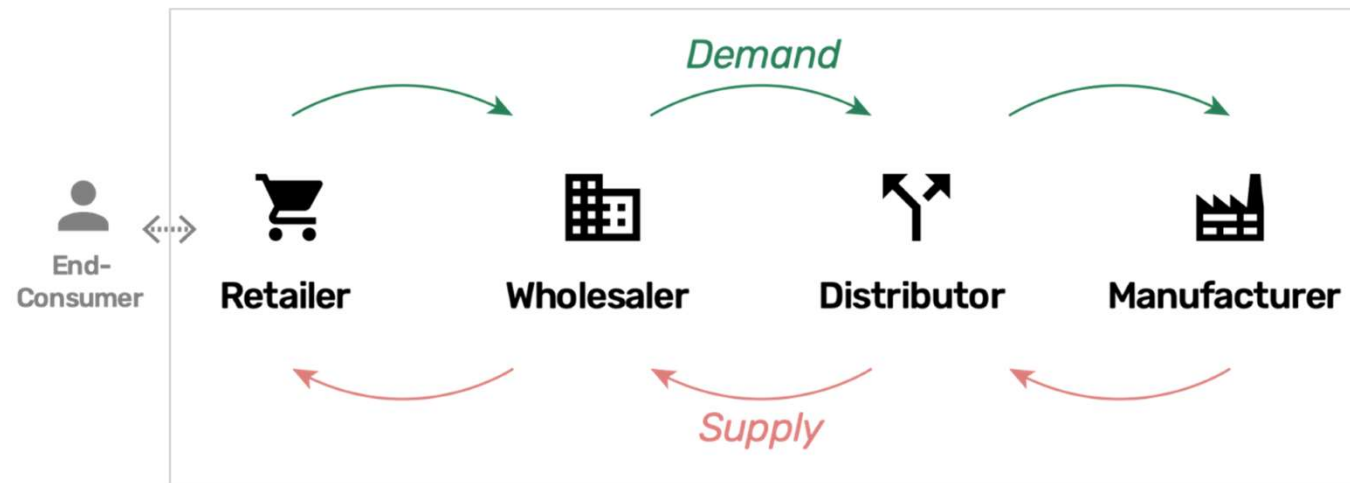


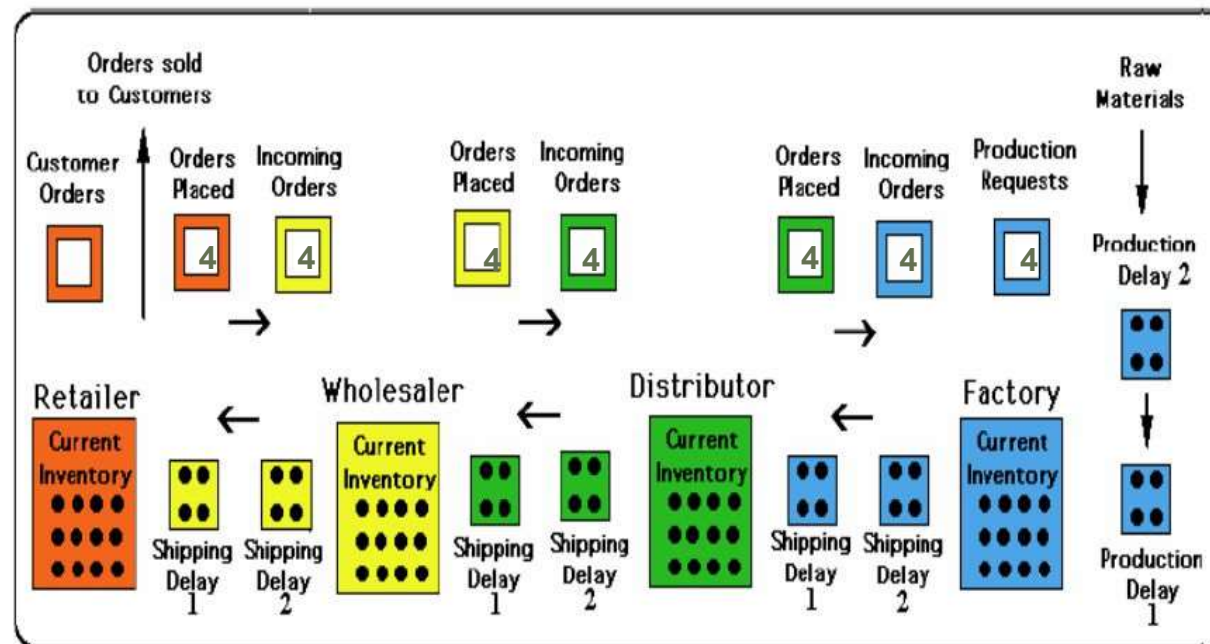


The Beer Game (Debriefing)

Supply Chain Structure



Game Board





Summary

- The game simulates a **Beer supply-chain**, composed of **four** nodes with different roles (retailer, wholesaler, distributor and factory / production plant)
- **Decentralised** decision-making setting
- Interact through order quantities; no alternatives for external interactions
- **Inventory** cost is £0.50 per unit per week
- **Backlog** cost is £1 per unit per week
- **Decision: How much should I order?**



Assumptions - Objective

- Each node acts individualistic
- No communication across the supply chain
- **Main objective: to minimise the total cost**
- Need to balance demand and supply
- Decide on the order quantity

Service level



Total cost = **Inventory** + **Backlog**

Typical Results

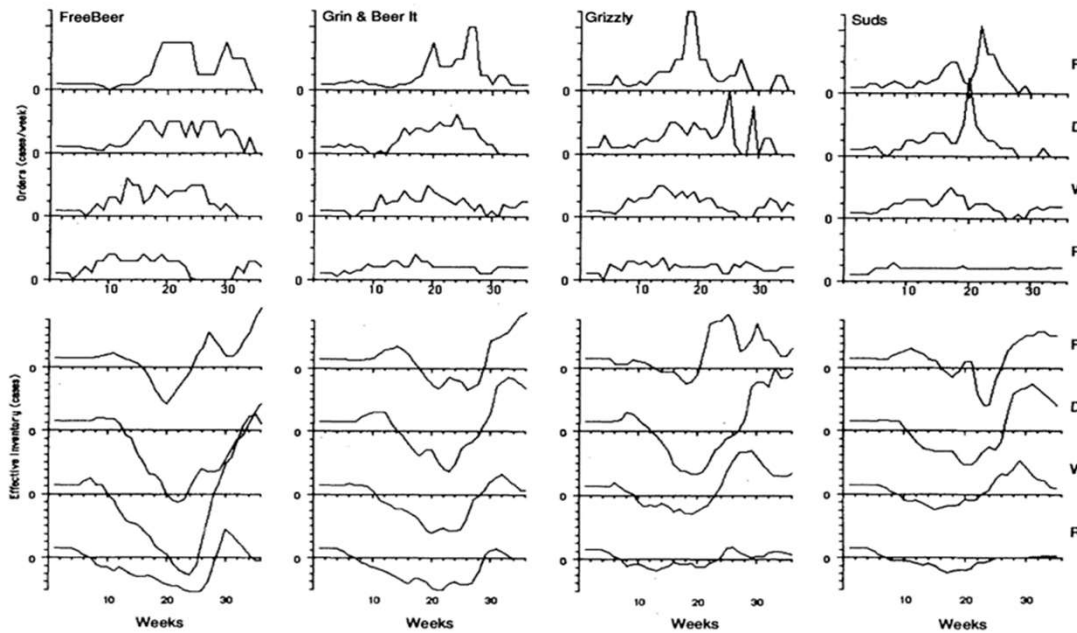


FIGURE 4. Experimental Results for Four Typical Trials.

Top: Orders; bottom: inventory (from bottom to top, Retailer, Wholesaler, Distributor, Factory). Tick-marks on y-axes denote 10 units. Note the oscillation, amplification, and phase lag as the change in customer orders propagates from retailer to factory.

Results: Group 1



Debriefing I

How did you feel while playing?

Were there any problems? If so, what?

Was the experience the same or different for each team?

Who did the worst on each team?

What did the consumer demand patterns look like?

The Bullwhip Effect



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”*

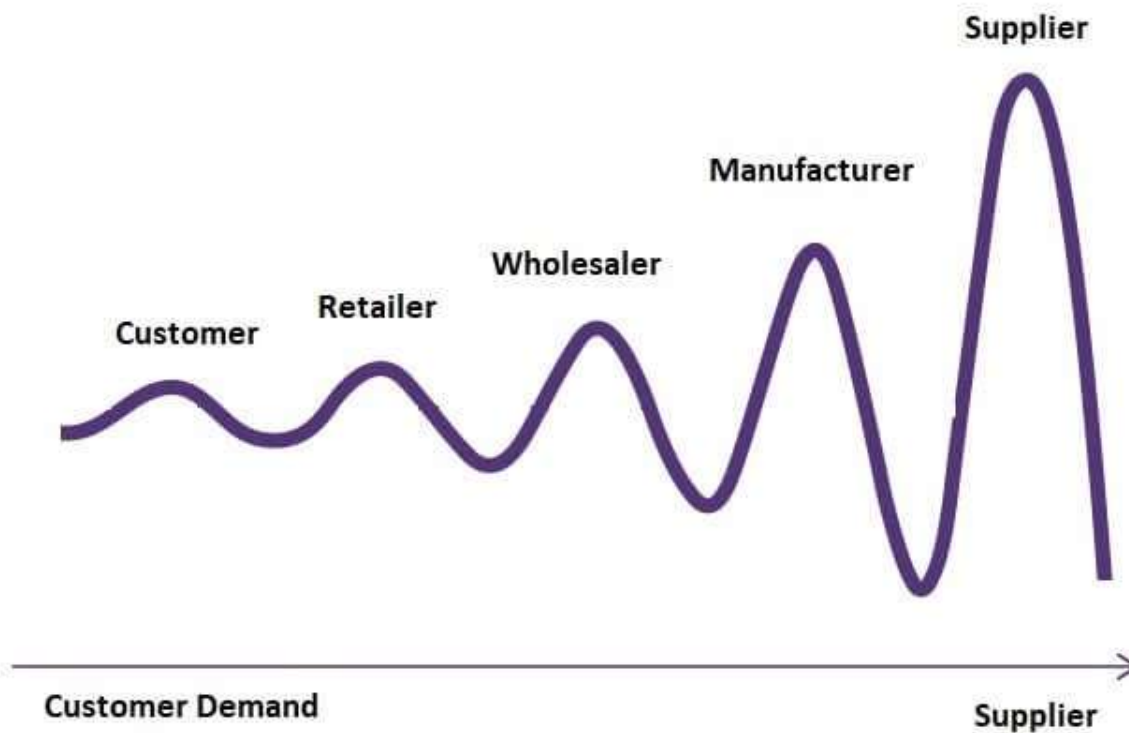


describes the general tendency for small changes in consumer demand to be amplified within a production-distribution system**

* 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, 7(3) 2002.

The Bullwhip Effect





Why is Bullwhip a Problem?

High inventory levels

Low service level (back orders)

High overall cost

High demand fluctuation causes more problems....

Variation in demand along the supply chain requires:

- Shipment capacity
- Production capacity
- Inventory capacity

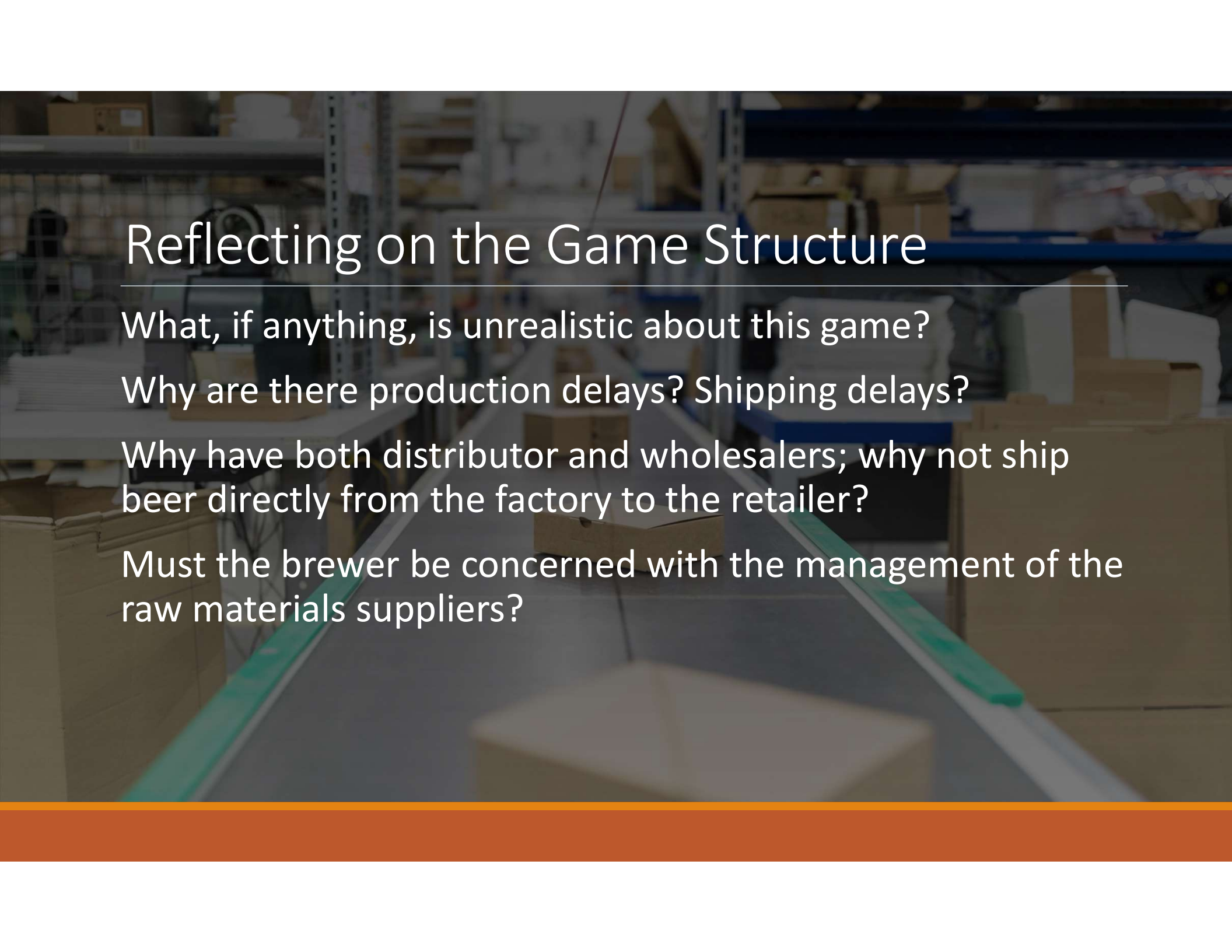
Most of the time this capacity will be idle



Debriefing II

What caused these problems?

What are some solutions to these problems?



Reflecting on the Game Structure

What, if anything, is unrealistic about this game?

Why are there production delays? Shipping delays?

Why have both distributor and wholesalers; why not ship beer directly from the factory to the retailer?

Must the brewer be concerned with the management of the raw materials suppliers?

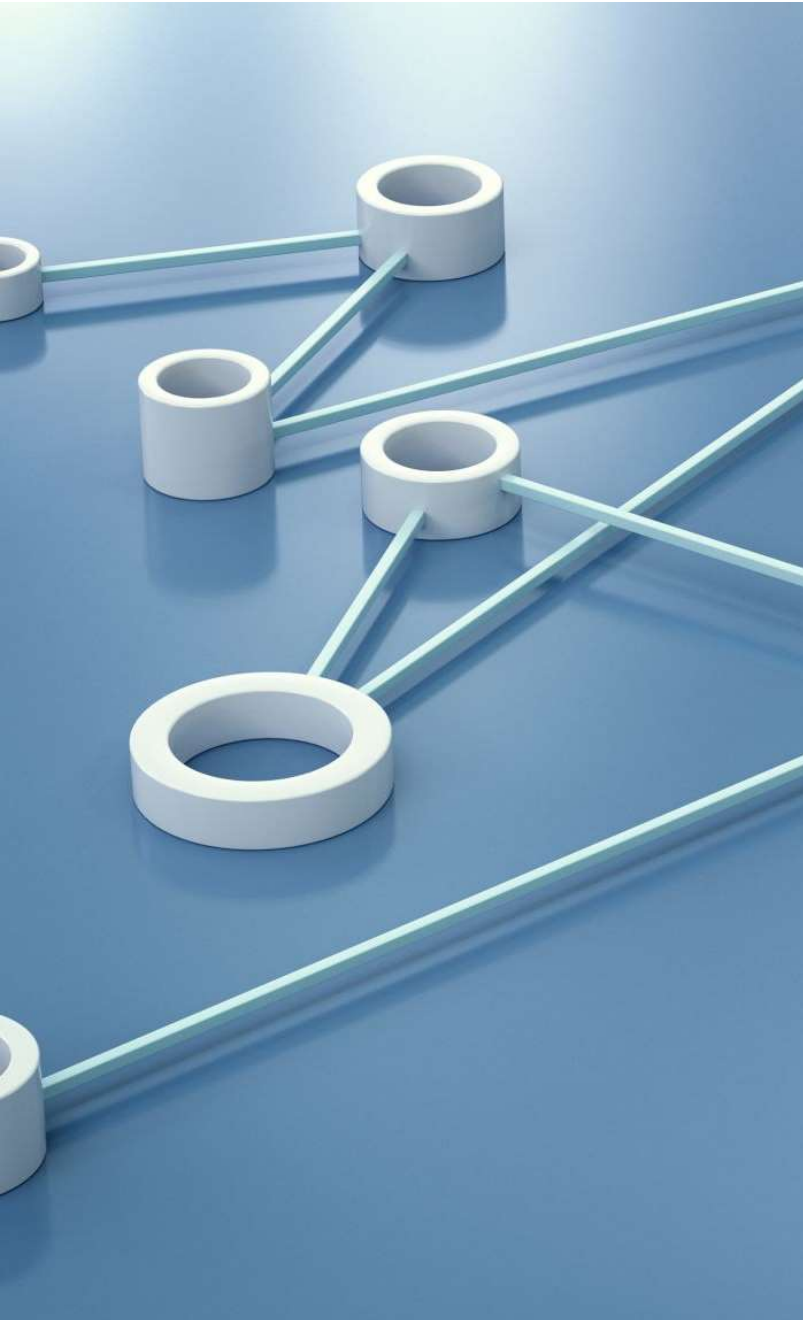


Real World Reactions

A typical organisational response would be to find the "person responsible" (the guy placing the orders or the inventory manager) and **blame** him/her

But the game clearly demonstrates how inappropriate this response is different people following different decision rules for ordering create similar oscillations

Instead: We should change the 'structural' setup!



Main Causes

Lack of information

The structure of the supply chain

Lack of collaboration

Factors Contributing to Bullwhip Effect



Demand forecasting

High variability leads to continuous adaptations of order policies and thus increases variability upstream



Lead time

High lead time creates uncertainty
Requires high safety stock levels
Reduces flexibility and adaptability to unforeseen changes in demand



Batch ordering



Price fluctuation



Inflated orders

Potential Solutions

Collaboration

Increase visibility

Use historical data

Shorter delays

Eliminate intermediate nodes

Strategic partnership & information sharing

Align policies & incentives

Other?





New Assumptions

.... and play
again!

