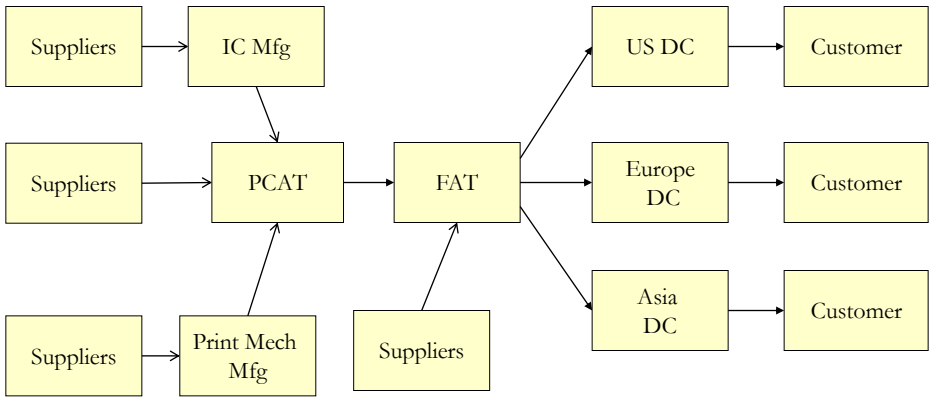
Logistics network design for global procurement

Agenda

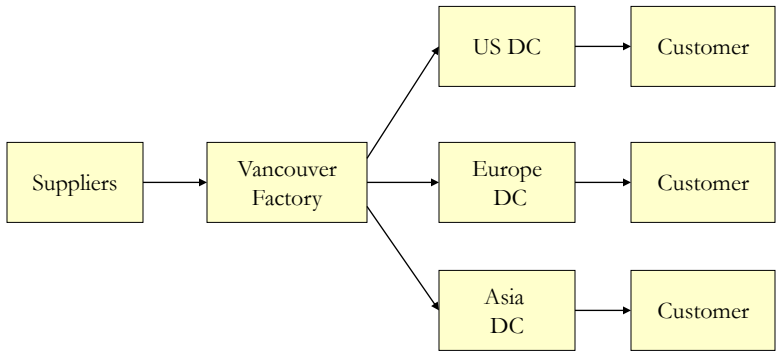
- Recap
- Hewlett Packard Deskjet Printers case
- Modularization and Postponement
- Market, Product and Process orientation of international facility networks
- Term paper topics

HEWLETT-PACKARD COMPANY: DESKJET PRINTERS SUPPLY CHAIN

HP supply chain - actual



HP supply chain - simplified



Parties involved

- Vancouver plant
  - Operates in pull mode: Made to order
  - Holds very less inventory
  - World-class factory
- International Distribution Centres
  - Made to stock
  - Pre-determined inventory levels
  - Service level targets
  - Burgeoning customer demand

Problem

- Problem: Model proliferation
- Consequence
  - Shortages of demanded products
  - Inventory pile up for others
  - Low customer service levels
- Reasons
  - Safety stocks of various models not balanced appropriately

Let's solve it then

- Determine the new safety stocks?
- Remember OM course???

$$safety\ stock = k * \sigma * \sqrt{L + T}$$

Option	Monthly Mean	Monthly Std. Dev.	Lead Time	Reorder Interval	SD (L+R)	Safety Stock
A	42.3	32.4	1.5	0.25	42.9	88.0
AA	420.2	203.9	1.5	0.25	269.7	554.0
AB	15830.1	5624.6	1.5	0.25	7440.6	15281.2
AQ	2301.2	1168.5	1.5	0.25	1545.8	3174.6
AU	4208	2204.6	1.5	0.25	2916.4	5989.6
AY	306.8	103.1	1.5	0.25	136.4	280.1

What about inventory costs?

- Lead time by Sea is 5 weeks
- Review Period at the DC – 1 week
- Assume product cost - $400
- Assume freight cost per unit by Sea is $ 9
- Safety stock levels: **25367.5**
- For given safety stock levels, average monthly inventory costs would be **1.56 mn dollars**

Option 1 – Use Air transport

- Assume $32 per unit air freight
- Lead time reduces to 14 days from 42 days
  - 34% reduction in safety stock of each model
  - Average Inventory reduces from 25367 units to 16607 units
  - Extra air fare = USD 1.11 mn per month

Other options?

- Manufacture in Europe
  - Safety stock: 14035.4 : 44% reduction
  - Monthly Inventory costs: 812352.6 : 48% reduction
- Challenges
  - High capital investment
  - Capacity issues
  - Replication of Vancouver not easy

There's gotto be a better way!

- Ever heard of demand aggregation

$$\sigma = \sqrt{{\sigma_1}^2 + {\sigma_2}^2 + {\sigma_3}^2 + \ldots}$$

- Safety stock

$$safety\ stock = k * \sigma * \sqrt{L + T}$$

- Aggregating demand for lower safety stock

Customize in Europe

- Use Air transport: 34% reduction in safety stock, 1.1mn in extra expenses
- Use Air transport with customization in Europe: 56%reduction in safety stock, 2.6 mn in savings
- Use sea transport with customization in Europe: 34% reduction in safety stocks, 4.6 mn in savings

Advantages of postponement

- Customize in Europe
- Advantages
  - Reduce SD of monthly demands for all products
  - Lower safety stocks, demand can be customized per orders
  - Lower shipping and average inventory costs

Challenges of postponement

- Engineering changes to be made to the product
- "Manufacturing and distribution of separate activities, we have to focus on our core competencies"
- "Where should the DCs procure from?"
- Too many stakeholders

MODULARIZATION AND POSTPONEMENT IN LOGISTICS

Postponement

- Related to outbound logistics
- Relies on economies of scope
- Value addition process for a set of end products that maximizes the common processing requirements shared by the products
- Triggered by customer demand

Modularization

- Related to inbound logistics
- Relies on economies of scale
- Product is assembled from a set of standardized constituent units
- Different assembly combinations different end products

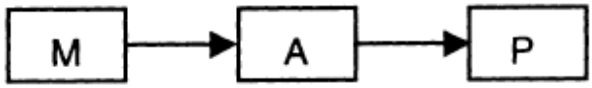
Postponement and Modularization

- Concepts used in product and process design should also influence supply chain structures
- Product design should enable modularization
- Process design should enable postponement
- We should ideally have both!

Activities of the supply chain

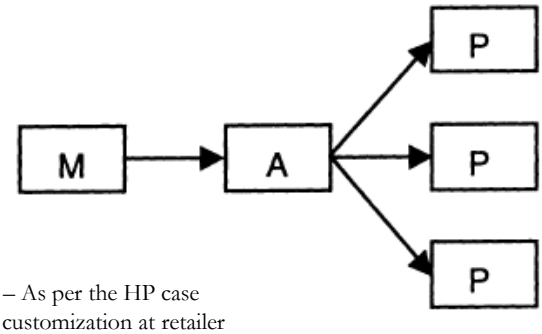
- Making of the component parts
- Assembling of the component parts to put together an interim or finished product
- Packing involves actual packaging and final customization of the product

Rigid



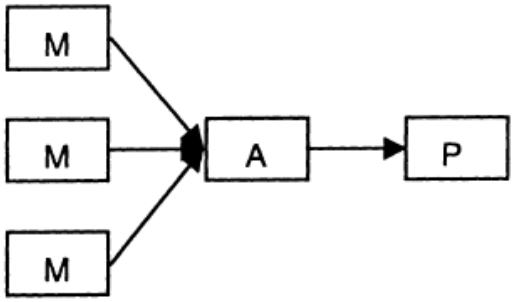
Class examples
Mahindra bikes – Only one model of bike available
Titan Bikes
Ford Model T – Vertically integrated

Postponed



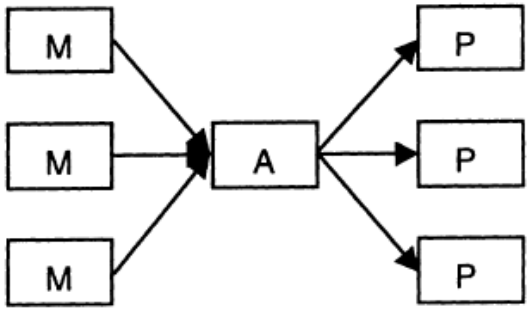
Class Examples
HP Deskjet Printers – As per the HP case
Asian Paints – color customization at retailer
PCB manufacturing – Final printing done only after customer order
UCB – dyed shirts based on demand
Pan wala

Modularized



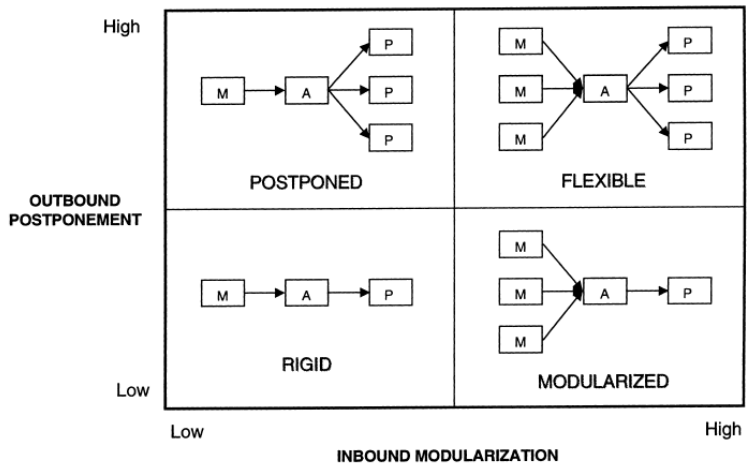
Class Examples
Toyota Manufacturing – Component commonality
Electrical Components
Aircraft
Oil Rigs
HP Desktop

Flexible



Class Examples
Dell Computers
Harley Davidson bikes

Which one is the best?



Source: Ernst and Kamrad 2000

Implications to global procurement?

- When things are global, cost savings are astronomical
- Before going global, supply chains need to be re-structured and re-looked through this framework

Term paper topics

- **The emergence of Re-shoring and Near-shoring**
- **Importing to India**
- **Exporting from India**
- **China: the factory of the world**
- **Political and Economic alliances**
- **The road to global procurement: company-specific or industry-specific case study**

Next Session

- Whirlpool case