

Value Chain Dynamics: *Business and Supply Chain Strategy* *in a Fast-Clockspeed World*

1

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Supply Chains and Value Chains

2

Supply Chain Management

Order fulfillment

Reaction & Anticipation

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

"The Physics of Flow"

Value Chain Design

System Design

Static

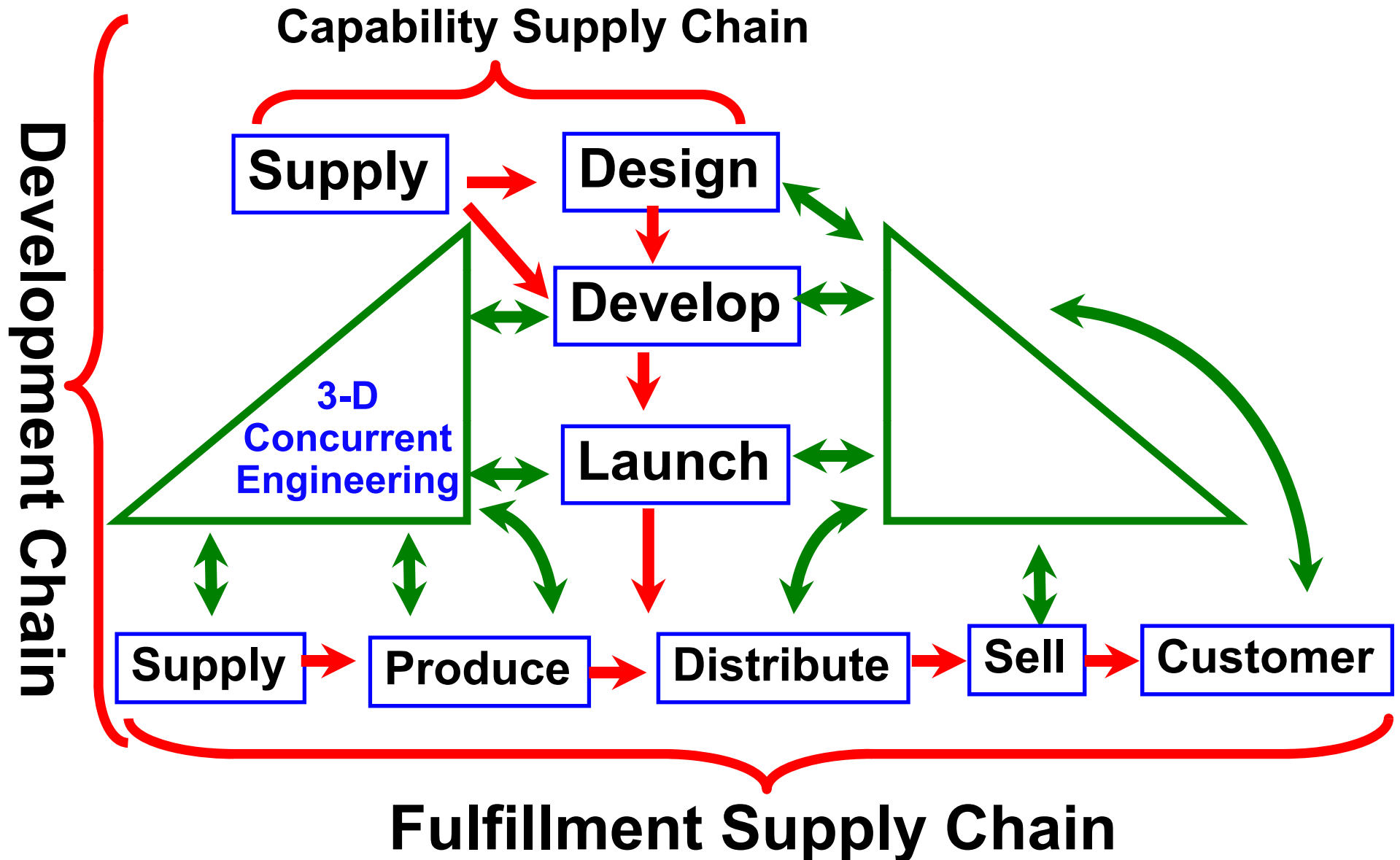
- Core competences
- Make/Buy
- Relationship Design
- Strategic Intent

Dynamic

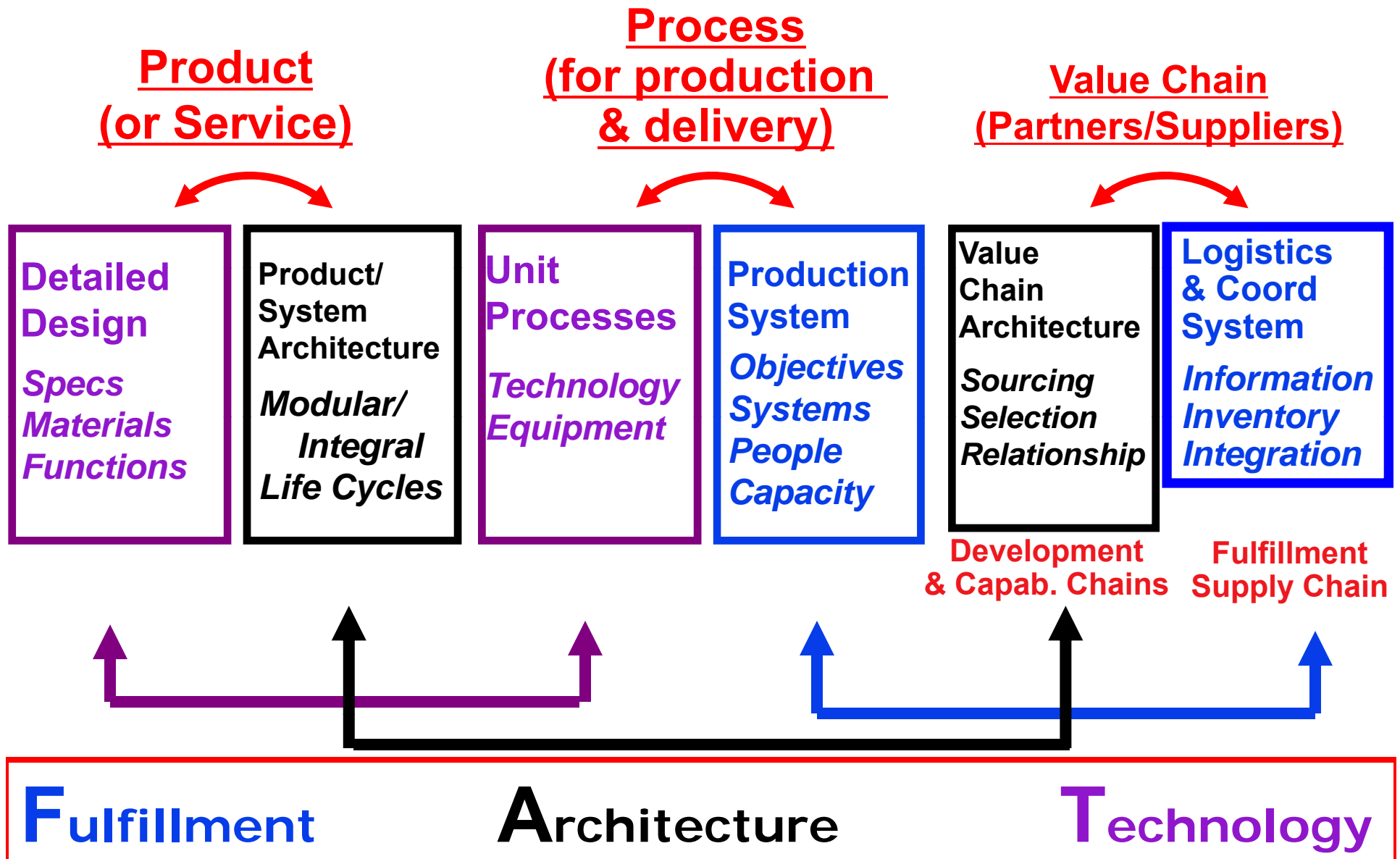
- Fast Clockspeed
- External Forces
- Disintegration
- Dependence
- Capability development
- Disintermediation

"The Biology of Evolution"

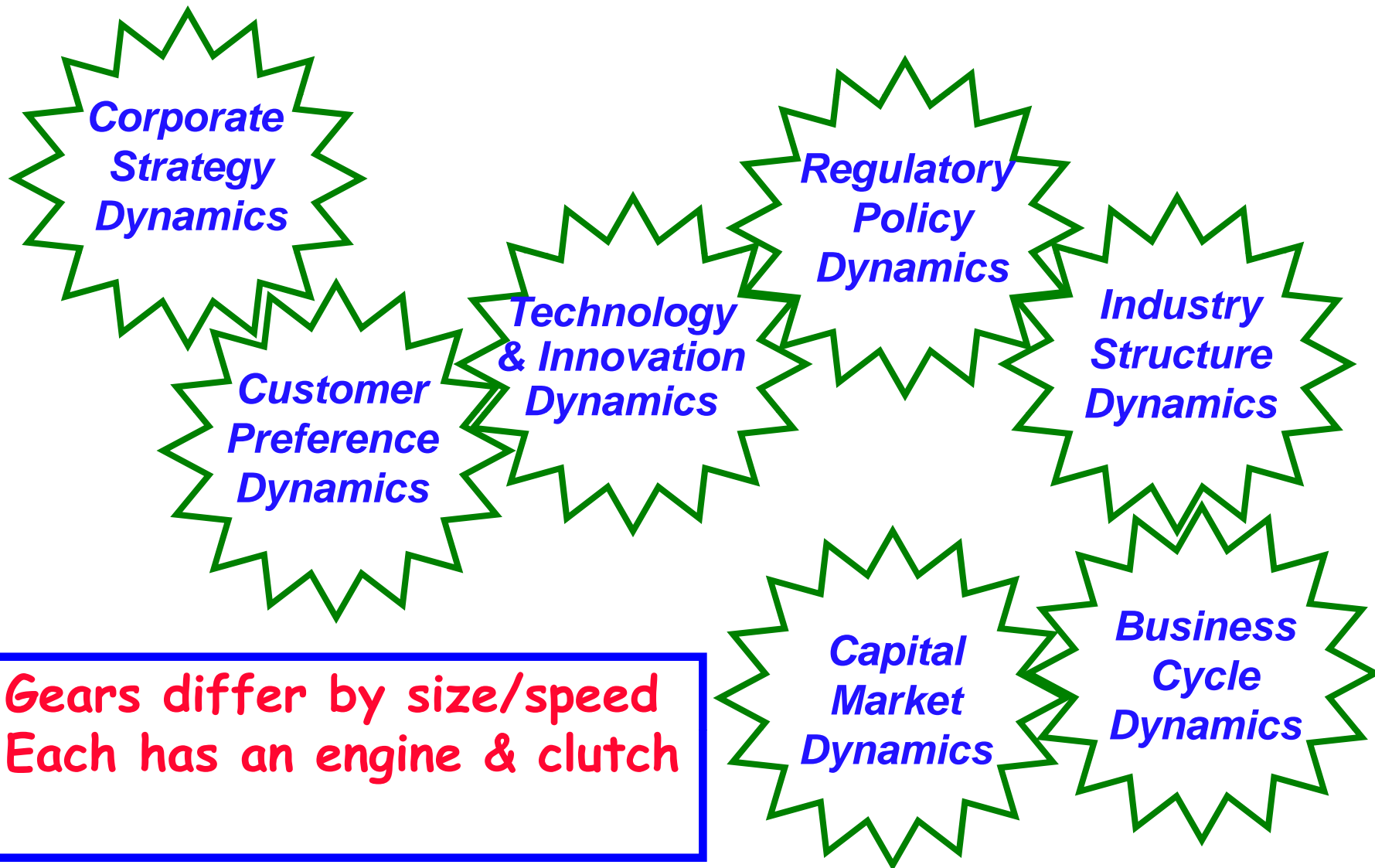
The Three Chains of Enterprise Design: *Fulfillment, Development, & Capability Chains*



3-D Concurrent Engineering & the imperative of concurrency



“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)



MANUFACTURING STRATEGY FORMULATION

1. DRAFT MISSION STATEMENT (ADVISED BY BENCHMARKS)

2. SET OPERATING OBJECTIVES

- QUALITY**
- COST**
- LEAD TIMES**
- FLEXIBILITY**
- CUSTOMER SATISFACTION**
- INNOVATIVENESS**

3. DEVELOP POLICIES & INVESTMENTS

STRUCTURAL

**CAPACITY ACQUIS.
FACILITIES
EQUIPMENT/TECH.
VERTICAL INTEG.**

INFRASTRUCTURAL

**HUMAN RESOURCES
QUALITY ASSUR.
PDTN. PLAN/CONT.
PRODUCT DEVELOP.
PERF. MEAS/EVAL
CAPITAL ALLOC.
ORG. STRUCTURES.**

Major Manufacturing Decision Categories

1. **FACILITIES**
 - size
 - location
 - focus
2. **CAPACITY**
 - amount
 - timing
 - type
3. **VERTICAL INTEGRATION AND SUPPLIER MANAGEMENT**
 - direction
 - extent
 - interfaces
 - collaboration
4. **PRODUCTION TECHNOLOGIES AND PROCESSES**
 - equipment
 - automation
 - interconnectedness
 - scale
 - flexibility
5. **WORK FORCE AND MANAGEMENT**
 - wage policies
 - security
 - skill levels
6. **INFORMATION TECHNOLOGIES**
 - use and level of investment
 - parity or differentiation
7. **SUPPLY CHAIN AND MATERIALS**
 - logistics facilities and methods
 - inventory policies
 - vendor relations
 - production planning
8. **ORGANIZATION AND INCENTIVES**
 - structure
 - reporting levels
 - degree of centralization
 - role of staff
 - control/reward systems
 - costing systems
9. **BUSINESS PROCESSES**
 - product generation
 - interfaces
 - responsibilities
 - vendor development
 - order fulfillment
 - service and support
 - quality management, flexibility, and other cross-cutting capabilities

SAMPLE MANUFACTURING STRATEGY TEXT

MANUFACTURING VISION

MANUFACTURE WORLD-CLASS QUALITY AUTO COMPONENTS
IN THE PRESCRIBED VOLUMES, ON SCHEDULE, AT THE LOWEST
COST

MANUFACTURING MISSION

ACHIEVE WORLD-CLASS STATUS (BY THE YEAR 20xx) IN
QUALITY COST, TIME, AND FLEXIBILITY WITH PEOPLE WHO
HAVE A SHARED VISION AND OBJECTIVES THAT ARE BASED ON
A CULTURE OF CONTINUOUS PROCESS IMPROVEMENT

PERFORMANCE METRICS

1. QUALITY: PRODUCT & PROCESS
2. COST/PRODUCTIVITY
3. TIME
4. FLEXIBILITY

SAMPLE MANUFACTURING STRATEGY FRAMEWORK (CONTINUED)⁹

PROCESSES

- TECHNOLOGY
- CAPABILITY
- CONTROL
- FLEXIBILITY
- STD. OPER. PROCS.

PEOPLE

- SKILLS, TRAINING, HIRING PRACTICES
- KNOWLEDGE, EXPERTISE, EMPOWERMENT
- PARTNERSHIP W/ ACCOUNTABILITY
- FLEXIBILITY
- ENVIRONMENT

VALUE CHAIN

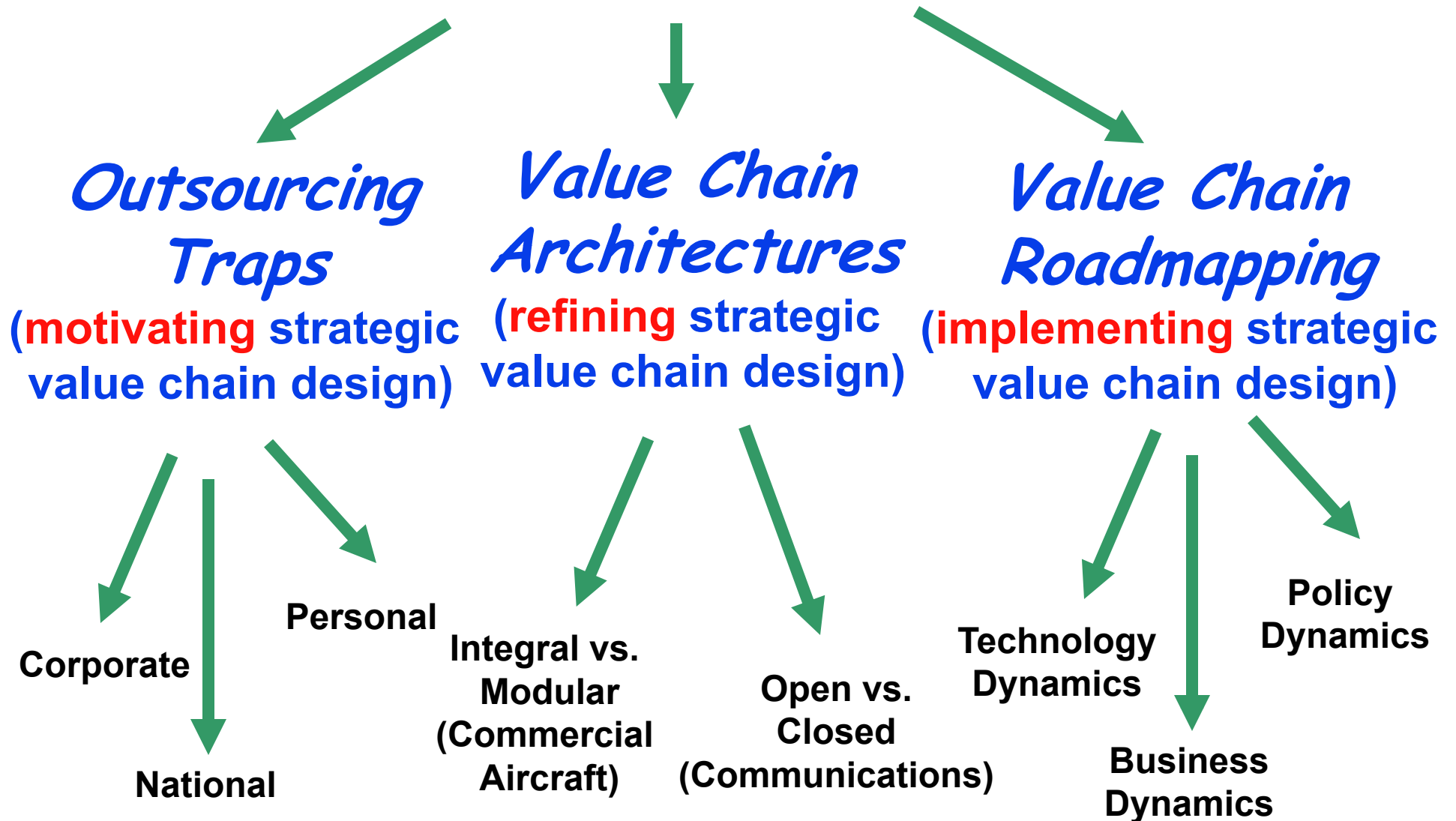
INTERNAL

- PROCUREMENT/SUPPLY
- ENGINEERING
- MARKETING/SALES
- DESIGN OFFICE
- FINANCE
- LABOR RELATIONS

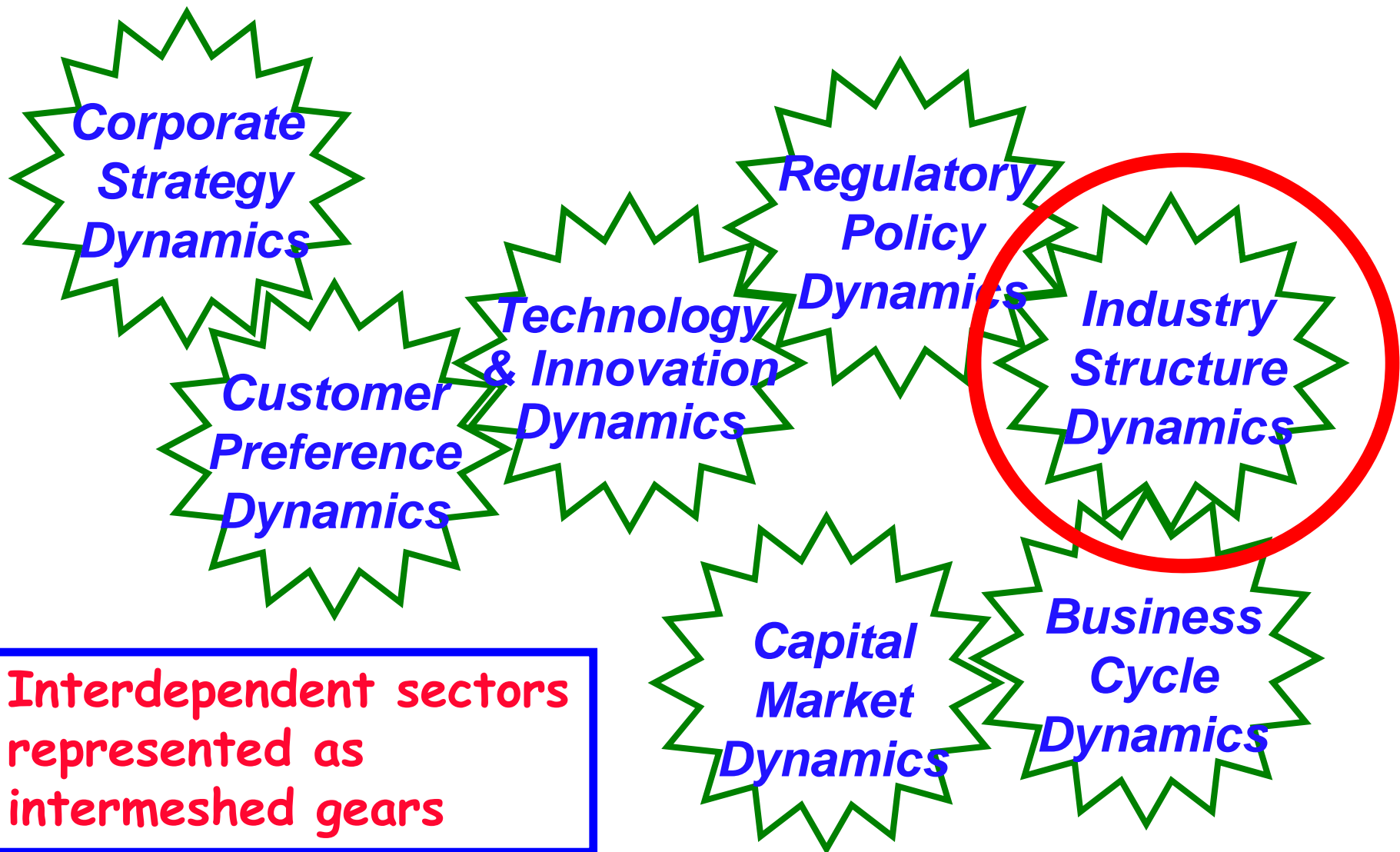
EXTERNAL

- WORLD-CLASS BENCHMARKS
- CUSTOMERS & DEALERS
- SUPPLIERS
- GOVERNMENT
- UNIVERSITIES

Value Chain Dynamics as an Operations Strategy Lens

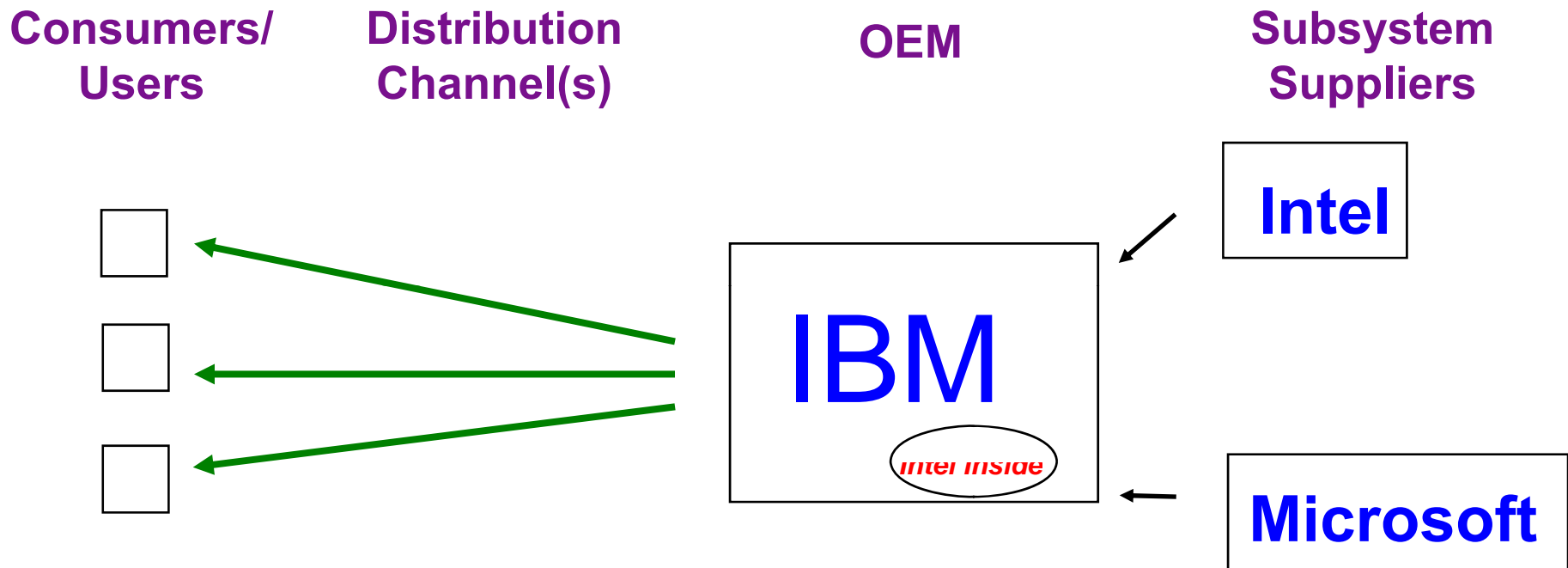


“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)



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

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



The Outcome:

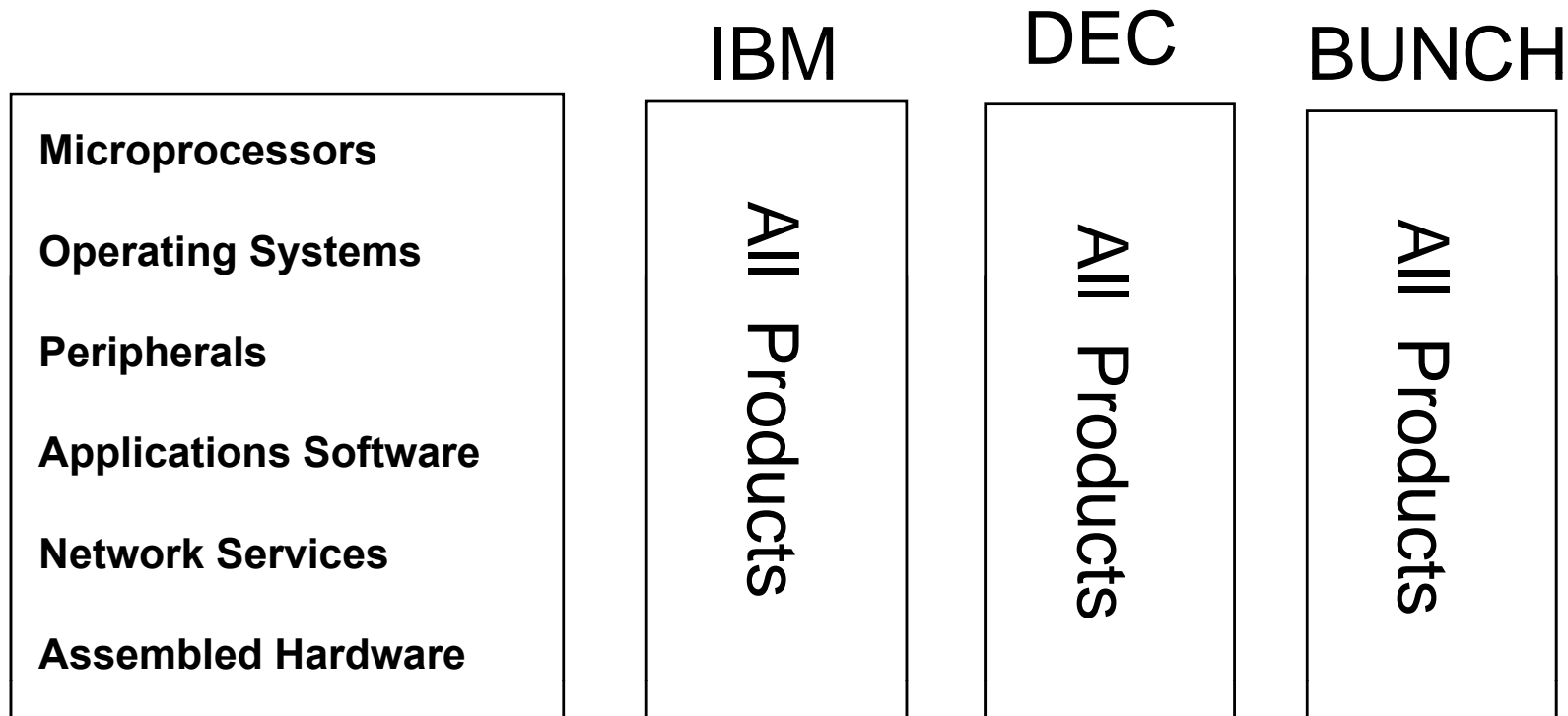
A phenomenally successful product design
A disastrous value chain design (for IBM)

LESSONS FROM A FRUIT FLY: *THE PERSONAL COMPUTER*

1. BEWARE OF *INTEL INSIDE*.
(Regardless of your industry)
2. TACTICAL MAKE/BUY:
IT MAY BE A LITTLE BIT *CHEAPER* OR *FASTER*
TO *OUTSOURCE* VERSUS *INSOURCE*.
3. *STRATEGIC SOURCING*:
VALUE CHAIN 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.

Vertical Industry Structure with *Integral* Product/System Architecture

Computer Industry Structure, 1975-85



(A. Grove, Intel; and Farrell, Hunter & Saloner, Stanford)

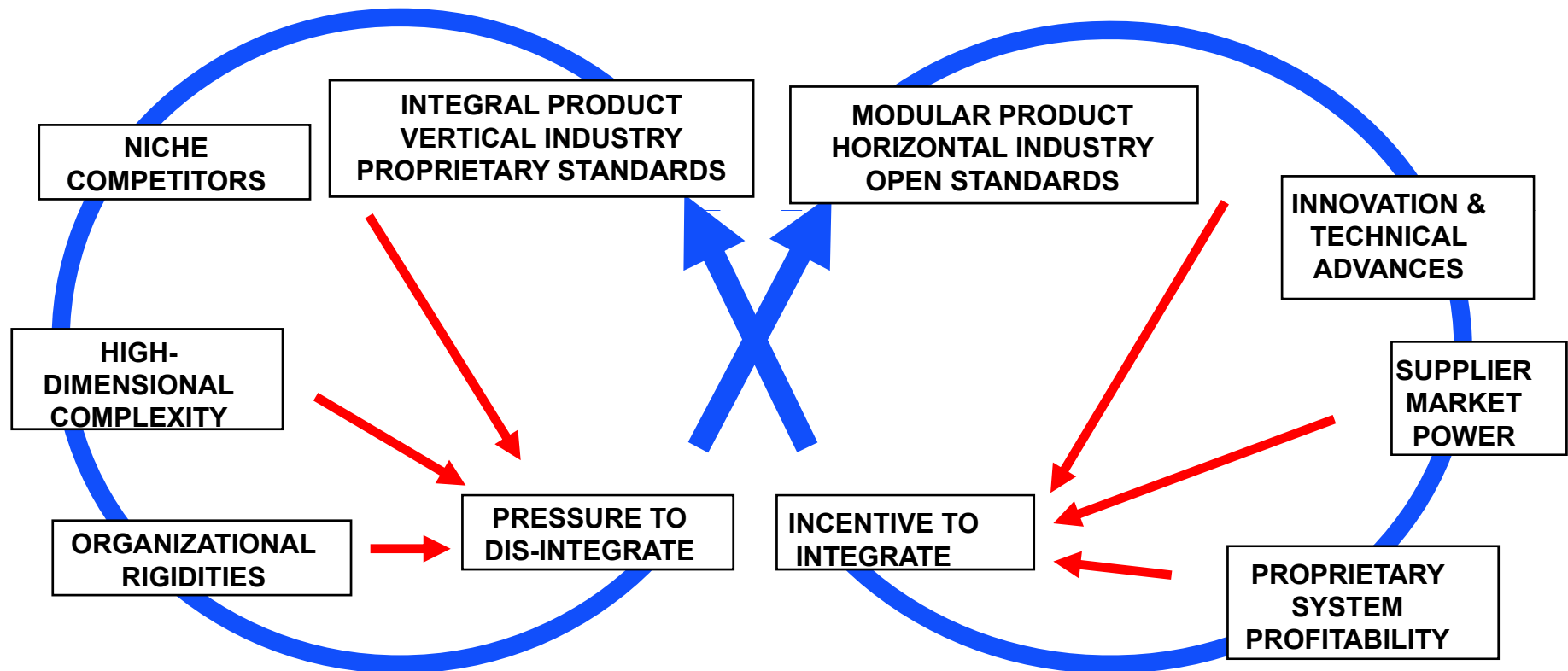
Horizontal Industry Structure with *Modular* Product/System Architecture

Computer Industry Structure, 1985-95

Microprocessors	Intel	Moto	AMD	etc
Operating Systems	Microsoft	Mac	Unix	
Peripherals	HP	Epson	Seagate	etc etc
Applications Software	Microsoft	Lotus	Novell	etc
Network Services	AOL/Netscape	Microsoft	EDS	etc
Assembled Hardware	HP	Compaq	IBM	Dell etc

(A. Grove, Intel; and Farrell, Hunter & Saloner, Stanford)

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

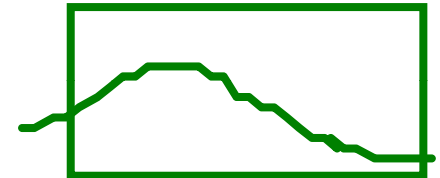
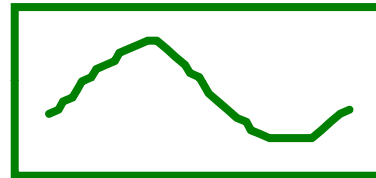
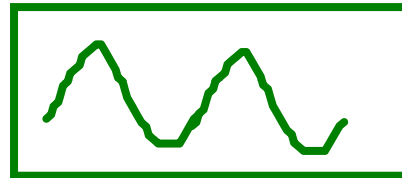
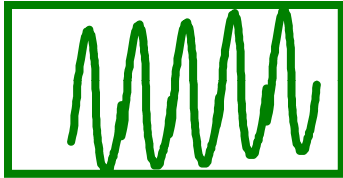


Examples: IBM, Autos, Embraer/Boeing, Nokia, Small Firms

Fine & Whitney, "Is the Make/Buy Decision Process a Core Competence?"

What Drives Clockspeeds?

**technology/innovation push, customer pull,
system complexity, and regulation**



Consumer

**Handset or PC
Applications**

**Handset or PC
Platforms**

**Communications
Equipment
and Networks**

**Semiconductor
Components**

**Semiconductor
Manufacturing
Equipment**

ALL COMPETITIVE ADVANTAGE IS TEMPORARY

Autos:

Ford in 1920, ***GM*** in 1955, ***Toyota*** in 2000

Computing:

IBM in 1970, ***Wintel*** in 1990, ***Apple*** in 2010

World Dominion:

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

Sports:

Red Sox in 2007, ***Celtics*** in 2008, ***Yankees*** in 2009

The faster the clockspeed, the shorter the reign

Value Chain Evolution 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

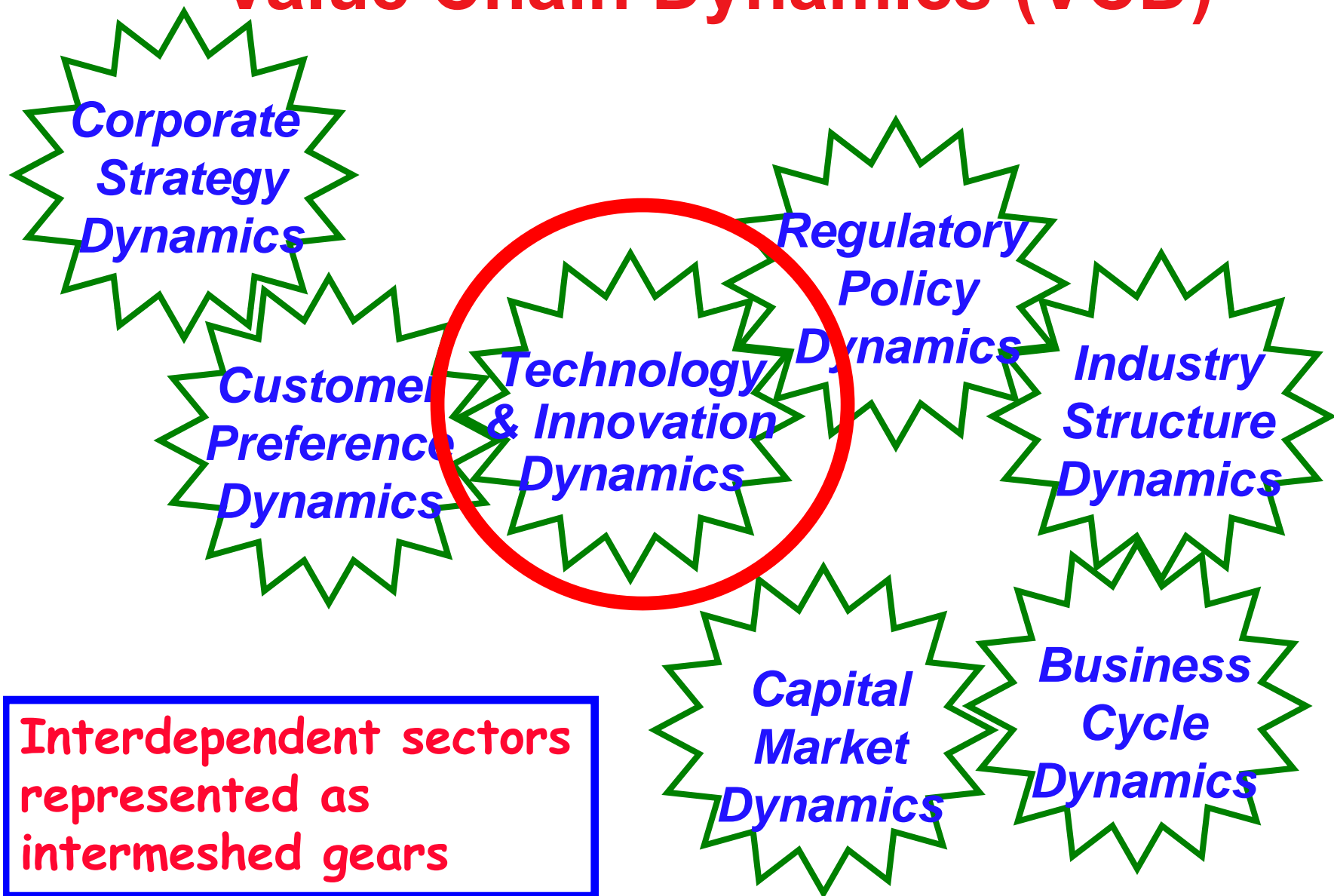
AIRCRAFT evolve faster than

MINERAL EXTRACTION

THE KEY TOOL:

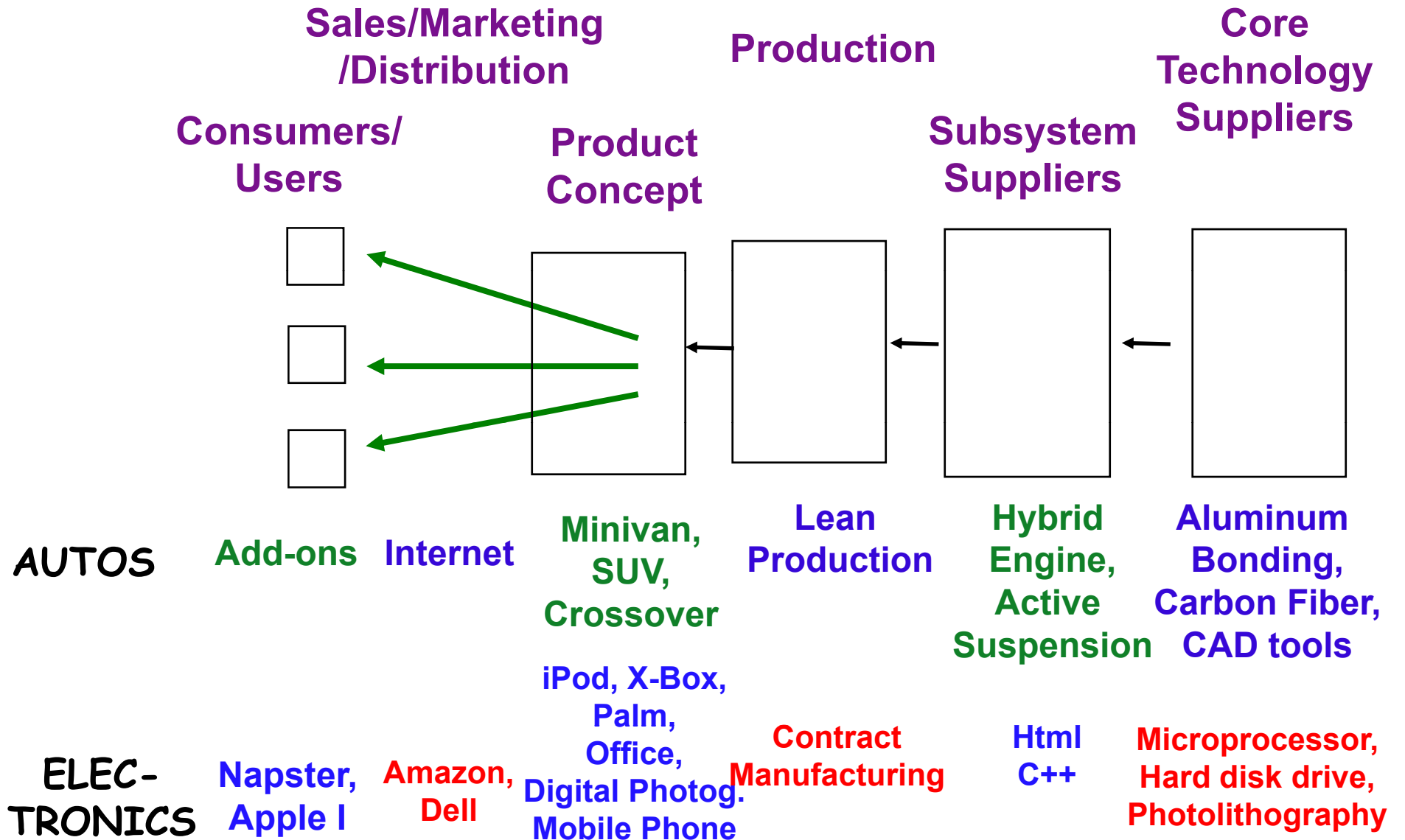
***Cross-INDUSTRY
Benchmarking
of Dynamic Forces***

“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)

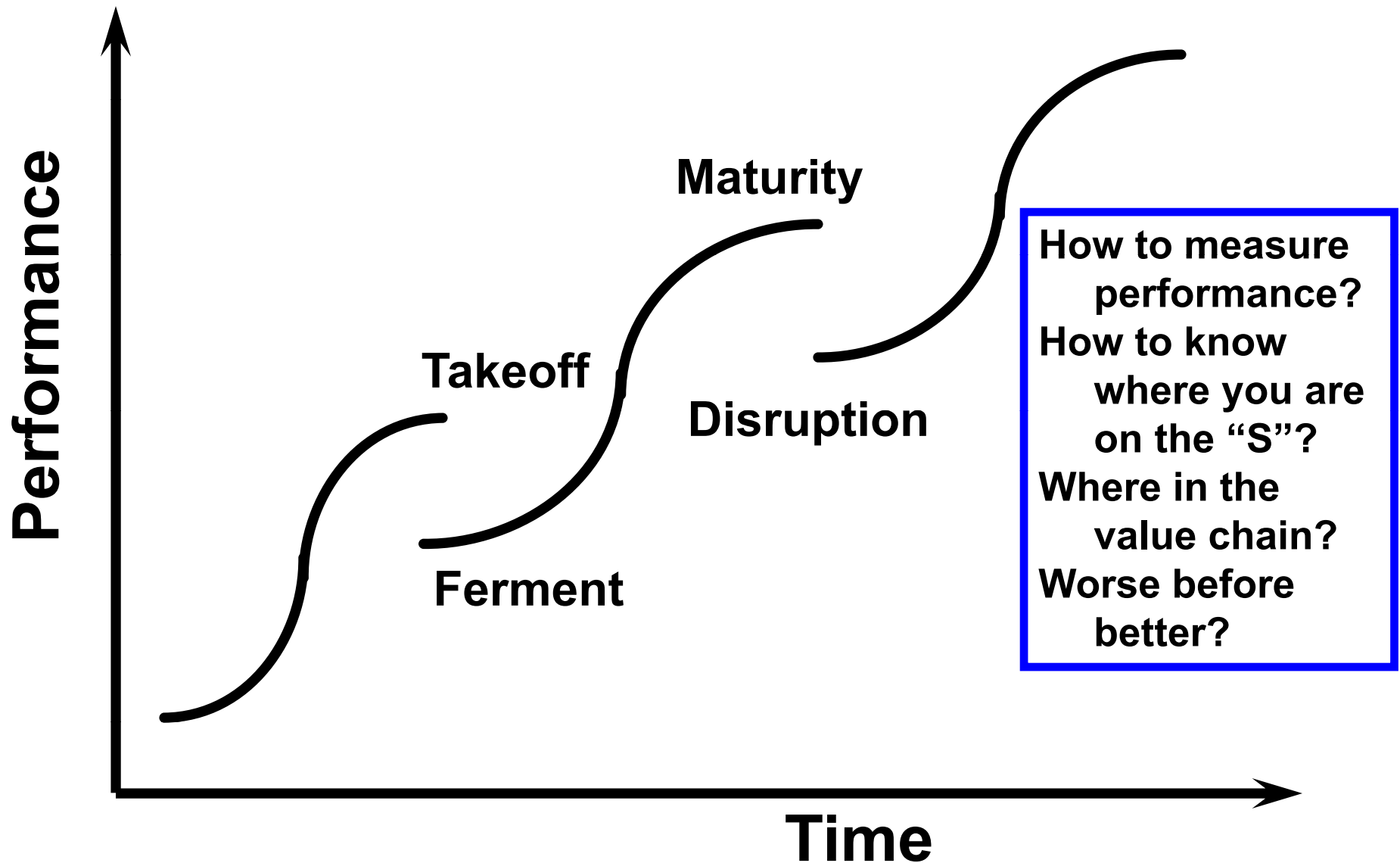


Innovation along the Value Chain:

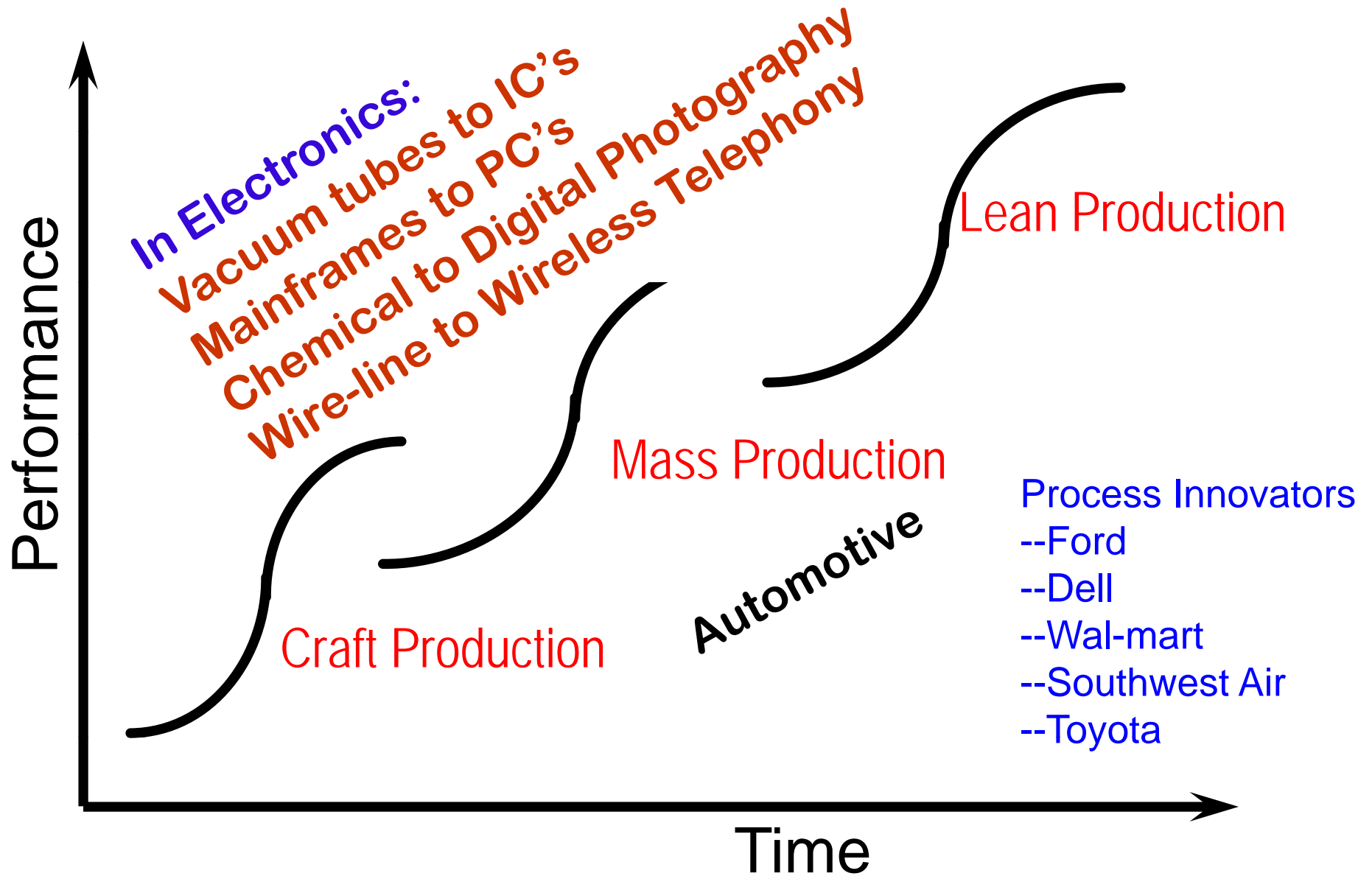
How (& why) do Autos & Electronics Differ?



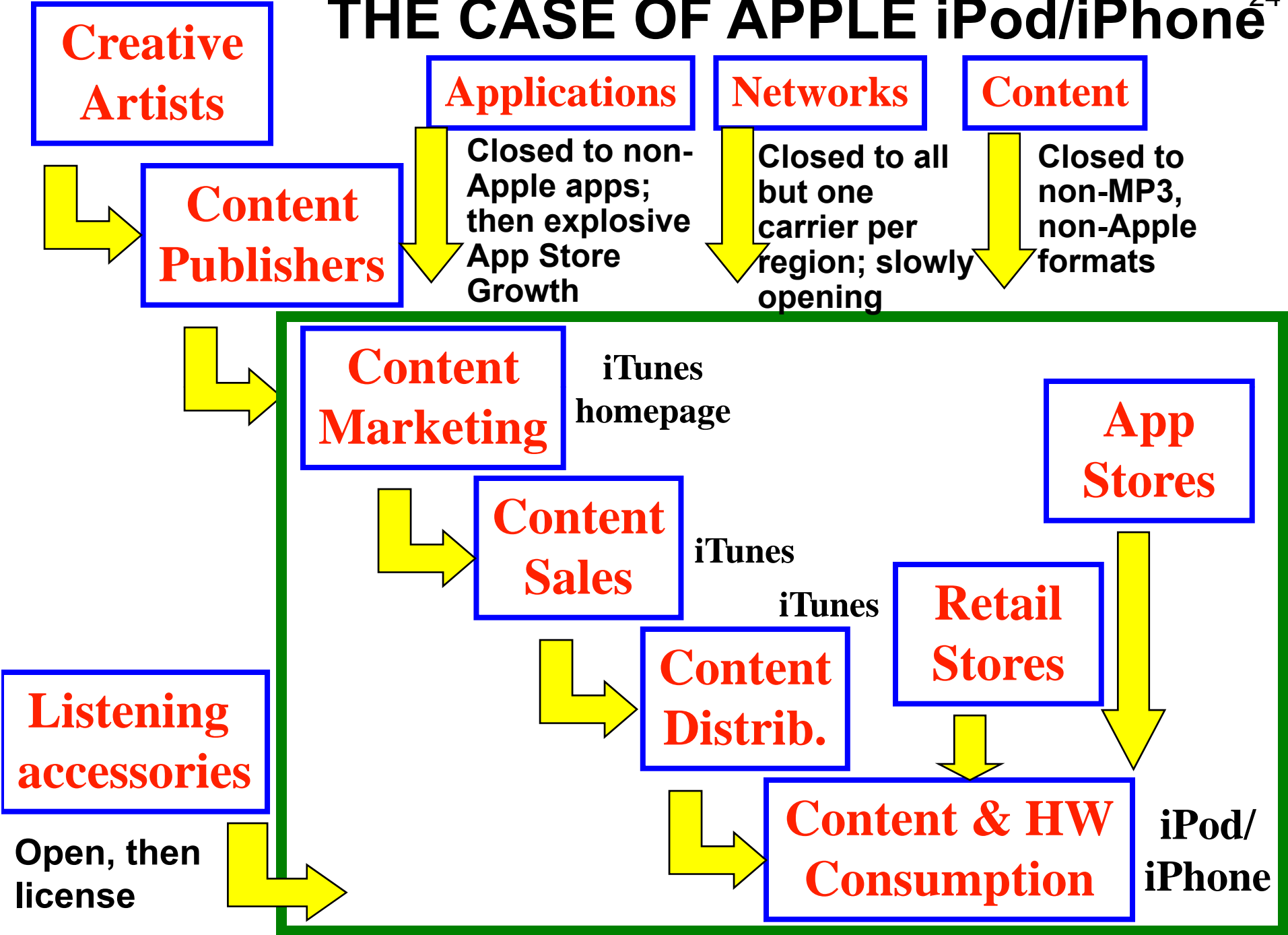
Innovation Dynamics can be RADICAL (*disruptive*) or INCREMENTAL (*sustaining*)



Disruptive *Process* Innovation in Autos vs. Disruptive *Product* Innovation in Electronics



THE CASE OF APPLE iPod/iPhone²⁴



What makes an innovation disruptive?

Performance Push

an overwhelmingly superior technology/process
(penicillin, mass production)

Customer Pull

new customers care about different measures of performance

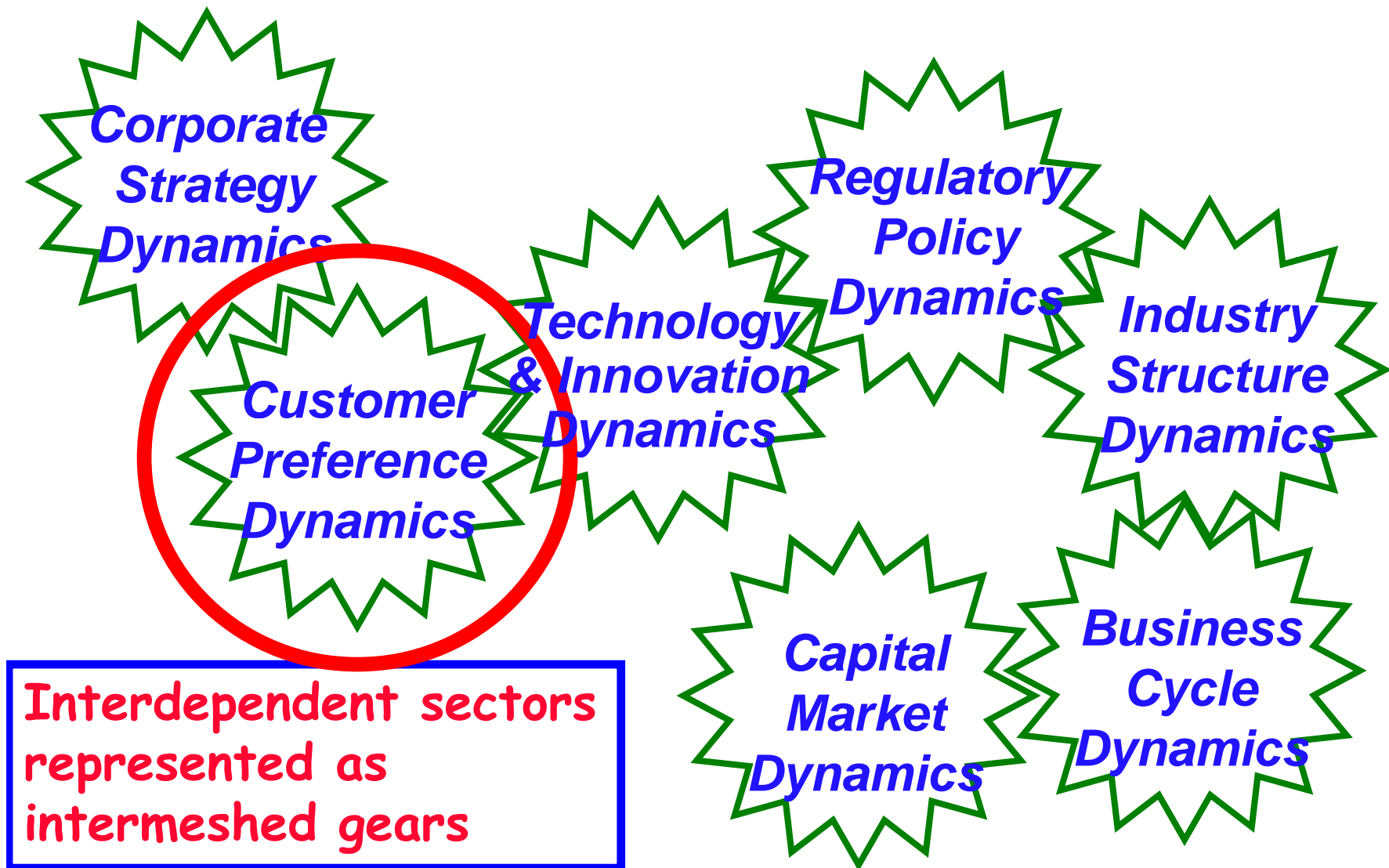
(wireless phones, personal computers)

Organizational Competencies

incumbents cannot do what the innovators can

(Dell supply chain, Southwest Air)

“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)

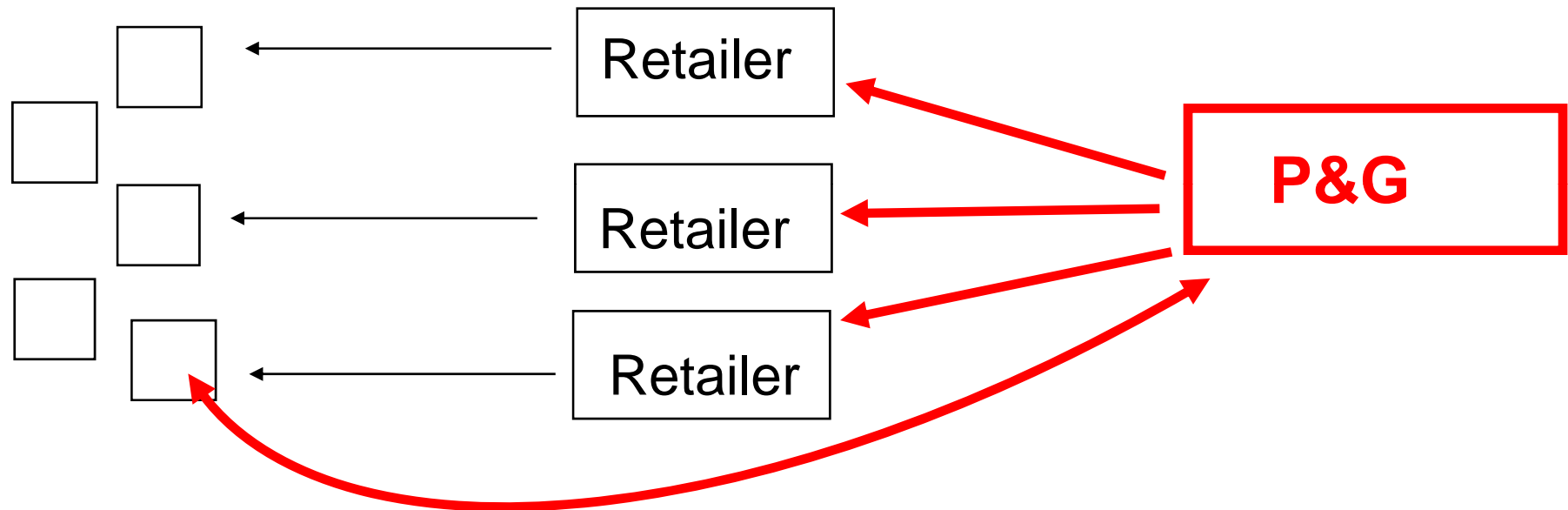


CUSTOMER PREFERENCE DYNAMICS:

P&G Value Proposition: Premium Products at Premium Prices

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

Customers

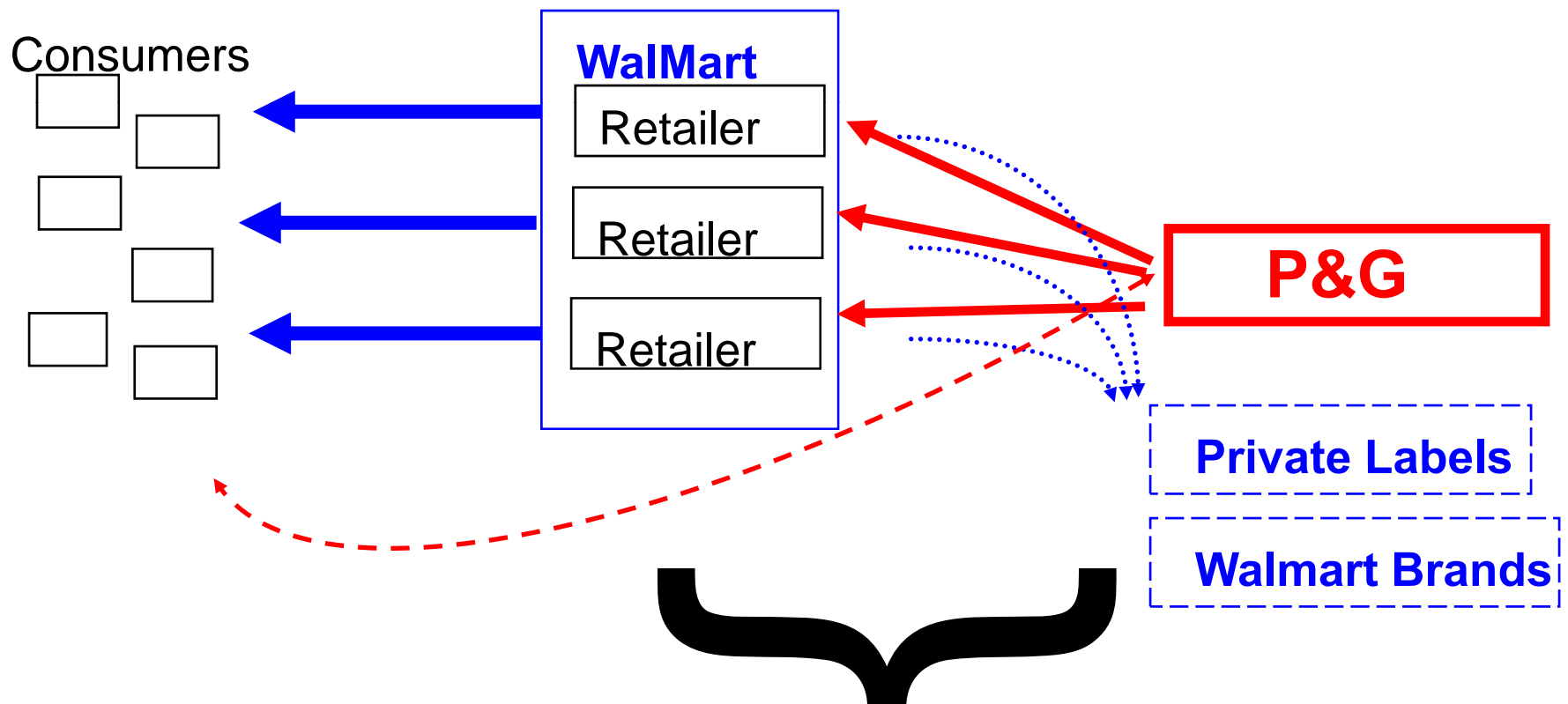


**What is the role of brand names vs. product features?
Laundry Detergent; Mobile Phones; Motorcycles**

CUSTOMER PREFERENCE DYNAMICS:

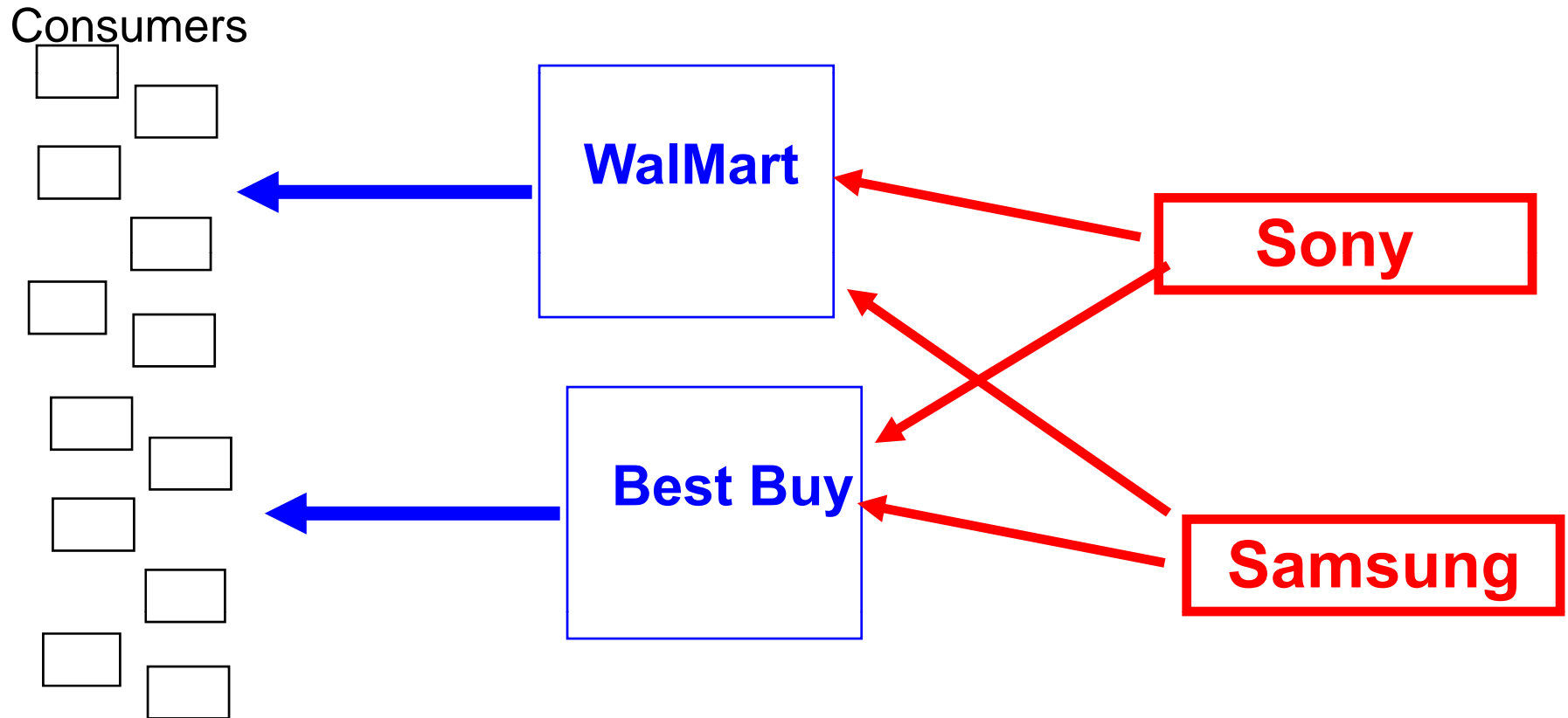
Walmart Value Proposition: Large Selection of Products at Very Low Prices

Controlling the Channel Through Closeness to Customers: Chain Proximity

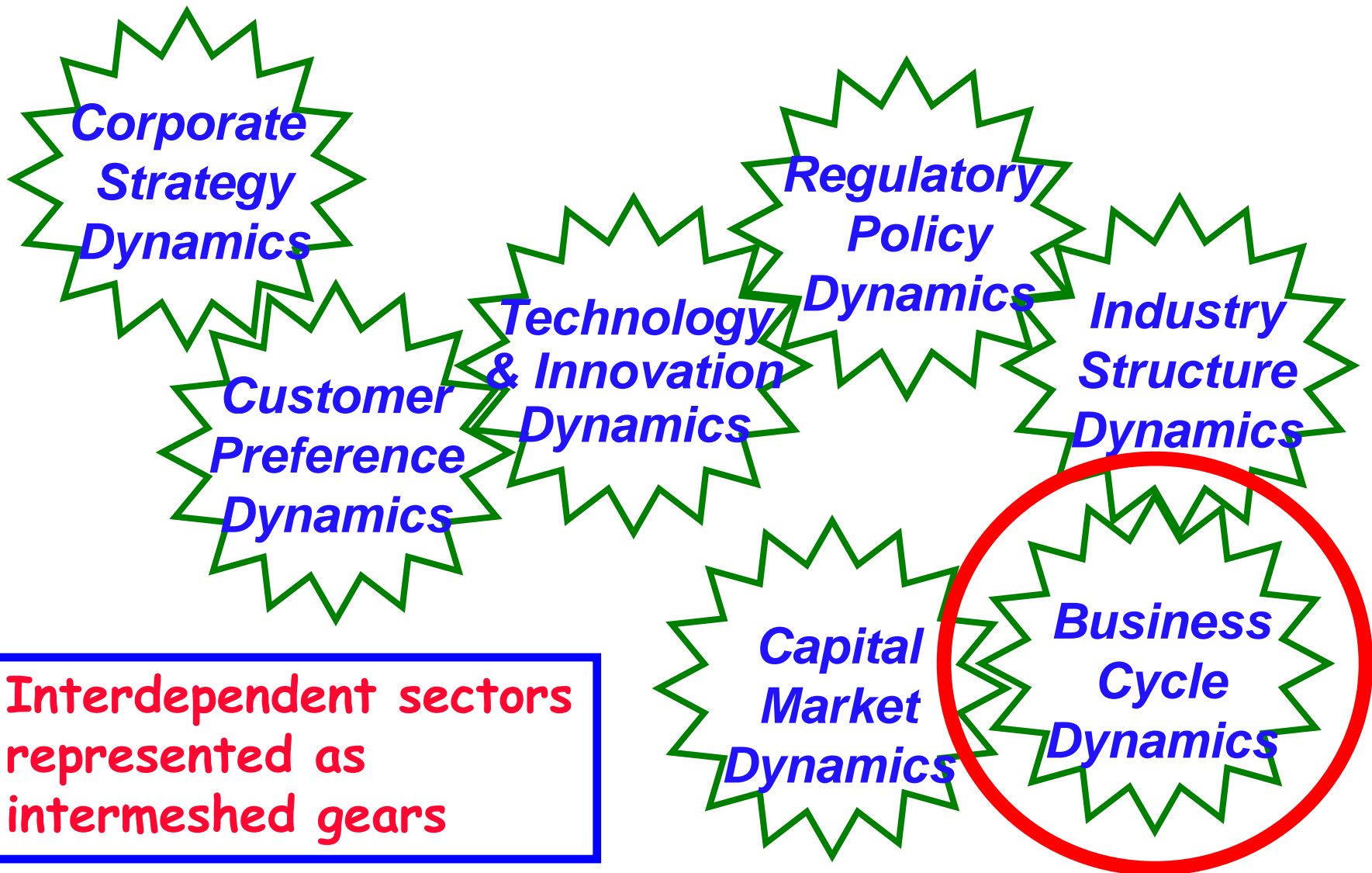


Vertical Growth on the Double Helix

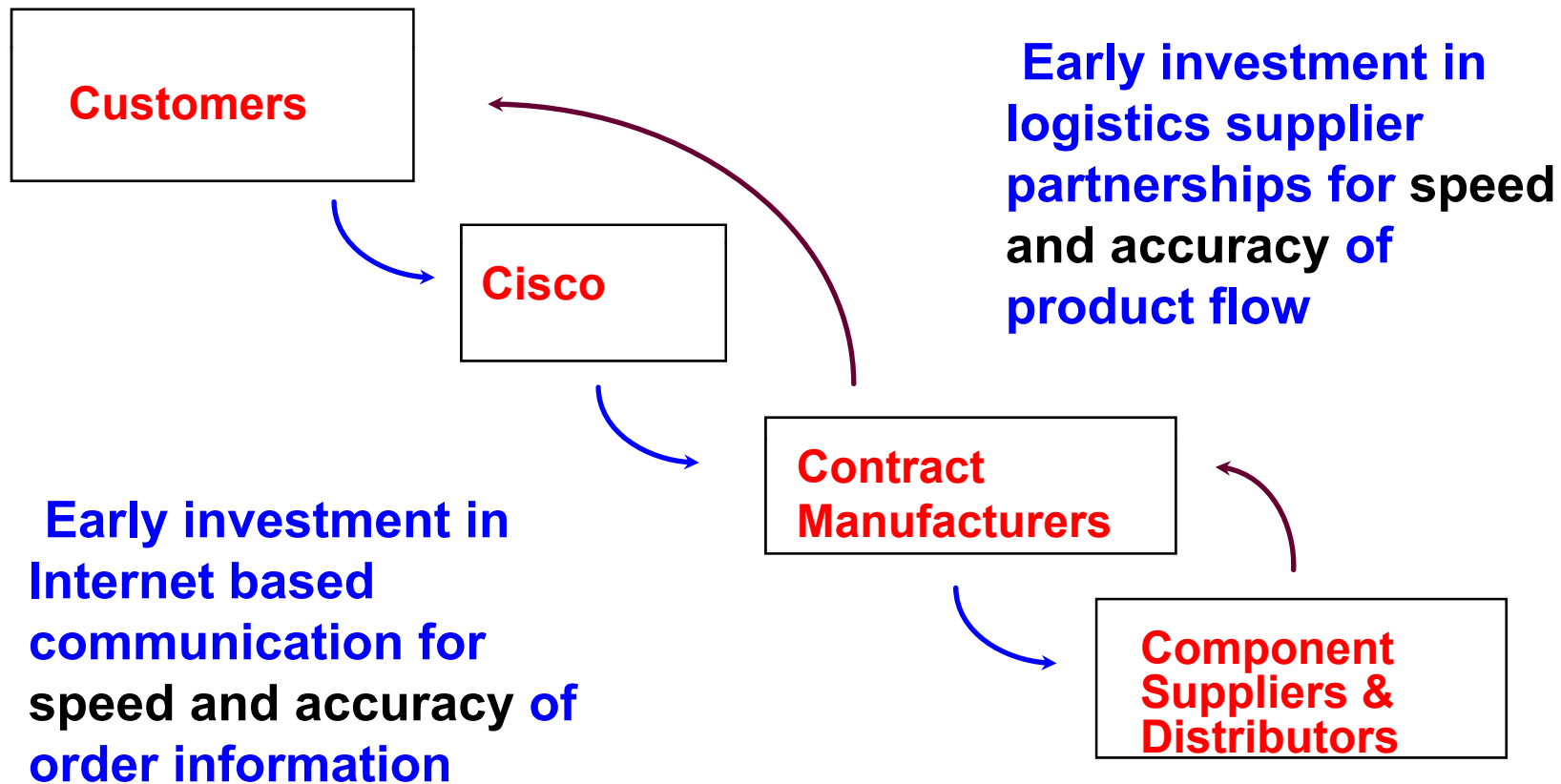
Brand vs. Brand vs. Channel vs Channel: Competing on fast-clockspeed retail



“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)



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

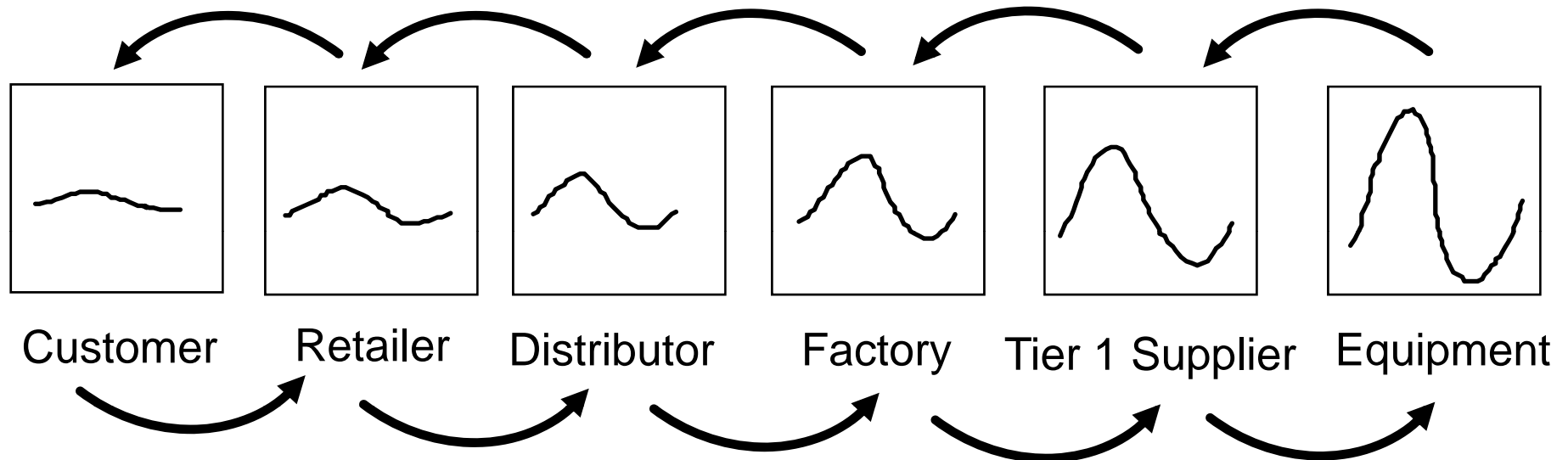


Cisco's Strategy for Technology Supply Chain Design (I.e., Capabilities)

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"



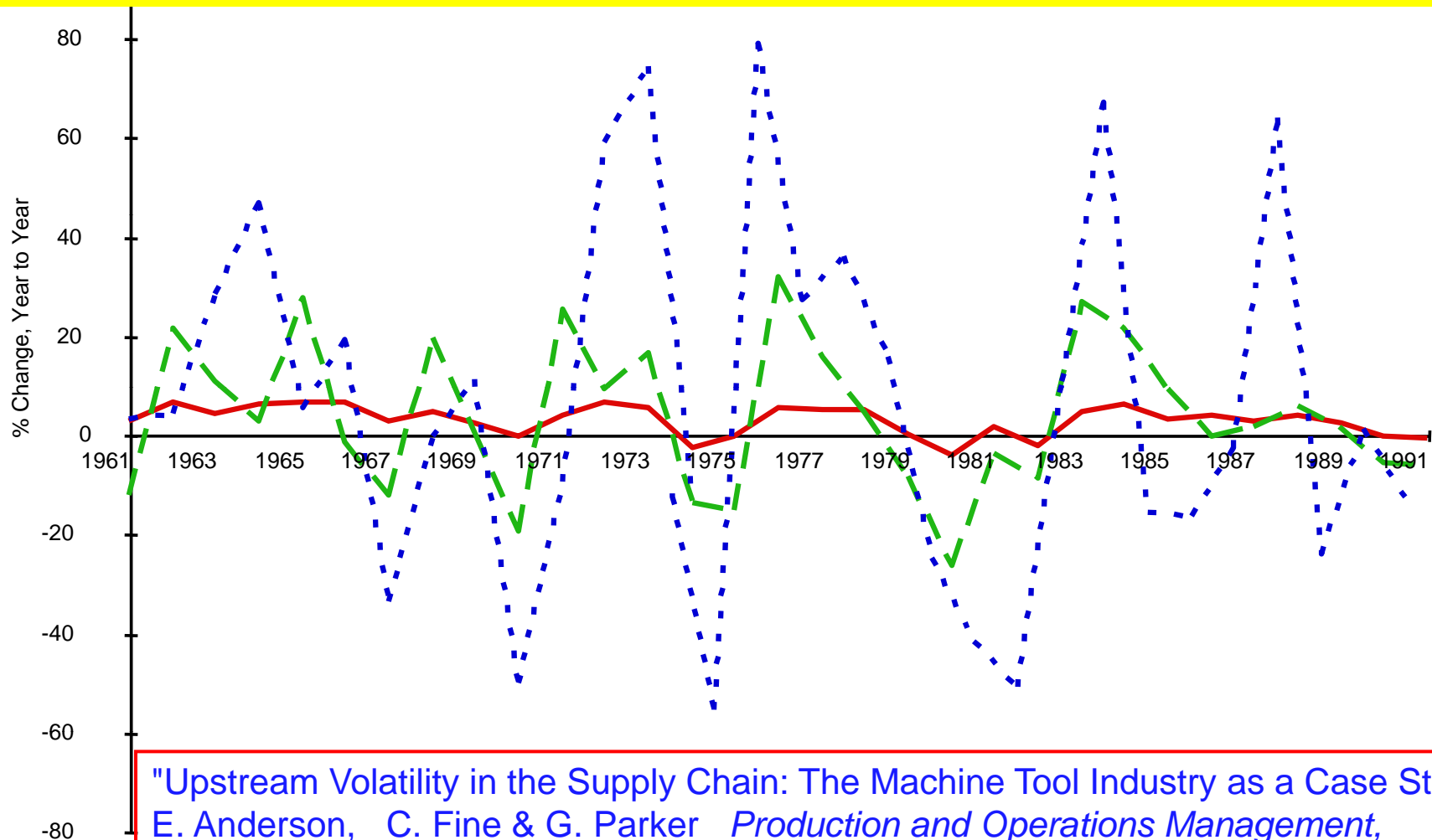
Information lags
 Delivery lags
 Over- and underordering
 Misperceptions of feedback
 Lumpiness in ordering
 Chain accumulations

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

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

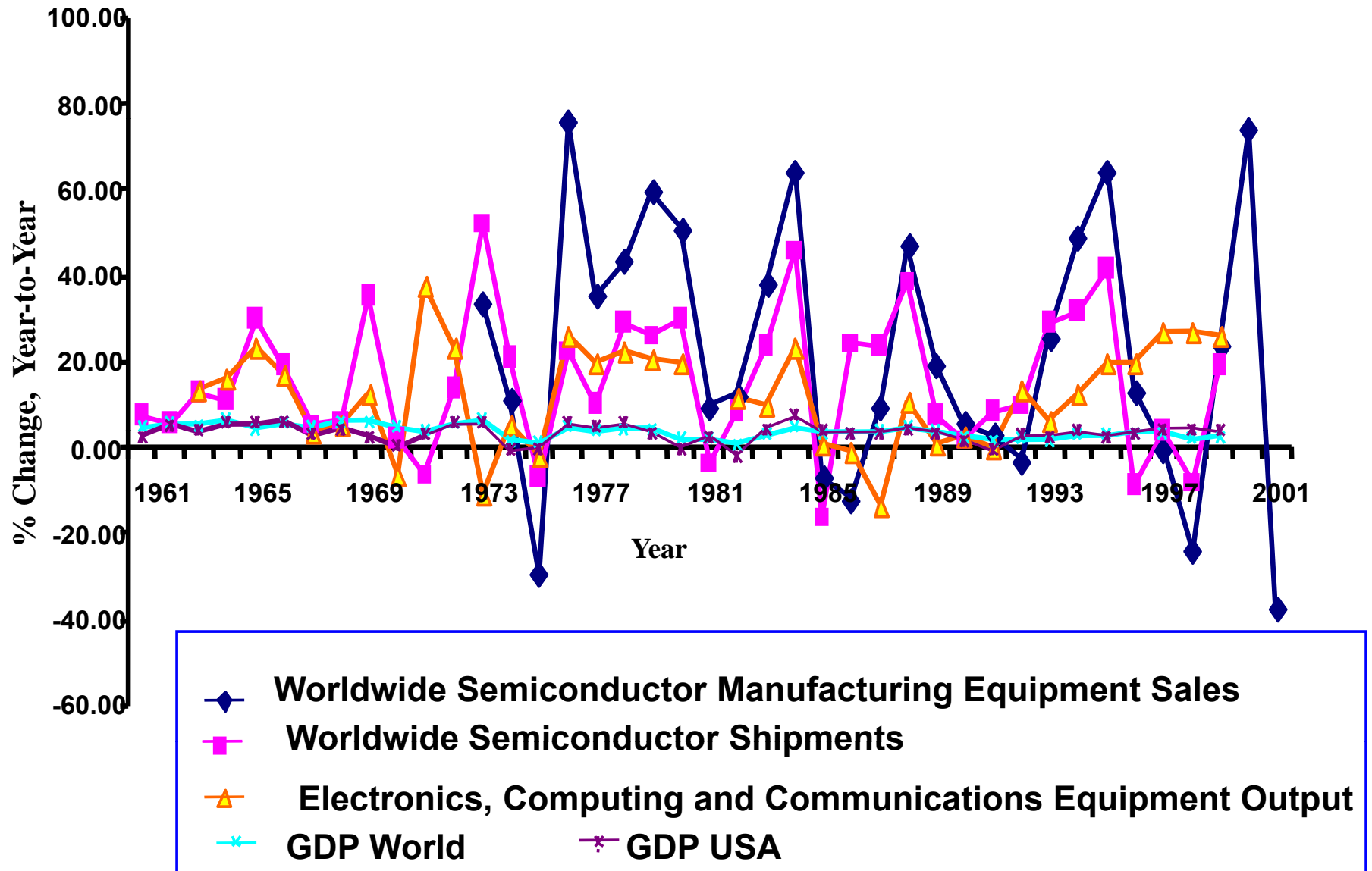
— % Chg. GDP — % Chg. Vehicle Production Index - - - % Chg. Net New Orders Machine Tool Industry

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



"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.

Volatility in the Electronics & Semiconductors Supply Chain



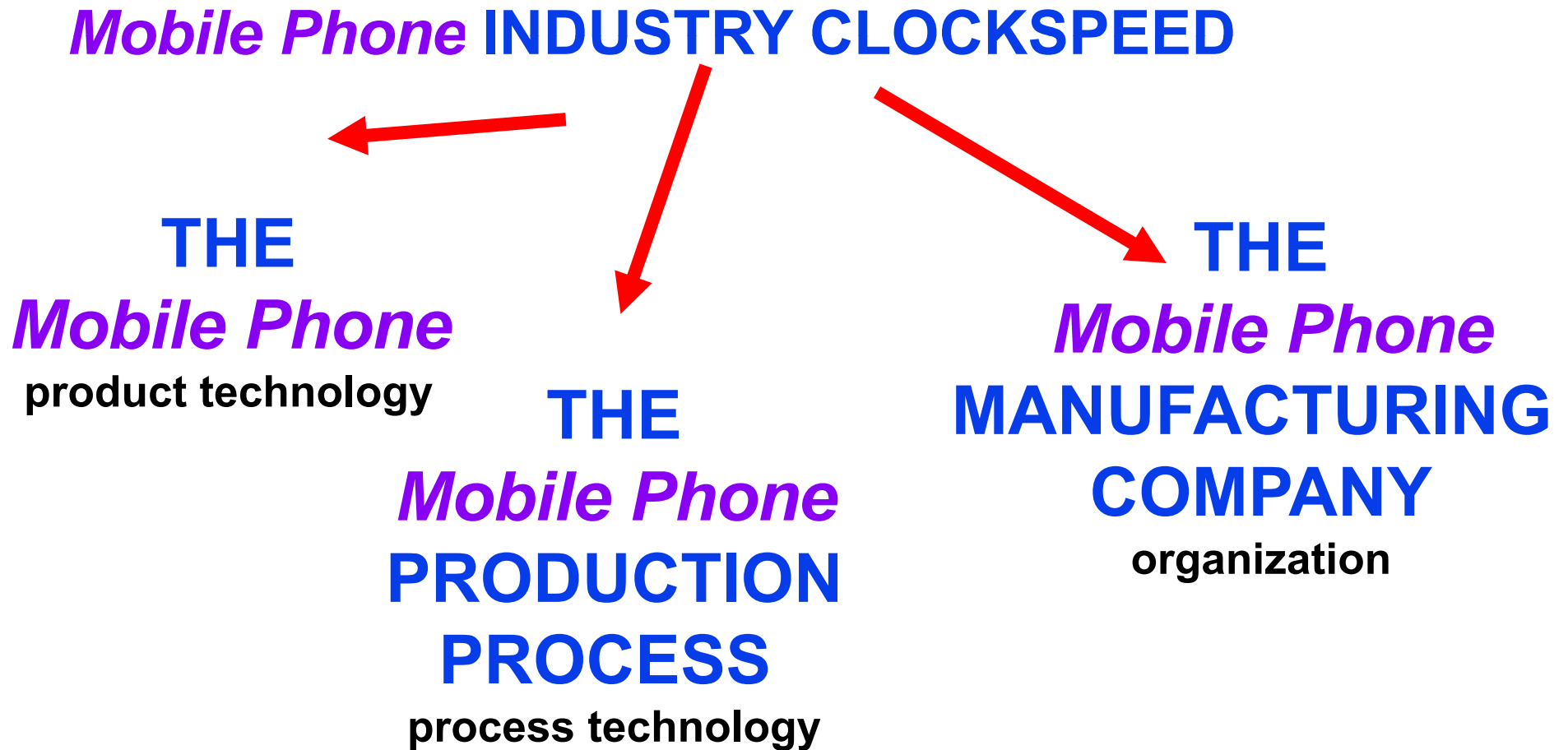
LESSONS FROM A FRUIT FLY: *CISCO SYSTEMS*

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.

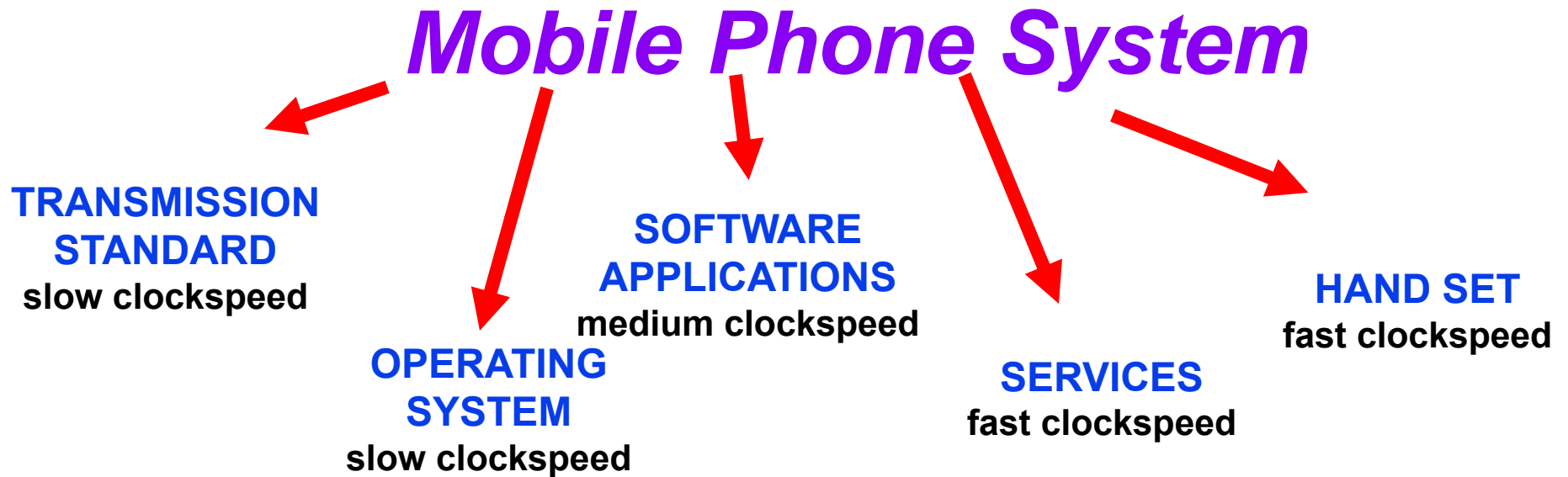
Bonus Question:

How does clockspeed impact volatility?

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

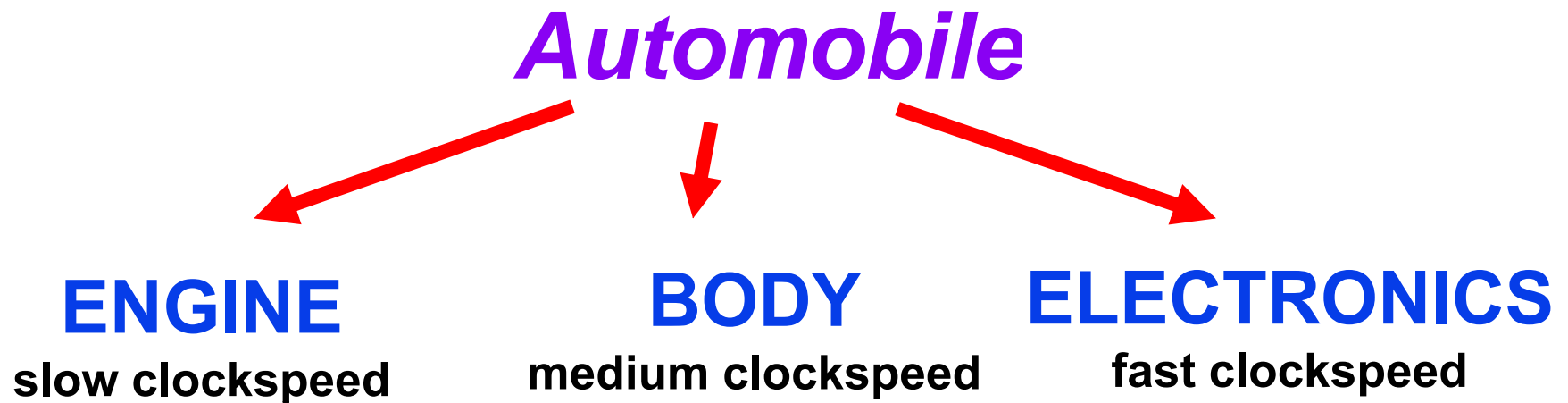


Mobile Phone System **CLOCKSPEED** is a mix of Transmission Standards, Software and Handsets



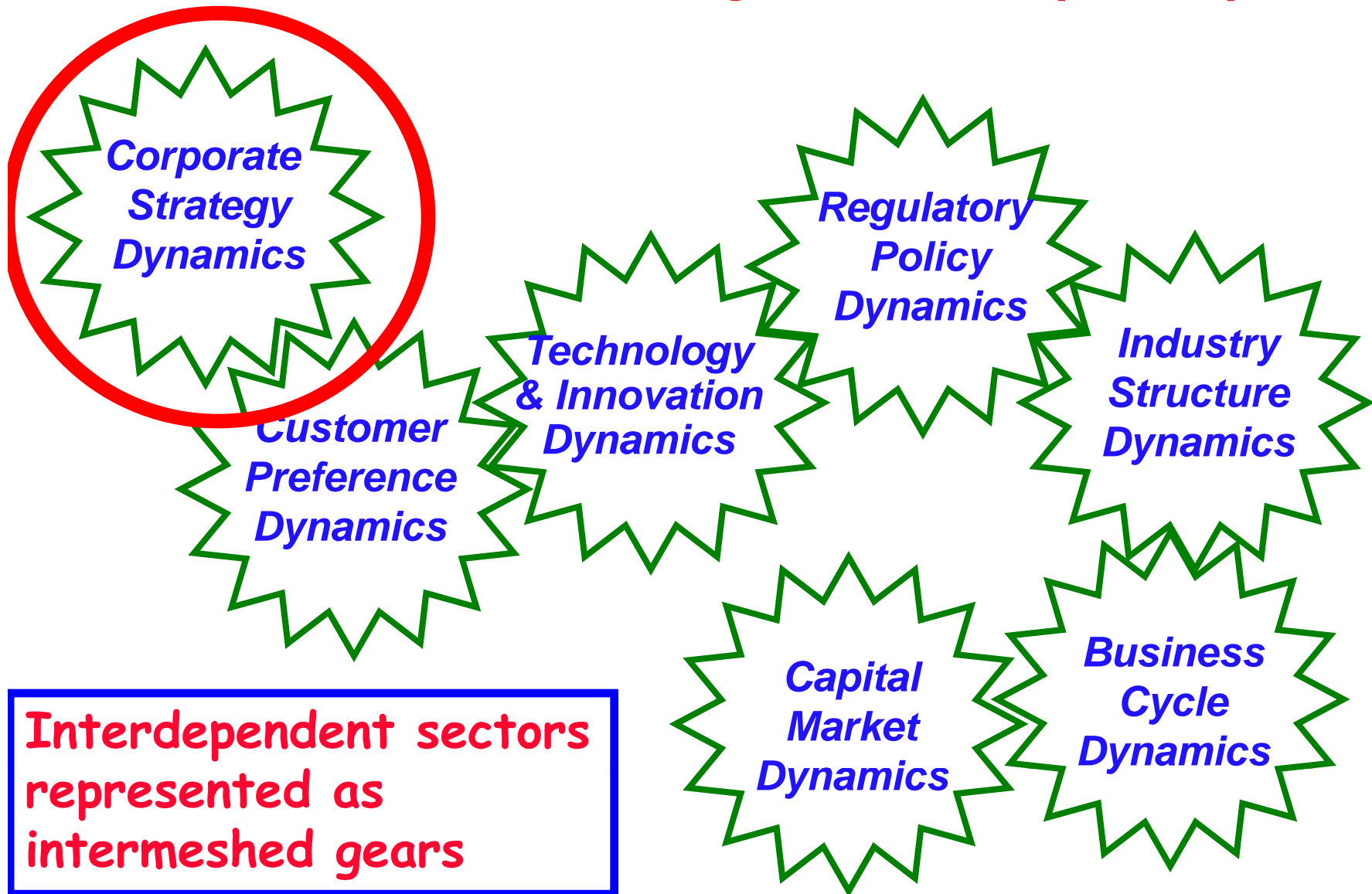
ISSUE: THE FIRMS THAT ARE FORCED TO RUN AT THE FASTEST CLOCKSPEED ARE THE MOST LIKELY TO STAY AHEAD OF THE GAME.

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***.

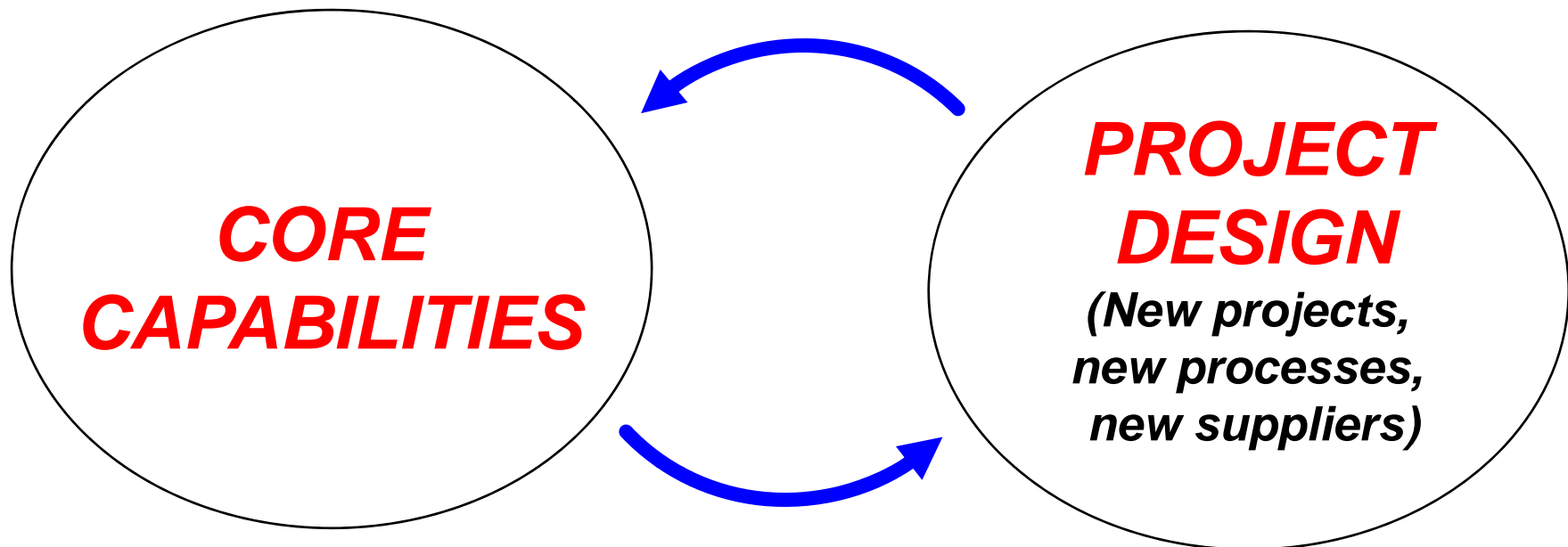
“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)



Projects, Strategy, and Value Chains

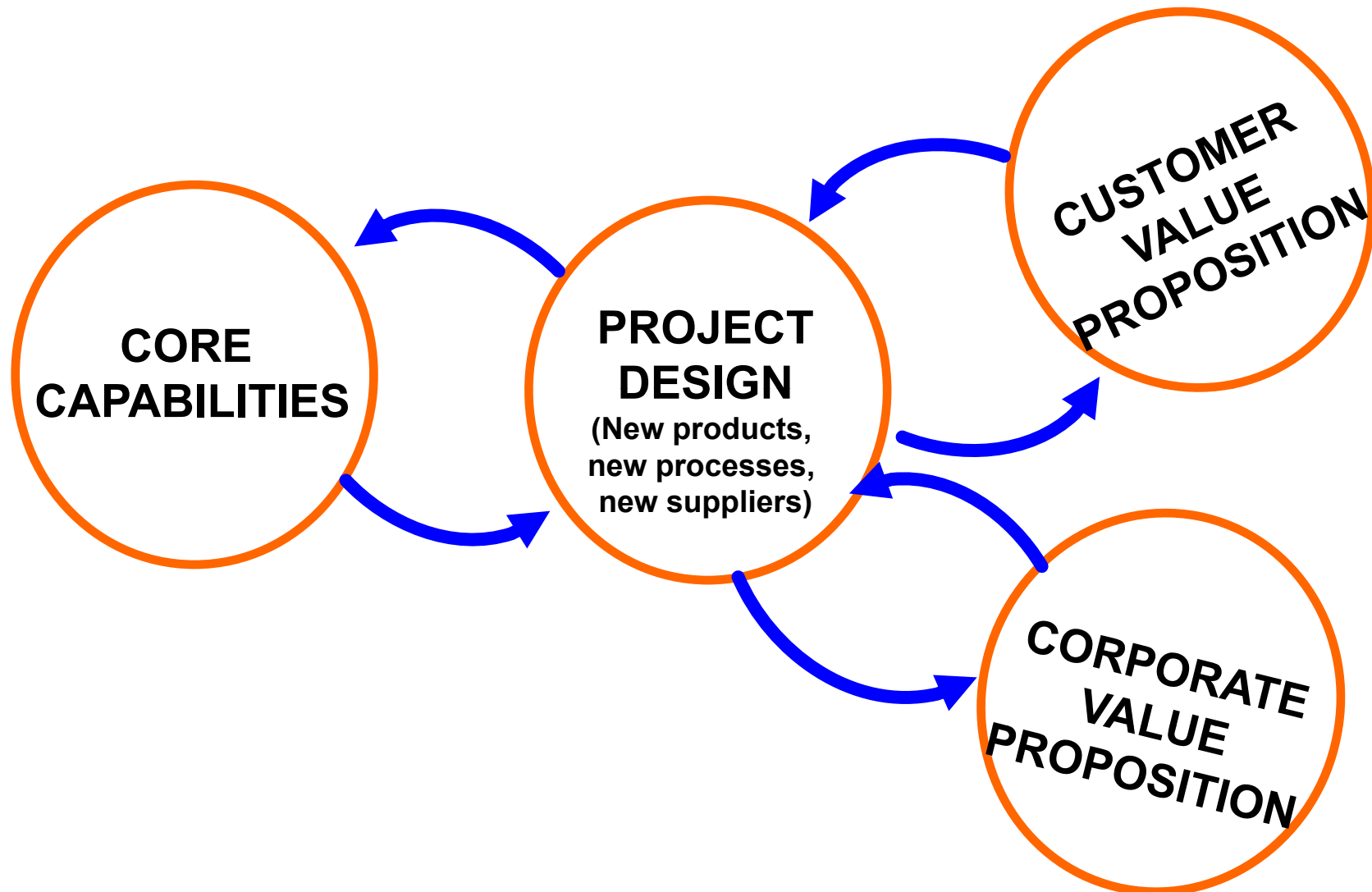
**Clockspeed drives
Business Strategy Cadence**

**CAPABILITIES enable & constrain PROJECTS;
PROJECTS build CAPABILITIES**



Leonard-Barton, *Wellsprings of Knowledge*

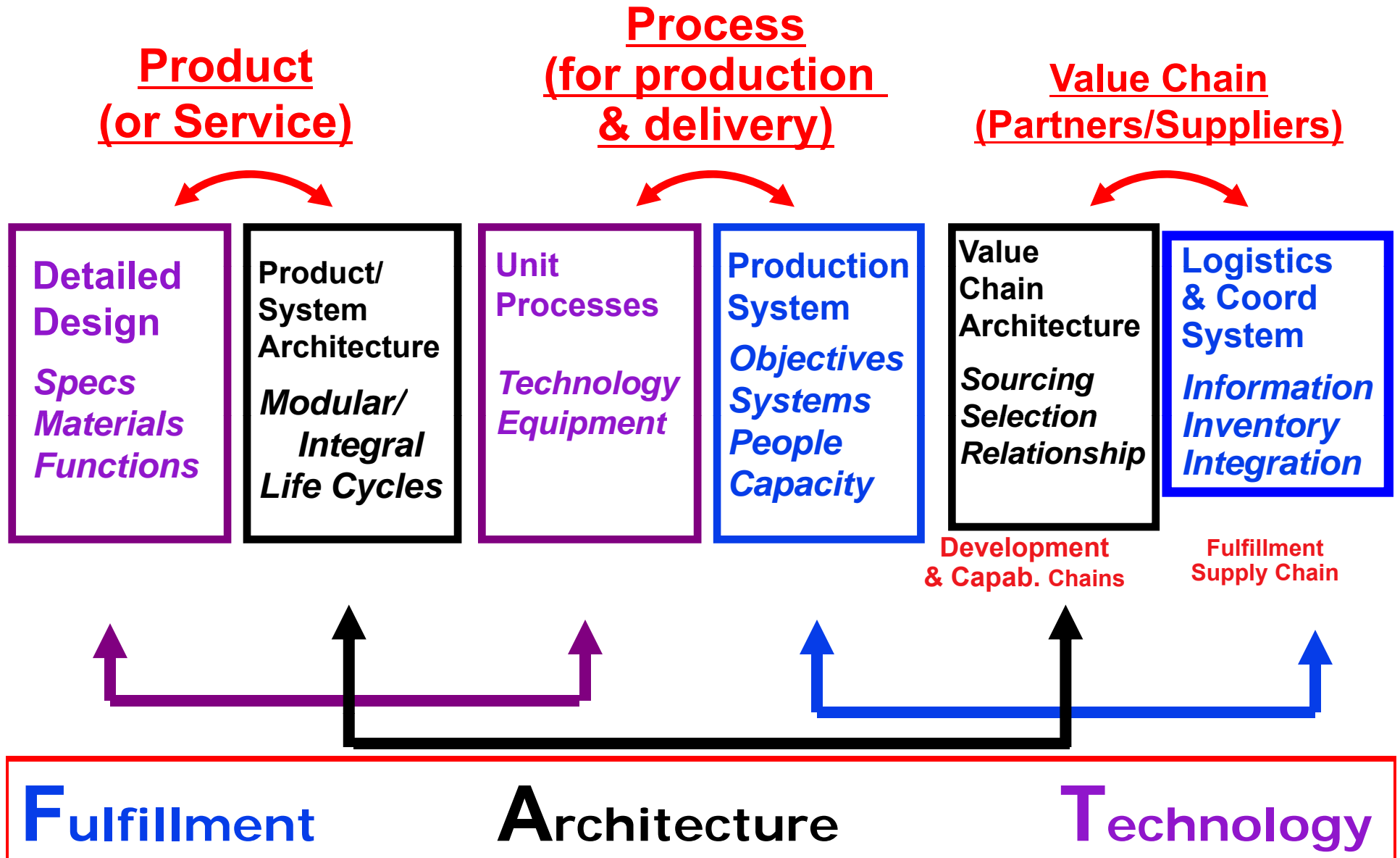
Projects Serve Three Masters: Capabilities, Customers, & Corporate Profit



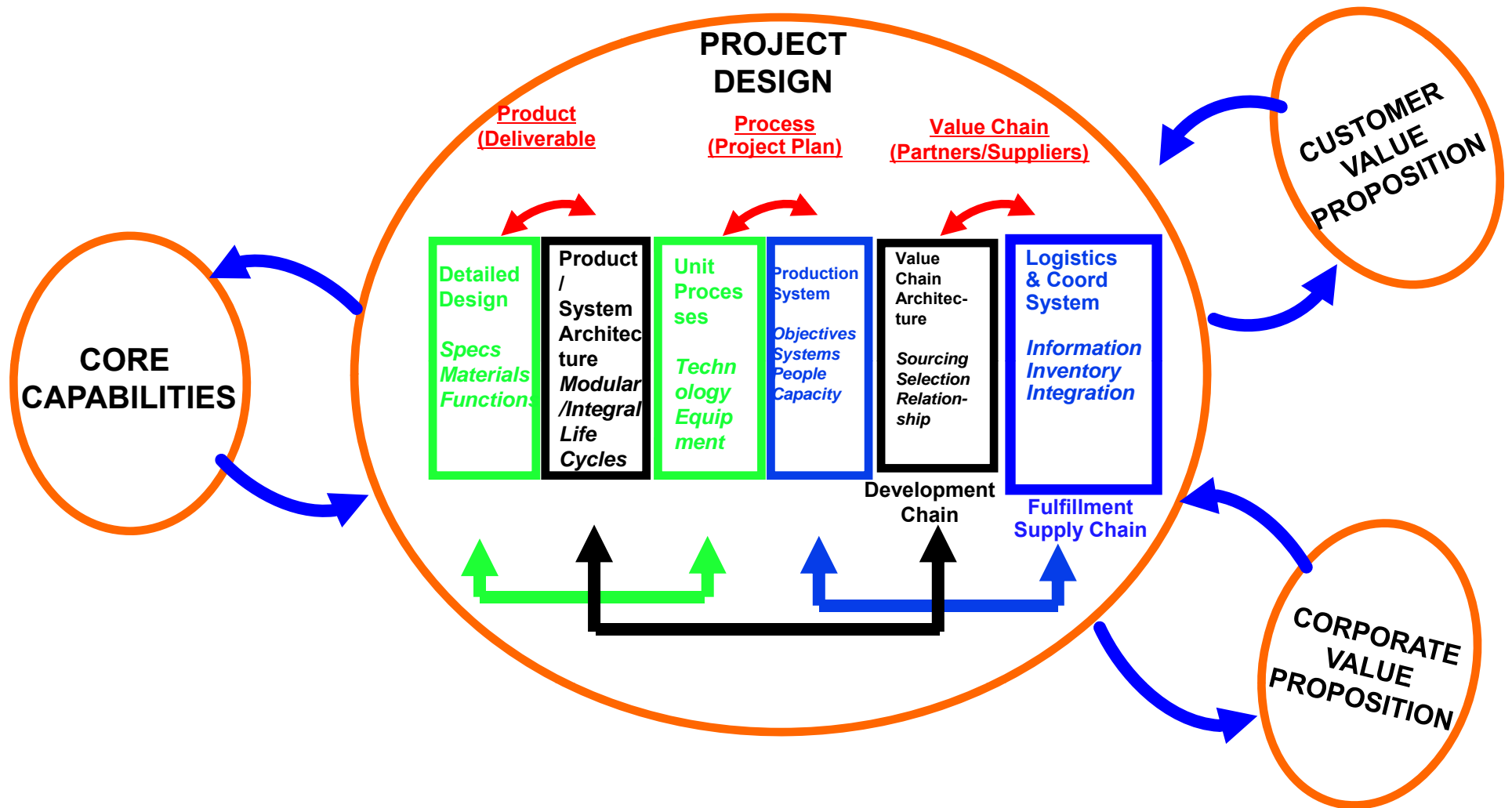
VALUE CHAIN DESIGN: Three Components

- 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.)

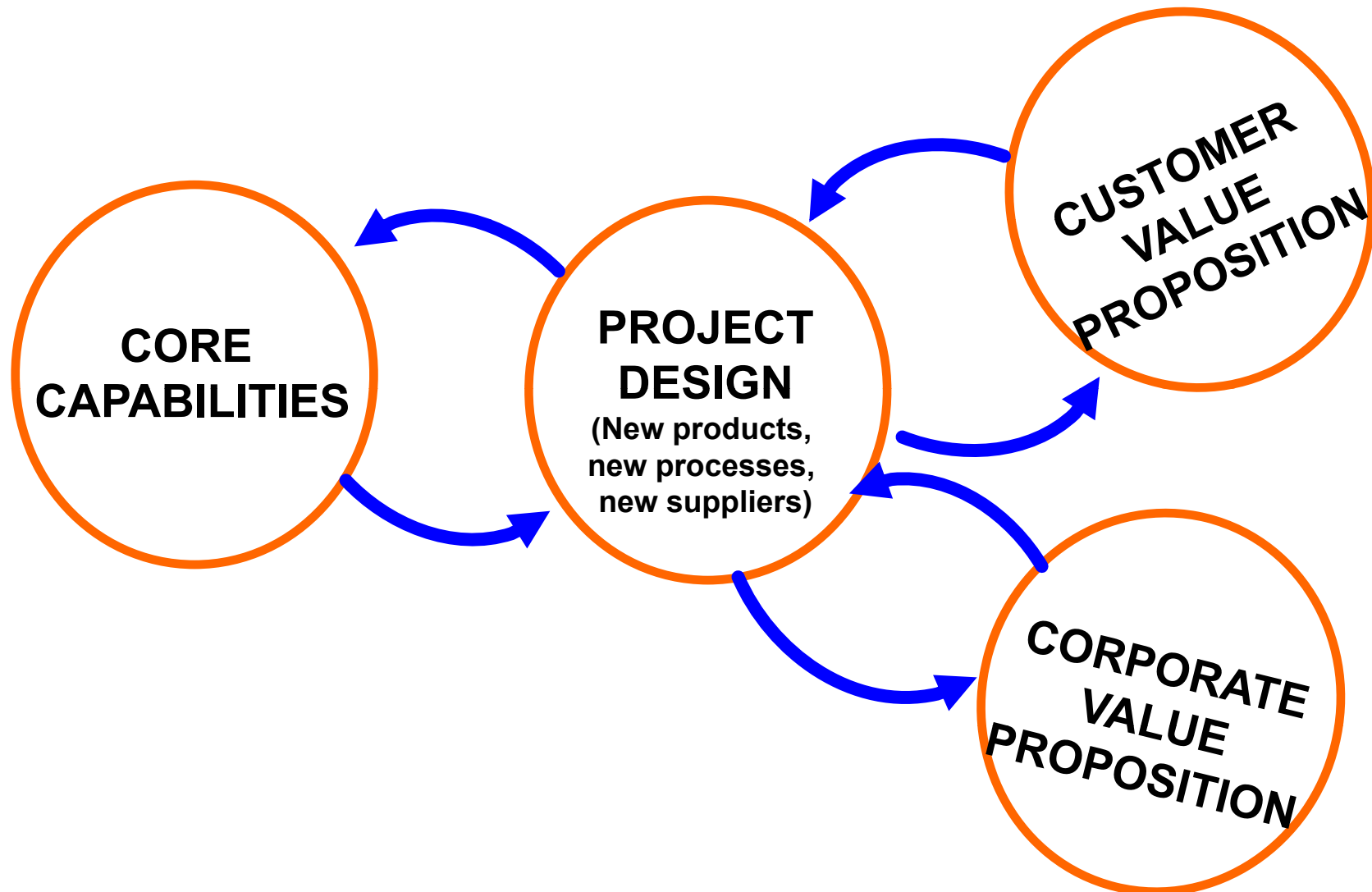
3-D Concurrent Engineering & the imperative of concurrency



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



Do you have to think strategically about every project?



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**

ALIGN ARCHITECTURES ACROSS SYSTEMS AND VALUE CHAINS

SUPPLY CHAIN / VALUE CHAIN ARCHITECTURE

(Geographic, Organizational, Cultural, Electronic proximity)

INTEGRAL \longleftrightarrow MODULAR

PRODUCT / SYSTEM ARCHITECTURE

INTEGRAL



MODULAR

**Microprocessors
Mercedes
& BMW vehicles**

**Lucent
Nortel**

Polaroid

**Chrysler (90's)
Nokia**

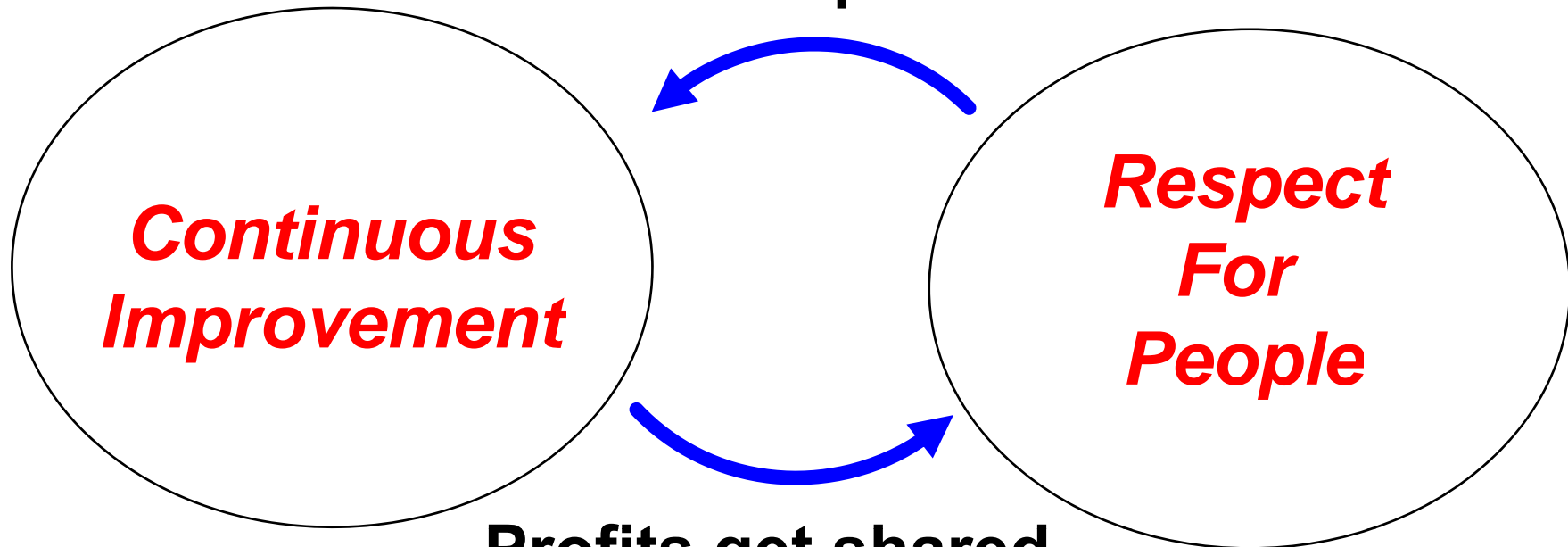
Cisco

**Digital Rights/
Music Distribution**

**Dell PC's
Bicycles**

TPS Dynamics between Continuous Improvement & Respect for People (Stakeholders)

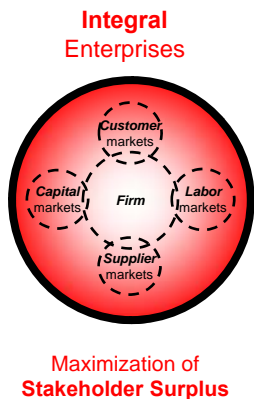
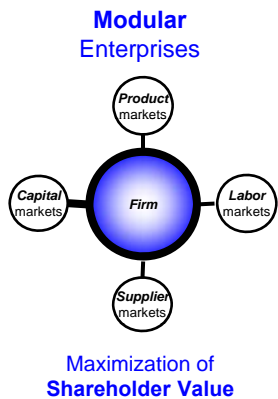
Motivated People
Drive faster Improvement



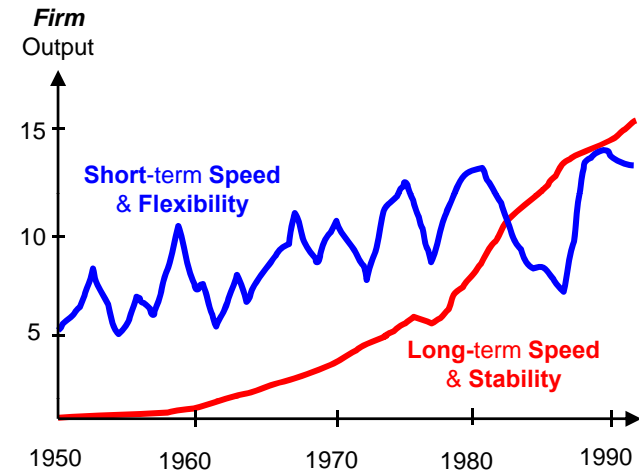
Profits get shared
to reward and incentivize alignment

The Evolution of Business Ecosystems

Operations (or "quantity") Loop *Ted Piepenbrock, MIT*



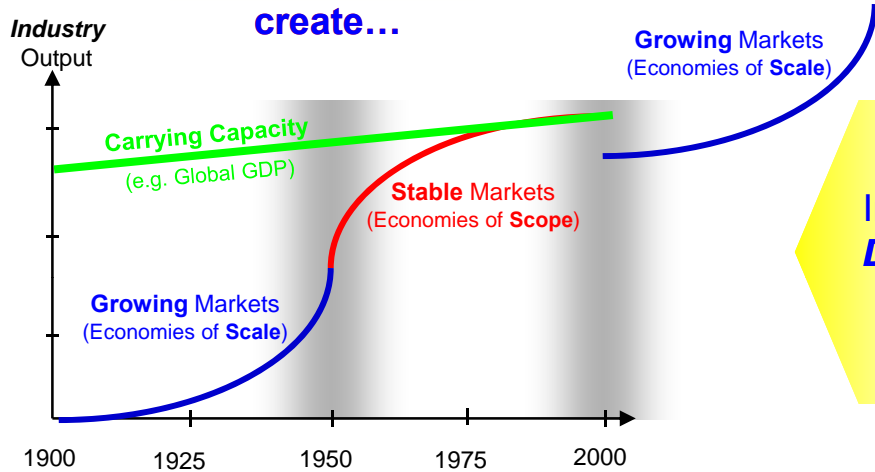
which drive... **Competitive Dynamics**



Enterprise Architectural

which generates...

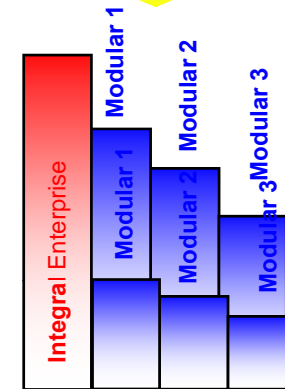
Firm Long-Term Performance



create...

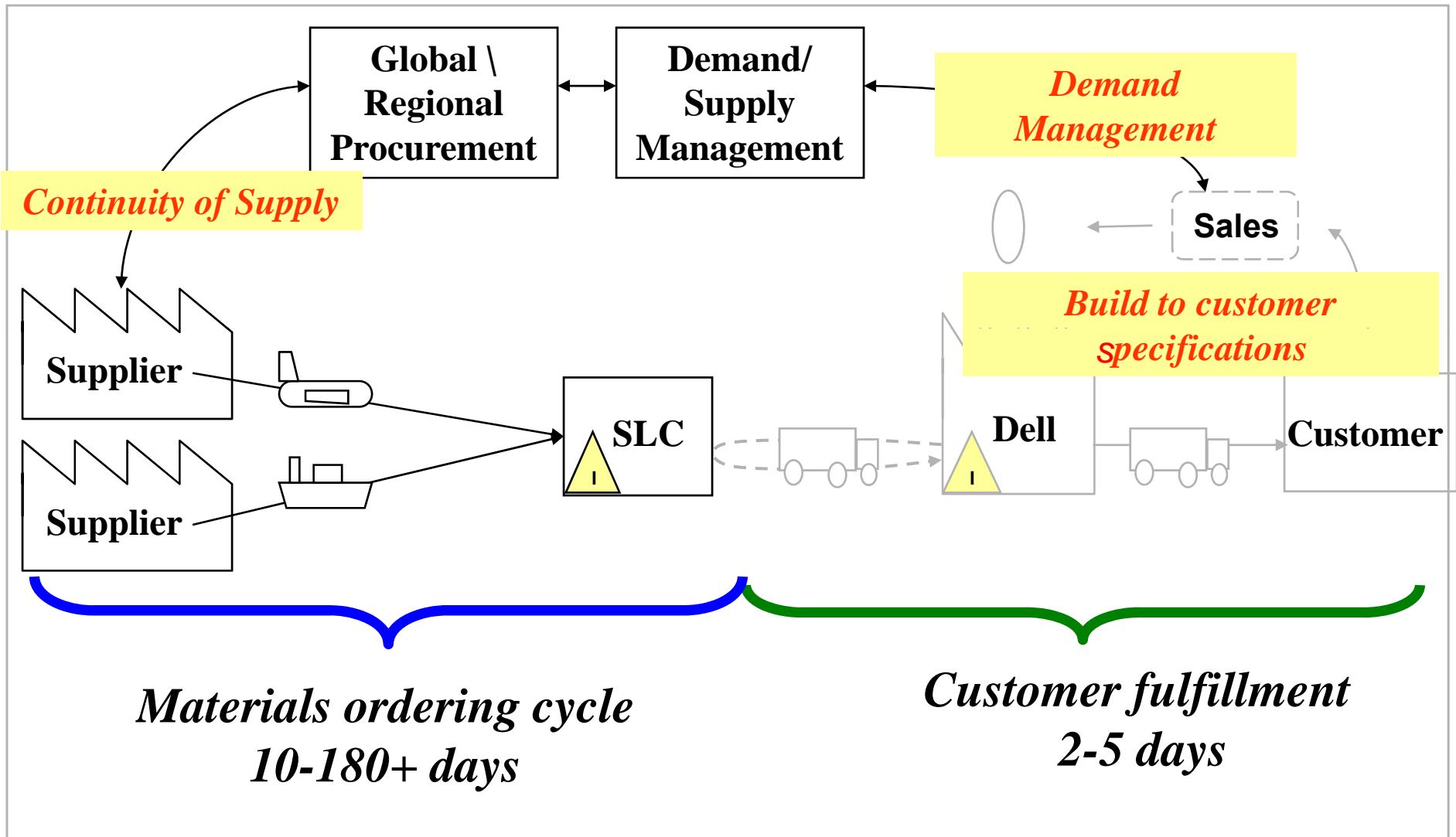
Industrial Dynamic

which shapes...



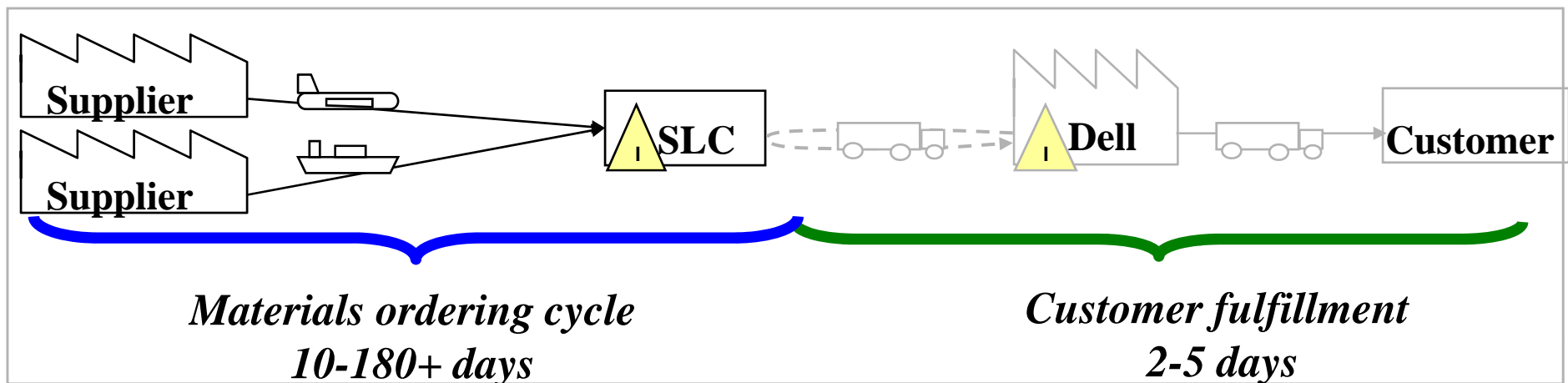
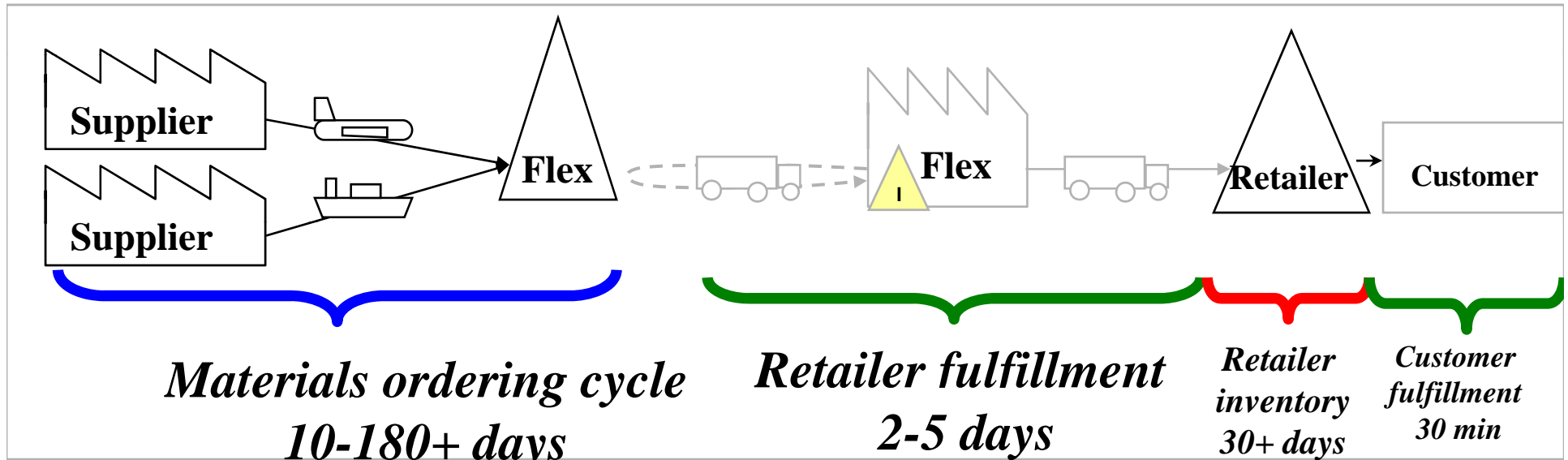
Market Capitalization

Dell Supply Chain



Modular Product Architecture enables Modular Supply Chain

HP/Flextronics vs. Dell Supply Chain



Modular Product Architecture enables Modular Supply Chain

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

Adapted from Prof. J.P. MacDuffie, IMVP & The Wharton School

BUT, A Car is not a Computer!!

• Personal Computer

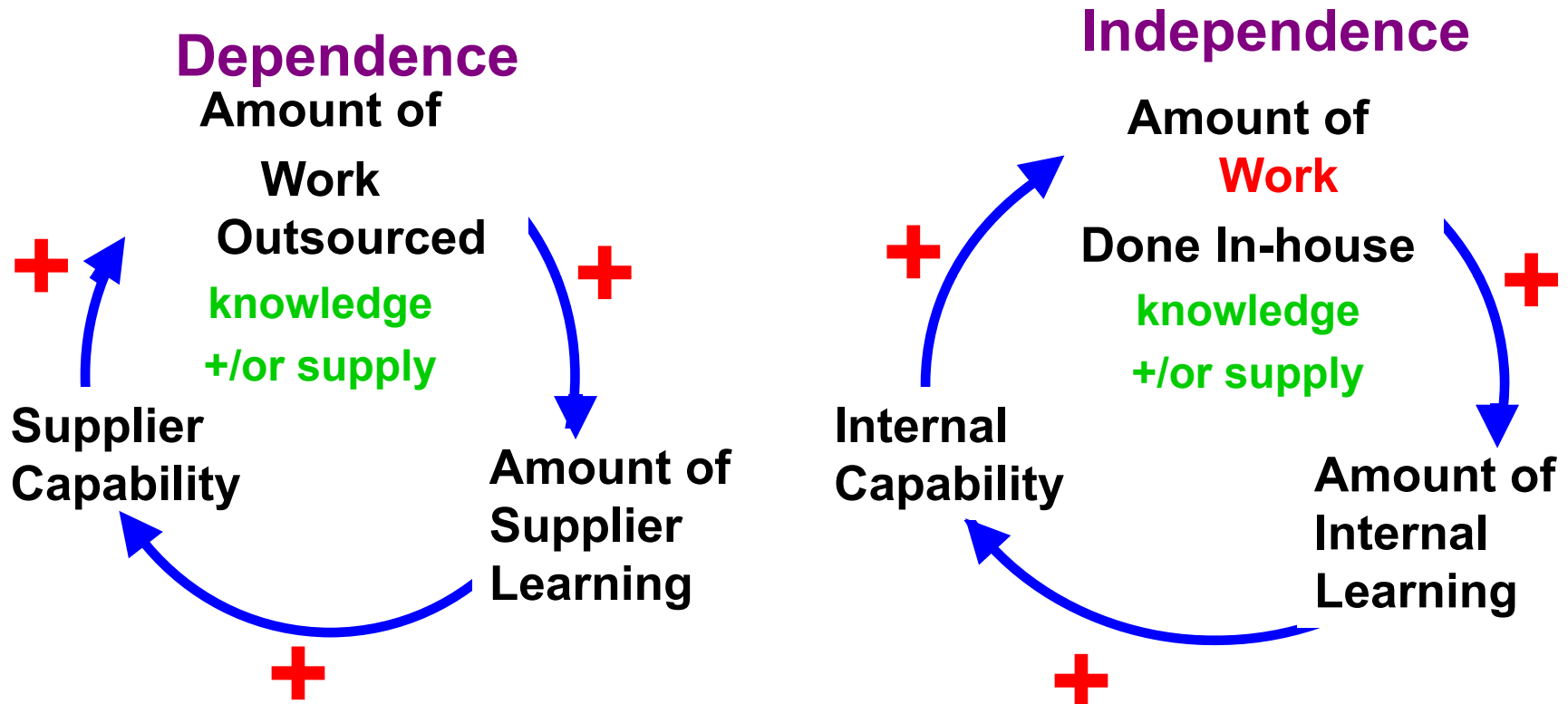
- ~50 components
- 8-10 key parts
- 40 key suppliers
- 24 hour burn-in
- 100 design variations
- Modular Architecture

• Car

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

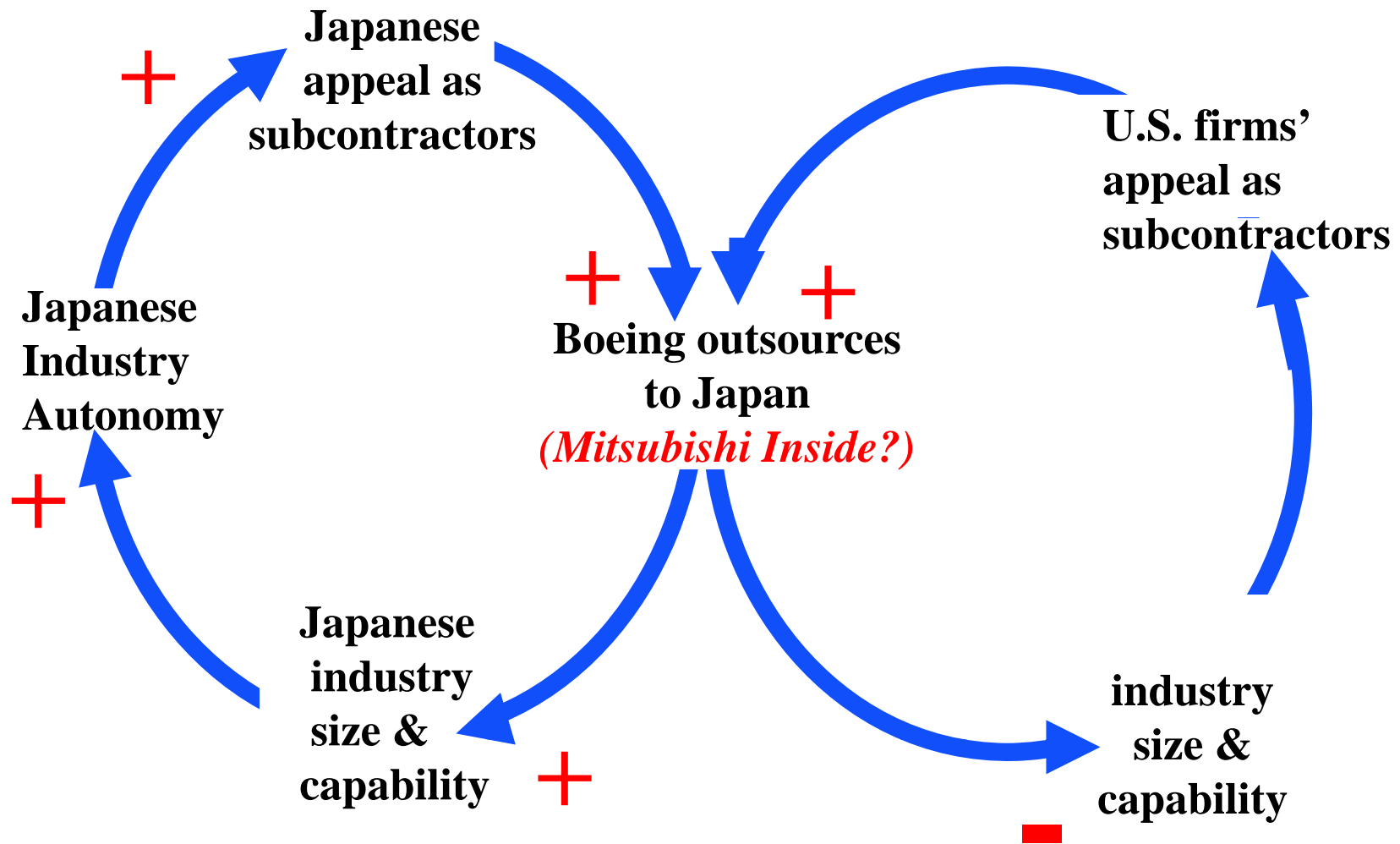
Adapted from Prof. J.P. MacDuffie, IMVP & The Wharton School

In/Outsourcing: Sowing the Seeds of Competence Development to develop dependence for knowledge or dependence for capacity

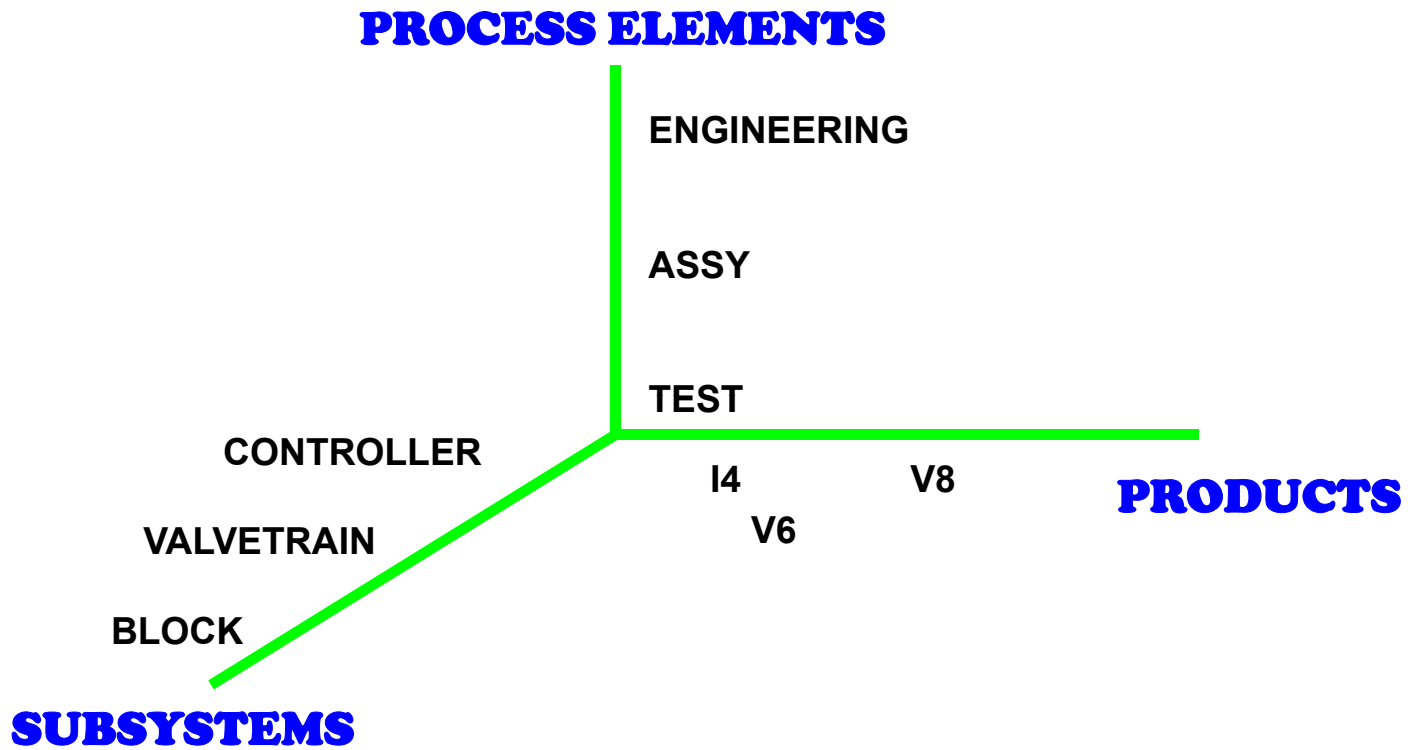


Technology Dynamics in the Aircraft Industry:

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 MODULAR	A POTENTIAL OUTSOURCING TRAP	BEST OUTSOURCING OPPORTUNITY	OVERKILL IN VERTICAL INTEGRATION
ITEM IS INTEGRAL	WORST OUTSOURCING SITUATION	CAN LIVE WITH OUTSOURCING	BEST INSOURCING SITUATION

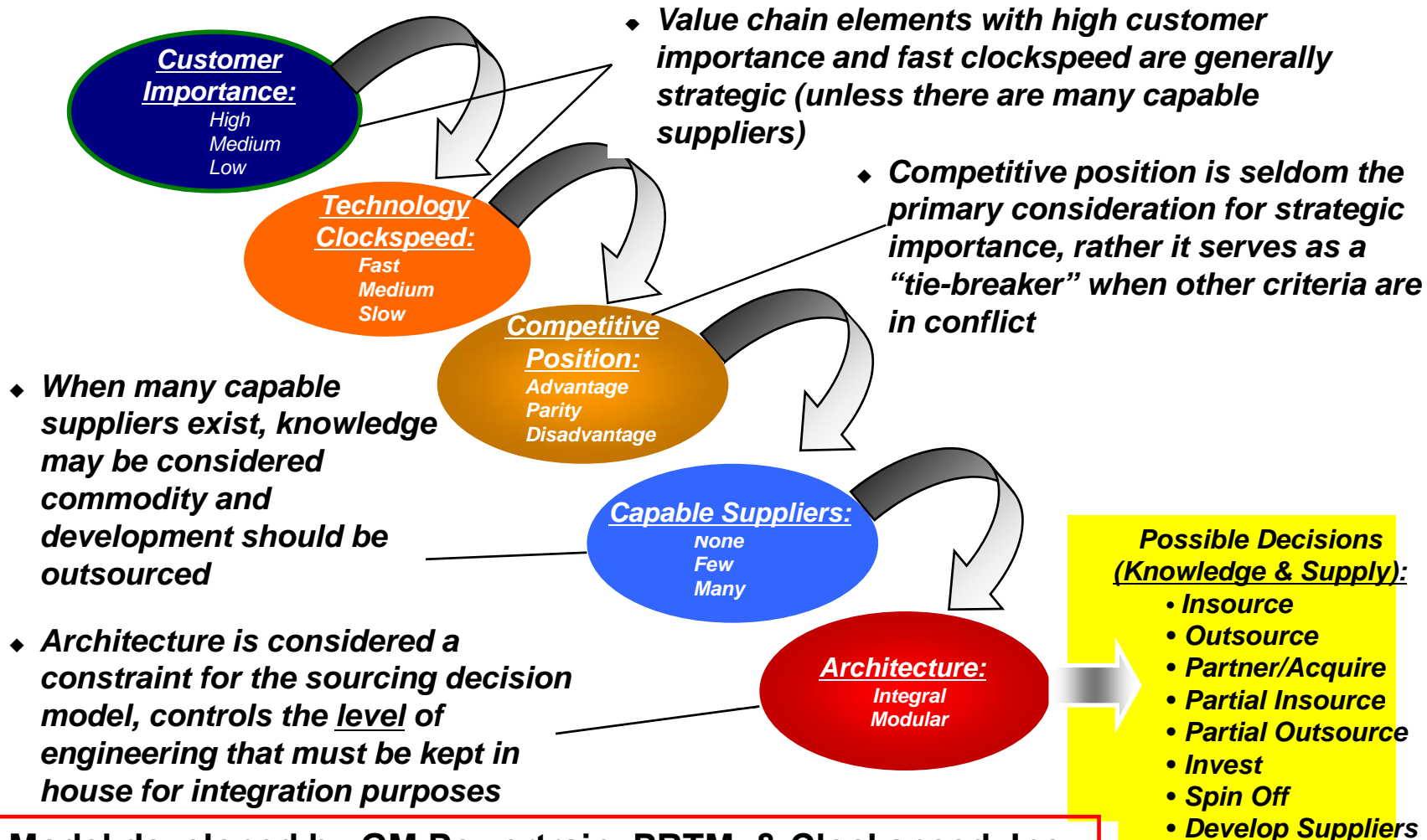
Adapted from Fine & Whitney, "Is the Make/Buy Decision Process a Core Competence?"

Strategic Make/Buy Decisions: Also consider Clockspeed & Supply Base Capability

		DEPENDENT FOR KNOWLEDGE & CAPACITY	DEPENDENT FOR CAPACITY ONLY	INDEPENDENT FOR KNOWLEDGE & CAPACITY											
DECOMPOSABLE (Modular)	<p><i>Trap</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td>OK</td> </tr> <tr> <td>Watch it!</td> <td></td> </tr> </table>		OK	Watch it!		<p><i>Best Out</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>					<p><i>Over-kill</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>				
		OK													
Watch it!															
INTEGRAL	<p><i>Worst</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>					<p><i>OK</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>					<p><i>Best In</i></p> <p>Clockspeed Fast Slow</p> <p>Suppliers Few Many</p> <table border="1"> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </table>				

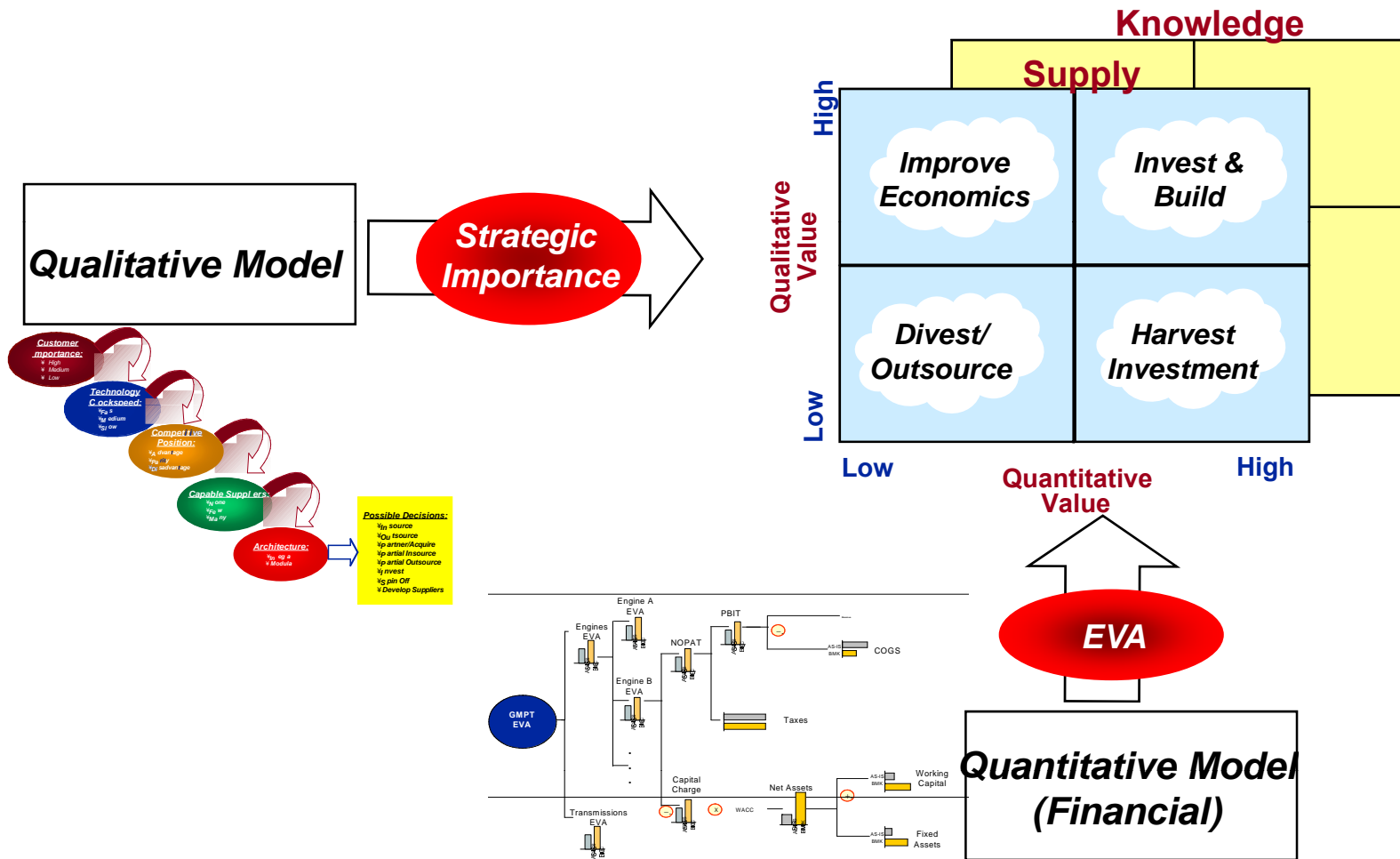
Adapted from C. Fine, *Clockspeed*, Chap. 9

Qualitative analysis of strategic importance uses five key criteria



Model developed by GM Powertrain, PRTM, & Clockspeed, Inc.

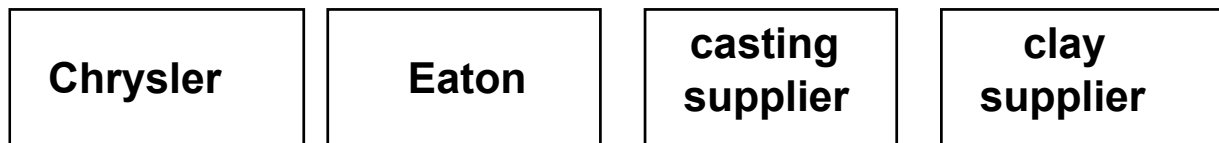
Every decision requires qualitative and quantitative analysis to reach a conclusion



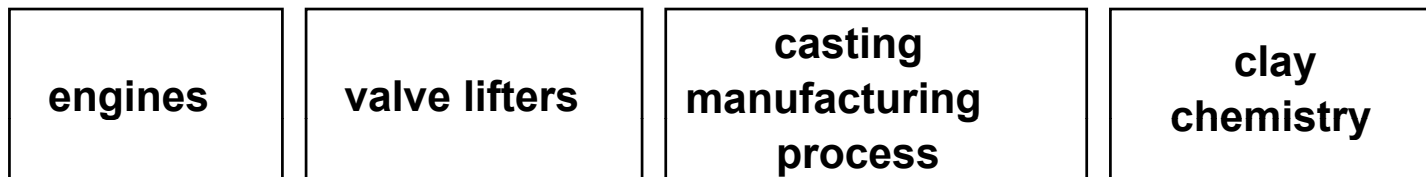
Model developed by GM Powertrain, PRTM, & Clockspeed, Inc.

Value Chain Mapping

Organizational Supply Chain



Technology Supply Chain



Capability Chain



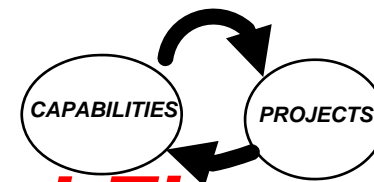
Underlying Assumption: You have to draw the maps before you can assess their dynamics.

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:

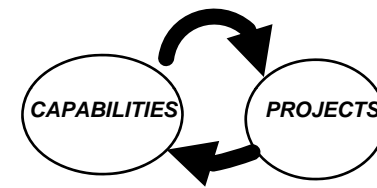
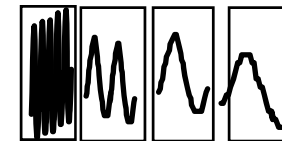
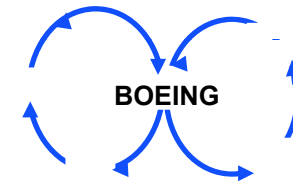
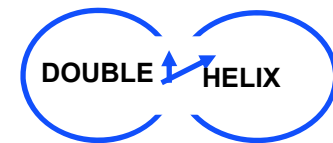
1. **Forecasting the dynamic evolution** of market power and market opportunities
2. **Anticipating** Windows of Opportunity
3. **3-D Concurrent Engineering:**
Product, Process, Value Chain



Fortune Favors the Prepared Firm

PROCESS FOR VALUE CHAIN DESIGN

1. Benchmark the **Fruit Flies**
2. Map your Value 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**



In-depth Exercise 2: Value Chain Analysis

Consider these five industries or an industry of your choice:

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

At each table, pick ONE industry:

What are the key dependency relationships in the value chain?

What are the opportunities for outsourcing?

What are the windows of opportunity in the chain?

“Takeaways” from the day

- 1. Value Chains are dynamic*
 - industry structure dynamics*
 - technology & innovation dynamics*
 - customer and channel dynamics*
- 2. Innovation happens along the value chain and in the value chain model itself.*
- 3. All advantage is Temporary*
- 4. Strategic Sourcing is a key leverage point for supply chain design.*
- 5. Supply Chain organizations have multiple strategic roles to play.*

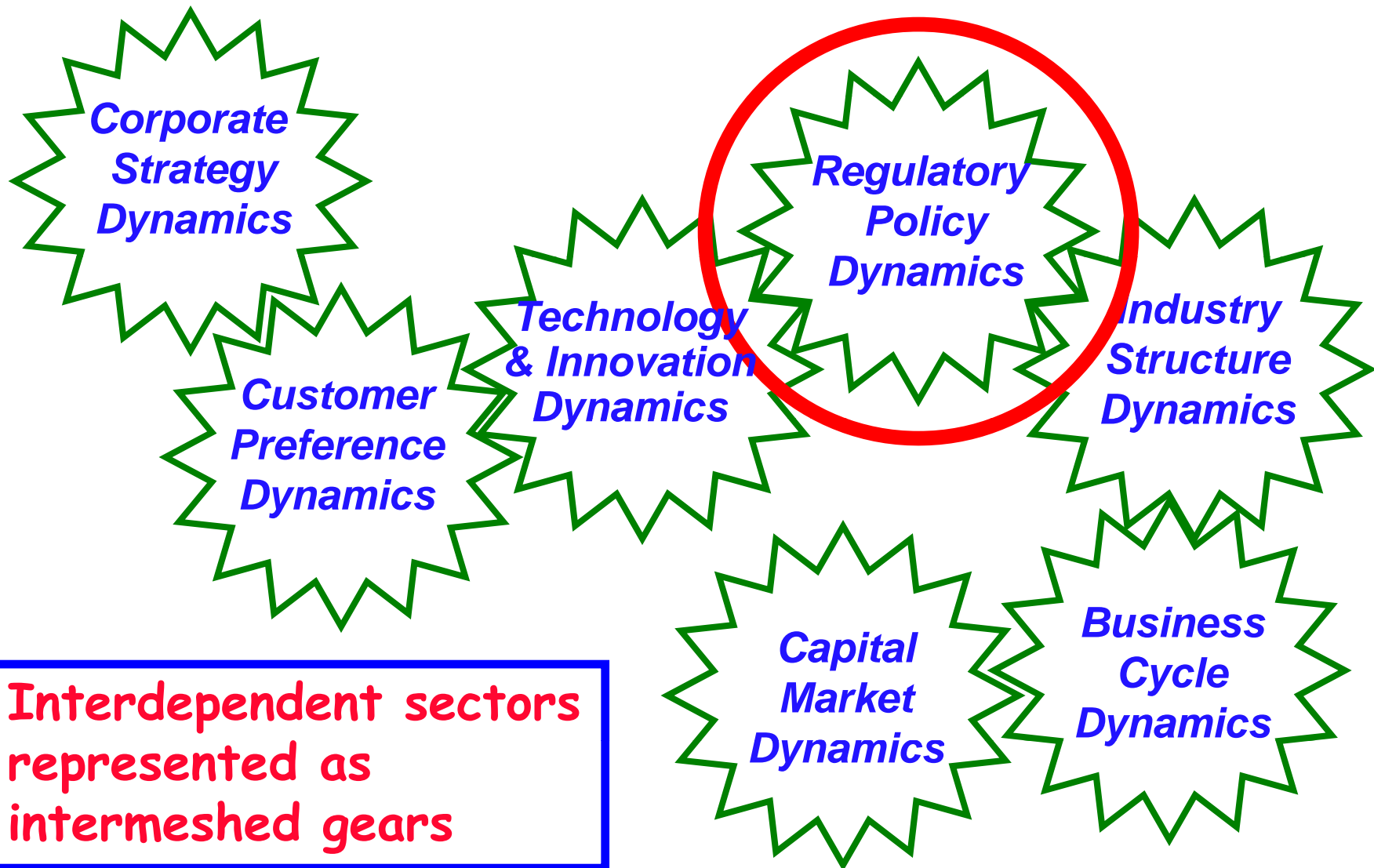
All Conclusions are *Temporary*

Clockspeeds are increasing almost everywhere
Value Chains are changing rapidly



BACKUP SLIDES

“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)

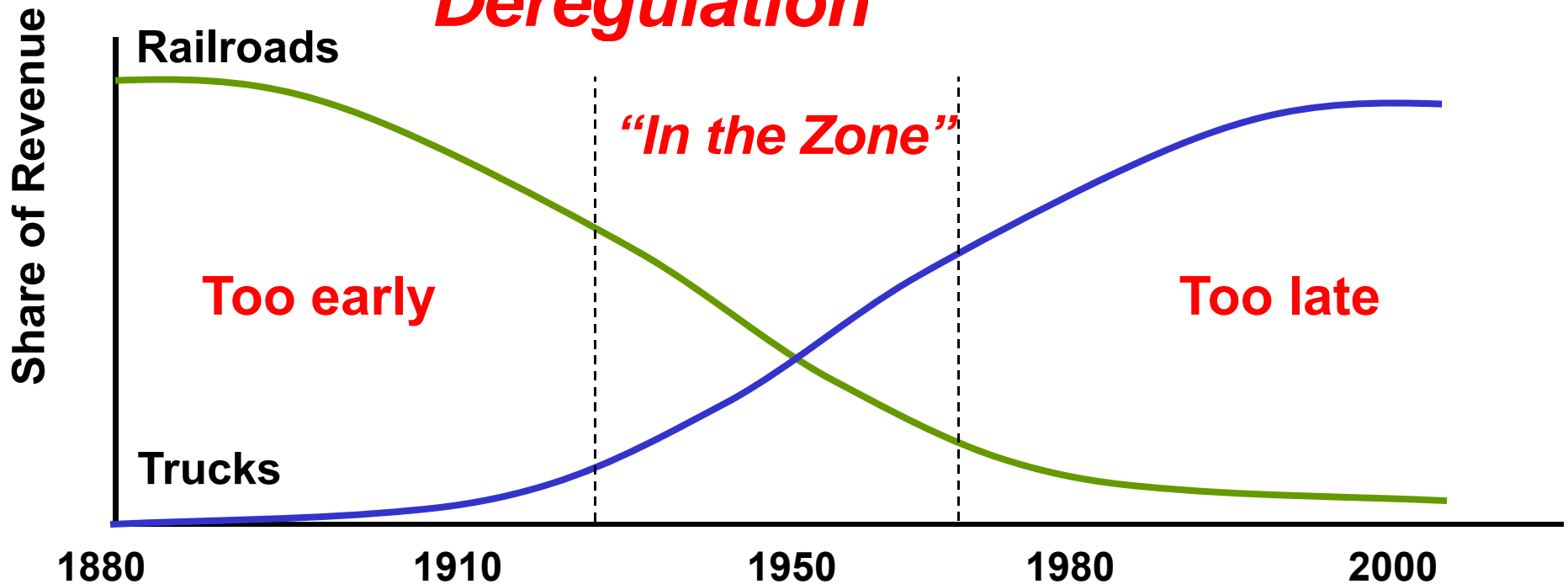


**A long, long time ago in an
industry far away . . .**

Freight Railroads vs. Trucks

The Dynamics of Industry Economics

and the Optimal Timing of Deregulation



Regulation
reins in
"monopoly"

Shocks happen;
Environment
changes;
Substitutes
may arise

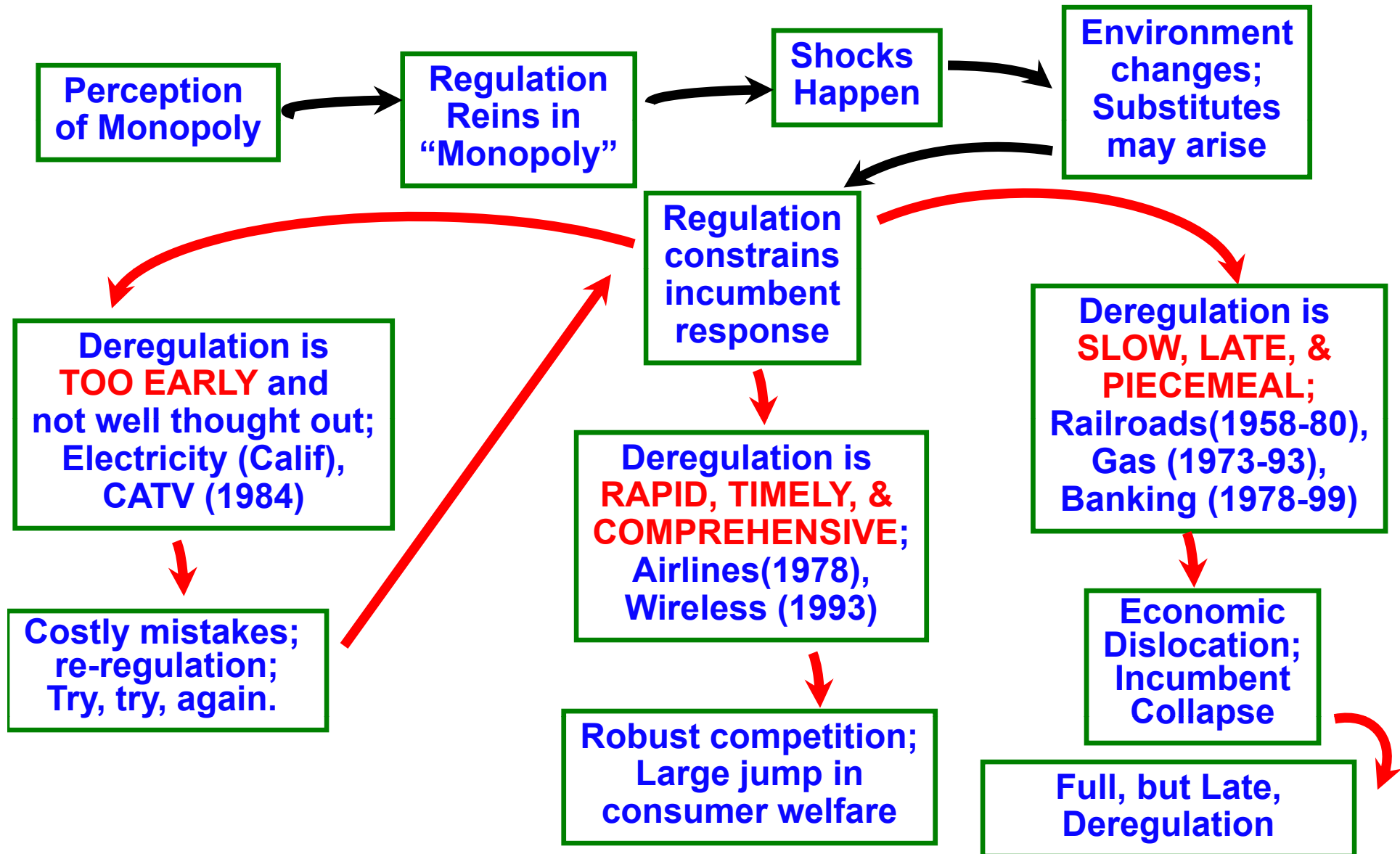
Regulation
constrains
response;
deregulation
timing is critical

If deregulation is
**SLOW, LATE, &
PIECEMEAL**; then
Economic Dislocation;
Incumbent
Collapse

Histories: Dynamics of Regulation

	Regulation Reins in "Monopoly"	Shocks Happen	Environment Changes; Substitutes arise	Regulation Constrains response	Deregulation timing is Critical	Mistakes harm incumbents, consumers & taxpayers
RailRoads	Rockefeller & Morgan "Robber Barons"	Autos & Highways	Trucking arises	Prices, Exit, Innovation	1958 vs. 1980	Weak rail capabilities; Trucking dominant
Natural Gas	"Natural" Monopoly	Oil Embargo; Fall of Iran	Gas Demand Explodes	Low prices inhibit new supply	Long lag for new sources (1978 v 1989)	Shortages; price swings; LT consumer costs of take or pay contracts
Banking	Bank size limited to limit power	Inflation in the 1970's	Money Market Funds	Deposits Shrink; Riskier investments	1978 vs. 1989	S&L's died; \$160B+ Bailout
Telecom	AT&T "natural" monopoly	Internet & Moore's Law	Wireless Broadband VOIP	TELRIC pricing; entry & exit; access fees	Wireless, BB, & VOIP less constrained than ILECs	Wireless success; wireline TBD

Conceptual Model: *The Dynamics of Regulation and Deregulation Processes*



Collapse of the railroads

- number of Class I railroads dropped from 230 → 7 between 1907-1999
- railroad mileage declined from 254,000 → 99,000 between 1916-1999
- by the 1970s, every major Northeast railroad filed for bankruptcy
- By the 1970s, 21% of track-miles were operated by bankrupt railroads
- deferred maintenance and delayed capital expenditures amounted to billions of dollars
- rate of accidents due to track or structure defects quadrupled from 1966 to 1976
- BY 1976, 15% of track (50,000 miles) was operated at reduced speeds (as slow as 10 miles per hour)
- standing derailments (when a train falls over when not moving) became prevalent
- terminal facilities deteriorated

Deregulation improved performance

- Inflation-adjusted rail rates have plunged 60% from 1981-2001
- By 1999, railroads were generating 58% more ton miles than in 1979
- In the 1990s, railroads stopped the erosion of market share. From 1996 through 1998, the railroad's market share actually exceeded 40%

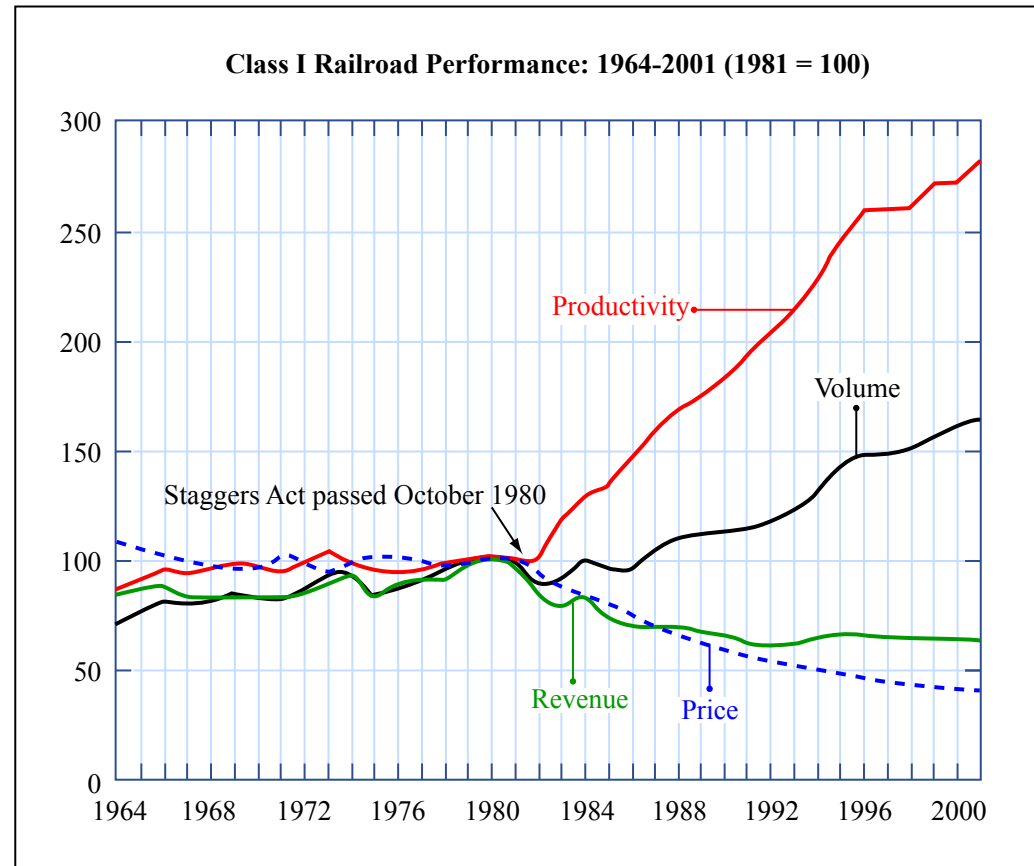
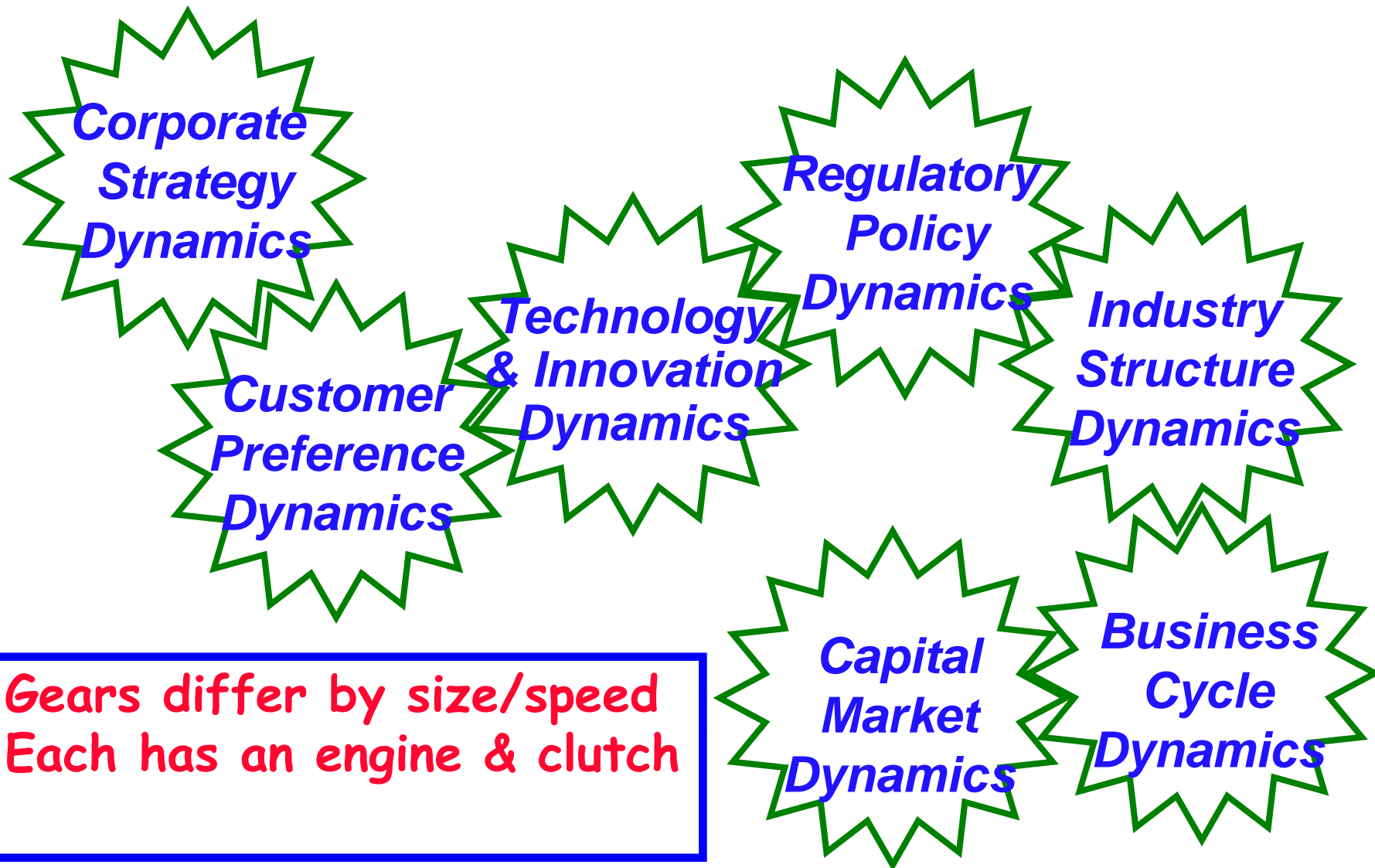


Image by MIT OpenCourseWare.

“Gear Model” to support Roadmapping of Value Chain Dynamics (VCD)

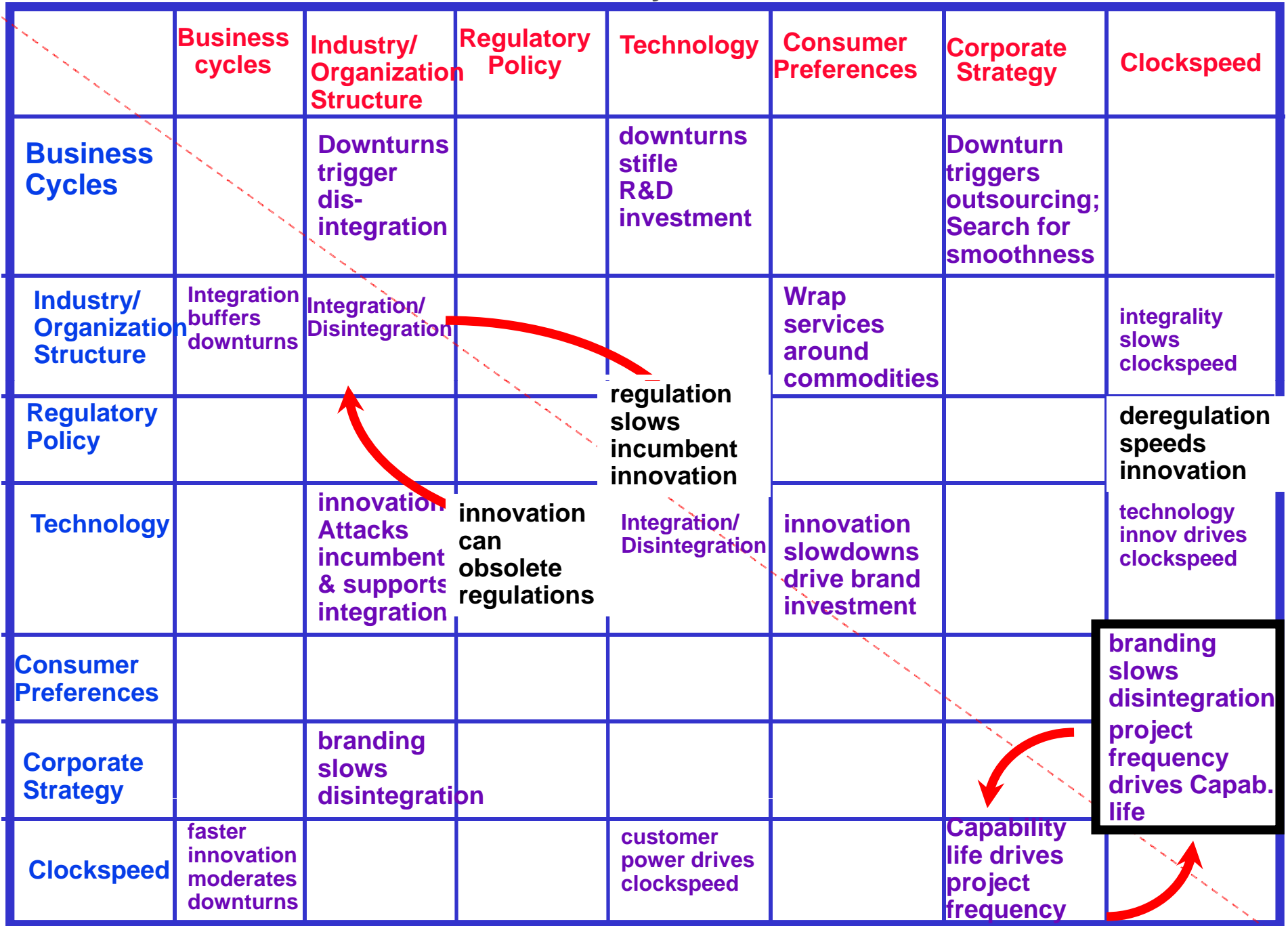


Gear Teeth Dynamics

	Business cycles	Industry/ Organization Structure	Regulatory Policy	Technology	Consumer Preferences	Corporate Strategy	Clockspeed
Business Cycles							
Industry/ Organization Structure							
Regulatory Policy							
Technology							
Consumer Preferences							
Corporate Strategy							
Clockspeed							

Gear Teeth Dynamics

	Business cycles	Industry/ Organization Structure	Regulatory Policy	Technology	Consumer Preferences	Corporate Strategy	Clockspeed
Business Cycles		Downturns trigger dis-integration		downturns stifle R&D investment		Downturn triggers outsourcing; Search for smoothness	
Industry/ Organization Structure	Integration buffers downturns	Integration/ Disintegration			Wrap services around commodities		integrity slows clockspeed
Regulatory Policy				regulation slows incumbent innovation			deregulation speeds innovation
Technology		innovation Attacks incumbent & supports integration	innovation can obsolete regulations	Integration/ Disintegration	innovation slowdowns drive brand investment		technology innov drives clockspeed
Consumer Preferences							branding slows disintegration project frequency drives Capab. life
Corporate Strategy		branding slows disintegration					
Clockspeed	faster innovation moderates downturns			customer power drives clockspeed		Capability life drives project frequency	



Mother Nature strikes

The Cell Phone Supply Chain

8:00 pm, Friday 17 March 2000: Lightning Strikes an ASIC semiconductor plant of Philips in Albuquerque, New Mexico, USA
8:10 pm: Fire is extinguished. Plant will be down for months.

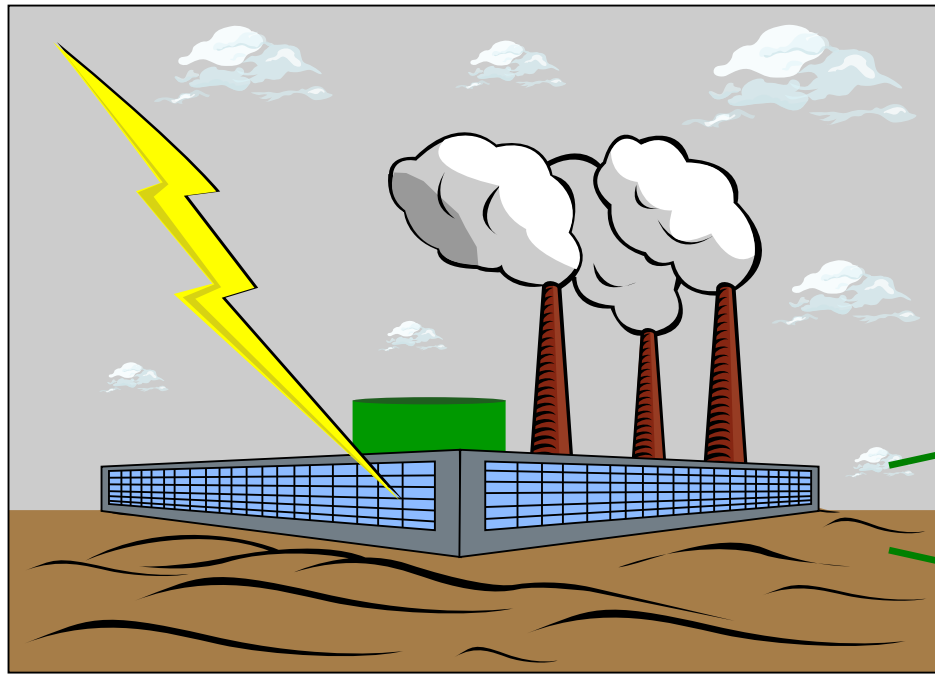


Image by MIT OpenCourseWare

**Philips
Chip Factory**

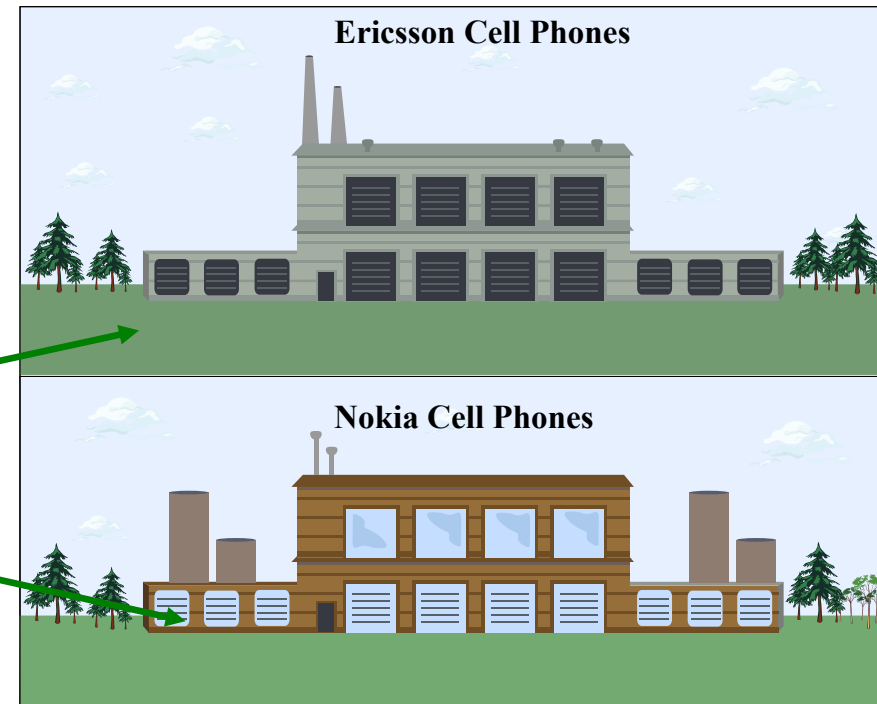


Image by MIT OpenCourseWare

LESSON: RESPONSE SPEED

Mother Nature strikes

The Cell Phone Supply Chain

NOKIA

Shipment discrepancies noticed within 3 days.
Philips is pushed hard.
New supply sources.
New chip design.
Global capacity grab.

ERICSSON

Problem undiscovered for weeks.
Slow chain of command.
Slow response.
Capacity already taken.
\$400M revenue loss.
Exits phone manufacture.

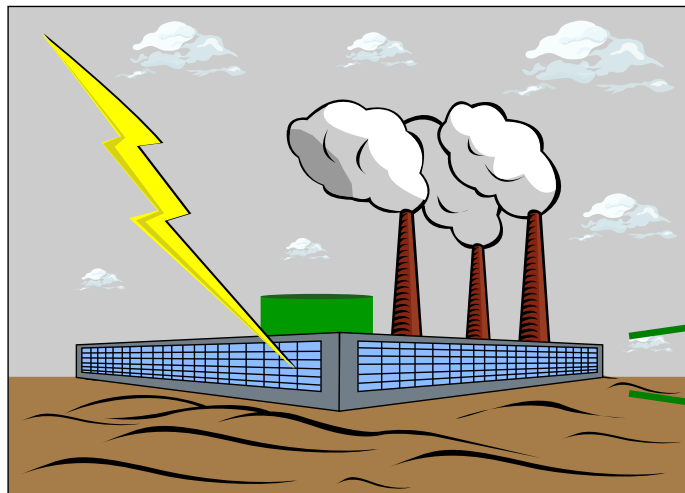


Image by MIT OpenCourseWare.

**Philips
Chip Factory**

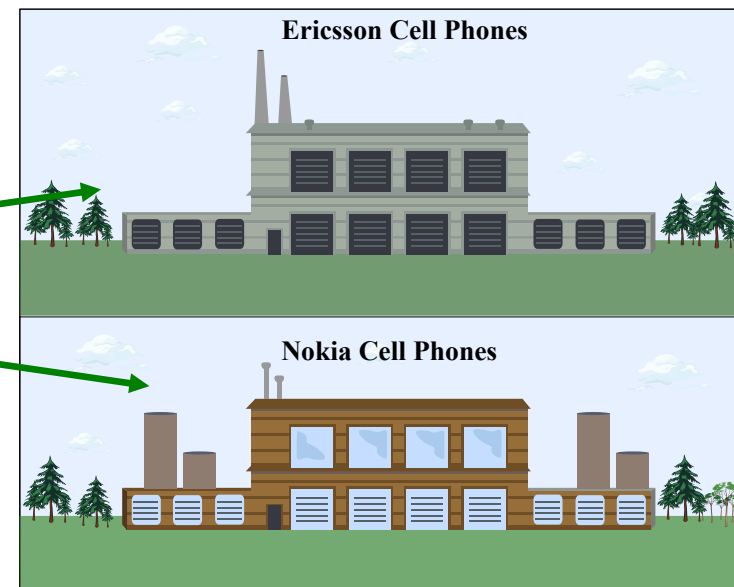


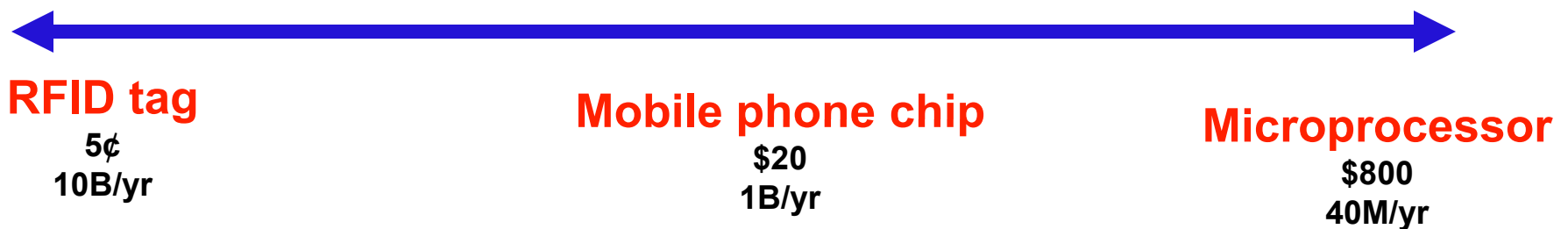
Image by MIT OpenCourseWare.

LESSON: RESPONSE SPEED

RFID tags push the boundaries of the Edge

(Research Assistant: Natalie Klym)

1. DoD wartime needs will *prime the pump* for RFID technology and applications.
2. Walmart will add to this effect: box & pallet.
3. Pharmacies will do the same for item tagging.



What *disruptions* will be driven by
the explosion of the edge?

VALUE CHAIN MAPPING

Exercise

For each business:

Key elements in the chain?

Who has power in the chain?

**Who makes the profits
in the chain?**

**Sources of power & profits
(technology, brand, etc.)?**

**Key dynamic processes
influencing chain power?**

Locus of innovations?

Clockspeed Drivers?

Energy

Automotive

Consumer Products

Telecoms

Financial Services

Construction

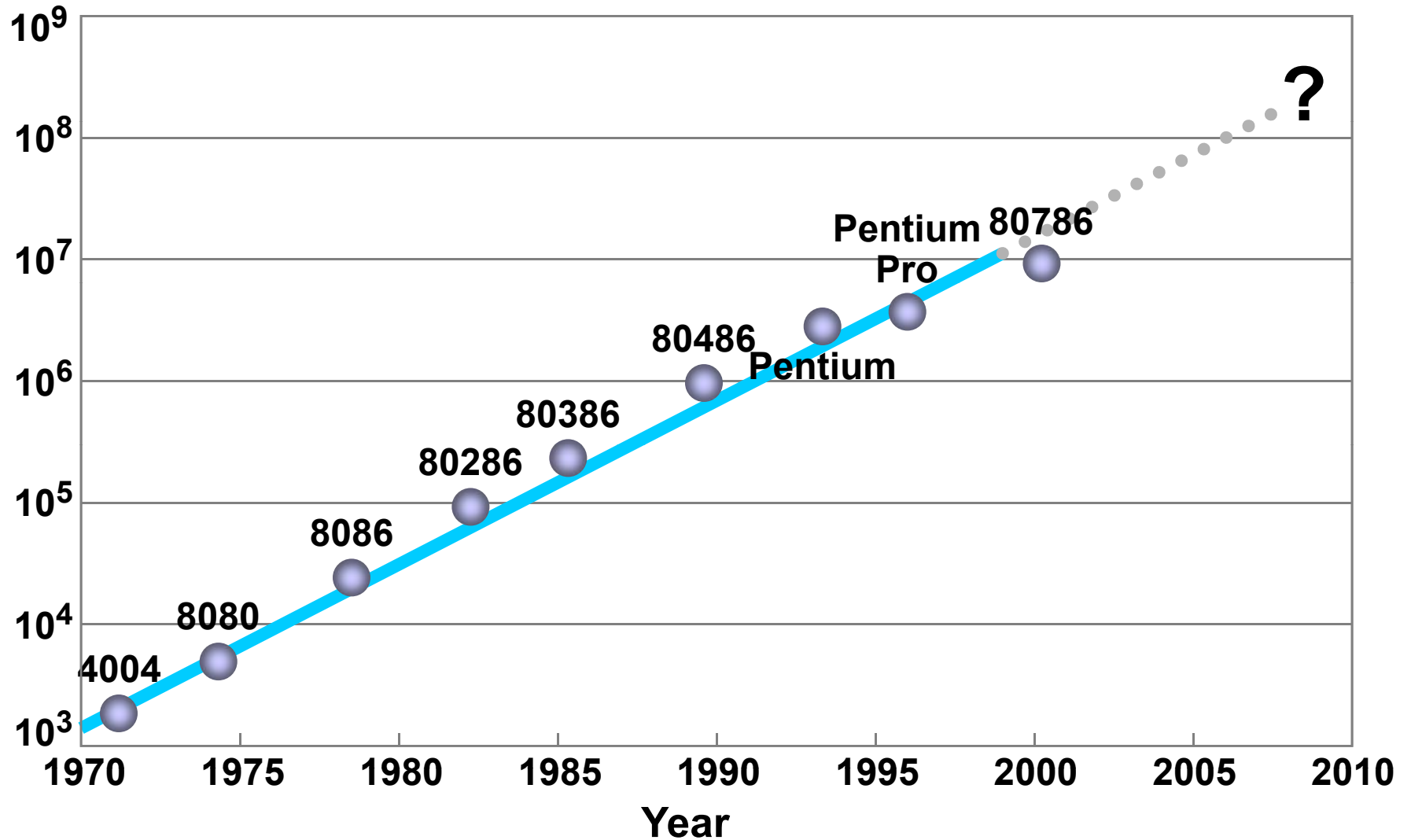
Health Care

Food

Chemicals

Moore's Law

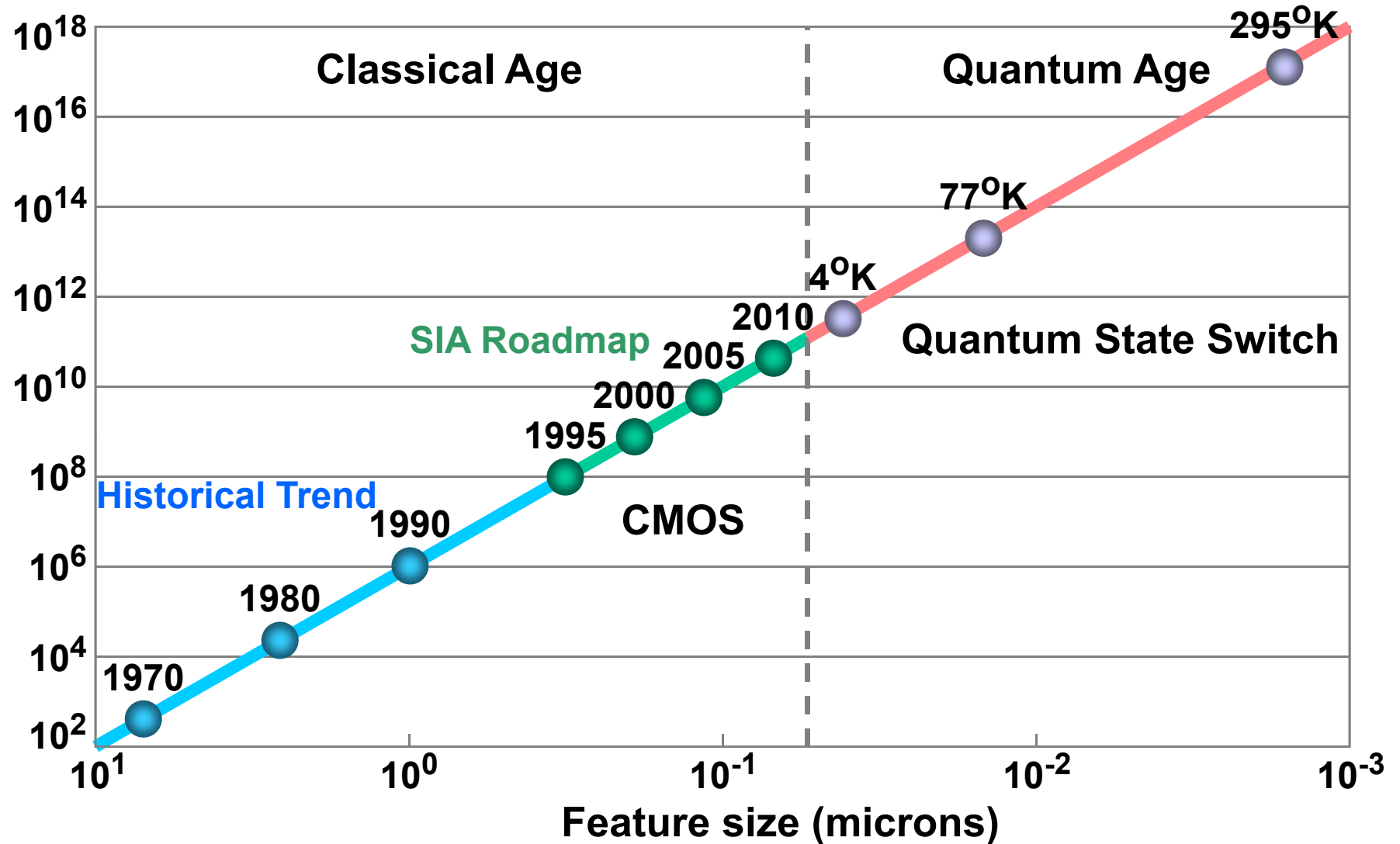
Transistors per chip



Source: Joel Birnbaum, HP, Lecture at APS Centennial, Atlanta, 1999

Roadmap for Electronic Devices

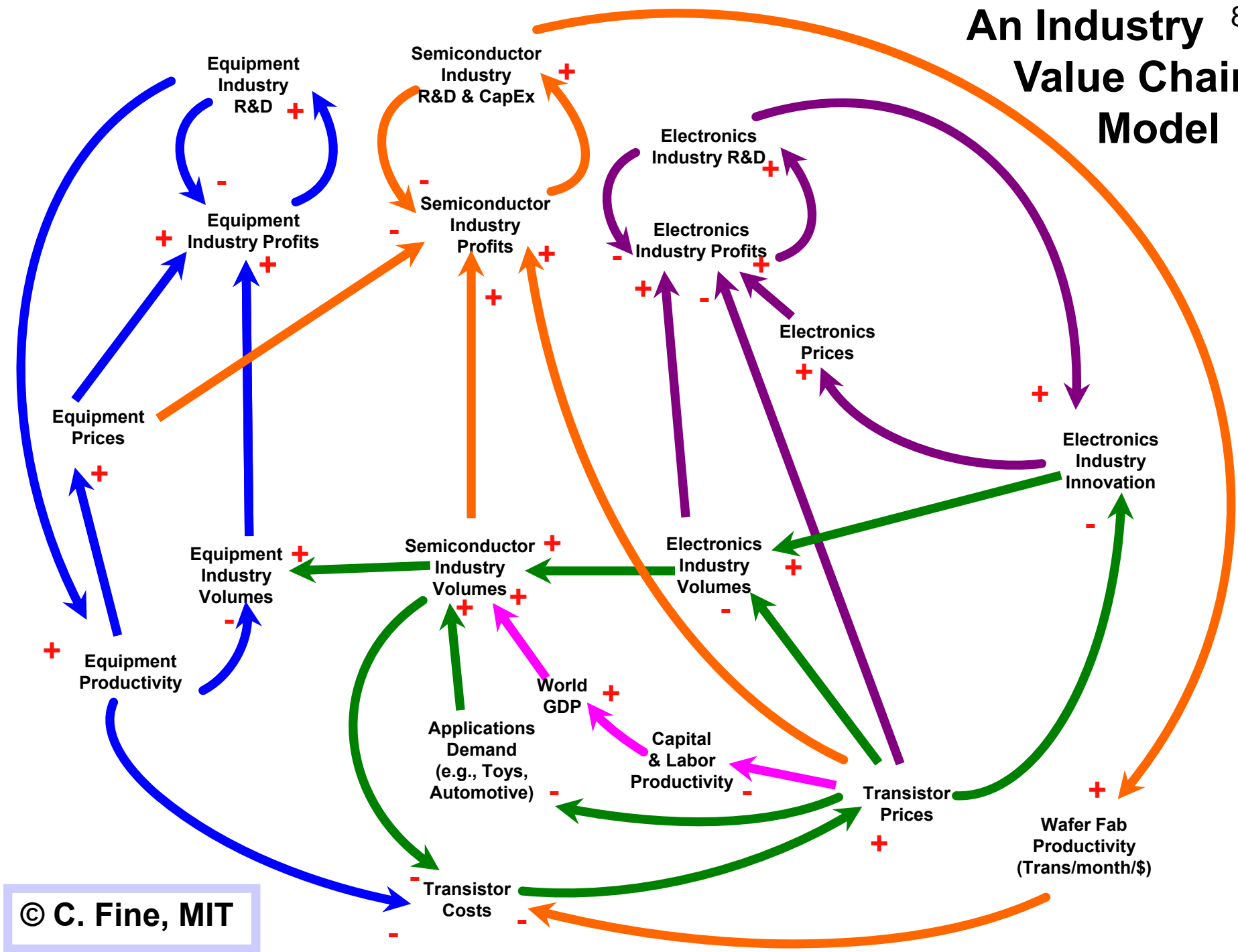
Number of chip components



Horst D. Simon

LAWRENCE BERKELEY NATIONAL LABORATORY

An Industry Value Chain Model ⁸⁷



The Outsourcing Trap: A Novel of Four Families

- **Navy Pilot:** Crash, Investigation, SC education, “Columbo”
 - Visits, Toyota, Dell, Zara & aircraft supply chain
- **Pilot’s sister:** MIT grad; laid off; discovers entrepreneurship
- **Pilot’s wife:** Policy analyst for Senator;
- **Pilot’s son:** outsources homework; *outsource capacity, not knowledge*
- **Pilot’s daughter:** business student; Zara shopper

- **Chinese Entrepreneur:** (e.g., Morris Chang/Terry Gou)
 - “Benevolent Father:” Chinese coexistence; Henry Ford; HongSing
 - Ultimately brokers cooperation
- **Warrior Daughter:** Chinese domination; aggressive growth

- **Defense contractor: Three Generations**
 - Grandfather (England), Father (USA), Grandson (affair w/Chinese daughter)
 - Makes avionics systems; lobbies senator; Outsource to HongSing
 - losing commercial business to Chinese

- **U.S. Senator:** Loses son in crash, orders investigation
 - Pork to military contractors; but cost pressures as well
 - How to keep good jobs in USA?
 - Campaign contributions from Americans & Chinese
 - “Caused” the death of his son
 - Ultimately works on collaboration with Chinese CEO & Gov’t

- **3rd tier supplier:** illegal outsourcing of circuit board
 - Tells senators: “you made me do this”

All Conclusions are *Temporary*

**Clockspeeds are increasing almost everywhere
Value Chains are changing rapidly**



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15.769 Operations Strategy
Fall 2010

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