

The Impact of the Internet on Supply Chain Management

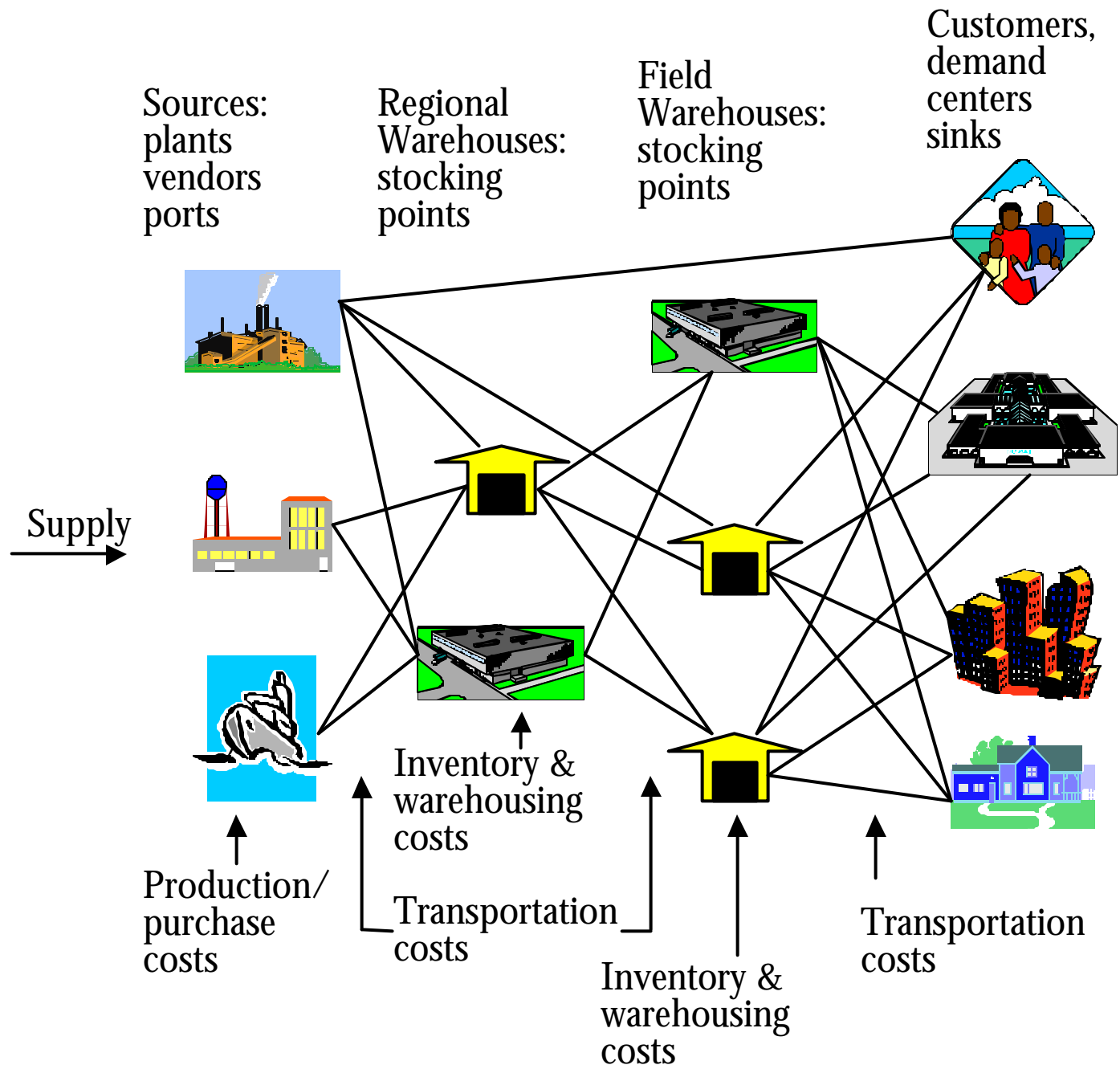
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Outline

- Introduction to Supply Chain Management
- Internet Based Supply Chain Strategies
 - a new business model
- e-Business Opportunities
- Internet Based B2B Strategies



Supply Chain Management

- **Definition:**

Supply Chain Management is primarily concerned with the efficient integration of suppliers, factories, warehouses and stores so that merchandise is produced and distributed in the right quantities, to the right locations and at the right time, and so as to minimize total system cost subject to satisfying service requirements.

- **Notice:**

- Who is involved
- Cost and Service Level
- It is all about integration

Conflicting Objectives in the Supply Chain

1. Purchasing

- Stable volume requirements
- Flexible delivery time
- Little variation in mix
- Large quantities

2. Manufacturing

- Long run production
- High quality
- High productivity
- Low production cost

Conflicting Objectives in the Supply Chain

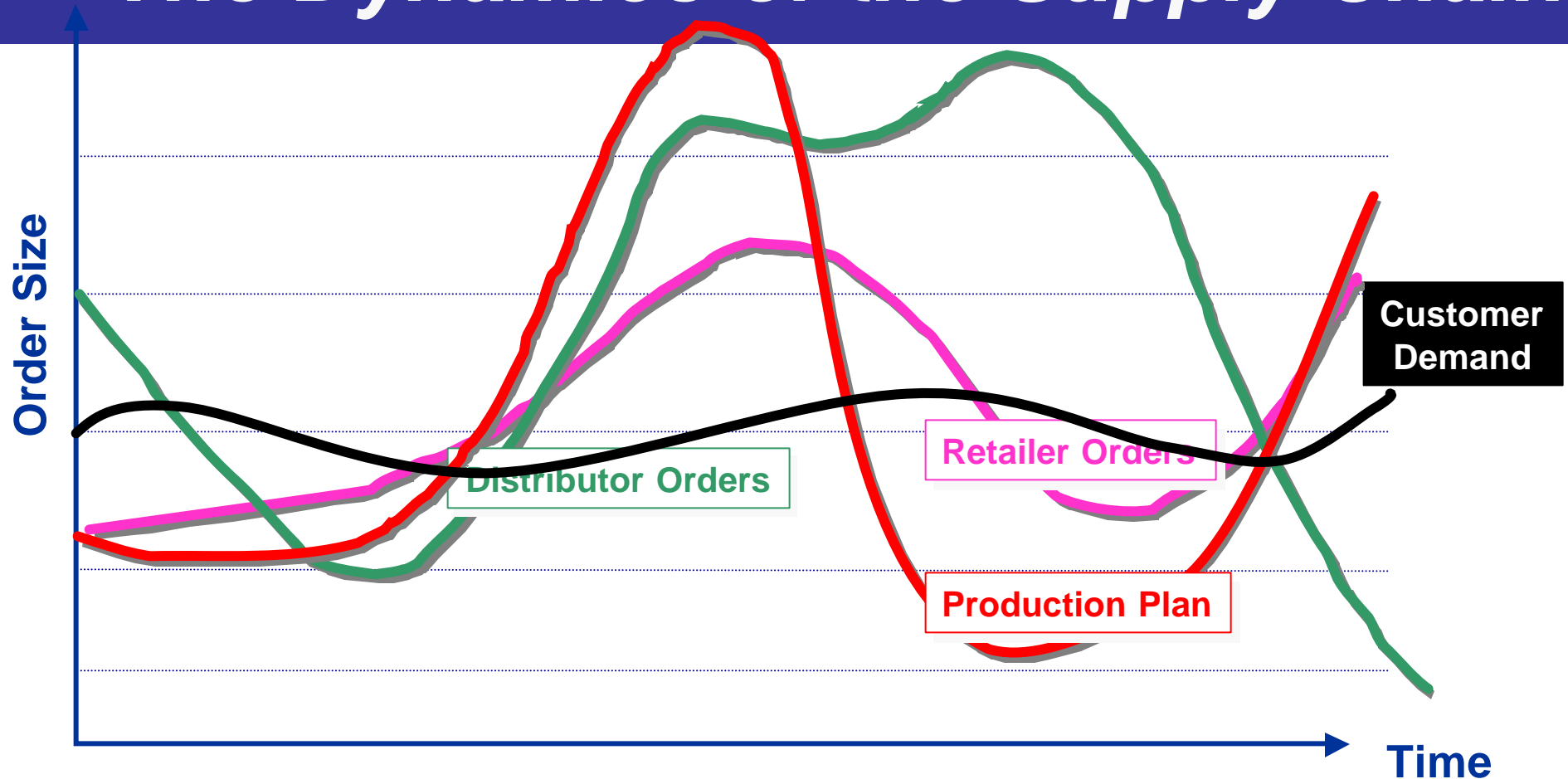
3. Warehousing

- Low inventory
- Reduced transportation costs
- Quick replenishment capability

4. Customers

- Short order lead time
- High in stock
- Enormous variety of products
- Low prices

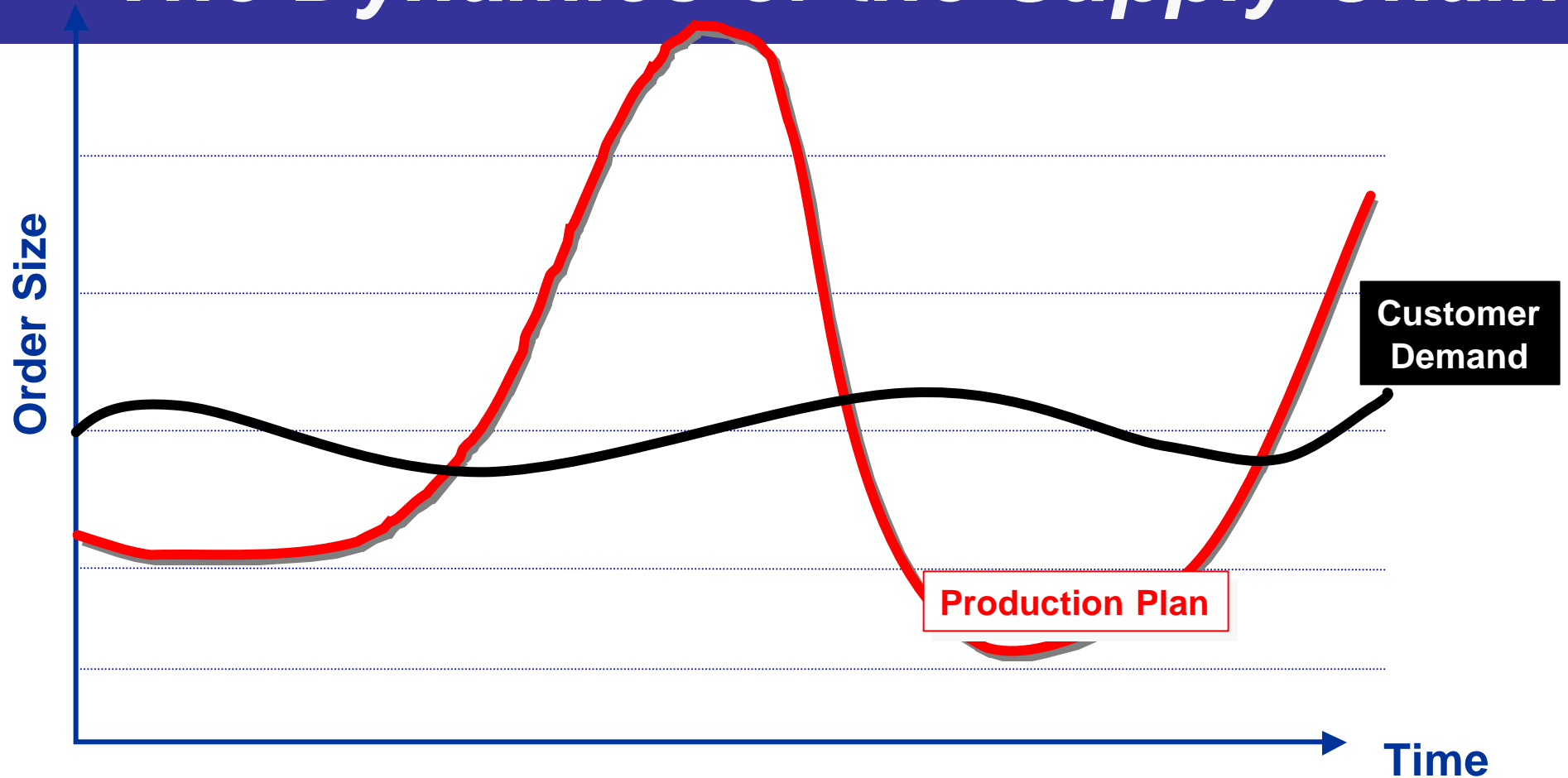
The Dynamics of the Supply Chain



Source: Tom Mc Guffry, *Electronic Commerce and Value Chain Management*, 1998

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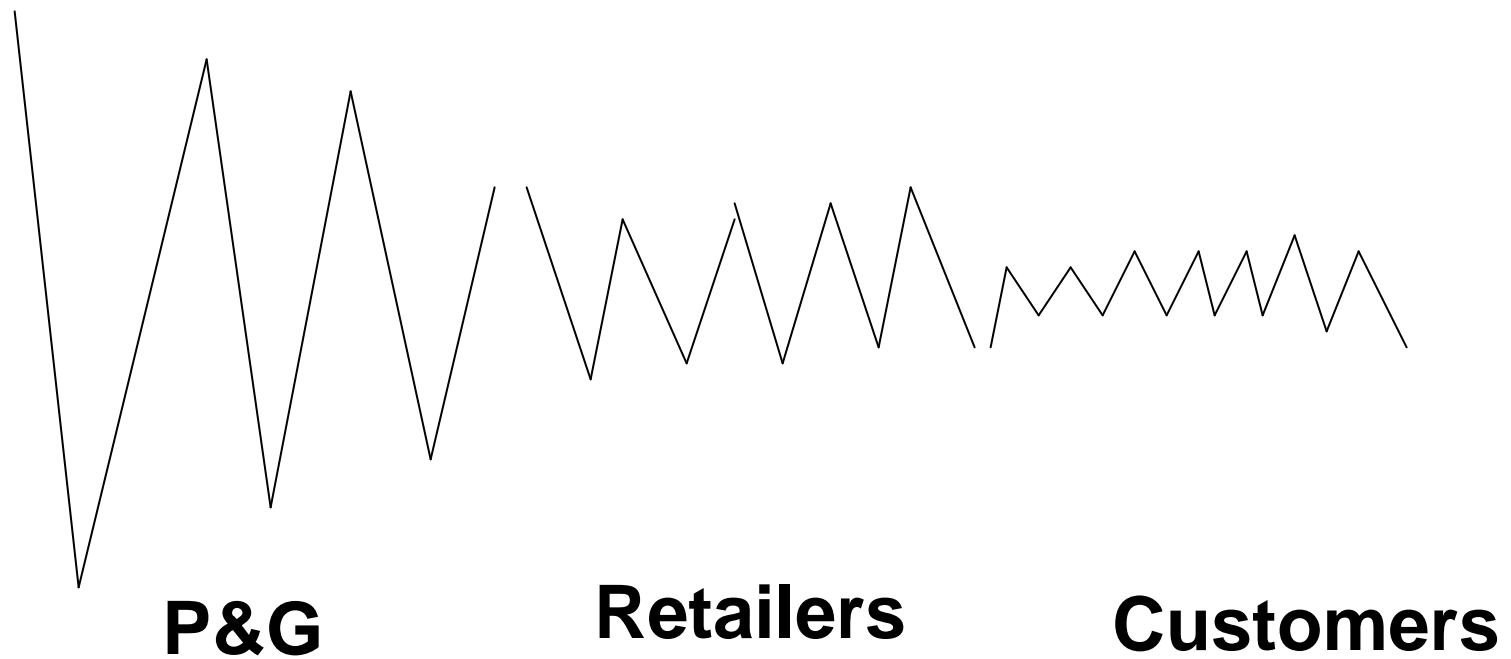
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We Conclude:

In Traditional Supply Chains....

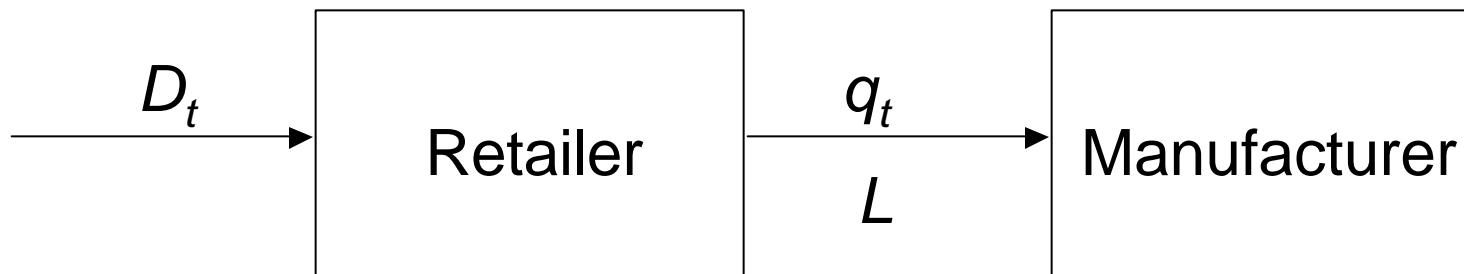
- **Order Variability is amplified up the supply chain; upstream echelons face higher variability.**
- **What you see is not what they face.**

The Bullwhip Effect



Consequences....

- Single retailer, single manufacturer.
 - Retailer observes customer demand, D_t .
 - Retailer orders q_t from manufacturer.



Consequences....

- **Increased safety stock**
- **Reduced service level**
- **Inefficient allocation of resources**
- **Increased transportation costs**

The Future is Not What it Used to Be

- A new **e**-Business Model
 - Reduce cost
 - Increase Profit
 - Increase service level
 - Increase flexibility

Reality is Different.....

- **Amazon.com Example**

- 4 year history
- 1st Internet purchase for most people
- 1996: \$16M Sales, \$6M Loss
- 1999: \$1.6B Sales, \$720M Loss
- 2000: \$2.7B Sales, \$1.4B Loss

- **Peapod Example**

- Founded 1989
- 140,000 members, largest on-line grocer
- Revenue tripled to \$73 million in 1999
- 1st Quarter of 2000: \$25M Sales, Loss: \$8M

Reality is Different....

- **Dell Example:**

- Dell Computer has outperformed the competition in terms of shareholder value growth over the eight years period, 1988-1996, by over 3,000% (see Anderson and Lee, 1999)

The e-Business Model

- e-Business is the process of redefining old business models, using Internet technology, so as to improve the extended enterprise performance
 - e-commerce is part of e-Business
 - Internet technology is the driver of the business change
 - The focus is on the extended enterprise:
 - Intra-organizational
 - Business to Consumer (B2C)
 - Business to Business (B2B)

A new Supply Chain Paradigm

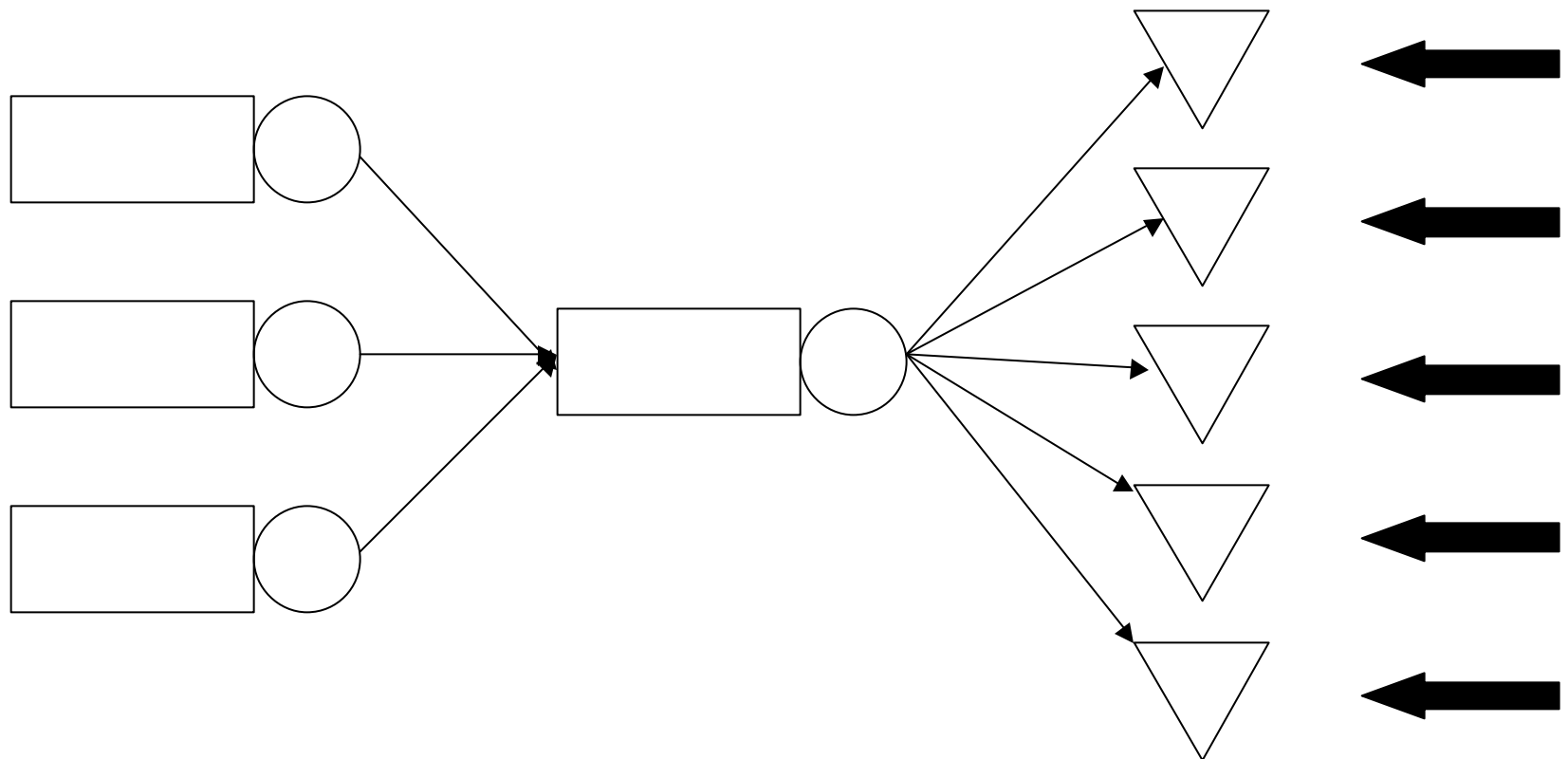
- A shift from a Push System...
 - Production decisions are based on forecast
- ...to a Push-Pull System

From Make-to-Stock Model....

Suppliers

Assembly

Configuration



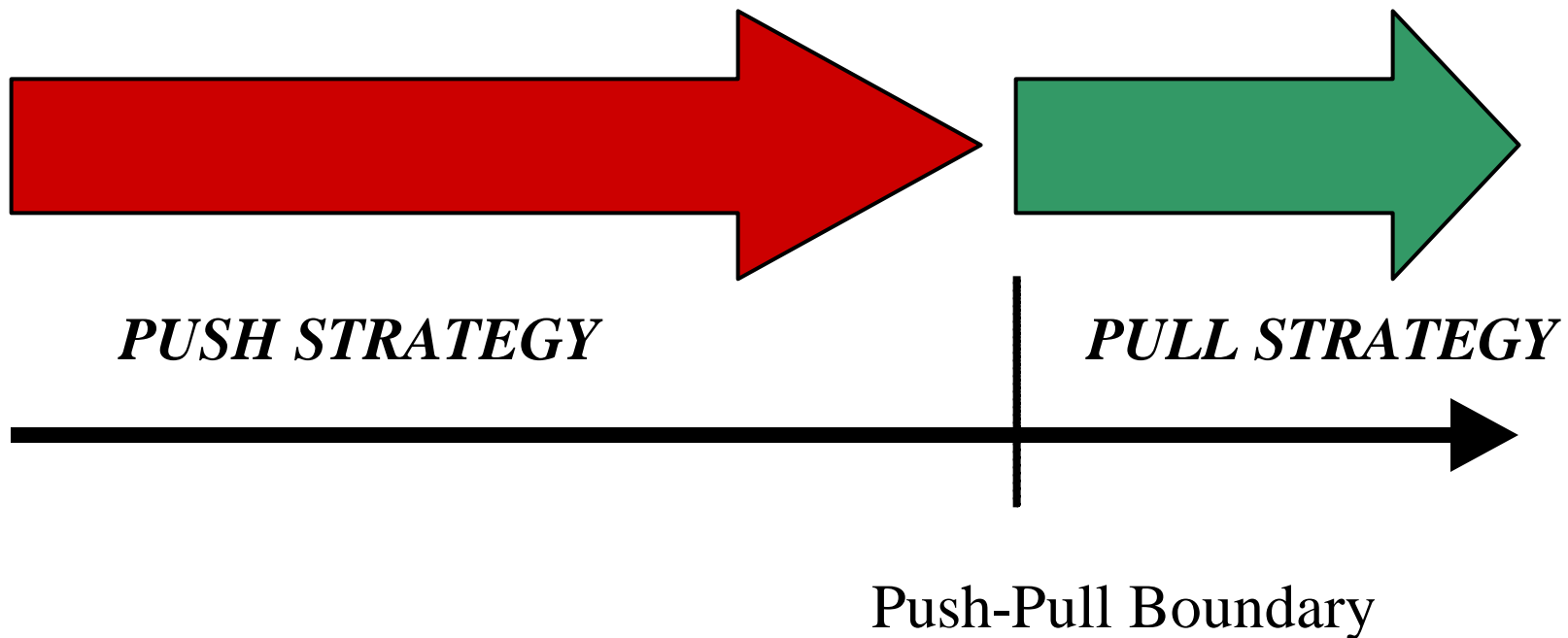
Demand Forecast

- **The three principles of all forecasting techniques:**
 - Forecasts are always wrong
 - The longer the forecast horizon the worst is the forecast
 - Aggregate forecasts are more accurate
 - The Risk Pooling Concept

A new Supply Chain Paradigm

- A shift from a Push System...
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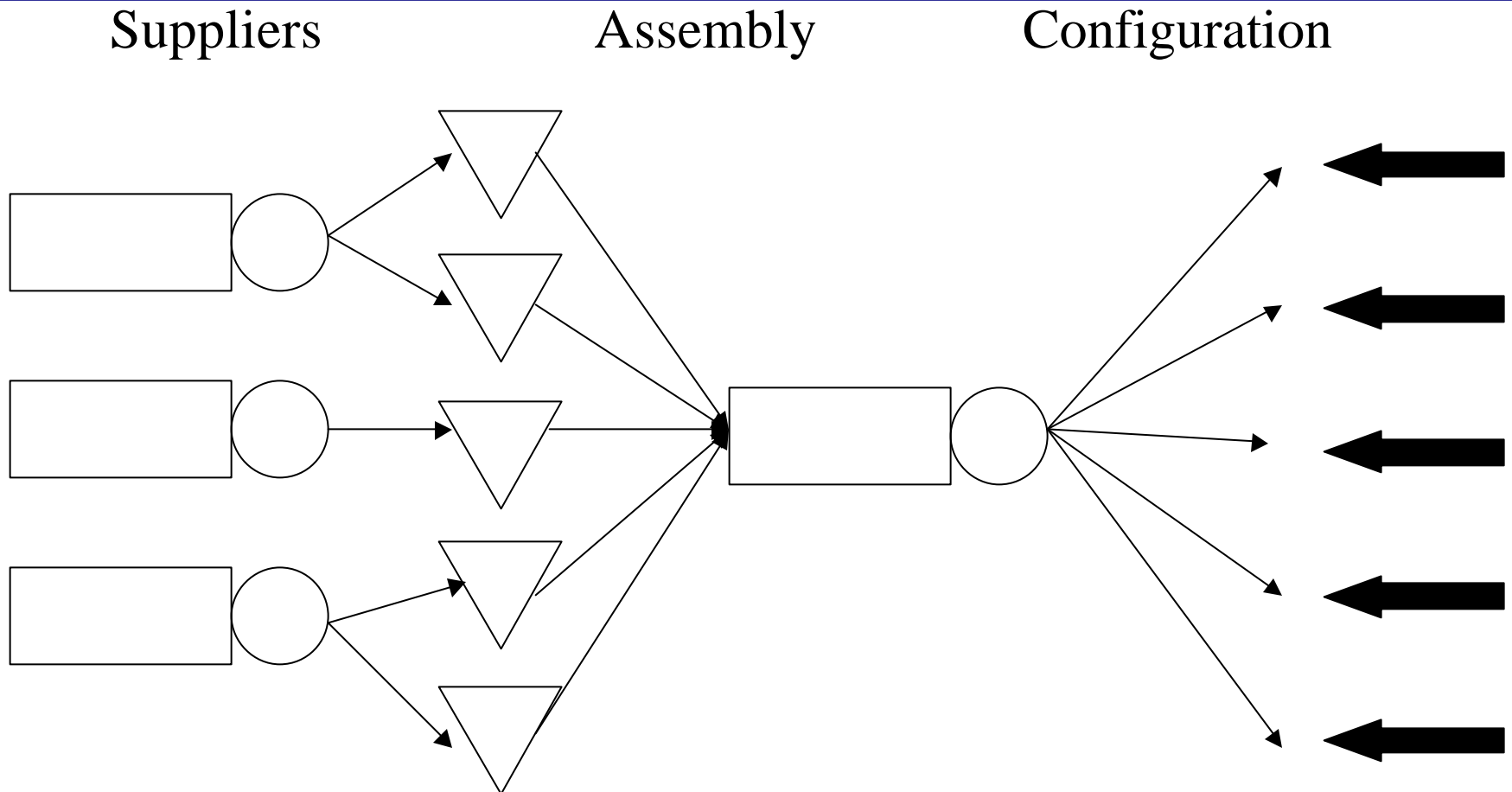
Push-Pull Supply Chains



A new Supply Chain Paradigm

- A shift from a Push System...
 - Production decisions are based on forecast
- ...to a Push-Pull System
 - Parts inventory is replenished based on forecasts
 - Assembly is based on accurate customer demand

....to Assemble-to-Order Model



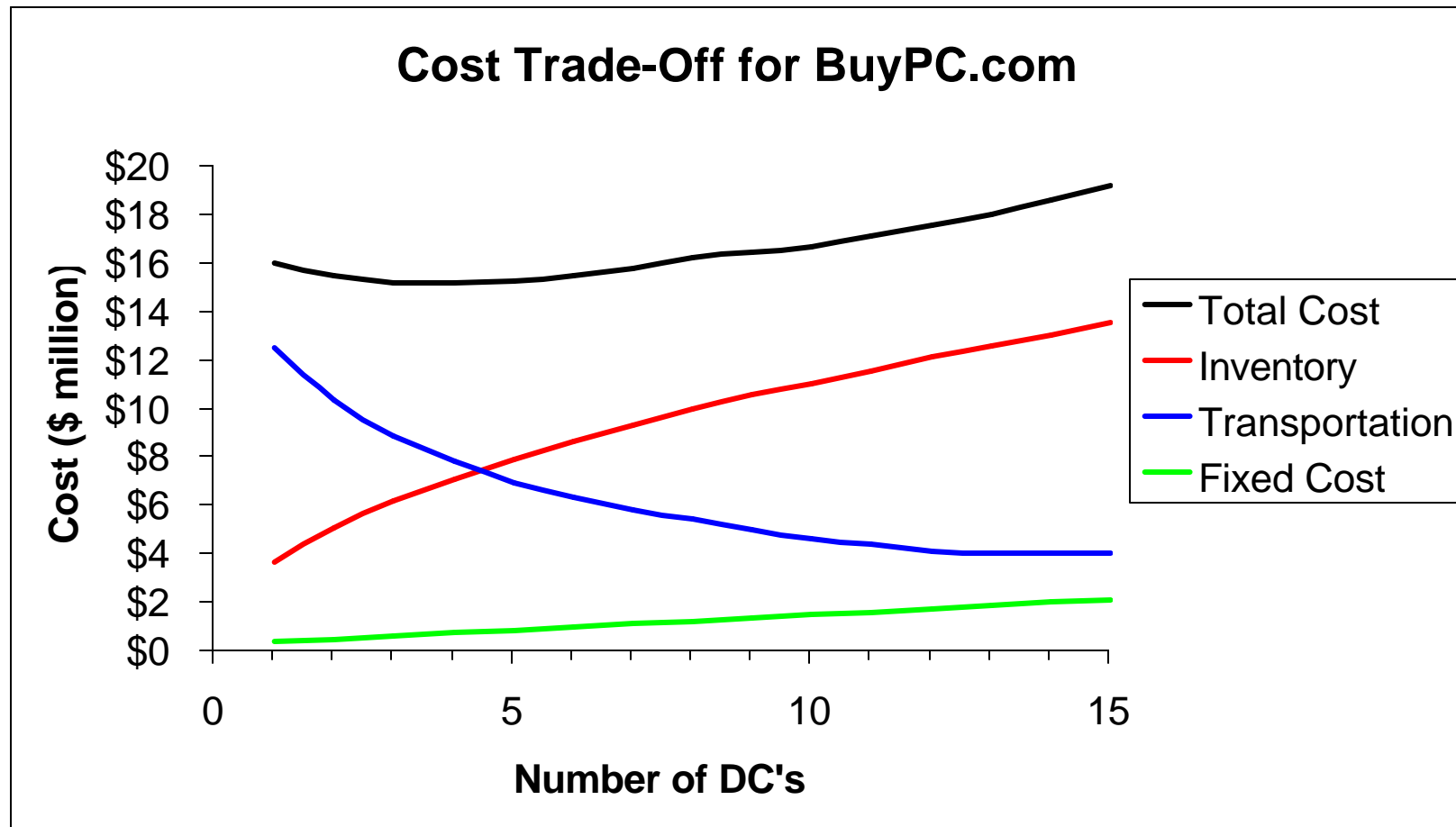
Demand Forecast

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Business models in the Book Industry

- From Push Systems...
 - Barnes and Noble
- ...To Pull Systems
 - Amazon.com, 1996-1999
- And, finally to Push-Pull Systems
 - Amazon.com, 1999-present
 - 7 warehouses, 3M sq. ft.,

Direct-to-Consumer: Cost Trade-Off



Business models in the Grocery Industry

- From Push Systems...
 - Supermarket supply chain
- ...To Pull Systems
 - Peapod, 1989-1999
 - Stock outs 8% to 10%
- And, finally to Push-Pull Systems
 - Peapod, 1999-present
 - Dedicated warehouses
 - Stock outs less than 2%

Business models in the Grocery Industry

- Key Challenges for e-grocer:
 - Transportation cost
 - Density of customers
 - Very short order cycle times
 - Less than 12 hours

Less than 300,000 shoppers

	Number of customers	Average order	Delivery charges
Webvan	21000	\$71	\$4.95 for < \$50 free for > \$50
Peapod	140000	\$120	\$7.95 per order
HomeGrocer.com	50000	\$110	\$9.95 < \$75 free for > \$75
NetGrocer.com	60000	\$70	\$2.99 for < \$50 \$4.99 for > \$50
ShopLink.com	3300	\$98	\$25 monthly
Streamline.com	3400	\$100	\$30

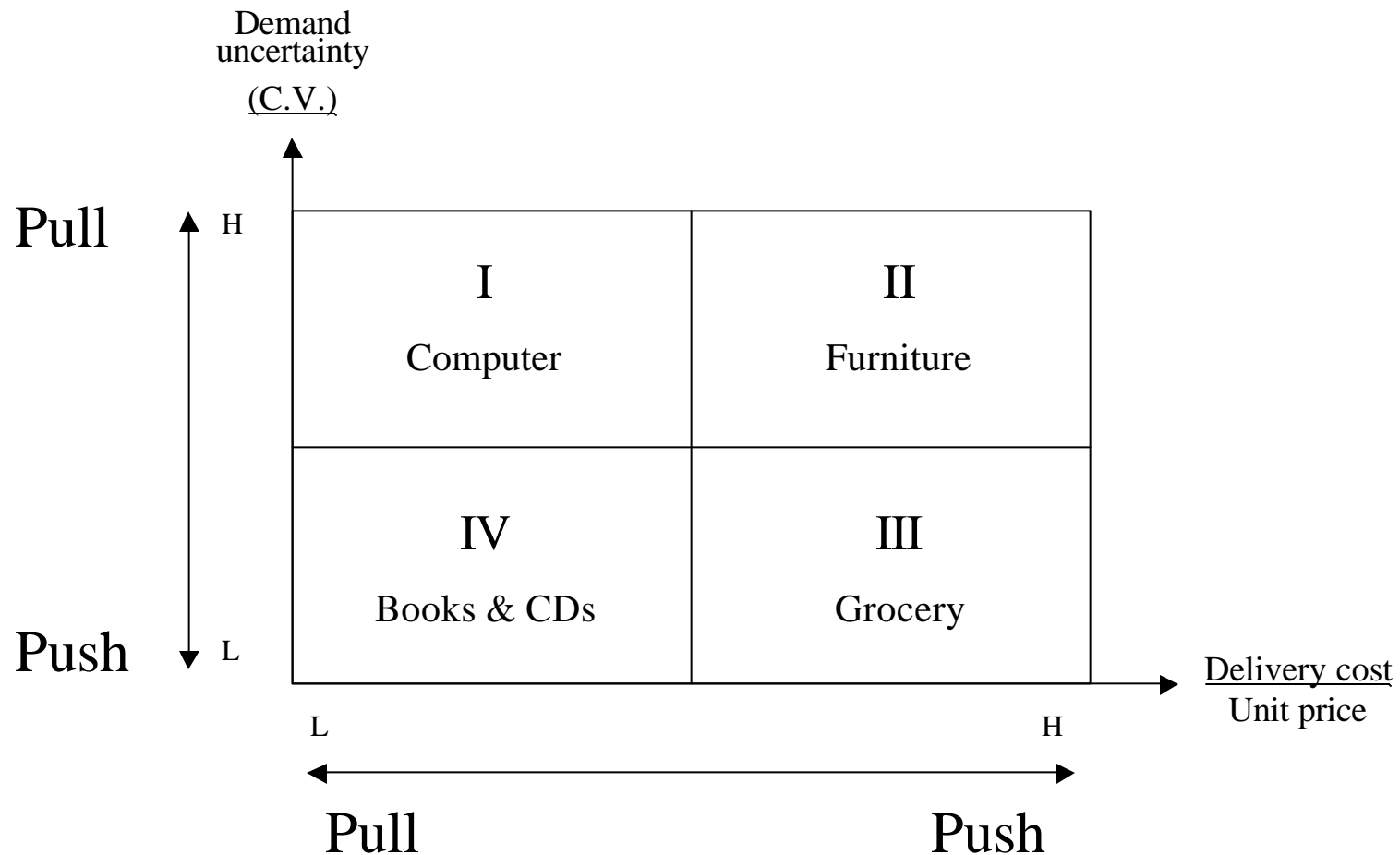
e-Business in the Retail Industry

- Brick-&-Mortar companies establish Virtual retail stores
 - Wal-Mart, K-Mart, Barnes and Noble
- Use a hybrid approach in stocking
 - High volume/fast moving products for local storage
 - Low volume/slow moving products for browsing and purchase on line
- Channel Conflict Issues

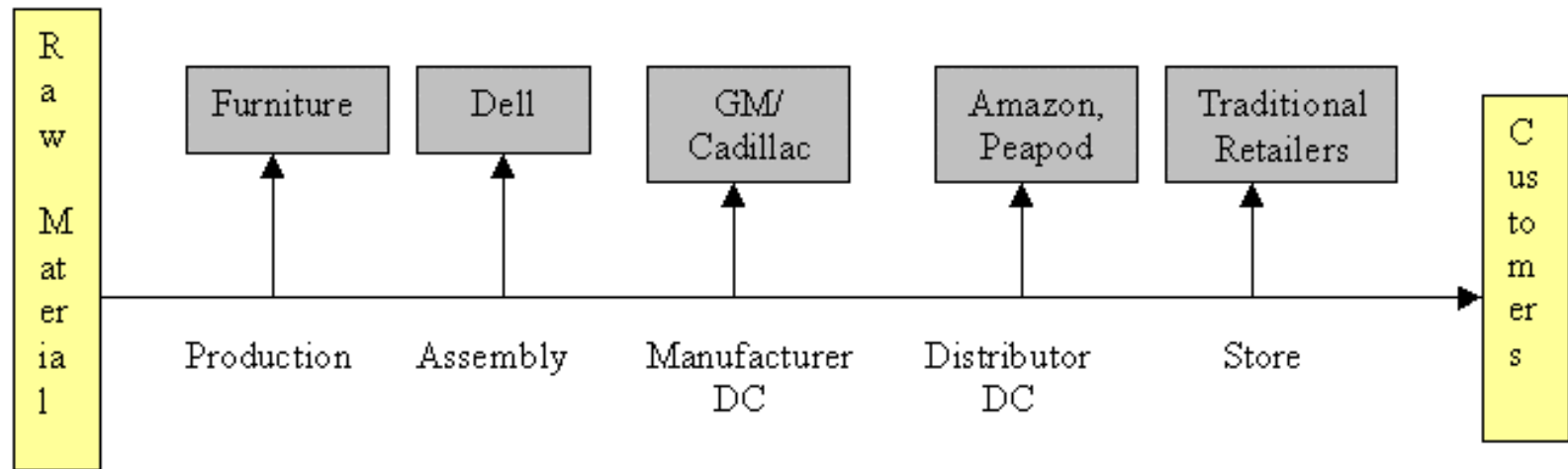
E-Fulfillment Requires a New Logistics Infrastructure

	Traditional Supply Chain	e-Supply Chain
Supply Chain Strategy	Push	Push-Pull
Shipment Type	Bulk	Parcel
Inventory Flow	Unidirectional	Bi-directional
Reverse Logistics	Simple	Highly Complex
Destination	Small Number of Stores	Highly Dispersed Customers
Lead Times	Depends	Short

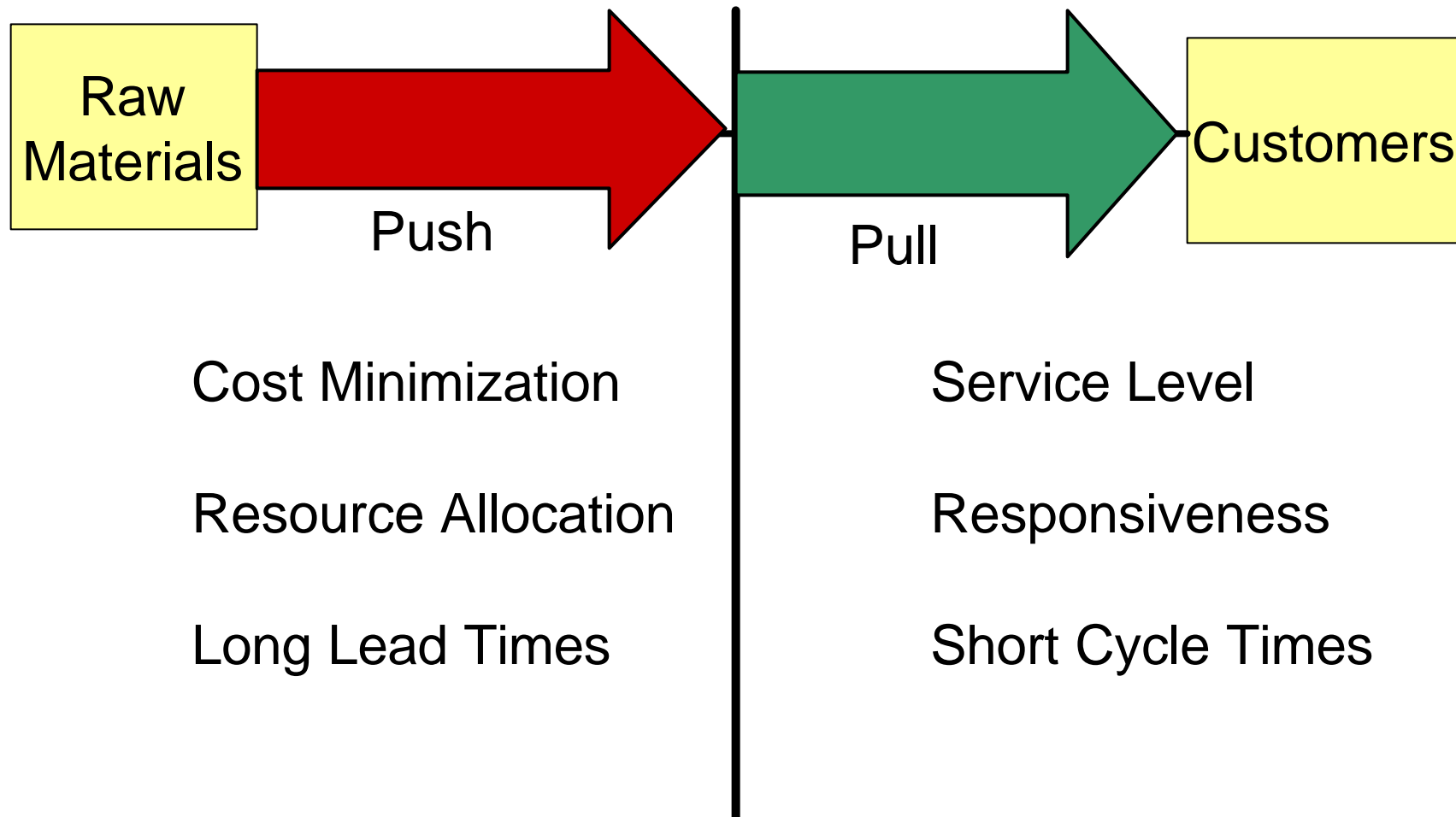
Matching Supply Chain Strategies with Products





Locating the Push-Pull Boundary



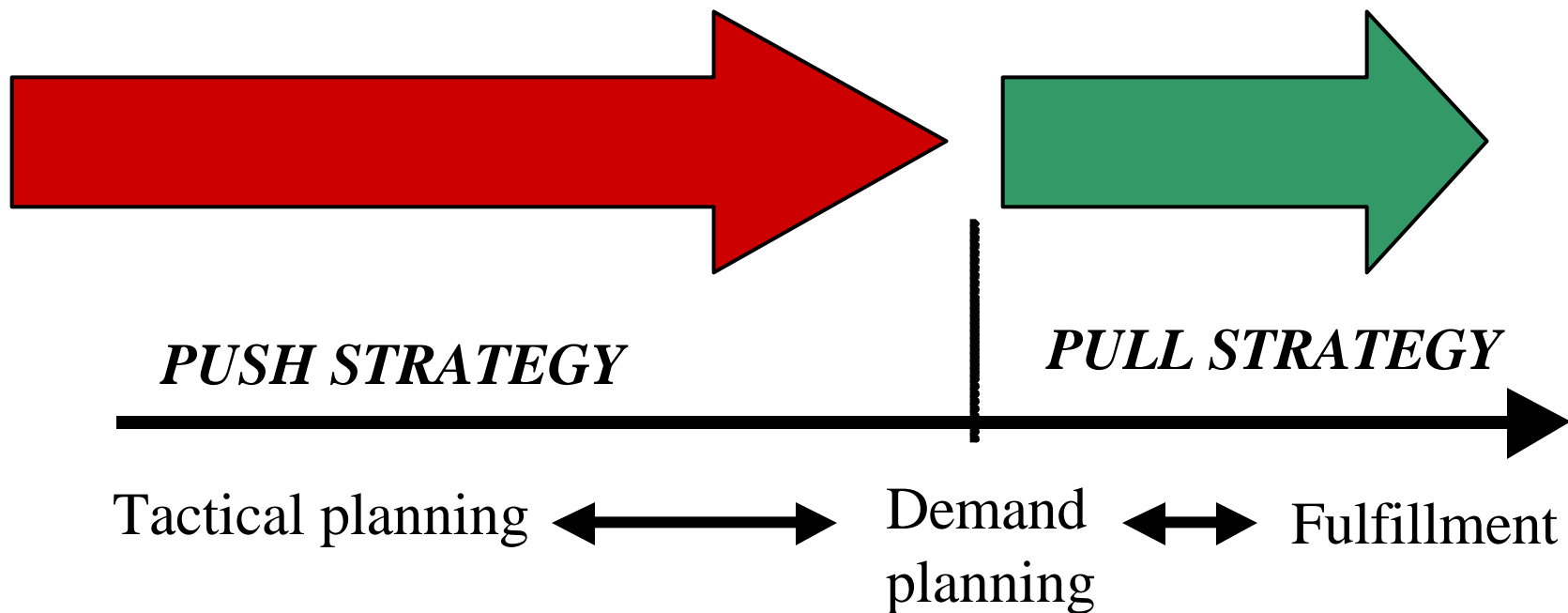
Organization Skills Needed



The Push-Pull Interface

- Integrate the Push and the Pull portion of the supply chain
 - **Order Fulfillment** manages the Pull portion of the supply chain  **Service Level**
 - **Tactical Planning** manages the Push portion of the supply chain  **Cost**
 - **Demand Planning** is the **interface** between the Pull and the Push portions

Push-Pull Supply Chains

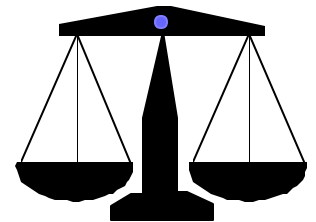


e-Business Opportunities:

- Reduce Facility Costs
 - Eliminate retail/distributor sites
- Reduce Inventory Costs
 - Apply the risk-pooling concept
 - Centralized stocking
 - Postponement of product differentiation
- Use Dynamic Pricing Strategies to Improve Supply Chain Performance

Dynamic Pricing: Trade-Offs

- Allocation of capacity to current or future demand
- High price and low demand versus low price and high demand
- Balance between production cost and inventory holding cost



When does dynamic pricing matter?

- Tightly constrained capacity
- Variability in demand
- Variability in capacity
- Product proliferation
- Market segmentation

Source:

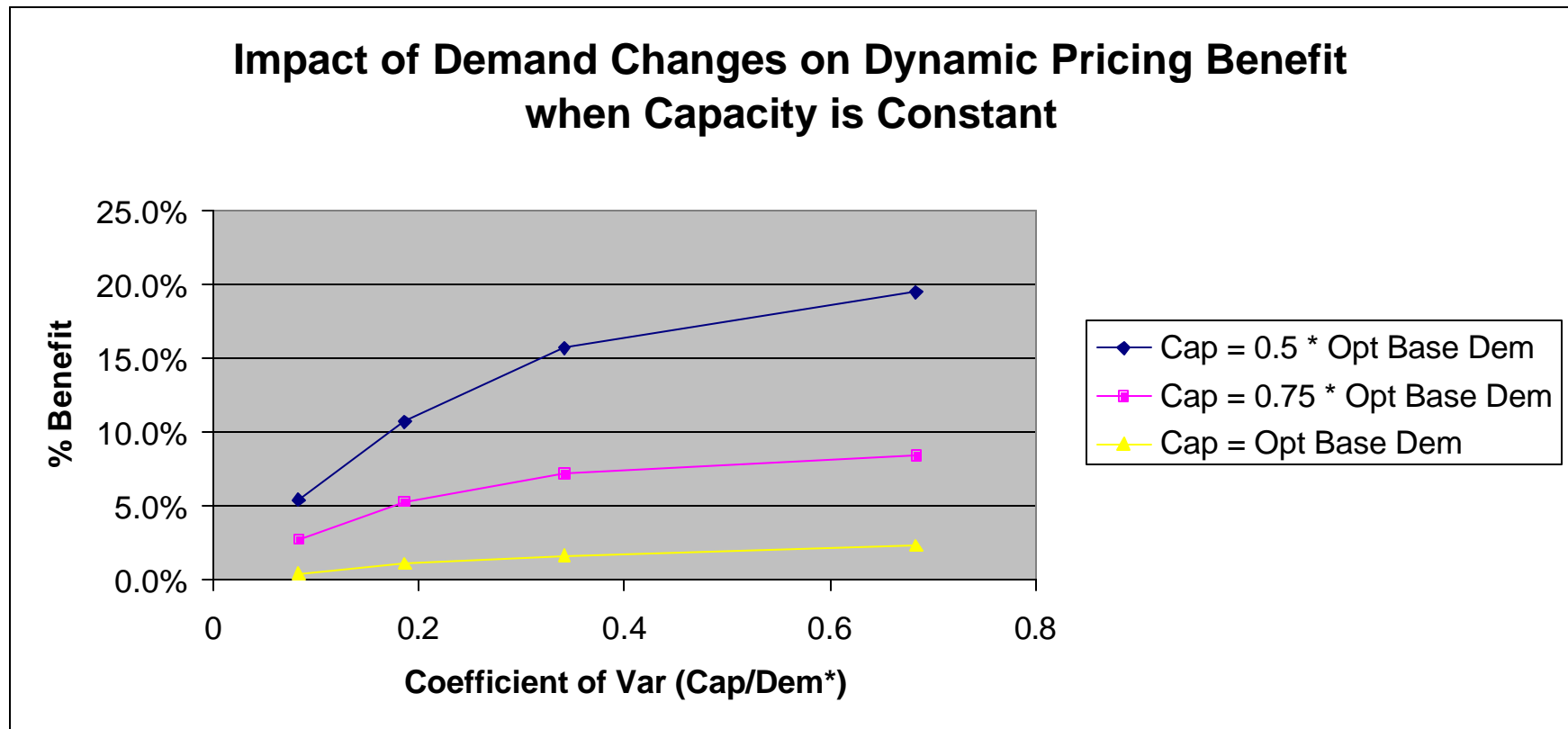
Chan, Simchi-Levi and Swann (2000), Using Flexible Pricing to Improve Supply Chain Performance

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Impact of Changes in Demand

- As the variability in demand increases, the benefit of dynamic pricing increases
- As capacity becomes more constrained, the benefit of dynamic pricing increases



Other Potential Impacts of Dynamic Pricing

- Reduction of variability in sales or production schedule
- Increase in average sales
- Reduction of inventory
- Reduction in average (or weighted average) price

Internet Based B2B Strategies

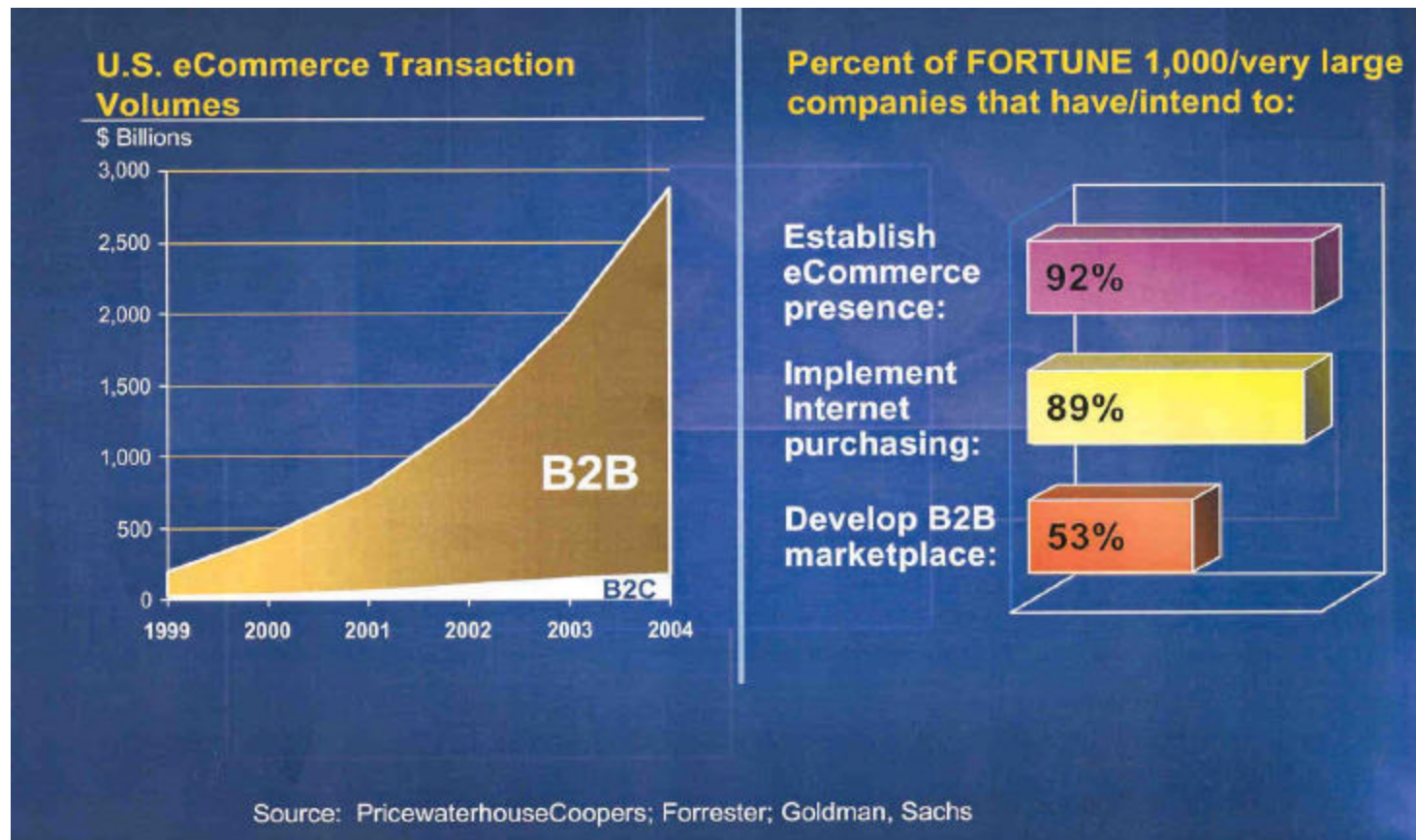
- 1) FreeMarkets Online: A Case Study
- 2) B2B Strategies
- 3) B2B Pitfalls

1. FreeMarkets Online, Harvard Business School, 9-598-109

FreeMarkets Online

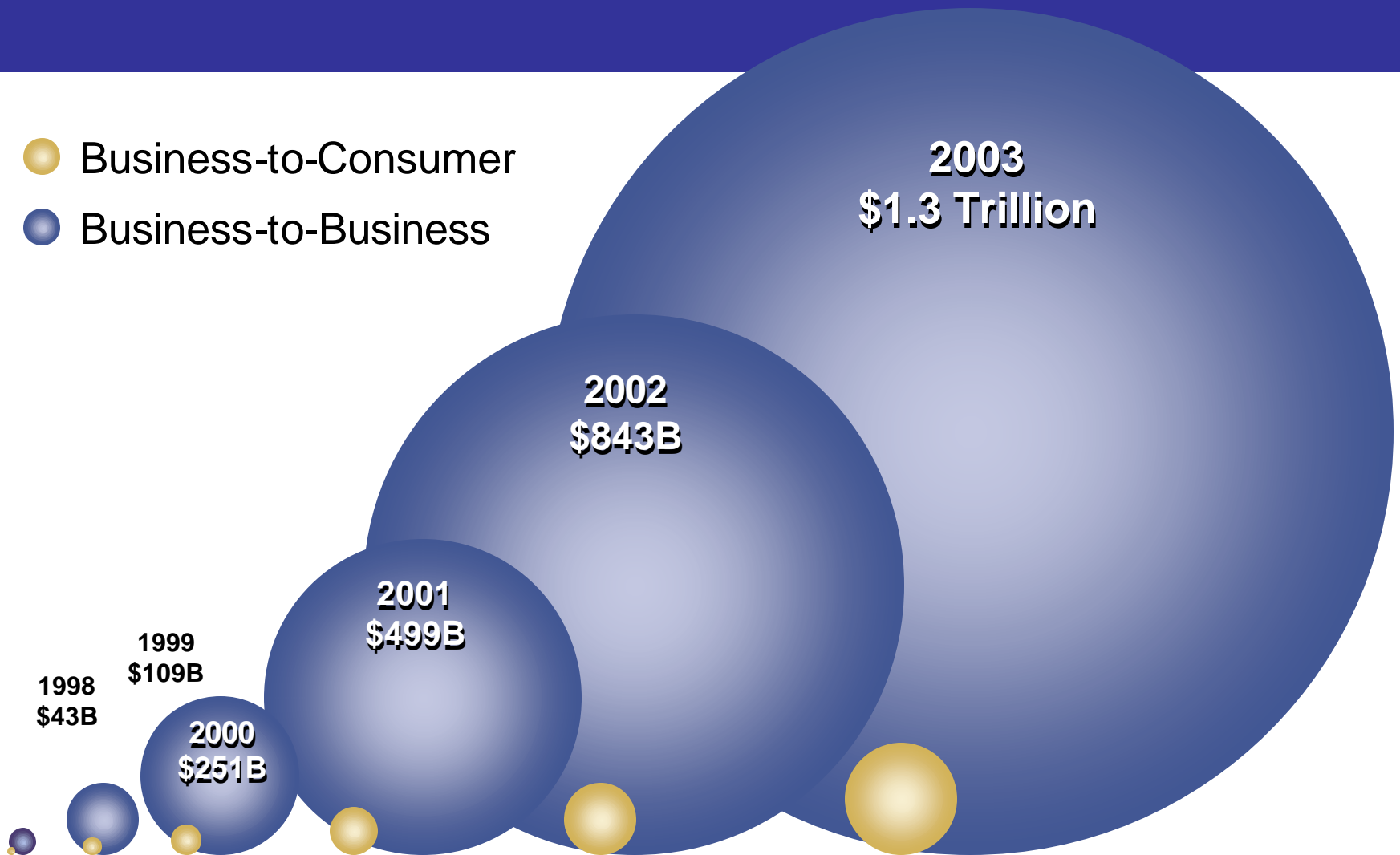
- FreeMarkets is an online market making firm that enabled industrial buyers to link up with their potential suppliers in a live electronic bidding
- The end result of such interaction among a network of suppliers was procurement cost savings of about 15% for the buyers
- The company was founded in 1995 and was on the verge of breaking even in 1998
 - It was expecting to receive commissions and fees of nearly \$6 million for arranging procurement of ~\$200 million worth of industrial components and parts

The Move to B2B Commerce

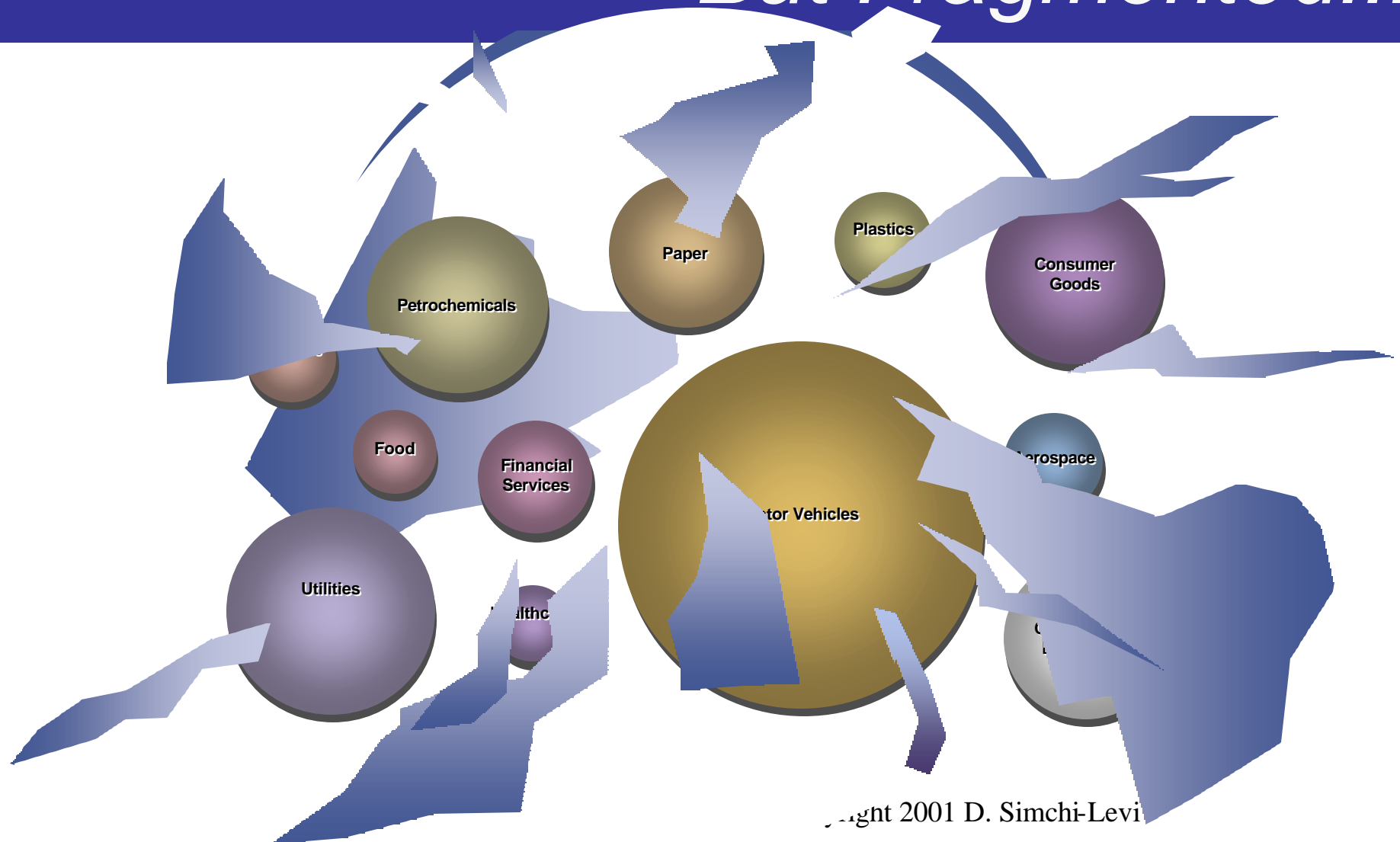


B2B is Huge...

- Business-to-Consumer
- Business-to-Business



But Fragmented...



Highly Fragmented

- Most product categories are highly fragmented, with numerous suppliers each offering different level of quality, service and pricing options
- Buyers incur significant cost in the actual purchase process
 - A buyer must invest internal resources to manage the process of collecting, analyzing and acting upon all the information in the market
 - In addition to purchase price companies spend over 10% in additional procurement costs
- On the suppliers side, there are significant costs in using the manufacturing reps
 - These commissions range from 4% to 7% of purchase price

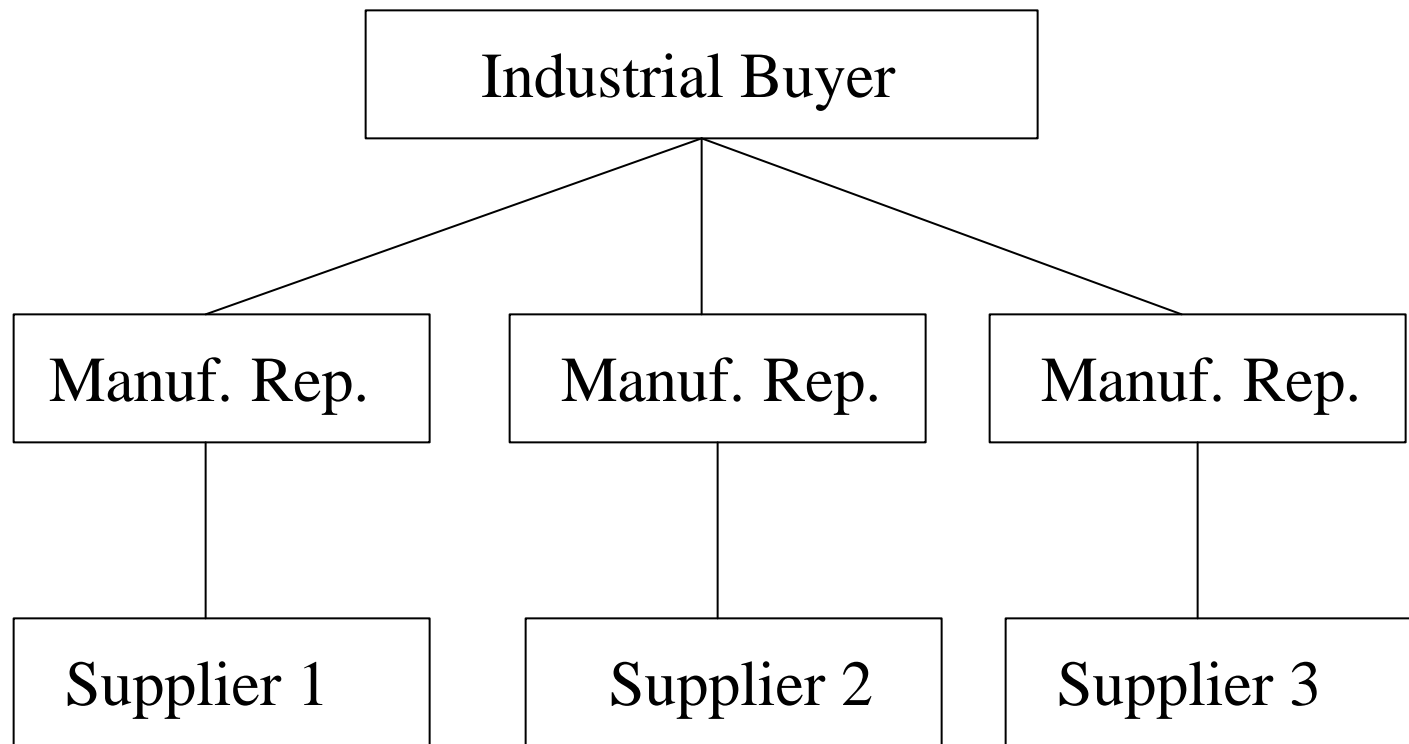
How Does FreeMarkets Online Create Value for its Customers?

- Consulting/Purchase outsourcing
 - Putting together specs, drawings, lot sizes, documentation and RFQs
 - Identifying potential savings opportunities
 - Identifying and qualifying suppliers
 - Educating and training buyers
 - Conducting the Competitive Bidding Event (CBE)
 - Providing post bid analysis and support

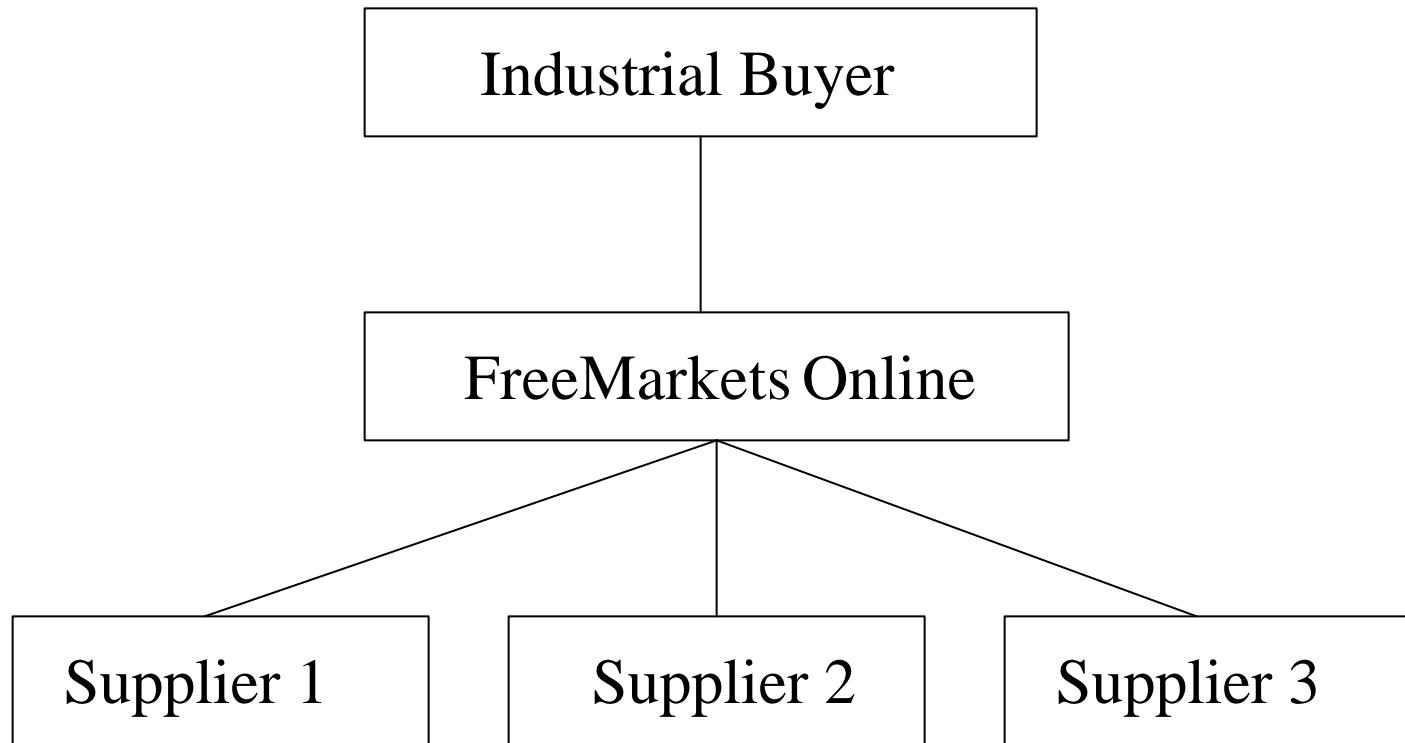
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- Distribution Intermediary

Traditional B2B Trading Exchanges



Internet Based B2B Trading Exchanges



How Does FreeMarkets Online Create Value for its Customers?

- Consulting/Purchase outsourcing
- Distribution Intermediary
- Network Enabler/Software Provider

To summarize the Value Proposition

- Value to Buyers
 - Elimination of the manufacturers' reps
 - Access to information that is otherwise difficult/expensive to assemble
 - Cost savings
 - Introduction to new suppliers
 - Another layer of quality assurance
 - An opportunity for the buyer to gain a better understanding of its own needs
 - Outsourcing the RFQ process
 - Real time bidding

What are the Barriers for the buyers?

- Elimination of established relationships with the suppliers and their representatives
- Elimination of manufacturing reps could result in loss of convenience
- Potentially longer time lag until bid
 - CBE process needs to be integrated into the manufacturing process
 - Less suitable for time sensitive parts

What is the value to the suppliers?

- Less value for the suppliers
 - Commission costs fell from 7% to 2.5%
 - 15% drop in revenue for the suppliers
- Suppliers could benefit from lower sales, marketing and distribution costs and better utilization of capacity

Which suppliers benefit from this model?

- Low cost, quality suppliers will benefit as they drive competition out of the market
 - The FreeMarkets model would be beneficial for large more efficient suppliers
- It will also provide opportunities for a host of small suppliers, especially if they are located overseas

How should e-marketplaces charge? Can they build a solid profitable business?

- Many have been motivated by the desire to build scale quickly
- Transaction fees (typically paid by the sellers)
 - Sometimes the wrong party is charged
 - Buyers and suppliers resist paying
- Subscription fees (typically paid by the buyer)
 - Depends on a number of dimensions
- Licensing the software

The evolution of the value proposition

- Most e-marketplaces now recognize that being a transaction hub alone is not sufficient
 - They are expanding their offering to include inventory management and financial services (Zoho); supply chain planning (Covisint, e2open, Converge, TheSupply)

The evolution of the Industry

- The early evolution was led by dot.com startups
 - Based upon charging transaction fees
- This was followed by consortium-based public markets....
 - Covisint (automotive); Trade-Ranger (oil); Omnexus (chemicals); e2Open and Converge (high-tech)
- ...And private exchanges
 - Valuechain.Dell.com (Dell) and eHub (Cisco)

E-marketplace Examples

Independent Vertical Exchanges (IVX)



Independent Horizontal Exchanges (IHX)



Consortia Trading Exchanges (CTX)



Private Trading Exchanges (PTX)



Private vs. consortium-based public markets

- Consortium-based market places
 - Aggregate activities
 - Serve as a virtual co-op
- Not clear that industry consortia can hold together and build e-marketplace in realistic timescale
- In a private exchange
 - Easier to integrate suppliers (Covisint has 20 suppliers after one year while eHub thousands)
 - Easier to build business intelligence into the exchange
 - Dell uses its exchange to help coordinate the demand planning of the suppliers
 - Cisco uses its exchange to help coordinate production plans at suppliers

Proposed Supplier/Procurement Management Model

- **Indirect Procurement (operating input)**: Procurement of non-production items such as MRO (maintenance, repairs and operating) goods should be done through **MRO Hubs** (MRO.com) or **Big Supplier (Grainger online catalogs)** Specific Hubs
- **Direct Procurement (manufacturing input)**: Procurement of production items (strategic sourcing) should be done through **Company Specific Hubs**
- **Excess Inventory or Capacity of Uncertain Demand** (spot purchases of direct and indirect materials) through **on-line Auction**

On-line Auction works best when

- Products are commodities or near commodities and can be traded sight unseen
- Trading volumes are massive relative to transaction costs
- Buyers and sellers are sophisticated enough to deal with dynamic pricing
- Companies use spot purchasing to smooth the peak and valleys of supply and demand
- Logistics can be conducted by third party
- Demand and price are volatile

Company specific hubs work best when

- Products are specialized, not commodities
- The number of products is large
- Purchasing is done through pre-negotiated contracts
- Long-term relationships are important

B2B Software Vendors

- Oracle (Indirect and Direct)
- i2 Technologies and Manugistics (Direct)
- Ariba (Indirect and Direct)
- Commerce One (Indirect and Direct)
- Agile (Direct)
- VerticalNet (Indirect)

E-Procurement: The reality

- Companies conducting greater than 20% of procurement transactions online have reduced their transaction processing cost by nearly a third (*Hackett Benchmarking*)
- Product savings and process cost improvements effect operating cost by 10% (*Credit Suisse First Boston Technology Group*)

Positive Aspects of Trading Exchanges (Companies who use exchanges):

- Reduce costs or labor (31%)
- Better access to products/vendors (24%)
- Increase speed or efficiency (29%)
- Access to more customers (21%)

Source: AMR Research

Positive Aspects of Trading Exchanges (Companies who plan to use exchanges):

- Reduce costs or labor (43%)
- Better access to products/vendors (26%)
- Increase speed or efficiency (23%)
- Access to more customers (10%)

Source: AMR Research

Negative Aspects of Trading Exchanges (Companies use exchanges):

- Security trust (17%)
- Start Up cost (5%)
- Loss of face-to-face relationships (12%)
- Lack of standards (5%)
- Immature technology (5%)
- Integration issues (7%)

Source: AMR Research

Negative Aspects of Trading Exchanges (Companies who plan to use exchanges):

- Security trust (16%)
- Start Up cost (15%)
- Loss of face-to-face relationships (11%)
- Lack of standards (6%)
- Immature technology (6%)
- Integration issues (4%)
- Pricing pressure (6%)

Source: AMR Research

