Lecture 10: Flow & Logistics
Flow & Logistics

I. • Production Flow
II. Distribution Flow
III. Systems Revolutions
I. Production Flows

A. Flow & Stock
B. Tracking
C. Quality Control
D. External Supply
E. Demand Pull
Flow

- Movement of material/product
  - Between stages of production

- Geography of flow
  - Within factory
  - From supplier to factory
  - From factory to customer

- Linkage
  - Trucks, carts, forklifts, moving lines, pipes, etc
Stock

- Breaks in flow
  - Buffer stocks

- Stock maintains flow
  - (ironically)

- Cost of stock
  - Quantity x time
Stock, Flow & Efficiency

- Labor time & flow
  - Materials must arrive as needed

- Capital cost & stock
  - Money tied up in unused, unsold stuff

- Time management
  - maximize flow, minimize stock
  - Ideal of ‘continuous flow’
I. Production Flows

A. Flow & Stock
B. •Tracking
C. Quality Control
D. External Supply
E. Demand Pull
Keeping track of flow

- Quantity (control)
  - How much flow in and out
  - Location in system

- Tracking systems
  - Monitoring & feedback
  - Manual & automatic
Tracking stock

- Measuring stocks
  - ‘Taking inventory’

- Maintaining stocks
  - Restocking

- Coordination
  - Shopfloor & stockroom
  - Store shelves & storeroom
How things have changed...
Beyond bar-codes...

Benetton to keep track of clothing with tiny transmitters

By Jenny Strasburg and Matthew Yi
Chronicle Staff Writers

Microchip transmitters, no larger than a grain of salt, will be embedded into Benetton clothing to help the Italian retailer track inventory and manage supply.

Microchip transmitters, no larger than a grain of salt, will be attached to pieces of clothing in 5,000 Benetton stores -- a technological leap the Italian retailer said will help it track pants and sweaters from factory to sales floor to cash register.

Benetton said Tuesday that the microchips will be embedded in the labels of its high-end Sisley clothing in all of its stores, including about 140 U.S. locations.

The chips -- to be made by Philips Semiconductors and fitted with microscopic antennas by an Italian technology startup called Lab ID -- will emit radio waves to a range of 5 feet. The companies said the radio signals will be picked up by sensors in each Benetton store.

The idea is for Benetton to know exactly what's sitting on its store shelves or in its warehouses and coming from offshore factories at all times. That knowledge -- cherished by retailers in a highly competitive business -- could save it money by boosting the accuracy of its orders and getting deliveries to stores more quickly.

Retail experts said the radio frequency identification (RFID) chips are based on technology that has existed at least a couple years. They have been used on a limited basis by retailers ranging from Wal-Mart to San Francisco Bay.

The chips have yet to be widely adopted in part because of the cost: They range from 10 cents to $1 each, depending on how much memory they hold, said Ruth Jones, a retail analyst at Cap Gemini Ernst & Young.

"Obviously that means that it's only feasible for items that..."
Fully automated systems

Supply Chain Solution Provider Introduces a System That Tracks the Quantity of Automotive Parts on the Assembly Line and Reorders When Stocks Are Low

WhereNet has combined its RFID-enabled real-time locating system and wireless local area network (LAN) technology with sensors and software from Visible Inventory, a Salem, N.H.-provider of inventory-management technology, to create WhereSoft, an automated parts-replenishment system for the automotive industry. Previous renditions of WhereNet's parts-replenishment products required human intervention to push a button. That alerted the system that specific materials and parts had been used. Now, by taking advantage of sensor technology from Visible Inventory, the system automatically senses when parts are taken from a storage container, alerts the system and triggers an order to an automotive parts supplier to replenish inventory as needed. In addition, the system can also be configured to alert factory workers to deliver more parts to a specified area.
I. Production Flows

A. Flow & Stock
B. Tracking
C. Quality Control
D. External Supply
E. Demand Pull
Quality control

- Testing
- Standards
- Rejects
- Cost (loss)
  - materials & labor time
Revolution in quality control

■ (add next year)
Computerized quality control

- Within factory
  - Sensors
  - Rejection
  - Replacement

- Among factories
  - Recorded & transmitted
  - Monitored by management

- Cisco Systems
  - Test machinery in all factories worldwide (subcontractors)
  - Linked to HQ
I. Production Flows

A. Flow & Stock
B. Tracking
C. Quality Control
D. External Supply
E. Demand Pull
External supply

- Market
  - Open market (spot)
  - Contractual (subcontractors)

- Managed
  - Intra-firm
  - Inter-firm
Forms of Coordination

- Ad hoc
  - Buy on open market

- Just-in-case
  - Quantity & time specified

- Just-in-time (‘lean production’)
  - Only as needed (timing)
  - No stockroom

- Computerized
  - Automatic reorders
  - Internet (interactive) orders
    - Coordination by website
I. Production Flows

A. Flow & Stock
B. Tracking
C. Quality Control
D. External Supply
E. •Demand Pull
Meeting demand

- End-point of production
  - Leanest system no good unless product sells

- Getting it right
  - Right product
  - Right place
  - Right time

- Pull-through production
  - The ideal
Linking demand & supply

- Anticipating demand
- Responding to orders
  - Time & place
- Communicating demand
  - Specifications
  - Blurring custom & mass production
Computerized systems

- The Quick Response system (>1985)
  - speeds up order fulfillment
  - allows retailers to react more quickly to changes in consumer taste
  - uses barcodes on sales, barcodes on containers, and electronic transfer of orders.
Flow & Logistics

I. Production Flow
II. Distribution Flow
III. Systems Revolutions
II. Distribution Flow

A. • Logistics
B. New Logistics
Logistics defined

- New Face of Distribution
  - New, longer supply chains
  - Globalization
  - New terminology
    
    Cf. Lecture 9

- Huge part of economy (GDP)
  - Transport, shipping, warehousing
  - 21% in China, 16% in India
  - 11% in EU, 8% in USA
Logistics as flow (& stock)

- Transport
  - Cheapest mode
  - Inter-modal transfer costs

- Storage
  - Warehousing
  - Container storage

- Tracking
  - Quantity, location, quality (damage)

- Time economies
  - Unity of production & distribution
Logistics as coordination

- Integration of global supply chains
  - Whole production & distribution systems

- Management of whole chains
  - Between factories
  - Between firms
  - Across transport modes
  - Across borders
Growing importance of logistics

- Greater flow
  - With rising output

- Greater distances
  - Global supply chains
  - Long-distance integration

- Greater attention
  - Management of distribution
  - Looking for efficiency
More reasons

- **Deregulation**
  - Increasing competition » cost-cutting

- **Information technology**
  - The ability to track cargo in real time

- **Management revolution**
  - Just-in-time manufacturing & point-of-sale retail
II. Distribution Flow

A. Logistics

B. New Logistics
Logistics revolution

- New Management
  - New focus
  - New expertise
  - New IT

- New Industry Structure (organization)

- Greater Efficiency
  - Share in US has fallen from 14.5% in 1982 to 8% in 2006
A Simple Scheme

How it was: The linked supply chain

Independent Companies handled each phase of the cargo-handling process

How it is: Integrated supply chain

Common ownership / One company controls all or many phases.
Logistics within big firms

- In-house
  - fleets
  - warehouses

- Logistics managers
  - offices near major nodes & hubs

- Samsung, Toyota, etc.
  - Vs. Apple, Dell, etc. (who outsource their logistics)
Shippers & new logistics

- Truck (UPS, FedEx, TCI India)
- Air (FedEx, DHL, UPS)
- Ocean (SeaLand, Merck, Evergreen)
- Rail (REA)
- Pipeline (El Paso Gas)
UPS

- Fleet
  - 90,000 trucks
  - 270 aircraft

- Nodes
  - Louisville package ctr
  - 300,000/hour
  - 17,000 conveyor belts
  - 50X computing NYSE
UPS global logistics

- Managing global supply chains
- “Synchronizing the world of commerce”
American President Lines

NOL (Neptune Orient Lines)
- Headquarters: Singapore
- Employees: 12,000 worldwide

American President Lines, Ltd.
- Container Liners

PMA Signatory
- Regional Headquarters: 1111 Broadway
  Oakland, CA
- Offices in more than 90 countries;
  24 U.S. offices include
  local offices: 614 Terminal Way
  Terminal Island, CA;
  959 South Coast Drive, Suite 225
  Costa Mesa, CA

APL Logistics
- 4,000 employees,
  300 offices in 53 countries;

Regional Headquarters: 1111 Broadway,
Oakland, CA
- 8 U.S. offices include local office:
  4281 Katella Avenue, Los Alamitos, CA

International Intermodal eXpress (IIX)

NVOCC
- 4281 Katella Avenue
  Los Alamitos, CA
- Wholly-owned by APL Logistics

Imperial CFS Inc.
- Contracted CFS
  1331 West Torrance Blvd.
  Torrance, CA

* Member of the New World Alliance with Hyundai
Merchant Marine and Mitsui O.S.K.
3d party specialists

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**Our Mission.** To Be The No. 1 Supply Chain Solutions Player in Asia Pacific

**Our Vision** To Build THE Logistics Superhighway in a Borderless World.

**Our Passion** To create the ultimate superhighway of optimal efficiency & speed.

THE Logistics Superhighway will enable the Physical, Informational, and Financial flows of the supply chain to flow seamlessly throughout a borderless world.
Port authority players

- Contract to coordinate flows
- Not just passive leasing of space
Flow & Logistics

I. Production Flow
II. Distribution Flow
III. • Systems Revolutions
Revolutions defined

- Reorganizing whole systems
  - Production + Distribution (Logistics)
  - Systems integration
  - Management of flows
  - Can be long-distance or local

- Not new!
  - But prominent today
III. Systems Revolutions

A. Swift
B. Ford
C. A&P
D. Toyota
E. Benetton
F. Dell
Swift & Co. - revolution in fresh meat
Swift’s achievements

- New meatpacking system
  - In Chicago, hub of beef production
- Railroads
  - Linking Chicago to New York
  - Refrigerated cars
- Warehouses & distribution
  - Wholesaler to eastern markets
- Coordinating it all
  - Telegraph
  - Business organization
    - Gary Fields, Territories of Profit
III. Systems Revolutions

A. Swift
B. •Ford
C. A&P
D. Toyota
E. Benetton
F. Dell
Ford & Mass Production

- Assembly line
- “Fordism”
What Ford achieved

- Standardization
  - Of parts & product (Model T)
  - Just-in-case stocks
- Taylorism
  - Break down labor process into component parts
  - Time study
- Mechanization
  - Of simple actions
- Linear sequencing
  - Workers & machines
- Moving assembly line
  - Only after other steps

R. Hounshell, *From the American System to Mass Production*
III. Systems Revolutions

A. Swift
B. Ford
C. •A&P
D. Toyota
E. Benetton
F. Dell
A&P and groceries - The chain-store
What the grocers did...

- Chain outlets
  - Formula stores
  - Self-service & check-out
- Warehousing
  - Integrating retail and wholesale
- Bulk purchase
  - Integrating suppliers
  - Processed food
    - Richard Tedlow, *New and Improved: The Story of Mass Marketing in America*
III. Systems Revolutions

A. Swift
B. Ford
C. A&P
D. •Toyota
E. Benetton
F. Dell
Rethinking Mass Production

- Postwar rebuilding of Japan
  - Copy & improve on US Fordism

- Making virtue of necessity
  - Low capital, space, output

- Where Ford failed
  - Too much inventory (‘just-in-case’)  
  - Limit of the loading dock 
  - (also treatment of workers as cogs)
Toyota system

- Just-in-time
  - Low inventory
  - Pull-through (Kanban)

- Quality control
  - Mistakes corrected
  - No lemons, no waste

- Work groups
  - Worker cooperation
  - Worker suggestions

- Keiretsu
  - External suppliers
  - Close ties & controls

- More than just ‘lean production’
Toyota’s geography
Nagoya & Toyota City

Population: 2,934,441 (as of July 1, 1997)
Area: 5,148.14 square kilometers
Spread of Japanese system

- Japanese car exports, 1970s
- Factories & suppliers transplanted to US & EU, 1980s
- JIT adopted by US & EU firms
  - But not completely
- Implanted in East Asia, 1990s
  - Thailand, Guangdong
III. Systems Revolutions

A. Swift
B. Ford
C. A&P
D. Toyota
E. Benetton
F. Dell
Revolution in retailing

- Tracking purchases
  - Store by store
  - ‘Demand pull’

- Rapid response
  - Restocking popular items

- Relay down the supply chain
  - Reorder & production
  - Quick turnaround
III. Systems Revolutions

A. Swift
B. Ford
C. A&P
D. Toyota
E. Benetton
F. Dell
Dell’s deal -
management via the internet

- Merchant-manufacturer
  - Some assembly, no parts, no stores, no transport
  - Everything is subcontracted
- Internet sales
  - Website orders
  - Ship by UPS, FedEx, etc.
- Build-to-Order (pull through)
  - Computer accounts
  - Projection & preparation
- Internet supply links
  - Orders transmitted by website
  - Coordination by website