Ch01: 21Centry Supply Chain

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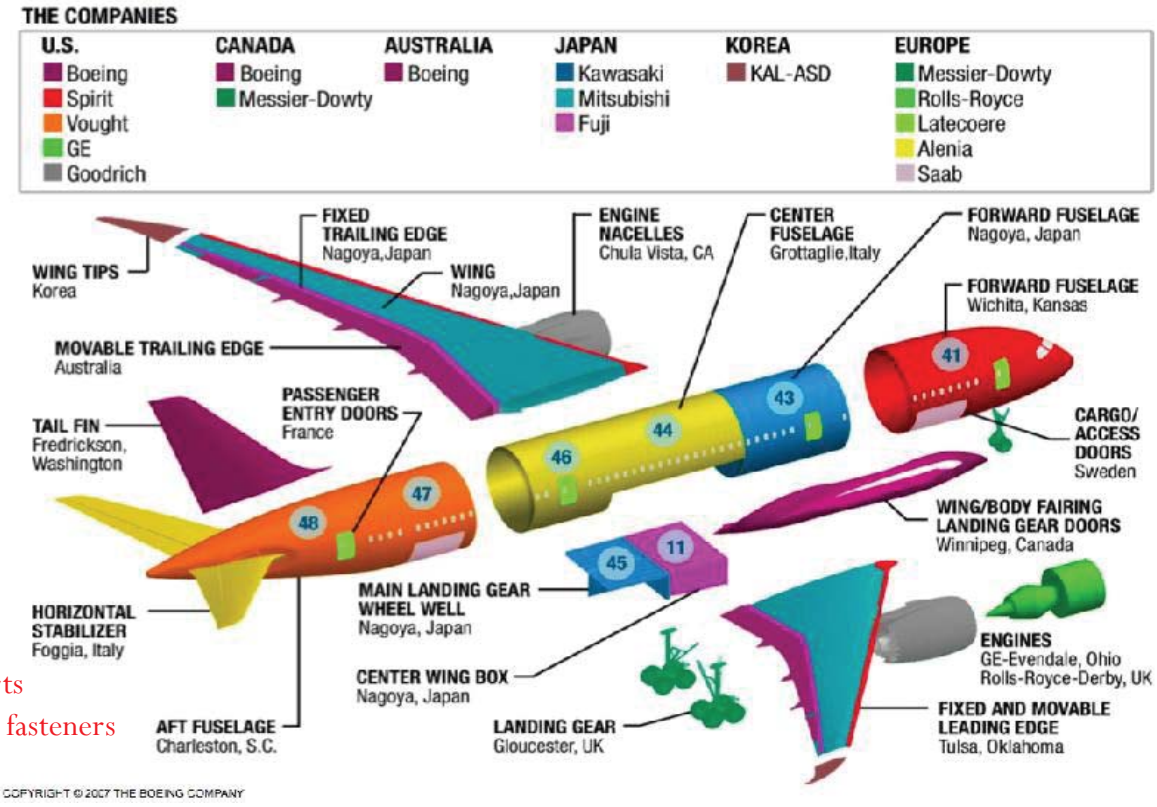
What is a supply chain

30000 parts/car

A Supply chain is complex - Boeing



6M parts

3M are fasteners

Supply Chain Needs Speed and Collaboration

The supply chain revolution

- In the 1990s, from a warehouse to a customer – 15-30 days
- Long lead time creates high inventory and bullwhip effects
- Now, the world no longer has scarcity – competition is even more intense than before
- Customers have shifted from passive acceptance to active involvement
- The ICT (information & communication technology) has helped SCM
- JIT, six-sigma, product innovation shapes nowadays industries
- Pursue for perfect orders – right assortment and quantity of products, to the right place on time, damage-free and correctly invoiced → lower costs and few financial resources commitment (ICT helps)

Topic 1: Bullwhip Effects in Supply Chains
供應鏈的長鞭效應

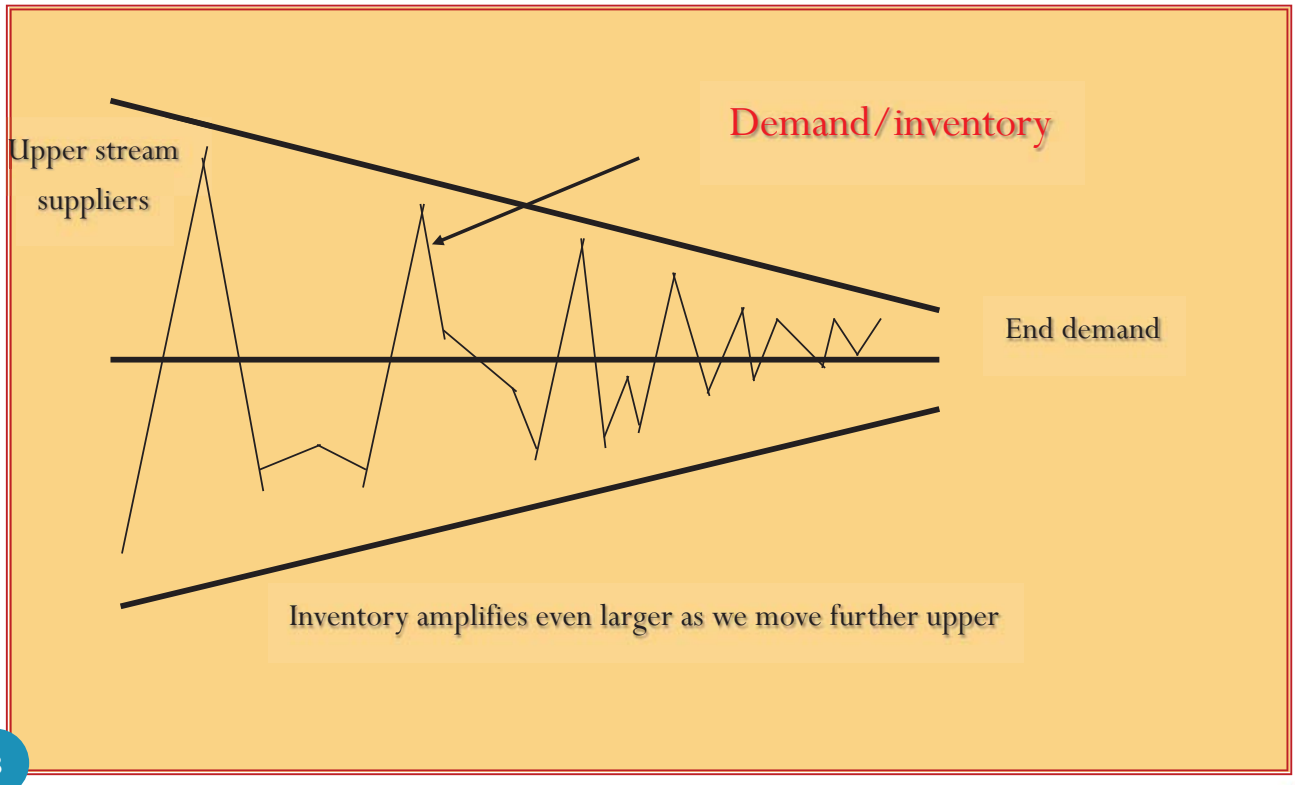
Bullwhip effects

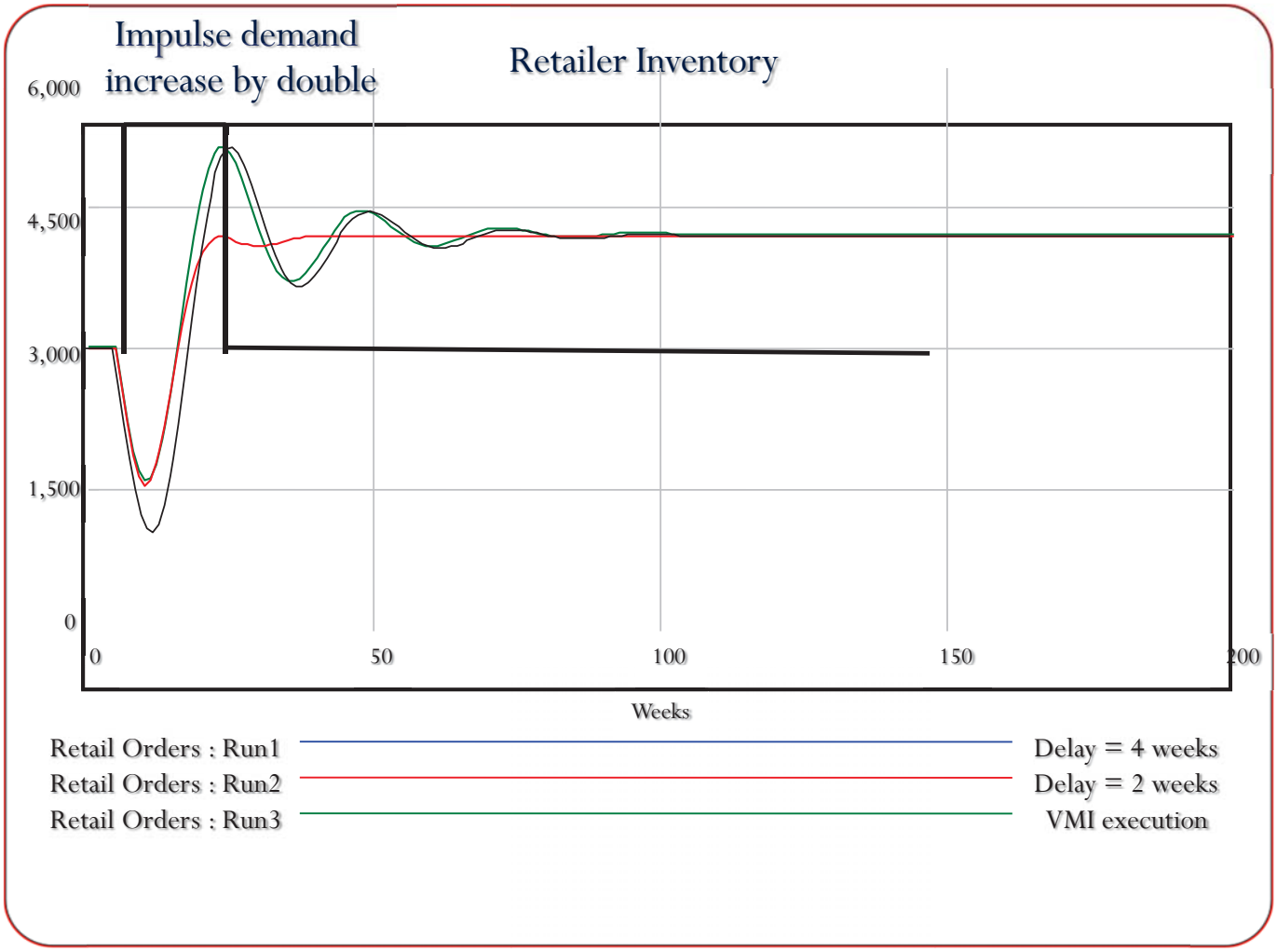
What is Bullwhip effects:

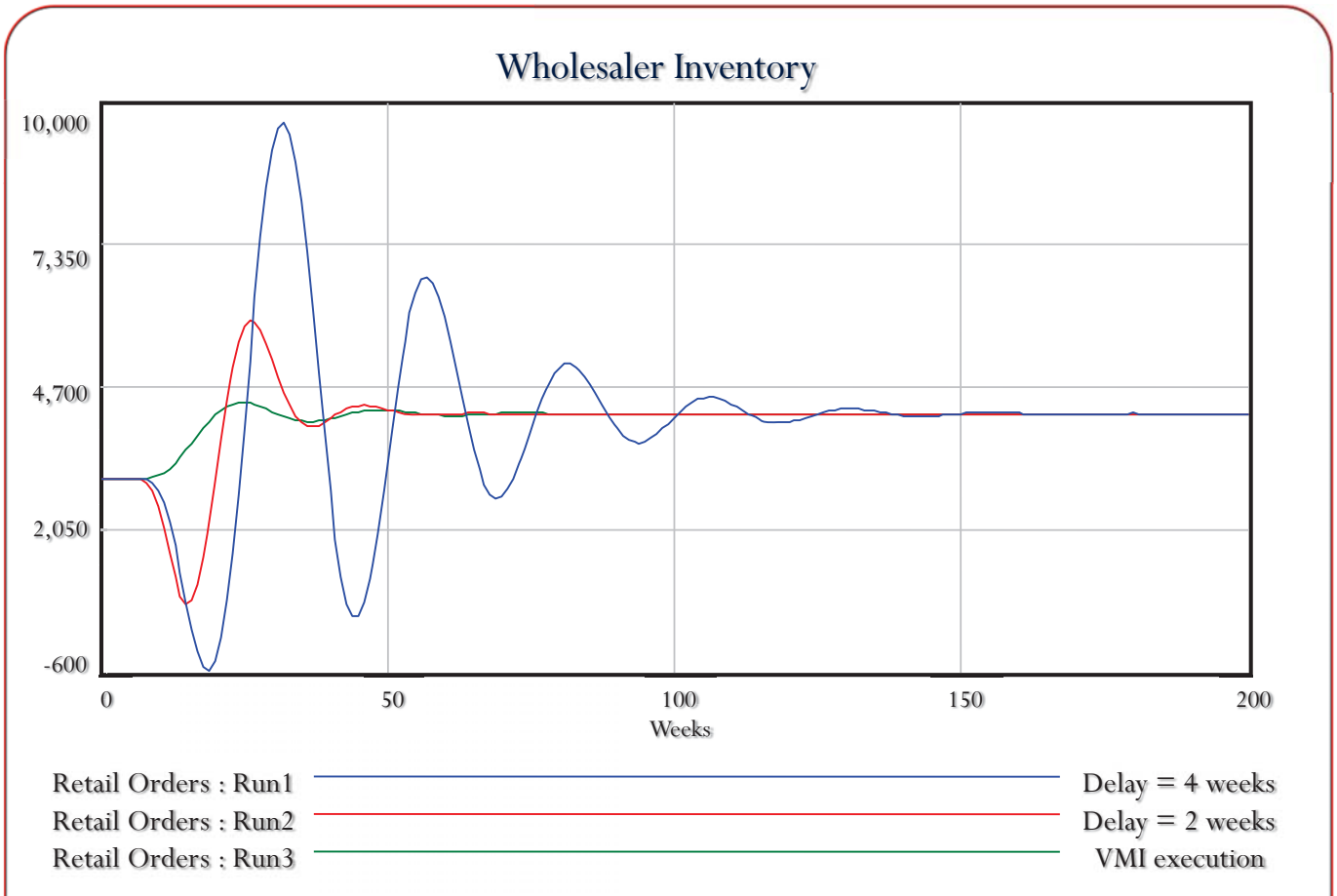
- In a supply chain cascading many layers, from consumers, retailers, distributors and up to manufacturers and the upper tiers of suppliers, the demand amplifies as it goes up to the supply end due to delay and Information distortion occurred at each stage of the supply chain.

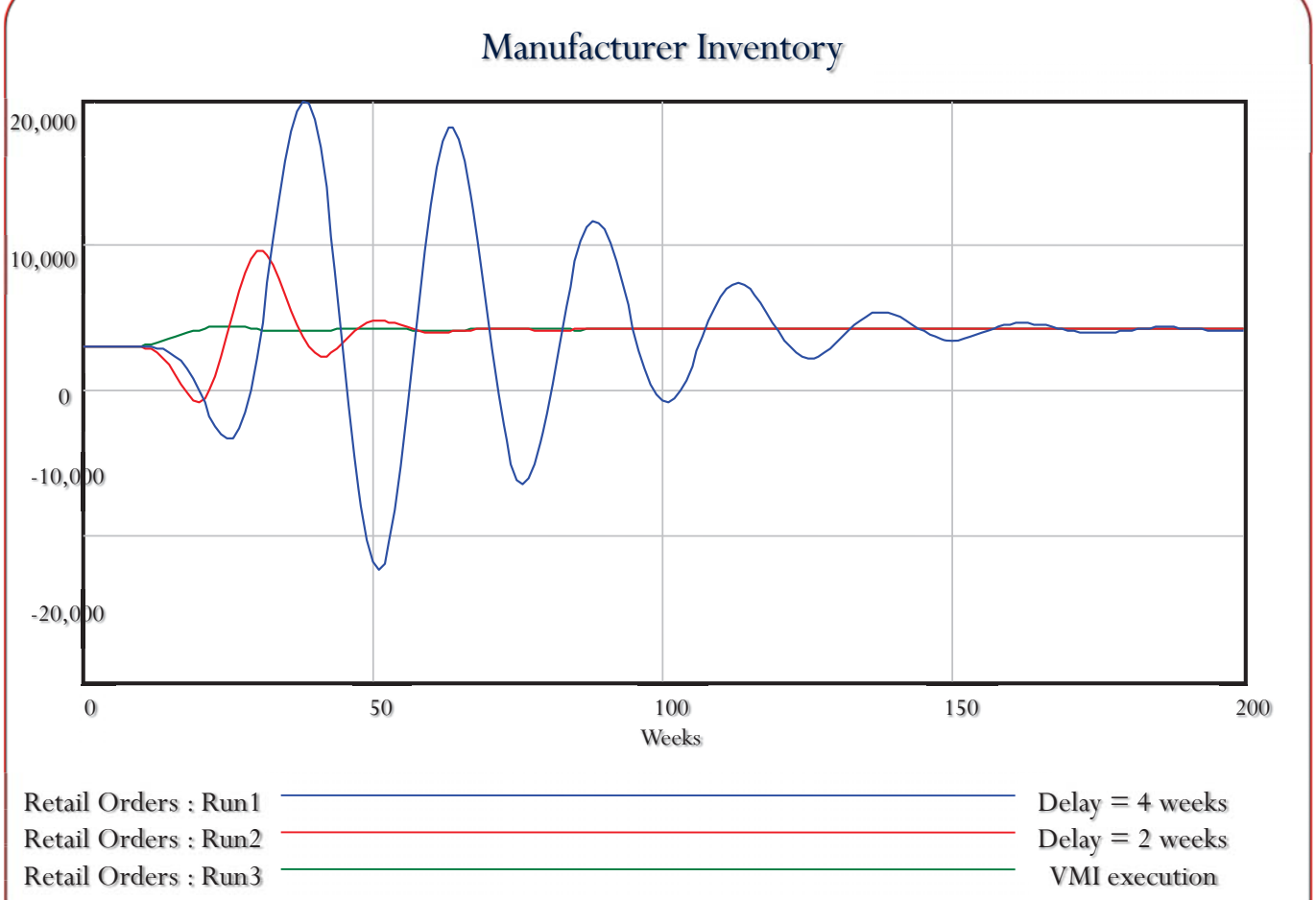
- The bullwhip effects cause the unbalance between supply and demand and can induce high inventory and low customer service, increasing the operating costs and risks of businesses.

The problems of the bullwhip effects of a supply chain




Impulse demand increase by double
Retailer Inventory
6,000
4,500
3,000
1,500
0
0
50
100
150
200
Weeks
Retail Orders : Run1
Retail Orders : Run2
Retail Orders : Run3
Delay = 4 weeks
Delay = 2 weeks
VMI execution


Wholesaler Inventory
10,000
7,350
4,700
2,050
-600
0
50
100
150
200
Weeks
Retail Orders : Run1
Retail Orders : Run2
Retail Orders : Run3
Delay = 4 weeks
Delay = 2 weeks
VMI execution



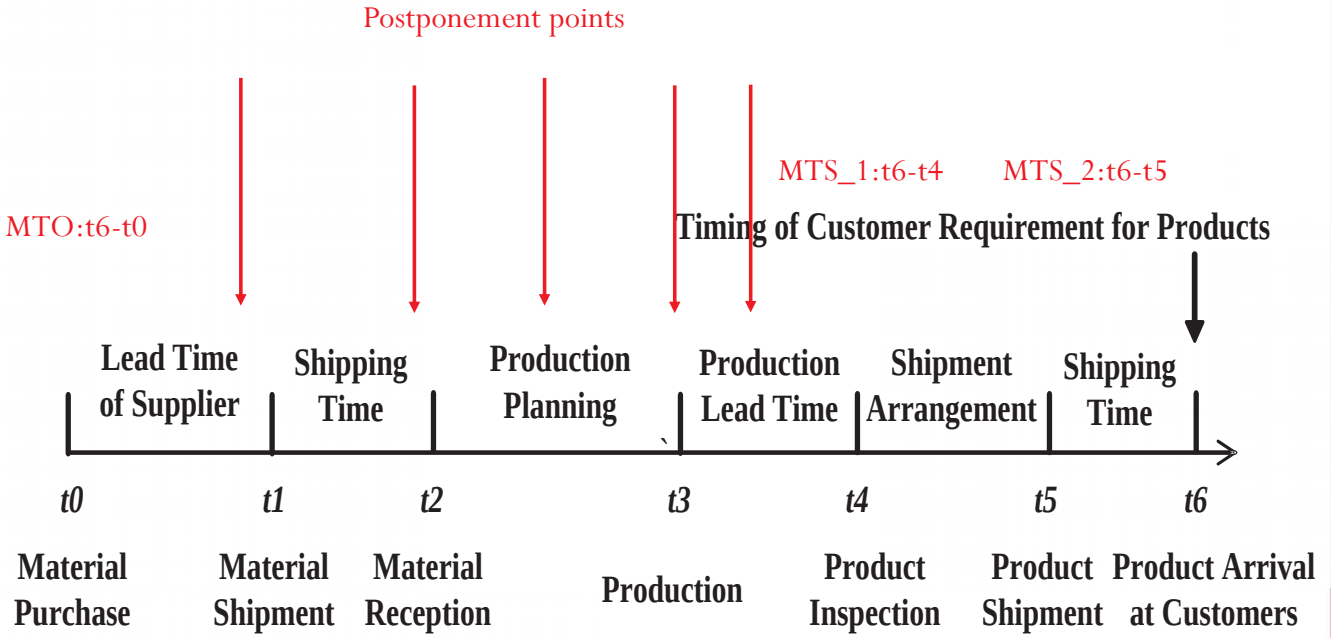
How the bullwhip effect affects performance

Performance	Effects
Manufacturing costs	Up
Inventory	Up
Lead time	Up
Transportation time	Up
Customer services	Down
Profit rate	Down

Causes of Bullwhip Effects

- The essential problems of SC – bullwhip effects
- Causes for the bullwhip effects in supply chains
  - Information distortion – use forecast instead of real demand
  - Long lead time resulted from purchasing, production, and transportation (ex. housing, security bonds, an empire)
  - Batch production – long lead time, unbalance b/w production and demand
  - Insufficient supply resulted in overproduction
- Order quantity / inventory is distorted even more serious in upper stream SC

Lead Time Composition



What happens as supply chains go internationally

- Internationalization – bullwhip effects increase
  - Supply sources increase – uncertainty of supply, difficulty in integration
  - Supply sources internationalization – longer lead time and uncertainty of supply
  - Global production – quality, delivery and integration difficulty increases
  - Global distribution – demand and delivery uncertainty increases, longer lead time

Topic 2: Supply Chain Revolution

Supply chain revolution

- Trade necessity creates marketing channels, and marketing channels drives the need of logistics
  - Channel revolution – fewer stages, chain stores, info. tech. implementation, e-commerce
  - Logistics revolution – even shorter stages, integration, support of channels
  - As channels are internationalized, so are logistics operations.
  - Supply chain evolves as the relationship between channel members bond together for better competition – Cooperation for lower wastes, faster in development, production and sale, lower cost, stable business forecast

IBM Maintenance Centers

$$N \rightarrow \frac{Nx1}{\sqrt{N}} = \sqrt{N}$$

e.g.
when N=16, 16→4
when N=9, 9→3

Concepts necessary for achieving integrated management

- **Lowest total process cost** is the focus of integrated management
  - Differs from lowest cost of each function in the process
- **Collaboration** of operating information, technology and risk has been encouraged by national legislation to keep US-based firms competitive
- **Enterprise extension** includes expanded managerial influence and control beyond traditional ownership boundaries of a single enterprise – information sharing
- **Integrated service providers (ISP)** provide a range of logistics services to accommodate customers, ranging from order entry to product delivery
  - Commonly known as third (or fourth) party service providers

An example of IS – Enterprise Extension

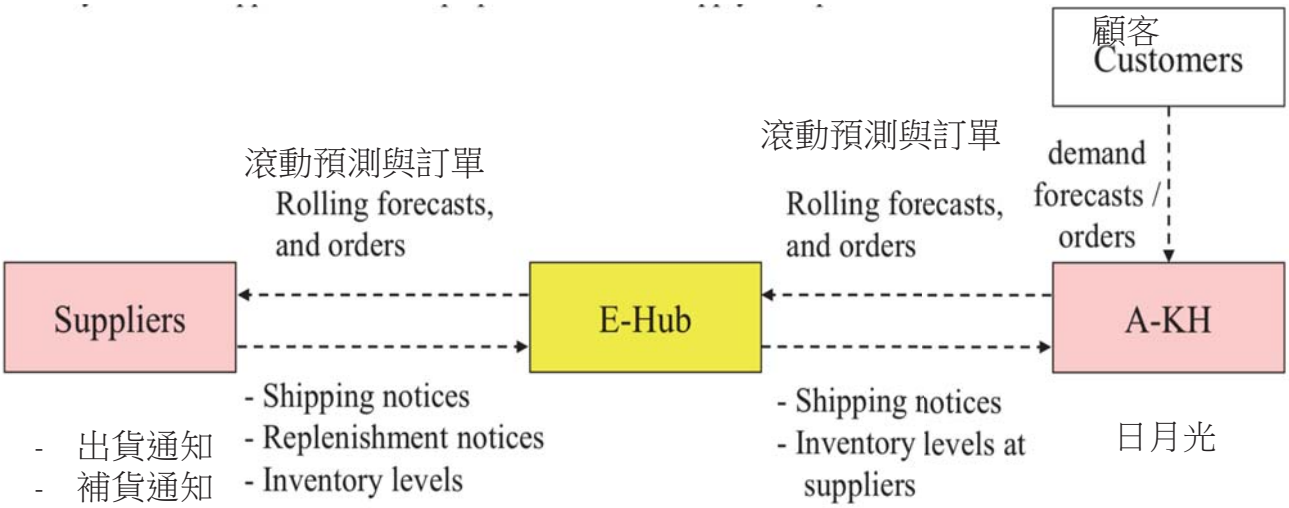


Figure 3: Information flow after the deployment of E-Hub

Topic 3-1: Collaboration 合作

SCM and Cooperation

- Well-managed SCM can streamline the flow of goods and help improve customer satisfaction
- Cooperation b/w upper/lower SC members can improve SC efficiency while lowering SC costs

QR, ECR and VMI – practices of SCM

- QR (quick response) – led by mfg, through integrating the sale and inventory info. of downstream wholesaler and retailers, with agile manufacturing to respond quickly to retailers' demand quickly - P&G
- ECR (efficient consumer response) – led by retailers, similar to QR - Wal-Mart
- VMI – led by mfg, the lower stream share their inventory/demand with the upper stream and the upper stream plan for order/delivery
- QR, ECR, VMI rely on proper cooperation by sharing mutual inventory and sale data and to change the way mfg, logistics, info., ordering system to lower the total SC operational costs, which is to be shared by all participants.

Wal-Mart and P&G Cooperation

	Wal-Mart	Sears	K-Mart
Gross Profits	22%	24%	24%
Operating Costs	17%	21.5%	21.5%
Net Profits	5%	2.5%	2.5%

- Why Wal-Mart can achieve 17% of operating costs?
- What can 2% short of gross profits do for marketing?
- What does 2 times the net profits mean?

Supply Chain Integration

- Businesses found that in searching for higher efficiency in processes and inventory, self-reengineering is not enough but cooperation among SC members for reengineering focusing on the requirements of customers can generate low cost and high service level of SC.
- Integration processes
  - 企業功能的整合(functional integration)
  - 企業內部的整合(internal integration)
  - 與其他企業外部整合(external integration)

Topic 3-2: Responsiveness
快速回應

Responsiveness emerges as a competitive advantage

Figure 1.8 Anticipatory Business Model

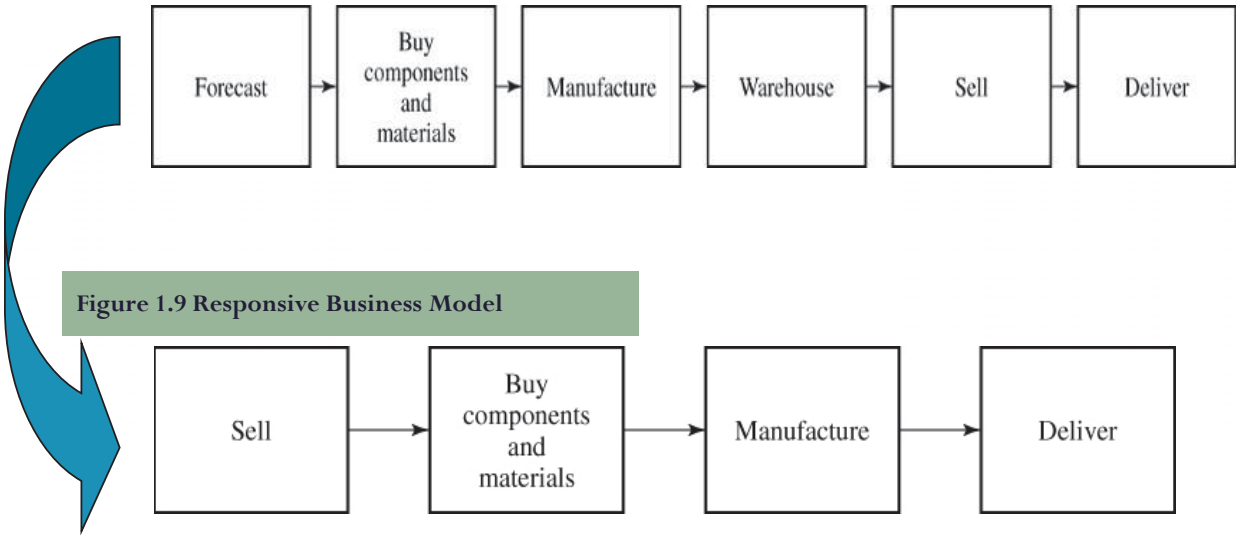


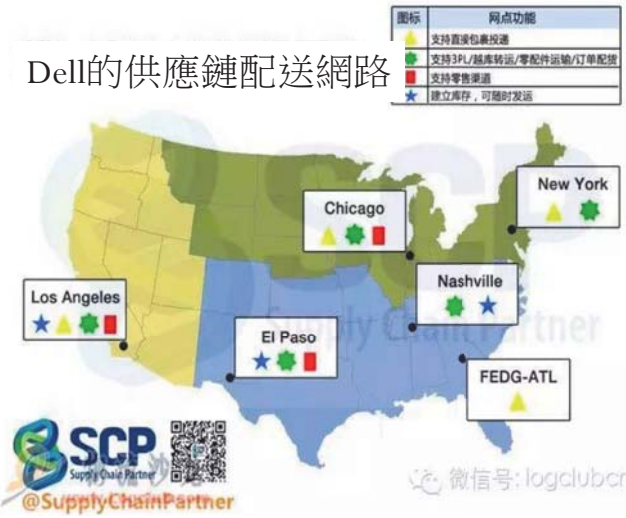
Figure 1.9 Responsive Business Model

Anticipatory/Responsive Business Model

- Anticipatory BM (ABM) is based on market forecast
- The difference between the two is timing -responsive BM reduce forecast by joint planning and exchange of info. b/w SC participants
- Dell's responsive can deliver goods in 5 days from China to the US, customized autos can be delivered in 10 days
- RBM has direct connectivity with customers via Internet
- Benefits of RBM – involvement, better informed about prices, customized products

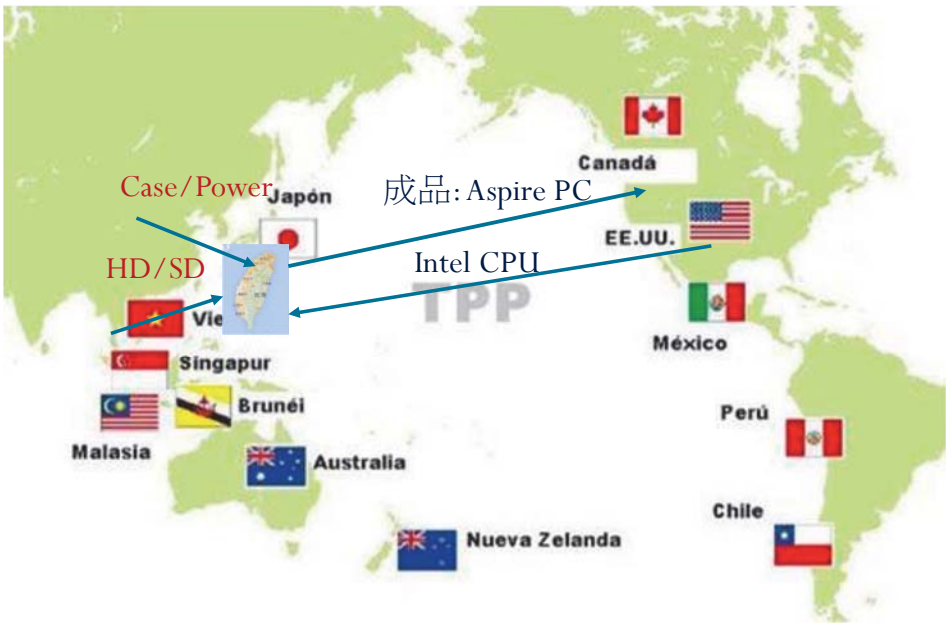
Dell cooperate with UPS for Responsive Global Supply Chains

- As Dell receive customer orders, they will inform UPS / suppliers at the same time as to delivery schedule and details. UPS then will pickup goods as scheduled
  - UPS delivers parts to China for assembly before delivering to customers
  - The whole process is 5 days for US customers



Acer Aspire 1995 Failure Case in the USA: ABM

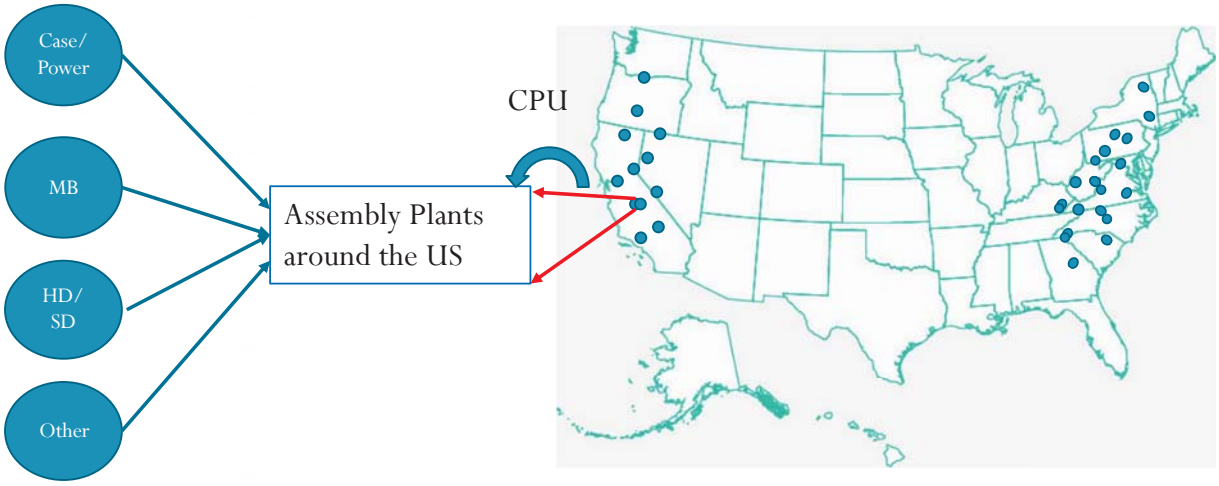
- What if 500 M of PC can not be sold after shipment ?
- Parts in a finished product is costly to take it back the original form which is possible to be used in other models later on



Acer restructured it SC structure

RBM via local assembly/VMI-hubs from suppliers

VMI-Hubs from Suppliers

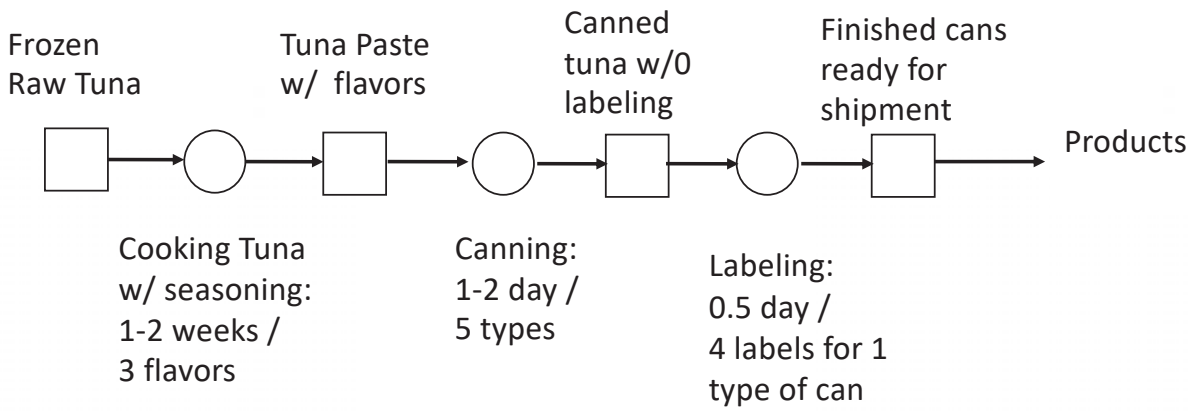


Topic4: Postponement
延遲策略

Manufacturing (or form) postponement

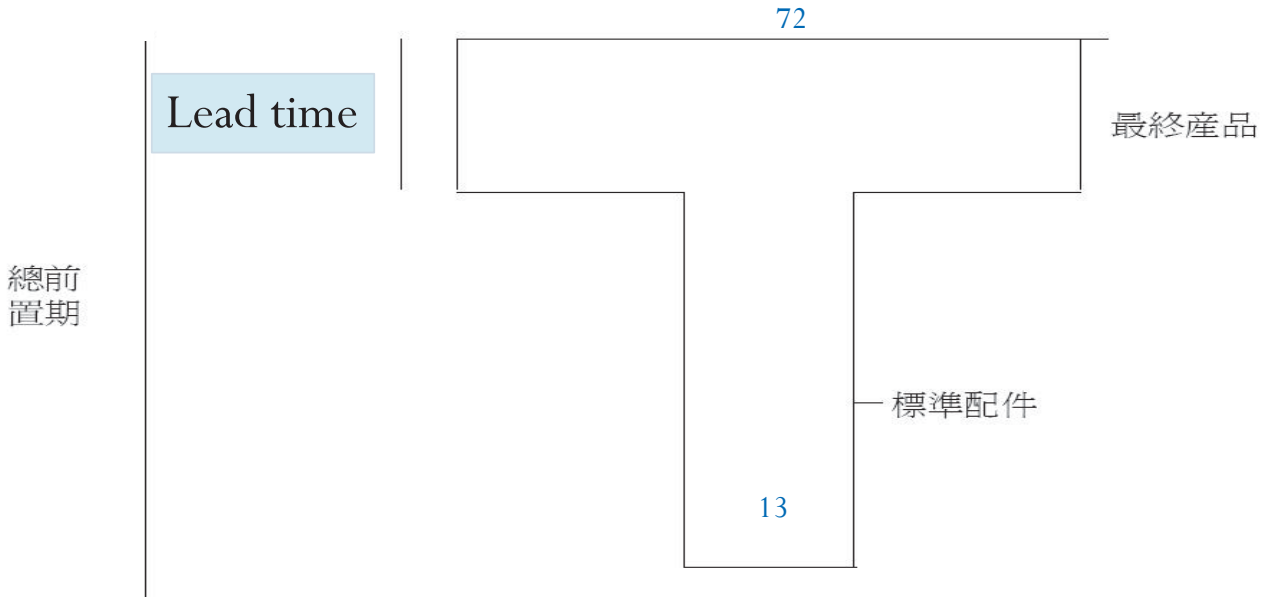
- Manufacturing one order at a time
- Base modular construction of product –cars (Toyota/Lexus)
- No customization until the exact customer specs and financial commitment is received
- Objective is to maintain products in an uncommitted status as long as possible – ex. Production of fish cans from raw fish to fish paste (w/wo flavor) to cans
- Balances economy of scale with responsiveness
  - Can build a sufficient quantity of "ready to customize" basic units
- Requires a lot of forethought during product design

Production processes of tuna cans



- How many varieties of products are possible?
- Where do you like to position your inventory? – where are the possible postponement points?

Mass Customization-
Module Design + Postponement



For Example：3Chasis+4 Engine+6Body, How many types of cars can be produced

35

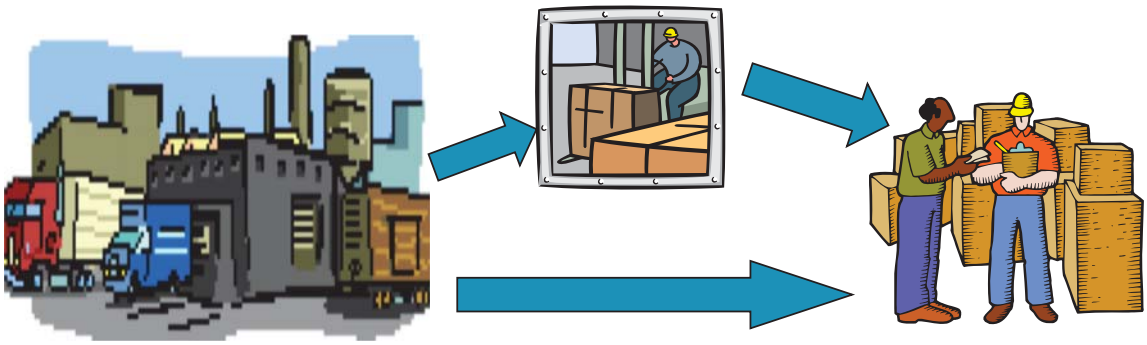
Example of manufacturing postponement

Keeping all the car panels a base color (white or gray) until the order is received, then painting to the color ordered

Geographic (or logistics) postponement

- Build or stock a full-line inventory at one or a few strategic locations – distribution of clothes, wall papers, TVs, etc.
- Forward deployment of inventory is postponed until customer orders are received
- Once orders received, specific item is expedited to the local distributor
- Advantages are manufacturing economies of scale along with responsiveness to customer
- Often used for critical, high cost parts and assemblies (e.g. engines, motor(cycle) parts)

Example of geographic postponement



Keeping full inventory in a central warehouse (e.g., Shinwan wall paper industry in China – Shanghai)

- Ship to (15) local distributors then to customers – unstable demand resulted in transshipment cost (5% of sale)
- Ship directly to customers – increase shipping cost