Games and Experiential Learning in Supply Chain Management

Dr. Yao Zhao
Professor in Supply Chain Management
Rutgers Business School
Use Experiential Learning to Empower Students

Team-based, computer-assisted, action-live simulations

Have fun & learn a lot!
Hunger Chain Simulation

A Newsvendor and Shortage Gaming Simulation

Mummy bird only has one worm, whom to give it to?

Supply is limited, how to allocate efficiently and fairly?
Supply Chain Problems Under Shortage

- Panic orders
- Hoarding
- Unfair allocation
- Supply chain melt down
Teaching Objectives

- The impact of demand uncertainty and power of the *Newsvendor* Model.
- Shortage gaming (*panic orders, hoarding*), the impact of information.
- Competition and equilibrium (*Prisoners’ Dilemma*): how one team’s action may affect other teams’ profit? Why order inflation is inevitable?
- *Inventory rationing* for fairness and supply chain efficiency
Why do we have both lost-sales and surplus inventory in the same time?!

Facing stable demand, why did total order increase significantly over time?!

Panic orders

Hoarding
Positioning and Audience

• Game positioning
  – Few existing games are interactive and competitive in the sense that one team’s action affects others’ payoff.
  – Newsvendor model, shortage gaming and Prisoners’ Dilemma are hard to teach but easy to play out.

• Courses and audience
  – Courses: Operations management, supply chain management, procurement / sourcing, distribution and logistics.
  – Target audience: undergraduate, graduate (MS, MBA) and executive / continuing education students.
The Game Setup

Multiple Retailers

Retailer 1

Compete for a limited supply
Screen Play (4-6 Hours)

1. The Newsvendor Game (abundant supply)
   – Students experience random demand, and must make decision under uncertainty
   – After the game, they will be after you for the solution

2. Newsvendor model lecture
   – Calculate the optimal order quantity for the game
   – Comment on winning / losing teams’ performance

3. The Shortage Game (short supply, the proportional rule)
   – Panic orders, hoarding, Prisoners’ Dilemma, supply chain melt down
   – Link game to real life events
   – Supply rationing: the fair sharing rule
Instructor: Account & Login

Email yaozhao@business.rutgers.edu for instructor access
Instructors Setup Games

Enter number of student teams, at least 2 teams.

Enter the number of periods, typically 6.

- Enter one email for each team (separated by ;)
- Teams will receive a password via this email once instructor clicks Start Game button.
Play a Sample Game

• Setup your game: rounds, # of players, students login
• Game parameters
• Game actions: start, restart, reset, save, end, …
• Saved games: view, reload, delete.

• Newsvendor or shortage? Your choice!

• Impact of information (3\textsuperscript{rd} round), game trajectory.
• Show a past game for order inflation – a live example of the Prisoners’ Dilemma
Melt-Down 2001: Solectron*

- In 2000, the telecom market was growing fast; the contract manufacturer, Solectron, has a short supply (capacity).
- Adding up orders from Cisco, Lucent & Ericsson, etc. exceeded the rosiest forecast – Solectron worried, but the telecom giants assured that they will pay.
- Meltdown happened in April 2001, it is too late to halt production from some 4000 suppliers, now Solectron sit on $4.7 billion inventory.
- In the meeting to resolve inventory

"Everyone says it's yours."

*"Why the Supply Chain Broke Down” Businessweek, March 18, 2001."
Supply Rationing: Fair Sharing

• Fair sharing: uses past shipment to allocate supply
  – Allocates limited supply among customers by their %s of the last 13-week of shipments
  – Ex: if CVS accounts for 10% of the last 13-week of shipments, reserve 10% of the supply to CVS

Pros:
– No order → no game playing
– Provides a clear incentive for retailers to sell the products rapidly
– Assures that units are sent to markets where they are most needed.

Cons:
– Tend to lock in market shares – not really fair
– Eliminate retailers’ forecast and business plans
– Still significant mis-match between demand and supply, ...

Efficient
Not fair
Student/Instructor Feedback

• “The Hunger Game was very interactive and brought critical thinking to the activity. I really enjoyed it as we got to work in groups while being inclusive enough to work together as a class. The competition aspect of the activity pushes each group to become more proactive with critical thinking which broadens everyone's perspective and reflection of real world competition.”

• “The game worked really well. My teaching evaluation in this semester finally reached 4.38 [out of 5] – I am SO happy!”
Summary

• “Hunger Chain simulation” can teach the following topics **effectively** and **effortlessly**
  – Decision under demand uncertainty: the Newsvendor model
  – Supply chain **competition**: one retailer’s profit depends on others’ actions.
  – Shortage gaming: **panic orders, hoarding**, supply chain melt-down via Prisoners’ Dilemma
  – Supply rationing can improve efficiency but may not be fair.
YouTube Videos

• Hunger Chain Simulation Introduction: https://youtu.be/tHCXs51Ba-E
  Hunger Chain Simulation - Introduction
  youtu.be
  An introduction to Hunger Chain - A Competitive Supply Chain Simulation

• Hunger Chain Simulation How to play: https://youtu.be/Blolth_6duk
  Hunger Chain Simulation - How to play
  youtu.be
  Use an example to show how to play the Hunger Chain Simulation

• Hunger Chain Simulation Teaching Note: https://youtu.be/WPqK5JwXEy8
  Hunger Chain Simulation - Gaming and Discussion
  youtu.be
  Teaching note for the Hunger Chain Simulation