ISOM 2700: Operations Management
Session 8.1 Managing Supply Chain: Introduction

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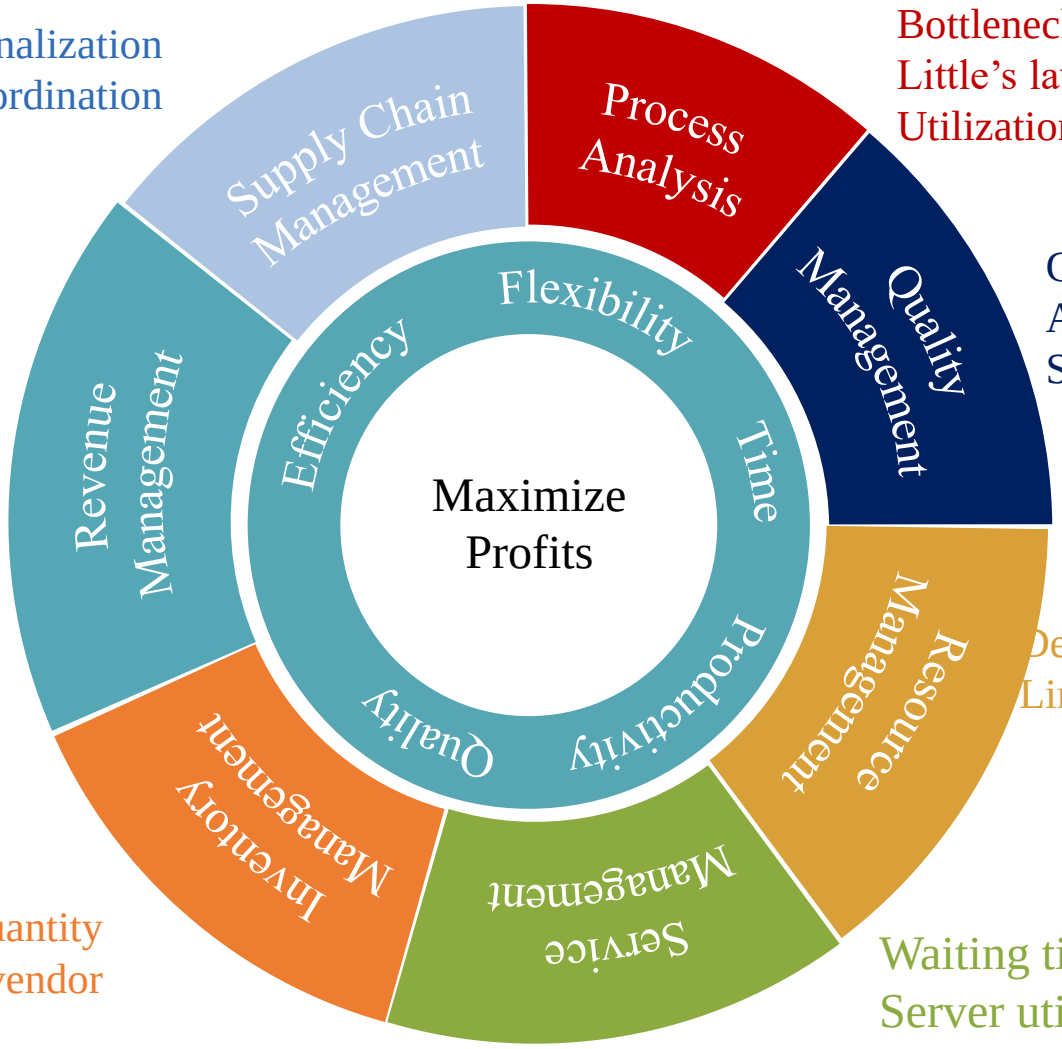
Course Roadmap



Double marginalization
Supply chain coordination

Bottleneck
Little's law
Utilization

Control chart
Acceptance sampling
Six sigma

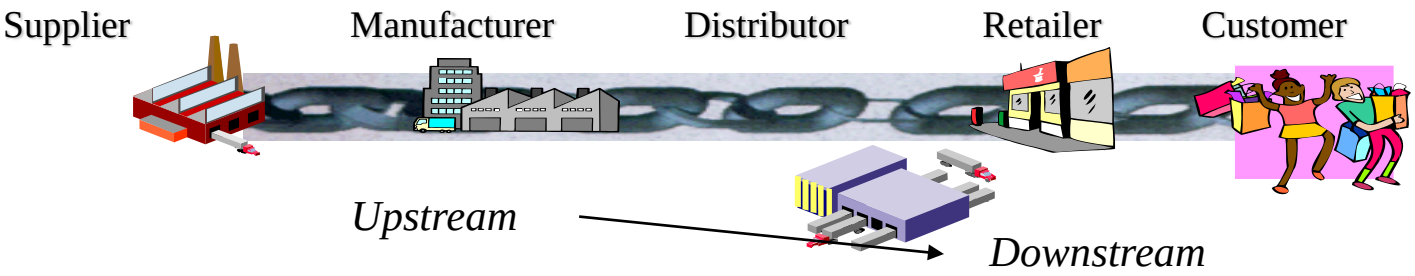
Demand forecasting
Capacity-based RM
Price-based RM

Decision tree method
Linear programming

Economic order quantity
Newsvendor

Waiting time
Server utilization

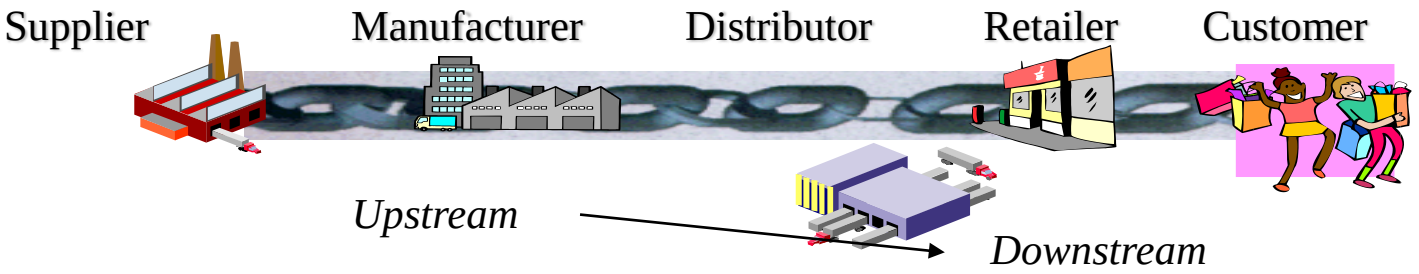
What is a supply chain?



A **supply chain** is the system of organizations, people, activities, information and resources involved in *moving a product or service from supplier to customer*.

What is a supply chain?

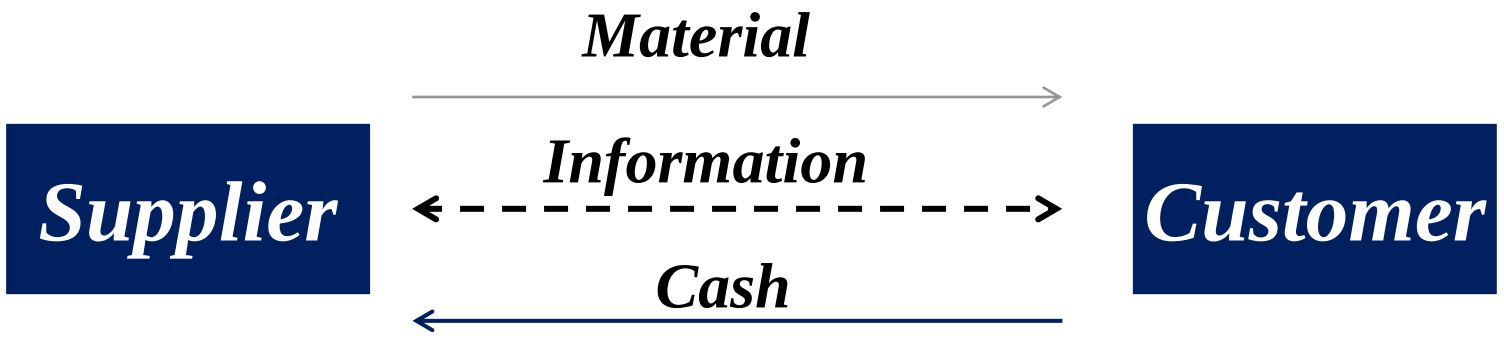
- A supply chain consists of

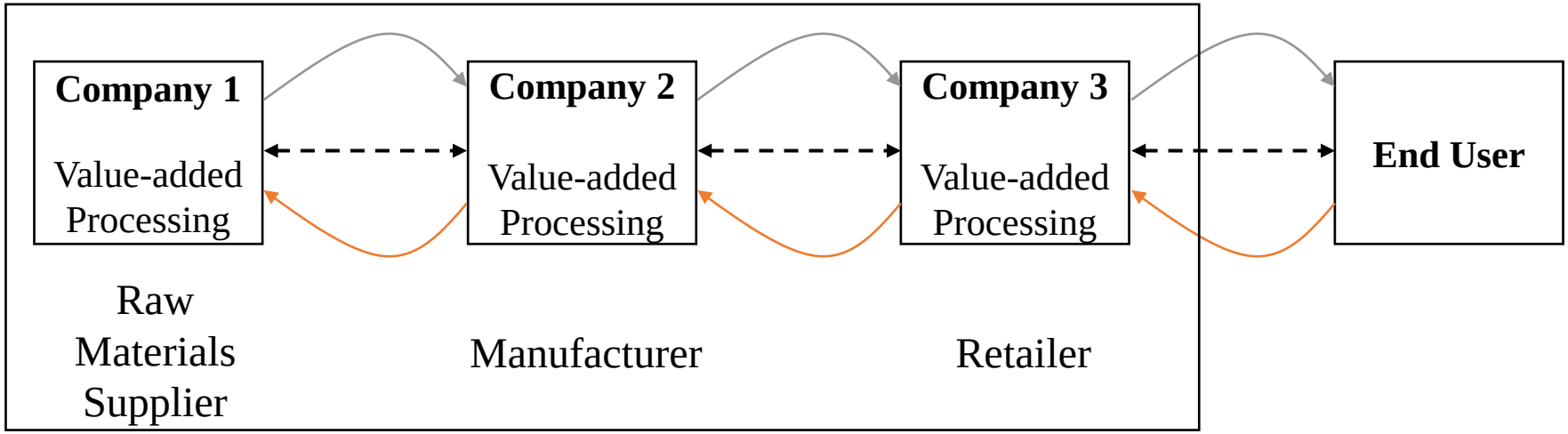


- Aims to Match Supply and Demand, profitably for products and services
- Achieves

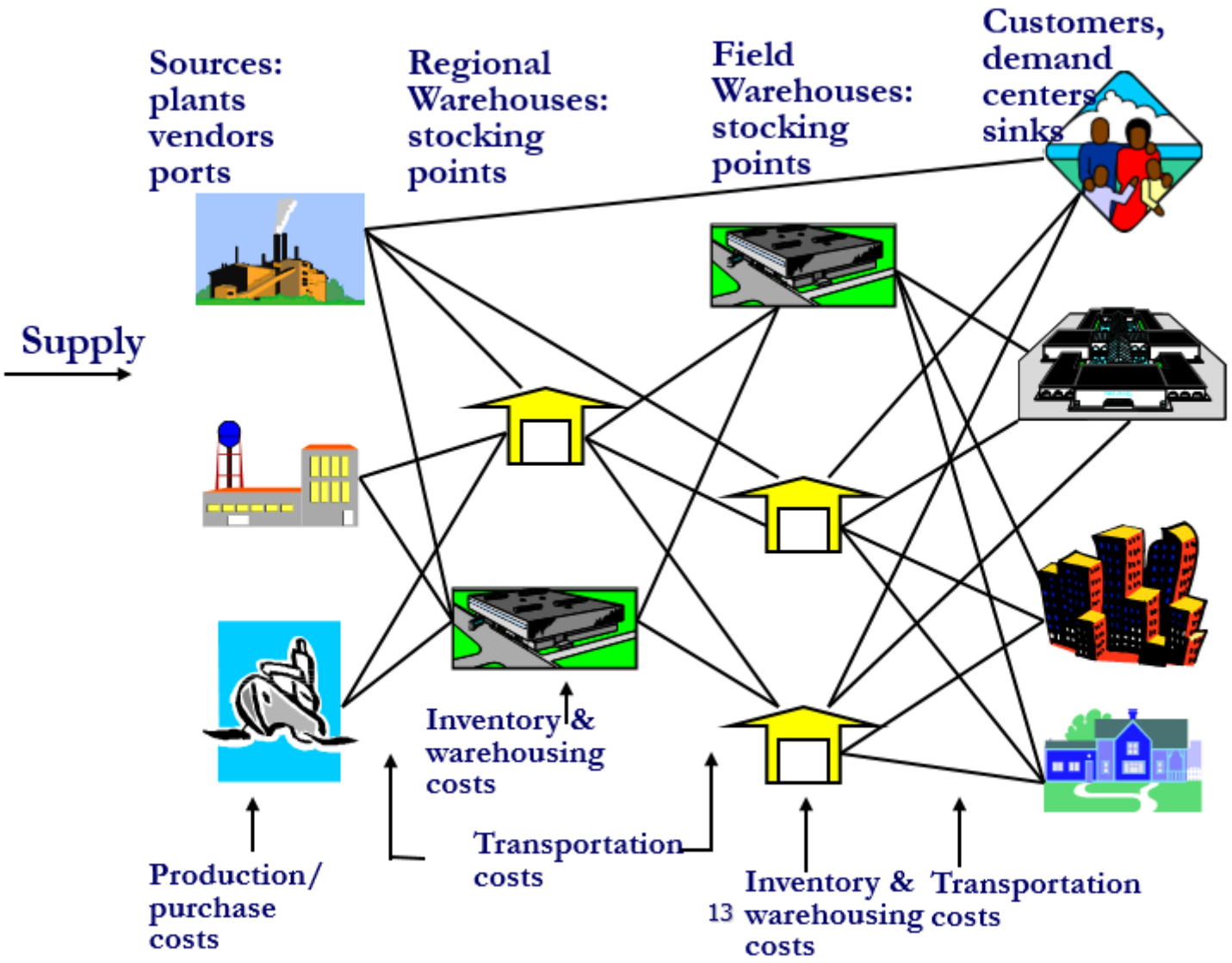
The right Product + **The right Price** + **The right Store** + **The right Quantity** + **The right Customer** + **The right Time** = **Higher Profits**

Flows in a Supply Chain





Complex Supply Network

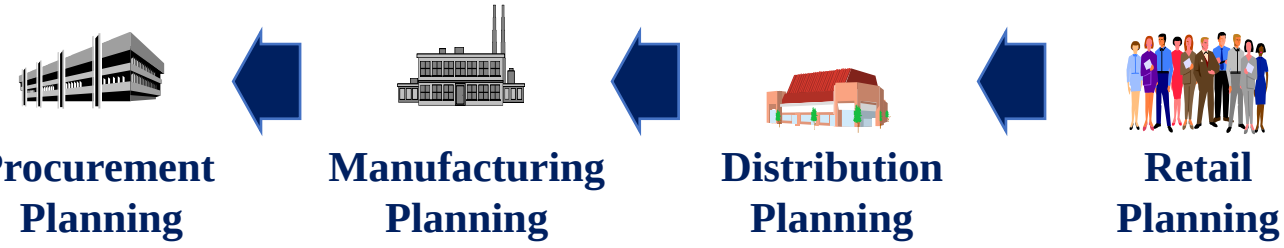


Local and Sequential Optimization

- Every company makes decision based on its own interest

- Decisions, such as capacity & quantity, are made individually, rather than collaboratively.

Sequential Optimization



What is Supply Chain Management?

- Supply-chain management (SCM) is a total system approach to managing the entire flow of information, materials, and services from raw-material suppliers through factories and warehouses to the end customer.

Design: California, USA

Moulds, paint pigments: USA

Assembly: Indonesia and Malaysia

Marketing: USA

Nylon hair: Japan

Body material: Taiwan

Clothing: China

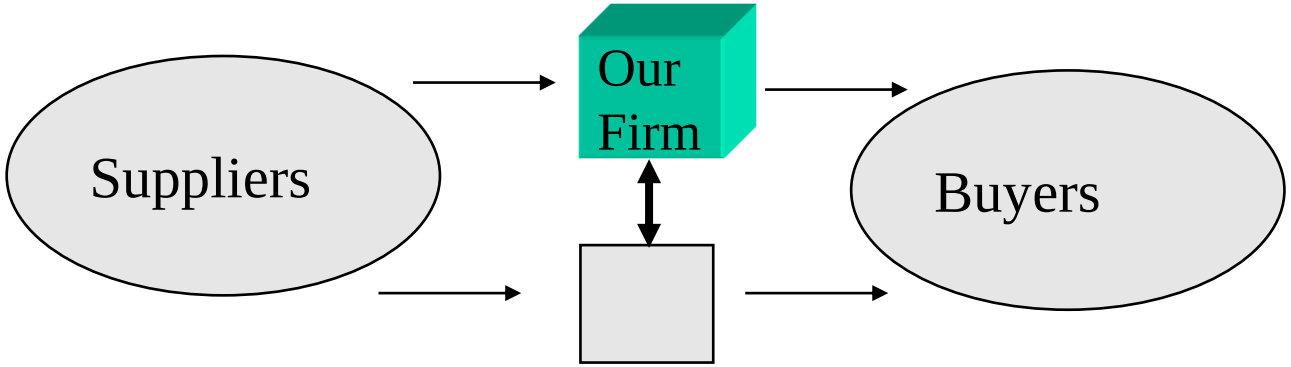
Quality testing: USA

Global Supply Chain for Producing a Barbie doll

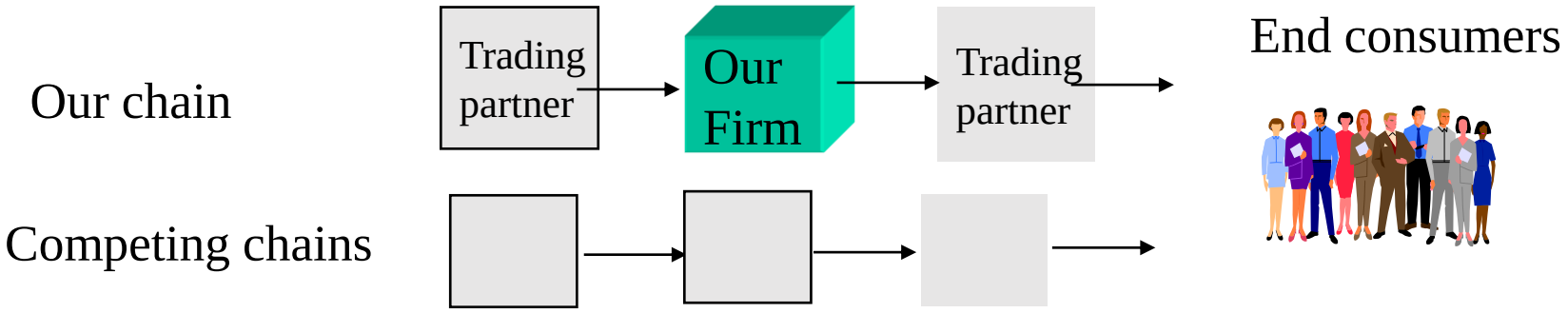
Video

SCM brings a new perspective

OLD: "We are a firm competing in our industry ..



SCM: "We are part of a supply chain competing with other chains for end consumers."



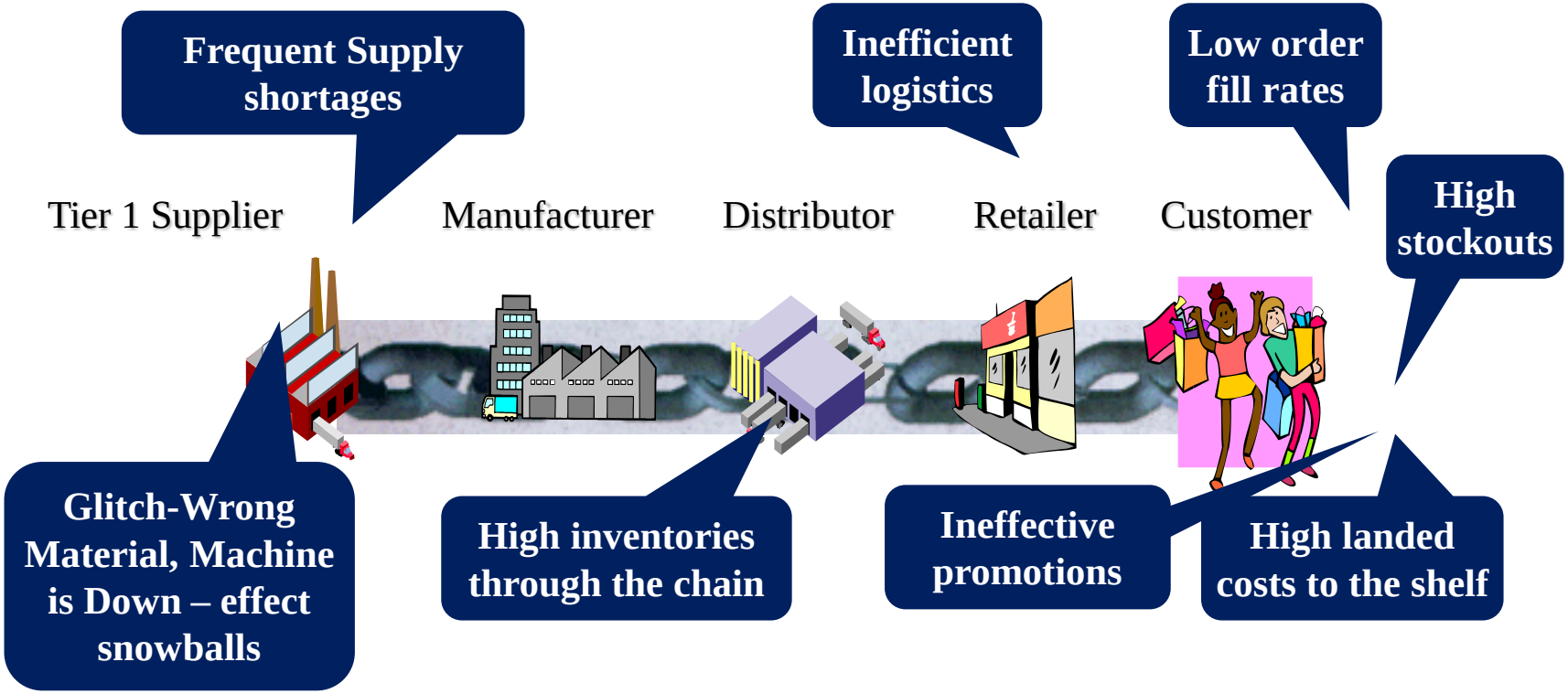
SCM brings a new perspective

Video: Think Globally

SCM objectives

- Increase revenues by being more responsive
  - product availability & variety
  - better service & delivery
  - speed to market/agility
- Reduce total costs through greater operational efficiency
  - procurement
  - production
  - inventory management
  - delivery
- Eliminate perverse incentives and destructive competition among channel partners

Challenges


Frequent Supply shortages
Inefficient logistics
Low order fill rates
High stockouts
Tier 1 Supplier
Manufacturer
Distributor
Retailer
Customer
Glitch-Wrong Material, Machine is Down – effect snowballs
High inventories through the chain
Ineffective promotions
High landed costs to the shelf

Challenges and Strategies To Win

Challenges	Implications
Increasing demand and supply uncertainties	Uncertainty drives need for flexibility
Shortening product and technology cycles	Dynamic instead of static supply chains
Multiple outsourced supply chain partners	Differential interests of multiple players

Agility

Adaptability

Alignment

Building Agility

"Sensible" Sense

"Responsive" Response

Video: About Zara

Video: Zara's Fast Fashion

7-Eleven's pantyhose

Introduction of pantyhose to convenience stores in Japan gained demand

↓

VP reported to the CEO, and suggested to add more cosmetic products to stores

↓

The CEO asked for more information about the buyers, e.g., gender

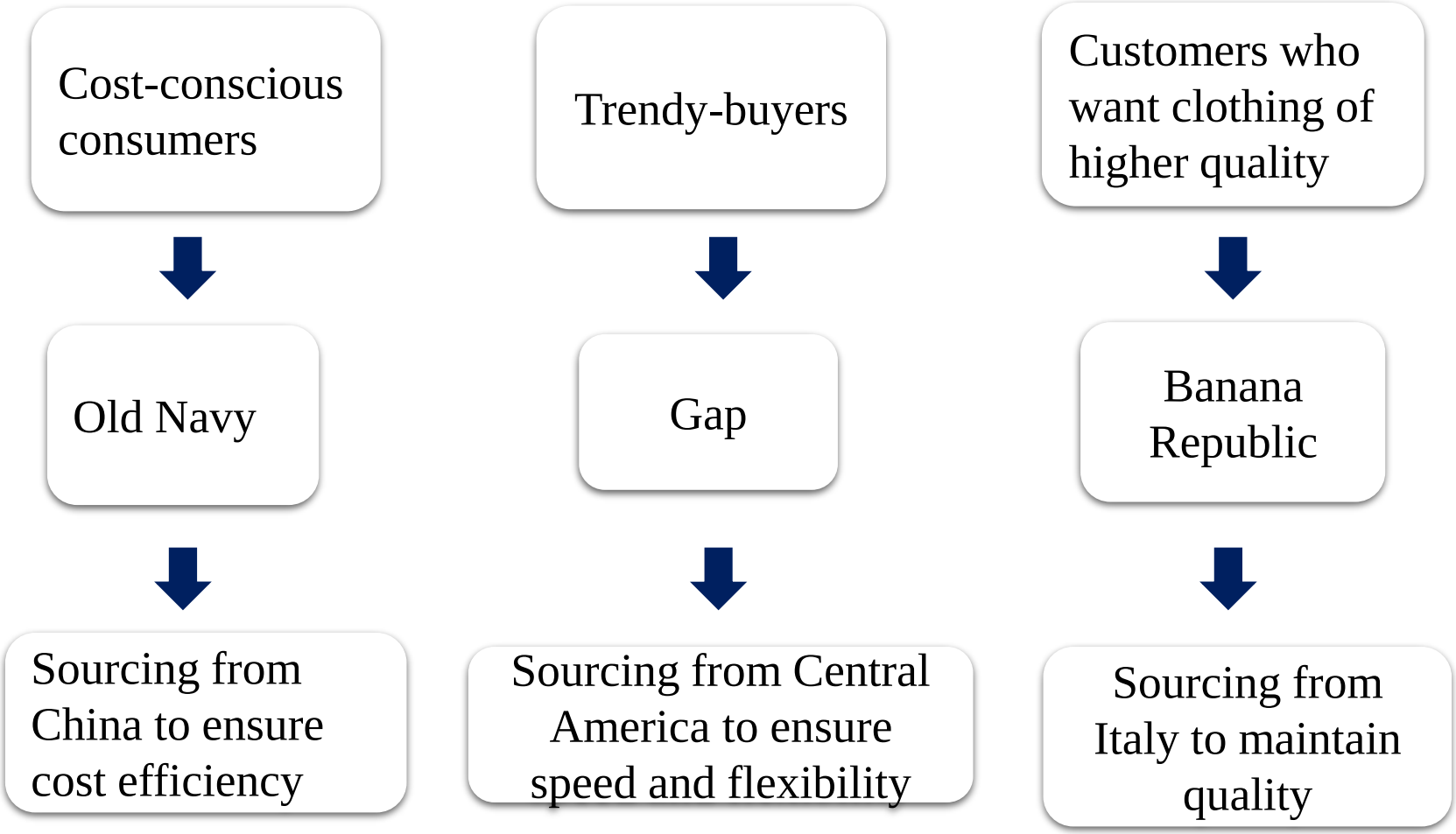
↓

?...!...

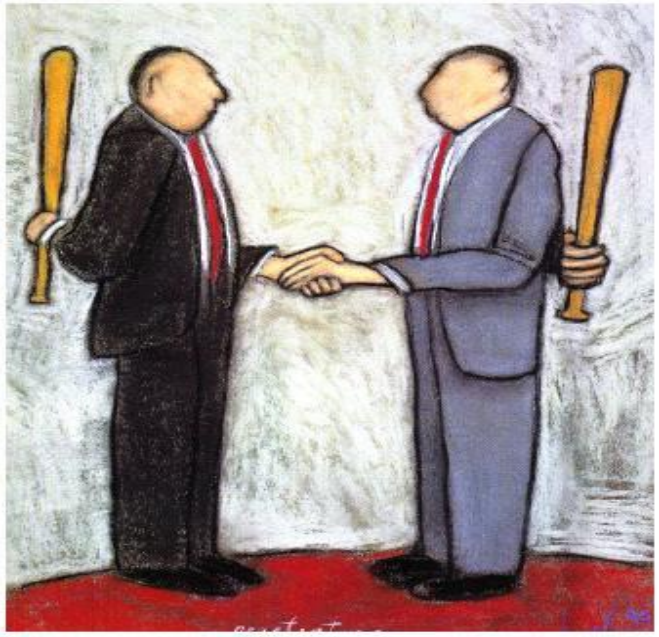
Building Adaptability

Architect Supply Chain for Right Product, Market & Time

Gap: three distinct supply chains



Building Alignment



Efficient sharing risks and rewards.

Trust-based, people-oriented organization.

Information sharing across supply chain.

7-Eleven with its Carriers

- If carriers fail to deliver on time, then they pay a penalty to 7-Eleven

- When carriers deliver products, there is no need to verify trucks contents (based on trust), thereby saving the carriers' time.

Delay of Boeing 787: Problem

- The first flight was delayed by 26 months and the first delivery was delayed by 40 months with a cost overrun of at least $10 Billion.

- A majority of the delays occurred not because Boeing and its suppliers were not able to do it right, but because some of them didn't want or care enough to do it right.

- Why?

Video: delivery after delay

Video: 787 Delayed Again

Delay of Boeing 787: Cause

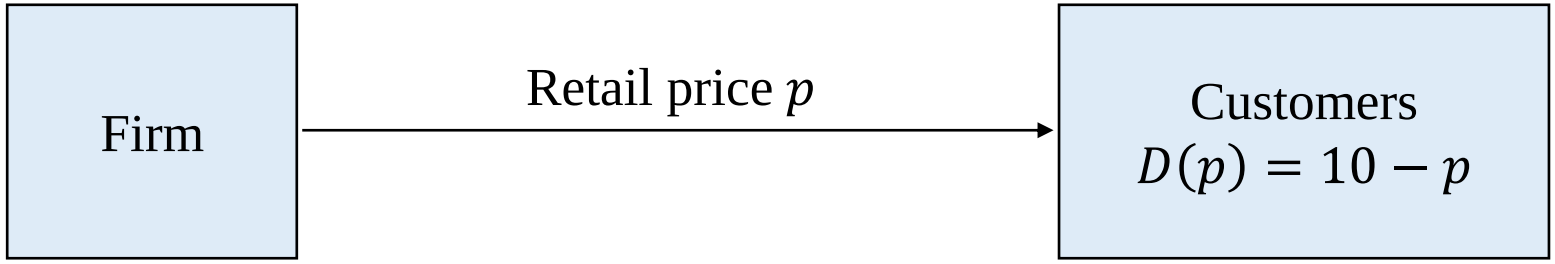
- Most of components' production are outsourced to suppliers
- The suppliers become stakeholders: investing first, and being compensated later when the plane is delivered
- Team incentive problem
  - Each supplier's effort in reducing production time is beneficial to the entire supply chain, but costly only to itself
  - Each supplier is not held responsible for its own delay

Double Marginalization

- Suboptimal supply chain performance occurs because …
  - Each firm makes decisions based on their own margin, not the supply chain's margin
  - This is called **double marginalization**

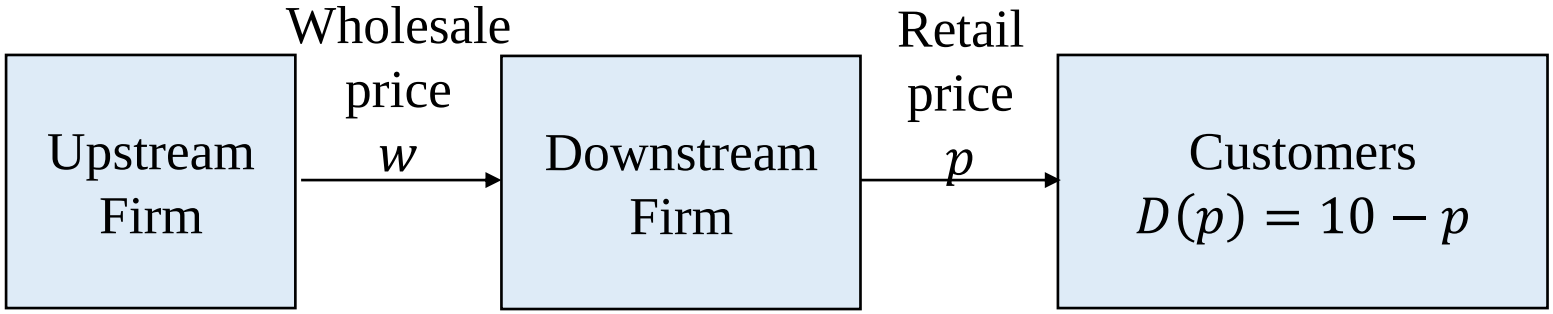
Double Marginalization: A Toy Model

- **Scenario 1: Single firm in a supply chain**



Unit production cost $c = 2$

- **Scenario 2: Two firms in a supply chain**



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Double Marginalization: A Toy Model

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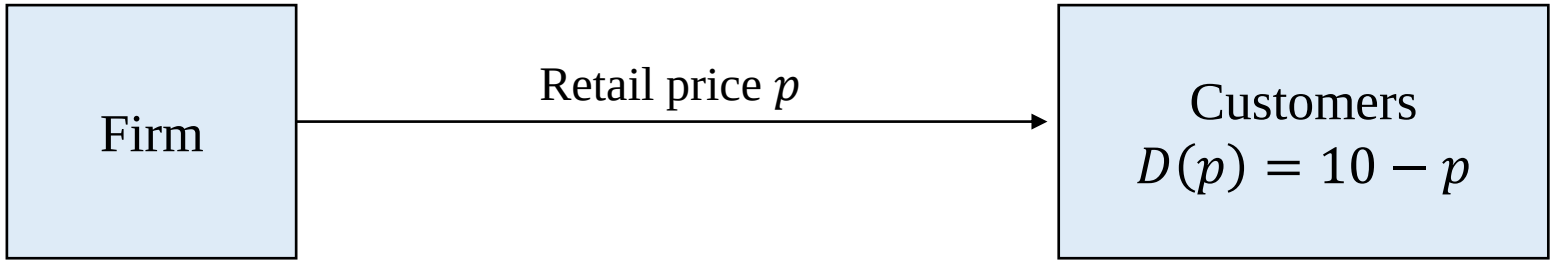


Unit production cost $c = 2$

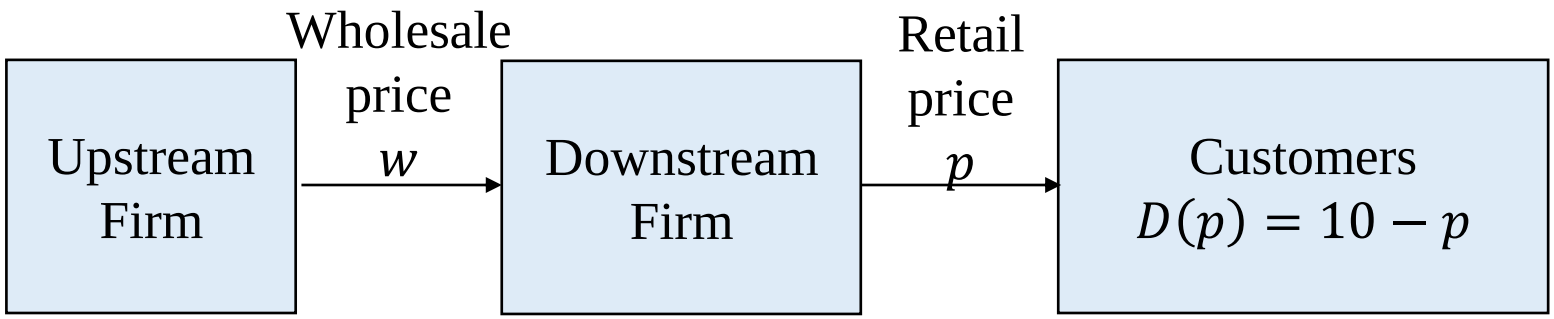
Firm's profit $R(p) = (p - c)D(p) = (p - c)(10 - p)$

- $\frac{dR(p)}{dp} = (10 + c) - 2p$
- Optimal price = $p^* = (10 + c)/2 = 6$
- Optimal profit = $(p^* - c)D(p^*) = 16$

This is called the first-best outcome!

Double Marginalization: A Toy Model

- **Scenario 2: Two firms in a supply chain**



Unit production cost $c = 2$

- **Downstream firm's profit**

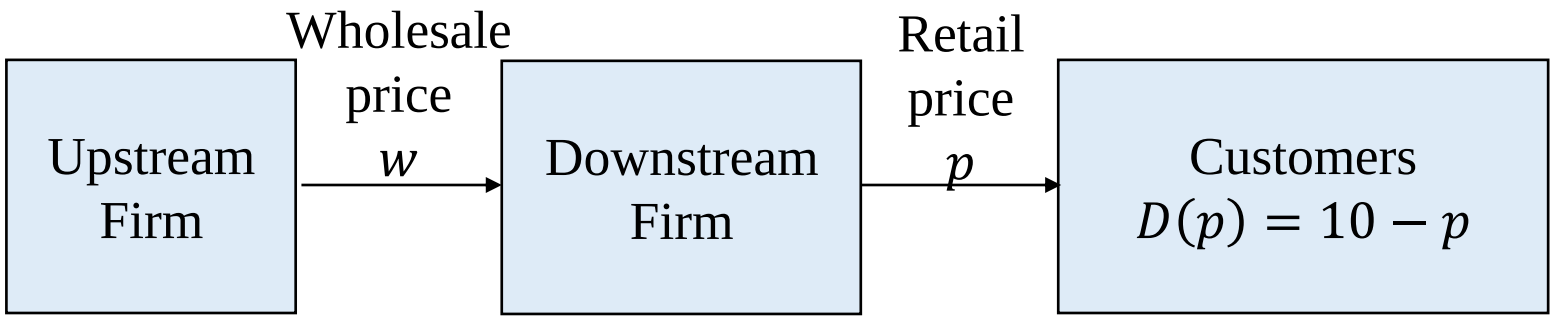
$$R_d(p) = (p - w)D(p) = (p - w)(10 - p)$$

  - $\frac{dR_d(p)}{dp} = (10 + w) - 2p$
  - Optimal retail price $p^* = (10 + w)/2$
  - Optimal downstream profit = $(p^* - w)D(p^*)$

This is the best-response retail price given wholesale price w

Double Marginalization: A Toy Model

- **Scenario 2: Two firms in a supply chain**



Unit production cost $c = 2$

- **Downstream firm's profit**
  - Optimal retail price $p^* = (10 + w^*)/2 = 8$
  - Optimal downstream profit = $(p^* - w^*)D(p^*) = 4$
- **Upstream firm's profit**
  - Optimal wholesale price $w^* = 6$
  - Optimal upstream profit = $(w^* - c)D(p^*) = 8$

This is called the second-best outcome!

Total supply chain profit = 4+8=12 < 16

Supply Chain Integration: MyFab.com

Video: MyFab Concept

Summary

- World class supply chains require capabilities in agility, adaptability and alignment
  - Sensible Sense and Responsive Response to gain agility
  - Right supply chain for the right product and right time
  - Winning with the whole supply chain

- Double marginalization ⇒ supply chain integration