


MIT MASSACHUSETTS INSTITUTE OF TECHNOLOGY

MIT Center for Transportation & Logistics





## The Beer Distribution Game: Debrief

Supply Chains Driving Strategic Advantage  
January 19, 2016  
MIT, Cambridge, MA

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### Debrief Plan

- How did you feel while playing?
- Were there any problems? If so, what?
- What caused these problems?
- What are some solutions to these problems?
- Announce winners
- Analysis



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## Heard while playing.....

- This is the 3<sup>rd</sup> time I'm playing
- We need you guys to start selling down there (Factory)
- Is it that bad?
- I am sending a message....but it not being received. We need to smooth...(Retailer)
- We're taking a break (~week 28, Factory)
- We laid everyone off (~week 28, Factory)
- How about running a promotion? (Distributor)
- Our inventory is decreasing; We're trying to steady this ship (2 Distributors)



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## How did you feel while playing?



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Were there any problems? If so, what?



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How would you solve those problems?



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### So who won? Scores January 2016

- Good Looking Team (GLT)      \$1,232  
(potential recording error)
- The Keg                              \$2,356
- Dos Equis                            \$1,831
- Corona\*                              \$4,791
  
- Average (today)                    \$2,552
- Worst Average (6-14)            \$24,821

\*Expert table



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### How do most teams do?

- Top scores                            \$1,000
- Worst scores                        \$15,000 and up
- Average                              \$2,000
  
- Best Possible                        **\$200**
  
- Worst Average (6-14)            \$24,821



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## A Mystery

Why do smart, well-intentioned people  
perform so poorly?



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Most people deal with systems at the level of .....

Events



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## Event thinking....

Saturday, May 14, 2005

### **Union divided over how to reverse membership drop**

WASHINGTON – ... Labor leaders cite many reasons for the decline: The global economy, trade agreements, ... poor enforcement of labor laws, and Republican tax policies that squeeze the middle class.



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## Event thinking....

### **Union Membership Drops to Record Low**

"Much of the decline is coming from shifts in the economy," said Greg Denier, a spokesman for Change to Win, a federation of labor unions. "Thousands of jobs are being outsourced or lost to technological changes."

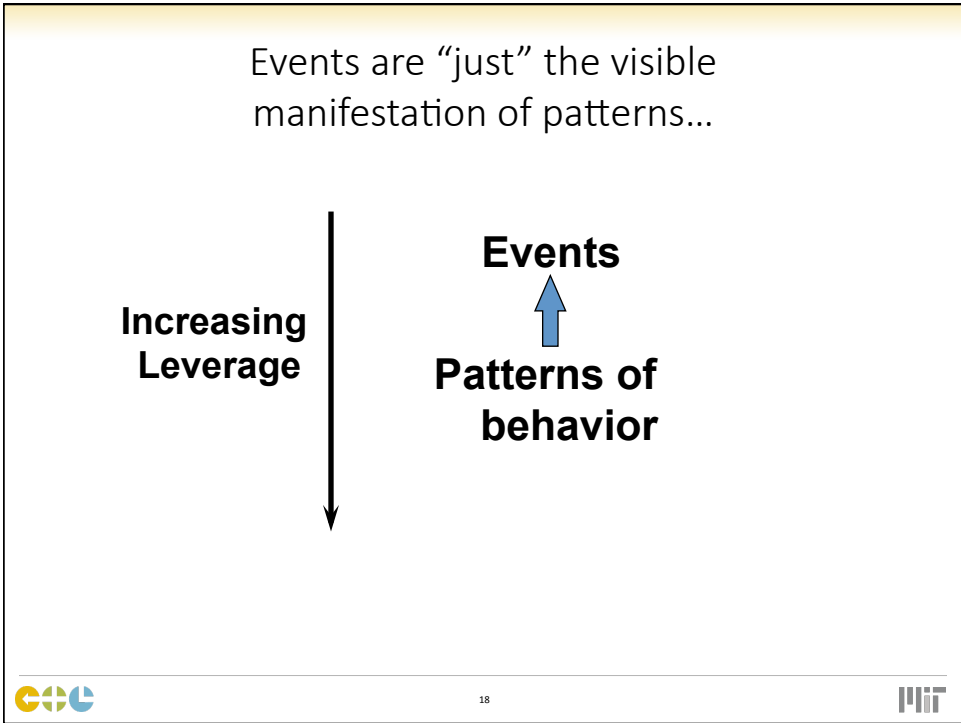
"The unions are losing so many members each year because their jobs are being outsourced and they are organized in shrinking sectors of the economy, like autos, steel and textiles," said Gary Chaison, a labor specialist at Clark University in Worcester, Mass.

Ref: Will Lester, Associated Press, Thursday, January 25, 2007



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Founded in 1920

Pioneer in underground mining equipment

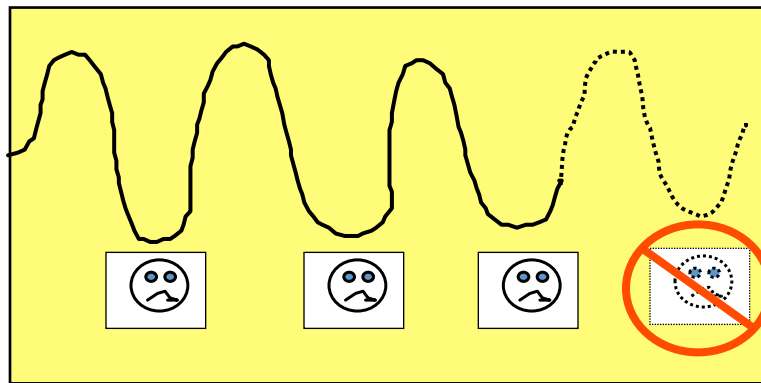
Andre Horn offered CEO post after unprofitable year....



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Before he took the job,  
Horn presented to the Joy Mfg Board....



change in profits



Ref. J. Hines, MIT

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“Buoyed by Rising Sales, Industry Courts Risk of Overcapacity as It Adds Factories in NA”

**MARKETPLACE**

**Beanie Babies' Creator Avoids Jail**  
OFFSHORE ACCOUNTS B3

**Charter Kicks Off Campaign for Rival**  
CABLE B4

**Suntory Climbs Onto World Stage**  
LIQUOR B5

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## Auto Makers Dare to Boost Output

*Buoyed by Rising Sales, Industry Courts Risk of Overcapacity as It Adds Factories in North America*

By NEAL E. BOUDETTE

DETROIT—The auto industry's recent fat profits from rising demand for new cars in North America is about to confront the law of supply and demand: A string of new factories in the region will start cranking

Apple's China Deal Not Limited To iPhones

By PAUL MOZUR

BEIJING—Apple Inc.'s deal with China Mobile Ltd. to sell

GO+U 21 \* Wall Street Journal, Jan 15, 2014 MIT

What patterns did you observe?

GO+U 22 \* Wall Street Journal, Jan 15, 2014 MIT

## Common patterns

- Oscillation
  - Large amplitude fluctuations, average 20 weeks.
- Amplification
  - Amplitude and variance of orders increases steadily from customer to retailer to factory
- Phase Lag
  - The order rate tends to peak later as one moves from the retailer to the factory.



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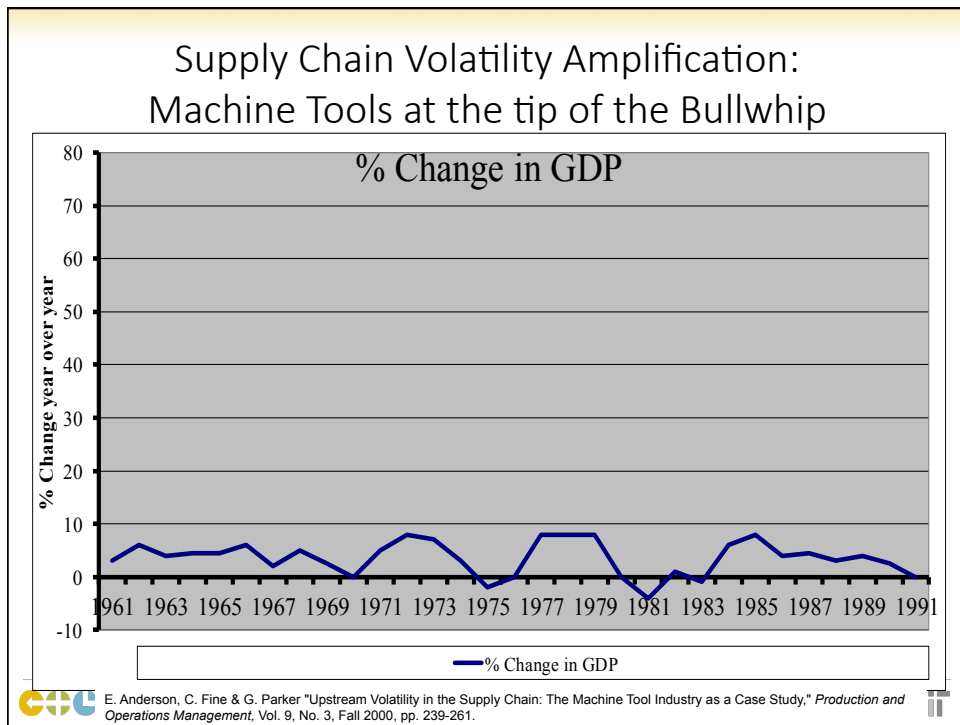
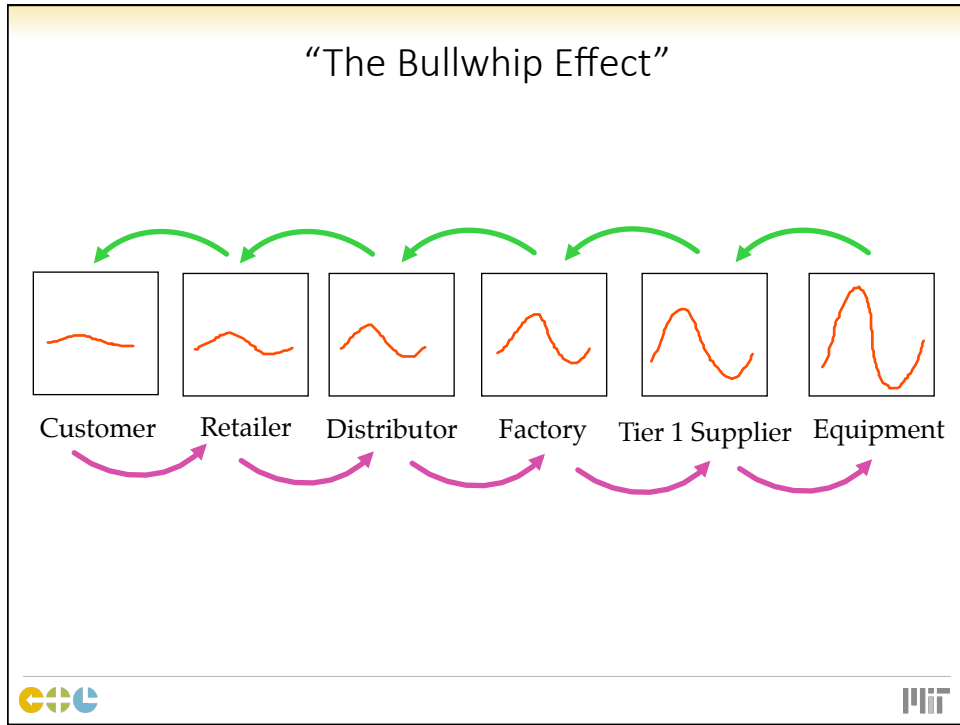
## We call these collective patterns “The Bullwhip Effect”

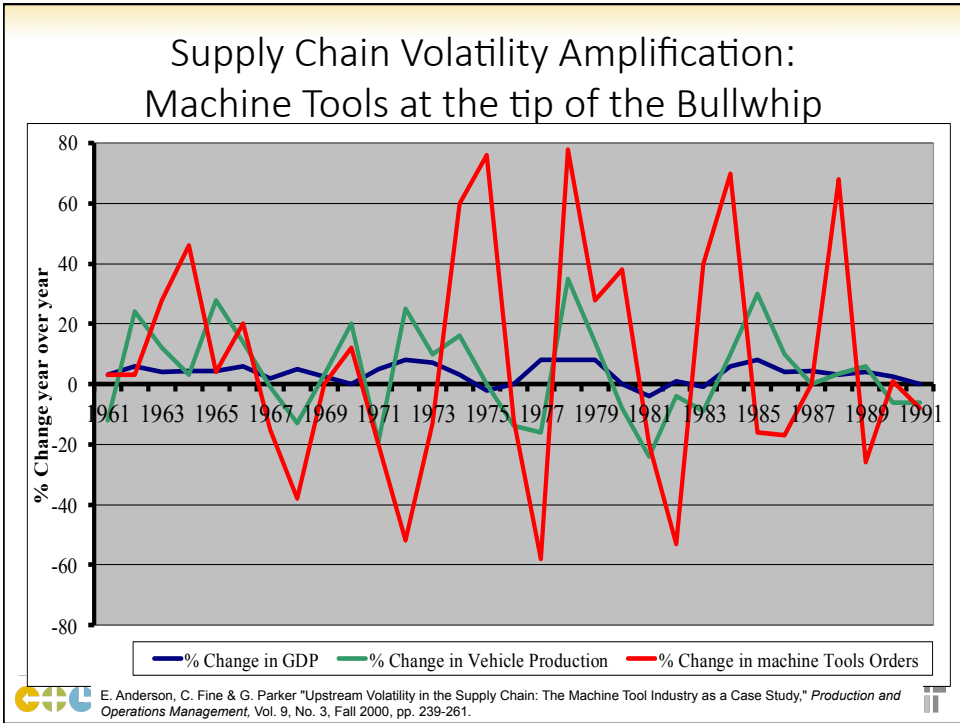
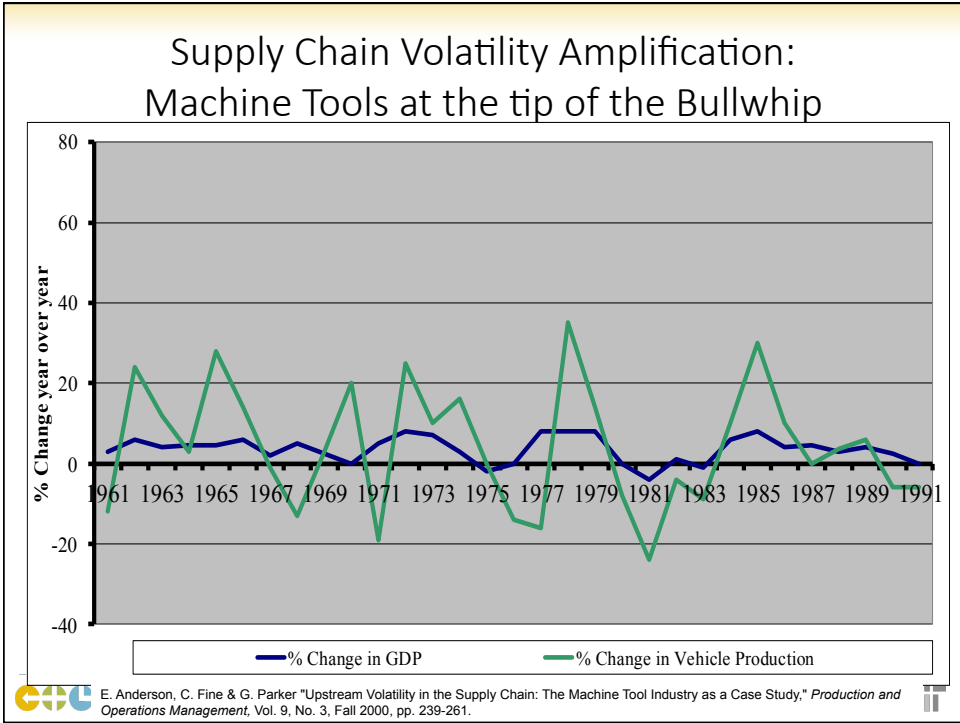
- “Bullwhip” coined by Prof. Hau Lee (1997)
  - is where “information transferred in the form of orders tends to be distorted and can misguide upstream members in their inventory and production decisions... the variance of orders may be larger than that of sales, and the distortion tends to increase as one moves upstream”\*
  - describes the general tendency for small changes in consumer demand to be amplified within a production-distribution system\*\*

\* Lee, Padmanabhan and Whang, The Bullwhip Effect in Supply Chains, Sloan Management Review, Spring 1997

\*\* McCullen and Towill, Diagnosis and reduction of bullwhip in supply chains, Supply Chain Management: An International Journal, Vol 7, No 3 2002







## What patterns exist in your supply chain?

- Oscillation
- Amplification
- Phase Lag



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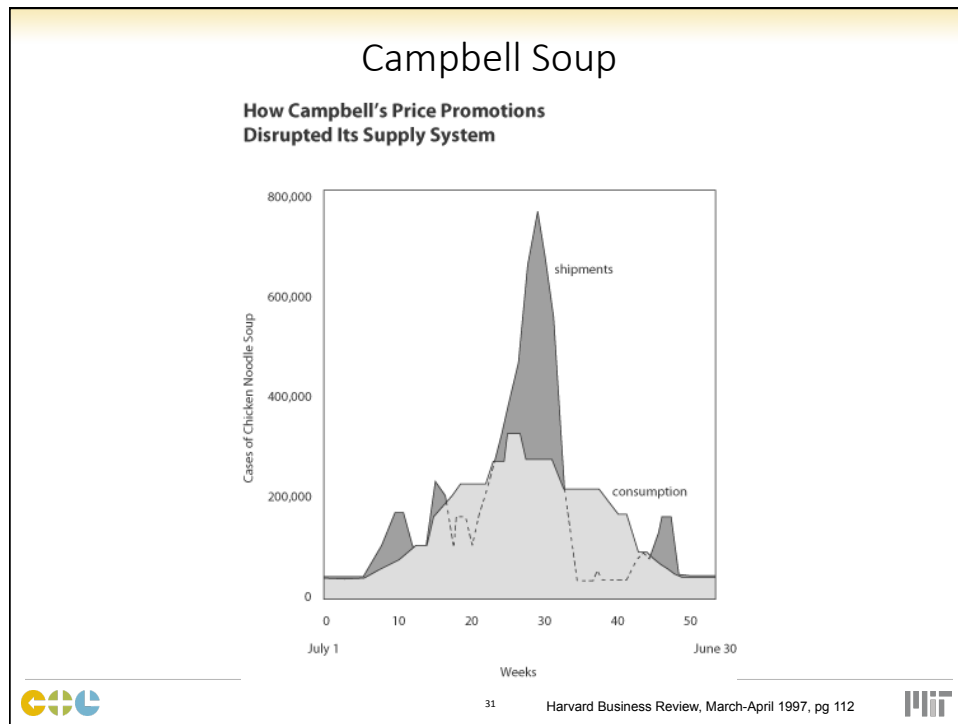
## Common Patterns in Supply Chains

- Oscillation
  - Factory output, orders received each day, cycle times, demand variation,
  - Delaying purchases to meet volume requirements (truckload quantities for discounts, efficient order quantities)
- Amplification
  - The Bullwhip Effect – Pharma, Electronics, Machine Tool industries
  - Ex. Eastman Chemical: a 10% sales variation required 45% extra capacity to supply
- Phase Lag
  - Manufacturer cycle time is 6 weeks & cannot respond to retailer 1 week forecast
  - Lag from order receipt to release to supplier



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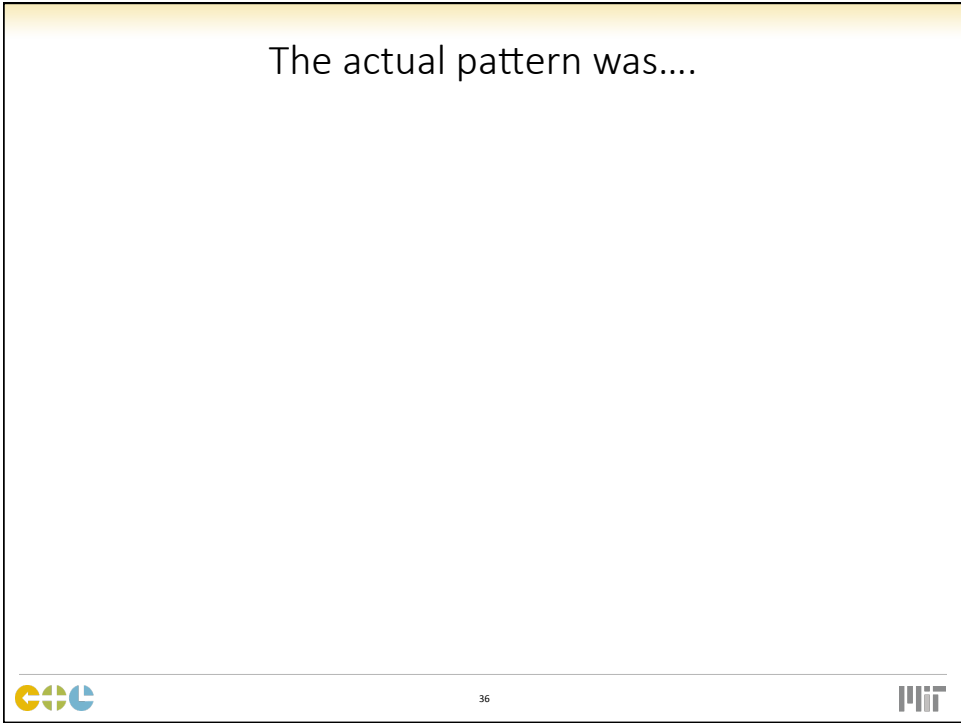


## Questions about Patterns


- Who did the worst on each team?
- Was the experience the same or different for each team?
- What did the demand patterns by customer look like?

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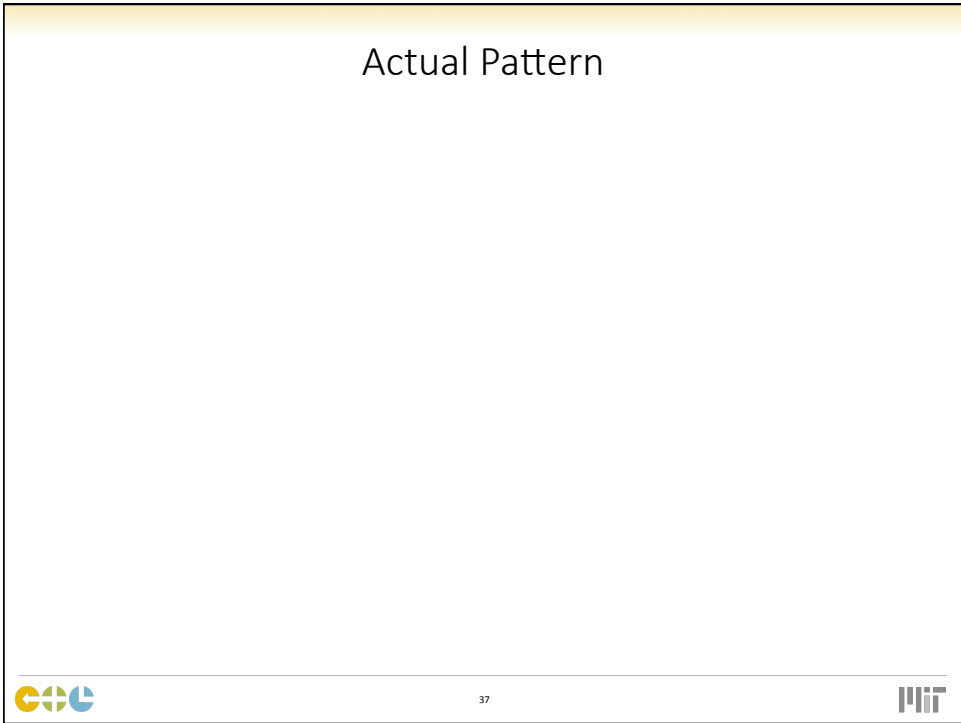
The actual pattern was....




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Actual Pattern



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But the “Estimates” of Customer Demand Indicate

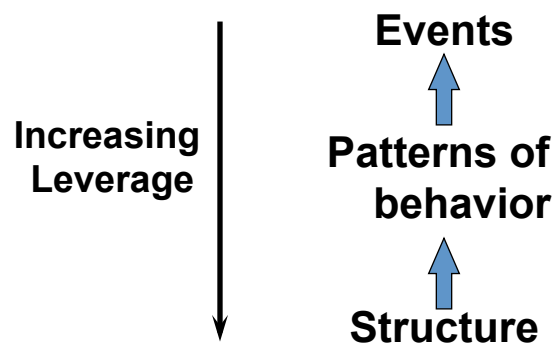
- People are transferring “event orientation” to patterns
- The cause is still a single thing
- The cause is ‘out there’



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The Ultimate Cause is Structure



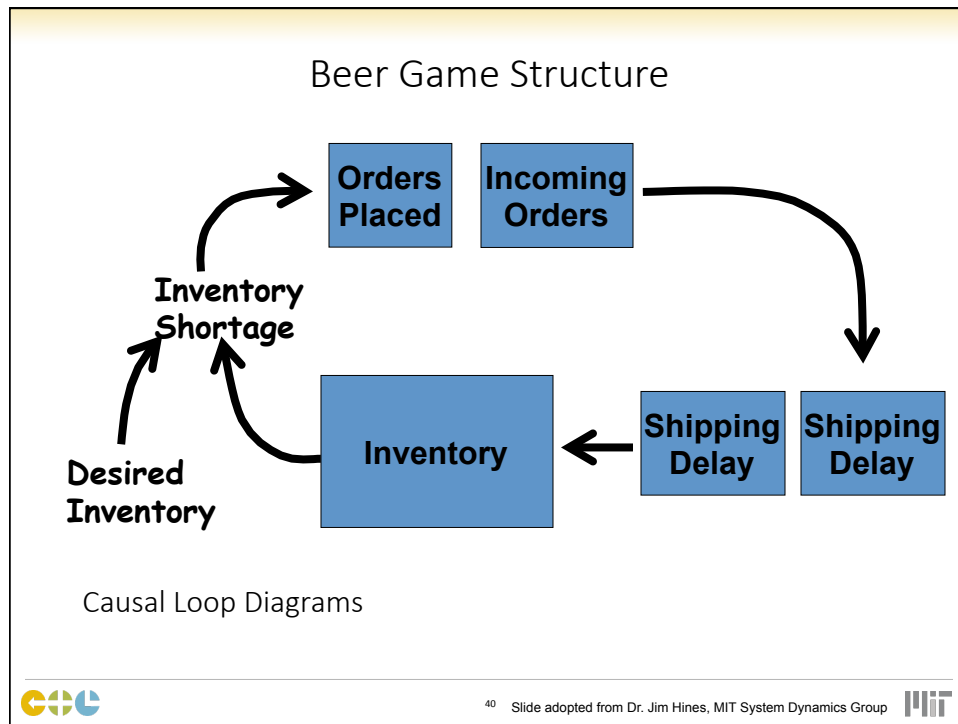
The behavior of the players is controlled by the structure of the system



<sup>39</sup> Slide adopted from Dr. Jim Hines, MIT System Dynamics Group







Now that we understand the patterns and structure.....

- What are the structural problems?
- What are some solutions?

## What are the structural problems?



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## What are the structural problems?

- Information lags
- Delivery lags
- Independent forecasting
- Order batching
- Inconsistent incentives
  - Leads to gaming allocations
  - Quarterly sales goals, unit cost factory measure, lowest cost distribution
- Promotions/discounting



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What are some solutions?



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What are some solutions?

- Collaboration
- Increase visibility
- Use historical data
- Shorter delays
- Eliminate middle-man
- Strategic partnership & information sharing
- Align policies, incentives, perf. measures



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Some suggestions... & cost to implement

- Collaboration
- Increase visibility
- Use historical data
- Shorter delays
- Eliminate middle-man
- Strategic info sharing
- Align incentives, KPIs

Expensive	Inexpensive
√	
√	
	√
√	
√	
	√
	√

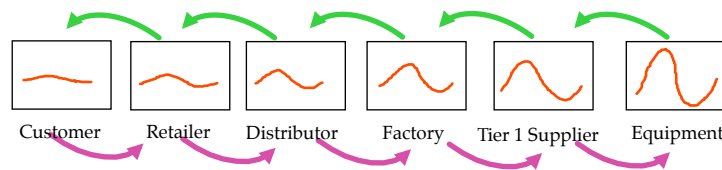
These all effect the structure of the system.....



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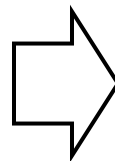


Applying these to “The Bullwhip Effect”



STRUCTURAL PROBLEMS:

- Information lags
- Delivery lags
- Independent forecasting
- Order batching
- Price fluctuations
- Inconsistent incentives
- Gaming allocations
- Promotions/discounting



SOLUTION STRATEGIES:

- Reduce Uncertainty
- Reduce Variability
- Reduce Lead time
- Improve Channel Mgt
- Align policies, incentives, KPIs



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## Thoughts to Leave With

- What caused the problems?
  - Rush to solutions before seeing the problem (oscillations)!
  - Even after seeing the problem we rushed to solutions without understanding the real dynamics (flat demand) and the root cause (structure)
- What will you do when you return to the workforce?
  - Rush to solution?
  - Or will you first determine the root causes?
  - How will you do that?
  - How will you find the big problem in your system?



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## Thank You

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## Reference Info

- “The Fifth Discipline” by Peter Senge
- Available at the MIT COOP (next to Marriott)

