Understanding the Supply Chain

Outline

- Introduction
- What is a Supply Chain?
- Decision Phases in a Supply Chain
- Process View of a Supply Chain
- Supply Chain Macro Processes in a Firm
- Summary of Learning Objectives

Traditional View: Logistics in the Economy (1990, 1996)

- Freight Transportation $352, $455 Billion
- Inventory Expense $221, $311 Billion
- Administrative Expense $27, $31 Billion
- Logistics Related Activity 11%, 10.5% of GNP

(US GNP in 2013 was about $16 Trillion!)

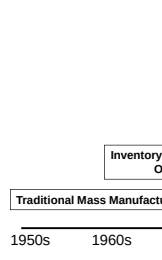
Source: Cass Logistics

How big are a billion and a trillion?

- One billion is written as the number "1" followed by 9 zeroes and one trillion is written as the number "1" followed by 12 zeroes
- One billion seconds = 31.5 years!
- One trillion seconds = 31,546 years!
- US national debt is about 17 trillion dollars!
- This number is currently increasing at the rate of about 4.2 billion dollars per day

Traditional View: Logistics in the Manufacturing Firm

- Profit 4%
- Logistics Cost 21%
- Marketing Cost 27%
- Manufacturing Cost 48%



Evolution of Supply Chain

Supply Chain:
The Magnitude in the Traditional View

- Estimated that the grocery industry could save $30 billion (10% of operating cost) by using effective logistics and supply chain strategies
  - A typical box of cereal spends 104 days from factory to sale
  - A typical car spends 15 days from factory to dealership
- Laura Ashley turns its inventory 10 times a year, five times faster than 3 years ago

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Supply Chain:
The True Magnitude

- Compaq estimated that it lost $0.5 billion to $1 billion in sales in 1995 because laptops were not available when and where needed
- When the 1 gig processor was introduced by AMD, the price of the 800 mb processor dropped by 30%
- P&G estimates it saved retail customers $65 million by collaboration resulting in a better match of supply and demand

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What is a Supply Chain?

- Involves all stages, directly or indirectly, in fulfilling a customer request
- Includes manufacturers, suppliers, transporters, warehouses, retailers, and customers
- Within each company, the supply chain includes all functions involved in fulfilling a customer request (product development, marketing, operations, distribution, finance, customer service)
- Examples: Detergent supply chain (Wal-Mart), Dell

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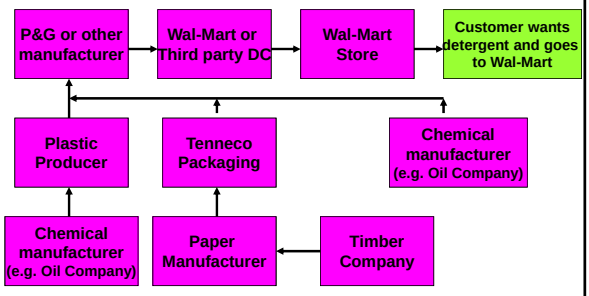
What is a Supply Chain?



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What is a Supply Chain?

- Customer is an integral part of the supply chain
- Includes movement of products from suppliers to manufacturers to distributors, but also includes movement of information, funds, and products in both directions
- Probably more accurate to use the term “supply network” or “supply web”
- Typical supply chain stages: customers, retailers, distributors, manufacturers, suppliers
- All stages may not be present in all supply chains (e.g., no retailer or distributor for Dell)

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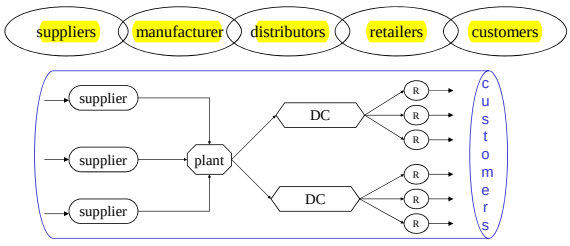
Supply Chain Stages



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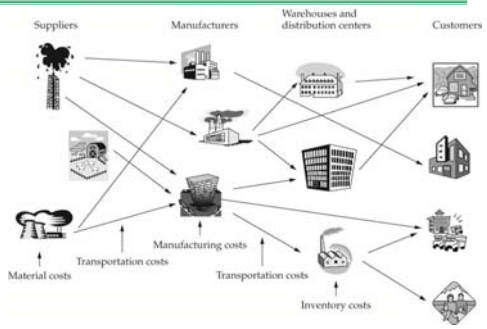
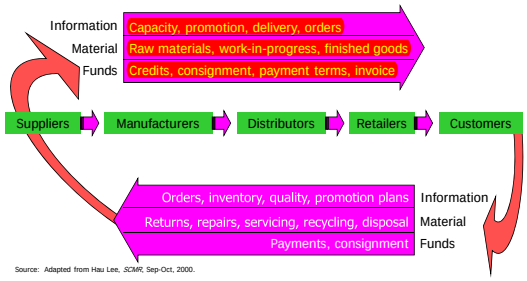
Supply Chain Network



Flows in a Supply Chain



Source: Adapted from Hau Lee, *SCMR*, Sep-Oct, 2000.

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The Objective of a Supply Chain

- Maximize overall value created
- Supply chain value: difference between what the final product is worth to the customer and the effort the supply chain expends in filling the customer's request
- Value is correlated to supply chain profitability (difference between revenue generated from the customer and the overall cost across the supply chain)

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The Objective of a Supply Chain

- Example: Dell receives $2000 from a customer for a computer (revenue)
- Supply chain incurs costs (information, storage, transportation, components, assembly, etc.)
- Difference between $2000 and the sum of all of these costs is the supply chain profit
- Supply chain profitability is total profit to be shared across all stages of the supply chain
- Supply chain success should be measured by total supply chain profitability, not profits at an individual stage

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The Objective of a Supply Chain

- Sources of supply chain revenue: the customer
- Sources of supply chain cost: flows of information, products, or funds between stages of the supply chain
- ***Supply chain management is the management of flows between and among supply chain stages to maximize total supply chain profitability***

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What is Supply Chain Management?

- A set of approaches utilized to efficiently integrate suppliers, manufacturers, warehouses and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, in order to minimize system-wide costs while satisfying service level requirements.

Source: Simchi-Levi and Kaminsky (2003)

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What is Supply Chain Engineering?

- Supply Chain Engineering (SCE) emphasizes the design of the supply chain network and uses mathematical models and methods to determine the optimal strategies for managing the supply chain.

Source: Ravindran and Warsing (2013)

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Decision Phases of a Supply Chain

- Supply chain strategy or design (**strategic**)
- Supply chain planning (**tactical**)
- Supply chain operation (**operational**)

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Supply Chain Strategy or Design

- Decisions about the structure of the supply chain and what processes each stage will perform
- Strategic supply chain decisions
  - Locations and capacities of facilities
  - Products to be made or stored at various locations
  - Modes of transportation
  - Information systems
- Supply chain design must support strategic objectives
- Supply chain design decisions are long-term and expensive to reverse – must take into account market uncertainty

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Supply Chain Planning

- Definition of a set of policies that govern short-term operations
- Fixed by the supply configuration from previous phase
- Starts with a forecast of demand in the coming year

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Supply Chain Planning (Cont.)

- Planning decisions:
  - Which markets will be supplied from which locations
  - Planned buildup of inventories
  - Subcontracting, backup locations
  - Inventory policies
  - Timing and size of market promotions
- Must consider in planning decisions demand uncertainty, exchange rates, competition over the time horizon

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Supply Chain Operation

- Time horizon is weekly or daily
- Decisions regarding individual customer orders
- Supply chain configuration is fixed and operating policies are determined
- Goal is to implement the operating policies as effectively as possible
- Allocate orders to inventory or production, set order due dates, generate pick lists at a warehouse, allocate an order to a particular shipment, set delivery schedules, place replenishment orders
- Much less uncertainty (short time horizon)

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Process View of a Supply Chain

- **Cycle view**: processes in a supply chain are divided into a series of cycles, each performed at the interfaces between two successive supply chain stages
- **Push/pull view**: processes in a supply chain are divided into two categories depending on whether they are executed in response to a customer order (pull) or in anticipation of a customer order (push)

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Cycle View of a Supply Chain

- Each cycle occurs at the interface between two successive stages
- Customer order cycle (customer-retailer)
- Replenishment cycle (retailer-distributor)
- Manufacturing cycle (distributor-manufacturer)
- Procurement cycle (manufacturer-supplier)
- Cycle view clearly defines processes involved and the owners of each process. Specifies the roles and responsibilities of each member and the desired outcome of each process.

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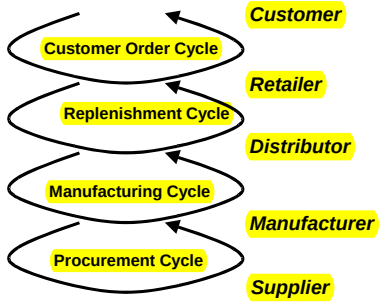
Cycle View of Supply Chains



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Cycle View of a Supply Chain

- Note that in this case there are five stages
- And there are four process cycles
- Important differences between the cycles are:
  - Uncertainty of order
  - Scale of order

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Push/Pull View of Supply Chain Processes

- Supply chain processes fall into one of two categories depending on the timing of their execution relative to customer demand
- Pull: execution is initiated in response to a customer order (reactive)
- Push: execution is initiated in anticipation of customer orders (speculative)
- Push/pull boundary separates push processes from pull processes

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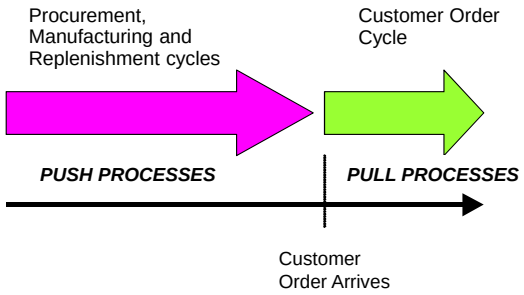
Push/Pull View of Supply Chains



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Push/Pull View of Supply Chain Processes

- Useful in considering strategic decisions relating to supply chain design – more global view of how supply chain processes relate to customer orders
- Can combine the push/pull and cycle views
  - Make to Stock (e.g. L.L. Bean)
  - Build to Order (e.g. Dell)
- The relative proportion of push and pull processes can have an impact on supply chain performance

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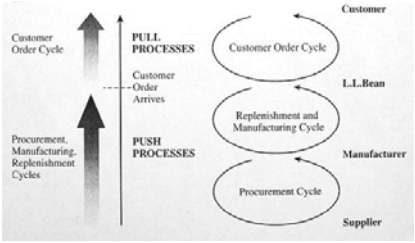
Make-To-Stock (L. L. Bean)



L.L.Bean

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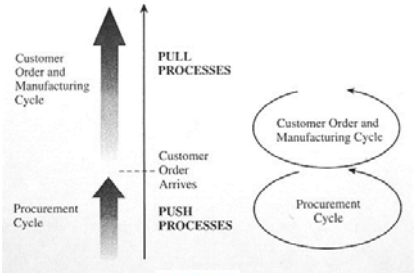
Build-To-Order (Dell)



DELL

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Potential Opportunities Exploited by Dell

- Revenue opportunities
  - 24 hour access for order placement
  - Direct sales
  - Providing customization and large selection information
  - Flexibility on pricing and promotion
  - Faster time to market
  - Efficient funds transfer - reduce working capital
- Revenue negatives
  - Longer response time than store
  - no help with selection

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Potential Opportunities Exploited by Dell

- Cost opportunities
  - Direct sales eliminating intermediary
  - Customer participation: Call center & catalog costs
  - Information sharing in supply chain
  - Reduce facility costs
  - Geographical centralization and reduced inventories
  - Postpone product differentiation to after order is placed using product platforms and common components
- Outbound transportation costs increase

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Opportunities Potential

- Significant, but must be combined with component commonality, and build to order. Must move product customization to pull phase of supply chain and hold inventories as common components during the push phase
- Opportunity most significant for new, hard to forecast products
- Complements strength of existing retail channels

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Supply Chain View in the Book Industry

- From Push Systems
  - e.g. Barnes and Noble
- To Pull Systems
  - e.g. Amazon.Com
- And Now to Push-Pull Systems
  - e.g. Amazon.Com, 1999-Present
    - Seven warehouses
    - Three million square feet
    - Best sellers are stocked

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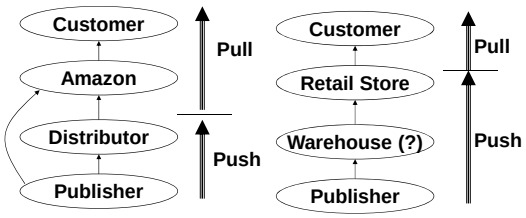
Retailing: Amazon.com



Amazon Supply Chain Bookstore Supply Chain

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Potential Opportunities Exploited by Amazon

- Revenue opportunities
  - 24 hour access for order placement
  - Providing large selection and other information
  - Attract customers who do not want to go to store
  - Flexibility on pricing
  - Efficient funds transfer
- Revenue negatives
  - Intermediary (distributor) reduces margin
  - Longer response time than bookstore

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Potential Opportunities Exploited by Amazon

- Cost opportunities
  - Reduce facility costs
  - Geographical centralization and reduced inventories: Most effective for low volume, hard to forecast books, least effective for high volume best sellers
- Cost increases
  - Outbound transportation costs increase
  - Handling cost increase

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Opportunities Potential

- Going on-line, by itself, offers lower cost advantages (may be some disadvantages) than in Dell model ***given current form of books***
- Cost and availability advantages are more significant for low volume books
- On-line channel has significant cost benefit if ***books are downloadable***

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Supply Chain Macro Processes in a Firm

- Supply chain processes discussed in the two views can be classified into:
  - Customer Relationship Management (CRM)
  - Internal Supply Chain Management (ISCM)
  - Supplier Relationship Management (SRM)
- Integration among the above three macro processes is critical for effective and successful supply chain management

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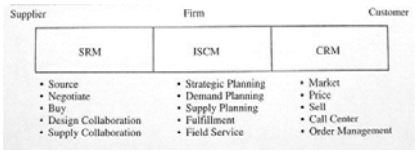
Supply Chain Macro Processes in a Firm



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2013 SC Rankings by Gartner

- Based on 50% weight to public financial data [Return on Assets (25%), Inventory Turns (15%) and Revenue Growth (10%)] and 50% weight to voting by 32 AMR analysts (25%) and peer panel of 156 senior level SC executives from companies (25%).
- Supply Chain leaders carry 15% less inventory, are 60% faster-to-market, complete 17% "more perfect" orders, have 35% shorter cash-to-cash cycle and 5% higher profit margins.

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2013 SC Rankings by Gartner

Rank	Company
1	Apple
2	McDonald's
3	Amazon.com
4	Unilever
5	Intel
6	Procter & Gamble
7	Cisco Systems
8	Samsung Electronics
9	Coca Cola
10	Colgate - Palmolive
11	Dell
12	Inditex
13	Wal-Mart Stores

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2013 SC Rankings by Gartner

Rank	Company
14	Nike
15	Starbucks
16	PepsiCo
17	H&M
18	Caterpillar
19	3M
20	Lenovo
21	nestle
22	Ford Motors
23	Cummins
24	Qualcomm
25	Johnson & Johnson

Source: AMR Research / Gartner Report (2013)

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Supply Chain Leaders

- Supply Chain leaders carry
  - 15% less inventory,
  - are 60% faster-to-market,
  - complete 17% "more perfect" orders,
  - have 35% shorter cash-to-cash cycle and
  - have 5% higher profit margins.

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Summary of Learning Objectives

- What are the cycle and push/pull views of a supply chain?
- How can supply chain macro processes be classified?
- What are the three key supply chain decision phases and what is the significance of each?
- What is the goal of a supply chain and what is the impact of supply chain decisions on the success of the firm?

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