# *15.760: Cisco/MRP/ERP*

1. **Admin: Peapod, Questions/Feedback**
2. **What were the lessons of the Beer Game?**
3. **How does production control work in the beer game?**
4. **Explain the purpose and logic of MRP.**
5. **What is the function of Cisco's ERP system?**

Volatility Amplification in the Supply Chain:
"The Bullwhip Effect"

Order Info → **Order Info** → **Order Info** →

Retailer → Wholesaler → Distributor → Factory
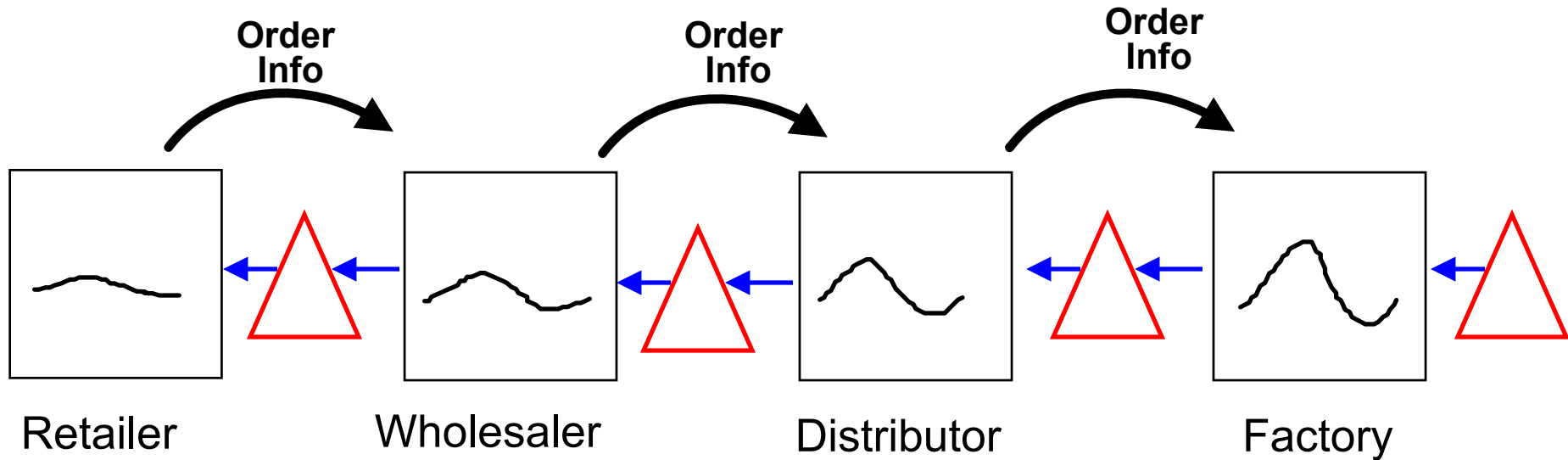
How does production control work in the Beer Game?

Information lags
Delivery lags
Over- and underordering
Misperceptions of feedback
Lumpiness in ordering
Chain accumulations

SOLUTIONS:
Countercyclical Markets
Countercyclical Technologies
Collaborative channel mgmt.
(Cincinnati Milacron & Boeing)

Applying EOQ and Newsvendor models to set Reorder Points and Reorder Quantities (s,S) (ROP, ROQ), (min, max)
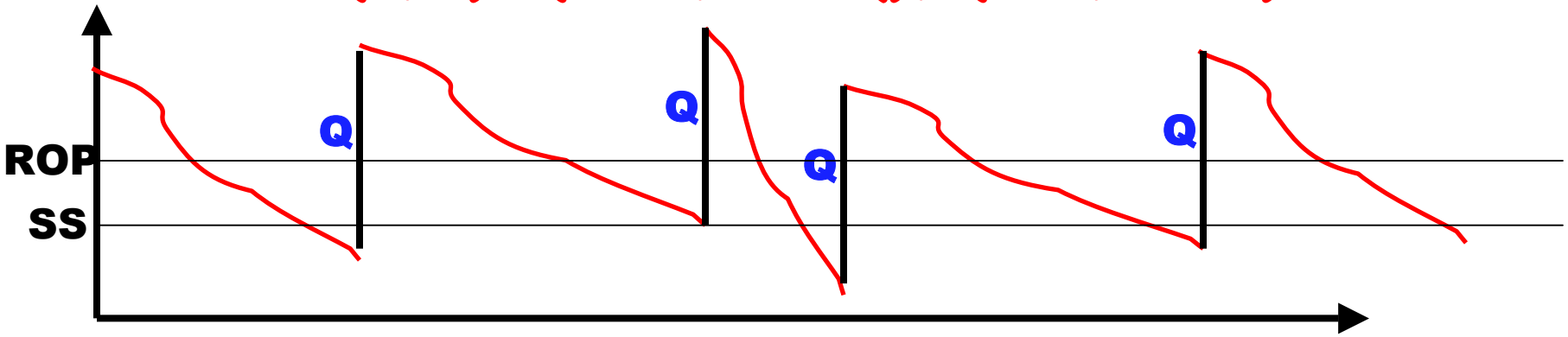
$$Q = \sqrt{\frac{2RS}{CK}} = \text{ROQ (REORDER QUANTITY)}$$

ROP=Reorder Point = Expected Demand During the order lead time + safety stock
$$= E\{DDL\} + SS$$

Prob $\{DDL \leq ROP\}$ = Cu/(Co+Cu)

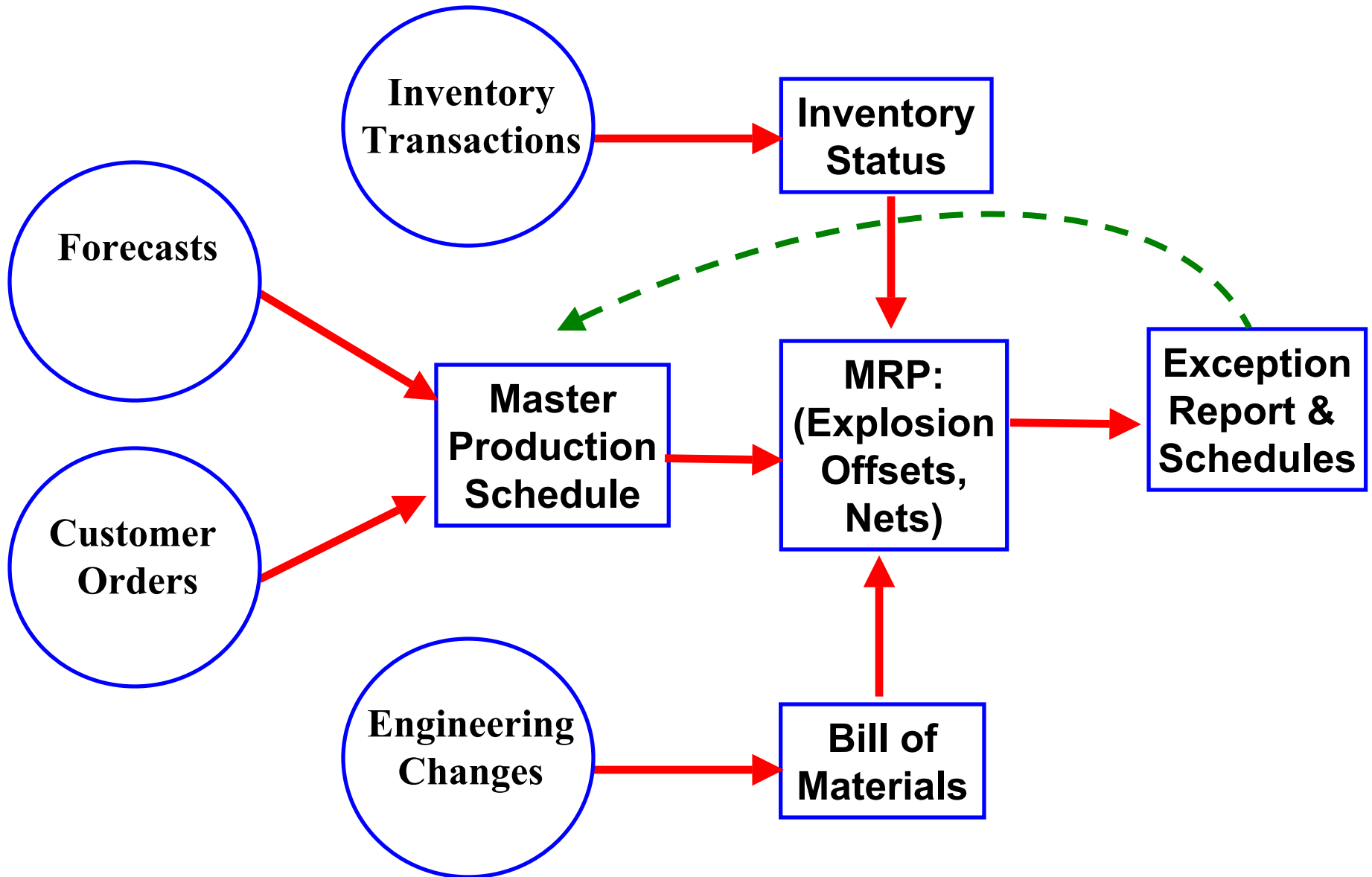Cu=Cost of Underage ($r-c$ in newsvendor); Co=Cost of Overage (c in newsvendor)
But, Co with nonperishables is c x cost of holding

ROP=SS+E$\{DDL\}$; DDL = $X_1 + X_2 + \ldots + X_L$; E$\{DDL\}$ = E$\{L\}$ x E$\{X\}$

i.e., DDL has a mean of Expected lead time x Expected avg demand/unit time

Variance$\{DDL\} \sim$ Var$\{X\}$ x E$\{L\}$ + Var$\{L\}$ x E$\{X^2\}$

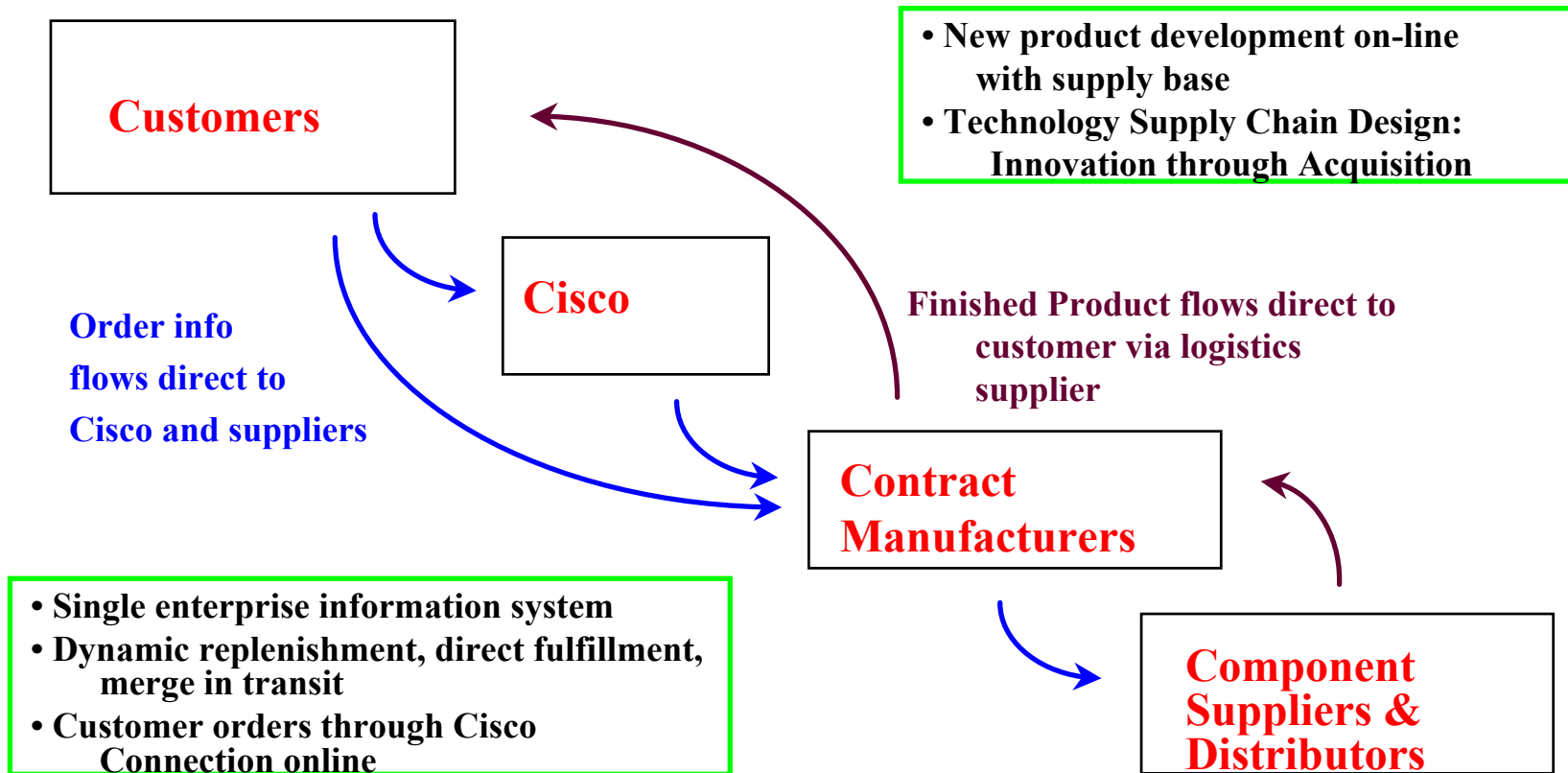# What is the Purpose and Logic of MRP ?

What is the Purpose and Logic of MRP?

- **Coordination of Production and Inventory in large, multi-stage production systems**
- **Used for**
  - **Scheduling & re-scheduling**
  - **Capacity Planning**
  - **Supplier coordination (internal & external)**
- **Timely dissemination of information**
- **Time-phased production & procurement**
  - **with lead time offsets & BOM explosions**
- **Independent vs. Dependent demand**
- **Requires centralized information system; hence ERP**
- **Organizes large complex production and delivery coordination requirements**

Criticisms of MRP

- **Deterministic Model**
- **Push system**
- **poor data ==> GIGO**
- **Self-fulfilling lead times**
- **Difficult/costly ot install & maintain**
- **Centralized command & control mindset**

# Cisco's End-to-End Integration for its Fulfillment Supply Chain

Customers

Cisco

Contract Manufacturers

Component Suppliers & Distributors

- New product development on-line with supply base
- Technology Supply Chain Design: Innovation through Acquisition

Order info flows direct to Cisco and suppliers

Finished Product flows direct to customer via logistics supplier

- Single enterprise information system
- Dynamic replenishment, direct fulfillment, merge in transit
- Customer orders through Cisco Connection online

Basic Design Principle: Arm's length Relationship with Fulfillment Chain Partners

Cisco's Strategy for Technology Supply Chain Design

1. Integrate technology around the router to be a communications network provider.
2. Leverage acquired technology with
   - sales muscle and reach
   - end-to-end IT
   - outsourced manufacturing
   - market growth
3. Leverage venture capital to supply R&D

Basic Design Principle: Acquisition Relationship with Technology Chain Partners

Volatility Amplification in the Supply Chain:
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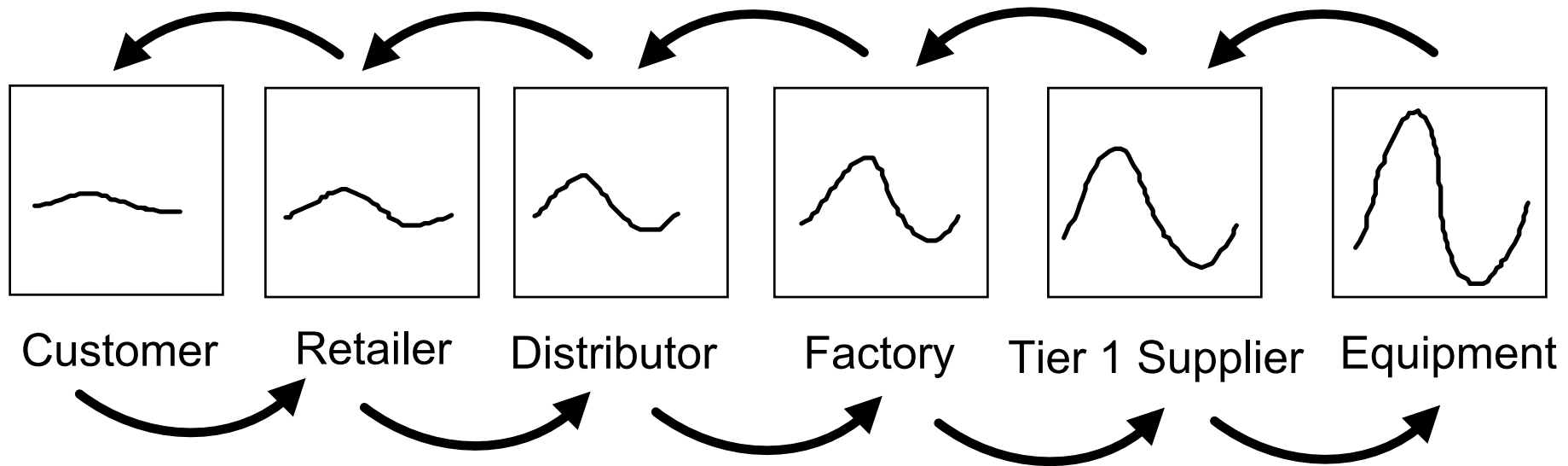
Customer   Retailer   Distributor   Factory   Tier 1 Supplier   Equipment

Information lags
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Supply Chain Volatility Amplification:
Machine Tools at the tip of the Bullwhip

"We are experiencing a 100-year flood."   J. Chambers, 4/16/01

See "Upstream Volatility in the Supply Chain: The Machine Tool Industry as a Case Study,"
E. Anderson, C. Fine & G. Parker *Production and Operations Management,*
Vol. 9, No. 3, Fall 2000, pp. 239-261.

LESSONS FROM A FRUIT FLY:
CISCO SYSTEMS

1. KNOW YOUR LOCATION
     IN THE VALUE CHAIN

2. UNDERSTAND THE DYNAMICS
     OF VALUE CHAIN FLUCTUATIONS

3. THINK CAREFULLY ABOUT THE ROLE
     OF VERTICAL COLLABORATIVE
     RELATIONSHIPS

4. INFORMATION AND LOGISTICS SPEED
     DO NOT REPEAL BUSINESS CYCLES OR
     THE BULLWHIP.