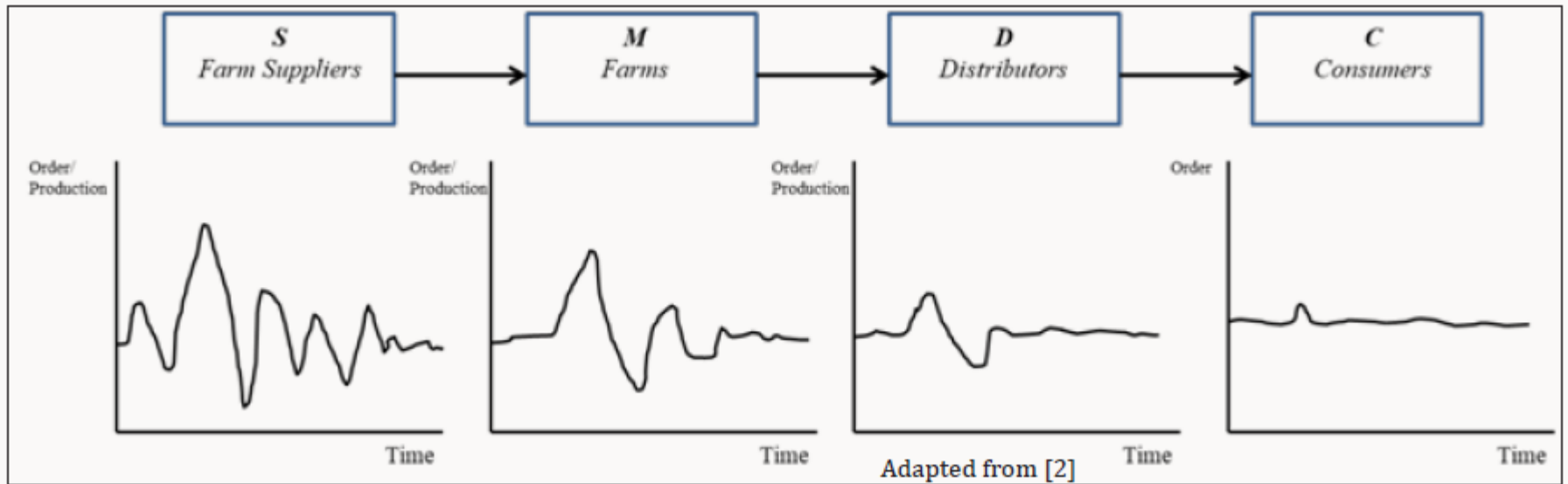# Bullwhip Effect in supply chains

Adapted from [2]

Bullwhip Effect also known as:

Demand Amplification

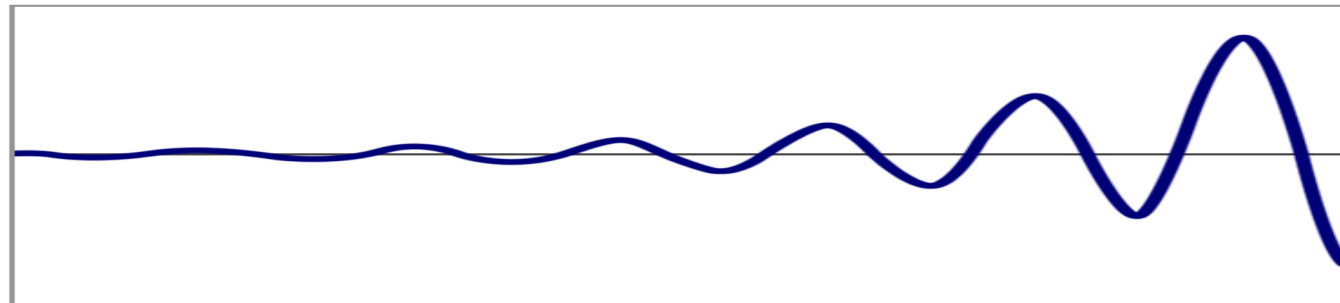**Forrester Effect**

Inventory Variance

Information Distortion

Bullwhip Effect

Demand Variability

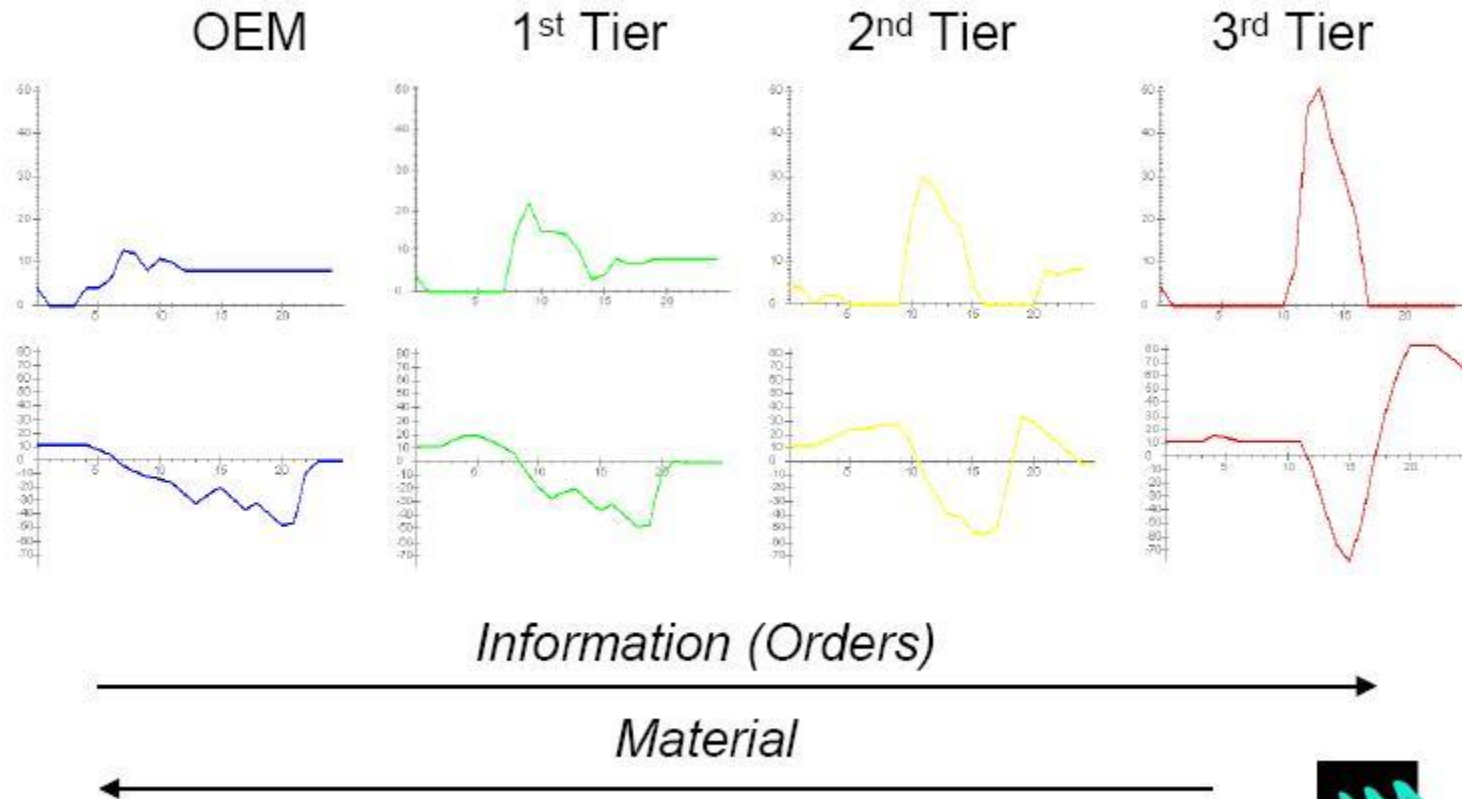**Industrial Dynamics**

Whiplash Effect

Demand

Supply

Let's discuss some examples!

Orders and Stocks in a Supply Chain

OEM | 1st Tier | 2nd Tier | 3rd Tier

Information (Orders)

Material

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Let's discuss Bullwhip Effect Today

?   ?   ?

Causes and Effects of the Bullwhip?

⊙ Demand variation/business
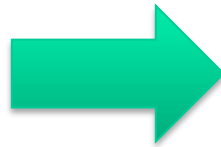
cycles

⊙ Price variations

⊙ Forecasting errors

⊙ Lead time

⊙ Lack of communication

⊙ Order batching

⊙ Shortage gaming

⊙ Internal issues

⊙ Policy Issues

⊙ Excess or insufficient

inventory
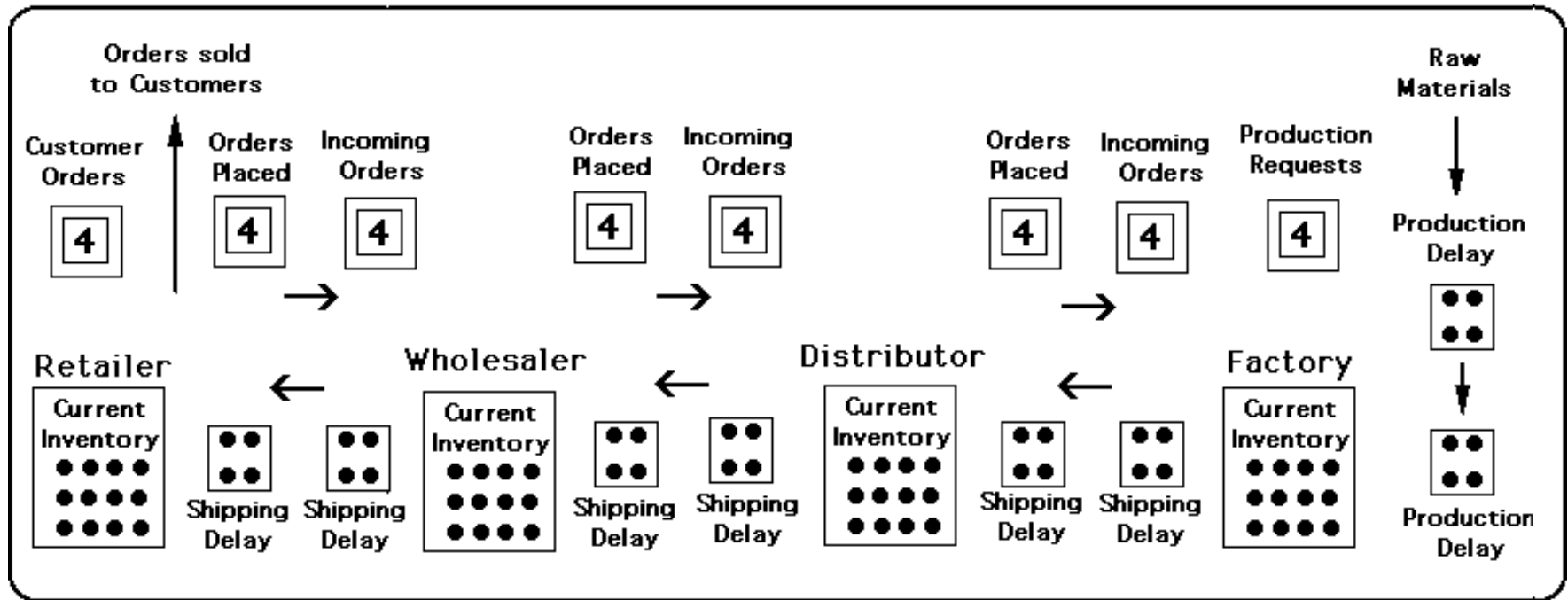
⊙ Shortage or excess

employees

⊙ Inefficient production

⊙ Delayed deliveries

⊙ Poor customer service

⊙ Poor public image

⊙ Lost sales

Beer Game is widely used to simulate Bullwhip Effect

Operations Management

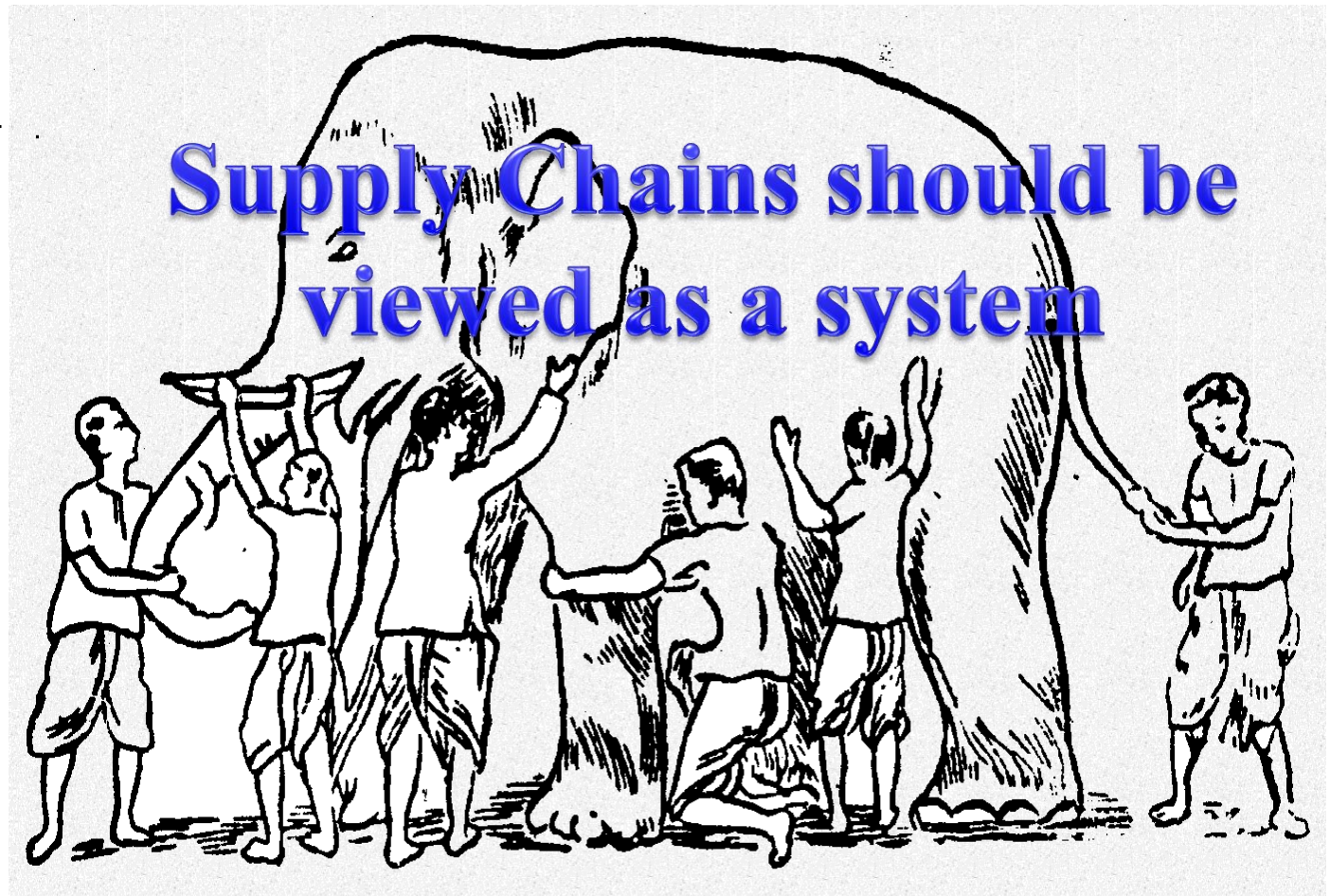# Let's play a game: 4 volunteers please

Learning points

1.

2.

3.

4.

5.

Communication is important to counter Bullwhip Effect BUT… not enough

	Information sharing	Channel alignment	Operational efficiency
Demand forecast updating	• Understand system dynamics • Point-of-sale data • ERP systems • Computer Assisted Ordering • E-commerce	• Vendor Managed Inventory • Encourage information sharing • Deliver direct to the customer	• Lead-time reduction • Supply chain level inventory control
Order batching	• ERP systems • E-commerce	• Mixed, large batches • Delivery in fixed time windows • Order consolidation • Outsource to 3PL's	• The use of ERP systems and E-commerce should reduce transaction costs
Price fluctuation		• Continuous low price	• Understand supplier costs – reduce through improvement teams • Hedge volatile goods
Rationing and shortage gaming	• Share demand, capacity and inventory data	• Long-term relationships leads to allocation based on past sales	

Source: Lee et al. (1997)

Taming the Bullwhip Effect

The blind men and the elephant

Supply Chains should be viewed as a system

The need for a systems view

⊙ Bullwhip effect is an example of systems dynamics in supply chains

⊙ As long as human judgments are involved in a supply chain, such effects are almost inevitable

⊙ Communication of knowledge is important but the key message of beer game (& SC dynamics) is that ***systems create behavior***

⊙ We must recognize supply chain as a system