

## MSIN0095: Operations Analytics

**Class 1-4: Process Analysis**

**Class 5,7: Waiting Time Analysis**

**Class 6: Inventory Management – Newsvendor Model**

**Class 8: Inventory Management – Newsvendor, Periodic Review**

**Class 9: Inventory Management – EOQ**

**Class 10: Inventory Management – Amazon Distribution Strategy**

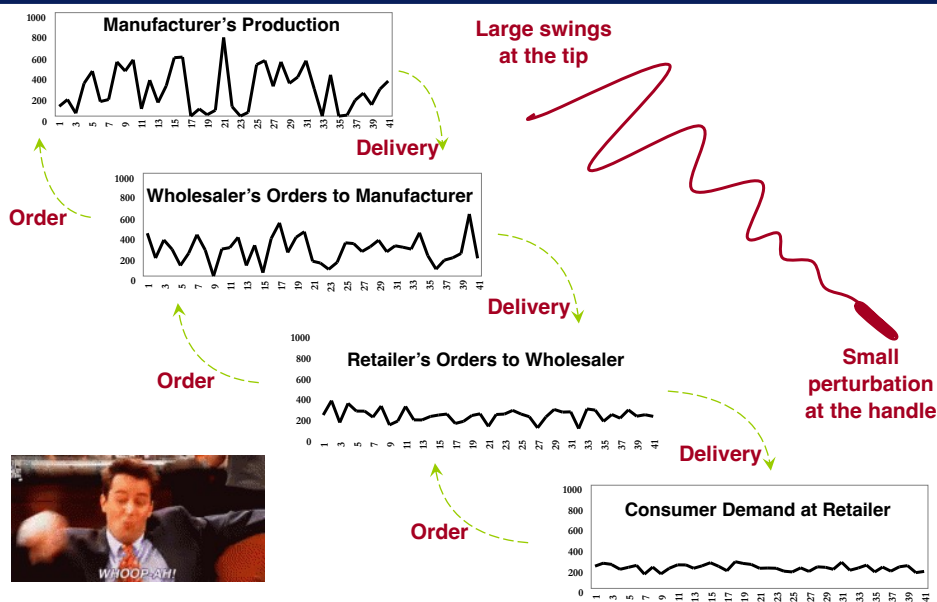
**Class 11: Supply Chain Management I: Beer Game**

**Class 12: Supply Chain Management II**

**Class 13: Supply Chain Management III: Strategic Sourcing,  
Sustainable Supply Chains**

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## The Bullwhip Effect



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## Two Types of Supply Chains

	Efficient Supply Chains	Responsive Supply Chains
Focus	<b>Cost</b> minimization Full capacity utilization	<b>Revenue</b> maximization Offer high-margin variety
Cost Concern	Make, handle, move, hold: <b>Tangible costs</b>	Lost sales, poor service: <b>Opportunity costs</b>
Operations Strategy Execution	<ul style="list-style-type: none"> <li>▪ Large batches</li> <li>▪ Full truck load shipments</li> </ul>	<ul style="list-style-type: none"> <li>▪ Small batches</li> <li>▪ Fast Design-to-Market time</li> <li>▪ Postponed differentiation</li> </ul>

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## Supply Chain Coordination

- A reason for coordination failure:
  - The terms of trade do not give firms the proper incentive to choose supply chain optimal actions.
- How to fix coordination failure:
  - Design terms of trade to restore a firm's incentive to choose optimal actions.
  - With revenue sharing a retailer can justify holding more units of the product.
  - With a buyback contract, a retailer can have a SL consistent with the supply chain optimal SL.

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## Strategic Sourcing

- Role of sourcing in a firm
- **Supplier selection and relationships**
- Sustainable supply chains

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## Choosing the right supplier

- Cost
- Quality
- Service level (speed)
- Risk (natural disaster, economic, political, etc.)



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## Sourcing supports business strategy: examples

Tata Nano



Range Rover Evoque



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## Sourcing method: face-to-face negotiation

- Face-to-face negotiations
  - Are traditional
  - Can take several weeks
  - Iterative communication
  - Can adjust to imperfect initial “Request for Quotes” (RFQ)
    - Spec changes, alternatives, etc.
  - With one supplier, outcome dependent on buyer-supplier power relationship



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## Sourcing method: auctions

“A mechanism of **bid submission**, together with **rules assigning payments and contracts** based upon the submitted bids”

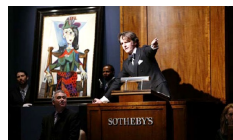
- Newly enabled by internet
- Typically completed in hour or two
- Communication over quote details front-loaded
- Leverages competition



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## Types of auctions

- **Sealed bid first price auction**
  - bidders submit bids simultaneously, without knowledge of other bids
  - best bidder wins at his/her bid price
  - Example: government procurement
- **Open bid second price (English) auction**
  - bidders submit bids sequentially with knowledge of previous bids
  - Best bidder wins at price of second highest bidder (plus one increment)
  - Examples: Sotheby's
- **Dutch auction**
  - Price moves automatically according to a “price clock”
  - First bidder to “accept” wins at current price
  - Used to sell millions of dollars worth of fresh flowers each day
  - Many variations...



William Vickrey

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## Supplier Selection Analysis

- Many factors play a role
- Choosing lowest bid is becoming rare
- *Factor-weighting* technique considers multiple criteria
  - Each factor is assigned a weight and a score
  - Choose the supplier with the best weighted score

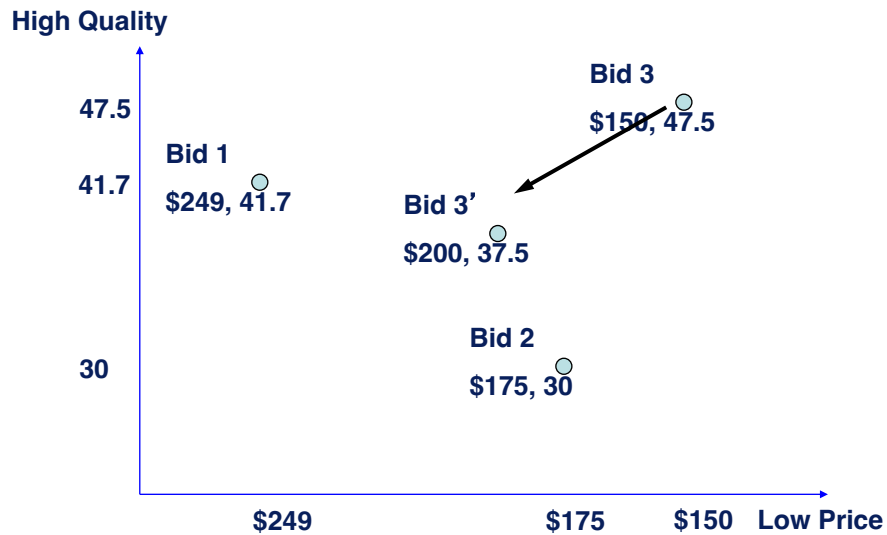
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## Evaluating Bids in Price and Quality

	Bid 1	Bid 2	Bid 3
<b>Price</b>	\$249	\$175	\$150
<b>1. Assurance of Quality (20%)</b>	<b>0</b>	<b>0</b>	<b>10</b>
Guarantee last-room availability	No	No	No
Guarantee late arrival	No	No	Yes
<b>2. Quality (20%)</b>	<b>13.33</b>	<b>13.33</b>	<b>6.67</b>
Wireless internet access	Yes	No	No
Non smoking rooms	No	Yes	No
Free health club access	Yes	Yes	Yes
<b>3. Service (20%)</b>	<b>13.33</b>	<b>6.67</b>	<b>13.33</b>
Ironing boards	Yes	Yes	Yes
Free Bottled water	No	No	No
Free newspapers	Yes	No	Yes
<b>4. Cost (20%)</b>	<b>0</b>	<b>10</b>	<b>10</b>
Complementary breakfast	No	No	Yes
Free parking	No	Yes	No
<b>5. Innovation (5%)</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>6. Regulatory (15%)</b>	<b>15</b>	<b>0</b>	<b>7.5</b>
Smoke detectors	Yes	No	Yes
Sprinkler systems	Yes	No	No
<b>Total</b>	<b>41.7</b>	<b>30</b>	<b>47.5</b>

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## Evaluating Bids in Price and Quality



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## Face to Face Negotiation vs. Auction

	Face-to-Face Negotiation	Procurement Auction
Parties	1 buyer, 1 supplier	1 buyer, many bidders
Time	No upper bound, can take several weeks	Bounded, typically a few hours
Communication	Iterative, revealed step-by-step	Bid details specified upfront
Competition	Limited, Can adjust imperfect initial RFQ	Leverage buyer power
Outcomes	Depend on buyer-supplier power	Economically efficient

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## Short Term vs. Long Term Relationships?



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<b>Supplier-Automaker Relations <i>in U.S.</i></b>	<b>"Arm's-Length"</b>	<b>"Partner"</b>
	<b>Suppliers (N=46)</b>	<b>Suppliers (N=46)</b>
<b>General Characteristics</b>		
Annual Sales	\$428 MM	\$373 MM
Percent of Sales to automaker	33.50%	33.90%
<b>Relation-Specific Assets</b>		
Distance between plants	589 miles	413 miles
Percent of capital equipment that is not redeployable	15.40%	17.70%
Annual "man-days" of face-to-face contact	1,169	1,385
Number of guest engineers	0.45	0.47
<b>Information Sharing/Assistance</b>		
Extent to which supplier shares confidential information*	3.1	3.3
Extent to which supplier shares detailed cost data*	4.5	4.3
Extent to which automaker assists supplier with cost reduction*	2.1	1.9
Extent to which automaker assists supplier with quality*	2.9	3.1
<b>Trust/Contracts</b>		
Extent to which supplier trusts automaker to be fair*	4.2	4.7
Extent to which supplier expects unfair treatment if automaker has the chance*	4.2	3.6
Average contract duration	2.4 years	4.7 years **

**\*\*Statistically significant difference**

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<i>Supplier-Automaker Relations in Japan</i>	<b>"Arm's-Length"</b>	<b>"Partner"</b>
	Suppliers (N=48)	Suppliers (N=45)
<b>General Characteristics</b>		
Annual Sales	\$1,400 MM	\$935 MM
Percent of Sales to automaker	18.90%	60%**
<b>Relation-Specific Assets</b>		
Distance between plants	125 miles	41 miles**
Percent of capital equipment that is not redeployable	13.20%	30.6%**
Annual "man-days" of face-to-face contact	3,181	7,270**
Number of guest engineers	2.3	7.2**
<b>Information Sharing/Assistance</b>		
Extent to which supplier shares confidential information*		
Extent to which supplier shares detailed cost data*	4.3	5.9**
Extent to which automaker assists supplier with cost reduction*	2.6	4.2
Extent to which automaker assists supplier with quality*	3	4.4**
<b>Trust/Contracts</b>		
Extent to which supplier trusts automaker to be fair*	6	6.3
Extent to which supplier expects unfair treatment if automaker has the chance*	1.6	1.6
Average contract duration	3.0 years	3.0 years

**\*\*Statistically significant difference**

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## Short Term vs. Long Term Relationships?

	Suppliers serving <b>U.S.</b> auto plants	Suppliers serving <b>Japanese</b> auto plants
Inventory turnovers	25.4	38.3
Work in process (WIP)	5.4	3.9
Finished goods storage time	5.5	4.4
% Change in manufacturing costs compared with previous year	0.65%	-0.85%
Percentage late deliveries	2.96%	1.38%
Emergency shipping costs in previous year (per million sales dollars)	\$714	\$371

Source: Sloan Management Review Fall 2000

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## Short Term vs. Long Term Relationships?

	Short Term ("arms-length")	Long Term (cooperative)
<b>Competition</b>	Induce suppliers to compete	limited
<b>Cost</b>	Low procurement cost, Low switching cost	High procurement cost, High switching cost,
<b>Information</b>	limited	Timely adequate information flow
<b>Quality Improvement</b>	limited	Joint efforts, Continuous improvement
<b>Example</b>	Flower market, Fish market	Toyota

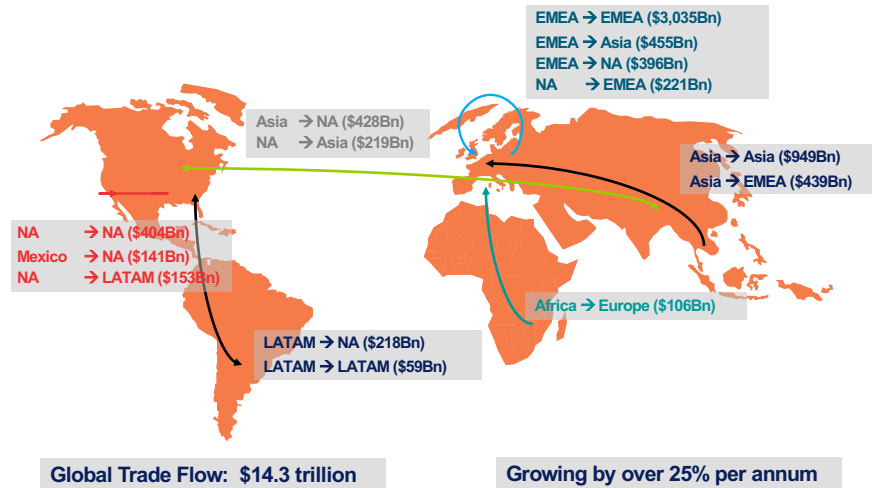
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## Strategic Sourcing

- Role of sourcing in a firm
- Supplier selection and relationships
- **Sustainable supply chains**

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## Significant Global Trade Flow

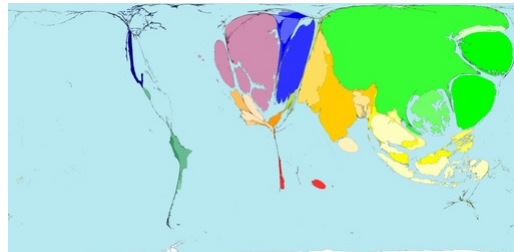


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## Clothing

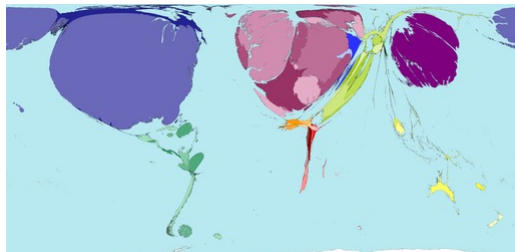
### EXPORTS

Territory size shows the proportion of worldwide net exports / imports of clothes (in US\$) that come from there.



"... Bangladesh ... relies on garments for more than three-quarters of its exports." Roland Buerk, 2005

### IMPORTS



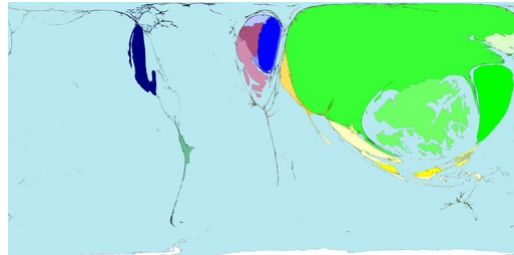
Source: [www.worldmapper.org](http://www.worldmapper.org)

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## Toys

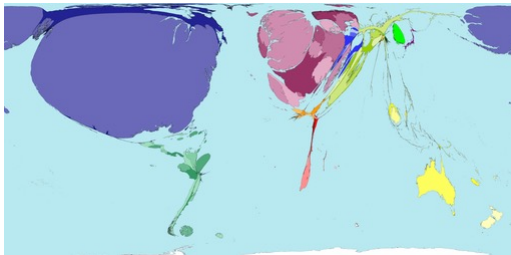
### EXPORTS

Territory size shows the proportion of worldwide net exports / imports of toys (in US\$) that come from there.



"At City Toys Ltd., ... Shenzhen, youngsters worked 16-hour days, seven days a week" Agence France-Presse, 2000

### IMPORTS



Source: [www.worldmapper.org](http://www.worldmapper.org)

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## Risks

### \$24 million cash fund to compensate pet owners whose pets became sick or died

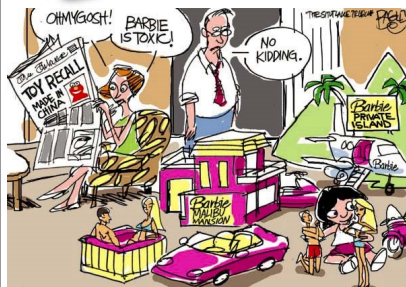
Almost 6,000 claims have been filed in a class-action settlement stemming from last year's massive petfood recall (read more [here](#), [here](#), and [here](#)). Menu Foods, other pet food makers and retailers in May agreed to set up a US\$24 million cash fund to compensate pet owners whose...

created by [gstevens](#) | 1 year ago | updated 1 year ago  
128 views | 0 recommendations | 0 comments



### Child sweatshop shame threatens Gap's ethical image

An Observer investigation into children making clothes has shocked the retail giant and may cause it to withdraw apparel ordered for Christmas



Mattel Lead Settlement Could Add Up to \$50M-Plus

### class action lawsuit filed against heparin manufacturer baxter

January 8th, 2009 by [Jennifer Walker-Journey](#)  
A class action lawsuit has been filed against [Baxter Healthcare Corp.](#), claiming the company began substituting ingredients in its anti-coagulant [heparin](#) with a dangerous counterfeit to "reap greater profits as a result of utilizing cheap component parts," according to [The Madison St. Clair \(Illinois\) The Record](#).

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## Corporate Social Responsibility

- How products and services affect people and the environment
- Stakeholders have strong opinions about environmental, social, and ethical issues
- Doing what's right can be beneficial to all stakeholders
- **Corporate social responsibility (CSR)**
- **CSR in SCM: sustainable supply chains**



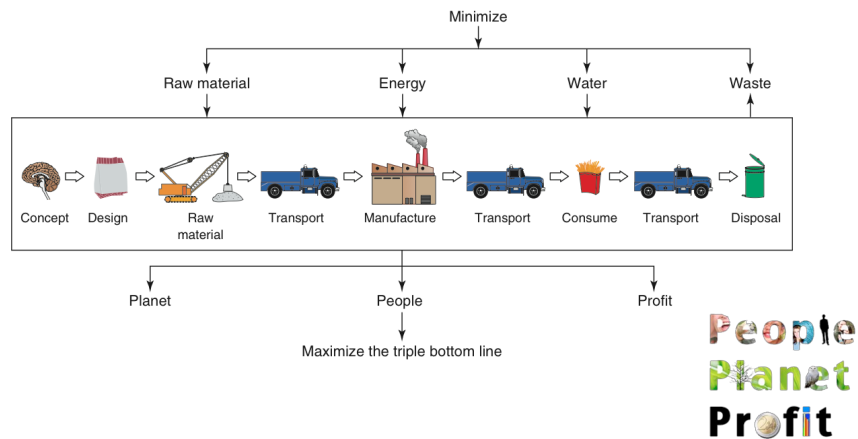
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## Tragedy of the Commons (Lloyd 1883)

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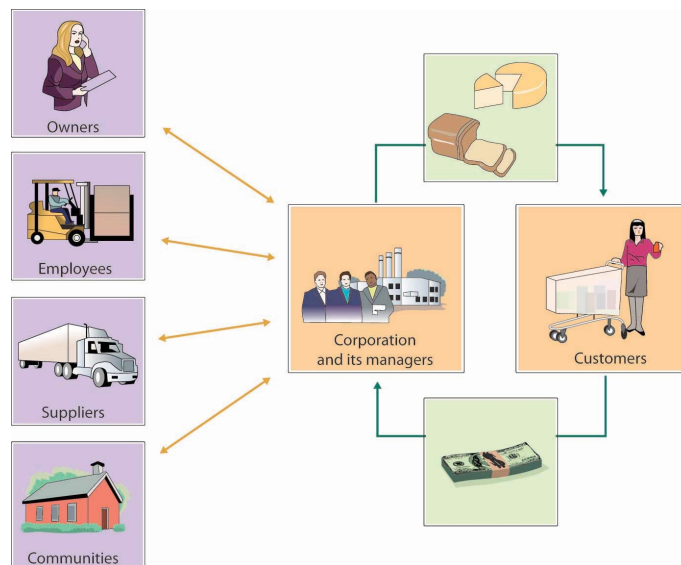
## Triple Bottom Line

- Consider the systems necessary to support the three Ps: **people, planet, and profit**



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## Social Side of Sustainability: People



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## People: Corporate Social Responsibility

### Owners

- Profitable operations
- Accurate information
- Fiduciary responsibilities

### Employees

- Safety and health
- Freedom from Sexual Harassment
- Equal Opportunity and Diversity
- Wages and Benefits

### Customers

- The right to safe products
- The right to be informed about a product
- The right to choose what to buy
- The right to be heard

### Communities

- Jobs
- Volunteerism
- Supporting Social Causes

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## The Darker Side of Chocolate



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## Implications For Nestlé



29 June 2012 Last updated at 12:33 GMT

**Nestle 'failing' on child labour abuse, says FLA report**



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NEWS » IN THE NEWS »

### The 14 Worst Corporate Evildoers

*Global Exchange*



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## Less than \$1/hr to Make iPads



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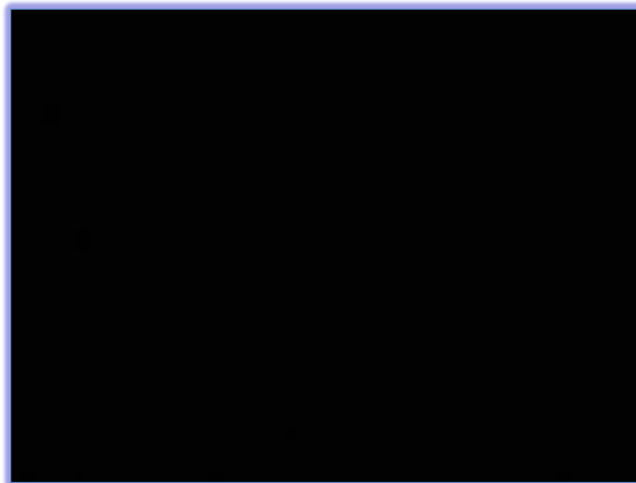
## Did Foxconn Bring Down Apple Stock?

Oct. 16, 2012 11:34 AM ET | 31 comments | About: Apple Inc. (AAPL)

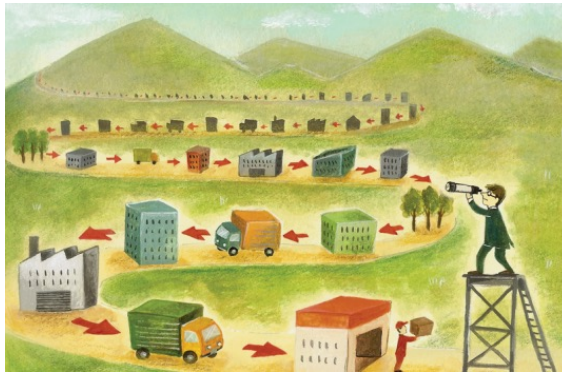


**“the stock dropped by \$35 on the 26<sup>th</sup> (Nov. 2012), from around \$695 to right down to \$660, a 5% drop that took out almost \$30 billion out of the stock’s market cap.”**

## Ben & Jerry's Fair Trade Using Sustainability as a Marketing Message



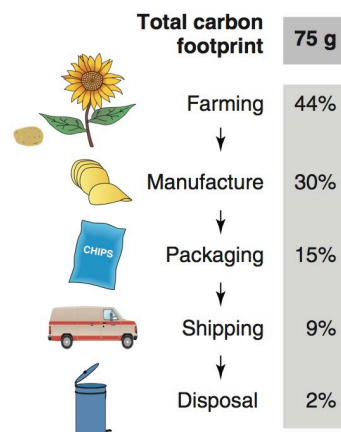
## Environment Side of Sustainability: Planet



Supply chains will not only have to match supply with demand at low cost, they will need to manage their **environmental impact**.

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## Carbon Footprint



**34.5-gram Bag of  
Frito-Lay Chips**



**Lifecycle Analysis (LCA)**

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## What Can Supply Chains Do for Carbon Footprint Management?

- Transportation Mode
- Sourcing
- Closed-loop Supply Chains

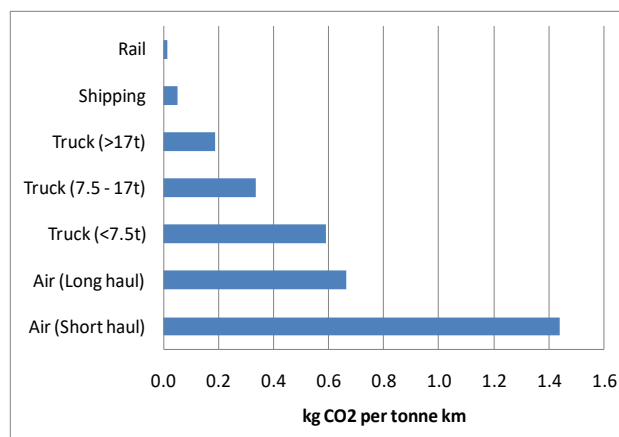
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## Transportation Emissions

- The mode of transportation has a substantial impact on emissions



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## The Carbon Footprint Of Various Sourcing Options Differ

- Because of differences in...
  - Raw materials
  - Local manufacturing process (e.g., fertilizer)
  - Weight of the product (e.g., packaging)
  - Electricity
  - Transportation

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## Local Sourcing?

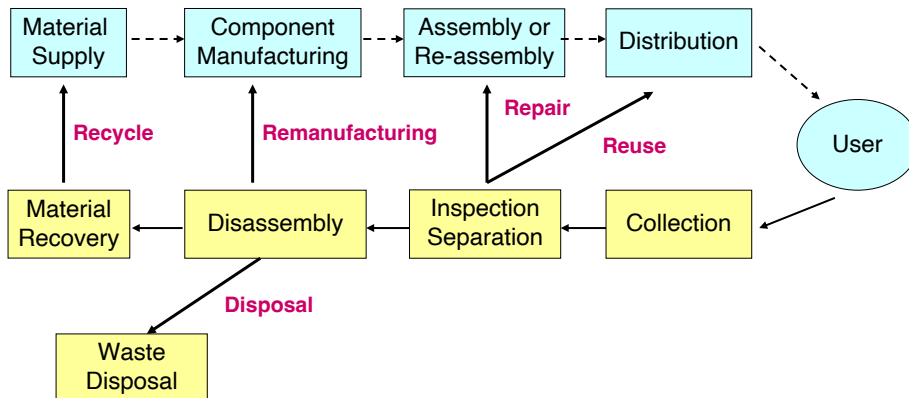
- New Zealand lamb served in England:
  - 11,000 miles of sea transport
  - Total emissions = 1,520 lbs. CO<sub>2</sub>
- English lamb served in England:
  - Emissions = 6,280 lbs. CO<sub>2</sub>



**New Zealand lamb is organically grown, so there is little carbon emitted due to feed, unlike in England.**

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## Closed-loop supply chain



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## Summary

- Strategic sourcing can be a very powerful profit lever
- Building the supply base: Procurement auction vs. negotiation
- Short term vs. long term relationships
- Sustainability in supply chain management: people, planet and profit

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