

Value Chain Dynamics



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Value Chains and Supply Chains

Supply Chains

Order fulfillment

- Inventory
- Quality, cost & service
- Flexibility
- Response times
- Logistics
- Distribution
- Procurement
- Forecasting
- Transportation
- Quantity accuracy
- Timing accuracy

"The Physics of Flow"

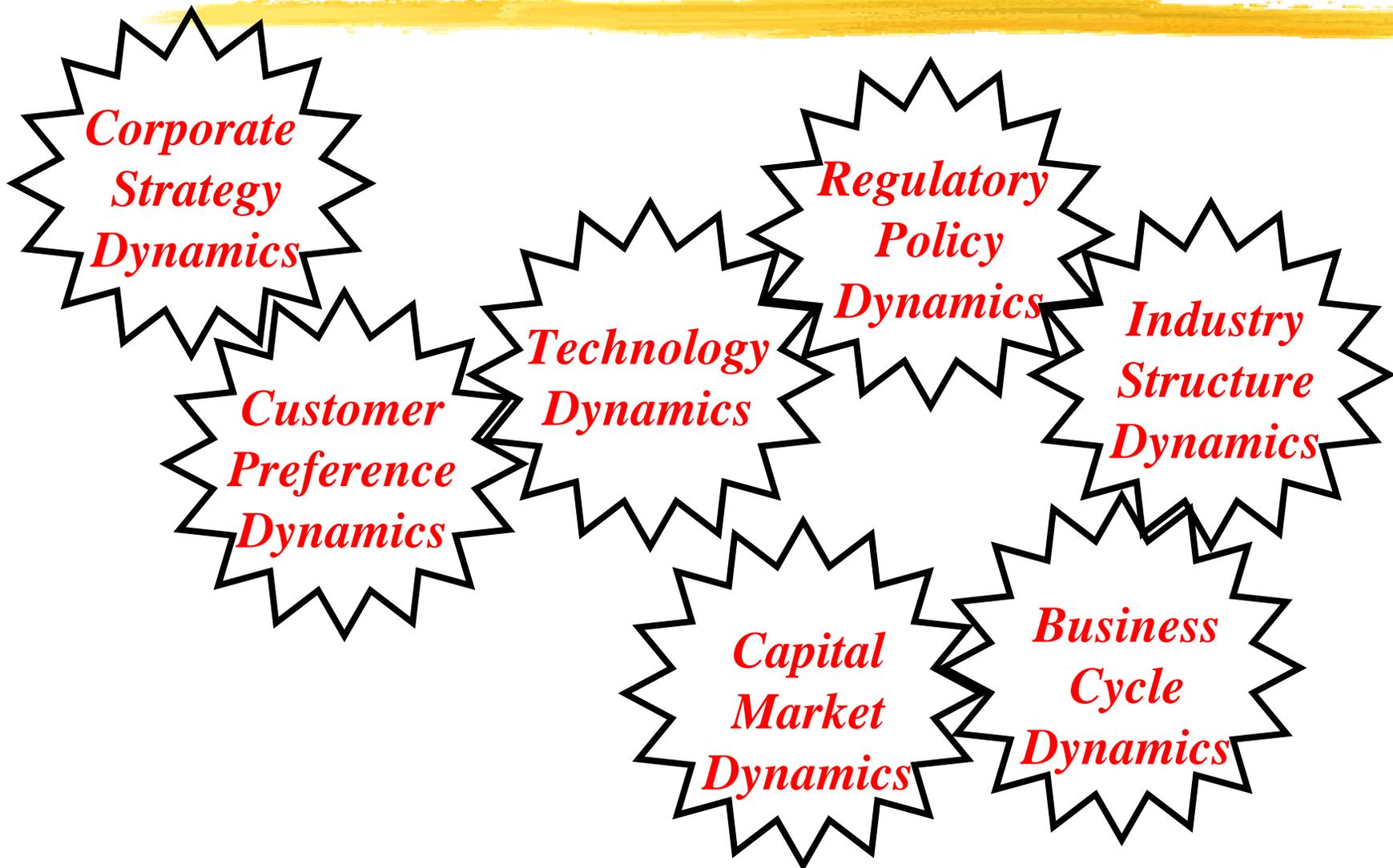
Value Chains

System Design

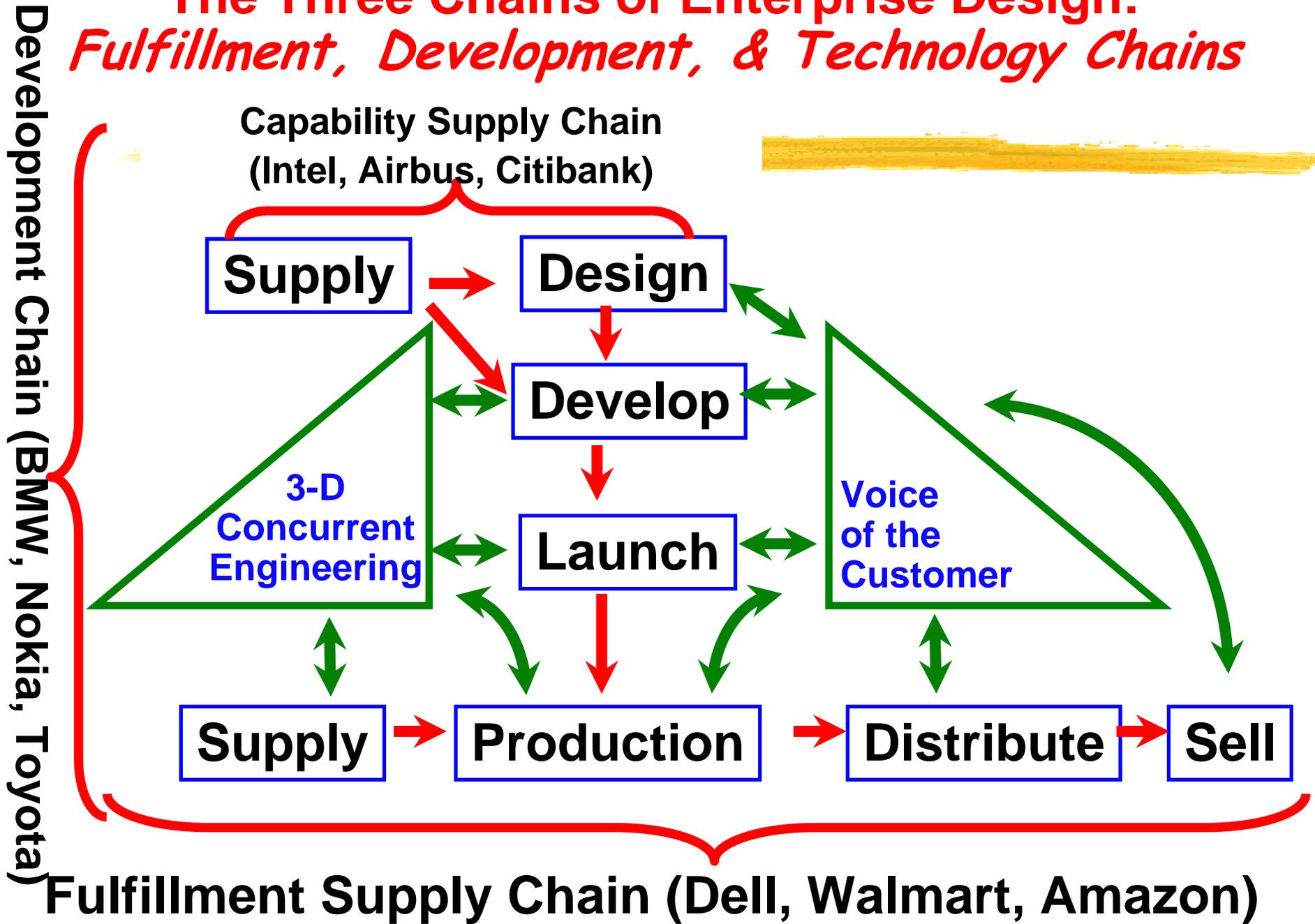
- Core competences
- Make/Buy
- Relationship Design
- Strategic Intent
- Clockspeed
- Dynamics of
 - Disintermediation
 - Disintegration
 - Dependence
 - Capability development

"The Biology of Evolution"

Dynamic Analysis to Support Industry & Technology Roadmapping



The Three Chains of Enterprise Design: *Fulfillment, Development, & Technology Chains*



Supply Chain Design in a **Fast-Clockspeed** World: Study the **Industry Fruitflies**

Evolution in the natural world:

FRUITFLIES

evolve faster than

MAMMALS

evolve faster than

REPTILES

THE KEY TOOL:

**Cross-SPECIES
Benchmarking
of Dynamic Forces**

Evolution in the industrial world:

INFOTAINMENT is faster than

MICROCHIPS is faster than

AUTOS evolve faster than

AIRCRAFT evolve faster than

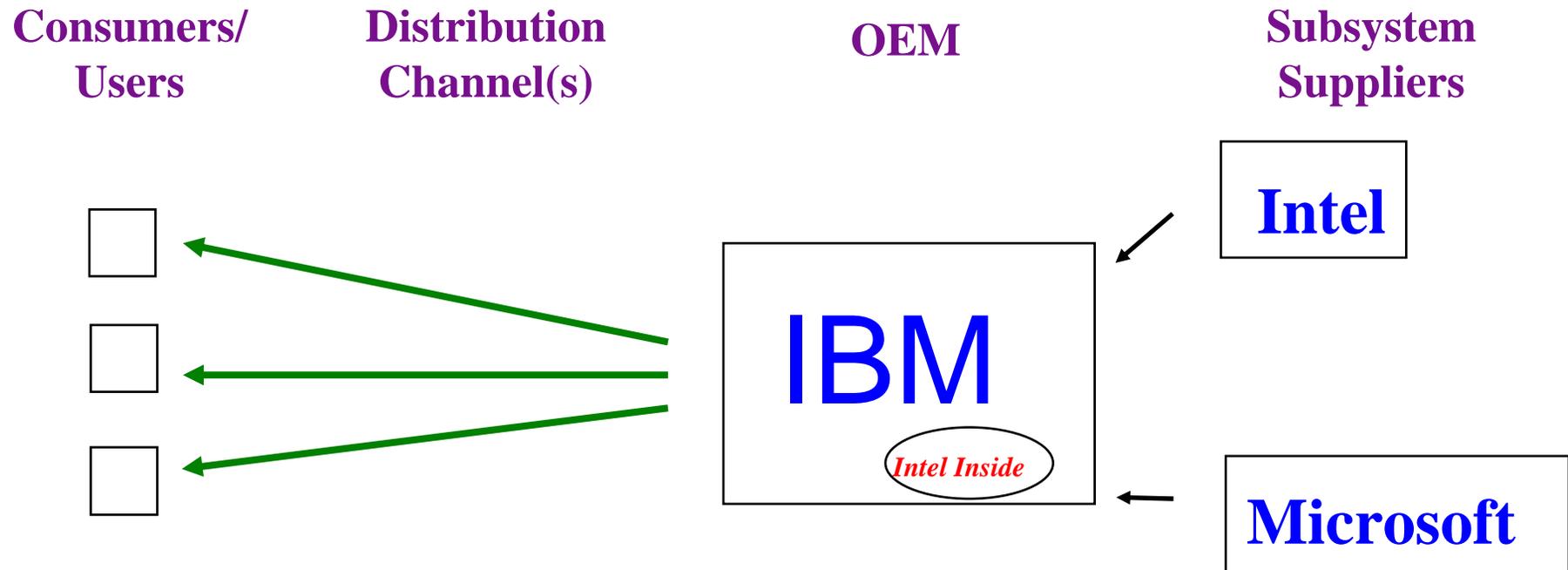
MINERAL EXTRACTION

THE KEY TOOL:

**Cross-INDUSTRY
Benchmarking
of Dynamic Forces**

The Strategic Impact of Project Design: *(Who let Intel Inside?)*

1980: IBM designs a product, a process, & a value ch



The Outcome:

**A phenomenally successful product design
A disastrous value chain design (for IBM)**

LESSONS FROM A FRUIT FLY: *THE PERSONAL COMPUTER*



1. BEWARE OF *INTEL INSIDE*
(Regardless of your industry)
2. MAKE/BUY IS **NOT** ABOUT WHETHER IT IS
TWO CENTS CHEAPER OR *TWO DAYS FASTER*
TO **OUTSOURCE** VERSUS **INSOURCE**.
3. DEVELOPMENT PARTNERSHIP DESIGN CAN
DETERMINE THE FATE OF **COMPANIES** AND
INDUSTRIES, AND OF **PROFIT** AND **POWER**
4. THE LOCUS OF VALUE CHAIN CONTROL
CAN SHIFT IN **UNPREDICTABLE** WAYS

VALUE CHAIN DESIGN:

Three Components



1. Insourcing/OutSourcing

(The Make/Buy or Vertical Integration Decision)

2. Partner Selection

(Choice of suppliers and partners for the chain)

3. The Contractual Relationship

(Arm's length, joint venture, long-term contract, strategic alliance, equity participation, etc.)

Buzz Groups



When have you seen sourcing decisions have a significant impact on a key innovations in the value chain?

What are the strengths and weaknesses of how sourcing strategy works at your company?

Vertical Industry Structure with *Integral* Product Architecture



Computer Industry Structure, 1975-85

For this diagram, see:

A. Grove, Intel; and Farrell, Joseph, Hunter Monroe, and Garth Saloner. "The Vertical Organization of Industry: Systems Competition versus Component Competition." *Journal of Economics & Management Strategy* 7, no. 2 (1998): 143-182.

Horizontal Industry Structure with *Modular* Product Architecture

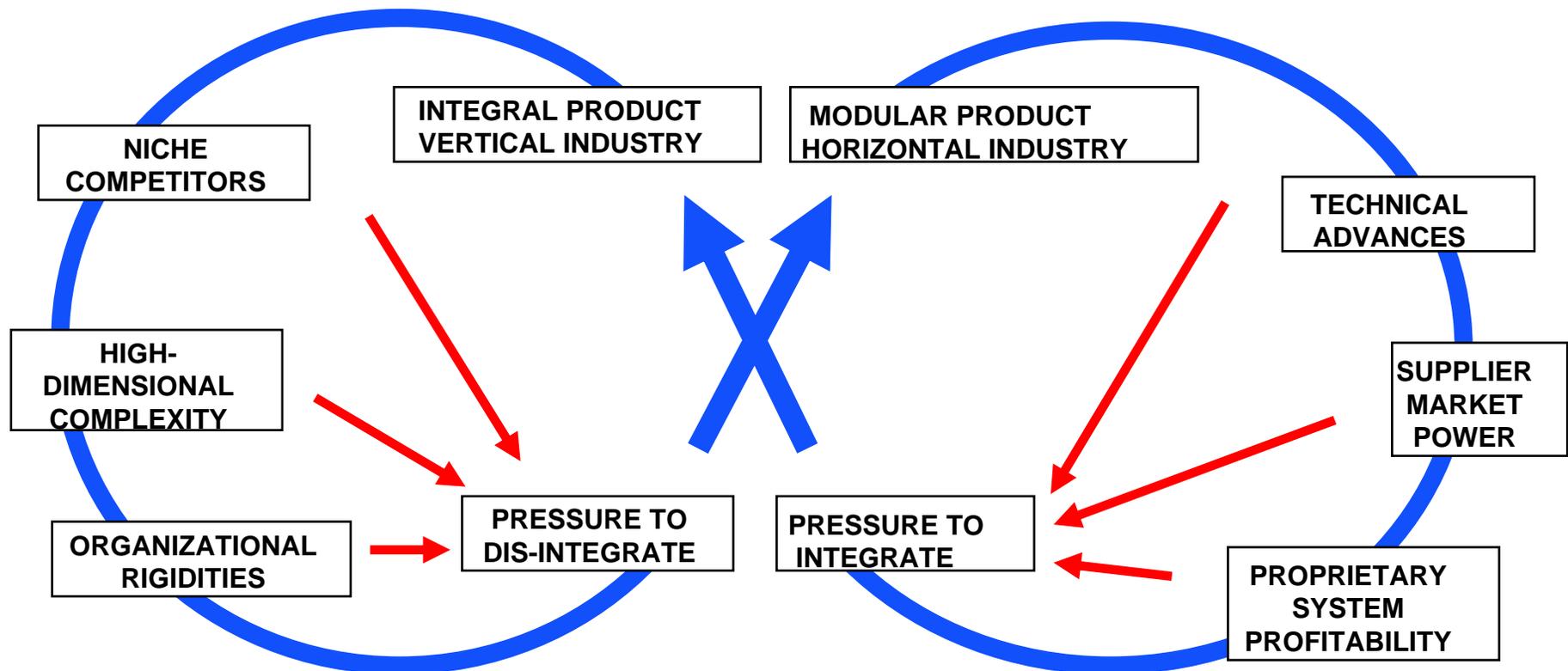


Computer Industry Structure, 1985-95

For this diagram, see:

A. Grove, Intel; and Farrell, Joseph, Hunter Monroe, and Garth Saloner. "The Vertical Organization of Industry: Systems Competition versus Component Competition." *Journal of Economics & Management Strategy* 7, no. 2 (1998): 143-182.

THE DYNAMICS OF PRODUCT ARCHITECTURE AND VALUE CHAIN STRUCTURE: **THE DOUBLE HELIX**



Source: Fine, Charles, and Daniel Whitney. "Is the Make-Buy Decision Process a Core Competence?" MIT Center for Technology, Policy, and Industrial Development, February 1996. Used with permission.

BUZZ GROUPS: THE *DOUBLE HELIX* IN OTHER INDUSTRIES



- 1. HOW HAS THE DOUBLE HELIX AFFECTED A VALUE CHAIN THAT YOU ARE FAMILIAR WITH?**
- 2. WERE THERE ANY "EARLY WARNING SIGNALS" AS TO THE COMING INTEGRATION OR DISTINTEGRATION?**
- 3. WHAT DO YOU THINK MIGHT BE SOME HELPFUL "EARLY WARNING SIGNALS?"**

THE *DOUBLE HELIX* IN OTHER INDUSTRIES

- **TELECOMMUNICATIONS--**
 - “**MA BELL**” was Vertical /Integral
 - **BABY BELLS & LONG LINES & CELLULAR** are Horizontal/Modular
 - Today’s Verizon is going back to Vertical /Integral
- **AUTOMOTIVE--**
 - Detroit in the 1890’s was Horizontal/Modular
 - Ford & GM in the mid 1900’s were Vertical /Integral
 - Today’s Auto Industry is going back to Horizontal/Modular
- **TELEVISION--**
 - RCA was Vertical /Integral
 - 1970’S THROUGH 1990’S were Horizontal/Modular
 - Today’s media giants are going back to Vertical /Integral
- **BICYCLES--**
 - Safety Bikes to 1890’s boom to Schwinn to Shimano Inside

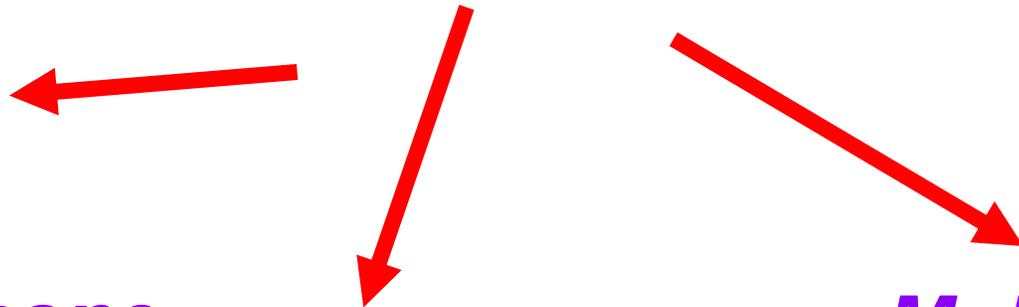
INDUSTRY CLOCKSPEED IS A COMPOSITE: OF PRODUCT, PROCESS, AND ORGANIZATIONAL CLOCKSPEEDS

Mobile Phone **INDUSTRY CLOCKSPEED**

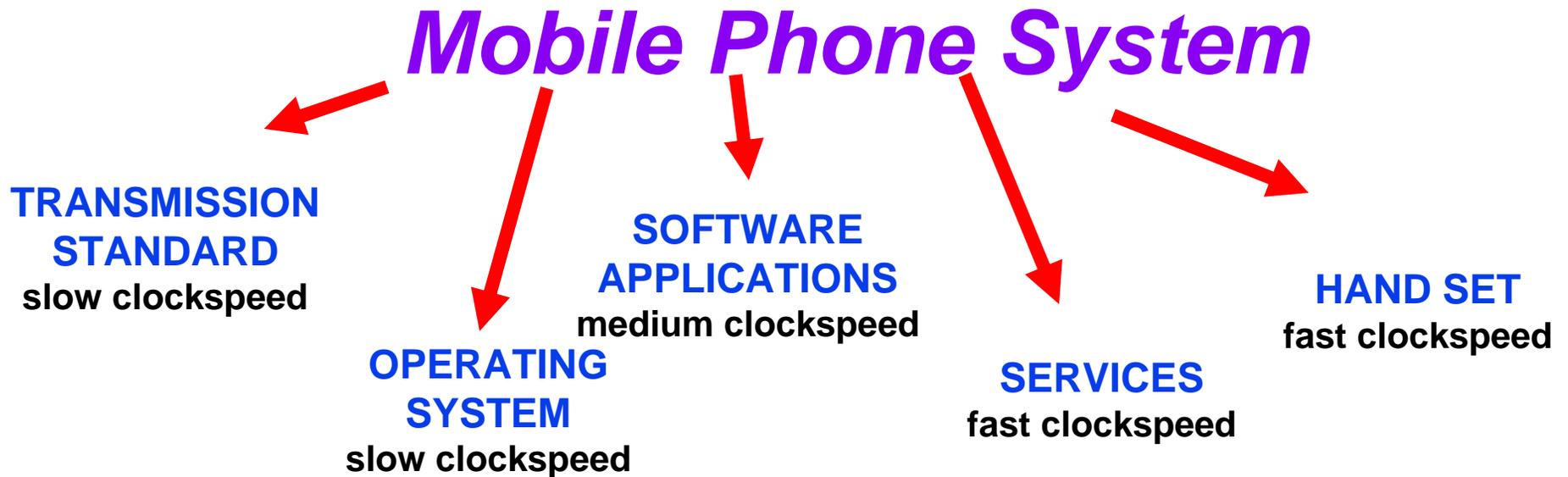
THE
Mobile Phone
product technology

THE
Mobile Phone
**PRODUCTION
PROCESS**
process technology

THE
Mobile Phone
**MANUFACTURING
COMPANY**
organization

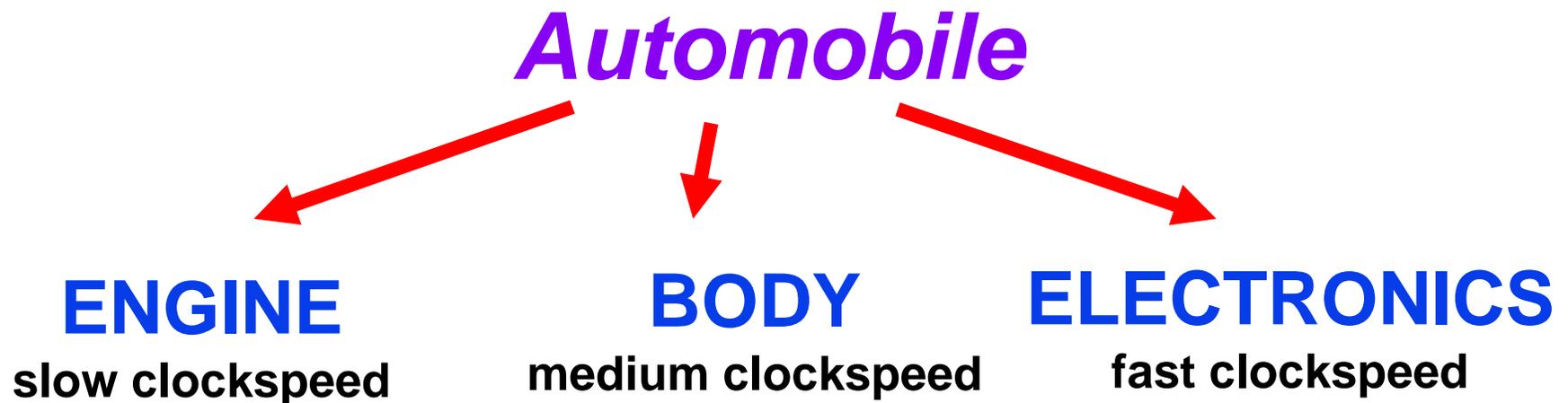


Mobile Phone System **CLOCKSPEED** is a mix of Transmission Standards, Software and Handsets



ISSUE: THE FIRMS THAT ARE FORCED TO RUN AT THE FASTEST CLOCKSPEED ARE THE MOST LIKELY TO STAY AHEAD OF THE GAME.

Automobile CLOCKSPEED IS A MIX OF ENGINE, BODY & ELECTRONICS



ISSUE: MOST AUTO FIRMS OPERATE AT **ENGINE OR BODY CLOCKSPEEDS**; IN THE FUTURE THEY WILL NEED TO RUN AT **ELECTRONICS CLOCKSPEED.**

Buzz Groups

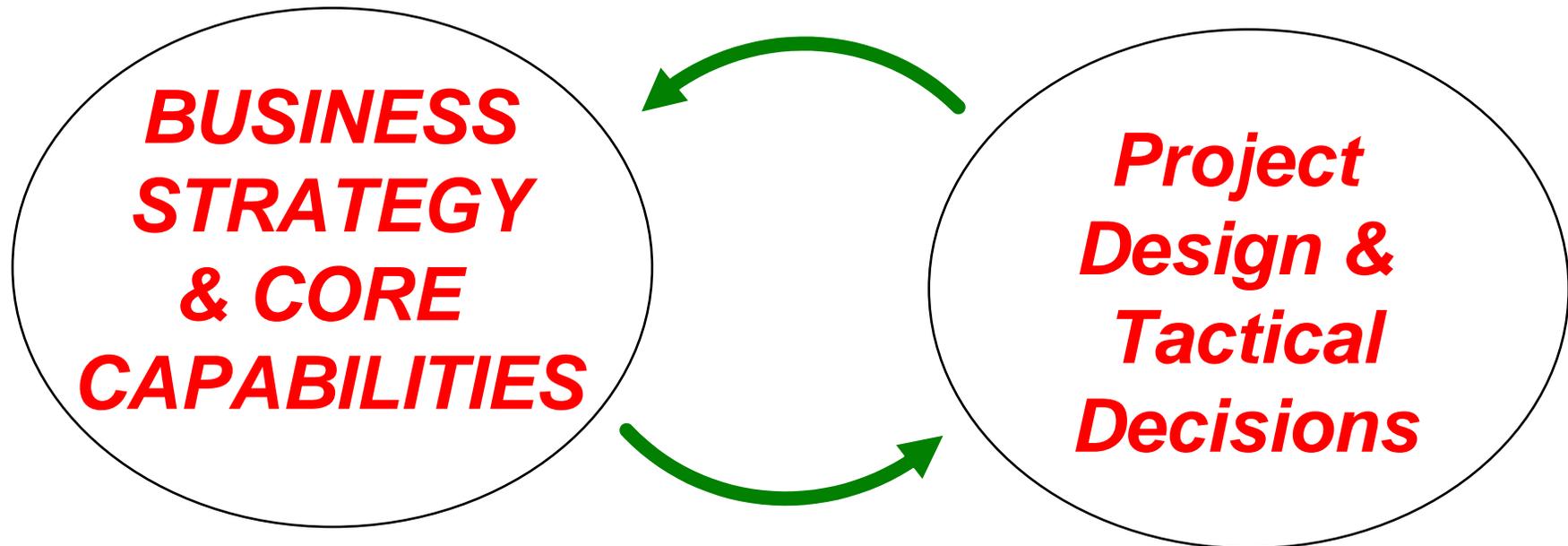


What's the fastest clockspeed component of your company's value chain?

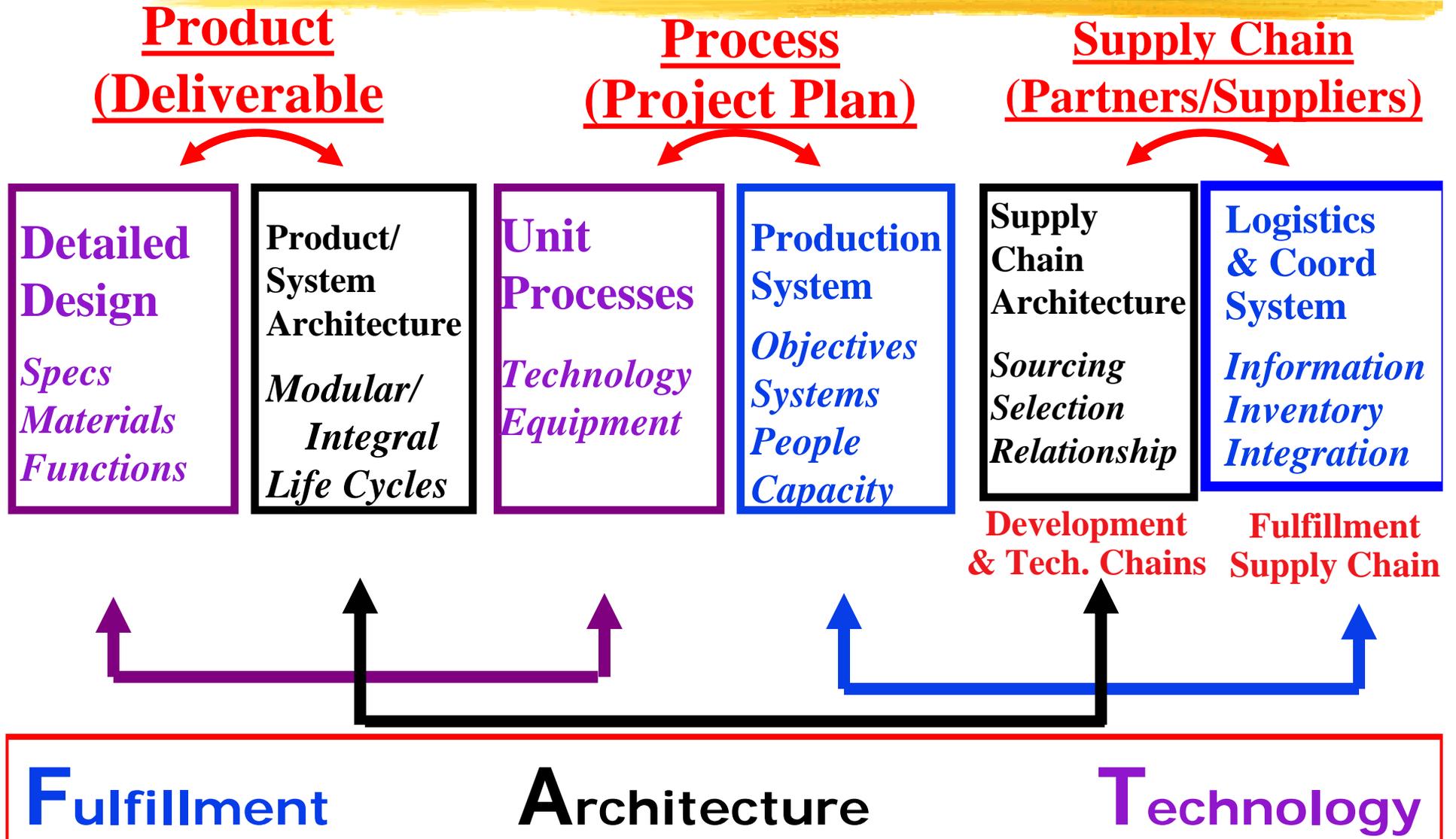
How is your company responding to the speed of this fast-moving component?

Clockspeed drives *Business Strategy Cadence*

Dynamics between **New Projects** and **Core Capability Development**: **PROJECTS MUST MAKE MONEY AND BUILD CAPABILITIES**



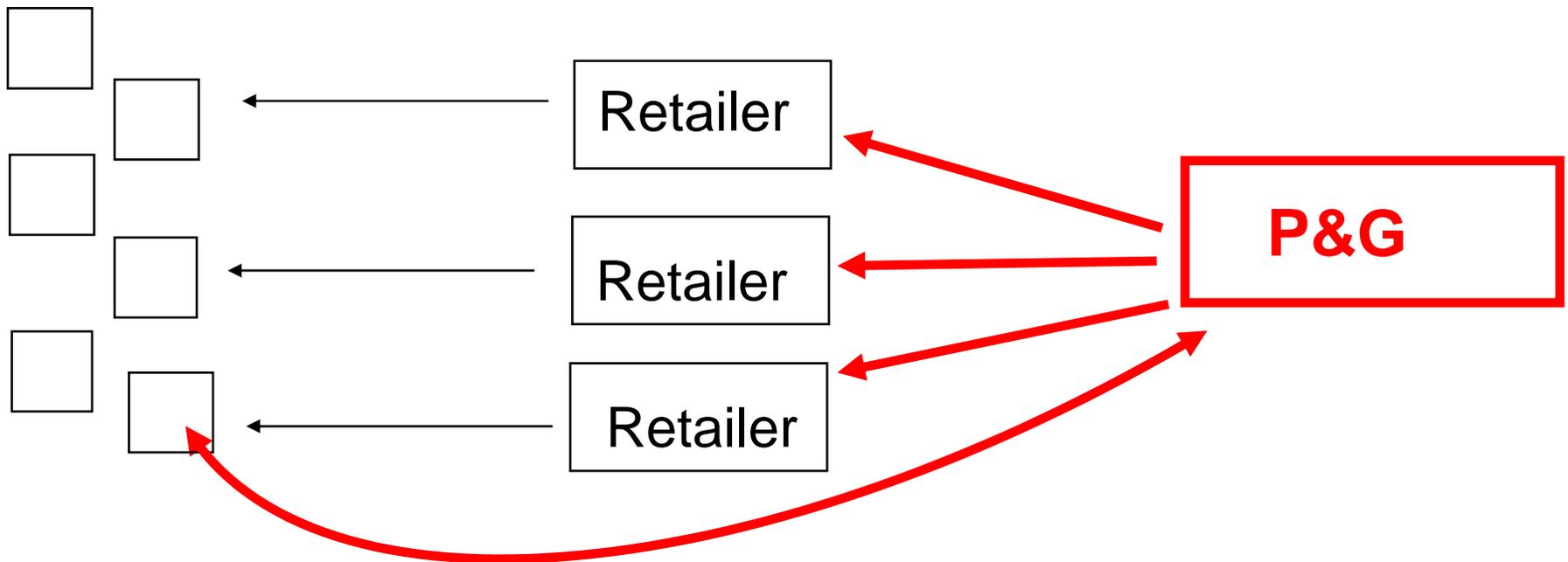
3-D Concurrent Engineering & *the imperative of concurrency*



Controlling the Chain Through Distribution: The End of *P&G Inside* ?

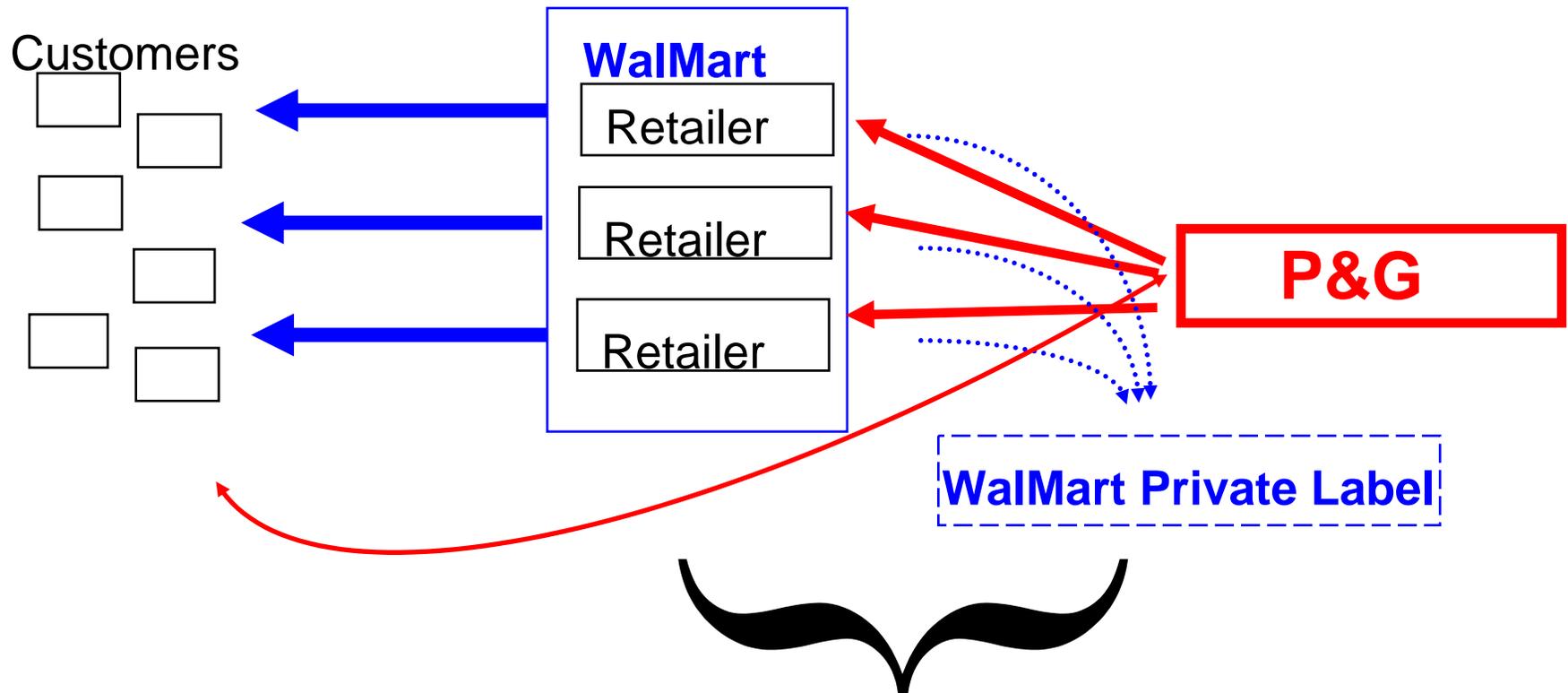
- *Controlling the Channel Through Closeness to Customers:*
- *consumer research, pricing, promotion, product development*

Customers



Controlling the Chain Through Distribution: Beware of *Walmart Outside*

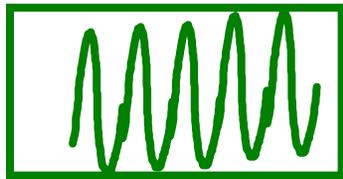
Controlling the Channel Through Closeness to Customers: Chain Proximity



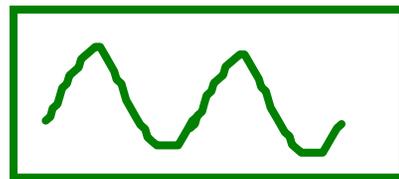
Vertical Growth on the Double Helix

***lockspeeds accelerate as you head downstream,
closer to the final customer;***

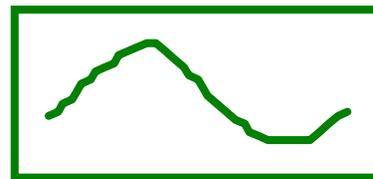
Clockspeed = f(technology push, customer pull, system complexity)



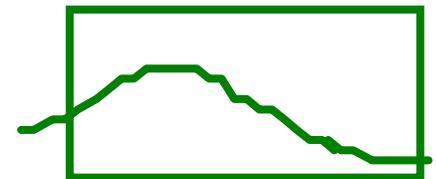
**New Phone
Applications**



**Handset
Platforms**



**Telecom
Equipment**



**Optical
Components**

**Web Site
Developer**

PC Maker

Chip maker

**Semiconductor
Equipment
Maker**

**In-Vehicle
Services**

Automobile

**Telematics
System**

**Vehicle
Electronics
Architecture**

ALL COMPETITIVE ADVANTAGE IS TEMPORARY

Autos:

Ford in 1920, **GM** in 1955, **Toyota** in 1990

Computing:

IBM in 1970, **DEC** in 1980, **Wintel** in 1990

World Dominion:

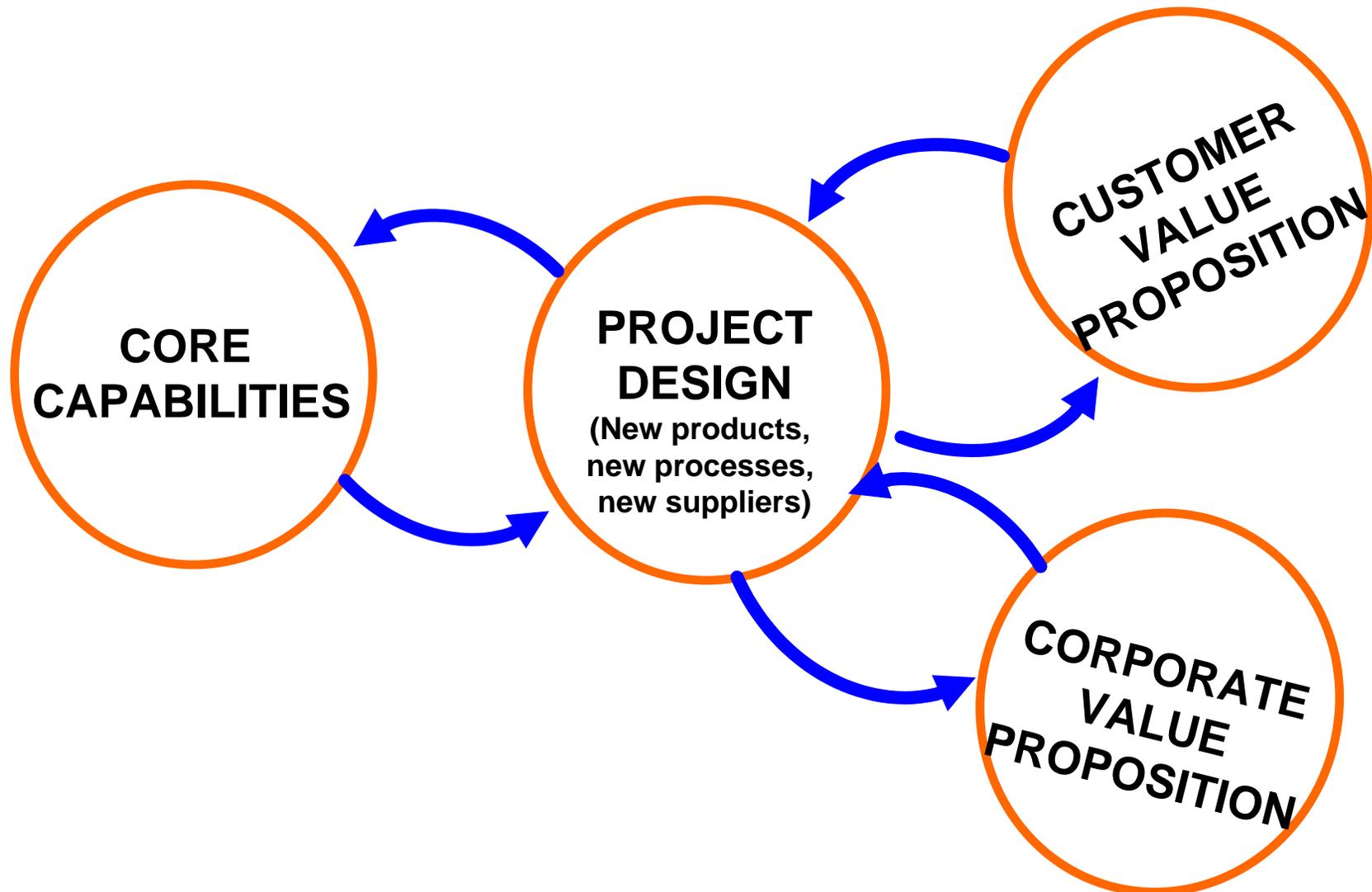
Greece in 500 BC, **Rome** in 100AD, **G.B.** in 1800

Sports:

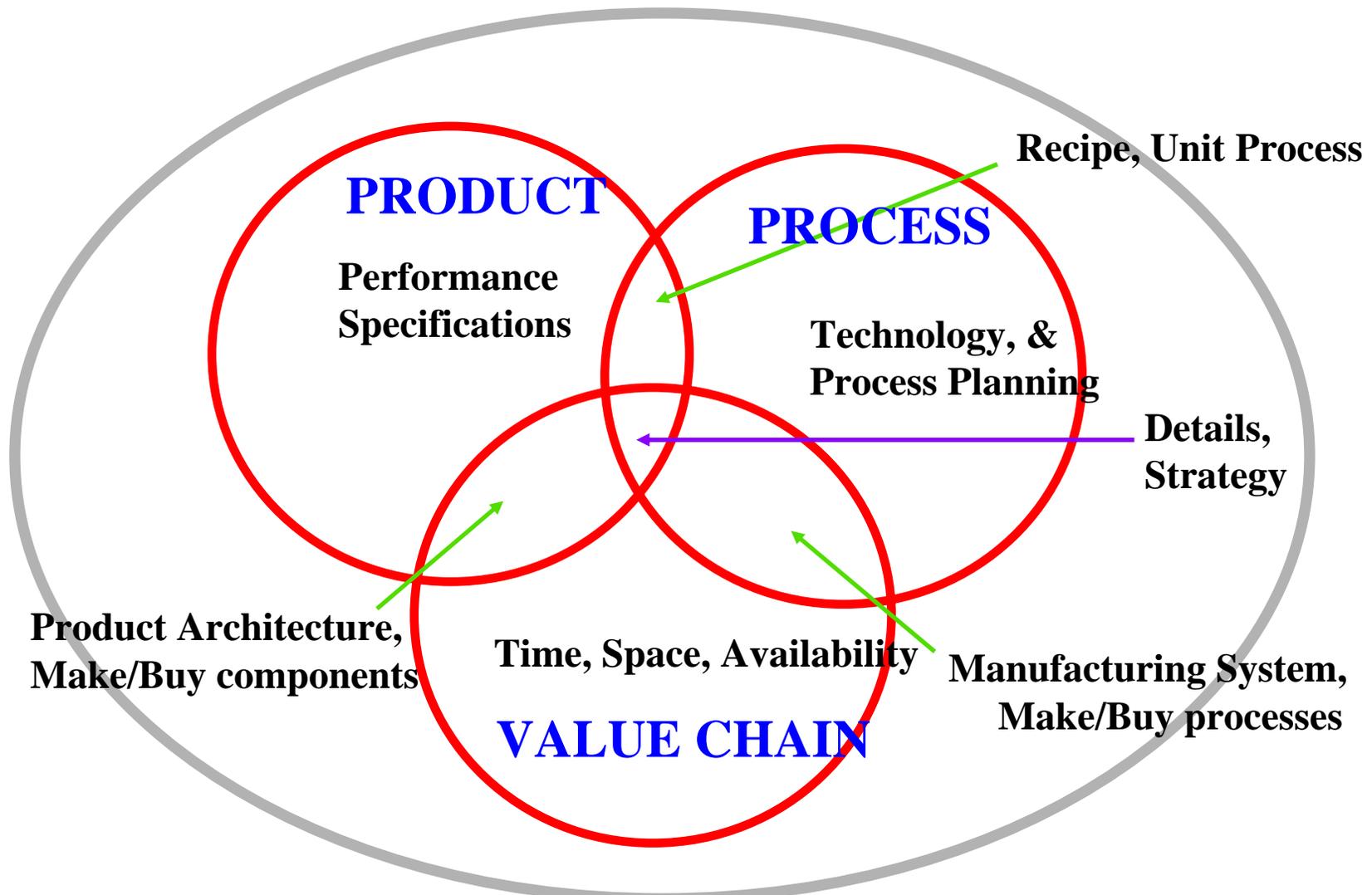
Bruins in 1971, **Celtics** in 1986, **Yankees** no end

The faster the clockspeed, the shorter the reign

Projects Serve Three Masters: Capabilities, Customers, & Corporate Profit



IMPLEMENTATION OF **PROJECT DESIGN**: FRAME IT AS 3-D CONCURRENT ENGINEERING



ARCHITECTURES IN 3-D

INTEGRALITY VS. *MODULARITY*



Integral product architectures feature

close coupling among the elements

- Elements perform many functions
- Elements are in close spacial proximity
- Elements are tightly synchronized
- **Ex: jet engine, airplane wing, microprocessor**

Modular product architectures feature

separation among the elements

- Elements are interchangeable
 - Elements are individually upgradeable
 - Element interfaces are standardized
 - System failures can be localized
- Ex: stereo system, desktop PC, bicycle**

VALUE CHAIN ARCHITECTURE



Integral value-chain architecture

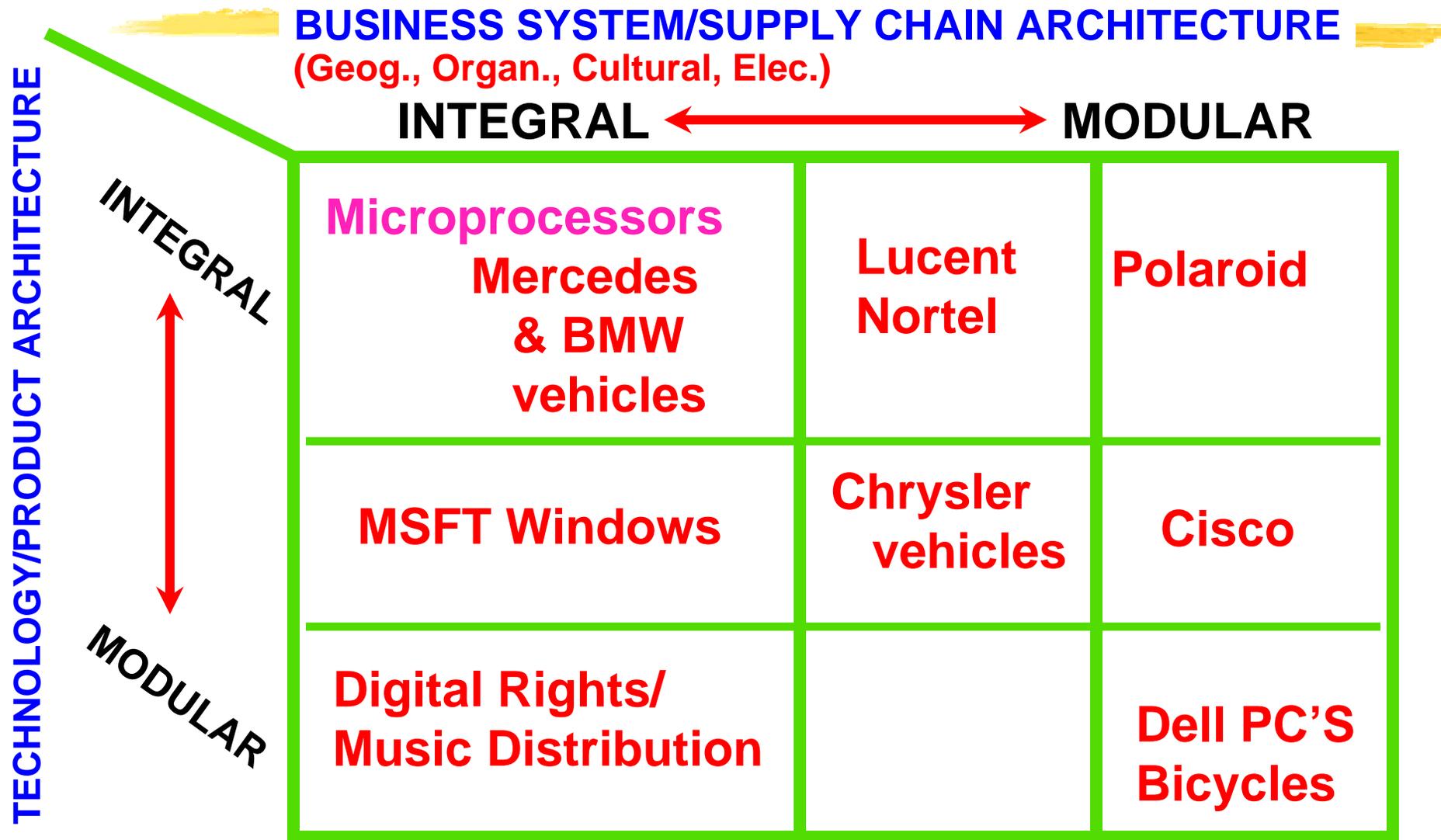
features close proximity among its elements

- **Proximity metrics: Geographic, Organizational
Cultural, Electronic**
- **Example: Toyota city**
- **Example: Ma Bell (AT&T in New Jersey)**
- **Example: IBM mainframes & Hudson River Valley**

**Modular value-chain architecture features multiple,
interchangeable supplier and standard interfaces**

- **Example: Garment industry**
- **Example: PC industry**
- **Example: General Motors' global sourcing**
- **Example: Telephones and telephone service**

ALIGNING ARCHITECTURES: BUSINESS SYSTEMS & TECHNOLOGICAL SYSTEMS



Demand-Supply Chain Management @ Dell



- **Demand Management:**
- **Forecast = Buy = Sell**
- **Buy to Plan, but Build to Order**
- **Inventory Velocity is a wonderful thing ...**
 - Customers have immediate access to the latest technology.
 - Suppliers get their products to market quickly
 - Quality is improved with fewer touches.
 - Cash is generated through negative cash cycle.
 - Model efficiencies drive Market Share gain.

Can "Dell Direct" Work for Autos?

- **Appealing to OEM's on Many Dimensions**
 - Satisfy customer need for Speed
 - Reduce Supply Line Inventories
 - Reduce mismatches and discounting
 - Direct OEM-Customer Relationships (& Data!)
 - Information Transparency

Ideas adapted from Prof. John Paul MacDuffie, IMVP (International Motor Vehicle Program at MIT) and The Wharton School of the University of Pennsylvania

BUT, A Car is not a Computer!!

• Personal Computer

- ~50 components
- 8-10 key parts
- 40 key suppliers
- 24 hour burn-in
- 100 design variations
- Modular Architecture

• Car

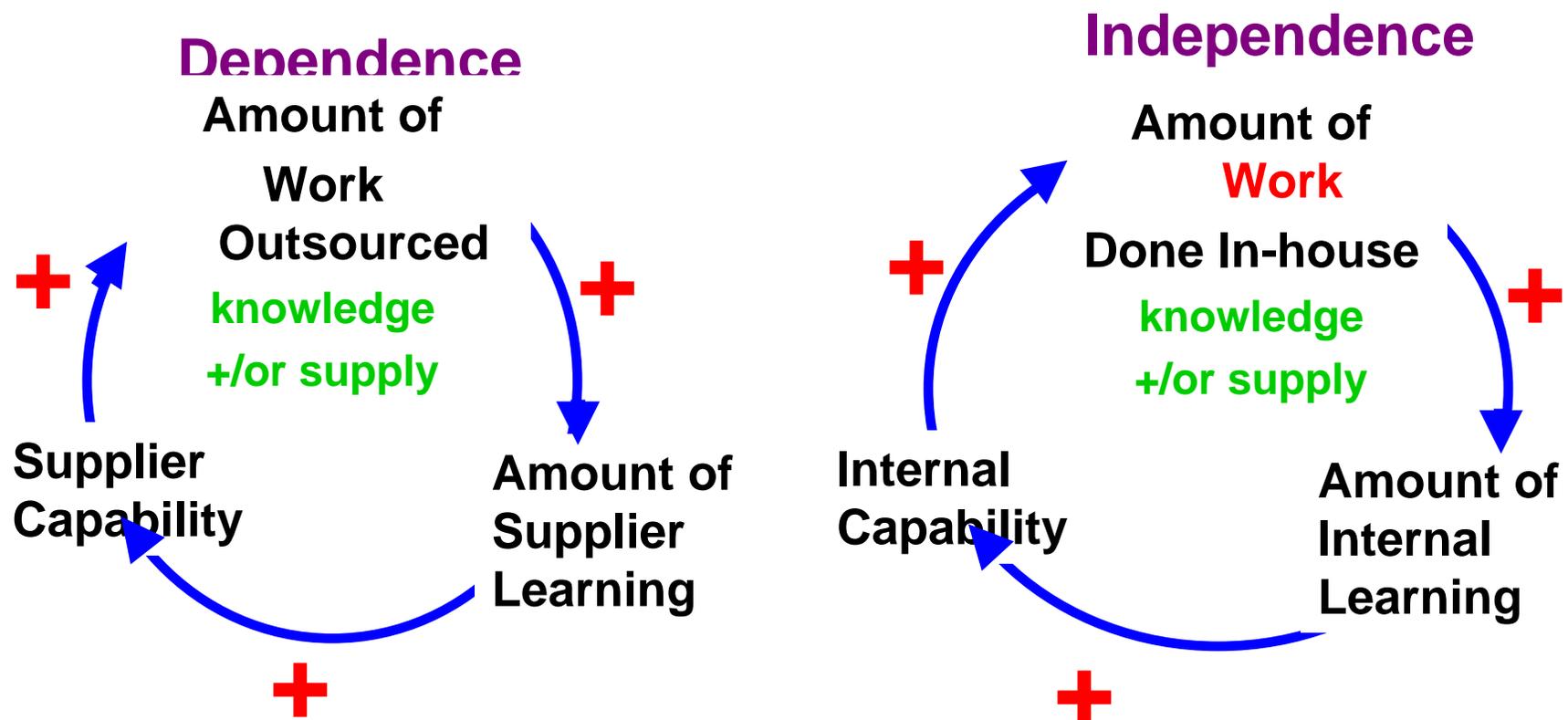
- ~ 4000 components
- 100 key subsystems
- 300 key suppliers
- 12 month validation
- 1,000,000 variations
- Integral Architecture

Ideas adapted from Prof. John Paul MacDuffie, IMVP (International Motor Vehicle Program at MIT) and The Wharton School of the University of Pennsylvania

Strategic Sourcing as a Driver of Dynamic Evolution of Capabilities Along the Value Chain

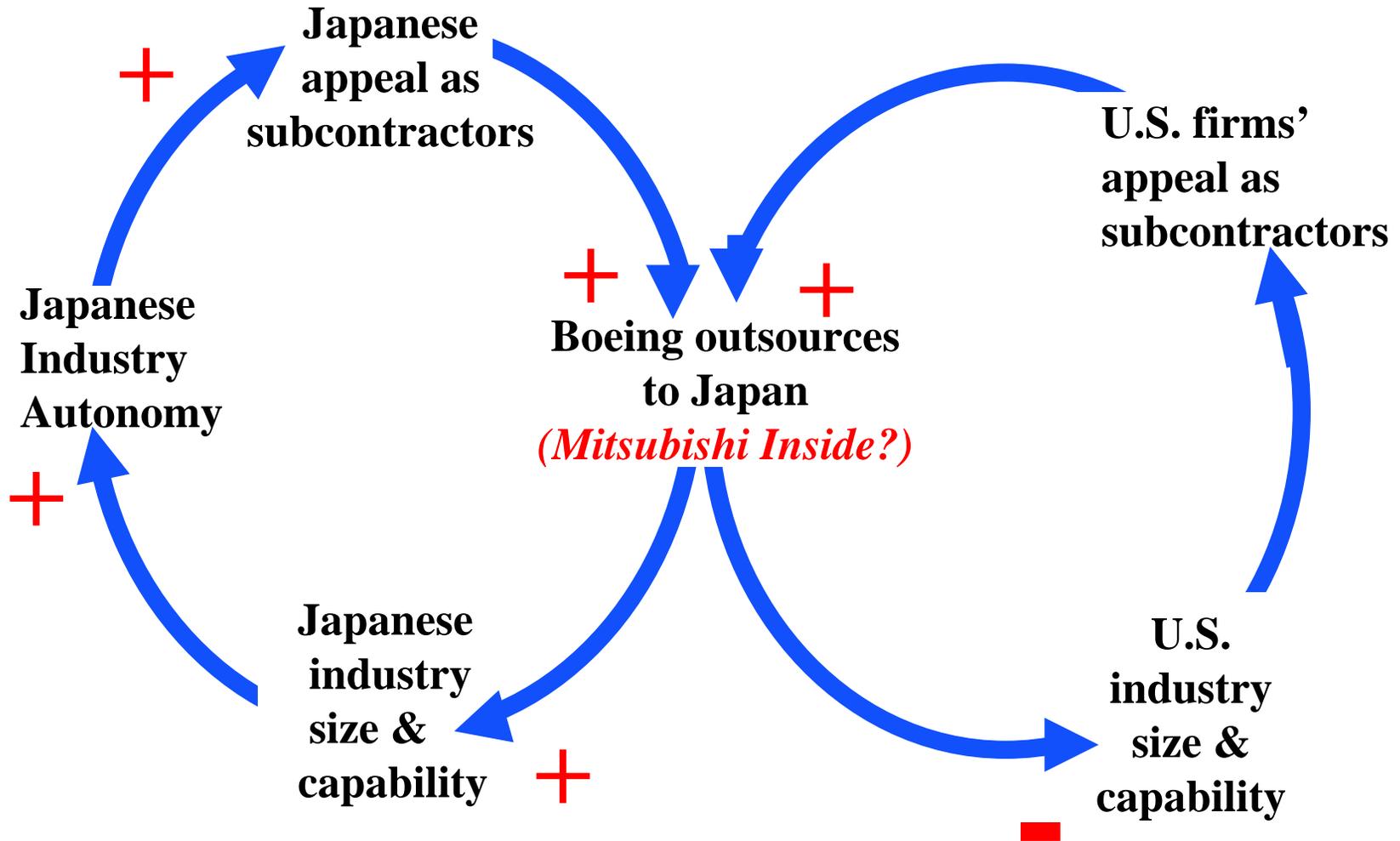
Distinguish between

dependence for knowledge or dependence for capacity

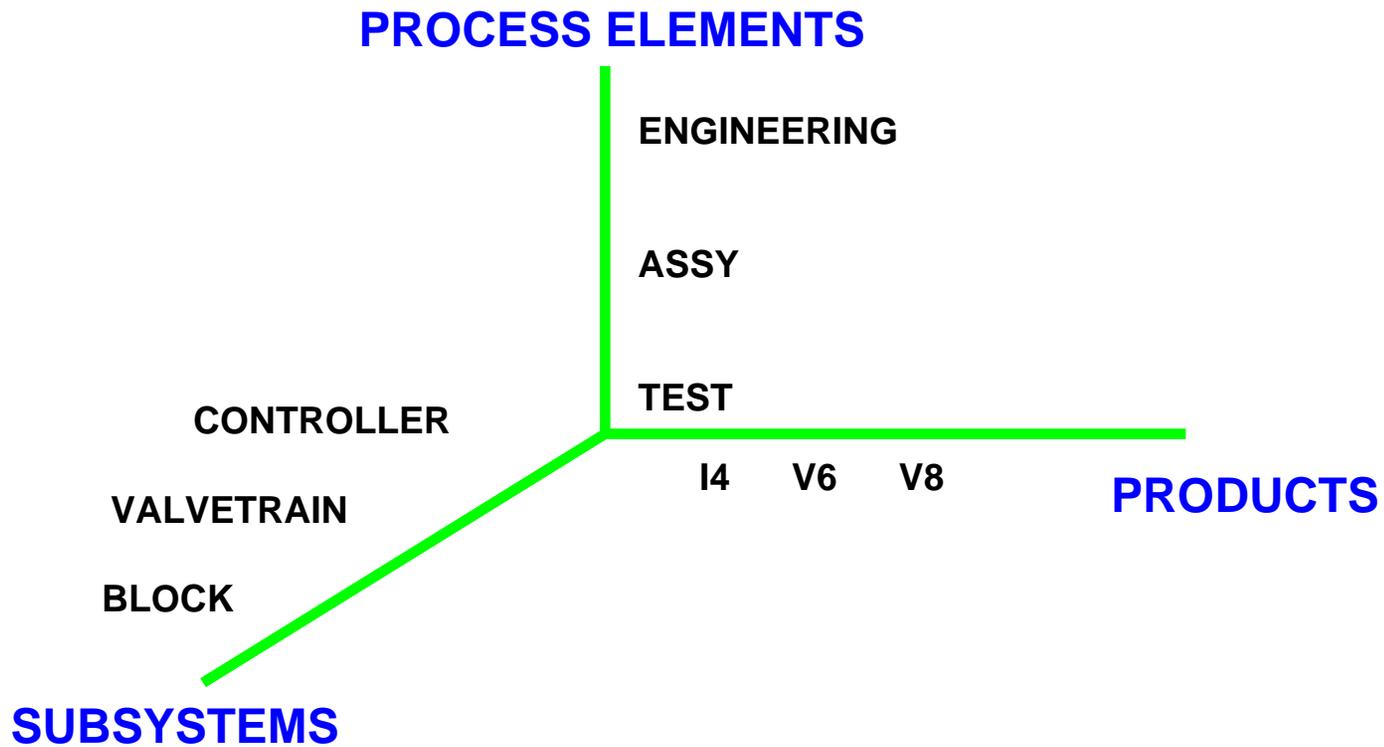


Industry:

LEARNING FROM THE DINOSAURS



SOURCEABLE ELEMENTS



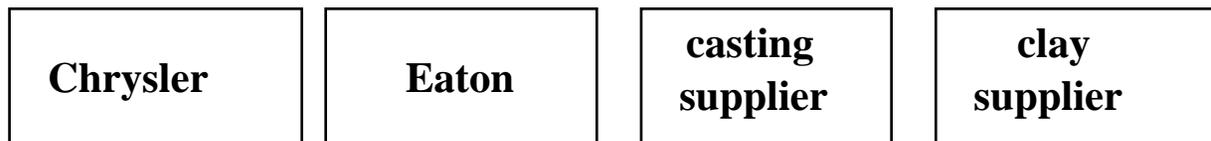
Strategic Make/Buy Decisions: Assess Critical Knowledge & Product Architecture

	DEPENDENT FOR KNOWLEDGE & CAPACITY	INDEPENDENT FOR KNOWLEDGE & DEPENDENT FOR CAPACITY	INDEPENDENT FOR KNOWLEDGE & CAPACITY
ITEM IS INTEGRAL	A POTENTIAL OUTSOURCING TRAP	BEST OUTSOURCING OPPORTUNITY	OVERKILL IN VERTICAL INTEGRATION
	WORST OUTSOURCING SITUATION	CAN LIVE WITH OUTSOURCING	BEST INSOURCING SITUATION
ITEM IS MODULAR			

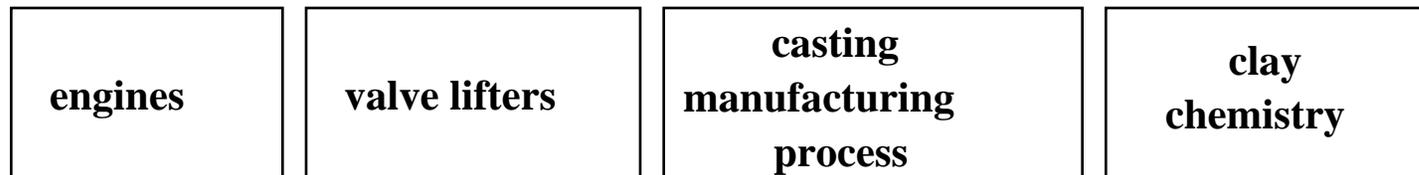
Adapted from: Fine, Charles, and Daniel Whitney. "Is the Make-Buy Decision Process a Core Competence?" MIT Center for Technology, Policy, and Industrial Development, February 1996. Used with permission.

Value Chain Mapping

Organizational Supply Chain



Technology Supply Chain



Capability Chain



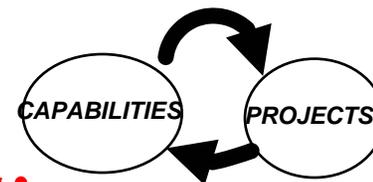
Underlying Assumption: You have to draw the maps before you can assess their dynamics.

VALUE CHAIN DESIGN IS THE ULTIMATE CORE COMPETENCY

Since *all advantages are temporary*,
the only lasting competency is to continuously build and assemble capabilities chains.

KEY SUB-COMPETENCIES:

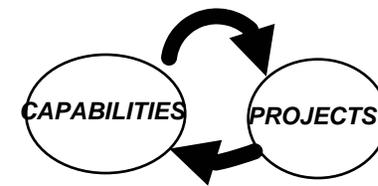
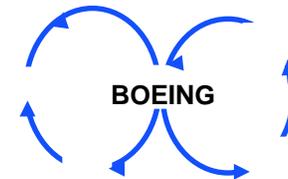
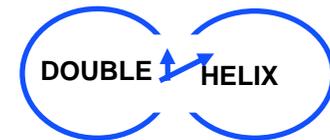
1. **Forecasting the dynamic evolution** of market power and market opportunities
2. **Anticipating** Windows of Opportunity
3. **3-D Concurrent Engineering:**
Product, Process, Value Chain



Fortune Favors the Prepared Firm

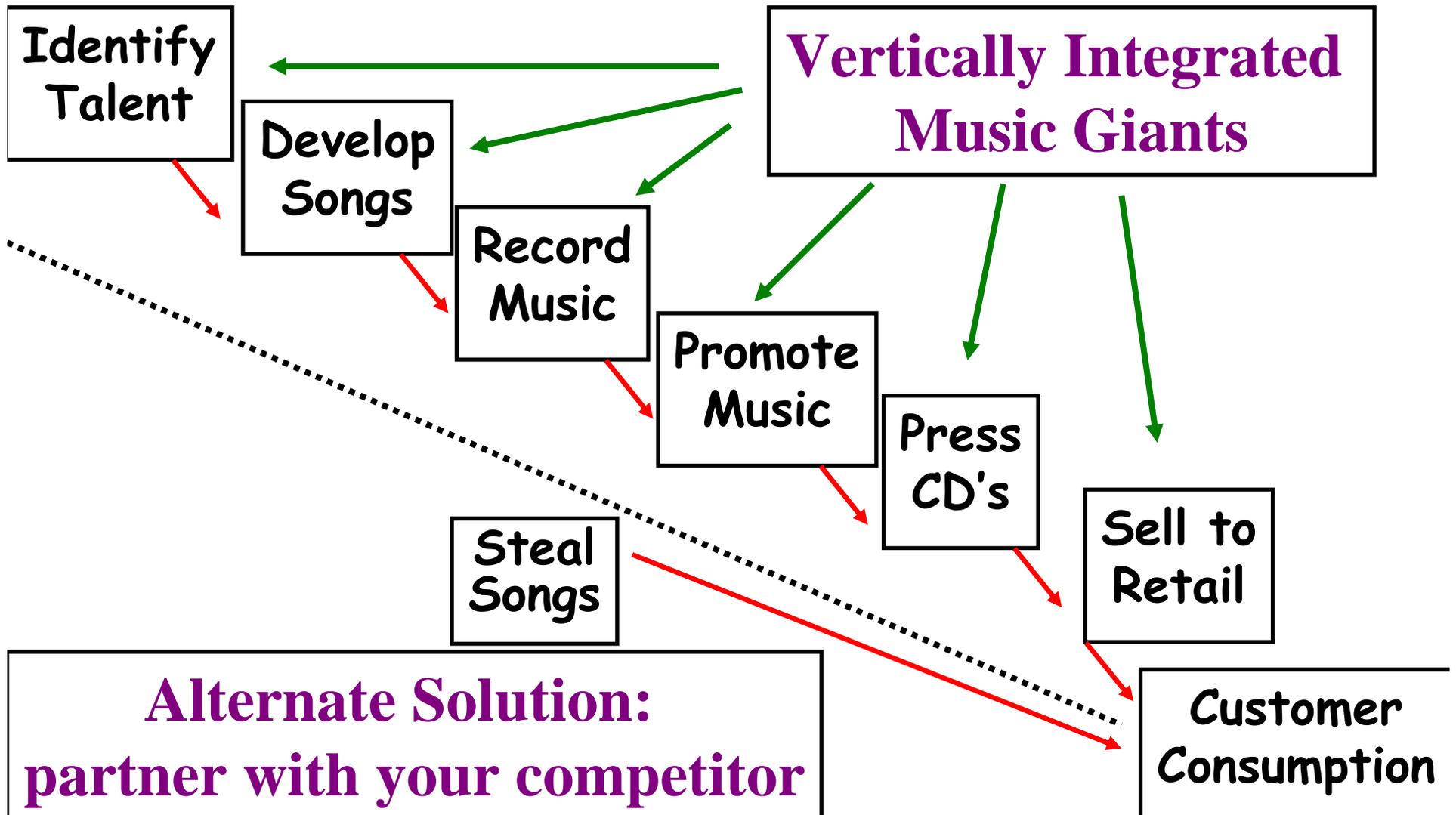
PROCESS FOR VALUE CHAIN DESIGN

1. Benchmark the **Fruit Flies**
2. Map your Supply Chain
 - Organizational Value Chain
 - Technology Value Chain
 - Competence Chain
3. Dynamic Chain Analysis
at each node of each chain map
4. Identify **Windows of Opportunity**
5. Exploit **Competency Development Dynamics**
with **3-D Concurrent Engineering**



DOT.COM COMPETITION: FOCUS ON THE SUPPLY CHAIN

Napster's New Supply Chain Strategy (go to the end and steal everything!)



STRATEGY IN 3-D: CASE EXAMPLES



**Boeing: Static 3-D in airplane Projects
Dynamic, Strategic Value Chain,
unintegrated w/ Product & Process**

**Intel: Modular Product vs. Process
Integral Process and Value Chain**

**Chrysler: Modular Product & Value Chain
(weak on process?)**

**Toyota: Integral 3-D in Nagoya
(weak on global 3-D?)**

Team Exercise: Value Chain Analysis

Consider one of these five industries (or one of your own):

- Food
- Defense aircraft
- Automobiles
- Handheld electronic organizers/communicators
- Music

What are the key elements in the value chain?

What are the key dynamic processes
influencing power in the chain?

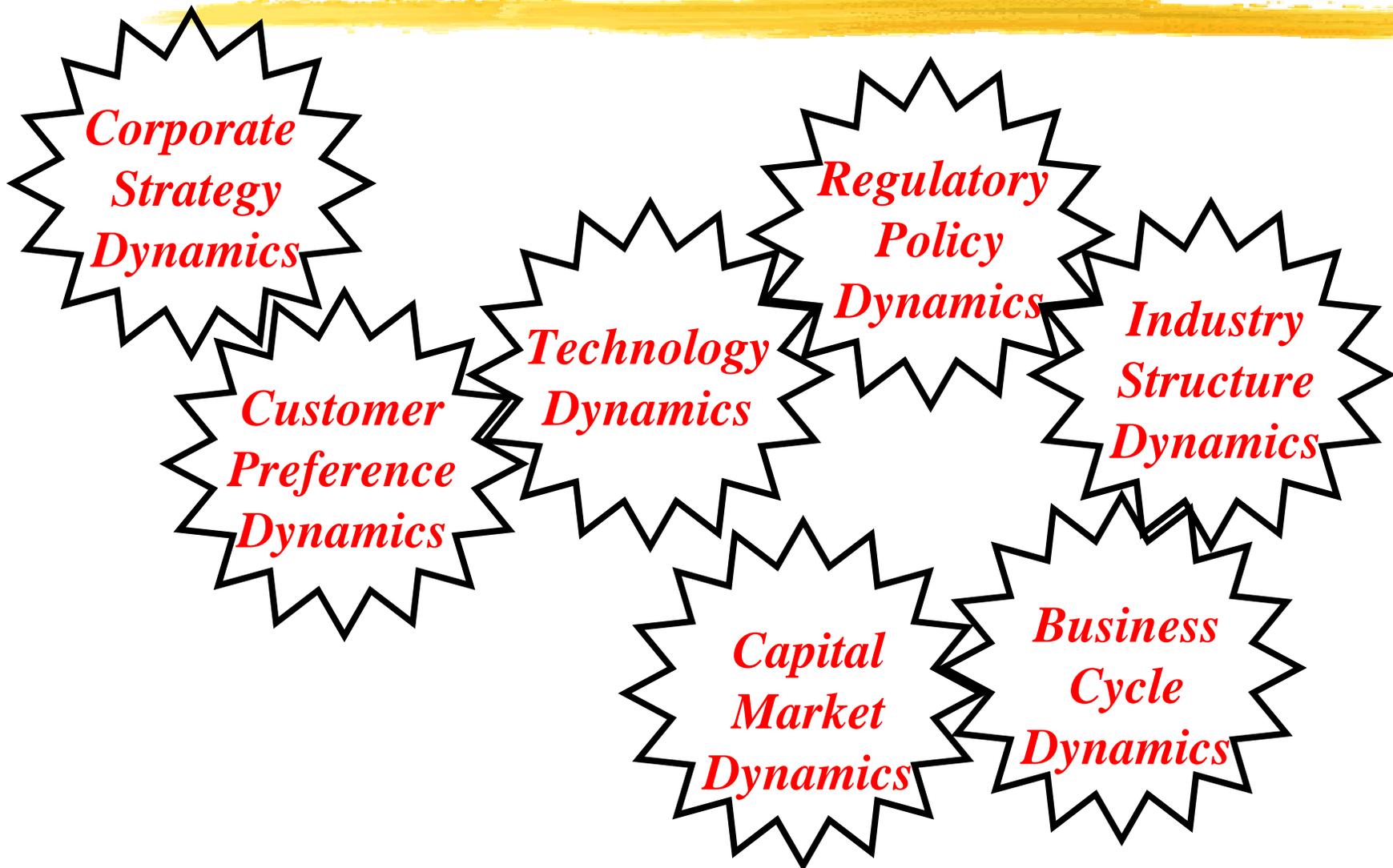
What are the key dependency relationships in the value chain?

What is driving the clockspeed in the chain?

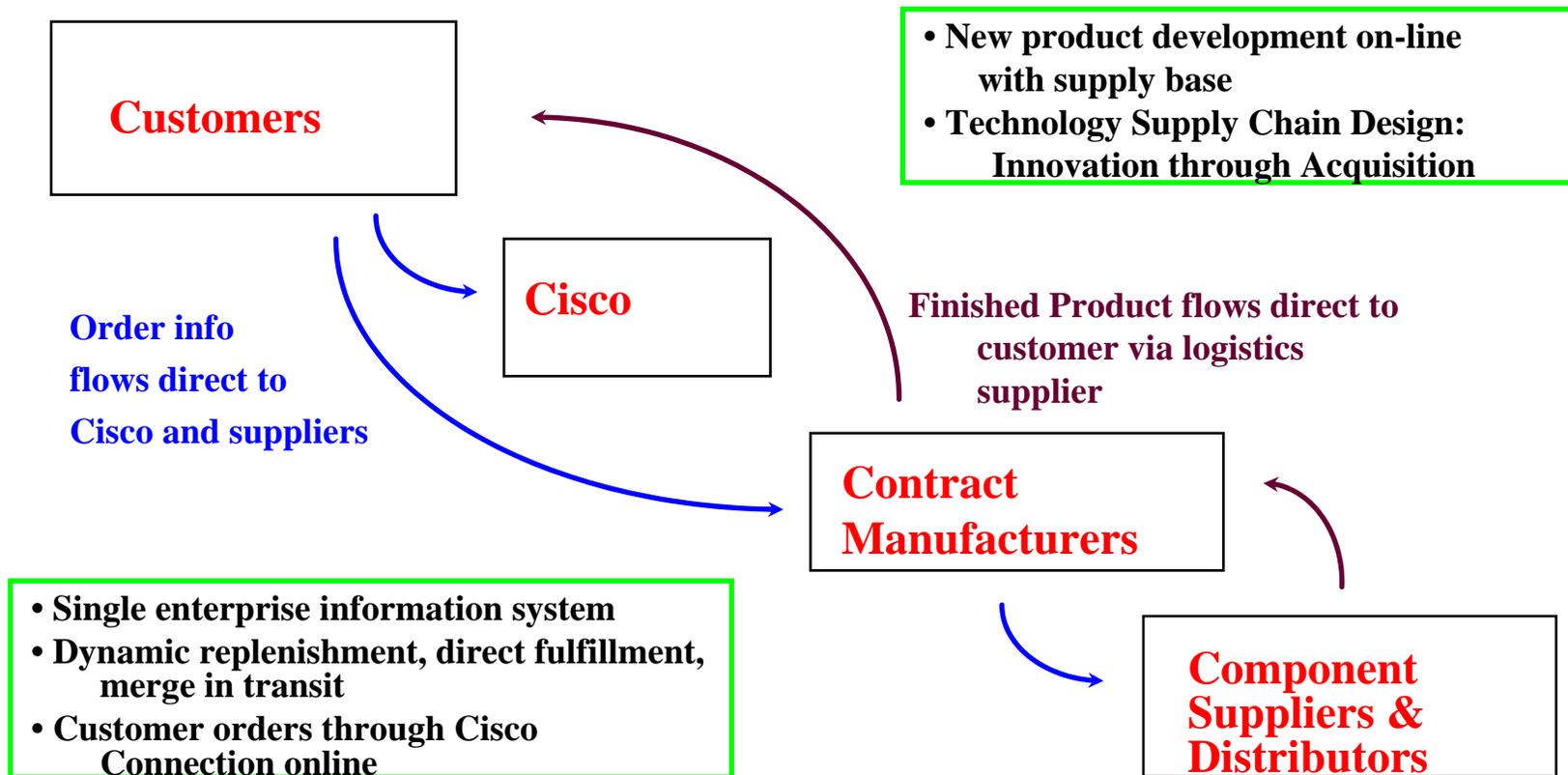
What are the opportunities for outsourcing ?

What are the windows of opportunity in the chain?

Dynamic Analysis to Support Industry & Technology Roadmapping



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



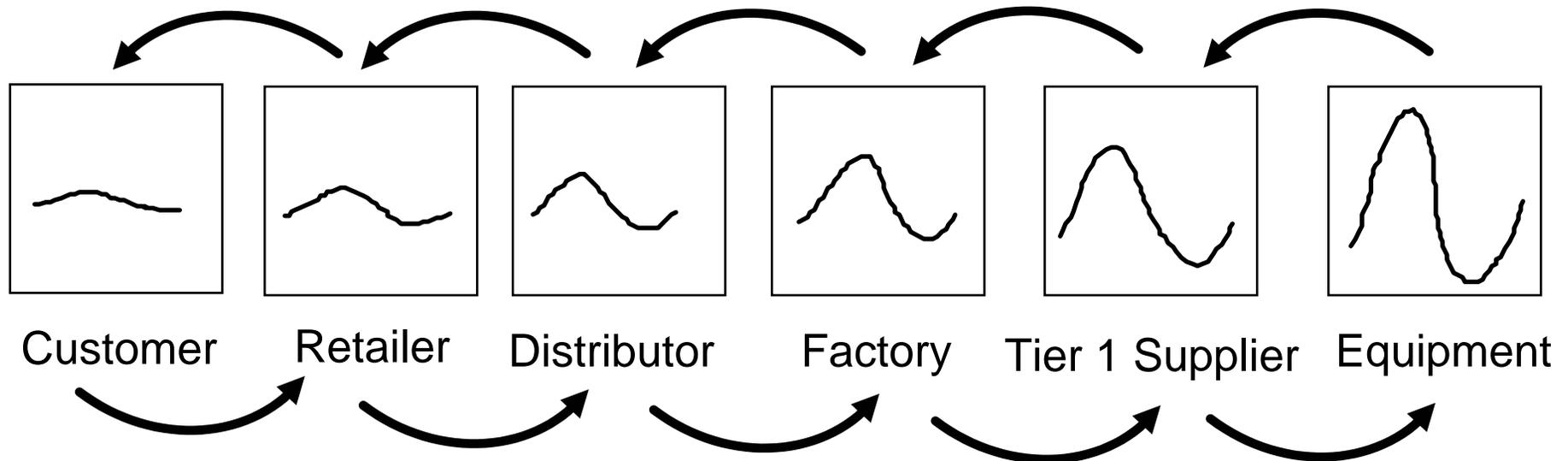
Basic Design Principle: Arm's length Relationship with Fulfillment Chain Partners

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: "The Bullwhip Effect"



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)

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

For this chart, see:

Anderson Jr., Edward G., Charles H. Fine, and Geoffrey G. Parker. "Upstream Volatility in the Supply Chain: The Machine Tool Industry as a Case Study." *Production and Operations Management* 9, no. 3 (Fall 2000): 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.

Bonus Question:

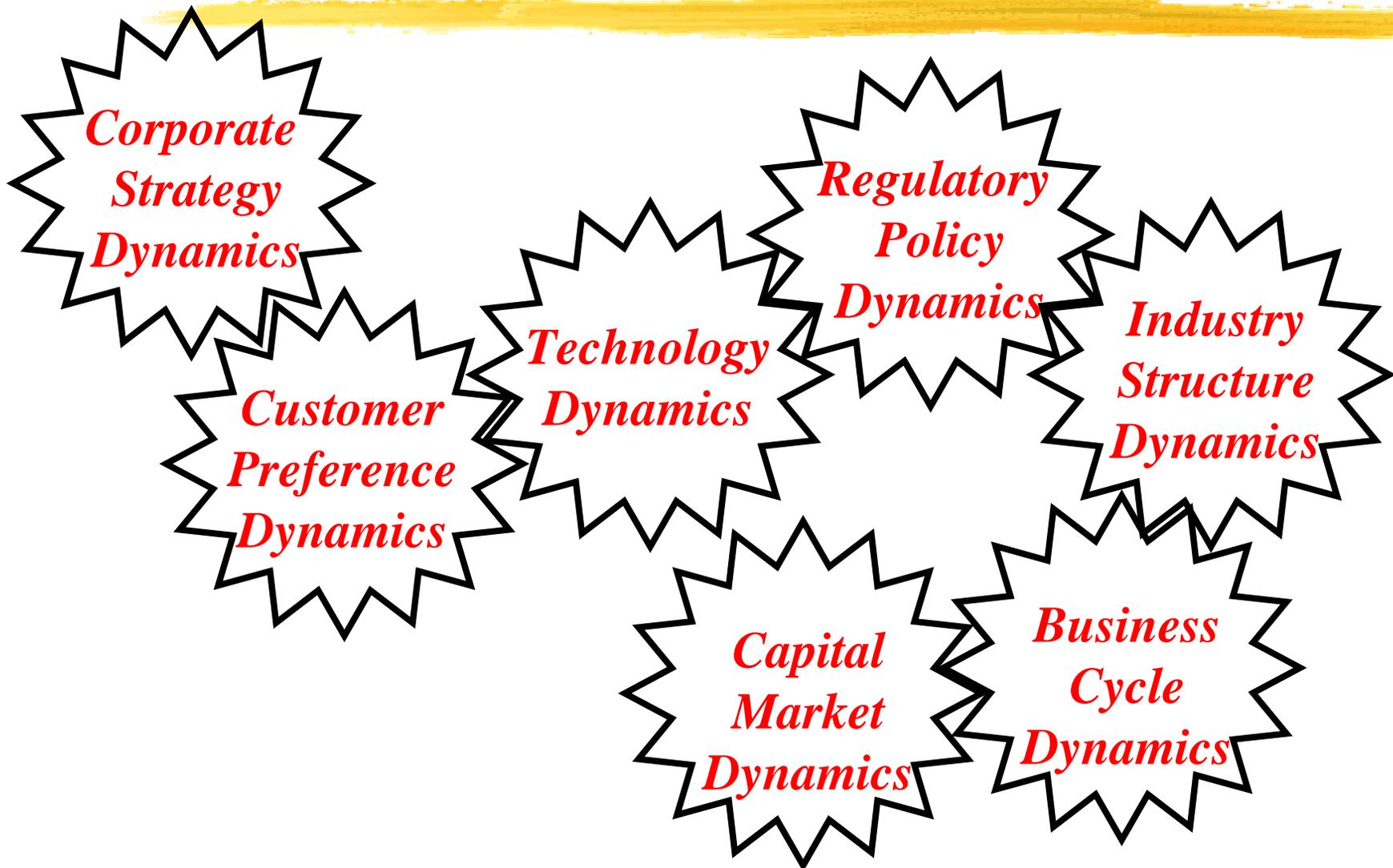
How does clockspeed impact volatility?

BUZZ GROUPS



1. HOW HAS THE BULLWHIP AFFECTED A BUSINESS THAT YOU ARE FAMILIAR WITH?
2. HOW FAR UPSTREAM OR DOWNSTREAM DID YOU SENSE THE IMPACT OF THE BULLWHIP?
3. WHAT MIGHT HAVE BEEN DONE DIFFERENTLY TO REDUCE THE NEGATIVE IMPACT OF THE BULLWHIP?

Dynamic Analysis to Support Industry & Technology Roadmapping



All Conclusions are *Temporary*



Clockspeeds are increasing almost everywhere

**Many technologies and industries exhibits fast
clockspeed & high volatility**

**Value chain design and service system key
competencies**

**Study of Fruit Flies can help with crafting
strategy**