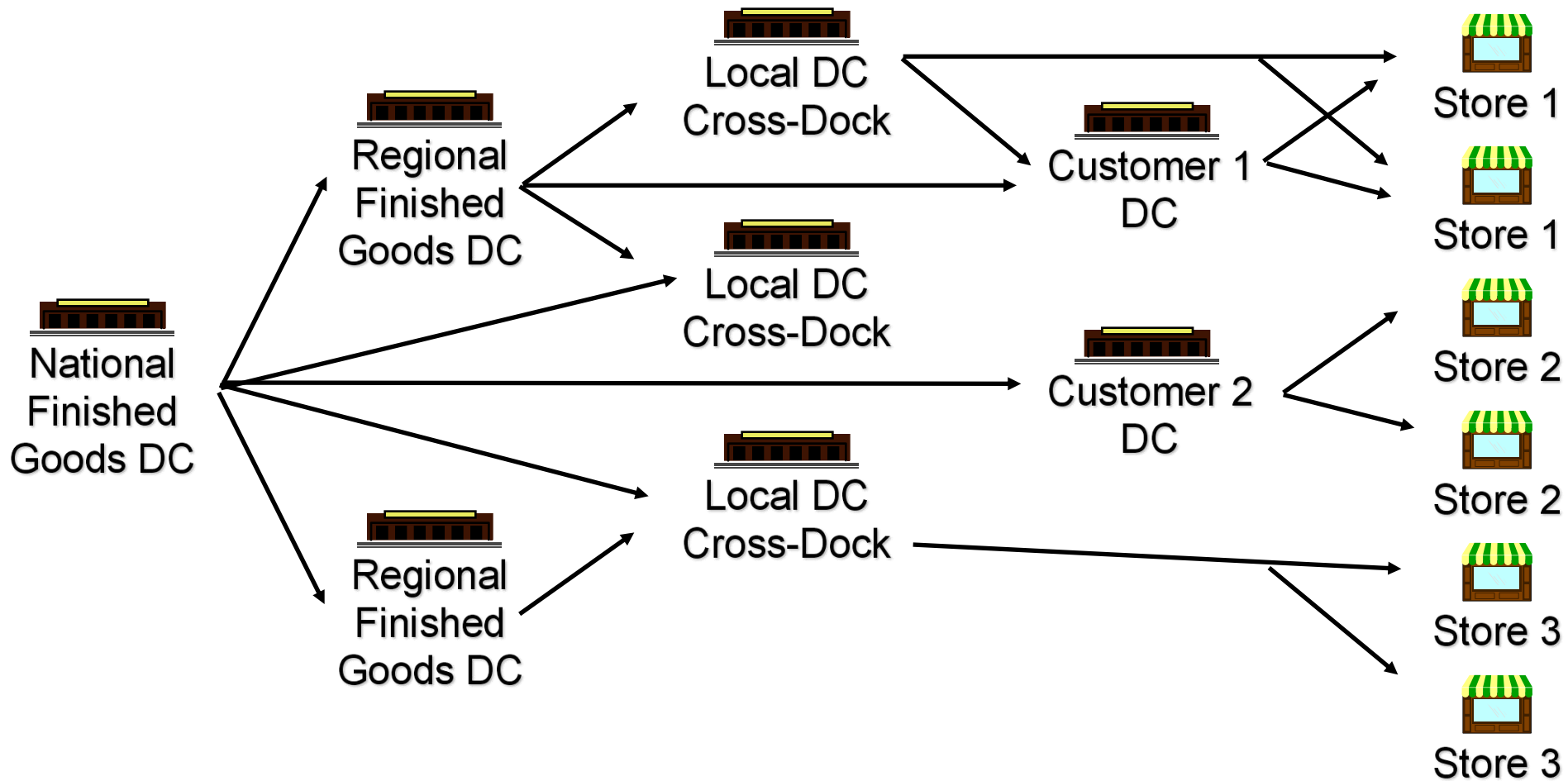
A Framework for Global Site Location



Conventional Network



Tailored Network: Multi-Echelon Finished Goods Network



Factors Influencing Network Design Decisions

- **Strategic** – Cost vs. Responsiveness
ex) Apparel producers, Convenience stores, Discount stores
- **Technological**
 - Economies of scale → few high-capacity locations ex) Manufacturer of computer chips
 - Lower fixed costs → many local facilities
ex) Bottling plants for Coca-Cola
- **Macroeconomic**
 - Tariffs, Tax incentives, Exchange rate and Demand risk
- **Political**

Cont'd

◆ Infrastructure

- availability of sites & labor
- proximity to transportation terminals, rail service, airports and seaports
- highway access, congestion, local utilities

◆ Competitive – Close vs. Far

ex) Retail stores in a mall, Supermarkets

◆ Logistics and facility costs

Cont'd

Infrastructure factors

- Availability of skilled labor
- Availability of transportation facilities
 - Ports
 - Airports
 - Rail
 - Highways
- Availability of necessary utilities
 - Power
 - Water
 - Sewage
 - Telecommunications / IT

The Role of Distribution in the Supply Chain

- ***Distribution***: the steps taken to move and store a product from the supplier stage to the customer stage in a supply chain
- Distribution directly affects cost and the customer experience and therefore drives profitability
- Choice of distribution network can achieve supply chain objectives from low cost to high responsiveness
- Examples: Wal-Mart, Dell, Proctor & Gamble, Grainger

Factors Influencing Distribution Network Design

- Distribution network performance evaluated along two dimensions at the highest level:
 - Customer needs that are met
 - Cost of meeting customer needs
- Distribution network design options must therefore be compared according to their impact on customer service and the cost to provide this level of service

Factors Influencing Distribution Network Design

- Elements of customer service influenced by network structure:
 - Response time
 - Product variety
 - Product availability
 - Customer experience
 - Order visibility
 - Return ability

Supply chain costs affected by network structure:

Inventories

Transportation

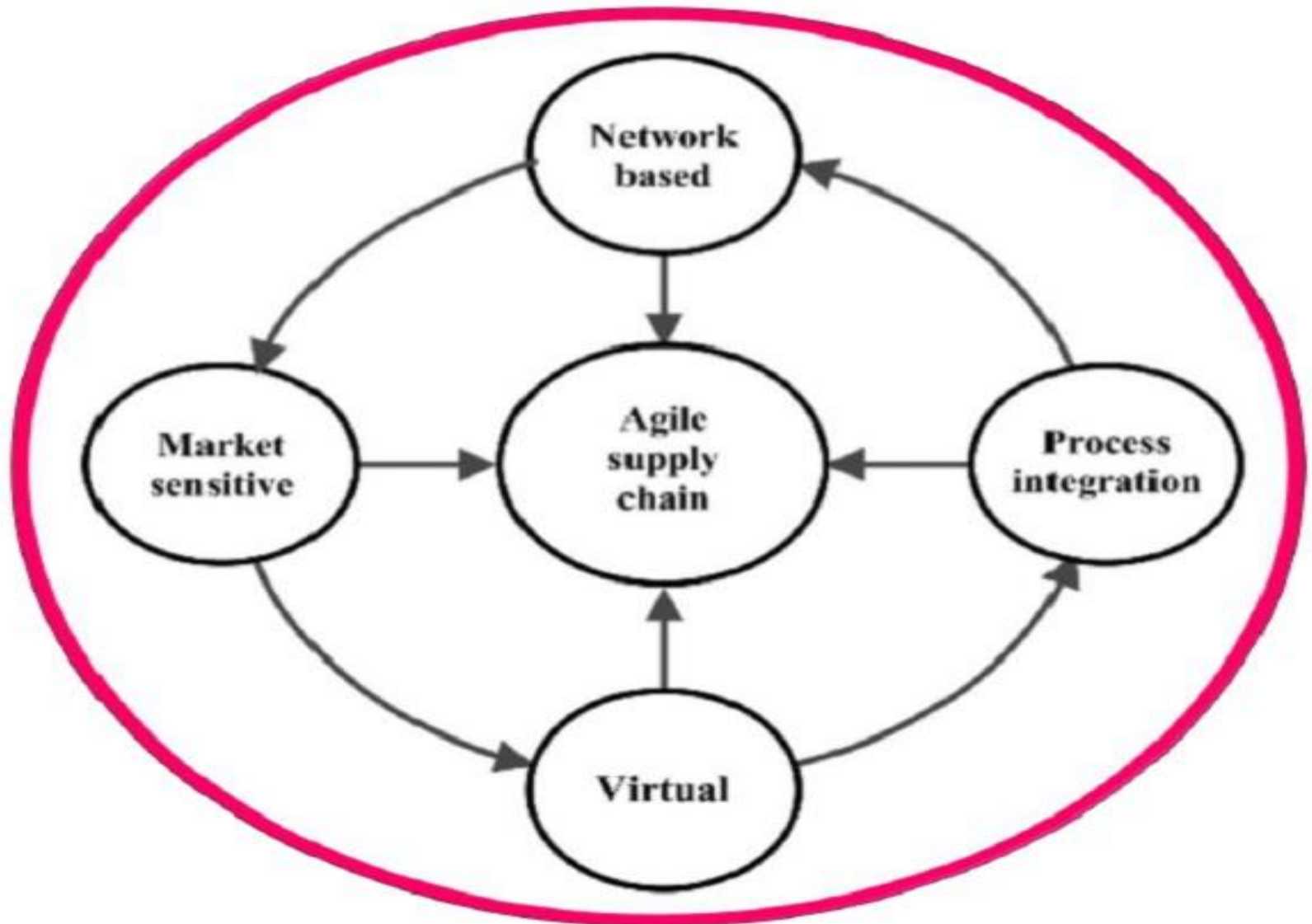
Facilities and handling

Information

2. Agile & Reverse Supply Chain Management

- An agile supply chain can be defined as a chain of supply that has the **potential to respond to changing requirements in a way that accelerates** the delivery of ordered goods to customers.
- Supply chain agility is a custom adopted by many companies for choosing a dealer.
- A supply chain with flexibility and the ability to quickly react to emergency requirements can help the business answer more efficiently to its customers.
- Apart from flexibility, speed and accuracy are also signature marks of this type of supply chain.

2. Agile & Reverse Supply Chain Management



2. Agile & Reverse Supply Chain Management

Agile Supply Chain

- To acknowledge the advantages of an agile supply chain, we have to learn about the elements of any type of supply chain.
- These include elements like collection of orders and processing, supply of materials to create the goods used to complete orders, packaging and transport of finished goods, and the quality of customer service that is advertised throughout the process from the point of sale to the actual delivery and beyond.
- Thus, for considering the functions of supply chain as agile, each one of these elements must be managed efficiently and coordinated in such a way that makes it possible to adapt to changing circumstances.
- With the help of an agile supply chain, merchants can easily respond to the varying requirements of customer with relatively less time required.
- Working collaboratively, the merchant and the customer develop a strategy to permit the delivery of as much of the order as possible within the new time frame required.

Reverse Supply Chain

- Reverse supply chain states the evolution of products **from customer to merchant.**
- This is the reverse of the **traditional** supply chain evolution of **products from merchant to customer.**

Reverse Supply Chain...

Mostly RSC is designed to carry out the below given five key processes

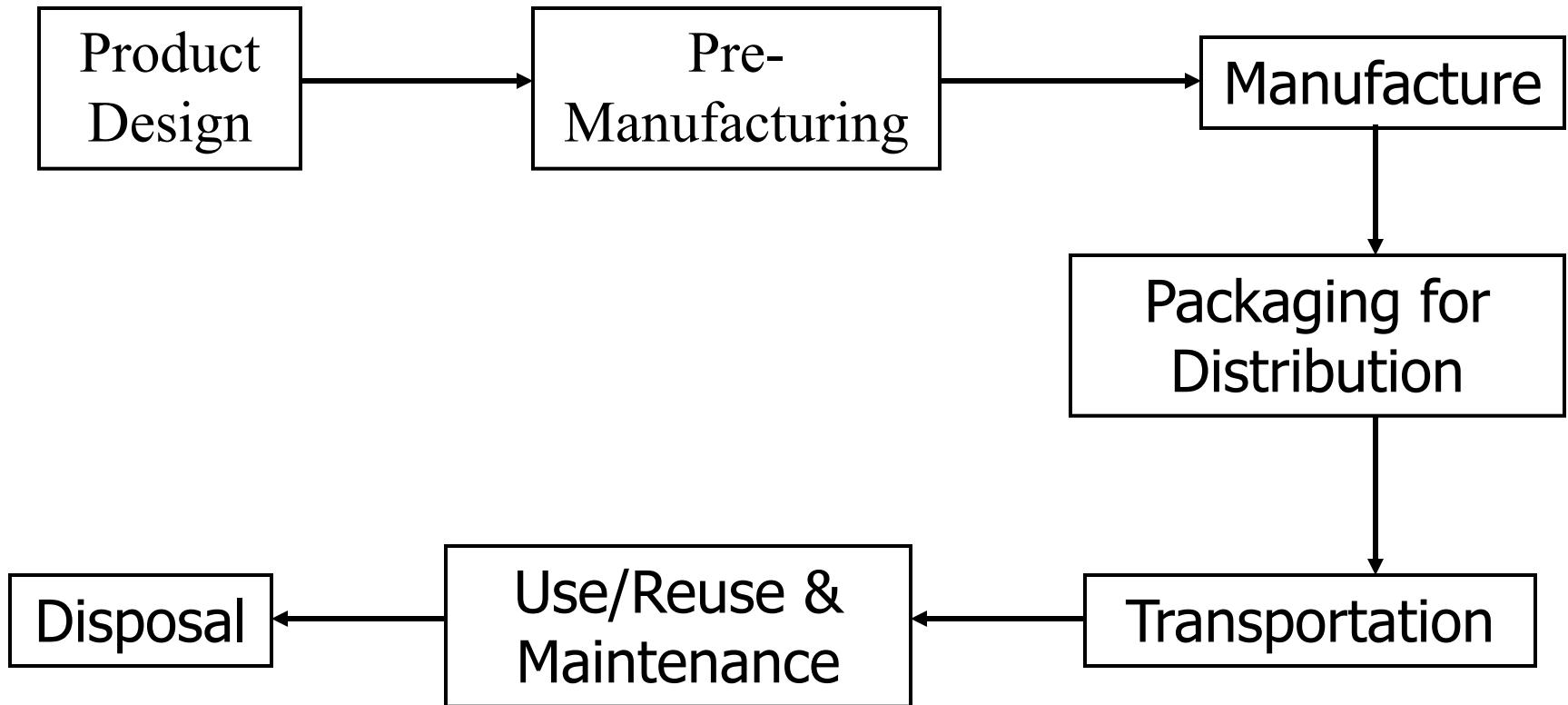
- **Product acquisition** – Accumulating the used product from the user by the reseller or manufacturer because of some manufacturing defect or some other reason. It is basically considered as a company's growth strategy.
- **Reverse logistics** – Shipping of products from their final destination for auditing, sorting and disposition.
- Reverse logistics is the process of planning, executing, monitoring and controlling the efficient and effective inbound flow and storage of secondary goods and information related to the **purpose of recovering value or proper disposal.**

Reverse Supply Chain...

- **Inspection and disposition** – Examining the condition of the product returned along with making the most profitable decision for reusing it in some other way.
- **Remanufacturing or refurbishing** – Returning the product to its original source from where it was ordered in the very first place along with specifications. This is done basically when there is a manufacturing or furnishing defect in the goods.
- **Marketing** – Establishing secondary markets for the goods that have been recovered by the merchant from the client who initially ordered it in the beginning but chose to return it.

3.Green Supply Chain Management

Life Cycle of Product(1)



Life Cycle of Product (2)

- There are emissions and consumptions of resources at every stage of product life
- Life Cycle Assessment (LCA) – process used to evaluate the environmental impact at every stage of production of a product or service
- Final goal: purchase products with the minimal negative environmental impacts

Green Supply Chain Management

- Management of Materials and Resources from **Suppliers to Manufacturer/Service Provider to Customer and Back, with the Natural Environment Explicitly Considered**
- GSCM is an **integrating environment thinking into supply chain management**, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end-of-life management of the product after its useful life.

Definition of Terms and Concepts

GSCI is integrating environmental thinking into supply-chain systems including

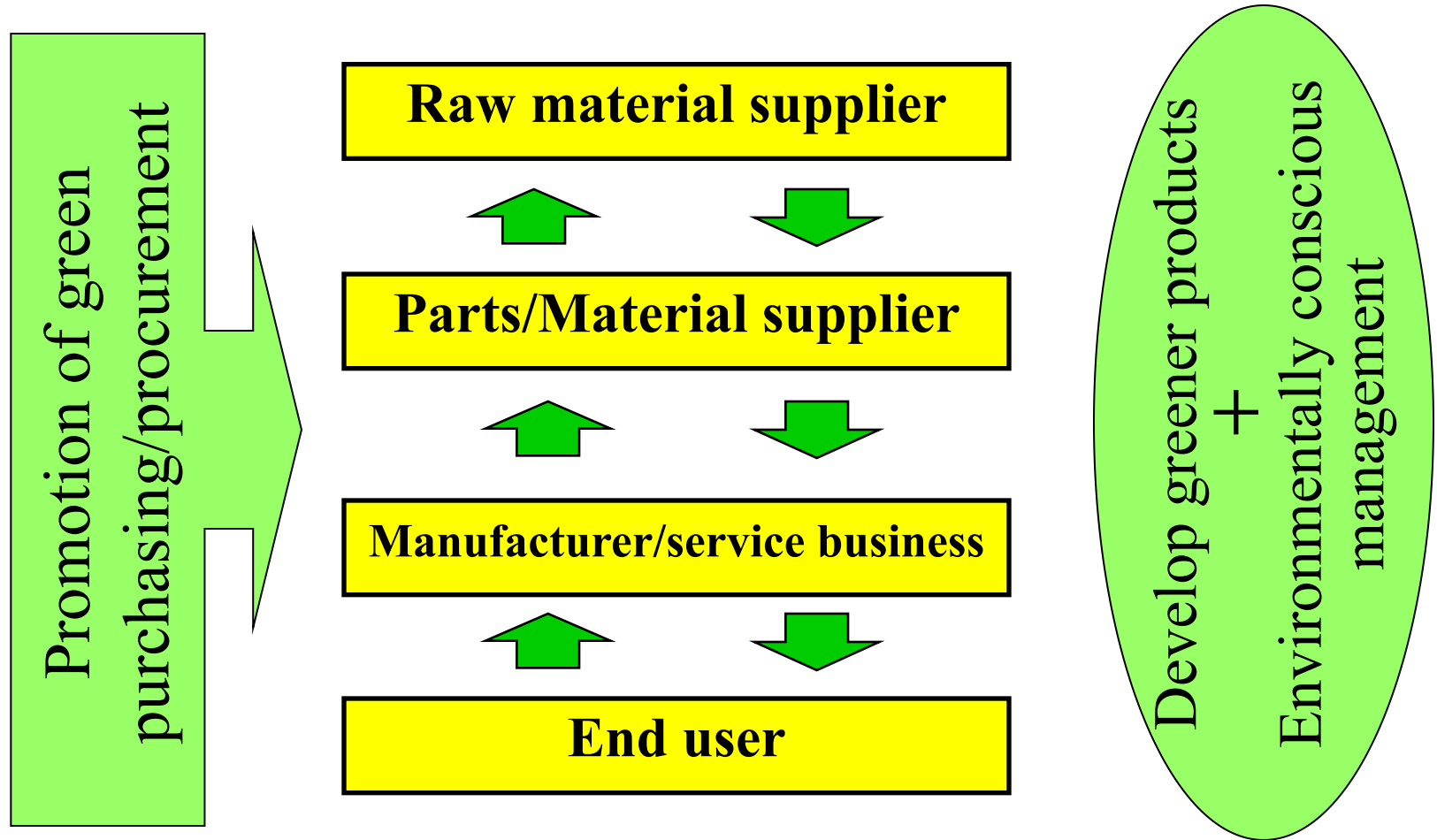
- Product design,
- Material,
- Manufacturing processes,
- Warehouse,
- Delivery of the final product to the consumers in order to achieve a greener supply chain and maintain competitive advantage (Seman1, 2012).

Though, GSCI includes green purchasing, design for environment (DFE), closed-loop supply chain (CLSC), life cycle assessment (LCA), green manufacturing, waste management, reuse, remanufacturing, refurbishment, and reverse logistics (RL) fall under the main umbrella of GSCM within the supply chain firm (Cascini, 2015).

Green Supply Chain Management

- The supply chain has been traditionally defined as a one way, integrated manufacturing process wherein raw materials are converted into final products, then delivered to customers.
- Nowadays due to recent changing environmental requirements affecting manufacturing operations, increasing attention is given to developing environmental management (EM) strategies for the supply chain.

Greening Supply Chain



Green Supply Chain Management...

- GSC strengthens & build greater support with suppliers for additional environmental initiatives
- GSC also screens suppliers for environmental performance, work with them on green design initiatives and provide training & information to build suppliers' environmental management capacity
- GSC- buyer requiring certain level of environmental responsibility in the business practice

Benefits of GSCM

- **Economic benefits from increased efficiency.**

By reducing wastes, companies decrease handling expenses, fines, and even costly inputs. Supplier's savings may be passed along to buyer companies.

- **Competitive advantage through innovation.**

Efficient production is enhanced through the use of cleaner technologies, process innovation, and waste reduction. Reduction in wastes equals dollars earned.

- **Improved product quality.** Supply chain partnerships help maintain relationships between buyers and suppliers leading to increased control over product quality.

- **Consistent corporate environmental goals.**

- In an era of multi-faceted, non-vertical manufacturing, companies include supplier outreach to address corporate environmental goals.

- **Improved public image.** Consumers, investors, and employees respond positively to companies with a reputation for good environmental performance.

Factors Drive A Company To Adopt GSCM

- Government
- Environmentally aware customer
- Market and competitor
- Company

Some Ways Of Greening Supply Chains

- Product Packaging
- Design for Upgradeability
- Design for Recyclability
- Materials Innovation
- Energy Efficiency /Green/Alternative sources of energy
- Environmental cleaning and greening e.g tree planting

GSC and the 5 Rs

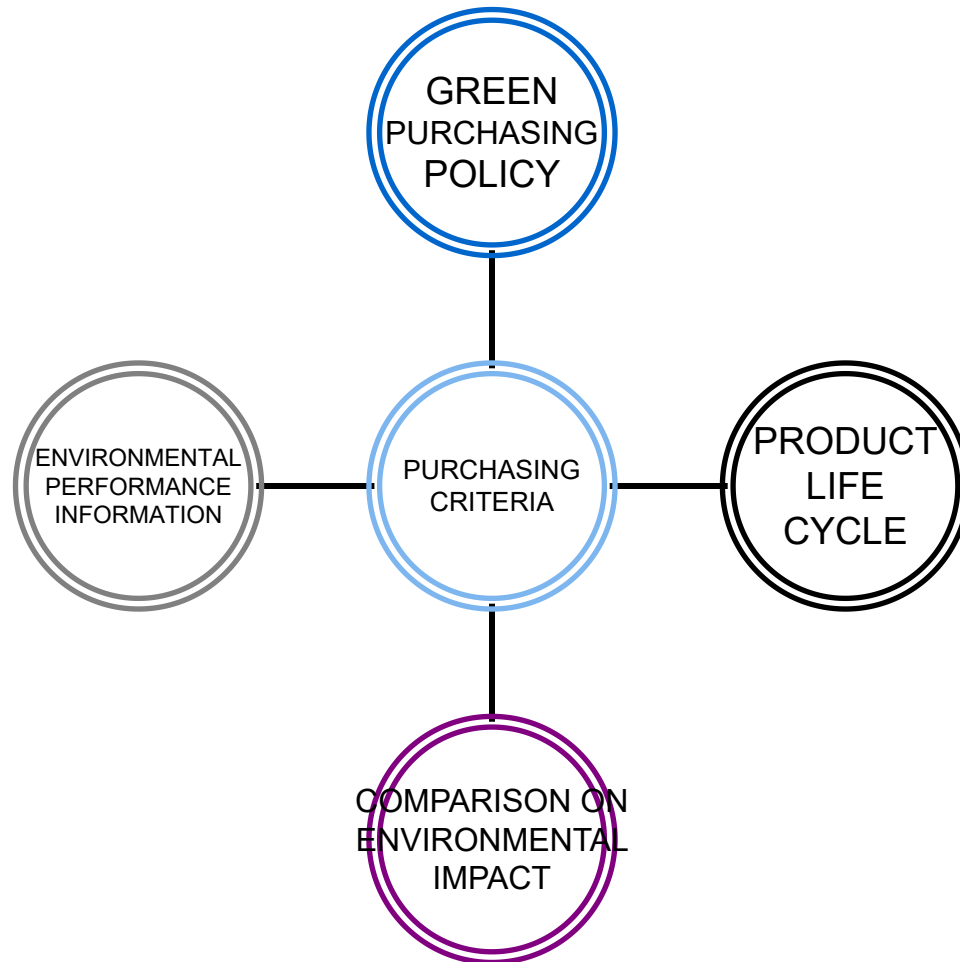
- Reduce
- Reuse (Replace)
- Recycle
- Refuse (Reject, Return)
- Repair (Refine)

What is a 'Green' Product?

A 'Green' Product:

- Can be recycled
- Have a recycled content
- Be energy efficient
- Emission reducing
- Re-usable
- Biodegradable
- Organic

Purchasing Criteria



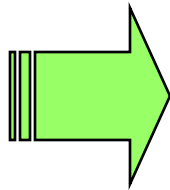
To cope with environmental problems: focus on input - purchasing

GREEN INPUT

Reduce input (optimal input)

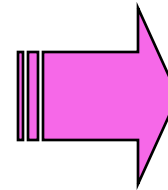
Materials:

- Non-hazardous
- Easy-to-recycle
- Energy efficient
- Resource saving



OUTPUT REDUCED

Wastes
Pollution
Hazardous
substances
Carbon Dioxide

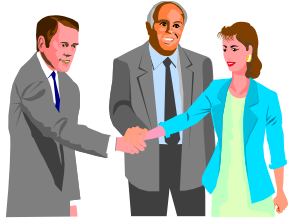


Recycled
material

5R



Complete the Circle of recycling

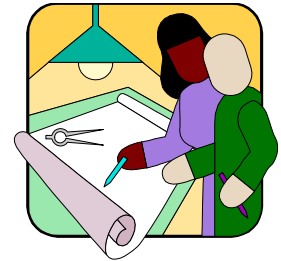


Proactive sales of
recycled products

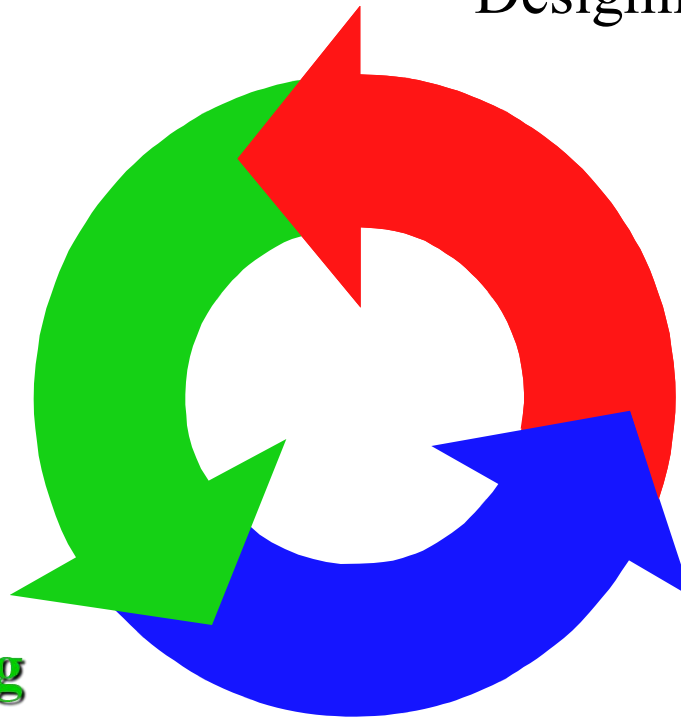


Green purchasing
**purchase of
recycled products**

Use of recycled products
Designing recyclable products



Discharge after sorting/collection
→easily recyclable



Green Purchasing

- Considering the quality, price and the environment
- A way of purchasing which gives preference as far as practicable to those products & services which cause least harm to the environment
- The purchase of items made with recovered materials.
- It encompasses environmentally preferable purchasing i.e. the purchase of products which are least harmful to the environment & human health
- Taking into considerations of the quality, price & environment, the purchase of a product or service with the least environmental impact

Green Purchasing

Environmental issues to consider:

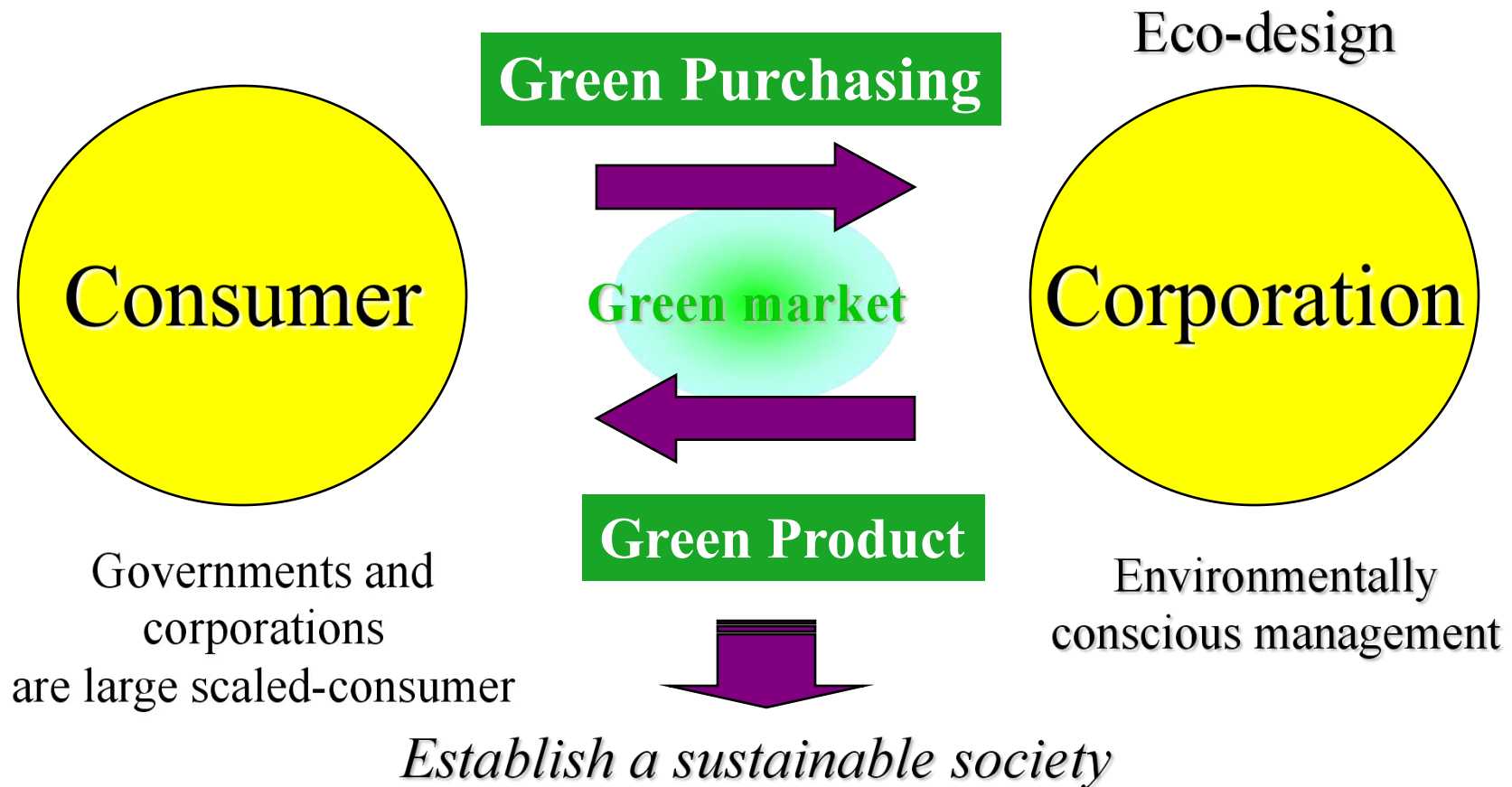
- Packaging
- Recycled contents
- Low energy
- Longer life
- Locally produced
- Low pollution

Purchasing Criteria ...

- Green Purchasing Policies and Product Specifications
 - ❑ Include environmental considerations as a factor
- Product Life Cycle
 - ❑ Emphasis on eliminating or reducing potential risks to health and environment
- Comparison of Environmental Impact
 - ❑ Environmental impact to be given due consideration
- Environmental Performance Information
 - ❑ Manufacturers and distributors to provide comprehensive, accurate and meaningful information for purchasing consideration

Green Purchasing changes a corporation

Encouraging environmentally conscious management and product development through the market



Green Purchasing & Costs ...

- Do not be biased against Green Purchasing – does it cost more ?

There are increasing numbers of products which can be purchased at the same price as conventional products.

- Seek measures to avoid cost increases as a whole, including the reduction of purchasing quantity, reuse, etc.

— R e v i e w i n g t h e w a s t e , r e c o n s i d e r a t i o n o f t h e
necessity, co-ownership, etc.

- Also consider “life cycle costs”.

- Some Green Products may be costly for now, but the stance to support it may be necessary in consideration of the social significance of Green Purchasing: “Social Costs”.

Issues In Green Supply Chain

- Financial Cost
 - Smaller suppliers have financial constraint and may not devote the necessary resources
 - Essential for consumer to consider overall benefits
 - Awareness amongst consumers
- Liabilities and Responsibilities
 - Supplier must comply to the laws and regulations
 - Example: Computer manufacturer increase offerings to meet the Green Star standard for energy efficiency

Issues In Green Supply Chain...

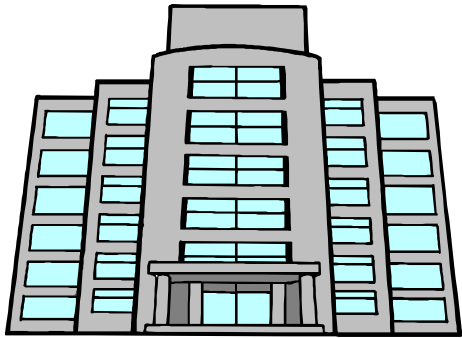
- Documentation
 - To meet environmental criteria, consumer can demand supplier to meet standards in operation and practise
 - Formal environmental management system (EMS) or other certification such as International Organisation for Standardisation (ISO) to validate supplier's compliance
- Transparency versus Confidentiality
 - Supplier should be transparent in providing information for customer's decision making
 - However, lack of protection for innovation & intellectual property challenge the confidentiality of the information

Issues In Green Supply Chain....

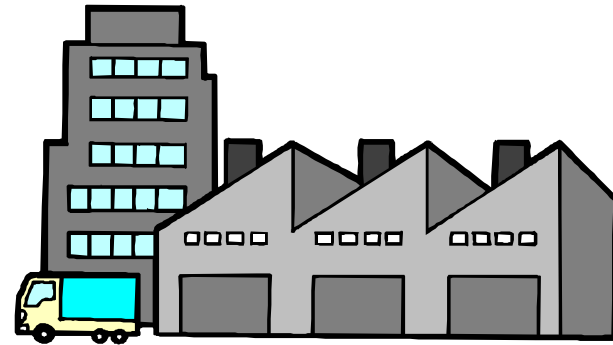
- Cooperation and Long-Term Business Relationships
 - Supplier's effort in addressing the environmental issue can result in:
 - Cost reduction for consumer
 - Greater operational efficiency
 - Enhanced value for consumer
- Advantage of cooperation between supplier and consumer:
 - Strengthen customer-supplier relationship
 - Shared savings and benefits

Anyone can take the initiatives

Government



Corporation



Consumer

→ *Green consumer*

4. Supply Chain Performance Measure(SCPM)

- ✦ Due to lack of clarity and comparability concerns in this area, there are no guidance or set rules under which can to measure supply chain performance (Khan Rai Waqas Azfara, 2014) ,
- ✦ Context-dependent process ,tolerated and contextual measuring scenario (Piotrowicz, 2011).
- In SCPM **quality, final product delivery reliability and cost were** highly rated and the most important indicators for the supply chain performances (Ambe, 2014) .
- Even though firms still largely use **financial and productivity performance** measures for measuring their supply chains (By Fasika Bete Georgise, 2013).

4. Supply chain performance measure...

- Supply chain performance measure can be defined as an approach to judge the performance of supply chain system.

Supply chain performance measures two categories

Qualitative measures – for example, customer satisfaction and product quality.

Quantitative measures – for example, order-to-delivery lead time, supply chain response time, flexibility, resource utilization, delivery performance.

4. Supply chain performance measure...

Quantitative Measures

- Mostly the measures taken for measuring the performance may be somewhat similar to each other, but the objective behind each segment is very different from the other.
- Quantitative measures is the assessments used to measure the performance, and compare or track the performance or products.

Quantitative measures of supply chain performance into two types.

-Non-financial measures

✓Financial measures

4. Supply chain performance measure...

Non - Financials Measures

- The metrics of **non-financial measures** comprise cycle time, customer service level, inventory levels, resource utilization ability to perform, flexibility, and quality.

Financial Measures

- The measures taken for gauging different fixed and operational costs related to a supply chain are considered the financial measures.
- Finally, the key objective to be achieved is to maximize the revenue by maintaining low supply chain costs.

4. Supply chain performance measure...

Financial Measures

- There is a hike in prices because of the inventories, transportation, facilities, operations, technology, materials, and labor.

Generally, the financial performance of a supply chain is assessed by considering the following items –

- Cost of raw materials.
- Revenue from goods sold.
- Activity-based costs like the material handling, manufacturing, assembling rates etc.
- Inventory holding costs.
- Transportation costs.
- Cost of expired perishable goods.
- Penalties for incorrectly filled or late orders delivered to customers.
- Credits for incorrectly filled or late deliveries from suppliers.
- Cost of goods returned by customers.
- Credits for goods returned to suppliers.

4. Supply Chain Performance Measurement Tools

Types SCPM Tools	Functions and Main Components
SCOR	Plan, Source, Make, Deliver, and Return
ABC	Assessing the financial intricacies like the total cost involved in engaging a particular customer or the metrics pertaining to a specific product in the supply chain. that means. assigning costs in a supply chain based on its activities rather than on the end deliverables
QMS/TQM	Customer-oriented, leadership, strategic planning, employee responsibility, continuous improvement, cooperation, statistical methods, and training and education
BSC	Financial, Customer, Internal process perspective , The learning and growth or innovation perspective
LSC	Logistics Financial Performance Measurement Logistics Productivity Measurement Logistics Quality Measurement Logistics Cycle Time Measurement

The Supply Chain Operations Reference (SCOR) Model

- This model was attempts to integrate well known concepts of process reengineering, benchmarking, and process measurement into a cross functional relationship by:
 - Capturing the “as is” state of a process and derive the “to be” future state (reengineering);
 - Quantify the operational performance of similar companies and establish “best of class” performance (benchmarking); and,
 - Characterize and describe the management processes that will result in “best in class” performance (best practice analysis).

The Supply Chain Operations Reference (SCOR) Model

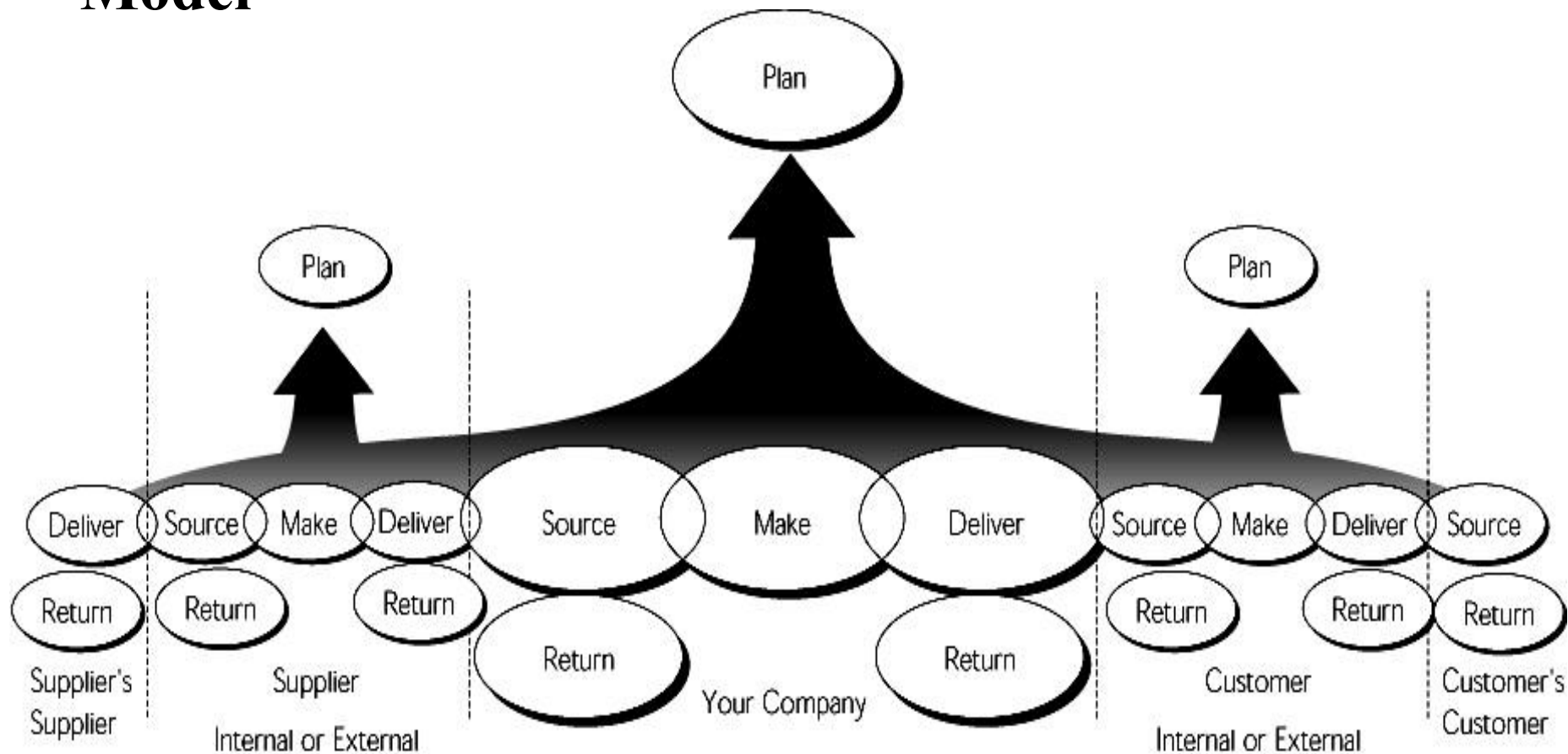


Figure SCOR is Based on Five Distinct Management Processes