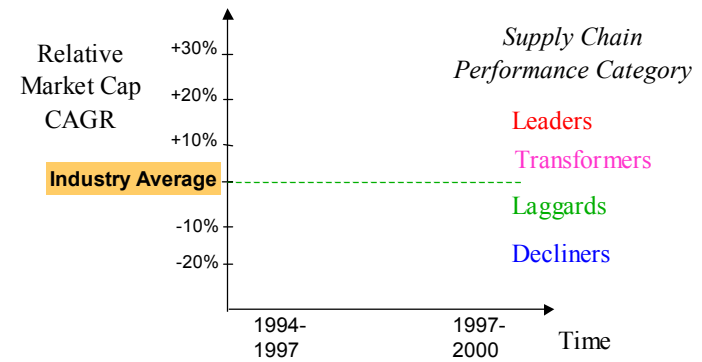


Information-Based Supply Chain Innovations

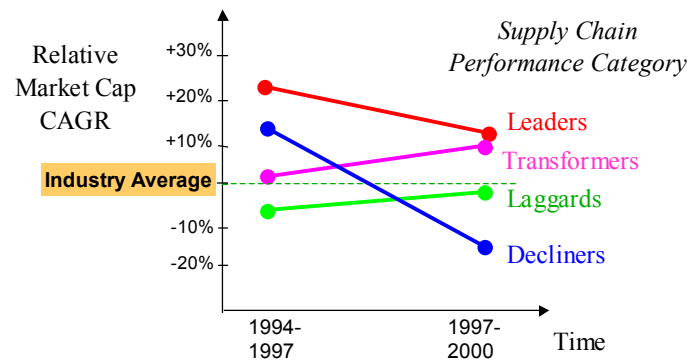
Hau L. Lee
Stanford University

Supply Chain Performance



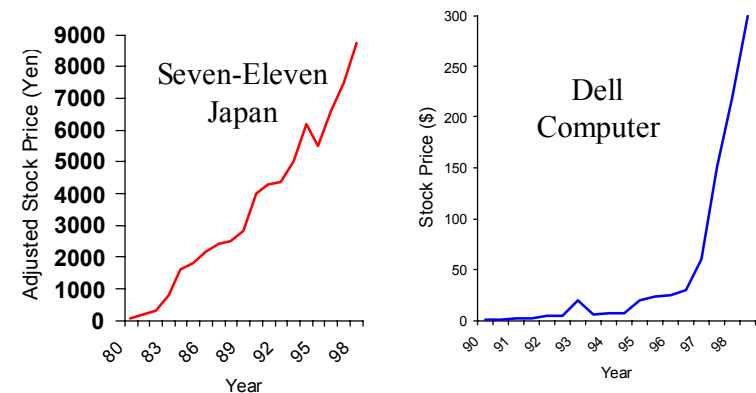
Based on joint study by Stanford University, INSEAD and Accenture, 2003

Rewards and Punishments

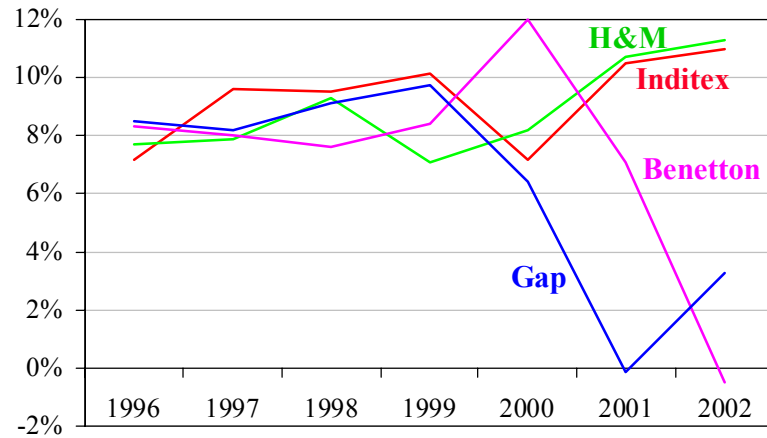


Based on joint study by Stanford University, INSEAD and Accenture, 2003

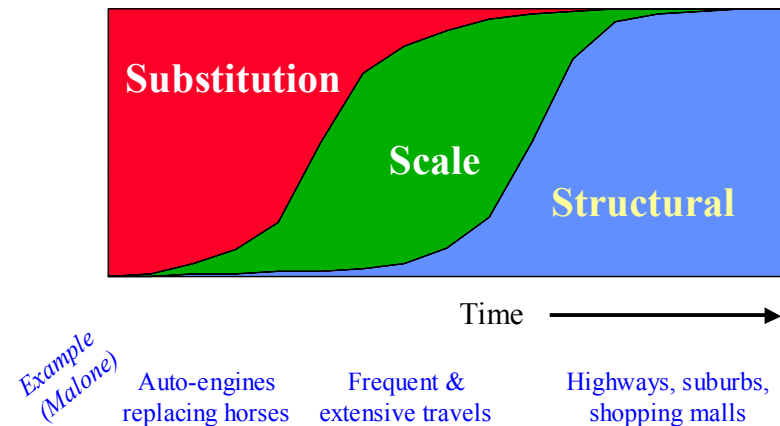
Higher Shareholder Values from Successful Order Fulfillment



Net Profit Performance



Evolution of Technology Innovations



Three S-Model

Substitution

Scale

Structure

Supply chain

Spain

Saragossa

Internet-Based Evolution

	<i>Opportunity</i>	<i>Values</i>
S ubstitution Effect	Internet-based transactions	Overhead and time efficiency
S cale Effect	Auctions and secondary markets	Lower costs, supply & demand matching
S tructural Effect	Intelligent coordination, collaborative commerce	Super-efficiency across the chain, higher revenues

Similar Evolutions

	<i>Third-Party Logistics Service Providers</i>	<i>Electronic Manufacturing Services</i>
Substitution Effect	More effective logistics provider	More effective manufacturing
Scale Effect	Economies of scale & risk pooling	Economies of scale & risk pooling
Structural Effect	4PL and logistics restructuring	Coordination & new services

Structural Effects with Logistics Outsourcing

<i>Measure</i>	<i>Category</i>	<i>With Restructuring</i>	<i>Without Restructuring</i>
Cost	Transportation	-18%	+4%
	Warehousing	-16%	-17%
	Inventory	-17%	-15%
	Others	-22%	-7%
Service	Order cycle time	-62%	-9%
	On time delivery	3-19%	--
	Availability	1-12%	--

Based on survey of 30 computer manufacturers that outsourced logistics functions (Kopczak, 1995)

Information-Based Supply Chain Innovations

	<i>Opportunity</i>	<i>Examples</i>
Substitution Effect	New and improved planning process	Intelligent & scientific planning
Scale Effect	Extensive connectivity & visibility	Coordination; sense & respond
Structural Effect	Re-engineered information, materials & financial flows	Design collaboration, postponement, new financial flow

Information-Based Supply Chain Innovations

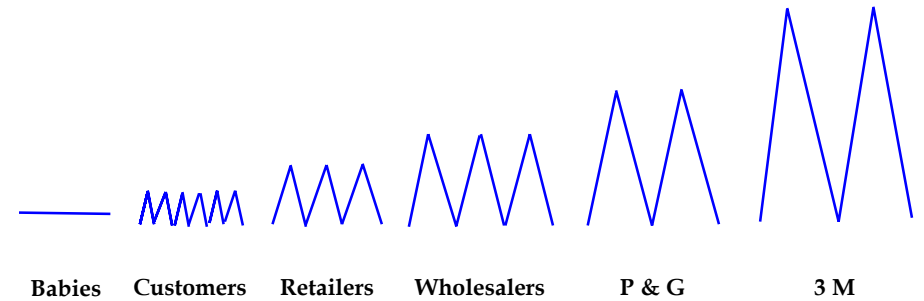
	<i>Opportunity</i>	<i>Examples</i>
Substitution Effect	New and improved planning process	Intelligent & scientific planning
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Information Distortion: The *Bullwhip* Effect

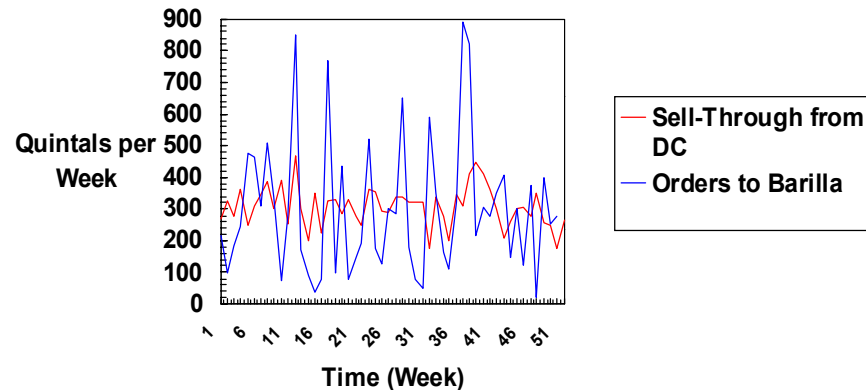


- Order variability is amplified up the supply chain: upstream is worse.
- What you see is not what they face.
- Bullwhip, whip-saw, whip-lash effect; or acceleration principle.

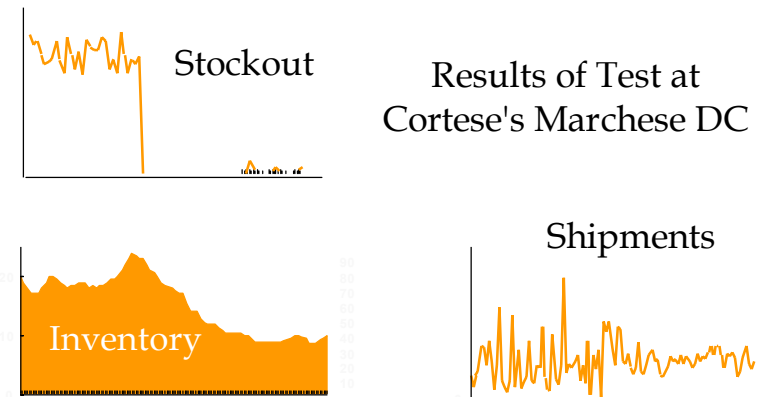
The Bullwhip Effect in the Pampers Supply Chain



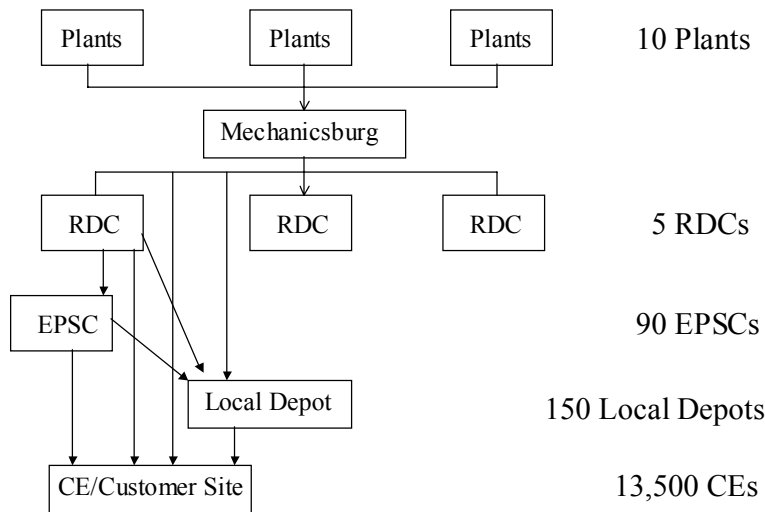
Sell-Through and Order Data at Cortese Northeast DC



Information Sharing and VMI at Barilla SpA

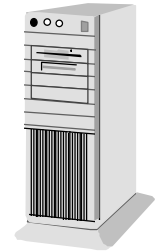


IBM Service Parts Distribution System



IBM National Service Division

- Information integration
- Multi-echelon inventory optimization
- Use of lateral transshipments
- Rationalize complex network
- Forecast improvement
- “Optimizer”
- > \$250M inventory reduction
- \$20M reduction in annual operating budget
- 10% improvements in service



The Mosquito Link

WAL★MART

Warner-Lambert Consumer Group

Information-Based Supply Chain Innovations

	<i>Opportunity</i>	<i>Examples</i>
Substitution Effect	New and improved planning process	Intelligent & scientific planning
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Service Delivery Division



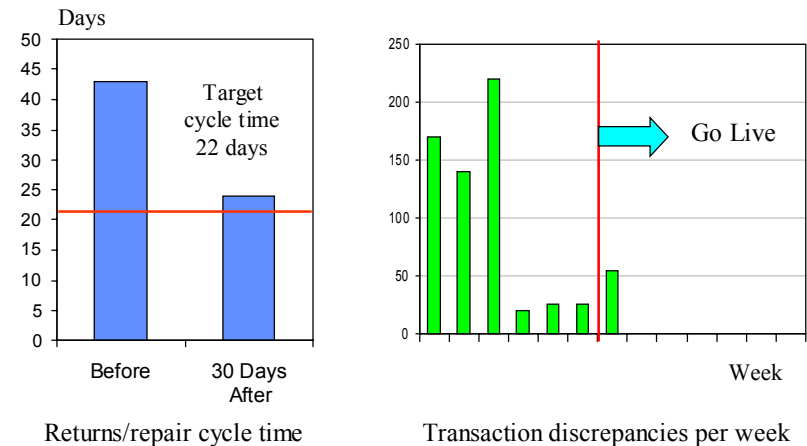
Challenges

- 150 vendors in reverse logistics network to process, repair, replace & ship computer parts & systems returned by customers.
- Long returns cycle tied up inventory.
- Lack of visibility & control.
- Excess service parts purchased.
- Lack of transaction integrity led to efforts to reconcile PO discrepancies.

Supplier Integration

- Total inventory visibility provided throughout repair cycle
- Real-time monitoring of Service Level Agreement performance against open repair orders and execute alerts when agreements are in jeopardy of being missed.
- Automated reconciliation of PO discrepancies.
- Historical reporting of supplier & repair vendor performance.

Fast Payoffs



Why the Supply Chain Broke Down

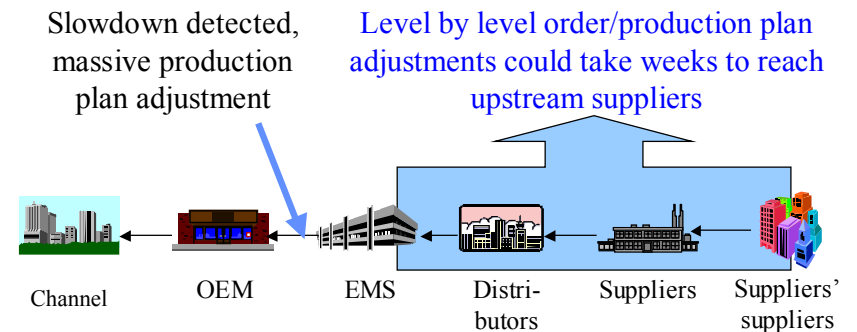
Business Week, March 19, 2001

“Forecasts by electronics and telecom companies are often inflated.”

“The problems include flawed flows of information, software tools that are too difficult and costly to use, and confused lines of responsibilities.”

“Now, Solectron has \$4.7 billion in inventory.”

Time to Adjust the Supply Chain



Result: huge inventory could still build up.



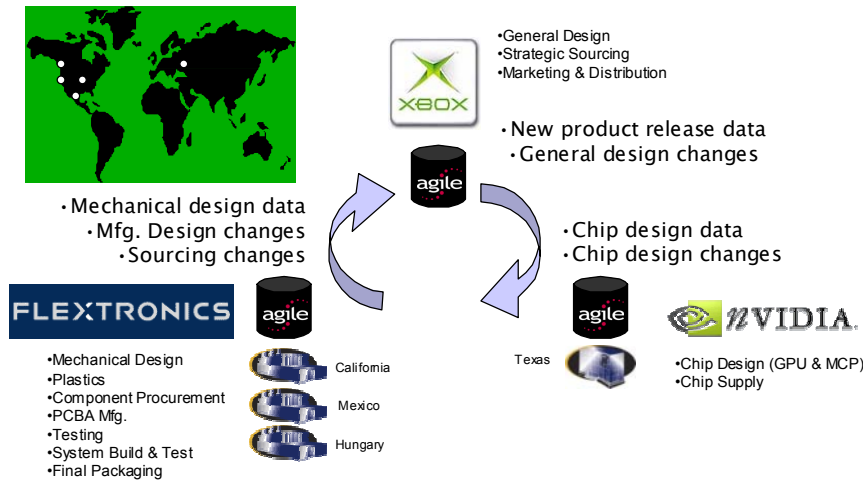
Cisco's New eHub

- | | |
|--|---|
| <ul style="list-style-type: none"> • Global B2B portal. • Extended visibility for supply partners • Exception identification and alerting. • Resolution path identification. • Shared performance measurement & reporting. • Robust supply planning. | <ul style="list-style-type: none"> • Total end-to-end visibility. • Single demand signal. • Better capacity planning and allocation of constrained materials. • Shorter lead times, higher availabilities, less expediting. • Improved partnership relationships. • Proactive SCM as opposed to reactive SCM. |
|--|---|

Information-Based Supply Chain Innovations

	<i>Opportunity</i>	<i>Examples</i>
Substitution Effect	New and improved planning process	Intelligent & scientific planning
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Design Collaboration



Mutual Success

Product launch in 14 months (vs 20 months for Sony Playstation 2), winning 3.6% market share in 4 months.

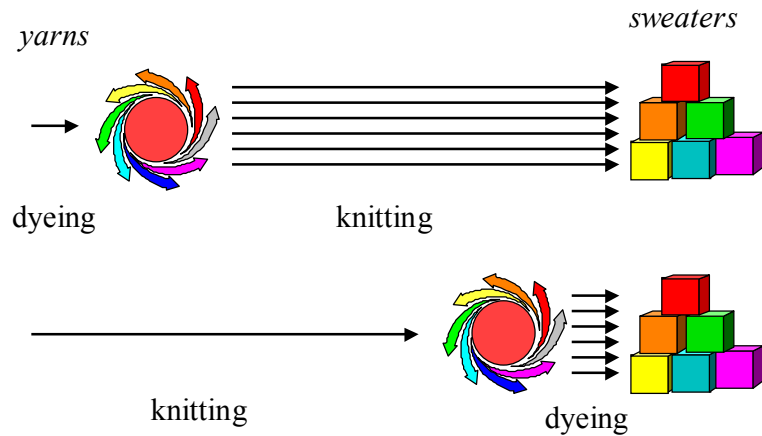
Ranking of Flextronics in Sales Among EMSs

	Xbox	PS 2
North America	6.2 M	17.7 M
Worldwide	9.4 M	30 M

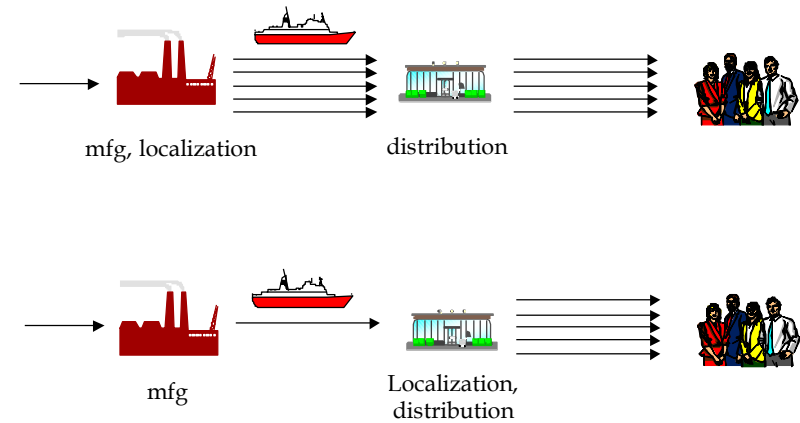
Installed Bases by Mid-2003

1993	22
1994	12
1995	10
1996	6
1997	5
1998	4
1999	4
2000	2
2001	2
2002	1
2003	1

UNITED COLORS OF BENETTON.



HP Deskjet Printer

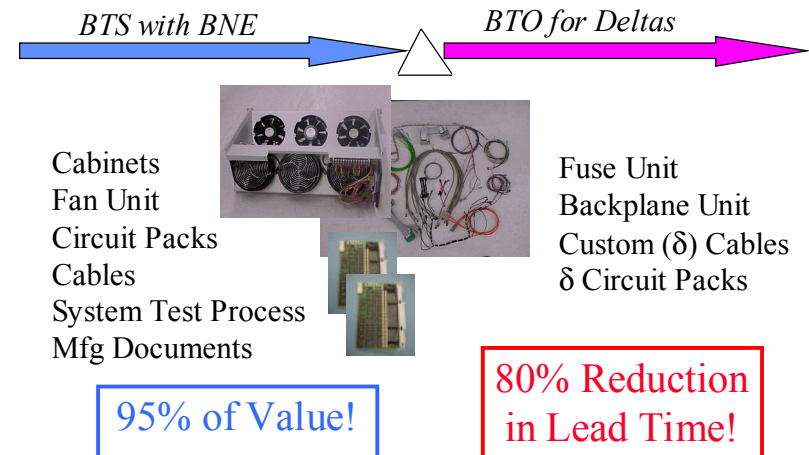


Lucent, Tres Cantos Challenge

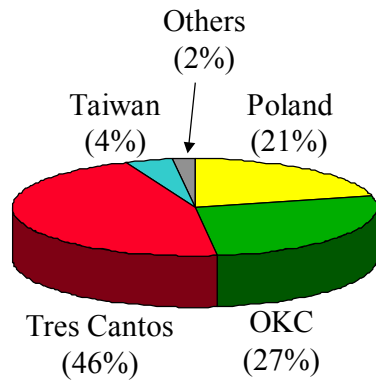


- Potential contract worth \$300M for Saudi Arabia in 1998.
- Exceptional lead time requirements due to Y2K, while Lucent's standard practice was completely build-to-order with lead time at 23-25 weeks.
- Tres Cantos, the only plant qualified to build customized products for Saudi Arabia, did not have enough capacity for the Saudi contract.

Basic Network Element (BNE)



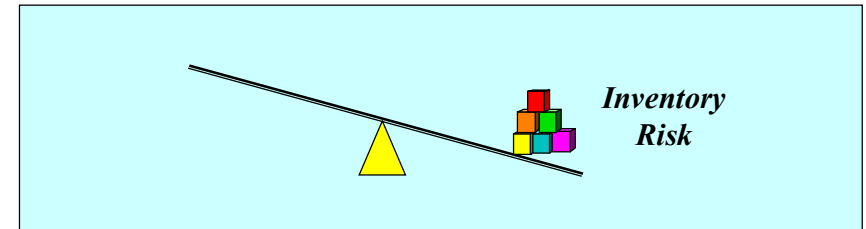
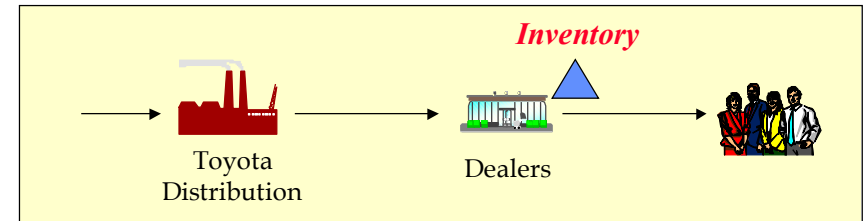
Successful Win with Saudi



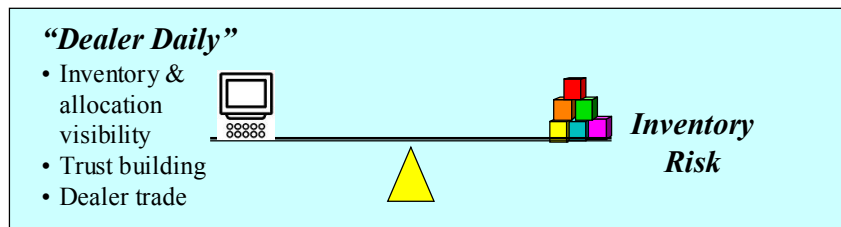
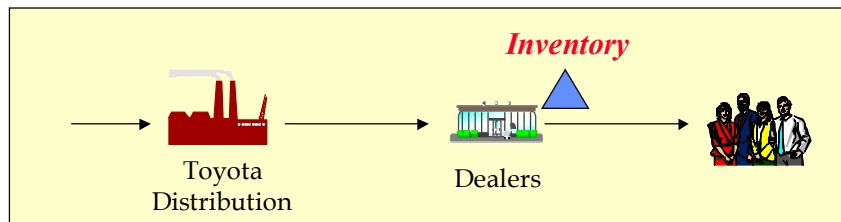
Global BNE Sourcing

- Saudi contract won.
- Multiple sites set up and qualified to produce BNEs.
- Organization change (new or changed job functions) needed.
- Saudi project completed on schedule

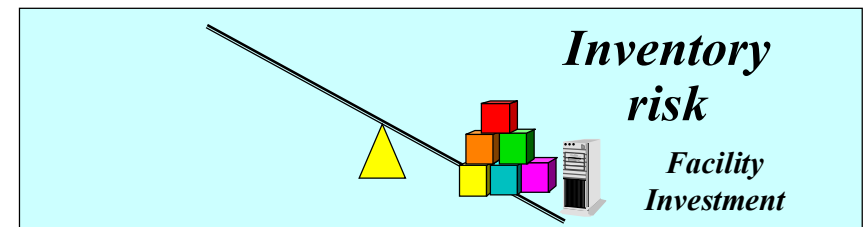
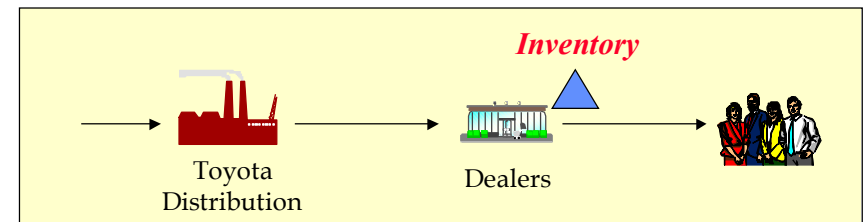
Push Pull Boundary at Toyota



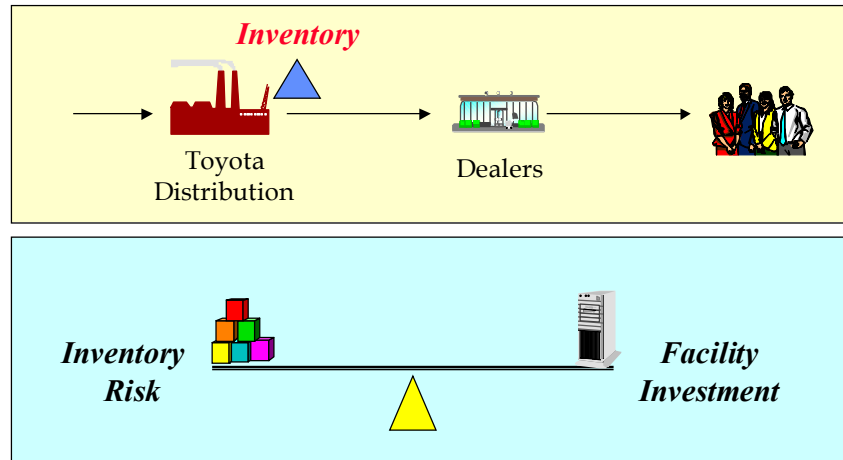
Incentive Alignment at Toyota



Push Pull Boundary for Prius



Incentive Alignment for Prius



Toyota Risk Pooling for Prius

Car Model

		Conventional	Prius
<i>Region</i>	North California	5-6%	25%
	Southeast US	20%	6%

Regional share of total US sales.

Financing Hub



- Supplier Hub or Vendor Hub is becoming a common establishment.
- Vendors are expected to provide JIT delivery, VMI.
- Vendors and 3PLs are being asked to procure and hold inventories
- Inventories are often “crammed down” on the weakest link in the supply chain, with limited or unfavorable access to the capital market.

Financing the Hub

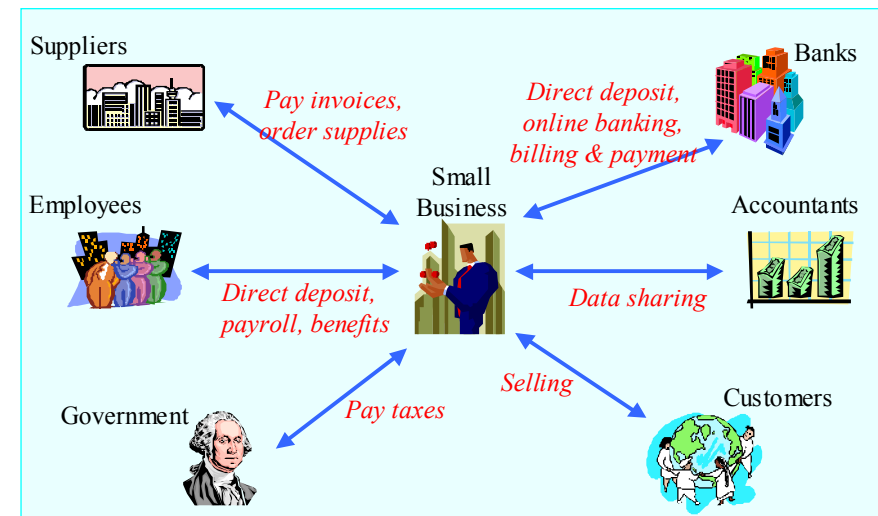
- VMI-hub for semi-conductor device manufacturer whose efficient production run constitutes 90 day supply.
- OEM vendor-hub in Singapore where suppliers had been unwilling to consign inventory in the hub.

- Leveraging bank’s power to get the lowest inventory holding cost rate .
- Increases the credit available to venture-backed companies.
- Provides means to gain efficiency with larger production runs.

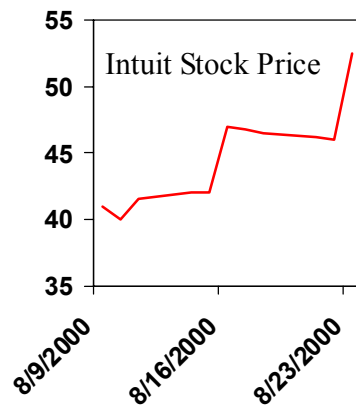
Evolution of Internet-Based Businesses

	<i>Focus</i>	<i>Intuit</i>
Substitution Effect	New sales channel	Product order directly on-line, digital downloads
Scale Effect	Mass customization	Custom products: MyAccounts
Structural Effect	New products, new services	E. tax filing, bill tracking, payment services

Intuit Casts a Wider Net



Turbocharged Day



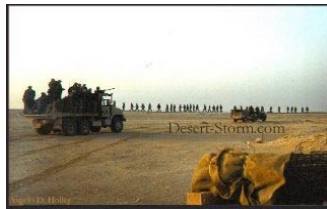
Intuit's shares rose 18.6%, after it said that sales should rise 22% next year, ... A big driver: Intuit's fast-growing Internet-services business, now a third of total sales. Three of its eight Net services now turn a profit.

Business Week, Sept 4, 2000

RFID Evolution

	<i>Opportunity</i>	<i>Values</i>
Substitution Effect	Inventory audit, product information	Fast checkouts/payments, inventory control, theft prevention, reduced spoilage
Scale Effect	Tracking, visibility, monitoring	Inventory location & control, asset management, product recall, product origin tracking
Structural Effect	Intelligent supply chain and services	Security, virtual supply chain, mfg process redesign, smart product/service/store

Desert Storm Logistics Inefficiencies



Without sound tracking and identification technologies, unnecessary shipments, wastage and added direct labor cost the DoD \$2 B.

- Of the 40,000 containers sent by the US Dept of Defense to the Persian Gulf, 25,000 had to be opened just to find out what were inside.
- Commanders ordered much more than they needed – bullwhip effect.
- “Iron Mountain” of containers.

RFID – the Emerging Technology

“RFID Technology works. We can track things from factory to foxhole. What would have taken **several days** to locate in the first Gulf war, we can now find in **20 minutes**. This technological transformation started only in the mid-90s, but it has led to dramatic efficiency gains. While there are one-third as many troops this time around as Desert Storm, the Army is using 90 percent fewer shipping containers.”

Maj. Forrest Burke, Chief of Logistics Information Management for the Coalition Forces Land Component Command, Operation Iraqi Freedom
[Text and quotes in Fortune Magazine and Federal Computer Weekly, April 2003].

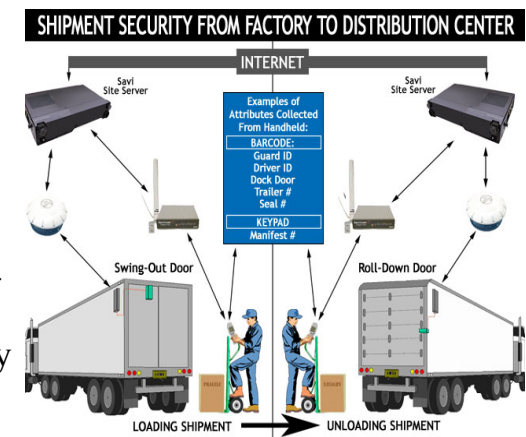


Juana Diaz, a logistics specialist in the 249th Quartermaster Company from Fort Bragg, reads an RFID tag on a container at Camp Arifjan.

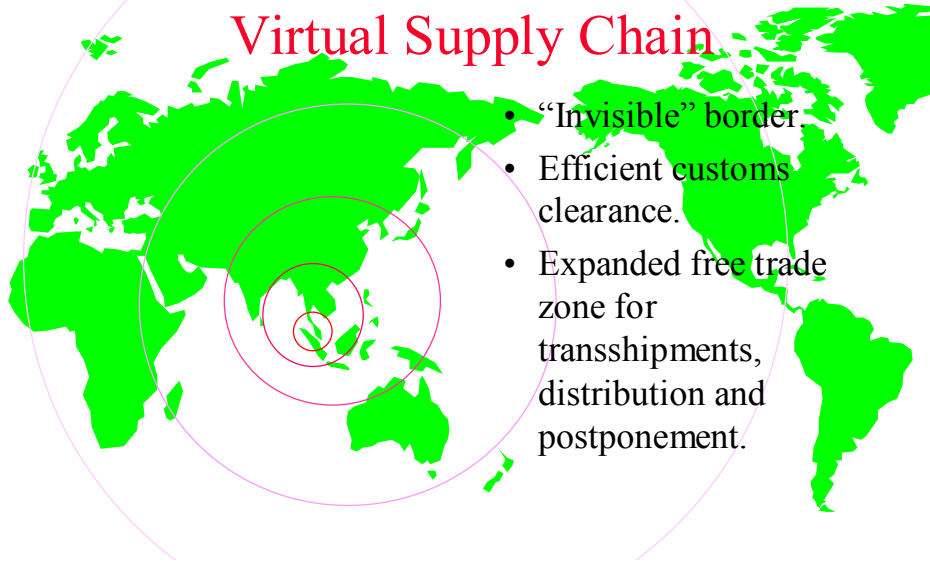
Focus on Security After September 11

Supply Chain Security with Smart-Seal

- Real time alert and notification provides security.
- Enables fast customs clearance & eliminates inspection.
- Higher assurance of supply leads to supply chain confidence.



Use Technologies to Extend Virtual Supply Chain



- “Invisible” border
- Efficient customs clearance.
- Expanded free trade zone for transshipments, distribution and postponement.

Summary

- Technology or business evolutions usually follow the substitution, scale and structure stages.
- Supply chain innovations also follow the three-stage evolution process.
- While structural impacts can create greater values, it also takes more time to emerge.
- Structural impacts could involve process redesign, postponement, collaborations, and financial flow re-engineering.

